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Finance and Investment

Del Credere provision applied within the central payment system

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Abstract

The business model called central regulation (from the original German term "Zentralregulierung") which has a very long tradition not only in the country of its origin but also in other western European countries. It is used mainly within trade associations that bring together large number of trade companies operating in different areas. In this article we will focus on general description and understanding of examined business model as well as on its application in business environment. System of central regulation plays an important role for small and medium enterprises to be able to strive against competition on the market. It is payment settlement system which is related to the payment transactions between suppliers and traders / customers who are members of a purchasing association. Generally, we speak about an organization offering financial services and control of cash flow between contracted partners of purchasing association - suppliers on the one side and customers on the other side. All these trading companies together create one huge buying group which is trying to use its purchasing power (based on the procurement of bigger volumes) by negotiations with suppliers/producers. There are many advantages for suppliers and customers arising from taking part in this payment system and these will be described in the article as well as new opportunities which are brought by this business model.

Keywords: Del Credere Provision, Central Payment, Central Regulation, Buying Groups, Purchasing Association, Economies Of Scale.

1 Introduction

Behind the challenges of increasing competition on the market there are hidden many short-term changes in trade conditions as well as many new ideas and strategies. The speed of innovations in economics has increased rapidly in the last years and one of the results of this development is competition - there has never been so much competition like today. In order to meet the challenges at both national and international levels companies need solutions which on one hand can push the firm forward and on the other hand can be implemented very quickly.

Current situation represents the new trend in which small and medium-sized enterprises (SMEs) are very often not able to fight against extremely big competition. The market shows us that the successful answer to the hyper competition, which has been rapidly increasing in the last years, could be the cooperative company networks and cooperation of already existing co-operations. This brings to the business necessary flexible combination of various resources. In particular, SMEs see in the cooperation the right way how to reach the critical size demanded by the competition, avoid risk, reduce costs and raise the capital. However, unsuccessful cooperation shows also a danger of failure leading to losses.

One example of such cooperation can be a buying group or a purchasing association where many SMEs can create one huge company which can be several times bigger than its member companies. In order to operate successfully in the market, buying groups are nowadays encouraged to develop new strategic concepts because there are many structural changes in the

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market. Fast technological development requires adaption of existing trade forms or lead to establishing of completely new business models and business areas. In addition to the legal assumptions and challenges regarding the requirements of digital world, the speed of the development plays a crucial role. So before implementing any idea into the business, it is advisable to collect as much information as possible about all legal conditions regarded to that issue.

In their core business activities, many purchasing associations use a model called central regulation (from the German origin "Zentralregulierung"). In this article we will focus on the general description and understanding of the above mentioned business model which is probably not very known but has been very successful in the countries in the Western Europe e.g. Germany, Austria, BENELUX etc., where it has a very long tradition. Buying groups plays an important role for SMEs in order to fight against the competition. Some reasons why it is advisable for SMEs to be a part of bigger organization will be analysed within this study.

2 Literature review

In the following summary there are selected studies addressing buying groups and central payment system, their current position on the market, advantages and disadvantages for participants as well as future assumptions about development of these cooperation units. There is also evidence of key factors for success of buying groups (AHLERT D. et al., 2006) that are described in the table below.

It is very difficult to bring generally valid numerical conclusion about impact of central payment system on cost savings in companies participating in this system. (MANDEWIRTH S., 1997). One of reasons is diversity of all companies and the level of cooperation with buying group.

In all observations, it is clear that pure buying groups acting the same way as in the past are not able to operate on the market in the future. There are assumptions that these groups will converge to hybrid models which combine buying associations´ characteristics with those of e.g. franchise systems. (Wegner D., Padula A., 2009)

Table 1 Overview of selected studies on buying groups, central payment system and its existence in the future

Author / Year	Main points of the study / Methodology / Analysed country	Results of study - current situation, advantages and disadvantages of business cooperation units and central payment system	Conclusions and future trends
Wegner D., Padula A., (2009) Brazil[2]	- Cooperation trends in horizontal business networks - retail networks - Methodology: study based on secondary data and in-depth interviews with German experts - Country: Germany	- Business cooperation models are an important strategy for survival and competitiveness of independent enterprises in Germany - Disadvantage: entrepreneurs have reduced rights to participate on networks decisions. - In cooperative networks, the authority of managers and	- Centralized governance as a way to coordinate big networks - Mixed models of organization, combining the cooperative system with the branches system and the franchise system - Establishment of networks alliances -merger of cooperative groups and their internationalization

[2] See WEGNER D., PADULA A. (2009). Tendências da cooperação em redes horizontais de empresas: o exemplo das redes varejistas na Alemanha.

		directors is limited and implementation of ideas and plans of the network depends on the conviction of the participating companies. Under such conditions, managers acquire new contours and require new skills that deserve to be explored in studies that involve managers of inter-organizational networks.	- Industry often refuse to supply small businesses -> solution: being part of greater cooperation business network
WEST HAUS EN H. (2015). Düsseld orf[3]	- Differences between buying groups and franchise systems - Methodology: Online questionnaire and interviews with experts - Country: Germany	Association groups: - Increasingly build their uniform brands on the market (like franchise system), which lead to: 1. Greater connection to the system, 2. More standardized assortments, 3. Increasing customer orientation, 4. Higher focus on the sales side ("front-end") Franchise system: -Tend to be focused more on qualitative than quantitative growth (more internal growth than only acquisition of new partners) - this leads to increase in importance of the individual franchisee -Increasing importance of optimization of backward processes and purchase ("back-end")	- Since association groups and franchise-systems tend to be more and more similar in their features and activities, there is an assumption for the future that there will exist hybrid models which will include activities and services of both, association groups and franchise systems
ROHN, T. (2016). Hannov er[4]	- Central payment system and its position on the market in the future - Analysis of advantages brought by central payment system to all participants - Country: Germany	- Costs of processing incoming invoice (30EUR) and outgoing invoice (15EUR) can be reduced by 50% - using electronic interchange of all data from invoices Advantages: - Member of association: simplification of intern processes, administrative activities - there is more space for core business activities - Contracted suppliers: save postage and handling costs, simplify their receivables management	- New trends lead to digitalization of all data interchange between participants of central payment system (documents, information, evaluations) - Consulting function of headquarter of buying group will be increasing towards all participating companies - members and suppliers - consulting function with focus on process optimization

[3] See WESTHAUSEN H. (2015). *Interne Revision in Verbundgruppen und Franchise-Systemen. Verbreitung und Qualität der Internen Revision in Unternehmensnetzwerken.*
[4] See ROHN, T. (2016). *Zentralregulierung für Verbundgruppen - Ein Modell für die Zukunft?*

MANDEWIRTH S., (1997), Pulheim[5]	- Reduction in transaction costs achieved by participating in business cooperation networks - Central payment system used within business cooperations - Country: Germany	Advantages: - Using electronic exchange of data within central payment system results not only in lowering transaction costs, but it leads to new opportunities for profit because purchase is simplified and company can focus on its core business - Members benefit from attractive purchase prices achieved by bigger volume purchased for all member companies (economies of scale) Disadvantages: - Reduction of transaction costs cannot achieve its maximum when there are still members who do not accept electronic data interchange and stay by old payment methods through paper. This is a challenge for every buying group - to bring all members to this system, so that the reduction in paper work can be significantly higher	- Buying groups want to intensify connection with their members and suppliers - one possibility how to achieve this will be contractually agreed investments (commitment to purchase some volume of products within a year) or long-term periods by terminating contracts
AHLERT D. et al., (2006), Berlin[6]	- Types of cooperation and its importance - buying groups, franchise system, association, alliances -Analysis of strategic factors for success within business cooperation networks -Country: Germany	- B2B and B2C represent the world´s fastest growing organizational form of entrepreneurial activities and beside it buying groups and franchise system play an outstanding role in trade - Importance of business cooperation explained through a phrase: "Who does not cooperate, looses." - Participation in cooperation network as an essential way for SMEs to fight against hyper-competition - Factors for success: 1. Efficiency and power to implement new ideas in the level of buying group headquarters (network management) 2. Quality and motivation of both, network partners and stuff in the headquarters (human capital)	- Hybrid systems are future of business network cooperation - Headquarters of buying group have to be financially strong enough to keep up on fast-changing market (including digital technology) - In these times of hyper-competition it is necessary to be able to respond quickly and flexibly to market and, above all, customer requirements.

[5] See MANDEWIRTH S. (1997). *Transaktionskosten von Handelskooperationen. Ein Effizienzkriterium für Verbundgruppen und Franchise-Systeme.*

[6] See AHLERT, D. et al. (2006). *Unternehmenskooperation - Auslauf- oder Zukunftsmodell? Strategische Erfolgsfaktoren kooperativer Unternehmensnetzwerke*

		3. A strong brand for network or a coordinated presence on the market of all participants (brand management) 4. Exchange of experience and networking of all partners (knowledge management) 5. Cooperative corporate culture	

<div align="center">Source: Author's research</div>

Each of recent studies and conference papers are in line with our assumption that small and medium - sized enterprises should become a part of some cooperation network in order to be able to fight against competition. Being a part of bigger group, having greater purchasing power is the future of SMEs. However, owners of these companies have to accept the reduction of their rights to participate on the decision making within this cooperation unit.

3 Group of associated companies - purchasing association, buying group

Bundling an economic power, achieving better purchasing prices through bigger volume, or searching for a stable partner who can help to win against your competition are reasons why SMEs in many different industry sectors are looking for cooperation with other companies and they try to become a member of some buying group / purchasing association.

Purchasing Groups[7] can be defined as *"two or more organizations joined together (or through a third party), in order to combine needs and leverage negotiating strength. This allows the individual purchasers the contractual strength to access best prices, best services, and best technologies that they might otherwise be unable to negotiate."* (Giordano, 2015)

In the centre of the buying group, there are contracted partners. Manufacturers (suppliers) on one side trust that through this cooperation they will reach solid source of new customers while distributors (members) on the other side are expecting valuable advantages for their end users. The partnership between the association and its members and supplier demands discipline, consistency and respect from both sides. This is the only way how all participants can achieve success. Not every trading company can become a member of the association. In most cases there are some conditions which have to be fulfilled. Becoming a member of the association is a longer process which begins with the analysis of the financial situation of the company. System of central payment means a commitment for the association which is active through its bank (big associations mostly found their own bank) to transfer all money for all the members at a certain time to all contracted suppliers. For this guaranteed transfer of money association receives a remuneration called "del credere" provision. That´s the reason why acceptance of the new company into the group of affiliated partners is preceded by detail examination of the financial situation. Company is mostly required to submit its balance sheets, profit & loss statements and then the bank examines company´s creditworthiness and solvency.

One of the main objectives of buying groups is to help their B2B company members to reduce the overall costs which each company has processing all payments. This is connected for instance to reduction of credit card processing costs and increase in cash flow.

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[7] Purchasing Groups can be also known as Centralized Purchasing

Purchasing association often means a key source of goods for its members. But on the market there are many challenges for these associations, for instance hyper-competition within their industry sector. In order to be more and more attractive for its partners, they need to develop its services and product ranges to win new clients and of course not to lose current members. In many cases these associations develop during the time from pure purchasing association into an integral, high-performance service provider for member companies. For the association a modern partnership means development of member´s market position with the objective to ensure strong, future success in the competitive environment. They are offering a multitude of professional services, alongside the extensive product ranges. Except of important cooperation in procurement they also operate on the market as central provider of marketing services.

3.1 Cooperation as a key success for SMEs

Cooperative corporate networks are an important part of professional business world more than 100 years and within European area they have very strong presence especially in Germany. Associations are considered as one of the oldest forms of cooperation with the birth date back to mid-19th century and it was connected to the retail freedom of trade introduced at that time. (Ahlert, 2006)

According to the German organization "Zentralverband Gewerblicher Verbundgruppen"[8] there are currently more than 230.000 small and medium-sized companies associated into approximately 310 associations. Evidence of its importance is overall turnover which is generated annually. All companies taking part in cooperative networks achieve annually more than 490 Billion Euro and this represents 18% of GDP in Germany. (Mittelstandsverbund.de, 2018)

Not all the headquarters of these associations offer the same support to their members. Partial business tasks such as marketing and promotion of private labels or special price discounts usually belong to the activities of these associations, as well as guarantee of payments through "del credere" provision and central regulation system (both often done also by external service providers). There are also other services which are provided by this kind of companies. For instance, negotiations of purchasing conditions by contracted suppliers, consulting services, logistics, multi-channel, information technologies, financial services, internationalization and trend research. They are the source of important information for their partners and through the data collected from all participants we can consider them also as a central data bank. As the data collector serves the suppliers who can send all the information about sold products to one central place instead of sending them to hundreds of clients.

When speaking about German specialized association this is often recognized by the industry as a capable, efficient partner whose key coordination role is acknowledged in the European trading landscape. The scope of services depends on the structure of members and the width of services differentiates according to their needs.

[8]Zentralverband Gewerblicher Verbundgruppen (ZGV) is central association of the cooperating small and medium-sized companies and its main role is to take care of the interests of all member companies (Mittelstandsverbund.de, 2018)

3.2 Central payment business model used within buying association

Central regulation (or a system of central payment) is a payment settlement system which is related to the payment transactions between suppliers and trading companies (customers) who are members of some purchasing association. Generally, we speak about an organization and control of cash flow between the contracted partners of purchasing organization. From customer's point of view, often called members of purchasing association, they could be for instance wholesalers, retailers or some other smaller associations created by group of some companies (in this case we can speak about cooperating co-operation and these companies would be indirect members of the main purchasing association). All these companies together create one huge buying group which is trying to use its power (based on the procurement of big volumes) by negotiations with suppliers/producers.

Almost every company is nowadays trying to save the costs. Almost everybody knows the trend of cost-saving projects because it influences all employees in the company. Managers try to analyse and understand all the processes within the enterprise focusing on their optimization which can lead to lower expenses. More and more people are realizing that the commercial processes are generating enormous potential for optimization. Once using the system of central payment, all participants can after implementing this system directly benefit from less administration, decrease in tasks which have to be carried out by bookkeepers. Other example representing benefits can be paperless electronic communication and exchange of documents which will be mentioned within this conference paper.

3.3 Banking business with "del credere" provision

According to law, all payments within central payment system have to be realized by bank. There are many purchasing association which for this purpose found their own bank which keep records about all transactions done within contracted partners. All invoices which have to be paid from members of the association to all contracted suppliers are cumulated in this one central bank and are paid at a certain date to these suppliers (these invoices represent payables of the bank). On the other hand, all liabilities of the member companies for the delivered goods or services from contracted suppliers are according to negotiated payment terms paid to the bank (these represent receivables of the bank).

"In business law, a del credere agency is a type of principal-agent relationship wherein the agent acts not only as a salesperson or broker for the principal, but also as a guarantor of credit extended to the buyer. If the buyer is unable to pay the bill after the transaction is completed, a del credere agent may become liable for the amount that was unable to be collected." (Investopedia, 2018)

Another source defines "DEL CREDERE"9 as following: "relating to or guaranteeing performance or payment by third persons to a principal in connection with transactions entered into by an agent for the principal usually in return for higher commissions". (Merriam-Webster, 2018). Del credere commission is a fee received by a sales agent from a principal for guaranteeing the payment of goods sold. Under "del credere" we do understand the unlimited guarantee of the bank (which represents purchasing association = sales agent) towards contracted supplier, for all his receivables against affiliated member companies. Supplier can be 100% sure that he will get his money for the goods sold to his customer, regardless of the customer´s liquidity and capital position.

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[9]The word "del credere" comes from Italian language and means "of belief" or "of trust"

3.4 Process of central payment system

All payments for liabilities of the trade companies (customers) who are buying goods from various suppliers, are processed at one central place (in the bank, formed for the purpose of central regulation) and from the same place is money transferred to the suppliers at certain date. On the other side all customers pay for the goods bought from several suppliers to one central place (the same bank as in the previous case). This system of central payment provides several advantages to suppliers and traders for example faster and easier administration processes, and this system means also security for suppliers who receive money for the goods sold regularly and with high certainty.

The whole business model was founded in order to simplify the settlements between the members of the buying group (suppliers and their customers) and to insure the punctual payments between all participants. Headquarters of the purchasing organization which connects all these companies into one big buying group, is required by law to establish a bank which is bringing this business form into practice. The bank is dealing with the banking business based on "del credere" provision for the guarantee which bank takes upon its shoulders. This bank ensures punctual payments to all its contracted suppliers also in case that customers are not able to pay for their liabilities. Secure and regular income for suppliers using this system means one of the biggest advantages for the suppliers which cost them some provision to a buying organization.
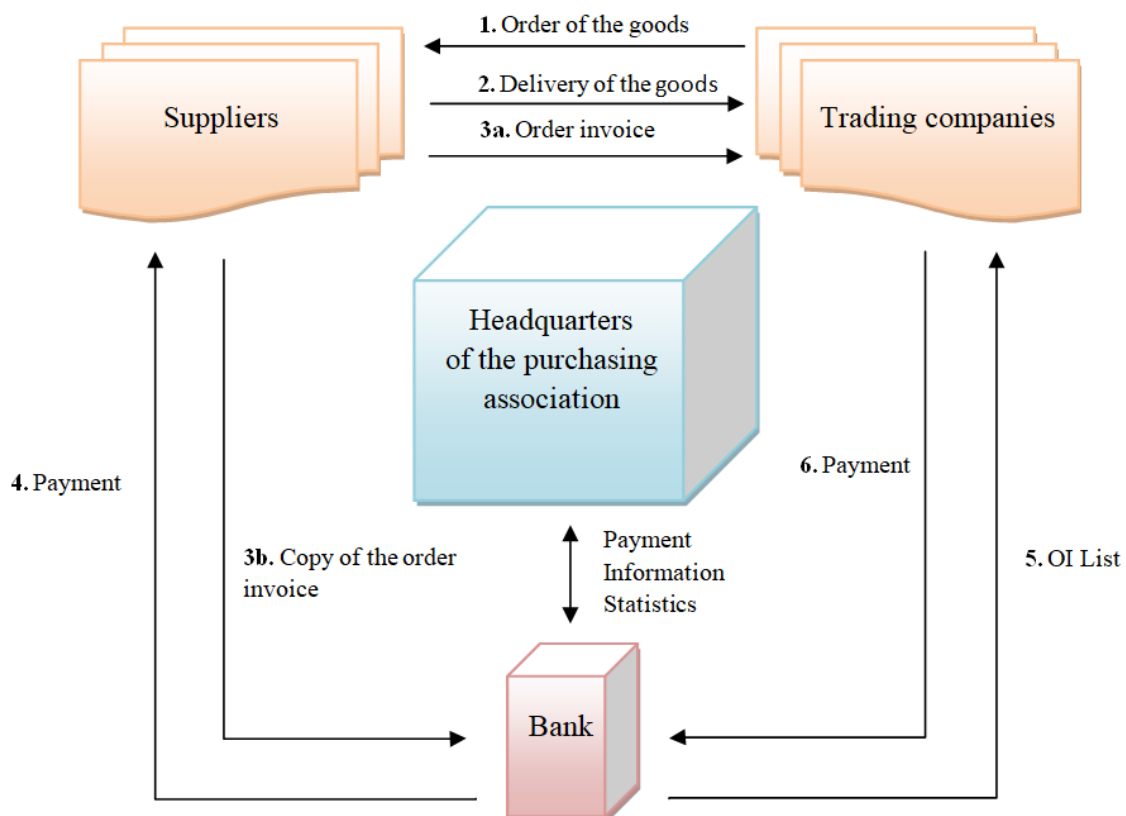
Figure 1 Process of the central payment system
Source: Author's research

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The whole process of central regulation can be described in following steps:

1. **Order of the goods**
   Customer orders the goods normally as he was used to before, directly by his supplier and for this order he receives order confirmation in which prices and delivery terms are stated. These price conditions have been negotiated between supplier and customer.

2. **Delivery of the goods**
   In this step the goods are delivered directly to the customer, to the address requested by the customer. Buying group as an intermediary in this purchase influences just cash flow, not the flow of goods. This is realized directly from supplier to customer.

3. **Invoice**
   a) **Order invoice**
      Once a delivery note is issued and goods were sent to the customer, there is an important document which is necessary for the whole central payment system - invoice document which is sent also directly to the customer either electronically or by mail.

   b) **Order invoice (copy)**
      At the same time as the invoice is sent from the supplier to the customer, the copy of it receives also the bank which is regulator of this central payment process. Bank gets these invoices consequently from all suppliers and keeps all records in its internal database system. At this stage there will be a change compared to the classic sale of the goods between the manufacturer and the buyer, since the third party enters the process -> buying association which regulates the whole payment process through its bank.

4. **Payment**
   According to the payment terms set in the contract between supplier and buying group, every supplier receives money within one payment for all invoices which he has sent during the given time period. The principle of the central payment system is based on the fact, that buying group guarantees payments to the supplier for all customers and for this service receives purchasing association del credere provision. By transferring money, the bank always deducts del credere provision from total amount stated on all invoices.

5. **Open item list**
   Once or twice in a month bank releases an OI list (open item list) to every member company. This list includes information about all invoices which were cumulated in the past days from all suppliers and have to be paid according to the agreed payment terms. These payment terms can differ between member companies but in particular, there are two possibilities of payment conditions. In order to motivate credit customers to pay sooner there is an early payment discount[10] offered by some companies. It is advantageous for entities at disposal of adequate cash as it will lead to cost saving. Let us explain it on the following example: payment term that is offered by bank to member

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[10]The early payment discount can be also referred to as a cash discount or a prompt payment discount. *"The seller often refers to the early payment discount as a sales discount, while the buyer may refer to the early payment discount as a purchases discount."*(Accounting coach.de, 2018)

is 3/5, net 60. This means that a customer is allowed to deduct 3% of the amount owed on the invoice when the payment is made within 5 days instead of paying the full amount in 60 days. These 3% for early cash transfer equates to a very attractive annual return for the firm so that many of businesses use this type of discount, sometimes even if they do not have own available cash. In such case most of them have a readily available line of credit from their own bank, where the costs of this credit are mostly lower than the amount which can be saved by early payments for the goods. When the company does not have cash or a credit line available, they use a net payment term which can differ by individual members mostly between 30 and 90 days. In our example mentioned above it means that the customer has to pay full amount on the invoice within 60 days. The biggest advantage for the member company is that money for all orders from many suppliers can be transferred within one payment and this can save not only time but also administration costs in accounting department.

6. **Payment**
   After receiving the OI list with all opened invoices, customers transfer the money to the regulating bank for all invoices from different suppliers during given period of time. They are required to pay the invoices until the maturity - either with the discount when they are paying earlier or they pay the full amount when using net payment terms. Transferring money once or twice in month to one central account instead of paying for every invoice separately to many different suppliers and different bank accounts can in the end of the year represent significant reduction of administration costs and saved time for bookkeepers.

3.5 Advantages

There are more advantages for all parties who are taking part in this payment system. The system of central regulation offers to member companies security and efficiency advantages by purchasing from variety of contracted suppliers. Collective invoicing combined with online accounting processes guarantee correct and rapid payment processes between members and contracted suppliers.

Purchasing association with its central payment system offers to the contracted suppliers financial planning security by undertaking the del credere liability and advantages in sales with many small and medium-sized trading companies which are connected to the association as members. In order to impact markets together with purchasing association and to boost sales-potential suppliers may use various possibilities offered by association. Thanks to close communication between association and its suppliers they can develop new effective marketing concepts or bring their innovations much faster to the market because buying group stands in the middle as intermediary and multiplies for supplier portfolio of customers.

Without using the system of central regulation the trading company (wholesaler or retailer) would receive separate invoice for every delivery of goods and service. Now paying every bill separately to all suppliers is a time consuming activity. In addition, the possibility that some mistakes can happen is quite probable. This brings us to one of the biggest advantages of this whole system - through processing of all invoices at one central place there is also much lower probability that some errors will occur.

Furthermore, purchasing association is able to reach the scale economy. Creation of the network of enterprises coming together to order supplies means the volume of the aggregated purchase demands and here arises the opportunity for small individual businesses to achieve the economy

of scale and benefit from multiple purchasing power that they just alone could not be able to obtain. (Giordano, 2015)

All stages of the lifecycle of contracts are managed by buying group so that individual enterprises are able to significantly reduce their time and energy and can focus on their core business, which is more important and strategic for them.

Advantages for affiliated partners - members:
- Many partners who are demanding the same supplies within the buying group represent greater negotiating power and so they are able to get lower prices by manufactures which usually generate considerable savings (ranging from 10 - 35%)[11]
- Long-time experience of the buying group can help member companies to achieve also technical saving through bringing their purchasing to the next stage using developed buying technologies
- Purchasing association in many cases is active also as a consulting company for its members and through sharing the best practices is trying to help them to increase their profits and market share
- Member companies can benefit from the information about suppliers, new technologies and market knowledge which purchasing organization is sharing with them
- Central payment system decreases transaction costs - instead of paying to many different suppliers there is only one central bank account

Advantages for contracted suppliers:
- Suppliers receive guaranteed payments of their bundled invoices at the agreed point of time
- Thanks guaranteed payments suppliers are liquid, can plan easily and with security
- Lower costs for accounting department - there are no separate payments from all members
- Next stage of business relationship between association and supplier doesn´t need any paper exchange - everything is done electronically when internal systems are connected together
- Supplier does not need to check his customers´ financial situation because it is the job of association
- Thanks to partnership with purchasing association suppliers can achieve very easy wide portfolio of customers

3.6 Electronic Data Interchange (EDI)
One of the biggest challenges for the buying associations in these days where everything is done electronically and through the internet is to be flexible in this dynamic world. The technology is developing very quickly, so the response time of such organizations to the changes in the electronic world has to be as quick as possible. Company which is connecting manufacturers with their customers and wants to stay as an intermediary between these two entities, has to offer them a value added which can be achieved also through intelligent supply chain management. Since the bureaucracy is time and money demanding, one of the good arguments for the associations towards its partners is simplification of the bureaucracy for both sides. This can be achieved through the system called EDI - Electronic Data Interchange. For nearly three decades EDI has ensured optimized B2B processes along the supply chain.

Electronic Data Interchange, or EDI for short, is the exchange of electronic business documents between business partners and belongs to the field of eCommerce or eBusiness (EDI Basics, 2018). The objective of EDI is to achieve the highest possible process automation by means of integrated data exchange and thus to avoid manual and paper-based business processes. EDI is

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[11]see Giordano (2015)

used, for example, to exchange order information between trading companies and manufacturers, as well as for billing. Electronic invoices are transmitted in real time, checked immediately and further processed.

There are various documents that are usually exchanged between businesses. To the most common documents exchanged via EDI are purchase orders, delivery notes and invoices. But there are many others such as bill of lading, customs documents, inventory documents, shipping status documents and payment documents. Introduction of such a system into company (headquarters of the association and all member companies) means also considerable costs in the following areas:

- Hardware and Software (Clearing-software and Mailbox-software)
- Manpower with "know how" for setting up and operating the system
- VAN services
- Realization of interface between members, suppliers and headquarters. (EDI Basics, 2018)

The analysis of the EDI show following strategic advantages which can be achieved with this system:

- Better competitiveness
- Fast response to market changes
- Improved service for the members and suppliers

Finally, there are expectations that implementation of this system will result in tighter, stronger and longer-term relationships between the EDI partners.

4 Conclusion

Consumer behaviour and the fast technological development lead to the general changes in the market behaviour of all parties involved. New business fields are giving new chances and as consequences there are shifts in the market shares of trade forms and in addition completely new business areas are developed.

Central regulation system takes over the function of a billing system described within this study, where regulating bank founded by purchasing organization represents "payment point" which regulates cash flow between all contracted partners - suppliers and trading member companies. There are many advantages arising from using this payment system which have been mentioned above.

The philosophy of this business model demonstrates that aggregation of more customers into the bigger groups enables them to purchase together much bigger volume from the suppliers and by doing this they are able to negotiate better conditions such as more attractive prices, longer payment terms etc. There are new opportunities for both sides of participants. Suppliers can easily expand to the new markets through contacts provided by association and on the other hand customers who are active locally with local suppliers can start cooperation with other producers.

We believe that there is a big potential for purchasing associations to growth on the market. They will make a high contribution to the financing of their partners´ profits as compensation to the uncertainty possibilities in external financing. Finally, we can summarize that whole this central payment model allows all participants to think globally, trade locally and regulate centrally.

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Business performance analysis in terms of modern methods of financial analysis

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Abstract

Currently, there are many factors to keep the business in a prosperous state in the market environment. The executive company needs managers who have as much relevant business information as possible to guide financial resources in order to ensure the smooth running and further development of the business. Information on the level of management provides a financial analysis, whose output helps in the management of the company, when comparing the company with the others, as well as in the retrospective evaluation of the executed decisions. Modern methods of financial analysis develop the traditional concept of financial analysis. The submitted contribution analyses the performance development of the selected enterprise by modern methods of company financial analysis. The analysis is based on the company's financial documents.

Keywords: Financial Analysis, Ratio Indicators, Modern Methods, Liquidity, Activity, Profitability, Debt, EVA, RONA, CROGA,

JEL Classification: G 30

1 Introduction

The authors view issue of financial analysis in a different way. Financial analysis can be defined as "the systematic analysis of data containing mainly the accounting statements". The process of financial analysis includes the evaluation of the management of the company in the past, the present, and future development.

There is a close link between accounting and the process of management of the company. Accounting provides information, which is further processed in the financial analysis. The outputs of the financial analysis then uses the management as a basis for decision making and improvement of operations of the company. (Ručková, Roubíčková, 2012)

Financial analyst working on financial analysis may obtain information from a great variety. The basic source of information for the elaboration of the financial analysis is considered to be the financial statements. The act on accounting 431/2002 Coll. is defined as "a structured presentation of facts subject to the bookkeeping, provided by the persons (users) that these information use". The financial statements in the system of double entry bookkeeping consists of the following financial statements: balance sheet, profit and loss account, and notes. For the purposes of the financial analysis, we also use cash flow which is mandatory to construct entities. Financial statements are then verified by an auditor. (Zalai, 2013) (Dluhošová, 2010) Methods and procedures of financial analysis are permanently getting standardized. For the normal financial analysis of a business, there following methods are used:

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- The analysis of absolute indicators – analysis of the equity and financial structure, trend analysis (horizontal analysis), the percentage analysis of the individual items in the balance sheet (vertical analysis).
- Analysis of the flow indicators – analysis of income, expenses, profit, cash flow.
- Analysis of business indicators – these are indicators of liquidity, activity, indebtedness, productivity, profitability, indicators of the capital market.
- Analysis of systems of indicators.
- Aggregated indicators management.

In addition to the deterministic methods may also be used mathematical-statistical methods. (Synek, Kislingerová, 2010) The fundamentals of different methods of financial analysis are financial ratios. They represent a formalized view of economic processes. Financial indicators are the numeric characteristic of the economic activities of the enterprise. Indicators directly taken from the accounting statements are expressed in monetary units, but arithmetic operations we can get the result in other units, e.g. in units of time, in percentage. The choice of the type of the pointer depends on the purpose and objective of the financial analysis, therefore, depends on the target group, which will be the results of the serve and from the business plan and circumstances. Financial analysis is not a purposeless tool for the financial management of the company, but targeted analysis detection of the strengths and weaknesses of its financial health". (Růčková, 2011)

Modern methods of financial analysis

In transformation process the inputs of the business change on the outputs. The efficiency with which this is happening, speaks volumes about the company performance. Manifestation of company performance, financial situation, in which it is located. The quantitative and the qualitative results are the internal factors related to business performance. The performance involved in it, what will be the outputs of the undertaking, and thus affects its market position.

On the basis of the observations of countries with a developed capital market, since the nineties of the 20. century may be noted that the objective of the business began to move from there evaluating process expressing the result of the management to maximize the value of the business. Modern methods of evaluating the performance of enterprises, such as EVA (economic value added), RONA (return on net assets), CROGA (return on gross assets), are based. (Zalai, 2013)

Indicator EVA (economic value added) puts to the fore economic gain. This profit is expressed by the difference between the proceeds of invested capital, and economic costs, which include in addition to the cost registered in the accounting and opportunity costs.

Company performance is evaluated positively only if EVA > 0. The positive value of the indicator means, that the income from the invested capital is higher than the cost of capital, so the company creates value for the owners. If EVA = 0, the return on capital covers only the costs associated with its obtaining. If EVA < 0, this suggests a decline in the value of the business.

The basic form of the indicator EVA is based on:
- the value of the net operating profit after tax, which is increased by the interest,
- the value of total invested capital (C), which is used for the main activity of the enterprise
- the weighted average cost of capital (WACC).

Taking into account these assumptions look like the relationship for the calculation of EVA is as follows (the relationship 1):

$$EVA = NOPAT - WACC \times C \qquad (1)$$

The value of the indicator EVA in year t is calculated using the relationship of cost of capital (the relationship 2):

$$EVA_t = NOPAT_t - NOA_{t-1} \times WACC_t \qquad (2)$$

The input variable may be calculated as follows: (Zalai, 2013)

- NOPAT = EBIT $\times$ (1 - t), where t is the rate of income tax. The starting point for calculating the value of NOPAT is EBIT after tax. It is necessary to exclude all items that are not related to main business activity, or that occur sporadically and so such an item as the revenues from the sale of non-current assets (or revenues from sale of material).
- The total invested capital (C) consists of long-term capital, from which business costs arise, i.e. the business pays for its use. Thus, these include the own capital (its price is the dividend) and foreign sources (whose price is the interest). Non interest short-term foreign capital (such as trade credit) does not belong here. Variable C is therefore equal to the value of NOA.
- The weighted average cost of capital (WACC) consisting of the cost of own and foreign capital. Represent the minimum return that must the business achieve to satisfy its investors. The weighted average cost of capital is to be calculated from relation 3: (Zalai, 2013, Synek, Kislingerová, 2010).

$$WACC = r_d \times (1-t) \times D/C + r_e \times E/C, \qquad (3)$$

where r_d = cost of interest-bearing foreign capital (the capitalization rate),
   D = interest-bearing foreign capital,
   E = own capital (equity),
   C = total long-term invested capital,
   r_e = cost of equity capital (the expected return on equity).

Indicator RONA (return of net assets) may be expressed as follows (the relationship 4):

$$RONA = NOPAT/NA \qquad (4)$$

with NOPAT = EBIT after tax, NA the = net assets = INTANGIBLE DHM inventories receivables from customers – liabilities to suppliers

In evaluating the performance of the enterprise, it is desirable to pay inequality RONA > WACC.

When the indicator CROGA (cash return on gross assets), we work not with the outcome of the management as to the variables EVA and RONA, but with the operational flow of cash. Relationship 5 for the calculation is as follows:

$$CROGA = OATCF/GA \qquad (5)$$

while OATCF (operating after tax cash flow) = operating cash flow after tax = operating profit after tax and depreciation GA = gross assets (gross assets) = DM ČPK

Operating cash flow after tax (OATCF) is most commonly defined as the sum of the operating profit after tax and depreciation. The value of the gross assets of the segment dc as the sum of the fixed assets in the current cost and the net working capital. In evaluating the performance of the enterprise, it is desirable that it was CROGA > WACC. (Zalai, 2013)

2.1 Goal of the research and methodology

The objective of this contribution is to analyze the performance of a selected company with modern methods. Modern methods develope the traditional concept of the financial analysis. In order to fulfil this main objective, we used the sub-objectives. Web come of the financial documents of the company for the years 2015, 2016, 2017, and from publicly available information, particularly from financial statements. By partial objectives, we determine the input data and calculate the economic value added (EVA), the value range of the EVA, the relative indicator EVA, EVA, ROS, EVA Momentum, return on net assets (RONA) and return on gross assets (CROGA). In the end, we evaluate financial situation of the enterprise on the basis of the analysis and related proposals for improving the financial management and performance of the business.

From the general theoretical scientific methods, we use the method of analysis and when comparing the results of the indicators in individual years, we use the method of comparison and the method of synthesis, where we come to conclusions.

2.2 Results achieved and their comparison

In the context of modern methods of financial analysis, there are the calculated indicators of the economic value added (EVA) and return on net assets (RONA), return on gross assets (CROGA). The data are obtained from publicly available sources, particularly from financial statements and annual reports of the company.

Calculating indicator EVA

The calculation of economic value added EVA is one of the most modern indicators of financial analysis in evaluating the performance of the business. The indicator EVA is designed to take into account economic profit, which business produced after the recovery of the costs for own and foreign capital.

For the calculation of the value of the indicator EVA, the calculation of the related sub-data – NOPAT, NOA, and WACC IS needed. All input data necessary for the calculation of EVA, as well as the resulting value of EVA for the individual years can be seen in table 1 and in chart 1.

Table 1 Calculating indicator EVA

Year	2015	2016	2017
NOPAT	-203 865	2 827 753	3 672 899
NOA	39 230 171	43 380 964	37 818 133
WACC	10,01%	9,82 %	8,65 %
EVA	-4 132 612	- 1 430 236	353 349

Source: self-processing
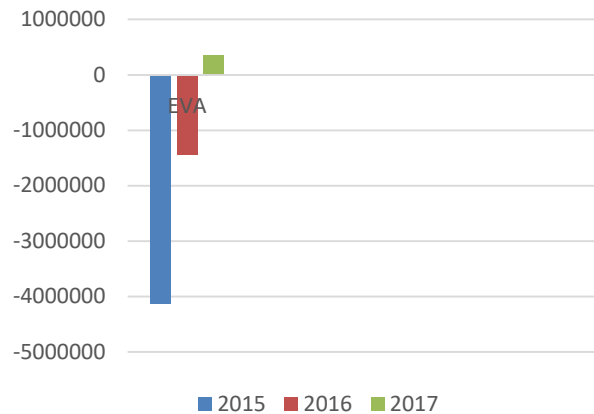
Figure 1 Development of EVA
Source: Self processing

In 2015, the company came to a negative value of EVA in the amount of 4 132 612 € so any added economic value can be created. The company achieved a respectable profit, but it was reduced by a disproportionately high value of the sold long-term assets, especially financial.

Assuming the absence of income with the irregular occurrence, the value of EVA was almost three million. The value of EVA for the year 2016 was -1 430 236€ This means that the absolute cost of operating the assets were higher than the operating profit after tax. This status is not for investors, the long-term acceptable. In 2017, the value of the EVA got into the positive numbers, when the value 353 349 €was reached. From this, we can see that economic value added is growing, which is a positive signal for the shareholders. The value range of the EVA, i.e. the net profitability of operating capital has developed to like EVA. Value range EVA in 2015, representing -10,53%, in 2016 is increased to -3,30%, and in 2017, were on the positive value of 0,93%. The data are shown in table 2.

Table 2 Calculation of value margin EVA

Year	2015	2016	2017
NOAt-1=C	39 230 171	43 380 964	37 818 133
Value margin EVA	-10,53 %	-3,30 %	0,93 %

Source: Self processing

The relative value of the EVA declined from a value of -38,63% in 2015 to the value of the -13,36% in 2016. In 2017, assuming a positive value of 3,63%. This indicator takes into account the personal costs, allowing you to compare companies with different labor and capital intensity. The data are presented in table 3 and on graph 2.

Table 3 Calculation of relative EVA

Year	2015	2016	2017
Personal expenses	6 770 314	6 447 239	6 472 449
Relative EVA	-38,63 %	-13,36 %	3,63 %

Source: Self processing
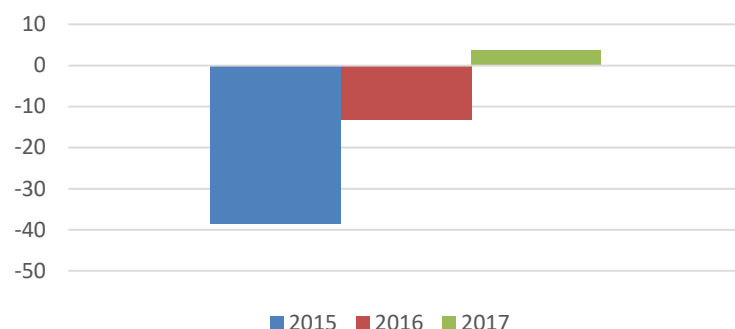
Figure 2: Development of relative EVA
Source: Self processing

Indicator EVA ROS gives the ratio of economic value added and revenues. As can be seen from table 4, the pointer acquired in 2015 the value of -10,80%, then reached the value of -4,08% in 2016 and eventually acquired the value of 0,92% in 2017. This means that increased profitability is expressed in economic value added.

Table 4 Calculation of EVA ROS

Year	2015	2016	2017
Sales	38 263 591	35 026 269	38 388 632
EVA ROS	-10,80 %	-4,08 %	0,92 %

Source: Self processing

When calculating the value of EVA Momentum was taken into account inflation for the given period from the data of the Eurostat. The difference value of the EVA between the years 2015 and 2016, the acquired positive value 7,07%. Indicator EVA Momentum between the years 2016 and 2017 reached the value of 5,11%. A positive result in these years says that the year-on-year increase in revenues from economic activities was greater than the year-on-year increase in costs. The indicator, however, declined, which was primarily due to a lower increase in the absolute value of EVA. The data are given in table 5.

Table 5 Calculation of EVA momentum

Year	2015	2016	2017
EVA Momentum	-	7,07 %	5,11 %

Source: Self processing

The calculation of return on net assets RONA
Return on net assets, i.e. intangible and tangible fixed assets, inventories and receivables to customers, net of liabilities towards suppliers, reached in the year 2015, the negative 0,57%, which does not mean that the company suffered a loss. Profit or loss for the period was positive, but due to a one-time sale of a fixed asset was cleansed by this amount, due to which IT acquired negative value.

Without the existence of revenues that are not related to economic activity, the value RONA was 19,28%. In the year 2016 to achieve profitability of the net assets of the amount of 7,89%. In the year 2017, there increase was 10,28%. The values are listed in table 6.

Table 6 Development of net assets profitability

Year	2015	2016	2017
Net assets	35 657 731	35 835 863	35 727 273
RONA	-0,57 %	7,89 %	10,28 %

Source: Self processing

The calculation of return on gross assets CROGA

Return on gross assets is the ratio of operating cash flow after taxation and gross assets, which include fixed assets and net working capital. By calculation, we came to the value of the pointer CROGA 8,03% for the year 2015, which is about 2% lower value than the value of the weighted average cost of capital. In 2015 the value of the indicator CROGA almost doubled the value of 16,73%, and this exceeded the value of the WACC.

In 2017, it increased to 19,15%, with a WACC slightly decreased, which represents a positive trend for the performance of the business. The data are given in table 7.

Table7 Development od Grosso assets profitability

Year	2015	2016	2017
OATCF	3 127 691	6 110 455	6 975 793
GA	27 736 538	36 514 243	36 425 866
CROGA	8,03 %	16,73 %	19,15 %

Source: Self processing

3 Conclusion

Financial analysis of the enterprise is considered as an important instrument for the management of the company. It enables the enterprise long-term to prosper. However, when business decisions do not take into account the outputs of the financial analysis, it may be liquidating for the company. A retrospective financial analysis defines the status of the business in analyzed period and allows on the basis of making related decisions.

The indicator EVA is an important tool for the assessment of enterprise performance. The indicators EVA, value range EVA, relative EVA, EVA ROS developed similarly, because based on the absolute value of the EVA. In the year 2015, economic value added, was negative, but this value was affected by a special sale of long-term financial assets (especially shares). Assuming the absence of these revenues, the economic value was positive.

Economic value added in 2016 was minus, which means that the company lost from its value. In the next year, although they rose by a smaller absolute value, they got to positive numbers. The company we recommend to maintain a positive value of EVA to maintain performance, and so remained attractive for the investors and shareholders.

Return on net assets was the lowest in 2015, however without the one-time sale of non-current assets would have received an excellent level. In 2016, declined, but in 2017 again increased. We recommend to maintain the profitability of the net assets at the level higher than the average cost of capital, which is managed only in the last year.

Return on gross assets, i.e. the proportion of operating cash flow to gross assets in the course to be analyzed period increased more than doubled to 19%. The company have performed well, whereas it succeeded in 2016 exceeded the average cost of capital, which have had a decreasing tendency.

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Determinants of hospital's financial distress

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Abstract

Hospital financial distress strongly influence the quality of stationary services. In this study we try to find determinants, which can be crucial from the point of view of hospital bankruptcy' risk. We pose several research hypotheses: (H1) hospitals operating in the form of companies are at lower risk of bankruptcy; (H2) hospitals located in big agglomeration are at lower risk of bankruptcy; (H3) a size of the hospital is an important factor of financial distress. We prove the hypotheses H1 and H3, but surprisingly, we found, that the localisation is not statistically significant factor of financial distress.

Keywords: Hospital, Financial Distress, M2, Forecasting

JEL Classification: I10, I11, L31, G30

1 Introduction

Hospital sector plays a key role in the functioning of the health care system by providing assistance in emergency situations, when people's life is in danger. This is due to the amount of the funds that are allocated in this sector, and a higher level of ongoing medical procedures. Due to the amount of funds involved, the effectiveness of hospital sector's functioning takes on particular importance (Hollingsworth, 2008), (Benton, 2013). Effective hospital should naturally maintain good financial condition, which is of crucial importance for the quality of benefits.

Literature provides evidence that the hospital's financial health significantly influences the quality of provided benefits, although not always in ways that are directly visible to a patient (like an average length of survival) (Picone et al., 2002). Financial distress may manifest in problems with staff with high qualifications or application, or using medical materials of poor quality. In terms of Polish conditions most patients perceive poor quality of food too few staff. On the other hand, hospitals that invest in quality's improving reach higher levels of efficiency (Alexander et al., 2006).

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By adopting the opinion, that financial health is very important from the point of view of the quality of provided benefits, we should ask what factors are relevant from the point of view of hospital's financial condition. The literature suggests that it may be factors such as:
- *the size of the hospital* (measured the size of revenue or number of beds) (Yafchak, 2000) (Nguyen et al., 2005), (Gapenski et al., 1993);
- *localisation* (village/town) (Kontodimopoulos et al., 2006), (Hunsaker & Kantayya, 2010), (Barnett & Barnett, 2003), (Renn et al., 1985);
- *type of owner (public/private)* (Tiemann & Schreyögg, 2012) (Duran-Fernandez & Santos, 2014) (Chen & Cheng, 2010), (Shen, 2002), (Tiemann et al., 2012), (Eggleston et al., 2008);
- *objective of activity (for-profit / not-for-profit / non-profit)* (Picone et al., 2002), (Smith, 2005), (Devereaux et al., 2004)
- *activity (company/other form of activity)* (Tiemann & Schreyögg, 2012), (Tiemann et al., 2012),
- *type and volume of provided benefits* (Weller et al., 2005), (Roberts et al., 2003).

The aim of this research is to answer to the question whether a form of activity, a size of a hospital and its location significantly affect the financial condition. At the design stage of the study, based on literature review, three hypotheses are formulated:
H 1: in the case of hospitals operating in a form of company the probability of bankruptcy is lower;
H2: hospitals located in smaller urban centres are more at risk of bankruptcy,
H3: a size of the hospital is an important factor of financial distress.

Hypothesis H1 refers to studies that indicate that hospitals operating in the form of companies have lower risk of bankruptcy due to the financial responsibility of the board of directors. Such entities are also more often profit-oriented and managers are held accountable for the effects of the activity (Tiemann & Schreyögg, 2012), (Tiemann et al., 2012). However, it must be also stressed, that in Polish conditions also entities with completely public ownership operate in the form of a company, reducing the responsibility of managers.

Hypothesis H2 is based on previous results, which suggest that hospitals located in areas characterised by lower population density, especially in rural areas, have worse financial condition (Holmes et al., 2017), (Renn et al., 1985). This can reduce, naturally worse, availability of health services in rural areas (Bem et al., 2013). The evidence in this area, however, are inconsistent. Many studies suggest that hospitals in remote, rural areas are much more fragile to a change of economic environment (Blanchfield et al., 2000) or report problem with advanced equipment or well skilled medical staff. There are several results which suggest, that those entities suffer from poor financial condition (Kaufman et al., 2016), (Succi et al., 1997), (Ferrier & Valdmanis, 1996), (Horwitz & Nichols, 2011), (Holmes et al., 2013) while others do not confirm it (Siedlecki et al., 2016).

H3 hypothesis assumes that larger hospitals (characterised by larger assets and higher revenues) are at lower risk of bankruptcy. We assume, that the higher is a sum of assets the higher is the probability of bankruptcy. On the other hand - the higher is income the lower is the probability of bankruptcy. Larger hospitals are usually located in bigger urban areas and play a greater role in the health system (typically larger entities provide services of a higher level of specialization). This may be a source of better cost-benefit relationship (Carr & Feldstein, 1967), (Sjetne et al., 2007), (Bem et al., 2014), (Richards et al., 2009), (Gapenski et al., 1993).

We use a research sample consisting of 184 Polish hospitals, collected by hand from EMIS Database. Data covers the year 2015. Calculations are supported by GRETL package.

2 Data and Methodology

In order to verify the research hypothesis we estimate the logit model, where a dependent variable is a synthetic measure of hospital's financial condition (M2). M2 is a synthetic indicator, which comprises of indicator of profitability, liquidity, debt and efficiency. The following interpretation can be implemented for the M2 measure:
- if $\alpha t < 0.7$ - a strong warning signal, high probability of financial difficulties;
- if $0.7 < \alpha t < 0.8$ - a warning signal, the average risk of financial difficulties;
- if $\alpha t > 0.8$ - lack of a clear warning signal – low probability of financial difficulties (Bem et al., 2015), (Siedlecki et al., 2015), (Bem et al., 2017).

Based on the interpretation presented above we create the dichotomous (qualitative) variable, taking values:
1 – if a hospital is classified as a bankrupt;
0 – if hospital financial condition is good or unidentified ("grey zone").

The explanatory variables are:
1)   Legal form (LFORM): the dichotomous variable, taking values:
1 – for hospitals operating in the form of companies;
0 – for hospitals operating in the form of SPZOZ (independent public health care facilities).

2)   Localisation (LOC): the dichotomous variable, taking values:
1 – for hospitals localised in big cities (with a population bigger than 200,000 citizens – "agglomerations");
0 – for others localizations;
3)   Revenue (REV): measured by the logarithm of annual income;
4)   Assets (ASSET): measured by the logarithm of total assets.

Additionally we employ other variables, representing selected financial condition (Zeller et al., 1996), (Siedlecki et al., 2015), (Hollingsworth, 2008), (Holmes et al., 2017),:
1)   ROA – Return on Assets = Net Income / Total Assets;
2)   ROCF - EBITDA Return on Assets = (Net Profit + Interest +Taxes + Depreciation) / Total Assets;
3)   DEBT% - Total Liabilities / (Total Assets - Total Liabilities).

We analyse the data for 2015 year, collected by hand from EMIS Database. First, we analysed 369 hospitals and 184 of them were qualified into this research. Among them 93 operates in the form of companies and 91 – as SPZOZ[2]. 60 hospitals are localised in agglomerations (cited with population higher than 200.000 residents, and 123 – in smaller cities).

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[2] SPZOZ – Independent Public Healthcare Centre

3 Results

First we analyse selected financial variables for companies and non-companies. We can observe, that both companies and SPZOZ (tab. 1 and tab. 2) achieve on average negative profitability if we employ ROA indicator. In the case of companies' profitability is on average slightly lower, but, on the other hand – more diversified. In it also a little bit surprising that a median value for ROA is positive in the case of SPZOZ and negative for companies.

Tab. 1: Descriptive statistics for hospitals operating in the form of companies

	Companies			
	Average	N	Median	St. dev.
M2	0.623255	113	0.632139	0.056646
ROA	-0.029759	113	-0.000555	0.077345
ROCF	0.045712	113	0.052305	0.081121
DEBT%	0.811023	113	0.728077	0.453502

Source: own study

If we measure profitability using EBITDA Return on Assets (ROCF) both companies and non-companies obtain very low, but positive profitability, and again – companies are characterised by, on average, lower profitability with higher standard deviation. The same conclusions can be formulated if we use M2 measure (tab. 1 and tab. 2).

Tab. 2: Descriptive statistics for hospitals operating in the form of SPZOZ

	SPZOZ			
	Average	N	Median	St. dev.
M2	0.641411	91	0.648146	0.073161
ROA	-0.007841	91	0.001594	0.046673
ROCF	0.072094	91	0.069003	0.055054
DEBT%	0.835790	91	0.721275	0.460177

Source: own study

Both companies and non-companies are characterised by relatively high level of the debt burden, while the debt ratio is slightly higher in the case of SPZOZ (tab. 1 and tab. 2).

Tab. 3: Descriptive statistics for hospitals with low possibility of financial distress

Variable	Low possibility of financial distress			
	Average	N	Median	St. dev.
M2	0.769098	71	0.756263	0.049320
ROA	0.019765	71	0.007251	0.102703
ROCF	0.100831	71	0.081981	0.111938
DEBT%	0.566888	71	0.522425	0.286949

Source: own study

In the next part of research, we use the M2 measure, in order to create to research subgroups: hospitals characterised by lower (tab. 3) and higher (tab. 4) risk of financial distress (bankruptcy). We can observe that hospitals which are at higher risk of financial distress are more heavily indebted and obtain lower profitability.

Tab. 4: Descriptive statistics for hospitals with high possibility of financial distress

Variable	High possibility of financial distress			
	Average	N	Median	St. dev.
M2	0.623255	113	0.632139	0.056646
ROA	-0.029759	113	-0.000555	0.077345
ROCF	0.045712	113	0.052305	0.081121
DEBT%	0.811023	113	0.728077	0.453502

Source: own study

Next we analyse financial indicators separately for hospitals localised in big cities (with population higher than 200.000 residents) and hospitals in small cities.

Tab. 5: Descriptive statistics for hospitals localized in big cities (agglomerations)

	Agglomerations			
	Average	N	Median	St. dev.
M2	0.667047	60	0.677964	0.090059
ROA	-0.005573	60	-0.000787	0.103106
ROCF	0.070137	60	0.061167	0.096834
DEBT%	0.772011	60	0.677727	0.430818

Source: own study

We can observe, that the financial condition of hospitals operating in big cities is, on average better, both in term of ROA and ROCF. On the other hand, hospitals localised in big agglomeration have, on average, higher debt ratios (tab. 5 and tab. 6).

Tab. 6: Descriptive statistics for hospitals localized in small cities

	Other localisations			
	Average	N	Median	St. dev.
M2	0.685572	124	0.676991	0.088561
ROA	-0.013105	124	0.000971	0.084862
ROCF	0.065454	124	0.067115	0.098464
DEBT%	0.690113	124	0.627885	0.405001

Source: own study

In order to verify our hypotheses, we built a logit model, when the dependent variable is qualitative variable characterising the risk of financial distress, estimated using M2 measure. Explanatory variables have both qualitative (LFORM, LOC) and quantitative character (Ln Assets, Ln Revenue) (tab. 7).

Tab. 7: Logit Model

	Coefficient	Std. Error	Z	P-value
Const	4.01263	1.97405	2.033	0.0421**
LFORM	−1.69708	0.372641	−4.554	0.00000***
LOC	−0.300043	0.398285	−0.7533	0.4512
Ln Assets	0.997544	0.299124	3.335	0.0009***
Ln REV	−1.20837	0.343203	−3.521	0.0004***

McFadden R-squared   0.151107
Adjusted R-squared   0.110038
Number of cases 'correctly predicted' = 126 (68.9%)
f(beta'x) at mean of independent vars = 0.230
Likelihood ratio test: Chi-square(4) = 36.7934 [0.0000]
* significance level α = 0.1, ** significance level α = 0.05 *** significance level α = 0.01

Source: own study

The estimated model suggests, that the localisation is not statistically significant from the point of view of the value of M2 measure, ergo the place of activity doesn't change the financial distress' probability. *According to that we are forced to reject the H2 hypothesis.*

Other determinants are highly statistically significant (significance level α = 0.01). Hospital equipped with a higher estate, measured by the value of assets, increases the likelihood of financial distress. On the other hand, increase in revenue reduces the risk of financial distress. Increase in revenue by 172% (multiplied by Euler's number) reduces the risk of poor financial condition by 70%. *Based on these findings we can adopt the H3 hypothesis, assuming that the hospital's size is an important factor of financial distress.*

Hospitals, which operate in the form of companies are at lower risk of financial distress than hospitals operating in the form of SPZOZ. The probability of financial distress for a company is ($e^{-1.69}$) -1 = - 0.82, that is about 82% lower than for SPZOZ, assuming a constant value of other variables (tab. 8). *This observation allows us to adopt the H1 hypothesis.*

Tab. 8: Logit Model's Interpretation

	Coefficient	When a variable changes by "1" the probability of financial distress is
Const	4,01263	
LFORM	-1,69708	-82%
LOC	-0,300043	-26%
Ln Assets	0,997544	171%
Ln Revenue	-1,20837	-70%

Source: own study

4 Discussion and Conclusion

Presented study examines the factors affecting the probability of financial difficulties in hospitals. Contrary to the expectations, the place of business is not a significant factor, despite the fact that the descriptive statistics suggest that hospitals in smaller towns are characterised by lower profitability (ROA) but, on the other hand, lower debt.

We also confirm, that the hospital's size is the important factor influencing the risk of financial difficulties. Hospitals having higher assets are characterised by higher probability of poor financial situation – this situation is especially difficult if bigger assets do not produce higher revenue (insufficient use of real estate and medical equipment, for example as a result of low contract or even lack of contract for certain medical services).

The most important finding, consistent with literature evidences, is that hospitals operating in the form of companies are at lower risk of financial distress – although this group of hospitals are quite different in term of size or ownership – it suggests that such a form of activity create important incentives for managers.

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The role of cash holdings in lending activity of private non-financial firms in Poland

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Abstract

Idea: To investigate reasons why private non-financial firms hold cash and find evidence if their cash holdings is used to provide loans to other firms in Poland, not only inside the internal capital market, but also outside the business group.

Data: Panel data from annual reports of 4,600 private Polish non-financial limited liability companies and unlisted on the stock exchange joint stock companies that provided loans to other companies in 2003-2014.

Tools: Generalized Method of Moments estimation of the determinants of holding cash, taking into account providing loans inside and outside business groups.

What's new?: Key findings: (1) private non-financial firms hold cash and provide loans from accumulated cash holdings originating mainly from cash flow from operating activity. (2) Lenders using long-term bank loan for financing accumulate higher level of cash holdings. This may result from precautionary motive and concerns about increase in costs of external financing or limitations in access to finance from banks. (3) Enterprises maintaining higher level of cash holdings invest less in shares of other companies from within or outside the business group. (4) The relationship between cash holdings and financing with, either long- or short-term, debt on internal capital market is positive.

So what?: This suggests that a non-financial limited-liability company could step into shoes of banks or other financial institutions and plays a role of an agent (a broker) in transferring loans to other companies. There is the mechanism of tax avoidance related with granting loans to unrelated entities, using limited-liability company as an intermediary.

Contribution: Findings confirm that non-financial private companies providing of loans outside the business groups with the use of cash holdings retrieved from bank loans and supported by borrowings from other entities may serve as a tool to avoid restrictions related with thin capitalization. This paper contributes to the literature on cash holdings, financial flexibility and internal capital market constituted by business groups. The outcomes of the analysis of lending money by firms outside the stock exchange in Poland are extension of the previous studies on public companies listed on the stock exchange in Warsaw conducted by Białek-Jaworska (2017, 2017a).

Keywords: Cash holdings, Private firms, Non-bank borrowings, Bank loans, Providing loans.

JEL Classification: G30, M21, M41

1 Introduction

The main purpose of this paper is to investigate reasons why private non-financial firms hold cash and verify if their main source originates from cash flow from operations. In this study we try to find evidence that these cash holdings are used to provide loans to other firms, not only inside the internal capital market, but also outside the business group. This research focuses on answer on the question if non-financial limited-liability companies step into shoes of banks or other financial institutions and if they play a role of an agent (a broker) in transferring loans to

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other companies. We try to confirm that there is a mechanism of tax avoidance related with providing loans to unrelated entities, using limited-liability company as an intermediary. We assume that the basis for such a lending activity is accumulation of cash flows and money borrowed from banks in a form of a long-term bank loan, financing with, either long- or short-term, debt on internal capital market and less investments in shares of other companies. This could be motivated by more probably inflows of interests on loans provided to other firms than dividends.

The considerable growth in corporate cash holdings around the world has increased interest of researchers and number of published articles on this topic. Consequently, there is now a large academic literature examining cash holdings and their impact on corporate outcomes and firm values, especially in the case of public companies listed on the stock exchange. Therefore, our paper contributes to literature on cash holdings not only by a focus on private firms that are relatively less cover so far, but also by a consideration of the phenomena of lending money to other firms, inside and outside the business groups. The research sample consists of panel data from annual financial reports (balance sheets and income statements) of 4,600 private Polish non-financial limited liability companies and unlisted on the stock exchange joint stock companies that provided loans to other companies at least in one year from a period of 2003-2014. We use Generalized Method of Moments to estimate the determinants of holding cash, taking into account providing loans inside and outside business groups.

The choice of Poland as a subject of such research is reasonable because partnerships constitute over 90% of Poland's business sector and are treated as unrelated companies under Polish accounting law. For the Polish setting the noteworthy considerations have: (1) the inside-debt concept of financing firms by loans granted by their owners (individuals); (2) the usage of limited liability companies for a tax avoidance mechanism for lending money by partnerships or individuals to their partnerships; (3) the unwillingness of equity holders to contribute funds to the firm in a form of share capital that is irreclaimable (paid once without any possibility of reimbursement before the company's liquidation).

This paper provides brief review of the literature, explains the differences between non-bank borrowings and bank loans and places borrowings from other companies among sources of finance. The main focus is on the identification of determinants of non-financial private corporate cash holdings as a basis for lending activity.

2 Literature review

The increase in cash holdings is closely linked with the issue of financial flexibility (the ability of a company to respond to changes in the company's cash flows or investment opportunity set by providing cost-effective sources of financing (Denis, 2011). Cash holdings are determined by a manager's expectations of the prospects for future growth and future financing costs (Frésard, 2012).

Managers arrange their liquidity management policies to provide the flexibility to respond to unexpected changes in the firm's investment opportunity set (Denis, 2011). Inside business groups, conglomerates or companies with the diversified firm structure the cash flows of operating segments with poor growth opportunities can be used to subsidize those segments with good growth opportunities, but poor cash flows. This allows to reduce the magnitude of financing frictions. Subramaniam et al. (2011) find that diversified firms have lower cash holdings than focused counterparts as the diversification might reduce financing frictions. Tong (2011) reports that the value of cash is significantly lower in diversified firms than in single-

segment firms because of agency problems associated with the conglomerate structure. Excess cash holdings might be used for inefficient cross-subsidization of more financially constrained firms (including partnerships (reported as less profitable units), for example in a form of granting loans.

Due to the high risk of the project (e.g. R&D, innovation, new product development), lenders may be interested in the development and implementation of such a project outside their own organizational structure, i.e. in another "friend" company that is related to or does not meet the definition of affiliated entity (a start-up or a partnership formed by their key associate (or even their employee)). At the same time, loss of liquidity by a "friendly" company can cause problems such as: (1) loss of key employees as a result of incapacity to pay wages; (2) blocking the bank account by the tax office as a result of non-payment of tax liabilities; or (3) initiating insolvency (bankruptcy) proceedings as a result of filing a bankruptcy claim by a supplier and a trade credit provider to whom this company owes money (did not pay for an invoice after the deadline for payment).

Intra-group loans (widely understood, this is containing inside business groups and also between unrelated firms) can be used to manage cash excesses in one firm and cash shortages in another. Almeida, Park, Subrahmanyam and Wolfenzon (2011) show that groups use internal revenues to set up or acquire capital-intensive firms, which are more likely to be constrained in financial markets (Belenzon, Berkovitz and Rios, 2013). Similarly, Gopalan, Nanda and Seru (2014) find that firm investment is partly financed by the dividends of other firms in the group.

Acharya, Almeida and Campello (2007) show that cash and negative debt can play distinct roles in the intertemporal optimization of investment by financially constrained firms. In essence, firms can use different combinations of cash and debt in order to transfer resources across future states of the world. These transfers allow constrained firms to improve the match between financing capacity and investment opportunities, and therefore can be value-enhancing. Empirically, their findings confirm that constrained firms with high hedging needs prefer to allocate excess cash flows into cash holdings (that, in our opinion, could be also use to provide loans to other companies to finance their investment opportunities first and benefit thanks to interest revenue collected from the borrowers).

In contrast, constrained firms with low hedging needs use excess cash flows towards reducing outstanding debt. According to Acharya et al. (2007) theoretical model and empirical results, financially unconstrained firms use free cash flows towards reducing the amount of debt that they have outstanding, irrespective of how their cash flows correlate with investment opportunities. Contrary to constrained firms which propensities to reduce debt and to increase cash are strongly influenced by the correlation between their cash flows and their investment opportunities. When constrained firms have high hedging needs they display a strong preference for saving cash (their cash flow sensitivity of cash is positive and highly significant), while showing no propensity to reduce debt. This indicates a place to collect and hold cash in order to support constraint firms via providing them loans besides just issuing a standard trade credit.

Based on literature review, even if non-financial firms that provide loans have poor investment opportunities, it is not clear that making intra-group loans is justified. There is a risk of expropriation of minority shareholders in pyramids (this behavior is called tunneling) (Buchuk, Larrain, Muñoz and Urzúa, 2014; Johnson, La Porta, López-de-Silanes and Shleifer, 2000). The minority shareholders of those firms can prefer an increase in dividends rather than being

lenders to other firms. Moreover, harm would be a fall in ROE or dividends because good projects are left unfunded (Buchuk et al., 2014). Intra-group loans can also be socially inefficient, even if they are privately efficient, because by retaining earnings, business groups can make it harder for standalone firms to access funds. This negative externality of business groups is discussed by Almeida and Wolfenzon (2006).

In the literature and findings of surveys concerning Poland, it is well documented that a significant amount of funds to micro and small firms are provided by owners or households (Yilmazer and Schrank, 2006; Seppa, 2010; Coleman and Robb, 2009; Casey and O'Toole, 2014).

"Inside-debt" is debt provided by principal owners and households as an alternative capital source to straight equity capital. Inside-debt does not often carry any regular amortization plan. Repayments are made when the firm has sufficient cash available; discipline of inside-debt repayment is similar to dividend payments. Indeed, credit providers consider inside-debt as quasi-equity despite the lack of sound empirical evidence. Conventional equity is adjusted for inside-debt (adjusted equity = book equity + inside-debt). In particular, in Poland, BRE Bank treats loans received from shareholders of the limited liability company in this way, i.e., quasi-equity, but requires the signing of a subordination clause. Seppa (2010) found that inside-debt is significantly and positively related to financial leverage, with the positive relationship between leverage and bankruptcy, well documented in academic literature.

Moreover, in literature there is some evidence presented of the occurrence of the "redistribution" effect through a trade credit channel. According to the redistribution view advanced in the 1960s, companies accumulate cash holdings in periods of loose monetary policy to pass their savings on in the form of trade credit at the time of credit constraints. As a result, large companies could use trade credit as an alternative to discount policies in order to ensure sales growth. In the years 1955-1957, enterprises with relatively high cash holdings used to extend payment terms when offering trade credit, thereby strengthening the standing of firms that experienced credit rationing in the tight monetary policy period (Meltzer, 1960).

Firms with a better access to bank financing offer more trade credit, which means that they may act as intermediaries between institutional lenders and companies with a limited access to bank lending. Short-term bank loans are used to minimise transaction costs. In the periods of restrictive monetary policy, buyers facing bank funding constraints increase their demand for trade credit much more than those who do not experience credit rationing, thereby proving the existence of a strong monetary policy transmission channel (Petersen and Rajan, 1997). Larger suppliers with a broader access to diverse sources of funding (including bank loans), are capable of mitigating the effects of monetary restrictions through the transmission of funds in the form of trade credit. The reason is that in periods of monetary tightening small firms will be more likely to substitute bank credit with financing at the cost of their suppliers in the form of trade credit. Yet, the more important the transactional role of trade credit over its financial role, the less trade credit can be used for mitigating the effects of monetary restrictions (Blasio, 2005). Trade credit is a channel through which financing is redistributed between firms and credit is relocated from sellers who enjoy the access to bank financing towards buyers whose access to bank financing is limited (Guariglia, Mateut, 2006, Taketa and Udell, 2006). Profitable firms lend some part of their bank loan via trade credit in order to support their business partners, but the size of this credit decreases as the availability of bank loans grow (Cull et al., 2007). Disturbances in the redistribution mechanism transmitted via trade credit are caused by the worsening financial standing (as a result of the crisis) of traditional providers of this type of

credit, i.e., firms with a higher level of short-term debt (Love, Preve and Sarria-Allende, 2007). Trade credit is found to have a positive impact on the real output, the counter-cyclical pattern of the substitution effect being the spontaneous relaxation of constraints imposed by financial institutions in periods of economic stagnation and a self-triggering mechanism smoothing liberal crediting policies during the rapid growth periods (Huang, Shi and Zhang, 2011). We would like to extend this concept into lending money to other companies with the use of loans (the real transfer of money) instead of trade credit (simply postponing repayment). We have not found confirmation that banks are aware of lending money by their borrowers to their affiliates (related companies) or other entities (unrelated companies). However, banks are aware of financing potential borrowers by loans granted by their shareholders. Banks respond to this precedent by requiring the signing of a subordinate clause that prevents the repayment of loans from shareholders before the settlement of a bank loan. This allows banks to treat these loans from the shareholders as quasi-equity, thereby improving debt ratios (leverage).

3 What are the differences between non-bank borrowings and bank loans?

Many countries have constraints to lending money by non-bank lenders in a form of a bank loan (a bank credit) that is regulated under the bank law and requires a banking license, for instance India, Poland, Czechia, other European countries that implemented Directive of the European Parliament and of the Council on the taking up and pursuit of the business of credit institutions to national regulations, and even China. In China such re-lending activity is treated as shadow banking (Du, Li and Wang, 2016). Werner (2014) confirms that only banks can issue money in the form of fictitious customer deposits when purporting to engage in the act of lending. Banks are exempt from the Client Money Rules, which prevent other firms from creating money in the same way. While there is no restriction for non-financial companies and other entities (including individuals) to funding others in a form of non-bank borrowings. The latter is also allowed in Poland and very popular in Romania. Non-financial companies, among others, are permitted to lend money to other firms in a form of a non-bank borrowing that is regulated under civil law. Although non-financial firms are legally restricted in their possibility to de facto act as banks, they are allowed to provide non-bank borrowings to other entities. What are the differences between non-bank borrowings and bank loans?

The loan agreement is governed by the provisions of art. 720-724 of the Civil Code. By a loan agreement, the lender is obliged to transfer ownership of a receiver (a person who takes a borrowing) a certain amount of money or things designated only for the species and the receiver (a borrower) undertakes to pay back the same amount of money or the same amount of things of the same species and quality. The necessary element of a loan agreement is not, therefore, the lender earning a salary (e.g. interest) in return for the service rendered (providing a non-bank loan). The feature of this loan (non-bank borrowing) in terms of the Civil Code is free of charge. Of course, the contract between the parties may be different. It can take into account interest fee in accordance with requirements of tax law. Not received interest of free of charge borrowing is a taxable revenue under the income tax law in Poland.

The partner (shareholder) of a limited liability company can lend money (provide a borrowing) to the company for various purposes. The necessary terms of the non-bank loan agreement (unlike the bank loan (bank credit) agreement) should not indicate how to use the subject of the loan. However, there is permissible that a provision of the contract obligates the borrower to use the object of the loan in a specific way (e.g. under the pain of using a right of withdrawal that is reserved for the lender). If the loan (borrowing) is provided by a shareholder interested in the development of the company, the contract may specify the purpose (or objectives) for which the loan is intended. However, when the Polish income tax law is taken into account, the

lenders should earn (gain) interests revenue based on market price (market interest rate) or on the arm's length principle (this is the condition or the fact that the parties to a transaction are independent and on an equal footing. Such a transaction is known as an "arm's-length transaction").

3.1 Importance of loans from other companies among sources of financing

Results of the "Survey on the access to finance of enterprises" (SAFE) confirm significance of the other loans use by borrowers from different EU countries not only micro and small firms, but also large companies (SAFE, 2016). 27% of the EU SMEs actually applied for a bank loan in 2016, while only 6% of them did not apply because of fear of rejection. Out of those that did apply, 7% of SMEs' bank loan applications were rejected and only 2% declined the loan offer from the bank because they found the cost unacceptable. Some of the applications were still pending at the time of the survey. The rejection rate went down from 15% in 2009 to 8% in 2015 and 7% in 2016. However, bank loan applications from smaller companies are still rejected more often: 12% of micro companies compared to only 1% of large ones. The financing is mostly used for fixed investments (by 38% of the EU SMEs) and inventory or working capital (34%). Development of new products and hiring or training employees are both reported by 15% of SMEs. The survey was conducted from 19 September to 1 November 2016 in each of the EU28 as well as in Iceland, Turkey, Montenegro, Albania, Serbia, and the FYROM. The total EU sample size was 17,354 firms of which 15,668 (90%) had fewer than 250 employees. The study mainly provides evidence on changes in the financial situation, financing needs and access to external financing of SMEs in the EU. The reference period is April to September 2016.
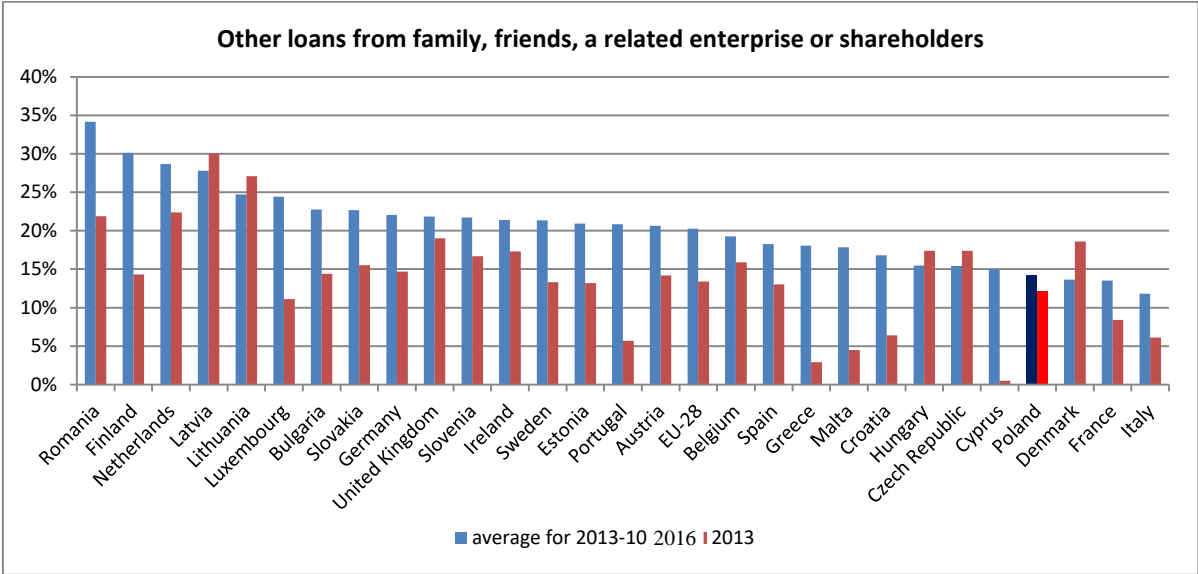
Figure 1 Use of other loans from family, friends and a related firms or shareholders
Source: Authors' elaboration based on aggregated answers on the following Q4f question: *Other loan, for example from family and friends, a related enterprise or shareholders, excluding trade credit - Are the following sources of financing relevant to your enterprise, that is, have you taken out or renewed such a loan in the past six months?* - April to September 2013 and average from April to September for a period of 2013-2016, based on SAFE, 2016

SMEs in Romania and Latvia most often used other types of loans (16%), while 9% in Poland. In the non-EU28 countries, SMEs in Turkey use other loans from family and friends, a related enterprise or shareholders most often (21%) and SMEs in Serbia the least often (3%). There are no large differences between the four distinguished sectors. In all sectors about one in ten SMEs

used other loans. There is also only a small variation across enterprise size. The proportion of SMEs that have taken out or renewed other types of loans is highest among large enterprises (with at least 250 employees) (14%) and lowest among micro enterprises (1 to 9 employees) (8%). The proportion of SMEs that used other types of loans is highest among gazelles: 14% of SMEs in this category compared to 9% of SMEs in total EU28. The proportion of high-growth SMEs that used other types of loans is 10% of SMEs. More innovative (11%) firms than non-innovative enterprises (7%) benefit from other loans (SAFE, 2016). Internal funds were used as one of (or the only) source of financing by 26% of EU SMEs in 2013. About one in seven (15%) SMEs used other loans from related companies, shareholders, family or friends (13.4% in Poland), more than in 2011 (13.4%) and 2009 (6.8%). One in eight (13%) had used grants or subsidized bank loans. Five per cent had used equity and a few had used subordinated loans (2%) and debt securities issued (2%). Levels of use of other sources of finance were similar to 2011 levels, with only a small increase in the level of bank loans (up from 30% in 2011 to 32% in 2013), retained earnings (also up 2% from 2011) and other loans (up 2% from 2011). Use of equity was slightly lower, down 2% from 2011. Other loan types from related companies, family or friends (15% overall) also rose by size (12% from micro SMEs to 22% for the largest businesses). The proportion of SME managers who would prefer a bank or other loan and who believe that there are no obstacles to getting external funding stands at nearly four in ten (37%); a slight increase on 2011, but not statistically significant. The two largest obstacles to external funding identified by SME managers were insufficient collateral and interest rates being too high – both were selected by 20% of managers. The proportion claiming that interest rates are too high has remained the same since 2011, whilst the proportion claiming insufficient collateral has dropped two percentage points. The share of SME managers who see reduced control of their firm as a major impediment to acquiring external finance remains very low, at 3% as it was in 2011. Similarly, the share claiming that financing is not available at all stands at 7%, the same level as in 2009 and 2011 (SAFE, 2013).

The vast majority of entrepreneurs operating in Poland are micro-entrepreneurs, with less than 9 employees, representing more than 95% of active companies in the Polish market.
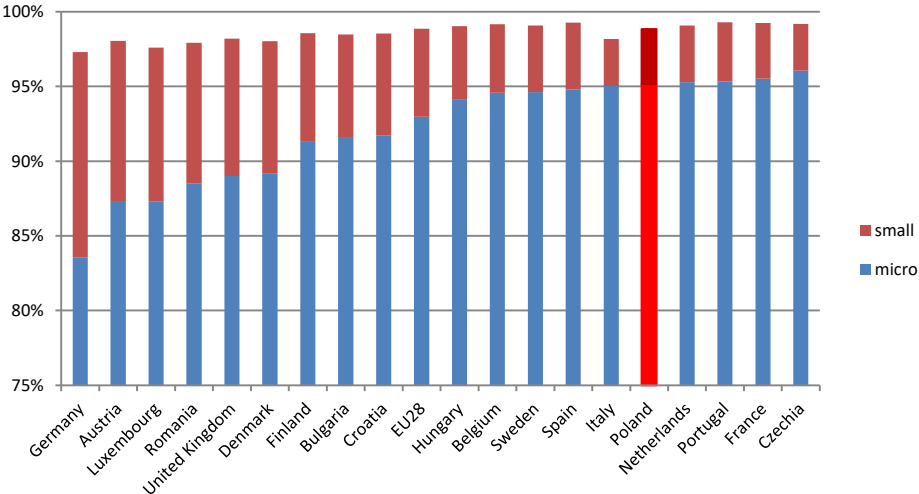
Figure 2 The share of micro & small firms in the Polish economy as compared to other countries
Source: Authors' elaboration based on the Eurostat database

There are less micro-entrepreneurs in Hungary (94%), Romania (88%), and Germany (82%), and slightly more in the Czech Republic (96%). However, there are more small firms in Germany, Romania, and Hungary, than in Poland (Figure 2 based on the Eurostat database).

Although the percentage of firms that use banking products to finance their activities is increasing in Poland, it is much lower than the EU average (ZBP, 2015; Dobbs et al., 2015). Often, even creditworthy businesses do not decide to obtain external capital because of the high cost of bank loans, not only financial, but also administrative costs, including an obligation to audit financial statements.

The lack of accounting records and financial statements is a major reason of limited access to bank credit. In this case, the basis for assessing the creditworthiness "of the company" is the tax returns of the entrepreneur (the owner of the company). However, if the owner of the company optimizes its taxation, i.e. commits to paying the lowest possible taxes, and subsequently reports a very low income that unable him to obtain a bank loan. In the case of bank lending to an individual, the bank takes into account the stability of income sources (requiring an employment contract for an indefinite period). While in the case of the analysis of a business loan application, firms are required to present at least a simplified balance sheet and a profit and loss statement. In the absence of accounting records, it is not so easy - it requires a recording of business operations for their aggregating and the preparing of a balance sheet and profit and loss statement.

In contrast, companies with accounting books obtain a bank loan on the basis of financial statements prepared on the basis of their accounts, not on the basis of tax returns. The low book-tax conformity allows them to obtain a bank loan, despite sustaining a tax loss, or non-payment of income tax due to corporate income tax (CIT) deductible tax losses. The company may deduct tax losses from the tax base for 5 years at no more than 50% of the losses from previous years in a given year. Data from the Ministry of Finance in Poland indicate that 60% of companies - potential taxpayers of corporate income tax CIT - do not pay corporate income tax (CIT tax = 0).

4 Research sample and design

This research was conducted with the use of the database of private firms provided by Bisnode, where we have identified 4,600 lenders among 30,000 private non-financial firms based on data retrieved from financial assets in which they recognized positive amounts of receivables from loans provided to related entities (inside a business group) and separate to un-related entities (outside the business group), at the balance sheet date. We retrieved data with positive values of the following four items recognized in the assets: long-term investments including (1) receivables of long term loans for related companies and (2) receivables of long term loans for unrelated companies; and short-term investments including (3) receivables of short term loans for related companies and (4) receivables of short term loans for unrelated companies.

Table 1 Lenders distribution by industry in the research sample

PKD code	Industry	Obs.	share (%)
10-39	**Manufacturing**	**9,157**	**41%**
49-53	Transportation	1,492	7%
55-56	Hotels and restaurants	757	3%
58-63	Information & communication	2,039	9%
68	**Real estate**	**3,822**	**17%**
69-75	**Professional, scientific & technical services**	**3,896**	**17%**
77-82&95	Administrative services	1,272	6%
		22,435	**100%**

Source: Authors' elaboration based on the Bisnode database

This study was conducted with the use of panel data from annual financial statements (balance sheet and profit & loss statement) of private Polish companies (limited liability companies and joint stock companies) for up to 12 years of data (2003-2014) retrieved from the National Court Register in Poland and collected by Bisnode company. Since 2002, Bisnode has been a strategic partner of Dun & Bradstreet - a global provider of business information for over 250 million companies in 220 countries. Research sample distribution by industry is presented in the following table 1. The industry categories are based on two digit PKD codes (Polish Standard Industrial Classification is based on the EU recommended standard). The definitions of all variables used in our study are presented in table 2.

Table 2 Variable definitions

variable	definition
cash holdings	cash and money at bank account / total assets
loan_other	receivables from long-term and short-term loans provided to unrelated entities outside the business group /total assets
loan_bg	receivables from long-term and short-term loans provided to related entities inside the business group /total assets
cash flow	cash flows from operations / total assets
leverage	capital structure measured by the ratio of total debt/total assets
st_bank_loans	short-term liabilities on account of bank loans / total assets
ltbankloan	long-term liabilities on account of bank loans / total assets
short_debt_related	financing with short-term debt within the internal capital market of the business group
long_debt_related	financing with long-term debt within the internal capital market of the business group
net_trade_bg	financing with net trade credit within the business group measured - trade credit obtained (trade liabilities) less trade credit granted (trade receivables)
net_trade_other	financing with net trade credit outside the business group measured - trade credit obtained (trade liabilities) less trade credit granted (trade receivables)
trade_n_other	trade receivables from other unrelated companies / total assets
trade_n_bg	trade receivables from related companies (within the business group) / total assets
trade_z_bg	trade liabilities to related companies (within the business group) / total assets
equity_oth	investment in shares of other entities (outside the business group) / total assets
equity_inv	investment in shares of related entities (within the business group) / total assets
dividends_related	dividends received from the related companies / total assets
capex	investment in fixed assets / total assets
grants_pl	grants received recognized in the other operational revenues / total assets
rdexpen	costs of finished developmental works with positive results / total assets
roa	lender's return on assets
firm size_b	size of lending company, measured as logarithm of total assets
tax_spread	tax avoidance, i.e. difference between nominal and effective tax rate etr
etr	effective tax rate = *taxation/gross_profit* that takes continuous values from the closed range <0;1>. The values of *etr* were limited, replacing etr=0 if etr < 0 and replacing etr=1 if etr >1.
growth	lender's growth opportunities approximated with sales growth rate

Peer-to-peer lending practices are driven, to a higher extent, by related party linkages when we consider the average receivables of loans given (Figure 4). However, more private lenders give short-term loans to unrelated companies. In the case of long-term loans for unrelated companies, the number of private lenders is slightly lower than lenders on the internal capital market created by business groups (Figure 3).

In the study we apply the Generalized Method of Moments (GMM) enables taking into account for heteroscedasticity due to usage of additional criteria on moments. This method enables obtaining unbiased estimations under known problems with heteroscedasticity and autocorrelation, even with measurement errors and endogeneity in explanatory variables.

Arellano-Bond (1991) estimator gained most of the popularity due to the possibility of verifying adopted assumptions on instruments with the use of Sargan-Hansen test.
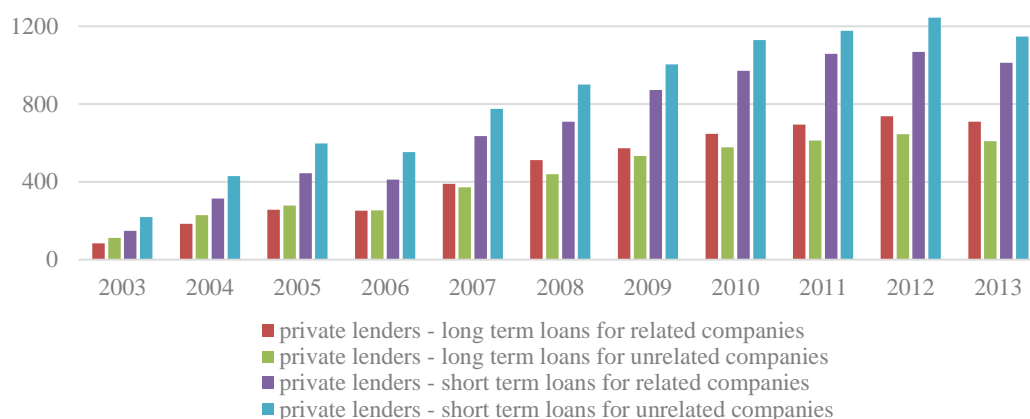
Figure 3 Number of private lenders
Source: Authors' estimates
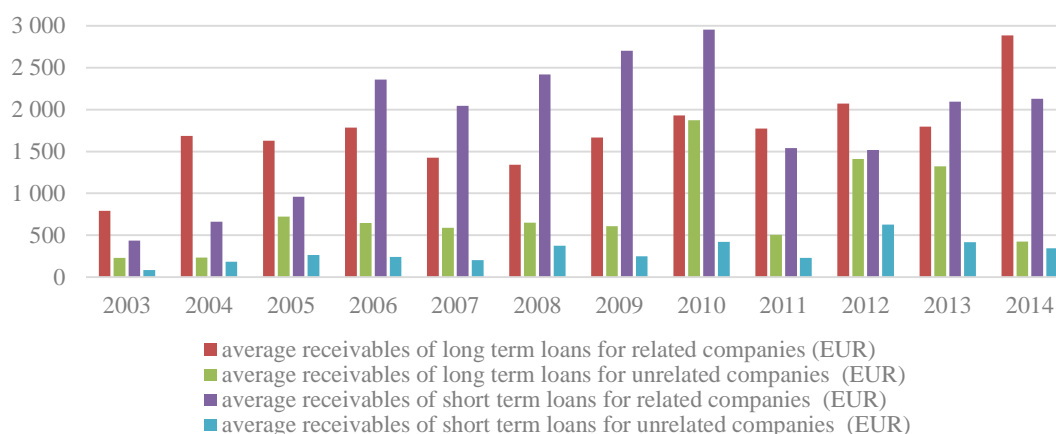
Figure 4 Average value of receivables of loans given, in thousands EUR
Source: Authors' estimates

5 Hypotheses development

On the one hand, according to the economic theory, higher financial surplus from the core activity (cash flow) favors accumulation of cash holding, since it enables financing of operating activity and investment using available cash. The choice of internal financing over external financing is caused by information asymmetry between managers and investors. Enterprises experiencing difficulties in accessing finance from capital market or those encountering high costs of external financing use cash reserves for the purpose of financing the operating activity. The precautionary motive leads companies to accumulate cash holdings, in order to secure from occurrence of such problems. Alternatively, these reasons could also encourage companies with higher financial constraints to request their suppliers or recipients for lending proposal.

H1: *Non-financial companies provide loans from accumulated cash holdings originating mainly from cash flow from operating activity.*

Next hypothesis states that **H2:** *Lenders using long-term bank loan for financing accumulate higher level of cash holdings.*

This may result from precautionary motive and concerns about increase in costs of external financing or limitations in access to finance from banks. The results obtained in the study of Białek-Jaworska (2017a) on sources of corporate savings (cash holdings) indicate a significant impact of unused bank loan on increase in the level of cash holdings (so-called liquidity reserves). Finance obtained from bank partly becomes a source of corporate cash holdings.

According to the signaling theory, the capital structure and the size of cash holdings give investors and management an information about the financial situation of the company. External institutions and other market players often do not have the access to the information, based on which they would be able to evaluate investment project's viability. Quality of an enterprise may be signalized by the size of financial surplus form the core activity. Managers seek to maintain their creditworthiness, in order to communicate good financial situation to the external environment, and use it when good investment opportunities appear. Therefore, taking a bank loan may signalize that managers expect high incoming cash flows.

According to the trade-off theory we could expect the substitution between cash holdings and investment, i.e. enterprises maintaining higher level of cash holdings invest less in shares of other companies from within or outside the business group. Thus we assume that

H3: *The association between cash holdings and liquid assets (financial investments in shares of other companies) is negative.*
Private companies may serve as intermediaries in transferring loans to other companies, in order to avoid restrictions related with thin capitalization. This means that there is the mechanism of tax avoidance related with granting loans to unrelated entities, using limited-liability company as an intermediary. Therefore we formulate the following hypothesis:

H4: *The relationship between cash holdings and financing with, either long- or short-term, debt on internal capital market is positive. This means that a non-financial limited-liability company steps into shoes of banks or other financial institutions and plays a role of an agent (a broker) in transferring loans to other companies.*

6 Results - determinants of cash holdings as a basis for lending activity

The results from conducted analysis are presented in Tables 3 and 4. Conducting the GMM estimation of models show that non-financial companies provide loans from accumulated cash holdings originating mainly from cash flow from operating activity. This is confirmed by significant positive relationship with cash flow, according to the pecking order theory. The results also show the significant negative relationship between loans provided both within and outside the business group and the company's cash holdings. This confirms the utilization of cash holdings for the purpose of lending and jointly provides evidences to confirm **hypothesis H1**.

According to the free cash flow theory, less indebted companies (with lower *leverage* and lower short-term liabilities due to bank loans *st_bank_loans.L1*) maintain higher level of cash holdings, since their financial condition is rarely monitored by creditors and lenders. Lenders using long-term bank loan for financing hoard more cash holdings. This confirms **hypothesis H2**.

The association between cash holdings and liquid assets is negative, in accordance with **hypothesis H3**. The results from this study confirm the substitution between cash holdings and

investment that is according to the trade-off theory. Companies holding more cash invest less and have lower share in equity of other companies from within or outside the business groups.

Moreover, in the case of positive cash holdings growth rate (*dcash*>0, model3), they carry out lower investment in fixed assets (*capex*). The pecking order theory indicates the positive relationship between enterprise's cash holdings and investment in fixed assets. Our findings show the positive relationship between cash holdings and financing with, either long- or short-term, debt on internal capital market. This in accordance with **H4** suggests that private companies may serve as intermediaries in transferring loans to other firms, in order to avoid restrictions related with thin capitalization. This indicates grounds for the mechanism of tax avoidance related with granting loans to unrelated entities, using limited-liability company as an intermediary.

Table 3 Determinants of cash holdings by nonfinancial companies who provide loans to other firms

variable	(1)		(2)		(3) if *dcash*>0	
cash holdings L1.	0,1529	***	0,2111	***	-0,8112	***
	(0,0222)		(0,0177)		(0,0430)	
cash holdings L2.	-0,0073				-0,2602	***
	(0,0094)				(0,0191)	
cashflow	0,0836	***	0,0903	***	-0,0058	
	(0,0068)		(0,0071)		(0,0091)	
loan_other	-0,5739	***	-0,5453	***	-0,1381	***
	(0,0574)		(0,0868)		(0,0436)	
loan_other L1.			0,1663	***		
			(0,0362)			
loan_bg	-0,4365	***	-0,4302	***	-0,2200	***
	(0,0259)		(0,0269)		(0,0338)	
loan_bg L1			0,1063	***		
			(0,0209)			
leverage	-0,1131	***	-0,0499	***	-0,0811	***
	(0,0151)		(0,0105)		(0,0236)	
st_bank_loans.L1.	-0,0594	***	-0,0510	***	-0,0557	**
	(0,0140)		(0,0114)		(0,0227)	
ltbankloan	0,0884	***	0,0503	***	0,0203	
	(0,0136)		(0,0131)		(0,0193)	
equity_oth	-0,1993	***	-0,2176	***	-0,1399	***
	(0,0317)		(0,0344)		(0,0368)	
equity_inv	-0,1946	***	-0,2061	***	-0,1363	***
	(0,0183)		(0,0186)		(0,0249)	
dividends_related	-0,1547	***	-0,1418	***	-0,1975	***
	(0,0472)		(0,0468)		(0,0678)	
capex L1.	0,0151	**	0,0196	***	-0,0300	***
	(0,0071)		(0,0071)		(0,0077)	
long_debt_related	0,1135	***	0,0674	***	0,0501	**
	(0,0198)		(0,0174)		(0,0243)	
short_debt_related	0,0379	*	0,0488	***	0,0947	***
	(0,0209)		(0,0137)		(0,0262)	
roa	0,1751	***	0,1707	***	0,1783	***
	(0,0074)		(0,0074)		(0,0133)	
firm size_b	-0,0083	**	-0,0065	*	0,0438	***
	(0,0039)		(0,0039)		(0,0080)	
tax_spread	-0,0335	***	-0,0310	***	-0,0573	***
	(0,0108)		(0,0110)		(0,0156)	
growth	-0,0024	***	-0,0014	**	-0,0027	**
	(0,0006)		(0,0006)		(0,0011)	
net_trade_other	0,2341	***			0,2138	***
	(0,0112)				(0,0155)	
trade_n_other			-0,2965	***		

variable	(1)		(2)		(3) if *dcash>0*	
			(0,0129)			
net_trade_bg	0,2044	***			0,1666	***
	(0,0153)				(0,0250)	
trade_z_bg			0,0551	***		
			(0,0163)			
trade_n_bg			-0,2961	***		
			(0,0193)			
grants_pl	0,0005	**	0,0005	**	0,0006	*
	(0,0002)		(0,0002)		(0,0004)	
rdexpen	-0,0686	*	-0,0558	##	-0,0511	
	(0,0374)		(0,0386)		(0,0491)	
Time effects	YES		YES		YES	
N	22 927		23 105		11 494	
Sargan's test	53,6568	[0,4106]	59,5424	[0,2498]	59,5424	[0,2498]
Arellano-Bond test for AR(1)	-11,291	[0,0000]	-15,626	[0,0000]	-15,626	[0,0000]
Arellano-Bond test for AR(2)	0,28411	[0,7763]	0,57739	[0,5637]	0,5774	[0,5637]
Arellano-Bond test for AR(3)	-1,3742	[0,1694]	-1,078	[0,2810]	-1,078	[0,2810]
Arellano-Bond test for AR(4)	-0,73815	[0,4604]	-0,34958	[0,7267]	-0,3496	[0,7267]

Significant at *p-value* level: 1% (***), 5%(**), 10% (*), 15% (##).

Source: own elaboration in STATA ver. 15

The results from analysis of control variables indicate that viable companies accumulate higher cash holdings which is in accordance with the theory of pecking order and financial flexibility.

Smaller companies maintain relatively higher level of cash holdings, due to the higher costs of obtaining external sources of finance and limited access to capital and credit market. This is in accordance with trade-off theory and the results obtained by Opler *et al.* (1999). Transaction costs related with financing and information asymmetry have a particularly strong influence on the access of small companies to the external sources of finance, which motivates them to maintain higher level of cash holdings. Larger companies have lesser cash holdings, which may be explained with e.g. lower probability of bankruptcy or economies of scale in managing cash holdings (Miller and Orr, 1966). Lenders who avoid taxes maintain lower reserves of cash holdings, which may result from higher investment or debt enabling utilizing non-interest (amortization) or interest tax shield (costs of external financing).

Lenders with higher growth opportunities (approximated with higher sales growth rate) maintain lower cash holdings. This is in accordance with the free cash flow theory, indicating utilization of investment opportunities. However, this may result from lending activity or not considering the precautionary motive, despite limitations in access to external sources of finance. Non-financial enterprise who grant loans obtain lower inflows from dividends, which results from their lower share in capital. Results confirm the trade-off between granting loans and capital contributions in related firms. Financing with net trade credit (surplus from obtained over granted trade credit) both within and outside the business group, causes the increase in the size of accumulated cash holdings. Financing with intra-group liabilities plays similar role, i.e. intra-group loans enable maintaining higher level of cash holdings.

However, deferred payments resulting from granted (and unpaid) trade credit to recipients, from within and outside the business group, decrease the size of maintained cash holdings. Received grants increase the level of cash holdings, while carrying out R&D activity is related with using of cash holdings (accumulated liquidity reserves).

Restricting the scope of the analysis in model 3 (only observations related with increased cash holdings) confirms most of implications described above. The exceptions are the negative

relationship of cash holdings and investment in fixed assets in year t-1 (*capex*) and positive relationship of cash holdings with the firm size. Larger companies make higher profits, which enables them to maintain higher level of cash holdings (last column in the **Table 3**).

6.1 Robust check

Next, the analysis of determinants of maintaining the level of cash holdings, dependent on the role of agency problem (**table 4**), confirms most of previously obtained results. Formulated conclusions for accumulating of cash holdings from financial surplus generated from operating activity (*cash flow*) and utilizing cash holdings for granting loans within and outside the business group do not depend on the character of agency costs. Results confirm **hypothesis H1**.

Table 4 Determinants of cash holdings of lenders, taking into account agency problems between shareholder (owner) and manager (management board)

variable	(1) outside the business group		(2) inside the business group		(3) professional manager		(4) manager-owner	
cash holdings L1.	0,2007	***	0,1549	***	0,2150	***	0,1689	***
	(0,0208)		(0,0449)		(0,0238)		(0,0258)	
cashflow	0,0931	***	0,0672	***	0,0868	***	0,0810	***
	(0,0069)		(0,0128)		(0,0091)		(0,0086)	
loan_other	-0,4866	***	-0,6904	***	-0,3534	***	-0,6120	***
	(0,0494)		(0,1957)		(0,0386)		(0,0721)	
loan_bg	-0,4406	***	-0,4348	***	-0,3991	***	-0,4531	***
	(0,0285)		(0,0607)		(0,0318)		(0,0350)	
leverage	-0,0432	***	-0,0870	***	-0,0412	***	-0,0606	***
	(0,0079)		(0,0244)		(0,0110)		(0,0146)	
st_bank_loans L1.	-0,0460	***	-0,0460		-0,0425	***	-0,0460	***
	(0,0116)		(0,0290)		(0,0140)		(0,0140)	
ltbankloan	0,0459	***	0,0622	**	0,0482	***	0,0331	**
	(0,0137)		(0,0311)		(0,0176)		(0,0165)	
equity_oth	-0,2105	***	-0,1941	***	-0,1861	***	-0,2174	***
	(0,0362)		(0,0608)		(0,0420)		(0,0427)	
equity_inv	-0,2136	***	-0,1639	***	-0,1774	***	-0,2445	***
	(0,0209)		(0,0437)		(0,0249)		(0,0258)	
dividends_related	-0,1350	**	-0,1903	*	-0,1500	**	-0,1271	*
	(0,0559)		(0,1080)		(0,0608)		(0,0674)	
capex L1.	0,0133	*	0,0319	***	0,0308	***	0,0080	
	(0,0074)		(0,0084)		(0,0071)		(0,0099)	
long_debt_related	0,0813	***	0,0344		0,0608	***	0,0666	***
	(0,0197)		(0,0284)		(0,0217)		(0,0254)	
short_debt_related L1.	0,0403	**	0,0383	*	0,0586	***	0,0286	
	(0,0164)		(0,0225)		(0,0165)		(0,0210)	
roa	0,1748	***	0,1695	***	0,1686	***	0,1713	***
	(0,0078)		(0,0178)		(0,0108)		(0,0094)	
size_b	-0,0071		-0,0122		-0,0059		-0,0059	
	(0,0047)		(0,0081)		(0,0065)		(0,0048)	
tax_spread	-0,0318	***	-0,0238		-0,0086		-0,0457	***
	(0,0118)		(0,0243)		(0,0150)		(0,0146)	
growth	-0,0014	**	-0,0004		-0,0017		-0,0010	
	(0,0007)		(0,0014)		(0,0011)		(0,0007)	
trade_n_other	-0,2964	***	-0,2491	***	-0,2994	***	-0,2802	***
	(0,0135)		(0,0270)		(0,0176)		(0,0170)	
trade_z_bg	0,0505	***	0,0888	**	0,0586	**	0,0575	***
	(0,0180)		(0,0390)		(0,0235)		(0,0216)	
trade_n_bg	-0,2967	***	-0,2473	***	-0,2840	***	-0,3002	***
	(0,0207)		(0,0421)		(0,0282)		(0,0254)	
grants_pl_1	0,0004	##	0,0000		0,0004		0,0004	

variable	(1) outside the business group		(2) inside the business group		(3) professional manager		(4) manager-owner	
	(0,0003)		(0,0005)		(0,0003)		(0,0003)	
rdexpen	-0,0240		-0,1019	**	-0,0184		-0,0842	
	(0,0519)		(0,0508)		(0,0359)		(0,0634)	
Time effects	YES		YES		YES		YES	
N	18 333		4 773		11 322		11 784	
Sargan's test	50,4287	[0,2033]	59,3939	[0,254]	59,3297	[0,0498]	45,0662	[0,7725]
Arellano-Bond test for AR(1)	-14,8330	[0,0000]	-7,4389	[0,0000]	-14,227	[0,0000]	-7,2019	[0,0000]
Arellano-Bond test for AR(2)	-0,2330	[0,8157]	0,0648	[0,9483]	1,2023	[0,2292]	0,1458	[0,8841]
Arellano-Bond test for AR(3)	0,0387	[0,9691]	-1,2976	[0,1944]	-0,7411	[0,4586]	-0,5954	[0,5516]
Arellano-Bond test for AR(4)	-0,7090	[0,4783]	0,9640	[0,3350]	-0,3856	[0,6998]	-0,5758	[0,5647]

Significant at *p-value* level: 1% (***), 5%(**), 10% (*), 15% (##).

Source: own elaboration in STATA ver. 15

Enterprises with lower share of debt in the capital structure (*leverage*) and lower short-term debt due to bank loan maintain higher level of cash flows, since they are monitored by creditors less frequently. Only within the business groups the relationship between cash holdings and short-term bank loan is not significant. Higher liabilities due to long-term bank loan lead motivate companies to maintain higher cash holdings, in case of increase in external finance costs or occurrence of problems with debt servicing. These results are in accordance with **hypothesis H2**. Lenders who maintain higher level of cash holdings tend to invest less in shares of other companies, which may results from preferences towards providing loans rather than making capital contributions to entities either within or outside the business group. This confirms **hypothesis H3**. Negative relationship between accumulated cash holdings and obtained dividends may results from other sources of cash holdings than dividends from shares in other companies. Enterprises grant loans instead of making capital contributions, since the payment of interest neither depends on financial situation of the borrower nor requires the resolution of shareholders meeting, contrary to dividend payment.

Investment in fixed assets in previous period does not significantly reduce company's cash holdings, which may result from financing such investment with external resources, such as a bank loan. Only in the case of companies managed by the owner such a relationship has not been statistically confirmed.

Lenders accumulate cash holdings due to financing with debt or trade credit obtained from related entities in the internal capital market. Only within the business group, financing with debt is of a short-term nature. This may indicate utilizing limited-liability companies as intermediaries in providing loans to other companies, in accordance with **hypothesis H4**. This is at least partly due to their lower transparency resulting from neither publishing their financial statements nor submitting it to audit. Providing either trade credit or regular loans reduces the level of cash holdings. The results confirm that viable companies maintain higher liquidity reserves, while the relationship with the size of the company is not significant in neither of analyzed sub-samples. Besides the structure of business group (model 1 and 4) tax savings (indicated by *tax_spread*) do not lead to increase in the level of cash holdings, as they are rather spent for granting loans. Lower growth opportunities and grants obtained by companies outside the business group cause the higher accumulation of cash holdings. However, within the business groups, carrying R&D activity leads to the increase in the cash holdings.

7 Conclusion

Under conditions of limited access to debt finance from banks in Poland with low financial development measured by nonfinancial corporate debt-to-GDP ratio (c.a. 48%), business groups play an important role in providing liquidity to their members (Białek-Jaworska, 2017). The results allow us to extend this conclusion by identifying an important role of limited liability companies in transferring money to unrelated companies, outside the business groups, in a form of a loan. We suppose that most beneficiaries of such loans are firms that are constraint on access to bank loans in Poland.

Low transparency of business sector resulted from only 10% share of companies issued financial reports and 90% of the businesses constituted by partnerships encourage companies to hold cash to increase financial flexibility not only own, but also other firms. Reasons for corporate cash holdings originating mainly from cash flow from operating activity and/or long-term bank loan are well recognized in literature (among others, Kim et al. (1998), Deloof (2001), Ozkan and Ozkan (2004), Almeida et al. (2004), Bansal and Bansal (2012) and Qurat-ul-ann and Abdullah (2017) except for financing with, either long- or short-term, debt gained on internal capital market and usage of cash holdings to lending money (providing loans) outside the business groups. Our findings show that private companies (unlisted on any stock exchange) may serve as intermediaries in transferring loans to other companies, in order to avoid restrictions related with thin capitalization. This support an existence of the mechanism of tax avoidance related with granting loans to unrelated entities, using limited-liability company as an intermediary. Besides, enterprises grant loans instead of making capital contributions, since the payment of interest neither depends on financial situation of the borrower nor requires the resolution of shareholders meeting, contrary to dividend payment. Results of our study confirm the trade-off between granting loans and capital contributions in related firms. In consequence, non-financial enterprise who grant loans obtain lower inflows from dividends, which results from their lower share in capital. This is causes by a phenomenon that a non-financial limited-liability company steps into shoes of banks and plays a role of an agent (a broker) in transferring loans to other companies.

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Intellectual capital: A literature review and conceptual framework

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Abstract

The recent four decades have witnessed the information revolution that has resulted in a new era of economics based on knowledge and innovation. The phenomenon of knowledge economy represents the highest stage of the post-industrial society and economy development, where the economic growth is no longer defined through the ever-larger number of factory workers, but is directly related to the stock of knowledge, habits and capability for learning new skills. Thus, the prosperity and welfare of our society are nowadays greatly determined by the stock of knowledge as a catalyst for a global transition from the traditional economy based on an ever-larger numbers of factory workers, tangible assets, as well as financial resources, to the dynamic economy based on intellectual capital and other intangible assets. The paper aims to point out the significance of knowledge in modern enterprises and explain how it is linked to the intellectual capital. Specific attention is also paid to the definition of conceptual framework of the term "intellectual capital as well as providing the characteristics of single components of the intellectual capital, as well as methods of its measurement.

Keywords: Intellectual Capital Definition, Human Capital, Intellectual Capital Components, Measurement Intellectual Capital

JEL Classification: M21, O15

1 Introduction

In today´s fast-changing global environment, knowledge is recognized as one of the most important factors, besides financial and material resources, determining a success of a company. According to the Nonaka & Kazuo (2007), the success of today´s enterprises in a global business environment is highly determined by the extent to which its managers can develop intellectual capital through the knowledge creation and knowledge-sharing on a global basis. Nonaka & Kazuo suggest that a competitive advantage is contributed by knowledge, which is created continuously through accumulation of valuable knowledge assets and raising the level of employee´s intellectual capabilities. In this way a company becomes a knowledge-creating dynamic entity that interacts with its environment, reshapes the environment and even itself through the knowledge creation. As suggested by Young (2012), the greatest power of an organization is nowadays recognized in its non-visible and intangible assets derived from knowledge creation, which involves knowledge sharing, knowledge distribution and social interaction within a company. At this point, arises the question of what is considered to be "Intellectual Capital" within a company and how it contributes to the higher performance and better competitiveness.

Definition and classification of intellectual capital (IC) components as well as intangible assets have been a long-discussed issue in many research projects and studies. Webster &Jensen

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(2006) use terms "intangible assets" and "intangible capital" interchangeably and define "intangible capital" as all forms of capital existing within a company, which matter is not tangible in an instant. In that context they suggest that intangible capital of the firm includes ideas, skills, and creative potential of the firm´s employees. Moreover, intangible capital is considered to be an intermediate stage of production where the company is financing its business activities that does not necessarily have to result in a physical, tangible asset. However, Webster and Jensen acknowledge that the definition they have proposed seems to be a bit controversial, because some intangible assets may be embodied in tangible objects such as patents, licences, manuals or pictures. For instance, Penman & May (2009) insist that "intangible assets" should be recognized as a label for brands, patents, distribution systems, supply chains, "knowledge capital", and "organizational capital" within a company. They also point out to the possible accounting problems associated with the intangible assets reporting, that mainly occur due to the fact that intangible assets cannot be considered for "stand-alone" assets and thus, they cannot be valued on a balance sheet independently of other assets, because their value comes from producing cash flow streams jointly with other assets. One could not deny existence of the "intangibles" within a company, despite the fact that this kind of asset is often missing on the balance sheets. The following usually leads to the balance sheet errors, what consequently results in the emerging gap between firm´s book and market value. The widening discrepancies between market value of companies and reported tangible book value is considered to be an indication of the significance of intangible resources in the modern knowledge economy, what forces managers to visualize the value of intellectual assets in their organization (Krogh, Nonaka & Nidhiguchi, 2016).

Within the economy of knowledge and intellectual capital, the role of an employee has also changed. Employees are now faced with the task to meet requirements of the company to do more brainwork and implement their personal knowledge into new applications and innovative products (Ali-Ali, 2003). Knowledge and intellectual capital are now considered to be the main drivers in value creation, as insisted by Augier & Teece (2012), due to its unique capability to be utilized again and again without being consumed unlike tangible assets. According to Sohrabi, Raeesi & Khanlari (2010), intellectual capital can be viewed as an instrument mainly used to measure performance and efficiency of a company within knowledge economy.

2 Intellectual capital: conceptual framework

Intellectual capital is a concept often used to identify the intangible assets within an organisation and to formulate a framework for their meaningful classification. Exploring this concept enables us to understand how knowledge can be profitably transformed into the valuable activity outputs within enterprises. Intellectual capital has acquired an unprecedented role in contemporary society, since it has become an important factor for economic growth and business development (Moore & Craig, 2008). It is considered to be the one of the crucial determinants of a company´s sustainable competitiveness, superior financial performance and as important source of wealth, as suggested by many researchers, for example by Teece (2000), von Krogh & Grand (2002), and Petty & Guthrie (2000). Commercial enterprises, various civil society organizations and public agencies are actively engaged in the process of creation, transformation and use of intellectual capital. In the modern world, companies not only produce goods and services, but they have also focused a significant part of their business on the knowledge production. Augier & Teece (2012) claim that business organizations are nowadays employing knowledge. This means that employees are engaged in the production of knowledge, organisations are becoming learners, and innovations are becoming an important source of a new value creation. The ambition to create a higher value and sustainable competitive advantage is the main reason why developing of intellectual capital within organizations is

recognized for the core organizational competency which determines success and enhances business performance, as claimed by Ali-Ali (2003). As suggested by the one of the most important scholars on the topic Stewart (1997):" A success often comes to those, one who are willing to manage their intellectual capital wisely".

2.1 Intellectual capital definition

The term "intellectual capital" was first coined by the economist John Kenneth Galbraith in 1969, who described intellectual capital as a dynamic kind of capital, or asset, comprised of creative mental processes. Intellectual capital is thus considered to be another essential source of company´s competitive advantage besides physical and financial capital, as argued by Nahapiet & Ghosal (1998) and Subramaniam & Youndt (2005). However, there is no a general accepted, or explicit definition of what intellectual capital is and how it is used and converted into a business value, because of the multidimensional nature of the topic, the challenge of defining "intellectual capital" remains still a critical issue. Nevertheless, reviewing some known approaches proposed by academics and researchers, it is possible to provide a conceptual framework of the term.

In order to better understand the meaning of the intellectual capital, it is necessary to clarify the role of knowledge in a company from a business point of view (Edvinsson & Sullivan, 1996). Intellectual capital must therefore be seen from the perspective of knowledge management, whereby it plays a significant role. As suggested by Kamaruddin & Abeysekera (2013), intellectual capital is reflected in the organizational knowledge, since it helps an organization to identify and manage its knowledge in order to meet the expectations of various stakeholders. Brooking (1998) seems convinced that the term "intellectual capital" shouldn't be considered for something new and unusual, as it has existed since the first vendors realized how important and beneficial the good relationship with a customer for the company can be, and it was called a goodwill. The conceptual framework of IC has been developed through different lines of approaches and across diverse disciplines, what is reflected in the definition provided by Edvinsson (1997) as he describes intellectual capital as a multidimensional relationship issue between humans, ideas and knowledge, which enables to measure the unmeasurable, and is considered for a renewable, recyclable resource, that needs to be cultivated in a context. Taking a closer look at the concept from a perspective of firm, we can simply define intellectual capital as "combined intangible assets which enable the company to function", as argued by Brooking (1998). In a very similar manner, Moore & Craig (2008) characterize intellectual capital as intellectual assets that can create value, drive the development of business and provide economic growth. From a strategic perspective, a concept of the intellectual capital can provide an answer to the core strategic questions in the relation to the future source of profitability and the principles as well as theories of management that can help companies to explore these future resources (Marr, 2012).The source of success, according to the Marr, is in ability of an organization to make knowledge resources available and accessible for the whole company. The term "intellectual capital" is often used interchangeably with terms "intellectual assets", "intellectual material", "knowledge assets" and "intellectual resource of capital". This interchangeability of terms is to be found in work presented by Ali-Ali (2003) on this topic. In his view intellectual capital is considered to be the main dynamic force behind innovation and business performance that affect competition in the contemporary knowledge economy. Al-Ali (2003) believes that intellectual capital is comprised of such intangible assets and intellectual resources of capital that a company uses to create value by transforming it into new processes, products and services. For instance, Kelly (2004) views intellectual capital as the resource of capital, which stems from a relationship between "stakeholders and partners, and an organisation`s ability to provide innovative solution for its business, manage changes, as well

its infrastructure, stock of knowledge, experiences and transferable competencies of its staff. By contrast, Klein & Prusak (1994), designate intellectual capital as an intellectual material, which includes thoughts, raw ideas, electronic messages, books, magazines, databases and post-it notes distributed in multiple storage units including the minds of individuals, so it has to be considered for the output of human processes, that can be formalized, captured and leveraged to produce a higher-valued asset. The term "intellectual material" in relation to intellectual capital has been also used by Stewart (1997). In his view, intellectual capital consists of collective wisdom and energy, which is difficult to be measured and more difficult to be managed. Stewart also argues that intellectual capital includes three crucial components: human capital being the sum of existing status of learning, innovation and mentality, experiences embodied in employees; structural capital being the sum of existing stock of knowledge effectively tested and organized within a company; and finally, customer capital being the relationship with the company related persons and parties, which includes customer loyalty and satisfaction.

Webster & Jensen (2006) proposed to use the term "intangible capital" instead of term "intellectual capital". However, from their definition of "intangible capital", we can conclude that they seem to talk about very similar things. Webster and Jensen claim that "intangible capital" refers to all forms of capital that are not tangible in their nature, and it includes corporate knowledge, personal skills, individual potential, but also patents, licences, intellectual property and rights. They suggest that all named kinds of capital should fall within four broader categories, namely: human, organizational, marketing (or relational) and production capital.

From the above definitions, it emerges that the concept of intellectual capital comprises of diverse elements that can be grouped in a few board categories.
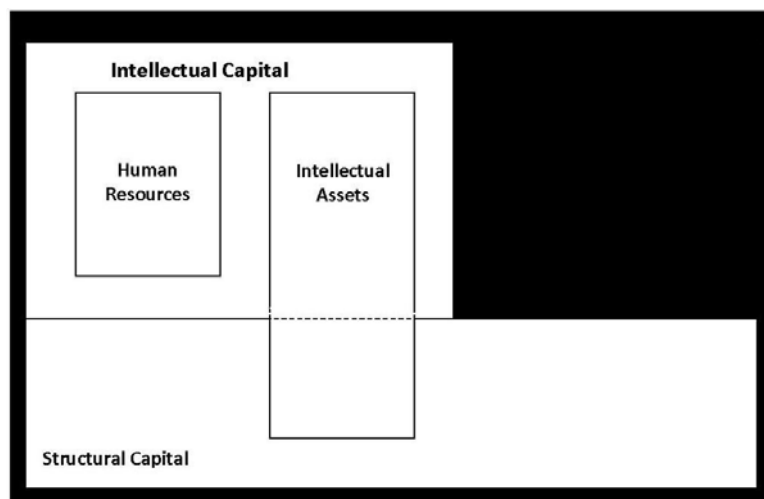
2.2 Intellectual capital components

Several contributions have formed different frameworks for the identifying and classifying the diverse components of the intellectual capital. According to the most of theoretical approaches, the following main components of the intellectual capital can be most commonly identified : human capital; structural or organizational capital; and customer or relational capital, as argued by Stewart (1997), Pulliam & Phillips (2002), Webster & Jensen (2006), Möller & Gamerschlag (2009), Moberly (2014), and Zakery & Afrateh (2016). One of the most representative scholars on the topic is Sullivan (1998) with his definition of intellectual capital represented by the sum of a firm's ideas, designs, acquired knowledge, inventions, technologies, know-how, data skills, processes, publications, patents and rights. From his view, under the term "intellectual capital" shall be understood everything what can be turned into the firm's profit. In that sense, he proposed a simplified model of intellectual capital, which consist of two dominant components, namely human capital and intellectual assets, which includes intellectual property:
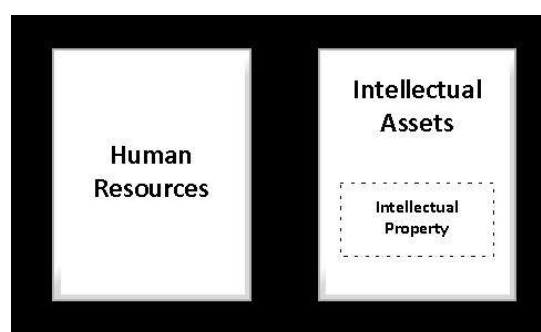
Figure 1: Intellectual capital model
Source: Sullivan, 1998

As suggested by Sullivan, human capital is comprised of a company`s individual employees, each of whom possess unique physical and mental qualities, knowledge and skills, as well as capabilities of suppliers, contractors and other organization related persons to create and deliver value to a customer. The most important parts of the human capital are collective knowledge, experiences, skills and know-how of all employees of the firm. Human capital is very important source of value in every company, because only through humans the company gains an ability to create and add value. The value created by human resources is reflected in intellectual assets of the company. Sullivan points out that creation of intellectual assets is not easy, and it requires managing the company´s human capital in the way that encourages people to codify their knowledge. One could basically distinguish between two forms of knowledge, namely explicit knowledge, which could be codified, formalized and is much easier to retrieve, as argued by Wellman (2009) and tacit knowledge, which refers to the personal qualities and capabilities of an individual and is difficult to extract and codify (Brooking, 1998). Once a company codifies tacit knowledge embodied in its employees, it becomes an only owner of the information. In this context, intellectual assets are codified, tangible descriptions of individual knowledge to which company can exercise ownership rights. Intellectual assets include data, documents, processes, inventions, drawing and programs. Once intellectual assets are legal protected, they become intellectual property being, for instance, trademarks, patents, copyrights, and trade secrets. Sullivan has also proposed a model of Knowledge Company by expanding existing model of intellectual capital to include structural capital:


Figure 2: Model of Knowledge Company
Source: Sullivan, 1998

Sullivan claims that intellectual capital by itself can bring a little value to a company. To deliver a greater value it must be supported by an infrastructure that company provides to its human capital. Sullivan is convinced that structural capital is the "hard" assets of the company, which include financial assets, buildings, machinery and other items to be found on the balance sheets.

One of the most important contributions to the development of the intellectual capital components structure is the model proposed by Saint-Onge (1996), which is comprised of three core components, namely human capital being defined as capabilities of employees required to provide value to customers; customer capital referring to loyalty and profitability of customers; and structural capital being the capabilities of an organization to meet market needs; Customer and structural capital are considered for inseparable components of intellectual capital- in contrast to the Sullivan´s model. This model divides individual aspects of intellectual capital into broader categories from a marketplace perspective. Saint-Onge points out relevance of

customer capital which unlike human capital that leaves a workplace at the end of the day, and structural capital that has only a little value without human capital, is represented by customers that keep the company alive with their willingness to pay for products and services offered by the company. He is convinced that right balance between human, structural and customer capital is what creates a corporate culture and thus is a guarantee of business success.

A further extension of the model, with its orientation on the market and customer relationship management is provided by Brooking (1998) as she suggests that intellectual capital is comprised of four key components: market assets, intellectual property assets, human- centred assets and infrastructure assets.
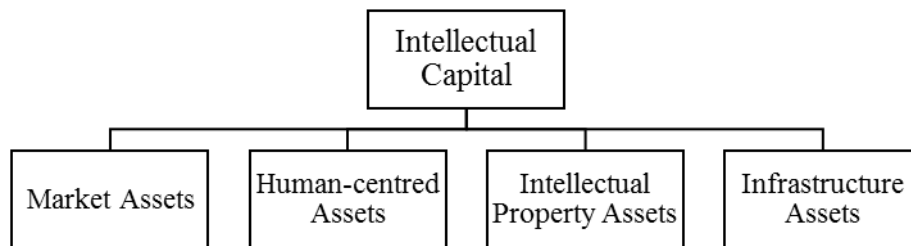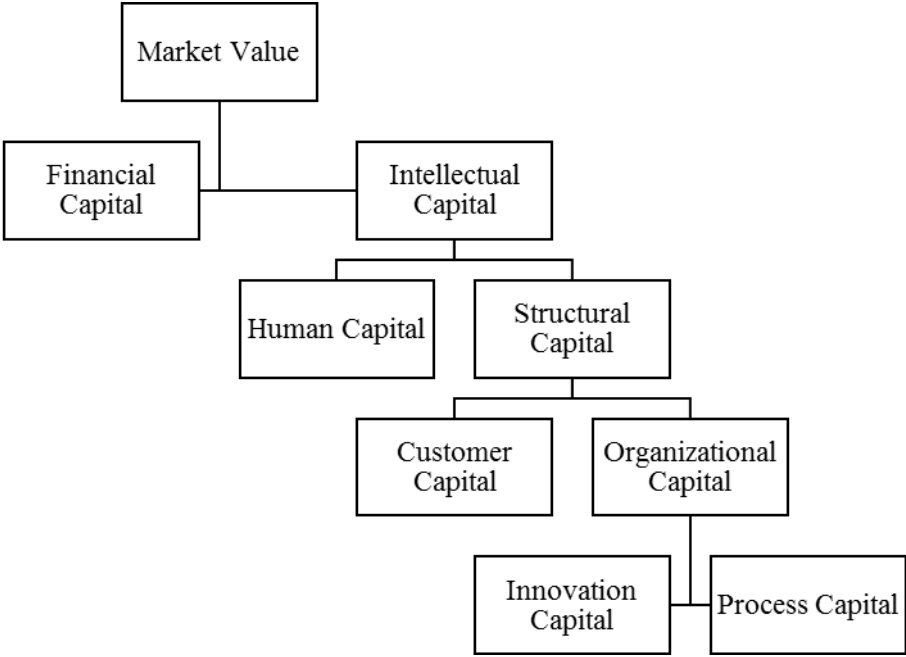

Figure 3: Model of Intellectual Capital
Source: Brooking, 1998

Market assets are considered for a source of firm's competitive advantage, because they include those intangible assets which are directly related to the crucial market activities of the firm. Branding, customer loyalty and sophisticated distribution network determine the success of the products placed on the market. Moreover, well-managed marketing strategy ensures the expansion of firm's reach and growth of its revenue. However, human-centred assets are very important source of knowledge in the company. They encompass the entire process of organizing expert work in collective, ability to lead employees, capability of creative thinking and problem solving, and other skills embodied by the employees of the firm. Brooking points out that, unlike other assets, human-centred assets cannot be owned by the firm. Good manager need to realize, that skills and knowledge generated and retained by humans, belong to the individuals and not to the company. Therefore, human-centred assets should be viewed as a very special source of wealth and hence should receive a special treatment, which includes, for instance, monetary motivation, and personal development opportunities. Successful managing of human-centred assets implies an ability to derive maximum benefit from individuals being in employment with a company, by understanding their skills, knowledge, expertise in order to create value within a company. Intellectual property assets enable company to create its own legal system for protecting sensitive data by registering patents, copyrights, trademarks and concluding non-disclosure agreements. All these legal protection instruments give a company an exclusive position in the market-place, by protecting its know-how, inventions, designs, software or trade secrets from theft. Brooking suggest, that the functionality of an organization is ensured by infrastructure assets being represented in technologies, processes and methods. In other words, infrastructure assets include a range of components determining the way the company works. This category of intellectual capital contains such intangible assets as the company culture, methods of managing risk and sales force, databases of information related to the market and customer issues, etc. It comprises also such assets as telecommunication and system support, which seem to appear tangible at a first glance, but it is all about the way it brings value to the company.

The most sophisticated classification of intellectual capital components has been proposed by Edvinsson (1997) as a technique for quantifying intangibles assets of a company. Edvinsson points out the importance of managing intellectual capital with an example of a company Skandia AFS: "A focus on intellectual capital provides an effective instrument to manage and develop a company". The increasing interest on the intellectual capital and hidden value in Skandia AFS led to the categorization of the intellectual capital components through formulation of such required questions as:

1. Identifying and improvement the visibility and measurability of intangible assets
2. Capturing and supporting processes by making knowledge more transparent and accessible within the company
3. Managing intellectual capital, improving and increasing capabilities of staff though access to training and IT networking
4. Capitalization and gaining competitive advantage by faster converting knowledge, skills and applied experience into an added value.

This has resulted in clarification of company´s intangible assets into the complex structure. Edvinsson is convinced that the definition of the term "intellectual capital" proposed by Stewart (1997): "Intellectual capital is something that you cannot touch, but still makes you rich", is reflected in a scheme of the intangible assets structure developed by Skandia AFS. The model illustrates major buildings blocks, which represent a range of non-financial values of the firm and can be considered for a gap between book and market value of the company.

Figure 4: Model of Intellectual Capital
Source: Edvinsson, 1997

The company´s capital structure starts with identifying of two core components of the stock market value, which are: financial capital and intellectual capital. Intellectual capital itself consists of two main elements: Human capital and Structural Capital. According to the scheme, shown above, intellectual capital can be considered as a creative aggregate of human capital and other forms of capital derived from the human capital. However, special attention should be paid to the human capital, because human beings are the most important creators of knowledge (Nonaka & Kenney, 1991).Human capital is represented not only by the employees

within a company, but also by the tacit and explicit knowledge, personal skills and qualities, moral values, corporate culture, managerial skills and ability to perform at a higher level. The specific attribute of human capital is that unlike other types of company´s intangible assets, human capital cannot be owned by anyone, because employees are not a property of a company they are working for. Moreover, no one can separate a person from his or her knowledge, skills, capabilities and experiences, however effective human capital management enables a company to become an owner of knowledge embodied in its employees.

Structural capital can be defined as the value that derives from the human capital. It refers to the documented knowledge of the employees and company related persons. This dimension of intellectual capital is often used interchangeably with "organizational capital" (Marr, 2007), and includes all components related to the organizational structure, routine methods and intellectual property of the company. Structural capital is comprised of internal processes, methodologies, structures and systems (Cabezas, 2008), that enable human capital to create market value, but it also encompasses intellectual property and other intangibles owned by a company, but that may not appear on its balance-sheets. Unlike human capital, structural capital belongs to the company and includes complementary assets of a business, such as manufacturing facilities and distribution capabilities, which enable to convert ideas into a saleable value (Sullivan, 1998). Sullivan argues, that structural capital provides an environment that stimulates the human capital to create and leverage its knowledge. It contains such sub-elements as a customer and organizational capital.

Customers are considered for another important source of wealth in every organization and for a crucial element used to achieve a competitive advantage (Horibe, 1999). Hence, customer capital may be defined as a long-term relationship between a company and its customers which is reflected in a customer satisfaction and loyalty to the products and services offered by the company (Iordache-Platis, 2017). The significance of the customer capital is emphasized by Roos (1998) as he is convinced that the value extracted from the long-term customer relationship is much more important than the value from the knowledge and skills accumulated within a company.

Organizational capital is defined as institutionalized knowledge and codified experience and is to be found within and used though databases, patents, processes, systems and structures (Youndt, Subramaniam, & Snell, 2004). According to the Foss & Knudsen (1996), organizational capital enables linking organizational structure to the competences of the firm´s employees. Sullivan (1998) describes the organizational capital as the way of how a company and its employees are organized to attain the best competitive advantage in the market conditions. He points out that the organizational capital is created as a merge of human capital and structural capital. This mean that all components of intellectual capital interact with each other. The structure of organizational capital is comprised of two crucial elements: innovation capital, being an ability of a company to generate new ideas, create new products and take its inventions to the market (Chesbourgh, 2006); and process capital, being methods and know-how that company uses to manage its business. According to López, de Castro & Verde (2010), innovation and process capital enable synchronization between all components of intellectual capital.

2.3 Intellectual capital measurement

Measurement of intellectual capital (IC) as well as intangible assets is still remaining a difficult point. There is no universal technique for a complex evaluation of a given issue. Therefore, the technique selection always depends on the data availability of individual IC components,

purpose of analysis and last but not least the report´s intended audience. Sveiby reffered to Luthy (1998) and Williams (2000) proposed classification of methods known for measuring, evaluating and reporting intellectual capital into the four main categories:

1. Direct Intellectual Capital Methods (DICM) – intellectual capital measurement is based on a monetary estimation and identification of its various components, which can be evaluated individually or as an aggregate index. Thus, DICM are able to provide a comprehensive and clearer picture of a company's intellectual wealth, since the methodology enables to measure and evaluate the individual components of intellectual capital separately (Gogan & Draghici, 2013; Huang, 2014;). Mohamed (2017) stressed that another huge advantage of DIC models is its accurate methodology which can be applied at any organizational level. However, DIC methods cannot be easily linked with financial statements results. Another weakness of the DICM lies in the variety of resource definitions its meaning between each company and each purpose, what makes comparison very difficult.

2. Market Capitalization Methods (MCM) – derive the value of intellectual capital from the discrepancy between a company´s market value and stockholders equity. This measurement approach is useful for intra-branch benchmarking due to its monetary focus, but it does not provide a detailed view of the intangible nature of intellectual capital components. Major advantages of MCM methods lie in their simplicity and easy application. However, the values are easy to calculate, the biggest weakness, according to the Sitar & Vasic (2004), is that the changes in the stock market value are not completely under management control, especially in times of takeovers and short business cycles, which may result in oscillations in a company´s intellectual capital value. Another disadvantage of MCM models lies in the limitations in interpreting the results when comparing the value of intellectual capital among diverse companies and organizations, due to the fact that organizations are often of different sizes. Hence the comparison is only possible if the influence of company´s size is omitted.

3. Return on Assets Methods (ROA) – measure intellectual capital on a basis of the profitability calculation of individual intangible assets of a company. The main advantage of the ROA methods, as argued by Huang (2014), is their simplicity and understand ability since they are based on the traditional accounting principles. The ROA models are also suitable for benchmarking and comparison of different organizations across the same sector. However, the ROA calculations often contain interest or discount rate, considering the time value of money, so the measurement at various points in time will also affect the results. Ståhle, P., Ståhle, S., & Aho, S. (2011) point out that the main disadvantage of ROA models lies in its inability to identify the value creation drivers, due to the confusing definition of intellectual capital, and to provide an information of possible improvements.

4. Scoreboard methods (SC) – measure intellectual capital through the specific indicators and indices calculated for it various components. The SC methods are very comprehensive and highly adaptable to the development strategy of a company. The biggest strength of the scoreboard methods is their suitability for all companies, regardless of size, business and intellectual capital categories definitions (Sitar & Vasic, 2004; Huang 2014). Scoreboard methods enable to capture and evaluate knowledge and skills encompassed in human capital on national and international level, as proposed by Bontis (2004), and thus to evaluate education and competencies of individuals in realizing organizational or even national tasks and goals.   The main limitations of the scoreboard models lie in the fact that every company build their own unique and specific index with respect to its environmental background and line of business. Thus, the comparison between competitive companies is quite difficult.

Based on several studies focused on a critical analysis of individual IC measurement methods, the strengths and limitations of the four categories have been summarized in the following table:

Table 1 IC Methods summary

Method	Advantages	Disadvantages
DIC	provides a comprehensive picture of a company´s intellectual wealth	no linking with financial statement results
	allows to measure intellectual capital components separately	not suitable for benchmarking or comparison
	able to apply at any organizational level	-
MCM	allows to calculate economic value of IC	not suitable for measuring non-financial aspects of IC
	simplicity, quick to apply	results are highly determined by the changes in the stock market
	allows intra-branch benchmarking and comparison between companies of the same size	-
ROA	allows to calculate economic value of IC, based on traditional accounting principles	unable to measure the value of IC of diverse categories in the organization
	suitable for comparison across organizations within the same industry	results are affected by the way of determining interest or discount rate
SC	extensive application and easy-to-adjust index	every organization build its own unique and specific index
	enables to estimate different dynamics of individual IC components or categories	comparison is quite difficult

Every method listed under the categories mentioned above, has it strengths and limitations derived from the different definitions on the concept of intellectual capital. Therefore, it is not possible to identify the most appropriate method for measuring the value of intellectual capital in organization. To provide the most accurate picture of the intellectual wealth, Sveiby recommended to combine multiple models and methods with one another, with the respect of data, purpose and audience.

3 Conclusion

The study had revealed that intellectual capital has gained increasing attention since it can be used to understand how knowledge can be profitably transformed into valuable activity outputs within enterprises. However, this concept is still partial unexplored but a significant branch of knowledge economy. The development of its conceptual framework has been discussed for many years. As it turned out, overall definition of intellectual capital allows us to build a relation between knowledge and intangible assets within a company. A success of the firm is now greatly determined by its ability to employee smart people and effectively utilize their knowledge capabilities. Organizations should focus their activities on making knowledge available and accessible for all employees. Thus, it can be concluded that intellectual capital a

sum is of all intangible assets of the organization created as a result of intellectual activities of its employees. Therefore, it should be noted that intellectual capital cannot be viewed as a sum of independent elements, but as a creation resulted from their interactions. Knowledge, skills and individual capabilities embodied in human capital are transformed into the organizational processes, culture and foundation of the basis for stable and sustainable customer relations. The successful handling of intellectual capital as a resource of competitive advantage can be achieved only through processes of interaction of all its components within a company.

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Empirical analysis of the availability and changes in the use of bank loans by enterprises in selected countries of European Union

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Abstract

The objective of the paper is the assessment of the access to capital in the countries of Central and Eastern Europe, its range, structure and impact on the development of small and medium enterprises (SMEs). The key question is whether the countries of the region benefit from the bank loans as the major funding source. Analyzes were conducted in reference to the continental (German) model which uses mainly traditional forms of raising capital like
loans and credits granted by banking institutions. Hence, all the analyzes relate the attitudes of entrepreneurs from the Central and Eastern European countries to the German economy and the EU-28 as a collection of all countries.

Keywords: Bank Loans, Continental Model, European SME Financing, Availability.

JEL Classification: G20, G21, F43

1 Introduction

Development depends on a range of various factors. The level of advancement of the financial sector and its availability is undoubtedly one of the key ones. It plays a crucial role for the country's economic system and thus is called its *lifeblood*. From the very inception of banks and stock exchanges, economists have recognized the fundamental role of the financial sector in the development of economy. Its key role in stimulating development was widely accepted in mid 50th of last century (Torre, Martinez, Peria and Schmukler, 2008). Many economists have proved that the most important development factor is a healthy internal engine of economy, i.e. a strong financial sector, which provides access to capital to all operating and producing market entities (Tamer Cavusgil and Pervez, 2017). Medium-sized enterprises, which tend to struggle to secure their position on the market, are an important sector for the financial system (Barth, Linand and Yost, 2011, Filip, Grzebyk and Kaliszczak, 2010). Changing over time business conditions, changing SME access to funding and alternative ways of funding the SME sector have recently become a significant area of research. The financial sector varies greatly from country to country. The differences relate among others to dominant financial institutions, forms of funding of economic initiatives, trading instruments and the level of technological development of infrastructure. According to the World Bank analysis, there is a close relationship between the size, availability and effectiveness of the financial market on the one hand, and the rate of economic growth in a given country on the other (OECD, 2009, World Bank, 2010, Andrejovska, 2014, Joos, Lang, 2014).

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The main research question is to recognize whether and how the countries of Central and Eastern Europe use bank loans as the main source of funding. Analyzes were conducted in reference to the continental model which uses mainly traditional forms of raising capital like loans and credits granted by banking institutions.

2 Advantages of traditional financing in the continental model

In the history of economic development loans constitute one of the main sources of financing enterprises (Grzywacz, 2012, Galindo, Micco, 2005). There are many types of bank loans: revolving loans for current company operations; investment loans supporting the sustainable development of enterprises; bank loans, which do not impose strict requirements, are needed to support smaller projects and activities; new banking products in the financial market (e.g. credit cards, current account overdraft and other loans) which allow repayment of the previously incurred trade liabilities without the need to apply for a new loan.

Loans are the basic banking product financing the global economy. Various types of loans have influenced the constant development of financial markets (Moritz, Block, Heinz, 2016). The corporate loan system allowed for technical progress and increased the role of banks in the financial system of the economy (Fernández, Lopez-Garcia, Marzinott, Vanhala, 2017). In the financial systems of various countries, two basic models of the banking sector are distinguished, also perceived as prevailing models of the financial system: the Anglo-Saxon model and the Continental (German-Japanese, Rhenish) model. The continental system, currently more often referred to as German, is a bank-oriented model as a basic credit institution. It can be also briefly described as a banking model (Surdykowska, 1999). The name reflects the main supplier of the necessary capital for enterprises. In this model, the axis is the central bank and commercial banks that perform both monetary and capital functions. The bank is the main source of short- and long-term capital acquisition. In this model, banks are of universal nature; they run both corporate banking (deposit and credit) and investment banking. A universal bank performs all kinds of banking activities. The bank combines credit transactions with transactions in the area of securities, issue activities as well as investment services and consulting. Thus, the bank can conduct a flexible policy towards its clients, because it can hold a holistic view of its customer treating it as a whole. There are long-term connections between the bank and enterprises, as well as mutual relationships and business relations that are very characteristic in the case of cooperative banks (Sołtysiak, Suraj-Sołtysiak, 2008). Until the global financial crisis, this system was considered quite stable. Its imperfections should also be noted (Krasodomska, 2010, Yakubiv, 2015). Criticism voiced by some researchers and analysts, shows that performing all operations in one universal bank in crisis situations may take place at the expense of weaker smaller entities (Barth, Lin and Yost, 2011,Sołtysiak, 2009). Among other flaws, researchers point to the delay of credit institutions in the process of implementation of innovative financial instruments.

3 Assumptions and research methods

The purpose of the own research was to empirically analyze the availability and changes in the use of bank loans by enterprises in the European Union. The essence was the recognition of the degree of use of traditional forms of financing, i.e. bank loans and other banking forms in financing their business activities by European enterprises. The idea of the undertaken research was to check the influence of entrepreneurs in EU countries on traditional attitudes in the methods of financing so-called the Continental Model (German model). The subject of the research was medium-scale enterprises employing 20-49 people. The analyzes were conducted for the neighboring countries of Germany, taking as a reference the effect of imitation and the

effect of direct cultural and economic impact. These countries were Czech Republic, Hungary, Poland, Slovakia, and Romania. The reference point in accordance with the concept of the German model was the German economy and the results obtained by all EU countries (EU-28).[3] The basic period of research was 2007-2016.In the first stage, the sub-index on access to debt finance index per country was listed for the analyzed countries, for the period 2007-2013 and countries were selected for the level of this development and accessibility. Methodically, the indicator largely reflects the importance of debt financing in terms of access to finance for SMEs and the fact that it is systematically monitored raises its cognitive value. On this basis, the level of the countries studied and their possibilities of financial development (support) were determined. Further for the next years, changes in economic values showing the economic growth of enterprises were calculated, ie turnover and value added of the non-financial business economy.In further studies, the initial and final details of the reasons for choosing a bank for a loan in European countries (2007 versus 2016 period) and the outcomes for the application of the a credit line, bank overdraft or credit cards overdraft in the bank (loan institutions) in the past period. Number of enterprises using credit products calculated with reference to 2009 due to the availability of comparable data (measured by the SAFE Accesses to finance, tool used by the European Commission UE and ECB).

Data for the study were obtained from a wide range of sources, including European Commission, European Central Bank, Eurostat Statistical Office of the European Union, National statistical Offices and World Bank data on how to measure and lead business. The statistical analyzes applied correlation coefficients between the growth rate of enterprises in the period of ten years, immediately after the financial crisis and explanatory variables in the countries surveyed. In extended analyzes, a statistical analysis of correlation was carried out and calculated on the correlation coefficients between the growth rate of enterprises in the period of ten years, immediately after the financial crisis and explanatory variables in the countries surveyed. The growth rates of enterprises as well as explanatory variables are counted as averages for the period. For this modification of data time series, the obtained results are stable and present long-term relationships between variables, not disturbed by the operation of business cycles.

The main goal of the article is to identify access to traditional banking capital in the countries of Central and Eastern Europe, its scope and structure and present its effects on the SMEs development.

4 Analysis of conducted research – results

Empirical analysis of the availability and changes in financial systems for small and medium scale enterprises in the European Union countries was diagnosed on the basis of the SMDF-Debt finance sub-index[4]. The Access to finance (SMDF) index points to the changing conditions of SME access to finance for the EU and its member states over time. The indicator is calculated on the basis of the initial value, which allows comparison between countries in time and space. The reference base of the conducted research concerned the initial period of 2007. The selected reference point is considered as the period before economic downturn caused by the global crisis.

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[3] The analyzes were carried out for the EU-27 (from 2007) and after the accession of Croatia in 2013 for the EU-28.

[4] The abbreviation used (SMDF) means SME Debt financing, the abbreviation SMEs is small and medium-sized enterprises.

In turn, the SMAF index includes two main elements of the current financial system, i.e. access to debt financing and access to equity financing. The index is a weighted average of partial indices. Partial indicators are weighted elements of indicators. The SMDF index is a normalized indicator, taking into account relevant values of weights on the basis of actual values, nature and range of partial indicators. What is important for the conducted own research, the chosen index reflects to a large extent the importance of debt financing in terms of access to financing, which are loans and credits[5].

Table 1 Sub-index on access to debt finance; per country, 2007 -2013 (in %)

Date	2007	2008	2009	2010	2011	2012	2013	Difference
UE-28	100	99	102	107	107	107	109	9
CZ-Czech Republic	101	100	103	109	113	115	114	13
DE-Germany	111	111	117	118	117	127	125	14
HU-Hungary	80	76	74	87	91	94	94	14
PL-Poland	102	99	102	106	108	108	112	10
RO-Romania	90	87	85	93	94	97	85	-5
SK-Slovakia	110	110	116	114	109	111	113	3

Source: Annual Report on European SMEs 2013/2014 – A Partial and Fragile Recovery; Access to finance for SMEs European Commission, Annual report on European SMEs 2016/17 Brussels, 23 November 2017, European Commission. Enterprise Finance Index, http://ec.europa.eu/enterprise/policies/finance/data/enterprise-finance-index/index_en.htm

Sub-index on access to debt finance increased by 9% over the period for all European Union countries. In the initial period, the German economy had the highest level. The worst access to debt financing was found in Hungary and Romania. In Poland and Czech Republic, the accessibility for the surveyed medium-sized enterprises was close to the average of the entire EU-28. The Slovak economy was distinguished, with an indication of 110%, i.e. close to the German economy. Comparing the changes in availability of access to debt finance over the years, the scope of access to the financial system in the studied countries against the EU-28 has clearly improved in such countries as Czech Republic, Germany and Hungary. The increase in availability was noted at 14%, which is above the EU average. Poland was in the next place, ranking as an economy with an average level typical for all European countries.[6] The Slovak economy slowed down significantly, with a negligible rate of improvement for debt financing.

A clear decline with a continuing downward trend was recorded in Romania. As the analysis for the preliminary research period showed, the financial sector of the studied area differs significantly from country to country. The differences found concern the access of SMEs to financial institutions. The economy of Czech Republic and Hungary is approaching the indicated continental model and Poland economy is following them.

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[5] Subindex debt financing has been set at 85% of the weight SMAF (General - Index Access to finance.)
[6] Debt finance sub-index (EU = 100, 2007). In 2010, the level was measured for the EU-27.

Table 2 Reasons for choosing a bank for loan finance among chosen European countries, comparison 2007 versus 2016 (%)

Items specified	Business already a client		Bank branch local		Best interest rate related terms offered		Best non-interest rate related terms offered		Bank emphasis on smaller firms		Bank branch known for good client relationships		Other	
	2007	2016	2007	2016	2007	2016	2007	2016	2007	2016	2007	2016	2007	2016
CZ-Czech Republic	58,1	57,7	5,1	6,0	20,5	21,2	7,7	6,4	1,0	3,3	6,9	5,6	0,8	0,2
DE-Germany	47,0	45,7	18,1	22,9	8,6	10,8	12,2	9,1	3,0	2,5	9,4	8,8	1,7	0,7
HU-Hungary	46,9	50,5	17,0	14,3	14,9	17,1	5,2	4,9	3,5	2,5	10,7	10,6	1,8	0,1
PL-Poland	42,8	44,6	11,8	13,1	15,8	17,1	11,2	8,3	5,7	4,4	12,6	13,1	0,2	0,3
RO-Romania	40,9	41,1	6,0	5,9	25,5	24,9	11,1	11,0	11,2	11,3	4,6	4,6	0,8	1,2
SK-Slovakia	54,0	52,7	10,9	11,5	17,5	17,7	4,7	5,2	1,4	1,8	10,4	10,3	1,0	0,9

Source: Structural business statistics and global value chains. Access to finance. SDMX Metadata Structure (ESMS), Eurobase- Eurostat, Statistical Office of the European Union, Luxembourg, ec.europa.eu/eurostat/statistics.

An interesting research problem was to examine how the attitudes of entrepreneurs in relation to credit institutions and banking products shaped in the countries studied and how they have changed over many years, from 2007-2016. The basic reasons for choosing a bank for loan finance in European countries are presented in above tab.2.As results from the collected data and comparisons, the basic reason for choosing a bank as a capital provider was the opinion that business is already a client. This is a positive opinion and process. This position was expressed by over 40% of entrepreneurs in all countries. Interestingly, in 2007 the highest business relationships between the bank and enterprises were found in the Czech Republic and Slovak Republic. Hungary had similar indications as entrepreneurs from Germany. The German economy, as ordered and stabilized, seems to show permanent tendencies. Nearly 47% of entrepreneurs emphasized this feature in 2007 and 45.7% in 2016.On the other hand, weak compounds of this type in the study were found in the Poland and Romania economy. During this period, only every third entrepreneur found business support in the bank. In 2016, the business approach towards entrepreneurs improved the most in Hungary and decreased in the Slovak Republic economy and slightly in the Czech Republic. This approach to entrepreneurs as clients in the analyzed period means that universal banks have built and continue to build good relationships and trust. This is a constant tendency and shows that the banking model operates in the countries studied. Financial conditions are another important motive. Every fourth Romanian businessman and every fifth Czech entrepreneur indicated on the best interest rate related terms.

The current rate of economic development of these countries is analogous to the financial incentives dedicated by banks in these countries. The financial incentives were applied by all countries, with the exception of German. The price of money and the policy of central banks of these countries encouraged the use of debt financing and constant use of bank offers.

Location and proximity and bank branch localization was important for the majority, with the exception of the Czechs. It was extremely important for the Germans, which testifies to the strength of habits. On the other hand, such factors as the best non-interest rate related terms offered had a decreasing importance. On the other hand, bank emphasis on smaller firms was important for business in Romania and in the remaining countries of Central and Eastern Europe was negligible. They were referred to by 1 to 5% of respondents. Opinion as bank branch known for good client relationships has been a constant trend for all researches for years. You can see that a client relationship is important for over 10%. This is a good motive to continue using banking services and products.

The analyzed reasons for choosing a bank for loan clearly indicate that banks care for mutual business relations and financial incentives over the years. The bank's influence on the economies of individual nations is particularly visible in the Czech and Hungarian economies, which coincides with the previously calculated sub-index on access to debt finance per country.

Table 3. Number of enterprises using credit products i.e .credit line, bank loan, bank overdraft or credit cards overdraft in selected European countries - analysis comparison in the 2009-2016 years (%)

Specification	EU- 28		Czech Republic		DE Germany		HU Hungary		PL Poland		RO Romania		SK- Slovakia	
	2009	2016	2009	2016	2009	2016	2009	2016	2009	2016	2009	2016	2009	2016
Used in the past 6 months	15	35	6	22	16	38	8	20	10	42	10	40	2	38
Did not use in the past 6 months	48	18	58	28	47	16	38	20	44	17	48	19	48	18
Not relevant to enterprise	25	45	32	47	27	46	39	56	34	40	30	38	35	42
Relevant but do not know if used	6	0	3	0	9	0	5	1	34	0	9	0	8	0
dk/na	6	2	1	3	1	1	10	3	8	1	3	3	7	2

Source own calculation on base: Survey on the access to finance of enterprises (SAFE) Accesses to finance. Analytical Report 2009, Flash Eurobarometer, Gallup Organization Hungary, Flash EB series 271, pp.55-59; SAFE 201, Analytical Report-Country data European Commission and the European Central Bank, Brussels, pp.74.

In the following step of empirical analysis we showed number of enterprises using credit products, i.e. credit line, bank loan, current account overdraft or credit cards overdraft in the last months of the former year. In this way we tried to check observed tendencies. We tested the willingness of banks to extend credit to businesses. In own research, we asked whether in the case of each of the following factors listed in Tab.3 they have improved, remained unchanged or deteriorated in the last 6 months. Number of entrepreneurs used bank loan in the past 6 months in the EU-28 countries increased from 15% to 35%, more than twice. In Poland, Slovak and Romania the most because four times more. In Czech Republic, Hungary has more than tripled. This is definitely more than in reference to the German economy accepted as a model. However, the reverse relation was noted in the group of enterprises that did not use the bank loan in the past months. This relationship is negatively correlated with the increase in the scope of using the credit banking products. It is worth paying attention to other indicators. These are the answers of the individual business regarding the fact that banking products are not relevant to enterprise. This indicator in the European Union increased twice what indicates there is a market gap in the financial market. This is an opportunity or a new need for other innovative new financial products Indicate at the same time that the countries of Central and Eastern European this area show similar behavior but the degree of change is smaller. In summary comparisons indicate that European entrepreneurs for banking products are reporting new demands. Trends are increasing. On the other hand, European companies point to the needed innovations and new financial solutions. In particular, this situation is observed in the group of companies operating on the German market.

Table 4. The outcomes for process of application applied credit line, bank overdraft or credit cards overdraft in banks in the lights of negotiation for this type of financing (in %, date for over the past six months, 2017).

Specification	EU-28	CZ Czech Rep.	DE Germany	HU Hungary	PL Poland	RO Romania	SK Slovakia
Applied, received everything	73	78	73	69	81	73	74
Applied, received above 75%	6	0	5	6	4	5	7
Applied, received below 75%	5	0	3	5	3	5	4
Applied but refused because cost too high	1	3	2	1	2	0	0
Applied but was rejected	6	2	3	4	4	8	5
Application is still pending	6	8	8	10	3	7	6
dk/na	3	9	5	6	3	3	3

Source: Survey on the access to finance of enterprises (SAFE) - Analytical Report 2017, European Central Bank SAFE survey report 2017 - business data, pp.145.

As for the results for the application process used credit products in the light of the negotiations with the banks over the last six months of 2017 we observed positive situation on the European market. In the Union, over 73% of companies have applied credit and received everything. The high rate of application with a positive effect was noted in the Polish economy. You can see that the banks have begun to meet the requirements customers during the loan granting procedure. A more precise selection of loan applications has started. There has been a change in the method of assessing solvency. It can be said that over time, banking institutions minimized the risk to such an extent that the probability of bank bankruptcy decreased. One of the observed trends in the operations of banks, was aware of choosing preferred company profiles. Companies that generated large profits and had relatively good financial liquidity were more willingly credited.

Banks once again proved their willingness to reduce risk to a minimum. Analyzing the situation in Poland, such behavior was a necessity. The segment of small and medium-sized enterprises does not have a high risk related to lending. However, if individual companies are analyzed, it may turn out that the risk of crediting such an enterprise is unacceptable for banks. Therefore, in the Polish economy, companies with a longer history of operations and an established financial position are preferred.

Comparing the changes in the accessibility of financing by banks over the years in terms of access to the financial system, as stated earlier, it clearly improved in such countries as Czech Republic and Hungary, followed by Poland. These results were compared with such results as turnover from sales of companies and value added created by business. For medium-sized businesses in European countries, employed 20 to 49 persons, changes in turnover on sales remained at an average level of about 4% in relation year-on-year, with the exception of declines in 2014. The German economy, in terms of the desired increases in turnover from sales and created value added, shows relative stability against this background. The financial results of medium-sized enterprises in the Czech and Romanian economy showed the highest increases, but also significant fluctuations. In the case of Hungary and the Czech Republic, the positive correlation between the openness to the banking system and the results achieved was

confirmed in the research. It should be emphasized that the cause and effect relationships are stronger in the group of medium-sized enterprises operating on the Hungarian market.

Table 5 Turnover and Value added of the non-financial business economy by size class of enterprises employed 20 to 49 persons in selected countries of UE in period 2011-2016 (in Millions EUR)

Specification/year		2011	2012	2013	2014	2015	2016
EU-28 countries	Sales revenues	2644768,3	2757828,5	2796458	2735144,6	2801284	2930974,3
	Dynamics (y/y)	-	4,27%	1,4%	-2,2%	2,42%	4,63%
	Value added	620486,1	636623,9	642671,7	643875,1	677275,4	700000
Czech Republic	Sales revenues	45208,6	49172	50214,6	53934,6	48191,4	48898,7
	Dynamics (y/y)	-	8,77%	2,12%	7,41%	-10,65%	1,47%
	Value added	7833,3	8135,9	8256,2	7729,7	7785,1	8377
Germany	Sales revenues	509509,7	518909,7	534548,8	530141,3	541622,7	565578
	Dynamics (y/y)	-	1,84 %-	1,03 %	-083 %	2,16%	4,42%
	Value added	129532,1	131237,8-	139637,2	144269,4	156053	162638
Hungary	Sales revenues	25007,6	25909	22570,8	23055,1	26427,3	27803,9
	Dynamics (y/y)	-	3,6%	-2,89 %	2,14%	14,63%	5,21%
	Value added	4018,7	4147,1	4175,4	4317,1	4925,9	5267,9
Poland	Sales revenues	70795,8	77393,6	78607,8	80391,3	82448,6	82593,4
	Dynamics (y/y)	-	9,3	1,57%	2,27%	2,56%	0, 17%
	Value added	14744,5	15577,9	15208,1	14957,6	15735,3	16299,3
Romania	Sales revenues	23794,9	27015,5	27464,5	27430,2	29493,2	31945,3
	Dynamics (y/y)	-	13,53%	1,66%	-0,13%	7,52%	8,31%
	Value added	0	4653,8	4657,3	4890,9	5548,2	5735,1
Slovakia	Sales revenues	12265,2	16335,9	16732,7	16119,4	16987,5	17729,8
	Dynamics (y/y)	-	33,19%	2,43%	-3,67%	5,38%	4,37%
	Value added	2466,2	3795,3	2746,7	2477,4	2611,6	2809,1

Source: own calculations based on source data, Non-financial business economy by size class of employment Eurostat, Statistical Office of the European Union, Luxembourg, ec.europa.eu/eurostat/statistics from proper years.

While the turnover of companies in all countries increased in the period, the level of added value was unchanged. From this it can be concluded that the position of medium-sized companies for the studied countries is similar. This means that it is difficult for these enterprises to expand the size of their operations in conditions of high competition and move to a group of large companies. The main reason for the expected changes is the limited ability to create financial surpluses. To analyze the statistical relationships between the financial results and the scope of using commercial banks as the main capital provider, the correlation analysis was analyzed.

Correlation analysis was performed in relation to many explanatory and significant variables for economic growth.

Table 6. Coefficients of correlation between the growth of enterprises and explanatory variables in the surveyed countries in the period 2007-2016

Explanatory variable	Correlation Coefficient
Indicator universality and accessibility of bank loans	0,62
Capitalization of listed companies (% of GDP)	0,39
Sub-index on access to debt finance per country	0,76
The highest CIT tax rate (%)	–0,20
Value added in enterprises (% of GDP)	0,55
Inflation rate (%)	–0,77
Interest rate on loans (%)	0,68

Source: own calculations based on source data

The results of the analysis of the correlation between the growth rate of enterprises in selected EU countries and potential explanatory variables being the factors of their growth are presented above. The growth rates of enterprises as well as explanatory variables have been counted as averages for the period under consideration. With such a modification of the time series, the obtained results are stable and represent long-term relationships between variables. Through these calculations, the influence of business cycles and other irregular fluctuations was eliminated. The correlation coefficient takes values from -1 to +1. The correlation coefficient of zero indicates no dependencies between variables. The closer the correlation coefficient is to unity, the stronger the positive or negative dependence. Positive dependence was found for the variable value added in enterprises as% of GDP and the interest rate on loans as well as indications about the universality and availability of loans. The largest statistically confirmed significance in dependencies in different countries had sub-index on access to debt finance. Negative dependence was confirmed for macroeconomic instruments, such as inflation and tax rates. Summing up the conducted research, we indicate that the proximity of banks typical of the continental model had impact on the effectiveness of enterprises in the surveyed countries.

5 Discussion and Conclusions

The study objective was to investigate whether medium-sized enterprises in the countries of Central and Eastern Europe have access to the bank-based financing, to assess their relationships and whether the use of their services is of permanent nature. Taking as a reference point the German economy, the effect of imitation in the countries surveyed was confirmed. The Central and Eastern European countries adopted the continental financing model. The results of the own research carried out in the period 2007-2016 indicate strongly that banks care for mutual business relations, apply various financial incentives and are the main supplier of capital.

Following the comparison of the changes in the availability of debt financing in the analyzed countries, we point out that bank-based financing in these countries is significant and developmental. Clearly, this trend has strengthened in countries such as the Czech Republic and Hungary, followed by the economy of Poland. In the case of Hungary and the Czech Republic, the positive correlation between the openness of the banking system and the achieved financial results was confirmed by the research. The correlation coefficients between the growth rate for medium-sized enterprises and the variables decisive for economic growth confirmed that the level of universality and availability of banks had an impact on their development. The research shows that entrepreneurs from the countries closest to Germany have consolidated the financing model by credit institutions.

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The impact of credit rating changes on prices of publicly traded companies

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Abstract

The term rating is particularly important in context of past financial crisis and current valuations of stock markets. It is, therefore, a focus point in scientific and economic circles. Rating is an assessment of company's creditworthiness and thus it simplifies the reflection of its solvency. Investors consider increased transparency based on ratings and it is taken into account when considering returns. From the businesses point of view, higher the rating grade, lower the capital costs. In particular, rating reflects company's external financing. Rating change will certainly affect the amount of interest needed to be repaid. Then these increased/ reduced interest flows must adequately reduce/ increase the company's cash-flow. The focus of this paper is to analyse the impact of credit rating downgrades on companies traded on the Czech and Slovak stock market and to find significant results to be used in further investment decisions.

Keywords: Credit Rating Change, Stock Prices, Event Study, Credit Rating, Publicly Traded Companies, Investment, Rating Downgrade

JEL Classification: G12

1 Introduction

Great amount of information on reactions of stock prices to credit rating changes is to be found on various databases, usually in form of event studies and dedicated researches. Those papers and studies examines periods of more than hundred years for the most important indices. However, there is little evidence on this issue among studies focused on East European Markets, in particular Czech and Slovak publicly traded companies. It is important to state that larger and more liquid market is Czech stock market, and for the purpose of this paper we selected index benchmark PX-GLOB for both countries. Although last financial crises of 2008 took place ten years ago the index value is still not above pre-crises levels. Information value of ratings provided by dedicated agencies are important for investors and traders. Despite the fact that the dynamics of this market is not as strong as on S&P500, DAX or Nikkei255 there is a need to bring more information value of market movements in connection with credit rating.

There are two important goals of this paper. The first one is to review relevant recent literature and prepare a clear summary of important studies. The second goal is to analyse the impact of credit rating changes – focusing particularly on downgrades and observe stock prices moves. We will choose a sample and analyse daily returns. Any significant result will be closely examined and interpreted. Motivation to write this paper is to find significant support for short trading strategy – if prices react significantly after rating downgrade it is worth to consider short selling of stocks during significant days.

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2 Fundaments of ratings

Term "rating" means the assessment of creditworthiness of assessed company. Rating therefore reflects also ability of the company to repay its loans. Basis for granting a rating are quantitative and qualitative factors and criteria such as business performance, management skills, business strategy and the potential for future business success. Quantitative evaluation procedures include mathematical-statistical models that are characterized by a high degree of formalization and objectification (Everling, 1991).

Other quantitative methods include regression analysis, pattern recognition method, artificial intelligence methodology as well as neural networks (Fama, Fisher, Jensen, Roll, 1969) Rating is generally an indication of the probability that the borrower will be able to repay its financial liabilities in the future (Füsser, Gleißner, 2005). A strong rating is required by the Basel III (previously Basel II) framework agreement, which takes into account the different forms of rating as well as focusing on four vital banking parameters i.e. capital, leverage, funding and liquidity. For bond investors, investing under Basel III should be safer as there are stricter capital requirements for banks including their bond issuance. There is a difference between internal and external rating. As an external rating, we understand a rating that is not provided by a credit institution but by an independent rating agency. On the contrary, internal ones are those carried out by special credit institutions. Rating is one of the key factors in the credit decision-making process.

3 Literature review

In order to increase the information content of the rating, it is first necessary to determine whether the rating-related activity contains new, supplementary information for the capital market, or reflects only the well-known up-to-date facts. Since the mid-1970s, this has been the subject of intense empirical studies, particularly in the US capital markets. Numerous case studies check whether, for example, at the time of the event extraordinary interest rates on bonds appear.

In most studies, it is well documented that there are significant stock price deteriorations after credit rating downgrade occurs. There are countless event studies on these correlations carried on various stock markets. On the other hand, the is little evidence on stock price increases after credit rating upgrades. Probably most clear view of studies, used methods and results sorted in one table provides the study of Heinke/ Steiner (2000). They also made their own research resulting in a knowledge that there are significant price changes in connection with downgrades on the day of the announcement and in the coming days while rating upgrades lead to small course movements compared to rating downgrades. Another study by Kliger, Sarig (2001) investigated the information effect caused by the introduction of a numerically sensitive grading (1, 2 and 3) in the rating by Moody's in 1982. Clearly, responses in price change ware not related to a fundamental change in creditworthiness but reflected primary rating information. Comparison of ratings by Moody's and S&P shows that investors are focusing on the S&P risk range. In addition, market price is considered to be a benchmark where spreads of loans are comparable to other titles. Creighton, Gower, Richards (2004) e.g., dealt with the information content of ratings for the Australian market. The change in spread is measured by borrowings that are derived from the maturity of the government bonds when the rating changes occurred. For the event day and also the next day, an uptrend (downtrend) in spread might be observed. Changes in spreads are confirming information value of a rating, however, compared to other studies, changes-to-be in rating cannot be forecasted.

All studies agree that it is impossible to establish a generally valid conclusion on information value of the credit rating. In all observations, it is clear that negative rating changes are associated with stronger price change responses as opposite to positive changes. In addition, low-rating bonds seem to show a more significant response than those with a higher rating.

Table 1 Overview of picked studies on credit rating information value (2004 – 2018)

Author/ Market	Time period; Sample; Return term; particularities	Event periods & results	Interpretation and results
Abdeldayem M. M., Nekhili R. (2016) Bahrain[2]	2014 - 2016 - Bahrain all share index - 45 listed companies - Divided into 3 sectors: Banks, Services and Industry - Standard & Poor's and Moody's - T (-501; -41; -20; 0; 20) - Daily returns - 0,5 % significance level	Event period M (-20;20) Downgrades: T(-20;-1) Banks M(-16) -1.158% Industry (-7) -2.930 % Industry (-8) 2.587 %	For Banks and Services, it takes longer time to absorb downgrades (16 - 19 days after announcement) - no significant abnormal returns
Timmermans M.A.J (2012), Tilburg, Netherlands[3]	1997 - 2012 Daily prices for the MSCI Europe Index; - Small Caps vs. Large Caps - considers type of downgrade - Standard & Poor's, Moody's, Fitch	Event period M (-29;30) - Upgrades, Downgrades - downgrades: For Large Caps significant CAR (-3;3) -1.92 %, - for Small Caps result was -2.17 % - downgrade has greater influence on Small Caps - Non-financial firms - significant CAR (-1;1) -1.16 % - Financial firms (-1;1) -2.04 %	In line with previous researches Bernard, Thomas (1990), Fama (1998), Hand. (1992) and Goh, Ederington (1993), - multivariate regression - significant CAAR for the event window (-1;1) 1.49 % at 1% sign. - downgrade has greater influence on Small Caps - small reaction for rating changes before 2007 - Banks response significantly more than corporates, financials react more than non-financials
Leonard M., Olinsky A. (2013)[4]	01/2001 - 09/2011 - S&P 500 - analyses stocks price movement downgrade as a result of its bond rating downgrade - 172 companies and 20 271 downgrades - T (-160; -2; 0; 2)	Event period - downgrades divided into 1-step till 4-steps rating downgrades	downgrade of a company's bond rating has no impact on its stock price on the day of and on the days surrounding the downgrade - no significant CAR

[2] see. Abdeldayem M. M., Nekhili R., (2016). *Credit Rating Changes and Stock Market Reaction in the Kingdom of Bahrain*. International Journal of Economics and Finance; Vol. 8, No. 8;
[3] see. Timmermans M.A.J. (2012). *Credit rating changes and the effect on stock prices*.
[4] see. Leonard M., Olinsky A. (2013). *The Stock Market Impact of Bond Rating Changes*.

Gupta V. (2017) New Delhi, India[5]	2001 - 2014 - CRISIL, ICRA, CARE, FITCH and BRICKS Ratings - downgrades, Indian Banking sector - calculates AAR, only 3 banks faced rating downgrade	Event period M (-45;45)	Calculate monthly returns - Punjab & Sind Bank -2.6 % monthly return - Indian Overseas Bank 1.2 % monthly return - Central Bank -3 % monthly return - Stocks average monthly returns in 2013 were 10,5 %, in 2013/2014 were -3,9 % and in 2014 were 5,7 %
Miyamoto M. (2016), Tokyo, Japan[6]	2000 - 2007 - TOPIX index - analyses 221 corp. - Rating agency - Rating and Investment Information (R&I)	Event Period M (-139; 10) - Upgrades, Downgrades - companies divided into 4 groups: financials, non-financials, manufacturing and non- manufacturing sectors	Calculate daily returns - for aggregated sectors (-21; 21) sign. Impact on downside for first 3 days - confirms other studies form UK, USA and EU

Source: Author's research

Each of recent studies and papers are in line with results from previous researches. Chosen studies cover large indexes as S&P 500, MSCI Europe, TOPIX and also Bahrain All Share and Indian Banking Sector.

4 Methodology

To determine abnormal returns, we calculate the benchmark yield according to the Market model. The Market model is based on Portfolio Selection by Harry M. Markowitz (1959). The model assumes a linear relationship between the securities and market portfolio returns:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}$$

where
ε error term

$R_{m,t}$ market portfolio returns on the day t

We will calculate Alpha and Beta using Ordinary Least Squares (OLS) method. As we are performing a regression analysis, OLS method is a very effective mean to estimate parameters of linear regression. By the principle, we estimate variables by minimizing the difference between predicted variable – in our case daily stock prices, and those variables predicted by the function. (Goldberger, 1964). In order to calculate the beta we take variance of daily stock prices and covariance of daily index prices. In calculation of alpha - we consider 10Y Czech government bonds as risk free return and PX-GLOB index as market return.

[5] Gupta V. (2017). *Impact of Rating Changes on Stock Prices*. SSRG International Journal of Economics and Management Studies – Volume 4, Issue2
[6] Miyamoto M. (2016). *Event Study of Credit Rating Announcement in the Tokyo Stock Market*. Journal of Economics, Business and Management, Vol. 4, No. 2

The day of rating downgrade is the focus day. The event period is set to 21 days before and after the announcement date. The estimation period serves to determine the parameters of the Market model and covers a period of 104 trading weeks. The estimation period ends one day before the start of the event period to avoid overlapping. Figure 1 bellow depicts clearly used timeline of this the event study.
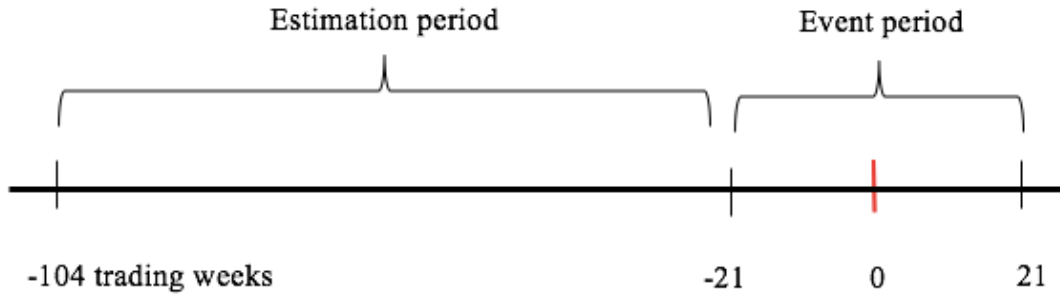
Figure 1 Event study timeline
Source: Author's research

The PX-GLOB index is used in the context of the market model to determine the market portfolio return.

The difference between the actual realized and theoretically expected market return of a stock represents the excess or abnormal rate of return. In an information-efficient market, while maintaining the validity of the model used to calculate the expected returns, there are no systematic deviations of these two yield values. The following applies:

$$E(AR_{i,t}) = 0 \qquad (1)$$

where the excess return is calculated as follows:

$$AR_{i,t} = R_{i,t}^* - E(R_{i,t}) \qquad (2)$$

where

$AR_{i,t}$ excess return of the stock i on the day t,

$R_{i,t}^*$ observed return of the share i on the day t,

$E(R_{i,t})$ expected return of the share i on the day t.

To determine accumulated excess returns, the literature uses the additive as well as the multiplicative linking of excess returns as well as the determination of buy-and-hold excess returns.

The additive calculation of accumulated excess returns is based on a work by Fama / Fisher / Jensen / Roll and is done as follows:

$$CAR_{i,\tau,L} = \sum_{t=\tau}^{t=\tau+L} AR_{i,t} \qquad (3)$$

In this conference paper study, the additive calculation of cumulated excess returns is used.

In our research we use both the CAPM and the Market model to capture the sensitivity of the results depending on the choice of the respective reference model. The abnormal return based on the CAPM is calculated as follows, as described above for the market model:

$$AR_{i,t} = R^{*}_{i,t} - r^{CAPM} \qquad (4)$$

5 Results of investigations

In this research we compared a sample of Czech and Slovak companies on respective local stock market that have received credit rating downgrade. We used data from period 25.11.2008 – 16.3.2017. However, some of those companies are not part of index during covered period of 10 years, such as Česka Sporitelna, a.s.[7]. Table 2 bellow provides results of t-test of the sample.

Table 2 T-Test of the sample

	t (-1, 1)	t (-5, 5)	t (-10,10)	t (-21, 21)
Average	-0,0068	-0,0041	-0,0279	-0,0266
Variance	0,0003	0,0037	0,0138	0,0198
Observations	25	25	25	25
Hypothetical difference of means	0	0	0	0
Degrees of freedom (df)	24	24	24	24
t-statistics	-1,9732	-0,3335	-1,1880	-0,9478
P (T <= t) on-sided t-test	0,0300	0,3708	0,1232	0,1763
Critical t-value for one-sided t-test	1,7108	1,7108	1,7108	1,7108
P (T <= t) two-sided	0,0600	0,7416	0,2464	0,3526
Critical t-value for two-sided t-test	2,0638	2,0638	2,0638	2,0638

Source: Author's research

According to t-test, only results of interval -1, +1 are statistically significant on 5% confidence level. As there is only one statistically significant interval, we chose not to evaluate the estimation period for market model.

[7] Czech company Česká Sporitelna, a.s. was publicly traded only until 2002
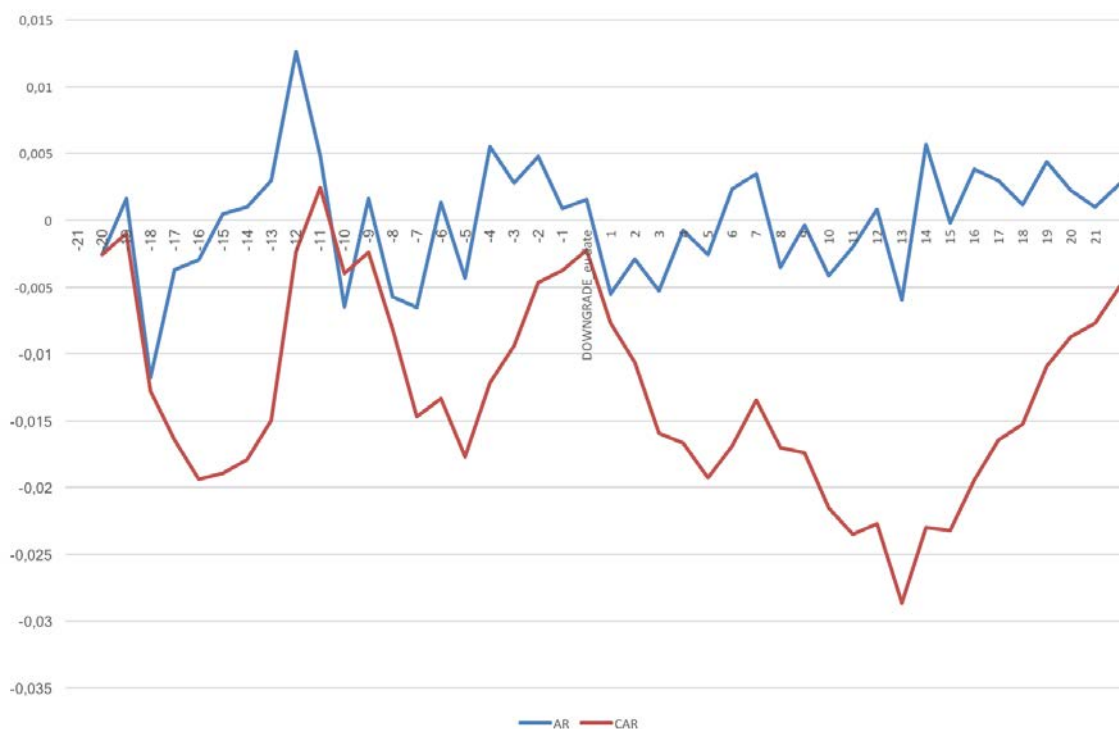
Figure 2 Abnormal returns and cumulated abnormal returns
Source: Author's research

There is a positive uptrend 18 days before downgrade and takes 8 days. After the event day we get significant abnormal returns for 3 days and in case of cumulated abnormal returns, alike occurs for 13 days after the event day

6 Conclusion

Existing research and literature show that rating has an influence on the stock price of companies publicly traded on capital markets. This hypothesis could also be statistically confirmed in the present study at least on the day of the downgrade announcement.

Results of this study could be of a benefit to traders and professionals in terms of creating a trading strategy. Absolute yield of 3,5% - 5% could be achieved during the first week after downgrade announcement using suitable short strategy.

The event period examined in this analysis covers a total of 42 days. In a further investigation, it could be checked whether the described strategy also provides a positive performance for longer periods of time. Furthermore, the sample size should be enlarged in order to increase the validity and significance of the results.

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Empirical evidence on intangibles: what does count - own development or externally purchased intangible assets?

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Abstract

The field of intangible assets, research and innovation represents a perspective area of current and future academic and practical research. In the paper we analysed the intangible assets and research and development expenditures in the position of exogenous variables affecting business value of publicly traded companies. We use panel data of 313 European publicly traded companies from four time periods (2014-2017). We find that R&D expenses, as well as intangible fixed assets, can significantly explain market capitalization of the selected companies. We find that increasing investment in the R&D causes an increase in the market capitalization. Our analysis expresses that firm with higher intangible investment tends to have higher market capitalization and that investment in intangible assets is rewarded in the form of higher intangible capital as a part of the market capitalization. So, the investment in the R&D is evaluated significantly positively by the market. However, the strategy of externally acquiring intangible assets instead of their own development is not positively evaluated by the market as we see base on results of our research. .

Keywords: Intangible Assets, Business Value, Research and Development, Intangible Fixed Assets, Intangible-Intensive Firms.

JEL Classification: M21

1 Introduction

Since the industrial revolution intangible assets have become the substantial foundation of the industrial corporation and indeed it is nowadays commonly believed that the value creation processes of the modern firm as well as of economic systems are largely founded on, and fostered by intangible assets. Also European Commission in its Europe 2020 strategy proposes smart, sustainable, and inclusive growth, where the main determinant of the innovation is knowledge that helps to strengthen economic growth and sustainable development, employment, and competitiveness in the European Union. Development of the information technology also mirrors importance of knowledge or intangibles. Considering globalisation, deregulation of the key industries, and exponential development in the area of technology stands behind the birth of economy of intangible assets, or more often used term the knowledge-based economy. Knowledge is anchored in a skilled workforce, sophisticated processes, customer relationships or unique organizational designs and brands. No one would argue that experienced employee brings more value to the firm than the newly hired one. Well established organizational processes are recognizably more valuable than disorganized management. Such considerations, however, raise the question: How to evaluate that difference? We can review all employee investments, we can look at the proportion of the profit an employee brings to the

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company, and we can compare profits of well and inappropriately managed firm. But will this be the reliable measurement procedure?

The fact that the topic of intangibles and intellectual capital is very popular and important is highlighted by the evidence that since the Millennium, the European Commission, through its different Directorate Generals, commissioned a number of studies and set up various expert groups devoted to various issues in the area. The most relevant of them are:

- The Intangible Economy – Impact and Policy Issues, Report of the European High-Level Expert Group on the Intangible Economy for DG Enterprise, October 2000 (Eustace et al., 2000);
- Study on the Measurement of Intangible Assets and the Associated Reporting Practices, prepared by the University of Ferrara, the Stern School of Business, and the University of Melbourne for DG Enterprise, April 2003 (Zambon et al., 2003);
- Report on the Feasibility of a Pan-European Enterprise Data Repository on Intangible Assets, prepared by Mantos Associates in association with IASCF and Athena Alliance for DG Enterprise, November 2004 (Mantos, 2004);
- Reporting Intellectual Capital to Augment Research, Development & Innovation in SMEs (RICARDIS), prepared by the High-Level Expert Group on RICARDIS for DG Research, June 2006 (EC, 2006);
- Creating a Financial Market for IPR, prepared by the University of St. Gallen and the Fraunhofer Institute for DG Enterprise, December 2011 (Bader et al.,2011);
- Final Report from the Expert Group on Intellectual Property Valuation, Luxembourg: Publications Office of the European Union, 2014 (Fuehrer et al., 2014).

According to results of the MERITUS project, the definition and classification of intangible assets is still a very open issue (Sánchez et al., 2001). From the practical perspective, firms seem to group intangible assets into three main categories – human capital, structural capital and relational capital. Human capital refers to skills, competencies, knowledge, experience, capabilities, and expertise of firm employees. Investments in employees have usually form of salaries, training and education. Firms very often seek experienced individuals, who bring know-how to the firm. Structural capital is also denoted as organizational or internal capital and includes all knowledge within the firm that is embedded in processes, databases, information system, organizations culture and is not tied to concrete employees. Intellectual property represents identifiable part of the structural capital. When a firm is able to meet all requirements for its issuance, it can be sold in form of intellectual property rights. The last group represents external capital built by relationships with third parties - the most often it is about the relationship with customers and suppliers. Examples might be brand names, marketing strategies or trademarks.

From another point of view, firms also distinguish between intangible resources and intangible activities. Intangible resources are the static term and we can perceive them as assets in a broad sense, which incorporates all intangible capacities of the firm likely to create the value in the future. Montresor et al. (2014) describe intangible assets in a broad sense as everything, what is non-physical and thus not touchable and focus on their identification via survey. This definition does not coincide with IFRS definition, which requires identifiability and controllability. If an intangible asset does not fulfill the conditions and cannot be recognized as an asset, IAS 38 requires the expenditure on this item to be recognized as an expense when it is incurred (International Accounting Standards Board, 2016). On the other hand, intangible activities comprise all dynamic investments to purchase or generate intangible assets. Intangible assets in form of patents, copyrights, licenses, or trademarks can be acquired separately or in a

business combination by purchase or by internal generation, e.g. through R&D efforts, marketing research, or investments in organizational capital (Ashton, 2005). In this paper, we focus more in detail on two specific financial statements' items: intangible fixed assets from the balance sheet and R&D expenses from the profit and loss account.

The paper is organized as follows. First, theoretical background of the researched topic and main definitions are introduced. Second, we describe data used for our analysis and briefly characterize applied econometric methods. In the third part, empirical results of the performed analysis are presented. To conclude, main findings are summarized.

2 Research and development expenditures as determinant of business value

Several case studies and econometric analyses like Sanchéz et al. (2001) have shown that research and development (R&D) expenditure and human resources affect the value of companies. In the past, the relationship between R&D expenditure and market value was very often the subject of economic analyses. Sougiannis (1994), among the first, analysed R&D expenditure as intangible assets and found that R&D expenditure significantly affected reported returns and market value of equity. The one-dollar investment in the R&D was, according to Sougiannis's analysis, reflected in an increase in the market value of four dollars. As mentioned by He and Wintoki (2016) or Di Cintio et al. (2017) R&D expenditures are often used as proxy variables for innovation intensity or intangible activity of companies as summarized by Boris and Brown (2013) or Peters and Taylor (2017). Griliches (1981) identifies a statistically significant positive relationship between historical R&D expenditure and market value. In one of the most recent publications, Nemlioglu and Mallick (2017) deal with the impact of R&D activities and pre-and post-crisis management practices on company performance, which is expressed in terms of profit. The best performance by their empirical analysis is achieved by companies that invest in both activities at the same time. Canibano et al. (2000) have revealed that investments in intangible assets, especially those in R&D, are associated with higher business performance in the future. Positive addiction was also demonstrated by Boujelben and Fedhil (2011), examining the relationship between intangible investments (R&D investment, quality and advertising) and future operational cash flows on a sample of Tunisian companies. The causal relationship between R&D expenditure and the value of the company was also addressed by Harris and Li (2008) and Ito and Lechevalier (2010). Likewise, Aboody and Lev (2000) consider R&D to be a source of insider gain in insider gains. They point to substantially higher profits for firms that invest heavily in R&D compared to firms that neglect investment into R&D. They mention a few characteristics that characterize the uniqueness of their use for further analysis. R&D activities are uniquely designed and subject to strict protection, so it is very difficult to imitate them. Therefore, it is not possible to derive information on the expenses of other companies from information on R&D expenditure of one company in the sector. Unlike physical and financial assets, intangible assets as R&D are not traded on an organized market, and therefore their price cannot be deduced from market prices. Active support for R&D investment can well indicate that the firm will continue to do so in the future. Firms investing heavily in R&D are expected to have a favourable market outlook but, on the other hand, they also bring a higher degree of uncertainty. The products, services, and processes to which investments are made must not always be successful. Decisions on investing in R&D are determined by several factors. Since R&D expenditure represents investments that are generated by generating the company's own intangible assets. An alternative procedure is external procurement from other companies that have already carried out research and development activities and provide returns for their investments, for example, in the form of patents or licenses. In the literature, a number of authors are devoted to examining factors that determine company decisions in relation to purchase (external acquisition) and the creation

(internal acquisition) of intangible assets. Xue (2007) identifies the different goals of the make strategy and buy strategy for the procurement of intangible assets in the technology sectors. As a proxy variable creation strategy, it uses R&D investments, while a purchasing strategy is external procurement of the final technology. The uncertainty of the creation strategy is associated with both systematic and non-systematic risk. Shareholders have the opportunity to diversify and thus minimize non-systematic risk and therefore the market only appreciates systematic risk. However, unlike shareholders, managers are exposed to different incentives, as their human capital is usually invested in only one company. For this reason, Xue (2007), among the determinants of the company's tendency to acquire new technologies, includes, besides the market variables, the variables related to the remuneration of management personnel. Like Xue (2007), Ciftci and Darrough (2015) apply a GMM method that takes into account endogeneity in choosing between R&D expenditure and intangible assets shown in the balance sheet. At the same time, they point to the inherent difference between firms that internally build and outsource intangible assets. Unlike previous research, Tsai et al. (2016) apply machine learning techniques and identify the predictive model for the valuation of intangible assets. Determinants of intangible assets are divided into five groups: intangible capital, ownership structure, corporate characteristics, industry characteristics, and analyst and customer feedback. All of these authors deal with a sample of US companies. Harris and Moffat (2011) have used the results of UK companies for their empirical analysis. They analyze the tendency of companies to invest in three activities: R&D, innovation and export. The limitation of their analysis is that they only have information about whether or not the company has implemented individual activities, but the amount of funds spent on individual activities is not known. The consequence and disadvantage of this nature of data is that companies that invest very little in one of the activities will have the same status in the analysis as those who are intensively allocating the funds to individual activities. On the other hand, the sample may also consist of companies that invest in individual activities, but this information does not appear relevant in the financial statements and therefore would not otherwise be included in the sample. We assume that each of the explanatory variables approximated the intangible assets capture a certain group of intangible assets and its change affects the value of the firm, taking into account market valuation. The hypothesis is about the relationship between R&D expenditure and business value. We assume that R&D expenditures are statistically significant when explaining the business value as a share of market and book value. R&D expenditure is representative of internally generated intangible assets. In most cases, large-scale accounting does not allow capitalization; research and development activities often include new technologies, patents, or designs that represent an essential component of the company's intangible assets. We expect that, ceteris paribus, there is a positive relationship between the intensity of R&D expenditure and the value of the firm.

3 Data and methodology of our empirical analysis

We started our analysis by analysing typical panel data model with many individual observations across several time periods. We analyze the effects of three variables expressed by research and development expenses scaled by total assets (RDAS), intangible assets scaled by total assets (IntAS), Rota Rank Measure (RotaRM) on dependent variable expressed by the firm value (MTB). We do not consider goodwill to be a part of intangible assets IntAS. Cross-sectional dimension of our data frame covers 313 individual firms. Time series dimension involves four years, from 2014 to 2017. Applying a Chow test for the poolability of the data suggests considering panel data structure of the model. Time effects are statistically significant. To decide whether fixed or random effects model is more appropriate, Hausman test has been applied, according to which fixed effects model is more relevant. As the model suffers from serial correlation and cross-sectional dependence, we applied heteroscedasticity robust

variance-covariance matrix to estimate unbiased regression coefficients under asymptotic properties.

Table 1 Estimated results for pooled model (PM) and fixed effects model (FE)

Dependent variable: MTB	PM	FE
Intercept	1,689*** (0,072)	1,812*** (0,218)
RDAS	10,838*** (0,736)	11,233*** (3,287)
IntAS	-0,872*** (0,182)	-1,104** (0,231)
RotaRM	0,653* (0,259)	0,623* (0,248)
Years	2014 - 2017	2014 - 2017
Firm's effects	No	Yes
Time effects	No	Yes
Clustering	No	Yes
R2	0,148	0,087
R2 adj	0,141	0,085

Source: own calculation

The results of the model in Table 1 we empirically affirms that of our three variables expressing the intensity of intangible assets, only the variable RDAS has a statistically significant positive effect on the value of the firm with a regression coefficient of 11,233 and a p-value of less than 0,001, which means that R & D expenditures can be used to explain the present value company. The regression coefficient of the RDAS variable is several times higher than the other regression coefficients. In addition, unlike Clausen and Hirth (2016), our analysis did not confirm any statistically significant relationship between the ROTA rank measure and the present value of the firm. As the table 1 shows there is a statistically significant negative dependency between the intangible assets on the balance sheet and the value of the publicly traded companies. The regression coefficient of -1,104 is statistically significant; indicating that the market evaluates the balance sheet intangible assets differently from R&D expenditures and their increasing value may have a negative impact on the market value of examined companies.

The results presented in the paper are very similar to the earlier results and finding based on different data sets of European publicly traded companies published by Glova and Mrázková (2018) and Mrázková (2018).

4 Conclusion

In our paper we expected that there is a positive relationship (ceteris paribus) between the intensity of R&D expenditures as well as investment in intangible assets to total assets in comparison with the increase in relation to other regressors. As we see an interesting fact is that however both of them are in both our models statistically significant, in case of R&D expenditures there is a significant positive effect of the proportion of R&D expenditures on total assets on firm value. So we can proof that internal or own research and development is evaluated by the market. However, the strategy of externally acquiring intangible assets instead of their own development is evaluated by the market negatively. The results are very similar to our previous finding based on different data set also using European publicly traded companies.

Acknowledgements

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Financial condition of Polish voivodeships in 2006-2016

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Abstract

The aim of the article is to assess financial condition of Polish self-government voivodeships in 2006-2016. Information obtained enables to determine the past and present financial situation as well as efficiency of regions functioning in Poland. Financial situation of self-government voivodeships has key importance in shaping investment possibilities, debt acceptability or the ability to obtain EU support.

Analyzing the indicators characterizing the income and expenditure, which were presented in the article, it should be noted that the level of own income in provinces remained at similar stage in the studied years. There was also no increase in external financing from the state budget (targeted subventions and subsidies), despite entrusting local governments with new tasks. However, alarming may be the fact that investment expenditure has decreased in total voivodeships expenditure. This situation causes Polish regions to seek external sources of non-returnable assistance in order to implement investments conducive to improve infrastructure equipment and, consequently, improve the image or investment competitiveness. The analysis also confirms differences in incomes and budget expenditure per 1 inhabitant. There is a difference here visible between more affluent voivodships of western and southern Poland and the poorer regions of eastern Poland.

Keywords: Self-government voivodeship, Poland, Financial situation, Financial indicators

JEL Classification: O18, P43

1 Introduction

Local government units were created to meet the resident needs at local or regional level. The voivodeship self-government plays a special role as a creator of socio-economic development in regions, hence the financial assessment of this local government unit level is so important.

The analysis of local government unit financial condition provides information about their past and present financial situation as well as operations efficiency. It also enables to determine their development opportunities. Important information for management is also data on potential threats that may result in deteriorating financial situation of local government (Zawora, 2012). Financial situation of voivodeships is determined on the one hand by the possibility of obtaining income and on the other by the size of expenditure needs in terms of their tasks. At the same time, it sets out possibilities of self-government borrowing and obtaining funding from non-repayable European Union sources (Wyszkowska, 2011).

Financial situation of local government units is determined by internal factors related to financial management disadvantages of self-government authorities (examples: excessive, unadapted to local income potential budget expenditure, inefficient investment and debt policy, inefficient absorption policy, local government unit referring to EU assistance funds; lack of appropriate risk management policy in the context of ensuring financial stability etc.). It is also

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determined by external factors such as instability of economic conditions as a result of economic downturn, unstable legal environment and related legislative changes destabilizing financial systems - unnecessarily limited by the state of local government unit financial independence; impacting limited "room for maneuver" of local government authorities in the aspect of financial management, especially in the event of an unexpected and disadvantageous disruptions, imposition of additional public tasks by the central government and omitting the financial compensation required by applicable legal regulations etc. (Poniatowicz, 2016).

In the context of signaled problems, the aim of the article is to present the financial situation of Polish voivodeships in 2006-2016. The implementation of such formulated aim required literature review on the subject of self-government voivodeships finances and presenting them in a regional configuration in Poland.

2 Territorial division in Poland

In Poland, since 1999, there is a three-tier administrative division for 16 voivodeships, 380 poviats and 2478 communes. The five-tier division of territorial units for statistical purposes (NUTS[3]) has also been in force since Poland's accession to the European Union. NUTS divides Poland into units of five levels (the last division is effective from January 1, 2015), three of which are defined at the regional level (NUTS 1 - regions, NUTS 2 - voivodeships - 16 units (statistical division corresponds to the administrative division); NUTS 3 - subregions (groups of poviats), and two at the local level (NUTS 4 - poviats, NUTS 5 - gminas). Basic data on voivodeships in Poland - NUTS 2 are presented in table 1.

Table 1. Basic data characterizing the voivodeships in Poland in 2016.

NO	Voivodeship	2016					
		Population	Area [km²]	Average salary (gross) in 2015	Unemploment rate IX 2016	Disposable income per person in household	Quality of life [max10]
	Poland	38437239	314316	3862,19	8,3	1344,3	x
1.	Dolnośląskie	2904207	19947	4204	7,3	1472	4,3
2.	Kuj.-pomor.	2086210	17972	3540	11,7	1246	4,3
3.	Lubelskie	2139726	25122	3699	9,9	1227	4,4
4.	Lubuskie	1018075	13988	3568	8,4	1420	3,9
5.	Łódzkie	2493603	18219	3791	8,7	1362	4,2
6.	Małopolskie	3372618	15183	3907	6.7	1305	4,5
7.	Mazowieckie	5349114	35558	5094	7,4	1756	5,1
8.	Opolskie	996011	9412	3793	8,8	1289	4,2
9.	Podkarpackie	2127657	17846	3528	11,4	1082	4,5
10.	Podlaskie	1188800	20187	3647	10,5	1258	4,6
11.	Pomorskie	2307710	19947	4204	7,3	1472	4,3
12.	Śląskie	4570849	12333	4221	6,7	1421	4,2
13.	Świętokrzysk.	1257179	11711	3581	10,8	1203	4,0
14.	Warm-mazur.	1439675	24173	3495	13,2	1281	4,2
15.	Wielkopolskie	3475323	29826	3729	5,1	1288	4,6
16.	Zachodniopom	1710482	22892	3794	10,6	1427	4,5

Source: Prepared based on: Atrakcyjność inwestycyjna województw i podregionów Polski 2016, Institute of Market Economy Research, Gdańsk 2016; Main Statistical Office - data for 2016

[3] This system was developed by Eurostat to build Community regional statistics. NUTS was created to collect, develop and disseminate comparable regional data within the European Union (e.g. in the field of regional accounts, demographics, labor market, information society). See: Smoleń, 2009.

Table 1 shows that the largest number of people live in Mazowieckie and Wielkopolskie voivodeships. These voivodeships also have high rating in terms of quality of life: Mazowieckie (5.1) and Wielkopolskie (4.6). The average gross salary also reaches the highest level in the Mazowieckie voivodeship, but also in Dolnośląskie, Śląskie and Pomorskie. The registered unemployment rate is the lowest in Wielkopolskie, Mazowieckie, Dolnośląskie and Pomorskie. It is also noticeable these mentioned voivodeships have the highest level of disposable income per person in the household. The voivodeships located in the east of the country were not included in this group.

Graphically, the location of individual voivodeships in Poland is shown in Figure 1.

Figure 1. Administrative division of Poland into 16 provinces.
Source: Struzik A., Podział województwa mazowieckiego statystyczny czy administracyjny?
https://www.mazovia.pl/downloadStat/gfx/mazovia/pl/defaultaktualnosci/692/23/1/prezentacja_marszalek_plock

3 Revenue of voivodeship self-governments in Poland

The voivodeship's financial management is based on the budget. It is an annual financial plan, covering the voivodeship's income and expenditure, sources of financing the budget deficit or the allocation of budget surplus as well as expenses related to multi-annual programs (Brzeziński, Matuszewski, Morawski and Olesińska, 2008).

The basic sources of voivodeship income that are guaranteed constitutionally in Poland are: own revenues, general subsidies and targeted subsidies from the state budget. They are the basis for the performance of specific tasks by these self-government units. The voivodeship's revenue includes among others: revenues of voivodeship budgetary establishments, income from property or interest on granted loans (Zalewska, Zawadzka, 2015). Subventions and subsidies are non-tax incomes of local government units. Targeted subsidies are related to implementation of own tasks, tasks in the field of government administration and those based on agreements. The purposeful subsidy from the state budget is a form of local government unit budget expense to finance or co-finance a specific budgetary task carried out by these units (Chojna-Duch, 2003). On the other hand, the general subsidy receives the self-governmental province from state budget. It consists of a compensatory, regional and educational part for implementation of tasks in this field (Jędrzejewski, 2007).

In the article to assess the income side of regional self-government budgets in Poland, several income measures were used (Skoczylas, 2011; Weber, 2001), which among others include:

- The share of own revenue in total income (%),
- Share of targeted subsidies in total revenues (%),
- Share of the general subsidy in total revenues (%),
- Share of liabilities to total income (%).

Financial analysis and indicators matched to it are important for proper financial planning in local government units and decisions taken in the future (Filip, 2006). The ratio of own income to total income shows which part of the total revenue constitute own income. The higher the value of this indicator (over 50%), the better the financial situation of voivodeship, including its development possibilities.

Own income is a special type of local government units' income. They determine the degree and scope of financial independence of local government bodies, as they are treated as an indicator of this independence level (Marczak, 2007). Own income is a strategic element in the local government finance system, not only from the perspective of local government financial independence, but also in the context of possible application for EU funds. The capacity of own budgetary resources determines the possibility of using other, i.e. supplementary financing sources (Poniatowicz, 2016).

The analysis of data contained in table 2 shows significant regional variation of this indicator in the analyzed years. Lubelskie voivodeships (28.21% in 2006 and 30.56% in 2016), Lubuskie (31.5% in 2006 and 31.67% in 2016) and Podlaskie voivodeships (27.89% in 2006 and 31.27% in 2016) belong to the voivodeships with the lowest rate (2016). The decrease in share of own revenue in total income is noticeable in majority of Polish voivodeships. The largest decrease concerns the Warminsko-mazurskie voivodeship (from 40.44% in 2006 to 29.22% in 2016) and Opolskie (from 40.10% in 2006 to 28.75% in 2016).
In the scale of the whole country, this indicator also slightly decreased from 55.94% in 2006 to 53.35% in 2016.

This is an unfavorable phenomenon as less financial resources from own incomes in the local government units demonstrate the lower wealth and independence of these units, as well as greater dependence on transfers from state budget (Brezdeń and Spallek, 2012). Other indicators showing how large is the supply of voivodeships with external funds in Poland is the ratio of the general subsidy to total revenues (%) and the share of targeted subsidies in total revenues (%).

By further analyzing the data of this table, it can be observed that share of external financial resources in Poland is high, accounting for 28.29% in 2016 in total (compared to 36.16% in 2006). This constitute for around 1/3 of budget incomes. The share of targeted subsidies in majority of voivodeships does not exceed 20% (with the exception of Warminsko-mazurskie voivodeship - in 2016 this rate reached the level of 22.6% and Lubelskie - 24.3%).

On the other hand, the share of general subsidy in total income is diversified in particular regions. In poorer voivodeships located in the east of country, this indicator in 2016 reached high levels, for example in Podkarpackie - 29.47%, Podlaskie - 29.92%, or Warmińsko-mazurskie - 30.11%. Data analysis shows that there are voivodeships where this indicator reaches very low values. These include Mazowieckie (4.04%), Wielkopolskie (5.11%) and Dolnośląskie (6.66%) voivodeships. However, it should be noted, that in 2006 the share of

general subsidy in total income was significantly higher than in 2016, reaching even 44.31% in Lubelskie or Świętokrzyskie voivodeships - 42.69%. This means that despite the imposition of new tasks on this level of territorial self-government, the State has failed to financially compensate their implementation.

Table 2. Indicators characterizing the income side of voivodeship budgets in 2006-2016

NO.	Voivodeship	Share of own revenue in total income (%)			Share of targeted subsidies in total revenues (%)			Share of general subsidy in total income (%)		
		2006	2011	2016	2006	2011	2016	2006	2011	2016
	Poland	55,94	44,29	53,35	14,22	14,60	13,74	21,94	16,59	14,55
1.	Dolnośląskie	60,72	51,98	57,94	13,47	20,12	22,47	17,97	10,30	6,66
2.	Kuj.-pomor.	39,26	30,02	41,03	14,88	15,63	14,72	39,51	28,72	22,48
3.	Lubelskie	28,21	22,60	30,56	13,17	19,07	17,68	44,31	30,42	25,97
4.	Lubuskie	31,50	30,60	31,67	17,46	24,30	22,47	35,04	25,31	19,74
5.	Łódzkie	59,76	44,34	55,62	9,81	8,96	8,04	30,18	15,59	14,36
6.	Małopolskie	52,12	40,13	49,43	16,37	19,69	13,04	19,57	10,05	12,60
7.	Mazowieckie	82,28	72,57	82,29	6,92	7,98	5,77	8,47	4,92	4,04
8.	Opolskie	40,10	28,67	28,75	14,19	16,24	15,83	29,86	19,62	15,90
9.	Podkarpackie	29,18	25,93	39,20	13,80	12,92	15,76	37,18	31,56	29,47
10.	Podlaskie	27,89	22,06	31,27	19,77	16,62	16,02	39,45	27,63	29,92
11.	Pomorskie	55,37	46,67	55,46	13,47	12,00	17,10	19,59	13,58	10,24
12.	Śląskie	59,78	55,33	62,14	25,32	9,46	7,87	9,16	15,60	12,03
13.	Świętokrzyskie	44,28	31,48	33,63	11,62	16,29	18,66	42,69	23,34	27,75
14.	Warm-mazur.	40,44	24,29	29,22	20,69	21,29	22,20	38,79	32,49	30,11
15.	Wielkopolskie	64,01	52,56	69,36	16,07	13,53	11,24	9,49	6,57	5,11
16.	Zachodniopom	33,35	27,72	39,77	13,54	19,63	18,47	40,47	22,25	18,57

Source: Own study based on Bank Danych Lokalnych, Main Statistical Office.

The ratio of total liabilities (%) to regional incomes is quite interesting (table 3). Its systematic growth can be noticed on the national scale as well as in individual provinces. The largest increase of this indicator concerns the Mazowieckie voivodeship (from 2.9% in 2006 to 62.7% in 2016) and Dolnośląskie (from 18% in 2006 to 63.2% in 2016). Thus, despite the increase in total income per capita, the share of credit and loan commitments for implementing programs with EU funds is increasingly burdened with incomes of these voivodeships. The only province that limits these commitments is the Podlaskie voivodeship. Here, the level of this indicator decreased from 34.5% in 2006 to 12.7% in 2016.

Table 3. Share of total incomes (%) in Polish voivodships in 2006-2016

NO.	Voivodships	Share of liabilities to total income (%)		
		2006	2011	2016
	Poland	16,6	36,9	50,1
1.	Dolnoślosląskie	18,0	43,1	63,2
2.	Kujawsko-pomorskie	39,5	50,5	40,4
3.	Lubelskie	32,8	37,4	87,5
4.	Lubuskie	23,0	40,9	39,5
5.	Łódzkie	13,7	46,9	46,6
6.	Małopolskie	23,3	35,5	48,5
7.	Mazowieckie	2,9	56,9	62,7
8.	Opolskie	33,6	55,6	30,7
9.	Podkarpackie	22,1	32,1	35,5
10.	Podlaskie	34,5	3,4	12,7
11.	Pomorskie	14,9	43,3	39,8
12.	Śląskie	0,7	25,5	56,9
13.	Świętokrzyskie	13,8	0,0	43,8

NO.	Voivodships	Share of liabilities to total income (%)		
		2006	2011	2016
14.	Warmińsko-mazurskie	39,2	32,3	50,4
15.	Wielkopolskie	24,8	12,8	37,4
16.	Zachodnioomorskie.	16,0	33,7	40,8

Source: Own study based on http://www.mf.gov.pl/ministerstwo-finansow/dzialalnosc/finanse-publiczne/budzety-jednostek-samorzaduterytorialnego/sprawozdania-budzetowe)

4 Expenditure of voivodeship self-governments in Poland

The financial resources management also includes the expenditure side of the voivodeship budget. The indicators taken here into account are:

- Share of current expenditure in total expenditure (%),
- Share of expenditures on servicing the voivodeship public debt per PLN 1000 of budget revenues (%),
- Share of investment expenditures in total expenditure (in%).

An indicator showing whether the financial resources in the budget are allocated for current needs is the share of current expenditure in total expenditure. As can be observed, this indicator reached 73.76% in 2016, compared to 63.28% in 2006. Making a more detailed analysis, so assessing particular voivodeships, it can be noted that the highest share of these current expenditures in total expenditure in 2016 concerns Mazowieckie (82.42%), Podkarpackie (80.59%) and Warmińsko-mazurskie (81.99%) voivodeships. Moreover, their increase is observed in all voivodeships in the analyzed years: 2006, 2011 and 2016.

As highlighted by Poniatowicz (2016), this worrying fact demonstrating the effects of imposing additional tasks on local government units by central administration without possibility to compensate disbursed financial resources. The increase in local government expenditure causes the need to limit capital expenditure, including investment expenditure - also those co-financed from EU assistance funds (Poniatowicz, 2016). Limiting current expenditures in local government units is very difficult due to numerous tasks legislator put on them without providing adequate pool of funds for their implementation. This forces local government entities to subsidize carrying them out (Gorzałczyńska-Koczkodaj, Koczkodaj, 2016).

The level of current expenditure in total expenditure informs whether this territorial unit is a developing region, striving to invest even in technical infrastructure. According to Kosek-Wojnar (2006), investment expenditures in local government units are considered to be a decisive factor for their development; for the investments to be possible, financial resources are necessary.Similarly, the indicator of investment expenditure share in total expenditure is at a low level, reaching from 10% to 12% in 2016 (8.8% in Warmińsko-mazurskie and 9.9% in Świętokrzyskie). This indicator was also significantly reduced in the analyzed years in all voivodeships. In 2006, its average level in Poland was 20.3%, compared to decrease - 11.8% in 2016.

Another indicator reflecting financial situation of these territorial units is the ratio of expenditure on servicing public debt of voivodeships per 1000 PLN of budget revenues (%). The higher the value of this indicator, the more budget revenues are burdened with the service of public debt. On a national scale, this indicator reaches the level of 9.5% and is not subject to major changes in the analyzed years. The lowest values of this indicator concern central and western voivodeships of Poland, i.e. Opolskie and Śląskie voivodeships - 7.1% or Wielkopolskie voivodeship - 7.3%.

Table 4. Factors characterizing the expenditure side of voivodeship budgets in 2006-2016

No.	Voivodeship	Share of current expenditure in total expenditure (%)			Share of expenditures on servicing the goverm. voivodeship debt per 1000 PLN of budget revenues (%)			Share of investment expenditures in total expenditure (w %)		
		2006	2011	2016	2006	2011	2016	2006	2011	2016
	Poland	63,28	59,53	73,76	9,6	15,6	9,5	20,3	22,7	11,8
1.	Dolnośląskie	68,52	58,05	68,61	11,3	18,2	11,7	20,8	22,4	12,9
2.	Kuj.-pomor.	67,50	68,31	76,19	12,5	16,4	10,3	19,3	22,6	10,3
3.	Lubelskie	56,42	58,02	68,21	9,0	13,9	9,6	18,4	24,5	11,7
4.	Lubuskie	67,34	63,29	75,83	13,3	29,1	9,6	22,6	19,5	11,3
5.	Łódzkie	64,98	56,84	76,94	10,2	14,9	9,7	19,5	19,7	12,4
6.	Małopolskie	54,46	47,89	59,29	13,4	16,2	9,1	19,7	24,3	13,1
7.	Mazowieckie	62,14	75,24	82,42	9,7	20,7	12,3	20,9	19,0	11,5
8.	Opolskie	63,66	58,80	52,40	7,3	13,7	7,1	22,0	20,5	12,8
9.	Podkarpackie	67,54	56,89	80,59	8,2	12,7	7,9	20,4	25,6	11,4
10.	Podlaskie	68,93	54,25	74,57	7,8	11,6	7,5	20,7	26,9	12,5
11.	Pomorskie	59,37	55,30	78,18	8,5	15,0	8,3	19,8	26,0	12,1
12.	Śląskie	58,51	58,69	72,90	6,5	10,8	7,1	21,4	21,4	11,5
13.	Świętokrzyskie	65,68	56,29	75,50	7,9	13,0	10,4	21,0	25,7	9,9
14.	Warm-mazur.	72,06	63,78	81,99	10,5	14,7	9,3	18,0	22,6	8,8
15.	Wielkopolskie	67,50	53,43	74,33	9,2	12,8	7,3	21,2	24,2	13,6
16.	Zachodniopom	65,35	49,51	73,94	9,0	14,5	11,2	17,9	25,4	10,9

Source: Own study based on Bank Danych Lokalnych, Main Statistical Office.

5 Income and expenditure of voivodeships per capita

Further analysis of income and expenses, however per capita, clearly shows the difference between eastern and western voivodeships (table 5). The highest level of income per capita is reached in Opolskie voivodeship (PLN 509.02), Mazowieckie (PLN 429.84) and Lubuskie (PLN 433.34), while the lowest income is achieved by inhabitants of Śląskie voivodeship (PLN 269.08) and Łódzkie (284, PLN 22). On the other hand while analyzing expenditures per capita, it is noted that in 2006 the highest level of these expenditures is characteristic for Mazowieckie (PLN 457.30) and Lubuskie voivodeship (PLN 305.33). Taking into account 2016, the situation has slightly changed. The highest expenditures concern Opolskie voivodeship (PLN 460.89) and Mazowieckie voivodeship (PLN 419.56). The lowest in Łódzkie (PLN 259.75) and in Śląskie (PLN 264.38). Turning to budget balances, it can be stated the financial situation of voivodeships is improving over the analyzed years. In 2006 only few voivodeships achieved financial surplus (Łódzkie, Świętokrzyskie and Śląskie voivodeships), while already in 2016, the only province with a budget deficit was Małopolskie (-13.8 PLN per capita).

Table 5. Incomes, expenditures and balance of budgets for voivodeships per capita in 2006-2016.

No.	Voivodship	Total income per one voivodship inhabitant (in PLN)			Total expenditure per capita in the voivodship (in PLN)			Deficit (-) Surplus (+) (in PLN)		
		2006	2011	2016	2006	2011	2016	2006	2011	2016
	Poland	248,76	391,09	351,46	262,98	424,10	328,35	-14,22	-33,01	23,11
1.	Dolnośl.	249,39	423,26	388,87	275,74	520,24	372,97	-26,35	-96,98	15,9
2.	Kuj.-pomor.	207,37	351,09	355,20	258,57	369,38	322,05	-51,2	-18,29	33,15
3.	Lubelskie	214,52	391,44	381,88	223,91	412,38	344,27	-9,39	-20,94	37,61
4.	Lubuskie	279,13	487,21	423,34	305,33	490,87	379,79	-26,2	-3,66	43,55
5.	Łódzkie	166,79	319,50	284,22	150,84	377,02	259,75	15,95	-57,52	24,47
6.	Małopol.	192,26	393,69	316,42	192,29	420,39	330,22	-0,03	-26,7	-13,8

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No.	Voivodship	Total income per one voivodship inhabitant (in PLN)			Total expenditure per capita in the voivodship (in PLN)			Deficit (-) Surplus (+) (in PLN)		
		2006	2011	2016	2006	2011	2016	2006	2011	2016
7.	Mazow.	410,73	465,98	429,84	457,30	492,09	419,56	-46,57	-26,11	10,28
8.	Opolskie	263,68	450,57	509,02	298,27	476,89	460,89	-34,59	-26,32	48,13
9.	Podkarpack.	229,33	436,96	347,30	261,57	452,32	288,75	-32,24	-15,36	58,55
10.	Podlaskie	216,04	404,27	356,97	240,71	431,14	315,00	-24,67	-26,87	41,97
11.	Pomorskie	249,04	385,36	315,52	253,64	418,60	305,50	-4,6	-33,24	10,02
12.	Śląskie	240,32	290,55	269,08	222,36	314,54	264,38	17,96	-23,99	4,7
13.	Świętok.	215,68	403,09	332,09	199,80	413,72	306,23	15,88	-10,63	25,86
14.	Warm-mazur.	238,81	384,13	356,92	265,73	399,47	320,37	-26,92	-15,34	36,55
15.	Wielkopol.	216,93	361,82	312,83	227,42	392,18	273,61	-10,49	-30,36	39,22
16.	Zachodniop.	221,49	431,45	390,56	222,06	494,76	337,50	-0,57	-63,31	53,06

Deficit (-), Surplus (+)

Source: Own study based on Bank Danych Lokalnych, Main Statistical Office.

An important indicator showing the possibilities of obtaining external funds is the share of EU funds for financing programs and projects in total income per 1 inhabitant (%). Here in 2011 r.[4] the highest rate was achieved by the Małopolskie (27.65%) and Podkarpackie (21.52%) voivodeships which are located in the southern part of Poland. The achievement of such high rates was possible mainly due to local government obtaining significant units, non-repayable funds from the European Union (EU). In 2008-2011, the scale of local government investments exceeded 3% of GDP in Poland, which was the best result in the European Union.

In 2016, in turn, these indicators were significantly reduced. The highest share of these non-returnable funds in total voivodships' income concerned the Dolnośląskie (14.83%) and Podkarpackie voivodships (11.73%).

The additional tasks imposed on local governments, without financial compensation and introduction of new regulation at the beginning of 2014 determining the maximum level of indebtedness of local government units contributed to the fact that they were not able to reach for total EU support in 2014-2020. This also resulted in, alongside with the changing economic situation and numerous changes in the law, deterioration of their financial situation and growing level of their indebtedness (Wyszkowska, 2007).

Table 6. Share of EU funds for financing programs and projects in total voivodships income per capita (%)

No.	Voivodeships	Share of EU funds for financing programs and projects in total income per capita (%)*	
		2011	2016
	Poland	11,87	8,00
1.	Dolnoślosląskie	7,66	14,83
2.	Kujawsko-pomorskie	17,66	11,53
3.	Lubelskie	8,06	7,45
4.	Lubuskie	19,92	7,97
5.	Łódzkie	6,60	7,84
6.	Małopolskie	27,65	9,64
7.	Mazowieckie	5,56	3,49
8.	Opolskie	10,64	5,74
9.	Podkarpackie	21,52	11,73
10.	Podlaskie	7,16	7,20

[4] Lack of data for 2006.

No.	Voivodeships	Share of EU funds for financing programs and projects in total income per capita (%)*	
		2011	**2016**
11.	Pomorskie	6,43	7,21
12.	Śląskie	12,41	8,90
13.	Świętokrzyskie	11,14	9,44
14.	Warmińsko-mazurskie	13,10	7,72
15.	Wielkopolskie	11,38	5,23
16.	Zachodnioomorskie.	8,36	7,33

*Lack of data for 2006.

Source: Own study based on Bank Danych Lokalnych, Main Statistical Office and
http://www.mf.gov.pl/ministerstwo-finansow/dzialalnosc/finanse-publiczne/budzety-jednostek-samorzaduterytorialnego/sprawozdania-budzetowe

6 Conclusion

Finances of self-government voivodeships constitute an integral part of public sector finances. Regional territorial self-government is a form of task implementation and financial resources allocation by the highest level of public self-government administration. This means that it is a specific form of decentralization of public authorities. The need for decentralization results from the natural right of individual to self-determine (Smoleń, 2007).

On the basis of conducted research, it can be concluded that the level of own income in voivodeships remained at a similar level in the analyzed years. There was also no increase in external financing from the state budget (targeted subventions and subsidies), despite entrusting local governments with new tasks to be carried out. Their large share in budget revenues is not conducive to implementing long-term development plans of Polish voivodeships.

However, worrisome is the fact that investment expenditure has decreased in the total expenditure of voivodeships. This situation means that Polish regions have to seek external sources of non-returnable assistance in order to implement investments. Mentioned investments conduct to improve the infrastructure equipment and, consequently, improve the image or investment competitiveness.

The analysis also confirms differences in incomes and budget expenditure per 1 inhabitant. There is a difference between the more affluent voivodeships of western and southern Poland and the poorer regions of eastern Poland.

The absorption capacities of local government units remain in close correlation with financial condition and status of public finances. This applies to budget incomes and expenses (including current and capital/investment ones), achieved budgetary results (general and operational) as well as local government debt. In this context, all unfavorable phenomena that were visible in recent years in the Polish public finance system (e.g. limiting independence of local government unit by state, applying additional tasks without adequate financial compensation, introducing new, restrictive debt limits, etc.) do not remain without impact on the absorption capacity of local government and can significantly reduce them (Sierak, 2015).

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Modifications of outperformance certificates and its creation

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Abstract

The paper deals with the modifications of outperformance certificates, i.e. Exotic outperformance and Phoenix certificates, on the financial market. The main contribution is to present the nature of these certificates' creation from the point of view of its investor. Also, detailed descriptions of the profit functions are provided in analytical forms using barrier options. We further develop formulas for pricing of these certificates and specify the conditions under which the issuer is profitable in the primary market. We conclude with the findings that these products are created through the process of financial engineering as the underlying asset together with barrier options, namely down-in call options. Based on a theoretical option pricing models, we propose these modifications of outperformance certificates on Facebook shares with different levels of its parameters. The profitability for potential investors at the expiration period is provided with showing which parameters the investor should focus and are significant for the profit profile.

Keywords: Outperformance certificate, Barrier option, Profit function, Option pricing, Fair value.

JEL Classification: G11, G13

1 Introduction

Development in financial markets in recent years has presented to many investors, what means investing responsibly and not just betting on growing rates, but appropriately adapting the expected revenues and risks to the market and individual goals and requirements. The high degree of digitalization and interconnection of financial markets has created ideal conditions for the emergence of a whole range of new investment products.

Exotic outperformance and Phoenix certificates, belonging to one type of the structured products, are the object of this research. Investment certificates introduce one main type of structured products. They are individually controllable investment combinations, which consist of a classical investment (such as a share, bond, currency, interest rate, commodity etc.) and one or more derivative financial instruments (usually vanilla and/or exotic option). In recent years, there has been plenty of studies such as Baranga (2017), Bluemke (2009), Breuer and Perst (2007) or Choudhry (2004) that introduce these modern structured products.

There are different types of certificates (linear, guaranteed, airbag, discount, outperformance, twin-win, turbo, bonus, express etc.) available for every estimated performance of the underlying asset (growth, fall or stagnation) or for every attitude to risk (conservative or aggressive investor). These products are created through the process of financial engineering as a combination of underlying asset with derivatives, often an option (vanilla and/or exotic option). There are many studies dealing with the investment certificates. For example, Rossetto

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and Bommel (2009) have analysed endless leverage certificates using Monte Carlo method. Also, Entrop *et al.* (2009) have presented the price-setting formula for open-end leverage certificates on the German market. In the papers (Younis and Rusnáková, 2014; Šoltés, 2010; Šoltés and Harčariková, 2017) authors create the replicating portfolio to investment certificates using analytical form of profit functions. Following the mentioned studies, we provide our certificates analysis.

The aim of this paper is to perform an analysis of the Exotic outperformance and Phoenix certificates. We apply portfolio replication method to price the certificate. The application to the Facebook shares is provided. Based on data set, we design the Exotic outperformance and Phoenix certificates with various levels of the barrier level and the leverage. We provide the profitability analysis for the potential investor at the maturity date. Our findings help to raise the ability of retail investors to understand these sophisticated products constructions.

2 Research methodology

Generally, investment certificates are created as the combination of the underlying asset (to be referred to as UA henceforth) and the financial derivatives, mainly options and option strategies on this UA. Options introduce the significant tool of every investment certificates, therefore the methodology used in this paper should be based on these instruments. There is proved the nature of Exotic outperformance and Phoenix certificates' creation using the analytical expression of the profit function of barrier options.

Geman (2005) defines option as a financial contract giving its holder (the owner or the buyer) the right (on the other side not the obligation) to buy (call) or sell (put) UA at a specified price (the strike or the exercise price) of the option on a specified date (either at the expiration date of option - European style or at any time within a specified option expiration period - American style). The call/put option seller (the writer) receives the option premium for buyer's right. The barrier level (also known as the second strike price) is typical for barrier options. According to Taleb (1997), there are total 16 types of barrier options that depend on the activation/deactivation of options (in/out option) and the placement of the barrier level (up/down option). Every investment certificate can be evaluated using option pricing models according to its UA. The fair value of every investment certificate can be calculated based on the individual components' value, i.e. an alternative portfolio's value created as the position in UA together with options. The issue of the structured products valuation is discussed by Burth *et al.* (2001), Grunbichler and Wohlwend (2005), Henderson and Pearson (2011), Pruchnicka-Grabias (2011) and Wilkens *et al.* (2003). The pricing of equity-linked structured products in the German market is examined by Stoimenov and Wilkens (2005). Grunbichler and Wohlwend (2005) analyses structured products valuation without a capital guarantee in the Swiss market. The pricing of bonus certificates is investigated by Baule and Tallau (2011). Wilkens and Stoimenov (2007) describe the empirical analysis for long and short index certificates pricing in the German market. Hernandez *et al.* (2011) and Hernandez *et al.* (2013a; 2013b) provide the valuation of Phönix, Outperformance and Exotic Outperformance certificates.

On the basis of existing studies, we can explore the financial engineering principles to the Exotic outperformance and Phoenix certificates creation using the analytical expression of the options. The profit function of these certificates is expressed by the formula (4) and (7) and the fair value by the formula (5) for both certificates, what is based on the value of its individual components. According to the presented approach we can simultaneously apply our research to Facebook shares. Consequently, we need to obtain values of the barrier option positions. For our approach, there is also Haug pricing model (Haug, 2007) used to evaluate the position in

European style of down and knock-in call barrier option prices in statistical program R due to lack of real data.

3 Analysis of modified outperformance certificates

In addition to the existence of the classic Outperformance investment certificate, issuers offer its different variations. These modifications can be Exotic outperformance and Phoenix certificates. The following part of the paper focuses on the characteristics, the profit function and the nature of the creation of the mentioned Outperformance certificates' modifications.

The ***Exotic outperformance certificate*** (referred as EO) represents a modification of the classic Outperformance certificate, which is created using a barrier option, namely a down-in call option. This certificate is suitable for investors who expect a slight decline in the UA, i.e. up to the barrier level, when the condition for activating of the barrier option is applied, and consequently the UA price increases. The maximum loss is a limited by the purchasing price in the UA price growth. The barrier level is set under the initial UA price. On the other hand, if the barrier level is not reached, investor receives a cash payment equal to the actual UA price at maturity (i.e. gains from UA price growth). Let us denote the UA price at the issue time S_0, the price at the maturity date S_T, the barrier level B, the multiplier m, the subscription ratio p, the fair value of the certificate k_0, then the profit function of EO certificate at the maturity date T is:

$$P(S_T) = \begin{cases} p \cdot S_T - k_0 & \text{if } S_T < S_0, \\ p \cdot S_T - k_0 & \text{if } \min_{0 \le t \le T}(S_t) > B \wedge S_T \ge S_0, \\ p \cdot \left[m(S_T - S_0) + S_0 \right] - k_0 & \text{if } \min_{0 \le t \le T}(S_t) \le B \wedge S_T \ge S_0. \end{cases} \qquad (1)$$

EO certificate is formed at the time S_0 by
- buying of the UA at the spot price S_0 and the price at the expiration date S_T

$$P_1(S_T) = p(S_T - S_0), \qquad (2)$$

- buying of *(m-1)* down-and-in call options on UA with the strike price referred to as the actual spot price S_0, the barrier level B, the premium c_{BDI} for an option

$$P_2(S_T) = \begin{cases} -(m-1)c_{BDI} & \text{if } S_T < S_0, \\ -(m-1)c_{BDI} & \text{if } \min_{0 \le t \le T}(S_t) > B \wedge S_T \ge S_0, \\ (m-1)(S_T - S_0 - c_{BDI}) & \text{if } \min_{0 \le t \le T}(S_t) \le B \wedge S_T \ge S_0. \end{cases} \qquad (3)$$

There is used a European-style of options for the same underlying asset and with the same expiration time. The alternative investment's profit function introduced as a sum of individual positions (2) and (3) has a form:

$$P(S_T) = \begin{cases} p\left[S_T - S_0 - (m-1)c_{BDI} \right] & \text{if } S_T < S_0, \\ p\left[S_T - S_0 - (m-1)c_{BDI} \right] & \text{if } \min_{0 \le t \le T}(S_t) > B \wedge S_T \ge S_0, \\ p\left[m(S_T - S_0) + S_0 - S_0 - (m-1)c_{BDI} \right] & \text{if } \min_{0 \le t \le T}(S_t) \le B \wedge S_T \ge S_0. \end{cases} \qquad (4)$$

At the maturity date the buying of the UA will be depending on the actual market situation and the reaching/not reaching of the barrier by UA development during time to maturity. The fair value of EO certificate for the subscription ratio p is:

$$k_0 = p \cdot \left[S_0 + (m-1)c_{BDI} \right] \qquad (5)$$

Certificate's issuer can obtain a profit only if the selling certificate's price is above the fair value k_0, i.e. $k_0 > p \cdot \left[S_0 + (m-1)c_{BDI} \right]$.

Phoenix certificate is a modification of classic Outperformance and Exotic outperformance certificate. Let us denote the UA price at the issue time S_0, the price at the maturity date S_T, the barrier level B, the multiplier m, the subscription ratio p, the fair value of the certificate k_0, then the profit function of P certificate at the maturity date T is:

$$P(S_T) = \begin{cases} p \cdot S_T - k_0 & \text{if } S_T < B, \\ p \cdot S_T - k_0 & \text{if } \min_{0 \le t \le T}(S_t) > B \wedge S_T \ge B, \\ p \cdot \left[m(S_T - B) + B \right] - k_0 & \text{if } \min_{0 \le t \le T}(S_t) \le B \wedge S_T \ge B. \end{cases} \qquad (6)$$

Alternative portfolio is created by buying of the UA at the spot price S_0 and by buying of *(m-1)* down-and-in call options on UA with the strike price equals to the barrier level B, the barrier level B, the premium c_{BDI} for an option, what is introduced as a sum of individual positions (2) and (3) and has a form:

$$P(S_T) = \begin{cases} p \left[S_T - S_0 - (m-1)c_{BDI} \right] & \text{if } S_T < B, \\ p \left[S_T - S_0 - (m-1)c_{BDI} \right] & \text{if } \min_{0 \le t \le T}(S_t) > B \wedge S_T \ge B, \\ p \left[m(S_T - B) + B - S_0 - (m-1)c_{BDI} \right] & \text{if } \min_{0 \le t \le T}(S_t) \le B \wedge S_T \ge B. \end{cases} \qquad (7)$$

The investment in the Phoenix certificate as well as the fair value determination at the time of issue is similar with EO certificate, but difference is in the strike price at down-and-in call options which is being consistent with the barrier level B. The fair value of P certificate is derived by the relation (5).

4 Application to FB shares

In this section, we propose Exotic outperformance and Phoenix certificates on Facebook (FB) with different levels of its parameters and perform the analysis of their profitability for to the investor at the time of maturity. Facebook is an American online social media and social networking service company which was launched in 2004 by Mark Zuckerberg. Given shares are chosen due to upward trend on the basis of their historical returns, but we do not exclude slight price fluctuation.

4.1 Data description

The actual price of Facebook is 192.4 USD on 12th June 2018. The price of FB shares is very volatile, what it is seen in its historical prices and the historical volatility at the level of 22.82%. Due to this fact, there are expected changes of the shares development. We expect a rapid

increasing within a year or year and half. We also believe the UA's value to fall once under the pre-set barrier during time to maturity.

The common stylized data about the certificates is in the Table 1. For showing we consider buying one Facebook share.

Table 1 Basic characteristics of Facebook at the issue date

Underlying asset	Facebook, Inc. (FB)
Underlying price (S0)	192.40 USD
Issue date	12.06.2018
Maturity date (T)	20.12.2019
Subscription ratio (p)	1:10
Dividends	-

Source: Yahoo.Finance, 2018

Let's assume, investors expect rapid increasing of FB price in the future (up to December 2019) and believe the UA drop under the pre-set barrier with the aim to gain from the bull market. Following the assumptions, our proposed certificates are analyzed and compared to each other. In this case we consider different levels of the barrier, i.e. 135, 145, 155, 165, 175, 180 and 185 USD, and the multiplier, i.e. 2 and 3, where calculated down-and-in call barrier option prices (results in the Table 2) depend on the input parameters such as the strike prices, the barrier levels, the maturity date, the risk-free interest rate (derived from treasury bills on the issue date, i.e. 2.43%) and the implied volatilities. The fair values are calculated according to relation (5).

4.2 Results

Let us propose ***Exotic outperformance s certificate (EO)*** as the replicating portfolio, i.e. a combination of a long position in FB with the actual price 192.4 USD and a long position in down-and-in call options with the strike level 192.4 USD, barrier level 180 USD, multiplier 2, option premium 12.55 USD per option, maturity date 20th December 2019. The profit function at the maturity of the designed EO is represented by the following form:

$$P(S) = \begin{cases} 0.1S_T - 20.50 & \text{if } S_T < 192.4, \\ 0.1S_T - 20.50 & \text{if } \min_{0 \leq t \leq T}(S_t) > 180 \wedge S_T \geq 192.4, \\ 0.2S_T - 39.74 & \text{if } \min_{0 \leq t \leq T}(S_t) \leq 180 \wedge S_T \geq 192.4. \end{cases} \qquad (8)$$

The purchase certificate's price k_0 based on (5) equals 20.50 USD. The results of designed certificate show, the profit profile depends on the reaching/not reaching the barrier level during time to maturity. If the barrier level 180 USD is not reached, the profit profile depends on the actual underlying asset price at the maturity date. In this case is valid, the higher the investor's profit is based on the higher FB price at the maturity date. On the other hand, if the barrier level is reached and FB is in the range of <0; 198.68> USD, the investor takes a loss, where the given loss is increasing with FB's drop. The maximum loss is in the amount of purchase price, i.e. 20.50 USD/ certificate. However, if the FB price increases above 198.68 USD, the investor's profit increase two times compared to the linear certificate.

However, if the multiplier is 3 (EO4) with the same barrier level 180 USD, the profit profile of EO certificate changes depending on barrier level as it is shown in Figure 1. If the barrier level is not reached during time to maturity, the variant with the lower leverage (EO3) is better due to lower costs on its creation. But if the barrier level is reached, then variant with the higher leverage (EO4) is better in the range of <204.70; ∞>.
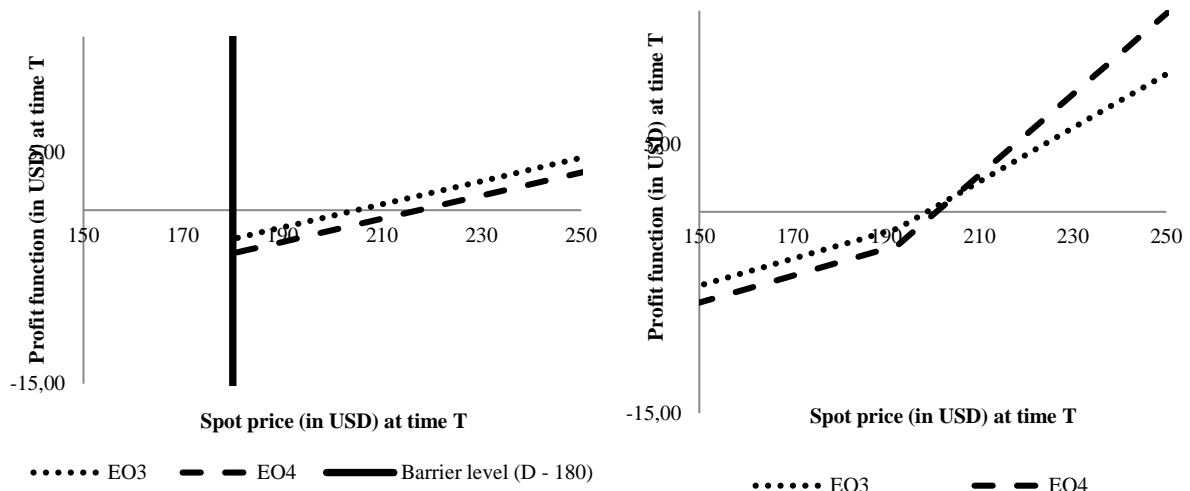
Figure 1 Profit profile of EO certificate with the leverage 2 and 3 if the barrier level is not reached (left figure) or is reached (right figure)

On the other hand if we consider different barrier 180 (EO3) and 165 USD (EO7), but the same multiplier 2, then the profit profile of EO certificate is illustrated in the Figure 2. In this case, variant with lower barrier (EO7) is still better than the variant with higher barrier (EO3).
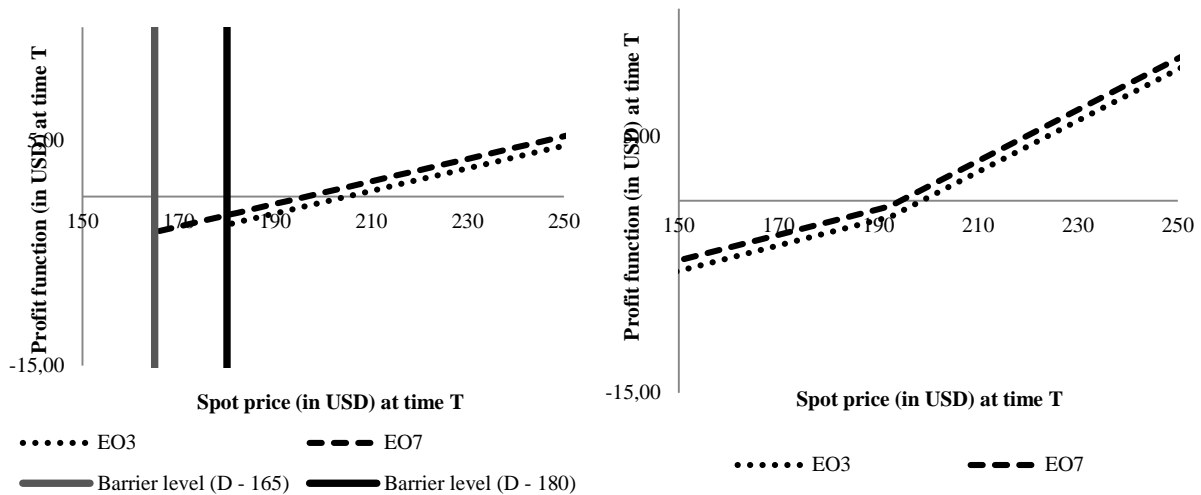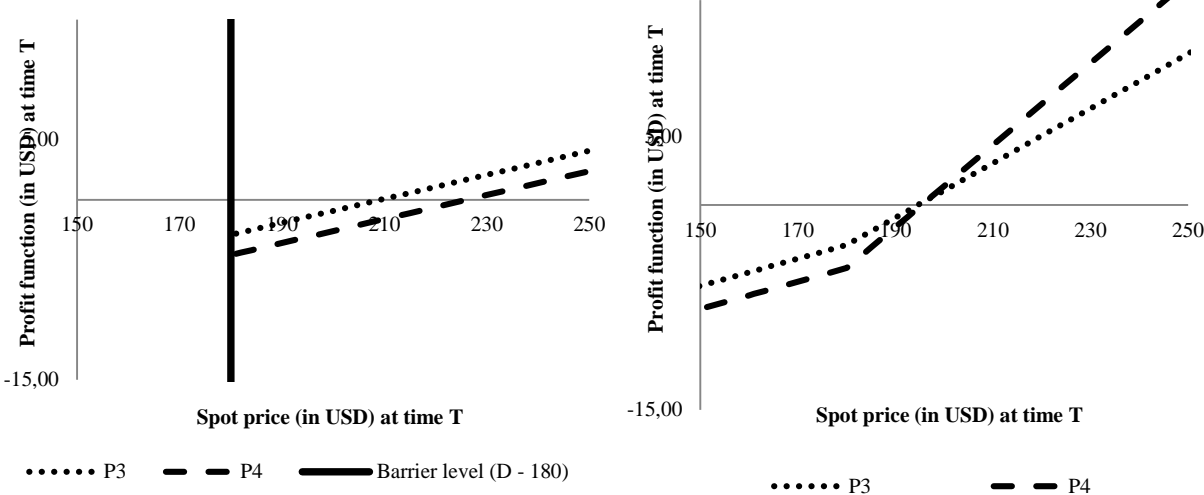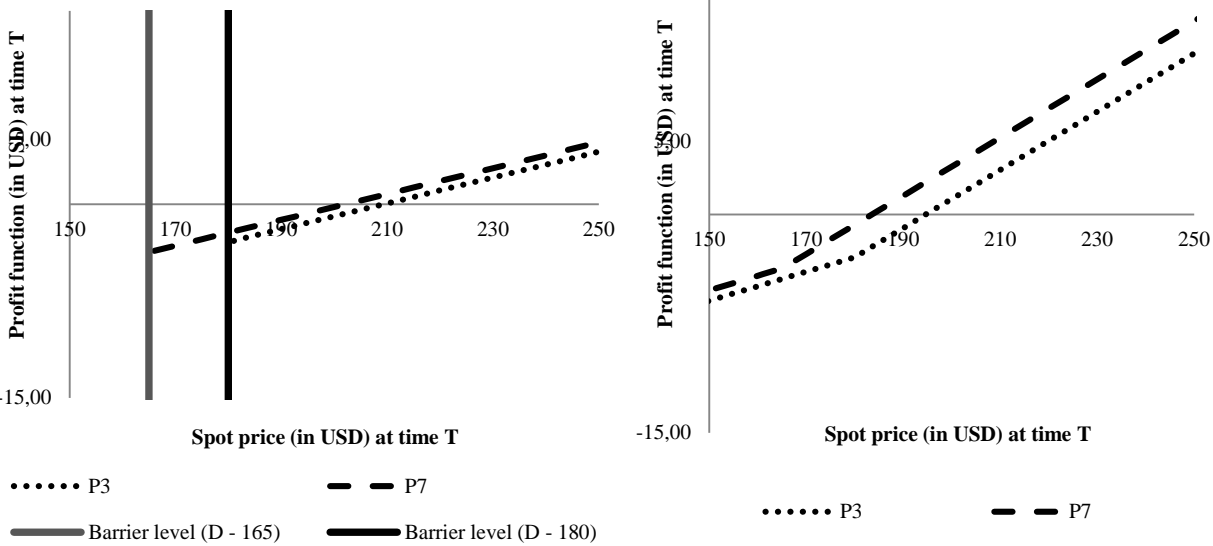

Figure 2 Profit profile of EO certificate with the barrier 180 and 165 USD if the barrier level is not reached (left figure) or is reached (right figure)

There is possible to create **Phoenix certificate (P)** as a modification of Exotic outperformance certificate. Now let us propose P certificate as a long position in FB with the actual price 192.4 USD and a long position in down-and-in call options with the strike level 180 USD, barrier level 180 USD, multiplier 2, option premium 16.85 USD per option, maturity date 20th December 2019. The profit function of created P at the maturity date based on equation (7) and the purchase certificate's price k_0 based on (5) equals 20.92 USD is shown by the form

$$P(S) = \begin{cases} 0.1S_T - 20.92 & \text{if } S_T < 180, \\ 0.1S_T - 20.92 & \text{if } \min_{0 \le t \le T}(S_t) > 180 \wedge S_T \ge 180, \\ 0.2S_T - 38.92 & \text{if } \min_{0 \le t \le T}(S_t) \le 180 \wedge S_T \ge 180. \end{cases} \qquad (9)$$

The creation of P certificates and results of profit profiles are similar than EO certificates but only with difference of the strike price what is illustrated in the following figures. If the multiplier is 3 with the same barrier 180 USD, the profit profile of P4 certificate changes depending on barrier level as it is shown in Figure 3.

Figure 3 Profit profile of P certificate with the leverage 2 and 3 if the barrier level is not reached (left figure) or is reached (right figure)

On the other hand, if we consider different barrier 180 and 165 USD, but the same multiplier 2, then the profit profile is illustrated in the Figure 4.

Figure 4 Profit profile of P certificate with the barrier 180 and 165 USD if the barrier level is not reached (left figure) or is reached (right figure)

The same method of profit profiles in the analytical expressions is used for next designed EO and P certificates with different parameters. Data of all designed certificates are summarized in the Table 2. Used profit profiles of all designed certificates at the future trade date can be provided readers upon a request.

Table 2 Parameters of selected EO and P certificates (in USD per 1 certificate) with the maturity date 20/12/2019

Certificate	B	S_0	m	$c_{DI}(S_0)$	k_0 (EB)	c_{DI} (B)	k_0 (P)
EO1 / P1	185	192.4	2	16,90	*20,93*	19,86	*21,23*
EO2 / P2	185	192.4	3	16,90	*22,62*	19,86	*23,21*
EO3 / P3	180	192.4	2	12,55	*20,50*	16,85	*20,92*
EO4 / P4	180	192.4	3	12,55	*21,75*	16,85	*22,61*
EO5 / P5	175	192.4	2	9,02	*20,14*	14,15	*20,65*
EO6 / P6	175	192.4	3	9,02	*21,04*	14,15	*22,07*
EO7 / P7	165	192.4	2	4,15	*19,66*	9,63	*20,20*
EO8 / P8	165	192.4	3	4,15	*20,07*	9,63	*21,17*
EO9 / P9	155	192.4	2	1,59	*19,40*	6,21	*19,86*
EO10 / P10	155	192.4	3	1,59	*19,56*	6,21	*20,48*
EO11 / P11	145	192.4	2	0,48	*19,29*	3,75	*19,61*
EO12 / P12	145	192.4	3	0,48	*19,34*	3,75	*19,99*
EO13 / P13	135	192.4	2	0,11	*19,25*	2,09	*19,45*
EO14 / P14	135	192.4	3	0,11	*19,26*	2,09	*19,66*

Notes: EO – Exotic outperformance, P – Phoenix, B – barrier level, S_0 – actual spot price, m – financial leverage, $c_{DI}(S_0)$ – down in call option with strike S_0, c_{DI} (B) – down in call option with strike B, k_0 (EO) – purchase price of Exotic outperformance certificate, k_0 (P) – purchase price of Phoenix certificate.

Source: own calculations

Let's look at the influence of the given parameters (barrier level *B* and multiplier *m*) on the change of the issue price of EB and P, which is identified by using selected certificates. Our results indicate positive relationship between the barrier level (variants EO1-EO3-EO5 etc. and P1-P3-P5 etc.) on both certificates price, i.e. the higher the barrier level (closer the actual spot price S_0) is, the higher the issue prices are and vice versa. On the other hand, profit from given certificates declines with the choice of the higher barrier level. Also, there is observed a positive influence of the multiplier (variants EO1-EO2, EO3-EO4 etc. and P1-P, P3-P4 etc.) on both certificates price, i.e. the higher the multiplier is, the higher the issue prices and profits/losses are and vice versa, as it is shown in the Table 2 and the Table 3. All calculations of given certificates at the barriers (135 to 185 USD) and the multiplier (2 and 3) are shown in the Table 2.

Table 3 Factors affecting the issue price and gain of EO and P certificates

| Factors	Effect on issue price		Effect on certificate's profit / loss	
	Factor decrease	Factor increase	Factor decrease	Factor increase
Barrier (*B*)	↓	↑	↑/↓	↓/↑
Leverage (*m*)	↓	↑	↓	↑

Source: own design

The comparison of the profit from designed Exotic outperformance (EO), Phoenix (P) and linear certificate (LC equals underlying asset UA) on FB with the barrier level 180 USD depending on FB price performance at the future trade date *t* of the certificates (if the barrier level is not (left figure)/ is (right figure) broken during time to maturity) is illustrated in the Figure 5.
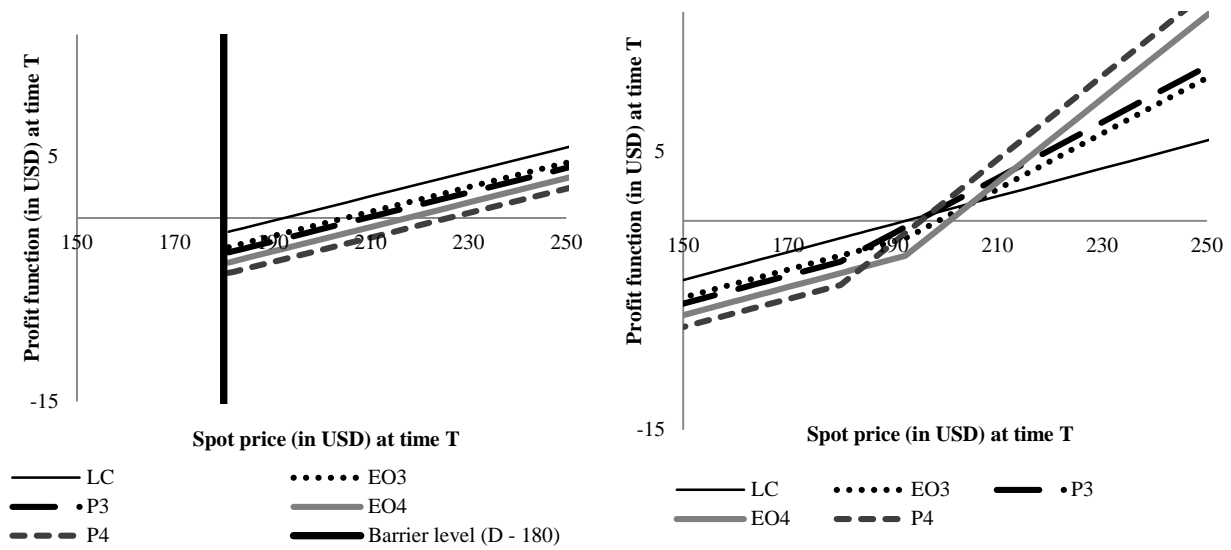
Figure 5 Profit profile of EO, P and LC certificate with the leverage 2 and 3 if the barrier level (180) is not reached (left figure) or is reached (right figure)

Based on the comparison of above analysed certificates, the recommendations for the investors, which variant is the best according to their future expectations of the UA's price, are given. Analysed results (Figure 5) indicate that all three types of certificates may generate the unlimited profit. The certificate's profitability depends on the achievement of the barrier level or not. If the FB price does not drop under the barrier level (180 USD) then LC is the best variant. Others certificates achieve worse results due to initial cost on buying barrier call options. On the other hand, if the barrier level is reached during time to maturity, P certificates ensures better results compared to EO certificates. And certificates with higher multiplier are recommended for investors. The best variant is P4 if FB shares increase above the level of 196.85 USD where the profit is multiplied by 3 compared to LC.
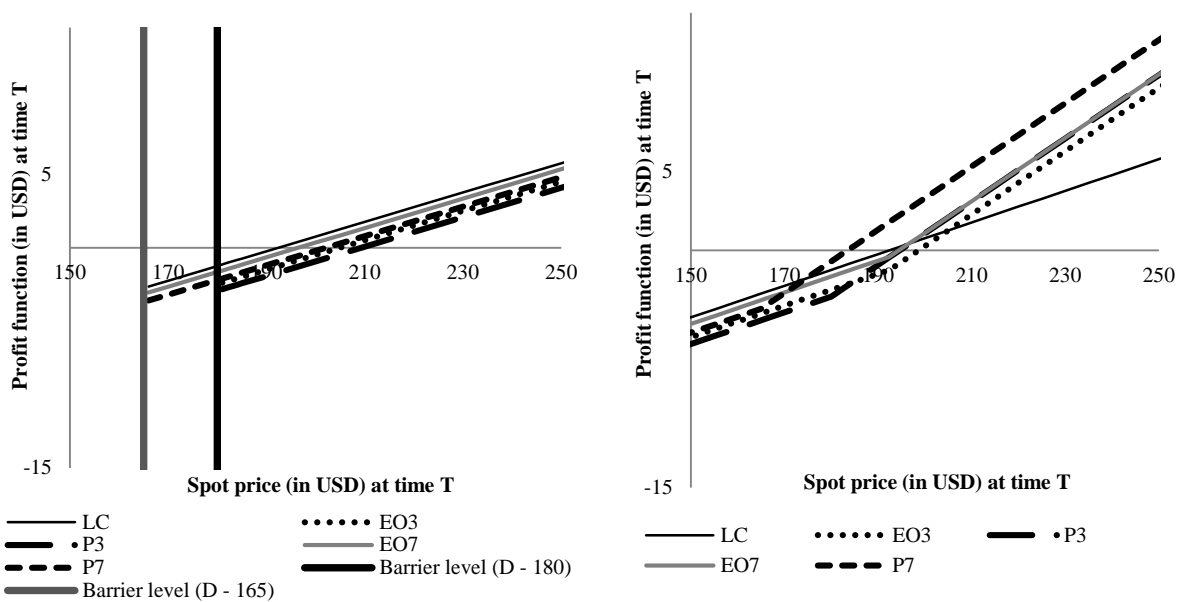
Figure 6 Profit profile of EB, P and LC certificate with the barrier 180 and 165 USD if the barrier level is not reached (left figure) or is reached (right figure)

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Finally, the most important role in investor's choice is given by the selection of investment certificates based on the appropriate parameters and expectations of the future UA's price performance.

These certificates can be applied not only to one but also to several underlying assets. In this case the certificate's price is expressed by the weighted average price of the underlying assets at the time of issue. The creation of given certificates will be the subject of next research.

5 Conclusion

The paper is aimed on the investment certificate's segment with the proposal of new barrier outperformance certificates creation using the analytical expression of barrier options. In this paper we focused on the design of Exotic outperformance and Phoenix certificate.

These certificates are suitable for risky investors in bull markets with multiplier but there is needed to reached lower barrier in order to activate an option. On the basis of the existing empirical studies, the scientific problem of our paper was to examine the nature of this investment certificates creation using portfolio replication method. We demonstrated that the profit of Exotic outperformance and Phoenix certificates can be replicated by the combination of a long position in some underlying asset and a long position in (m-1) down-and-in call options with the strike price equals actual spot price (Exotic outperformance) or barrier level (Phoenix certificate). Our empirical approach is applied on Facebook shares (FB) and performs the analysis of their profitability for to the investor at the time of maturity. We proposed Exotic outperformance and Phoenix certificates with different barrier levels and leverages. The relation between the certificates price and barrier level or leverage was detected.

Generally, investment certificates are financial derivatives, which involve more complex structures. This paper has given a new approach integrating the design of the investment certificates using the option pricing by duplication methods. The main aim was to perform an analysis of the Exotic outperformance and Phoenix certificates creation through the analytical expression of the replicated profit profiles. Performed analysis should help to understand the construction of the given certificates, as well as the influence of the individual factors.

From the methodological aspect, our research can be provided as an inspiration for another types of the certificates' creation, for example with using of European options and any underlying assets, such as stocks, indices, currencies etc.

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Assessing the financial condition of construction companies in Poland

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Abstract

The aim of the article is a evaluation of the financial condition of enterprises in the construction industry in Poland based on synthetic measure. The first part of the paper discusses theoretical issues relating to the construction industry and the construction of synthetic measures. In the second part of the paper, a comparative study of the financial condition of the construction industry in comparison with the financial condition of the companies in other industries was presented. This study was carried out on the basis of methods of linear ordering. These methods are within a multidimensional comparative analysis and, more broadly, taxonomy. In the literature of the subject, there are many methods proposed for creating synthetic measures; they are the output of Polish statistical and econometric ideas to a large extent. Usually, there are two groups of methods used for construction of a synthetic index: model and model-free methods. It is in the presented study that two methods of linear ordering have been used: one model-free method (standardized sum method) and one model methods (Hellwig's development pattern method).

Keywords: Financial Condition, Construction Companies, Synthetic Measure, Comparative Analysis.

JEL Classification: C10, G30, L74

1 Introduction

The construction industry plays an important role in the economy of every country. The condition of this industry is directly correlated with the condition of enterprises in many other sectors, such as industry or transportation. Hence, the financial situation of construction companies has an impact on the condition of other entities. Therefore, it is important to constantly monitor, analyze and assess the financial health of these companies. This information is useful not only to construction companies or their contractors, but also to entities such as banks and insurance companies. It should also concern politicians and officials who are responsible for supporting the development of the construction industry, among other things. This is because the changes taking place in this sector affect not only the economic, but also the social situation of the country.

In principle, the assessment of the financial condition of a company should take into account factors such as: profitability, financial liquidity, operational efficiency, and indebtedness. The assessment of these areas is usually carried out using specific financial ratios. However, individual indicators may give conflicting signals, e.g. liquidity ratios may be satisfactory, while performance ratios may indicate poor management of current assets. In that case, it is difficult to clearly assess the financial situation of the company. Therefore, in researching the financial condition of a company, it is helpful to use linear-ordering methods. They allow to

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determine a synthetic measure, which replaces a set of many features of the examined object with one aggregate variable. In assessing the financial condition of enterprises, the synthetic measure will replace a set of many financial ratios used to assess areas such as: profitability, liquidity, efficiency, and indebtedness.

The purpose of this article is to assess the financial condition of construction companies in Poland using a synthetic measure. This assessment was carried out in relation to other selected industries. The subject of this research are non-financial enterprises which keep accounting books or tax books of revenues and expenses, and which employ ten or more people. The time horizon adopted in the analysis and assessment of the financial condition of these enterprises is 2010-2016. This period is due to the availability of statistical data. This article uses data on the financial results of enterprises from the studies of the Polish Central Statistical Office (GUS).

This article consists of two sections. The first discusses issues related to the functioning and development of the construction industry. The second presents the research methods and results. Two methods of linear ordering were used in the study: non-standard (standardized score) (Panek 2009) and standard (Hellwig's development pattern model) (Hellwig 1968).

2   The construction industry in Poland

Construction is one of the most important sectors of the Polish economy. There are over 264,000 construction companies currently active in Poland. One in eight enterprises in Poland is a construction company. Data analyses over the years show that the number of these companies is systematically growing. In 2010, there were 233,000 such companies, while in 2016 there were 264,000. In 2016, one of the highest increases in the number of construction companies in recent years was observed compared to the previous year - by over 8% (Table 1).

When analyzing the structure of enterprises due to their size, it can be noticed that SMEs (micro, small and medium enterprises) are predominant in the construction sector - 99.9%, of which 96.8% are microenterprises (Table 1).

There were over 873,000 employees hired in construction in 2016, i.e. 9% of the total working population in the sector of non-financial enterprises. Most jobs in construction are generated by SMEs (90%), including mainly microenterprises (over 60%). In 2012-2013, construction recorded a significant decline in employment, which has nevertheless been systematically on the rise since 2014 (Table 1).

Table 1 Basic data on the construction industry in Poland in 2010-2016

	2010	2011	2012	2013	2014	2015	2016
Number of enterprises	233 005	239 221	233 721	223 796	230 301	244 103	264 210
Number of employees	887 698	919 254	870 168	818 310	821 198	841 659	873 583
Share of GVA generated by construction in GDP (%)	7,5	7,7	7,1	6,6	7,0	7,1	6,2
GVA - construction (previous year = 100)	104,9	113,5	96,0	95,0	109,0	106,4	91,5
Construction and assembly production (PLN bn)	160,9	182,2	170,6	158,0	165,7	171,3	159,5
Construction and assembly production (previous year = 100)	104,6	111,8	93,7	94,1	105,9	103,7	93,2

Source: Own study based on GUS data

The enterprise industry in Poland generates nearly three quarters of national GDP, with the share of construction not exceeding 8%. In addition, in 2016 this share was the lowest in the entire analyzed period. However, the relatively small share of construction in generating GDP is not synonymous with a low significance factor for this industry. In construction, there is the so-called multiplier effect involved, meaning that 100 people employed directly in the construction industry create at least 200 additional jobs (and also initiate production) in other sectors (BIG InfoMonitor, 2018).

In Poland, the value of construction and assembly production reached a record high of PLN 182.2 billion in 2011, and before 2011 construction was in an upward trend almost continuously since 1990. After 2011, construction companies reduced their processing capacity, adapting to the stagnation caused by the outbreak of the global financial crisis, among other factors. In 2016, the value of construction and assembly production was only PLN159.5 billion, with construction having been the only section of Poland's economy that experienced a decline in the value of production as high as 6.8%. The main reason for the downturn in 2016 was a significant reduction in public-sector orders, largely due to the slowdown in the implementation of projects co-financed by the European Union from the new financial perspective. As a result, there was a clear reduction in revenues from sales among construction companies, and therefore, the financial results of most of them worsened.

3 The financial condition of construction companies inlight of previous studies

Many authors have studied the financial condition of construction companies. A numberof articles and analyses assessing the current financial situation of construction companies or forecasting their financial condition can be found in the literature. Most of them concern construction companies operating in a selected country or region.

Kangari (1988) argues that construction companies should recognize the possibility of business failure and the importance of consistently monitoring their financial situation through financial indicators. Kangari et al. (1992) developed a quantitative model based on financial indicators to assess the financial condition and survival chances of construction companies in the United States.

Chan et al. (2005) tried to monitor and assess the financial condition of contractors in the construction industry the Asian economic turmoil, by using financial ratios together with one of Altman's distress models.

Chen (2009), based on data from development and construction corporations listed in the construction sector of the Taiwan Stock Exchange, developed a model for forecasting financial results of companies.

Shuang et al. (2011) proposed an early warning bankruptcy-possibility prediction model about China's construction companies.

In turn, Su (2011) attempted to develop an automatic expert model that provides practitioners with a forecasting tool to protect against financial risk through the use of derivatives.

Hegazy et al.(2012) developed a model based on key financial performance indicators for UK construction companies to benchmark and evaluate their business performance at corporate level.

Špička (2014) carried out an evaluation of the financial condition of construction companies with different payment behavior in the Czech Republic by using company-level data during the period 2008 – 2012.

Rajasekhar (2017) assessed the financial performance of construction companies in India. He identified seven indicators that are important for the construction industry. These are: liquidity factor, activity factor, long-term solvency, efficiency, profitability, asset management, inventory factors. The results of his research indicate a worsening situation of the construction industry, the reason for which might be continuous economic crises and stagnation.

The financial condition of construction companies was also the subject of research by many other authors, including Langford et al. (1993), Hall (1994), Abidali and Harris (1995), Pilateris and McCabe (2003), Lin (2008).

Summing up, there are many studies worldwide concerning the assessment of the financial condition of construction companies. The aim of this study is to either develop models that will support company managers or draw the attention of politicians and officials to the fact that the construction industry requires taking appropriate actions and developing an effective support policy.

Interestingly, not many authors in Poland have so far tried to assess or forecast the financial condition of construction companies. Studies in this area were conducted, among others, Łach (2008), Wędzki (2005), Kitowski (2013), Jędrzejczak-Gas (2015). In addition, the previously conducted assessment of the financial condition of construction companies usually consisted in the evaluation of filtered indices, such as: return on assets (ROA), return on equity (ROE), current liquidity ratio, and quick liquidity ratio. However, some filtered indices may give contradictory signals, e.g. liquidity ratios may be satisfactory while profitability ratios are low. Therefore, in studying the financial condition of enterprises, it is helpful to use multivariate statistics methods, which allow to determine a synthetic measure that replaces a set of different indicators with one aggregated variable.

This study is an attempt to fill the gap in research studies on the financial condition of construction companies in Poland. In the presented study, two methods of linear ordering were used within the scope of a multivariate comparative analysis.

4 Methods

An analysis and an assessment of the financial condition of construction companies were carried out using linear-ordering methods within the scope of a multivariate comparative analysis and, more broadly, taxonomy. In the literature, many methods are proposed for the creation of synthetic measures, and to a large extent, they are the output of Polish statistical and econometric thought (including Hellwig, 1968, Bartosiewicz, 1976; Cieślak, 1974; Pluta, 1976). In most cases, two groups of methods are used for designing a synthetic measure: standard and non-standard. In the presented study, two methods of linear ordering were used: non-standard (standardized score) (Panek, 2009) and standard (Hellwig's development pattern model) (Hellwig, 1968).

Linear-ordering methods allow to rank objects from the best to the worst. For example, they allow to rank countries by their economic development, regions by the innovativeness of their enterprises (Jędrzejczak-Gas, 2016; Malinowski 2017) and companies by their financial

condition (Jędrzejczak-Gas, Kużdowicz, 2016). In this study, the subject of ordering are industries (sectors), which are ranked by their financial condition.

The first stage in construing a synthetic measure - regardless of the method used - is to determine the diagnostic variables (x_{ij}) that are used to develop it. Using the substantive criteria (significance of variables from the point of view of assessing the financial condition of companies) and formal criteria (availability of statistical data), a total of 14 ratios from four areas determining the financial condition of companies were adopted (Table 2).

Table 2 Financial ratios – diagnostic variables (x_{ij})

Area of financial condition	Ratio name	Calculation method
Financial liquidity	Current ratio	current assets/current liabilities
	Quick ratio	(current assets – stocks – short-term inter-period settlements)/current liabilities
Profitability	Return on sales	(net profit (loss)/sales revenue) x 100%
	Return on assets	(net profit (loss)/average total assets) x 100%
	Return on equity	(net profit (loss)/average equity capital) x 100%
Efficiency	Total cost ratio	total costs/total revenue
	Total assets turnover ratio	total revenue/average total assets
	Current assets turnover ratio	total revenue/average current assets
	Inventory turnover ratio	sales revenue/average stocks
	Trade receivables turnover ratio	sales revenue/average receivables from deliveries and services
	Trade payables turnover ratio	sales revenue/average liabilities from deliveries and services
Debt	Debt ratio	total liabilities/total assets
	Debt structure ratio	long-term liabilities/total liabilities
	Long-term debt ratio	long-term liabilities/equity capitals

Source: Own elaboration

The financial ratios presented in Table 2 were calculated for all analyzed years (2010-2016) for both the construction industry and the other 12 industries subject to examination. Subsequently, these indicators were statistically verified. First, it was examined whether they had the right volatility: volatility ratios were calculated and the financial ratios for which the volatility ratio was lower than 10% were eliminated from further research. Second, an analysis of the Pearson correlation coefficients was conducted and ratios that were highly correlated with others were eliminated, i.e. if the correlation coefficient was higher than 0.7, one of the financial ratios was removed from further research.

Subsequently, the remaining ratios were determined in terms of their features. Some were stimulus, some nominal, while some were destimulus. The destimulus and nominal ratios were transformed into stimulants: the former according to Formula (1), while the latter according to Formulas (2) - (4):

$$x_{ij}^{S} = -x_{ij} \qquad (1)$$

$$x_{ij}^{S} = 0 \qquad \text{if } x_{j,nom,D} \leq x_{ij} \leq x_{j,nom,G} \qquad (2)$$

$$x_{ij}^S = x_{j,nom,G} - x_{ij} \qquad \text{if } x_{ij} > x_{j,nom,G} \qquad (3)$$

$$x_{ij}^S = x_{ij} - x_{j,nom,D} \qquad \text{if } x_{ij} < x_{j,nom,D} \qquad (4)$$

where:

x_{ij}^S - value of *j*-th financial ratio in *i*-th industry transformed into a stimulant,

x_{ij} - value of *j*-th financial ratio in *i*-th industry,

j = 1,2,3,…., m – number of financial ratios,

i = 1,2,3,…, n – number of observations of ratio (number of industries),

$x_{j,nom,D}$ - lower value of nominal range of *j*-th financial ratio,

$x_{j,nom,G}$ - upper value of nominal range of *j*-th financial ratio.

The next stage was to bring the analyzed ratios to cross-comparability, which is why they were normalized. In the literature, many proposals for these methods and discussions on the criteria for their selection can be found (see e.g. Perkal, 1953, Hellwig, 1968; Wesołowski, 1975; Bartosiewicz, 1976; Nowak, 1977; Strahl, 1978; Borys, 1978; Grabiński, 1992; Kukuła, 2000, Lira et al., 2002, Pawełek, 2008, Panek, 2009, Walesiak, 2014). In the present study, the non-standard method used unitization, according to Formula (5), while the standard method used standardization, according to Formula (6):

$$z_{ij} = \frac{x_{ij} - \min x_{ij}}{\max x_{ij} - \min x_{ij}} \qquad (5)$$

$$z_{ij} = \frac{x_{ij} - \overline{x}_j}{S_j} \qquad (6)$$

where:

z_{ij}- normalized values of *j*-th financial ratio in *i*-th industry,

min x_{ij} – minimal value of *j*-thratio,

max x_{ij} – maximal value of *j*-th ratio,

$\overline{x}_j$ - arithmetic mean of *j*-th financial ratio,

S_j - standard deviation of *j*-th financial ratio.

The last stage was to calculate the synthetic measure. In the non-standard method, it was calculated according to Formula (7), while in the standard method according to Formula (8):

$$S_i = \frac{1}{m}\sum_{j=1}^{m} z_{ij}, \qquad (7)$$

$$S_i = 1 - \frac{d_i^+}{d_0}, \qquad (8)$$

where:

S_i–value of synthetic variable for *i*-th object,

$$d_i^+ = \sqrt{\sum_{j=1}^{m} \left(z_{ij} - z_j^+\right)^2}$$

$z_j^+ = \max_i z_{ij};\ d_0 = \bar{d} + 2S_d;\ \bar{d}$ and $2S_d$ are arithmetic mean and standard deviation of vector $d = \lfloor d_1^+,\ d_2^+, \dots, d_n^+ \rfloor$, respectively.

5 Results

It was found, based on the non-standard method, that the construction industry in Poland is characterized by poor financial health compared to other sectors. In all analyzed years, construction achieved low synthetic values of the financial condition and ranked between 8th and 11th out of the 13 analyzed industries in financial health rankings (Table 3).

In line with the non-standard method, construction companies in Poland recorded the worst situation in 2012-2013, when the synthetic value was the lowest of all analyzed years, ultimately pushing construction down to positions 11th and 9th. In subsequent years (2013-2015), there was an increase in the synthetic value, meaning an improvement in the financial condition of construction. It should be noted, however, that an increase in the synthetic value was recorded by the majority of the industries, which ultimately resulted in construction ranking 9th in 2013, and 8th in 2014, in the industry ranking.

The highest synthetic value (0.566), and at the same time the highest position in the ranking (5th), was achieved by the construction industry in 2015. Unfortunately, in 2016, construction was the only industry that recorded a decline in the synthetic value, i.e. its financial condition worsened and it ranked 8th in the industry ranking.

In the analyzed period (2010-2016), the synthetic measure for the construction industry had the average value of 0.510, which made it rank as low as 9th and confirmed the poor financial health of construction companies compared to other industries.

Table 3 Synthetic measures of financial condition calculated using the non-standard method and the position of industries in the 2010-2016 ranking

Industry	2010	2011	2012	2013	2014	2015	2016	2010-2016
Synthetic measure of financial condition								
Industry	0,413	0,444	0,370	0,427	0,370	0,329	0,445	0,400
Construction	0,509	0,550	0,400	0,487	0,520	0,566	0,535	0,510
Trade; repair of motor vehicles	0,521	0,566	0,482	0,552	0,490	0,473	0,529	0,516
Transportation and storage	0,550	0,647	0,556	0,588	0,560	0,556	0,667	0,589
Accommodation and catering	0,622	0,594	0,582	0,538	0,544	0,601	0,695	0,597
Information and communication	0,644	0,693	0,608	0,683	0,589	0,596	0,664	0,640
Real estate activities	0,412	0,386	0,293	0,361	0,334	0,320	0,360	0,352
Professional, scientific and technical activities	0,402	0,255	0,484	0,434	0,449	0,369	0,445	0,405
Administrative and support service activities	0,548	0,593	0,553	0,574	0,601	0,504	0,561	0,562
Education	0,401	0,570	0,576	0,552	0,607	0,426	0,502	0,519
Human health and social work activities	0,571	0,618	0,614	0,652	0,536	0,570	0,655	0,602
Arts, entertainment and recreation	0,723	0,837	0,781	0,734	0,712	0,735	0,851	0,768
Other service activities	0,470	0,503	0,425	0,440	0,506	0,542	0,629	0,502

Industry	2010	2011	2012	2013	2014	2015	2016	2010-2016
Industry ranking position								
Industry	10	11	12	12	12	12	12	12
Construction	8	9	11	9	8	5	8	9
Trade; repair of motor vehicles	7	8	9	7	10	9	9	8
Transportation and storage	5	3	6	4	5	6	3	5
Accommodation and catering	3	5	4	8	6	2	2	4
Information and communication	2	2	3	2	4	3	4	2
Real estate activities	11	12	13	13	13	13	13	13
Professional, scientific and technical activities	12	13	8	11	11	11	11	11
Administrative and support service activities	6	6	7	5	3	8	7	6
Education	13	7	5	6	2	10	10	7
Human health and social work activities	4	4	2	3	7	4	5	3
Arts, entertainment and recreation	1	1	1	1	1	1	1	1
Other service activities	9	10	10	10	9	7	6	10

Source: Own processing (GUS 2011-2017).

Table 4 presents synthetic measures of the financial condition of the analyzed industries, which were calculated using the standard method. The data presented in this table also shows that construction companies are characterized by poor financial health compared to other industries.

According to the standard method, the construction industry scored low synthetic values in all analyzed years, and ranked between 8th and 12th out of the 13 analyzed industries for financial condition.

Similar to the non-standard method, the worst financial situation of construction companies was recorded in 2012-2013, when the synthetic value was the lowest of all analyzed years, which ultimately made it rank 12th in the industry ranking.

In line with the standard method (similar to the non-standard), the highest synthetic value throughout the analyzed period was recorded in 2015 (0.226), but it was still not very high compared to other industries (construction ranked 8th).

Analyzing the average value of the synthetic measure, it can be said that it is not particularly high in the construction industry, at just 0.120. Compared to other industries, construction ranked as low as10[th].

Table 4 Synthetic measures of financial condition calculated using the standard method and the position of industries in the 2010-2016 ranking

Industry	2010	2011	2012	2013	2014	2015	2016	2010-2016
Synthetic measure of financial condition								
Industry	0,096	0,040	0,173	0,151	0,095	0,097	0,151	0,115
Construction	0,100	0,070	0,053	0,095	0,135	0,226	0,161	0,120
Trade; repair of motor vehicles	0,152	0,146	0,229	0,206	0,175	0,209	0,228	0,192
Transportation and storage	0,179	0,220	0,249	0,250	0,193	0,253	0,430	0,253
Accommodation and catering	0,221	0,142	0,239	0,165	0,149	0,243	0,387	0,221
Information and communication	0,275	0,239	0,340	0,310	0,214	0,278	0,407	0,295
Real estate activities	0,026	-0,084	-0,004	-0,004	-0,043	-0,022	0,048	-0,012
Professional, scientific and technical activities	0,085	-0,328	0,229	0,124	0,116	0,101	0,189	0,074

Industry	2010	2011	2012	2013	2014	2015	2016	2010-2016
Administrative and support service activities	0,135	0,142	0,272	0,243	0,257	0,236	0,345	0,233
Education	0,072	0,173	0,355	0,256	0,301	0,188	0,205	0,222
Human health and social work activities	0,160	0,233	0,342	0,348	0,206	0,277	0,430	0,285
Arts, entertainment and recreation	0,282	0,497	0,491	0,391	0,296	0,442	0,639	0,434
Other service activities	0,132	0,122	0,231	0,168	0,257	0,311	0,359	0,226
Industry ranking position								
Industry	10	11	11	10	12	12	12	11
Construction	9	10	12	12	10	8	11	10
Trade; repair of motor vehicles	6	6	9	7	8	9	8	9
Transportation and storage	4	4	6	5	7	5	2	4
Accommodation and catering	3	8	7	9	9	6	5	8
Information and communication	2	2	4	3	5	3	4	2
Real estate activities	13	12	13	13	13	13	13	13
Professional, scientific and technical activities	11	13	10	11	11	11	10	12
Administrative and support service activities	7	7	5	6	3	7	7	5
Education	12	5	2	4	1	10	9	7
Human health and social work activities	5	3	3	2	6	4	3	3
Arts, entertainment and recreation	1	1	1	1	2	1	1	1
Other service activities	8	9	8	8	4	2	6	6

Source: Own processing (GUS 2011-2017).

Summing up, construction companies in 2010-2016 ranked between 8th and 12th out of the 13 industries analyzed, which points to poor financial health of these enterprises. In addition, in the analyzed period, their position in the industry ranking changed by no more than 1-2spots (except for 2015 in the non-standard method), which shows that the financial condition of these companies was rather stable compared to other industries.

6 Conclusion

Analyzing and assessing the financial condition of construction companies allows to identify changes taking place in this sector. It was found that the construction industry in Poland shows a poor financial condition compared to other industries.

Two methods of linear ordering were used to assess the financial condition of the industries (standard and non-standard). They both confirmed that, in 2010-2016, construction was characterized by poor financial heal thin comparison with other industries, which is confirmed by its low synthetic values for financial condition and its low position in the industry ranking. Out of the 13 industries analyzed, construction consistently ranked between 8[th]and 12th.

One of the main reasons for the problems of the construction industry is its particular sensitivity to various types of cycles, related not only to the general economic situation, investments or seasonality of operations, but also to fluctuations in demand, changes in financing conditions and the overall situation on the labor market. One should add to this specific factors such as: changes in economic policy, the initiation and termination of various government programs, or changes in legal regulations.

In recent years, the construction industry in Poland has experienced a special kind of cyclical changes related to the implementation of EU assistance programs that cause either accumulation of works (with its negative consequences) or subsequent stagnation resulting in suspension of orders. In addition, the long-lasting bureaucratic procedures - including those related to the preparation of tenders, their resolution and settlement – pose another serious challenge to the construction industry.

In subsequent years, this industry will have to confront other adverse changes in the economy. Currently, the biggest challenges for construction companies are the rising prices of building materials and raw materials, rising employment costs and rising costs associated with hiring subcontractors. Many construction companies concluded contracts 12-24 months ago, meaning that with the current construction and assembly prices (whose increase is much slower than production costs), these contracts may generate losses. In addition, many construction companies in Poland already have difficulties in recruiting employees, which further raises employment costs.

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Cost efficiency versus New cost efficiency under different unit prices

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Abstract

This paper turns to the topic of "cost efficiency" in order to show how Data Envelopment Analysis (DEA) can be used to identify types of inefficiency which can emerge for treatment when information on prices and costs are known exactly. We compare cost efficiency estimated by traditional DEA model presented by Farrell (1957) and new cost efficiency model under different unit prices presented by Tone (2002). We show how to make the relevant calculations and discuss some applications in the banking area. The aim is to make the reader aware of the pros and cons of both methods and to present the usage of these methods in efficiency evaluation in software R, namely package "Benchmarking".

Keywords: Data Envelopment Analysis, Cost efficiency, Software R.

JEL Classification: C14

1 Introduction

In the literature, there are two principal methods through which to measure cost efficiency frontier: the parametric approach and the non-parametric approach. These two approaches differ primarily in the underlying assumptions applied in estimating cost efficient frontiers. The most commonly employed parametric procedure is the Stochastic Frontier Approach (SFA) as it allows for the effect of statistical noise to be separated from the effect of inefficiency, thereby resulting in a stochastic frontier. However, this approach requires a specific functional form that presupposes the shape of the cost efficiency frontier and assumes a specific probability distribution for the efficiency level. Additionally, if the assumptions are mis-specified, the measured cost efficiency will contain errors. The non-parametric approach, commonly referred to as Data Envelopment Analysis (DEA), avoids this type of specification error because it does not require a priori assumptions about the analytical form of the cost function or an assumed probability distribution for efficiency. However, it suffers from one major drawback in that it does not allow for random errors (e.g. measurement errors, good or bad luck) in the optimization problem and all deviations from the cost efficiency frontier are measured as inefficiency. As both parametric and non-parametric approaches have their own merits and limitations and as the true level of cost efficiency is unknown, the choice of a suitable efficiency estimation procedure has been quite controversial (Dong et al., 2014). However, in the banking area, some researchers prefer to use parametric method (e.g. Weill, 2003, Fries and Taci, 2005), while some researches mainly used the non-parametric approach (e.g. Grigorian and Manole, 2006, Jimborean and Brack, 2010, Gavurová et al., 2017). We can also find some studies comparing the results of cost efficiency estimated by both methods simultaneously (e.g. Weill, 2004,

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Iršová, 2009). Most of these studies are based on the application of traditional cost efficiency frontier. In modern literature, we can also find some studies dealing with the application of a new cost efficiency function (e.g. Dong et al., 2014), but there are only a few studies dealing with the application of this method in the condition of Slovak banking (Pancurova and Lyócsa, 2013, Zimková, 2015).

Technology and cost are the wheels that drive modern enterprises; some enterprises have an advantage in terms of technology and other in cost. Hence, the management is eager to how and to what extent their resources are being effectively and efficiently utilized, compared to other similar enterprises in the same or similar field (Cooper et al., 2007). Regarding this subject, there are two different situations: one with common unit prices and costs for all Decision Making Units (DMUs) and the other with different prices and costs from DMU to DMU. Cost efficiency evaluates the ability to produce current outputs at minimal cost. The concept of cost efficiency was first introduced by Farrell (1957) and then developed by Färe, Grosskopf and Lovell (1985) by using linear programming technologies. In this model, it was assumed that input prices are the same across all DMUs. However, the common price and cost assumption is not always valid in actual business and it is demonstrated that efficiency measures based on this assumption can be misleading. So we decided to present a new cost efficiency related model introduced by Tone (2002) and compare results obtained by traditional and new cost model. We would like to present the usage of these methods in efficiency evaluation in software R, namely package "Benchmarking".

In this paper, we applied the DEA model under the condition of constant return to scale. To fulfil the aim of the paper, the structure of the paper is as follow. The second section describes the methodology. Next, the third section presents the empirical analysis and results. In section 4 we conclude the paper.

2 Methodology

Data Envelopment Analysis (DEA) was first developed by Charnes et al. (1978) under the constant return to scale assumption and provides a measure of technical efficiency. Following Farrell (1957), and Färe, Grosskopf and Lovell (1985), a sequence of linear programmes was applied to construct cost efficiency frontiers and from these, measures of traditional cost efficiency were calculated. The traditional cost efficiency model assumes that the unit cost of inputs is identical among DMUs. According to the Pancurova and Lyócsa (2013), to be cost efficient, the DMU must be both technically efficient (adopting the best practice technology) and allocative efficient (selecting the optimal mix of inputs to minimize the costs for a given output).

We define $\mathbf{y}_o$ as the $s \times 1$ vector of the o-th production unit´s s outputs ($r = 1, \dots, s$), $\mathbf{x}_o$ is the $m \times 1$ vector of its m inputs ($i = 1, \dots, m$), $\mathbf{Y}$ is the $s \times n$ matrix of outputs (n denotes the number of DMUs, ($j = 1, \dots, n$)), and $\mathbf{X}$ is the $m \times n$ matrix of inputs. Let us consider we have prices associated with inputs. Let $\mathbf{c} = (c_1, \dots, c_m)$ be the common unit input-price or unit-cost vector. Then the cost efficiency γ^* of DMU_o is defined as ratio between minimal cost and the actual cost:

$$\gamma^* = \frac{cx^*}{cx_o} \qquad (1)$$

Where x_o^* is an optimal solution of the constant return to scale cost minimization DEA model defined in the following terms:

Cost	$$cx^* = \min_{x,\lambda} cx$$	(2)
Subject to	$$x \geq X\lambda$$	(3)
	$$y_o \leq Y\lambda$$	(4)
	$$\lambda \geq 0$$	(5)

The solution to this optimization problem is known to be the point x^* where the isocost line is tangent to the isoquant as shown in Figure 1. This point represents the cost minimizing vector of input quantities for the evaluated production unit, given the vector of input prices $\mathbf{c_o}$ and output levels $\mathbf{y_o}$. The isoquant represents all possible combinations of inputs amount (x_1, x_2) that are needed to produce the same amount of a single output. The point x is a point in the interior of the production possibility set representing the activity of a DMU which produces this same amount of output but with a greater amount of both inputs. To evaluate the performance of this production unit we can use the customary Farrell measure of radial efficiency. The result is the measure of technical efficiency which can be calculated as the ratio between the distance from 0 to $\tilde{x}$ and distance from 0 to x. If the information about the input prices is available, we can define also isocost line whose slope is given by the ratio of input prices. Isocost line shows all combinations of inputs which cost the same total amount. The relative distance of $\hat{x}$ and $\tilde{x}$ refers to allocative efficiency which can bring minimal cost but is connected with the loss of technical efficiency.
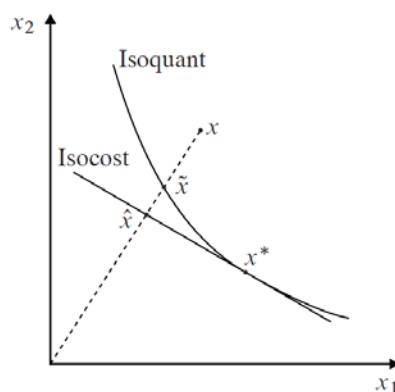
Figure 1 Cost minimum
Source: Bogetoft and Otto, 2011

In traditional cost efficiency DEA models, we assume that input prices are the same across all decision making units. However, actual markets don't necessarily function under perfect competition and unit input prices might not be identical across all DMUs. Thus, as pointed out by Tone (2002) the traditional DEA cost efficiency model doesn't take account of the fact that costs can obviously be reduced by reducing the input factor prices. For example, if two production units have the same inputs and outputs while the unit input prices for one DMU are twice those of the other DMU, then the total costs of the DMU with the higher unit input prices will be greater than those of the DMU with the lower unit input prices. However, under the traditional DEA model, the cost function is homogeneous of degree one in input prices and the scaling factor cancels out in the cost efficiency ratio and thus, the two DMU will be assigned the same measure of cost efficiency irrespective of the fact that they have significantly different input prices. This represents a serious drawback for assessing relative efficiency levels under the traditional DEA model an is caused by the peculiar structure of the DEA model which exclusively focuses on the technical efficiency of two DMU and cannot take account of variations in unit input prices between the DMUs. Therefore, in order to avoid this shortcoming, Tone (2002) proposed a new scheme for evaluating cost efficiency under which the production

technology is homogeneous of degree one in the total costs as distinct from being homogeneous of degree one in the input prices under the traditional DEA model. This means that under new DEA model DMUs with different input prices will return different measures of cost efficiency (Dong et al., 2014).

The new cost efficiency model is based on the definition of another cost-based production possibility set P_c as (Cooper et al., 2007):

$$P_c = \{(\bar{x}, y) \mid \bar{x} \geq \bar{X}\lambda, y \leq Y\lambda, \lambda \geq 0\} \tag{6}$$

Where $\bar{X} = (\bar{x}_1, \dots, \bar{x}_n)$ with $\bar{x}_j = (c_{1j}x_{1j}, \dots, c_{mj}x_{mj})^T$ where $(j = 1, \dots, n)$. Here we assume that the matrices X and C are non-negative, and elements of $\bar{x}_{ij} = (c_{ij}x_{ij}) (\forall(i,j))$, where $(i = 1, \dots, m)$ and $(j = 1, \dots, n)$, are denominated in homogeneous units in monetary terms (e.g. euro). The new cost efficiency $\overline{\gamma^*}$ is defined as (Cooper et al., 2007):

$$\overline{\gamma^*} = \frac{e\overline{x_o^*}}{e\overline{x_o}} \tag{7}$$

Where $e \in R^m$ is a row vector with elements being equal to 1, and $\overline{x_o^*}$ is the optimal solution of the linear programmes given below:

New Cost	$e\overline{x_o^*} = \min_{\bar{x},\lambda} e\bar{x}$	(8)
Subject to	$\bar{x} \geq \bar{X}\lambda$	(9)
	$y_o \leq Y\lambda$	(10)
	$\lambda \geq 0$	(11)

In the new cost efficiency model the optimal input mix $\overline{x_o^*}$ that produces the output y_o can be found independently of the DMU´s current unit price c_o, whereas in the traditional cost efficiency model keeping the unit cost of DMU j fixed at c_o we search for optimal input mix x^* for producing output y_o. These are fundamental differences between the two models. Using traditional cost efficiency model we can fail to recognize the existence of other cheaper input mixes. We can demonstrate this with a simple example involving three DMUs A, B and C with each using two inputs (x_1, x_2) to produce one output (y) along with input costs (c_1, c_2). The data and the resulting measurement are exhibited in Table 1.

For DMUs A, B and C, the traditional cost model gives the same efficiency score $\gamma^* = 1$. As they used the same amount of inputs to produce the same amount of output we can consider them as technical efficient. The traditional cost model assumes that the unit cost of inputs is identical among, so don't take into account the actual prices of production units.

Table 1 Comparison of traditional and new cost efficiency

	x_1	x_2	c_1	c_2	y	$\bar{x}_1$	$\bar{x}_2$	e_1	e_2	Cost γ^*	Cost $\overline{\gamma^*}$
A	10	10	10	10	1	100	100	1	1	1.00	0.10
B	10	10	1	1	1	10	10	1	1	1.00	1.00
C	10	10	1	10	1	10	100	1	1	1.00	0.18

Source: Prepared by author according to (Cooper et al., 2007)

The new scheme devised as in Tone (2002) distinguishes DMU A from DMU B and DMU C by according them different cost efficiency scores. This is due to the difference in their unit

costs. Moreover, DMU B is judged as cost efficient $\overline{\gamma_B^*} = 1$. We can also see the drop in DMU A from 1 (γ_A^*) to 0.1 ($\overline{\gamma_A^*}$) and in case of DMU C from 1 (γ_C^*) to 0.18 ($\overline{\gamma_C^*}$). This drop in DMU A´s and DMU C´s performance is explained by their higher cost structure. We can see that DMU A uses 10 units of input 1 with a price of 10 price units per one unit and 10 units of input 2 with a price of 10 price units per one unit. It means that for production of the same amount of outputs DMU A must incur a cost equal to 200 price units. In case of DMU B, we can see that it uses 10 units of input 1 with a price of 1 price unit per one unit and 10 units of input 2 with a price of 1 price unit per one unit, which generates total cost equal to 20 price units. The last one, DMU C uses 10 units of input 1 with a price of 1 price unit per one unit and 10 units of input 2 with a price of 10 price units per one unit, which generates total cost equal to 110 price units. It indicates, that all DMUs use the same amount of inputs to produce the same amount of outputs, but when we take into account different unit prices, we can see, that the total costs of production units are different, therefore we could not consider them as the same cost efficient.

3 Illustrative example

In this part of our paper we try to illustrate the application of traditional and new cost DEA model in the banking area. Results of the above formulated models are illustrated on efficiency evaluation of 9 commercial banks on the Slovak financial market. It is rather an illustrative example than a serious case study even through the data set used in the example has a real background. The data are taken from the public financial statements of commercial banks for the year 2015.

Practical calculation of cost and new cost efficiency is realized using the software R. R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS and can be downloaded on the web page: http://www.r-project.org/. R is very much a vehicle for newly developing methods of interactive data analysis. It is developing fast and has been extended by a large collection of *packages*. However, most programs written in R are essentially ephemeral, written for a single piece of data analysis. (www.r-project.org). One of the packages is a package „Benchmarking", prepared by Bogetoft and Otto (2013). Bogetoft and Otto (2010) in their work used software R for calculating efficiency not only for DEA models but also for SFA models. The package „Benchmarking" contains methods to estimate technologies and measure efficiency using DEA while supporting different technology assumptions (Free disposability hull, Variable return to scale, Constant return to scale, Decreasing return to scale, Increasing return to scale), and using different efficiency measures (Input based, Output based, Hyperbolic graph, Additive efficiency, Super efficiency, Directional approach). The methods can solve not only standard models, but also many other model variants, and they can be modified to solve new models.

We will illustrate using cost DEA models under the assumption of a constant return to scale, measuring of cost and new cost efficiency of commercial banks. This simple example involves 9 observations on banks which use two inputs (x_1 and x_2) to produce one output (y). Let denotes c_1 the price of input x_1, c_2 the price of input x_2. The following inputs, output, prices of inputs are taken into account. We report data set of these variables in Table 2.

- **Inputs:** Total deposits in EUR (x_1), Total number of employees (x_2).
- **Output:** Total loans in EUR (y).
- **Input prices:** The price of deposits (c_1) in EUR - can be calculated as the ratio of total interest expenses to total deposits, the price of labour (c_2) in EUR – can be calculated as the ratio of personnel expenses to number of employees.

Table 2 Data set - variables used for efficiency measurement

	Total deposits	Number of employees	Price of deposits	Price of labor	Total loans	e_1	e_2
	x_1	x_2	c_1	c_2	y		
ČSOB, a.s.	5 252 134 000	2 136	0.00677	30 517.32	4 502 454 000	1	1
OTP Banka Slovensko, a.s.	1 247 796 000	662	0.01108	26 421.45	1 271 311 000	1	1
Poštová banka, a.s.	3 532 287 000	841	0.01057	33 881.09	2 019 866 000	1	1
Prima banka Slovensko, a.s.	1 732 199 000	693	0.01217	24 568.54	1 619 163 000	1	1
Privatbanka, a.s.	513 400 000	166	0.01453	38 096.39	258 147 000	1	1
Sberbank Slovensko, a.s.	1 466 992 000	658	0.01481	34 708.21	1 351 801 000	1	1
Slovenská sporiteľňa, a.s.	11 062 984 000	3 831	0.00512	30 561.21	9 536 299 000	1	1
Tatra banka, a.s.	8 918 023 000	3 477	0.00397	29 884.96	8 084 517 000	1	1
Všeobecná úverová banka, a.s.	8 954 486 000	3 469	0.00771	29 396.66	8 732 192 000	1	1

Source: Prepared by author

To solve the traditional cost minimization problem using R, we first load the data from MS Excel file (*example.csv*) that must be saved in CSV (Comma-separated values) format. The next step requires the solution of the cost minimisation DEA model, using the procedure *cost.opt* from the Benchmarking package. This command estimates the optimal input vector (*xopti*) that minimizes cost in the context of a DEA technology. The part of the command is to define which variables will act as inputs (the matrix of inputs, *x*), outputs (the matrix of outputs, *y*), input prices (as a matrix, *c*) and used technology (variable return to scale "*crs*") of the applied model.

To calculate traditional cost efficiency, we have to find the actual costs ($cobs = \sum_{i=1}^{m} c_{iq} \cdot x_{iq}$) and

the optimal costs ($copt = \sum_{i=1}^{m} c_{iq} \cdot x_{iq}^*$), and then we divide the optimal costs by the actual costs.

This is calculated in R by using the inner product *%*%*, or matrix multiplication where the function *t* is matrix transposed. For calculation of traditional cost efficiency, it is necessary to select data from diagonals of formed matrices (*cobs1*; *copt1*). By dividing these values, we obtain traditional cost efficiency (*ce*) of evaluated banks. The process of calculation of traditional cost efficiency by using R can be entered via the following commands:

```
example = read.csv2("example_bank.csv")
x = with(example, cbind(x1,x2))
y = with(example, cbind(y1))
c = with(example, cbind(c1,c2))
xopti = cost.opt(x,y,c, RTS="crs")
cobs = x %*% t(c)
copt = xopti$xopt %*% t(c)
copt1 = diag(copt)
cobs1 = diag(cobs)
ce = copt1/cobs1
print(cbind("ce"=c(ce)), digits=4)
```

By multiplying the total deposits (x_1) and a number of employees (x_2) with their respective unit costs (c_1, c_2), we obtain new input data set (*xn*) which can be used to calculate new cost efficiency. By switching original input prices directly to the new input, the price data does not enter the new model but is replaced by the row vector with elements being equal to 1 (e_1, e_2). This new data set is used in the process of cost minimisation DEA model, using the procedure *cost.opt*. To calculate new cost efficiency, we also have to find the actual costs (*cobsn*) and the optimal costs (*coptn*), and then we divide the optimal costs by the actual costs. By dividing

values from diagonals of matrices (*cobs1n*; *copt1n*), we obtain new cost efficiency (*cen*) of evaluated banks. The process of calculation of new cost efficiency by using R can be entered via the following commands:

```
examplen = read.csv2("example_bank.csv")
xn = with(examplen, cbind(x1*c1,x2*c2))
y = with(examplen, cbind(y1))
cn = with(examplen, cbind(e1,e2))
xnoptin = cost.opt(xn,y,cn, RTS="crs")
cobsn = xn %*% t(cn)
coptn = xnoptin$xopt %*% t(cn)
copt1n = diag(coptn)
cobs1n = diag(cobsn)
cen = copt1n/cobs1n
print(cbind("cen"=c(cen)), digits=4)
```

The results and comparison of presented models for all banks are included in Table 3. All the results are given by models under the assumption of a constant return to scale.

Table 3 Cost efficiency scores given by DEA models

	Cost γ^*	Cost$\overline{\gamma}^*$
ČSOB, a.s.	0.8521	0.7567
OTP Banka Slovensko, a.s.	0.8874	0.6873
Poštová banka, a.s.	0.7456	0.5195
Prima banka Slovensko, a.s.	0.9450	0.7194
Privatbanka, a.s.	0.5625	0.3171
Sberbank Slovensko, a.s.	0.8789	0.5136
Slovenská sporiteľňa, a.s.	0.9547	0.9296
Tatra banka, a.s.	0.9251	1.0000
Všeobecná úverová banka, a.s.	1.0000	0.8646

Source: Prepared by author

The results of traditional cost model (γ^*) are presented in the second column. As can we see only one bank, VUB, a.s., is marked as cost efficient. The reason why this bank is marked as efficient is, that this bank is able to use its input in the maximal possible way. When we look at the inputs of VUB and compare them for example with Tatra banka a.s., we can see that approximately the same amount of inputs is used to generate a higher level of output. As we know the advantage of traditional cost efficiency model is that it assumes that the unit cost of inputs are identical among all banks and doesn't take into the account the actual input prices. But when we take into the account also the information about the actual input prices and use them in new cost DEA model we can calculate new cost efficiency ($\overline{\gamma}^*$) presented in the third column. Under this model, VUB is not marked as efficient yet. We can see that as efficient is marked Tatra banka. The reason is, that Tatra banka has a lower price of the deposit. Compared to VUB, the price of deposit was approximately twice as higher as in the case of Tatra banka. This leads to the situation that Tatra banka costs are lower compared to VUB.

The highest new cost efficiency score, the ability to produce current outputs at minimal costs, is proved in the cases of the largest banks on the market because these banks are able to gain their inputs at minimal prices. In the traditional model, the higher efficiency score is also obtained by smaller banks which are able to use a minimal level of inputs to produce approximately level of outputs. But these banks are no able to obtain a lower value of input prices. As they don't have such a strong position when acquiring clients must accept resources at a higher price.

4 Conclusion

The original contribution of the paper is an illustrative application of the traditional Farrell approach of DEA as well as a new approach by Tone with the aim to evaluate the cost efficiency of the Slovak commercial banks. From the gained results it comes out that, in the case of the traditional approach, which assumes that prices of inputs are exogenously given, transformation of human sources and deposits into loans was successfully achieved by one bank, namely VUB. In the case that prices of inputs are added, transformation of human sources and deposits into loans was successfully achieved by one bank, namely Tatra banka. As could be seen it is very important to take into account real information about the input prices. This can lead to the better results of cost efficiency compared to traditional DEA model which assumes that the unit cost of inputs are identical among all banks. We hope that new scheme for evaluating cost efficiency is free from such shortcomings and would contribute to fathom the true level of cost efficiency.

Acknowledgements

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Final demand of information technologies: an analysis of customer relations management strategies in a broad context of economy

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Abstract

Final demand of information technologies is an issue of manifold perspectives within the topic of Global Value Chains. Paper takes advantage of the global and local perspective that global value chains offer. Global perspective is focused on input-output analysis, whereas local one was intrigued by customer relations management (CRM). Both parts discuss information technologies either in their use or in their demand and provision. In the realm of strategies both i.e. global and local perspective is useful. One of main outcomes is noticing a few particularities in final demand of only one industry in Slovak Republic that is mainly focusing on automotive production in its economy. When pointing out CRM importance and challenges that it encompasses, it is obvious that this sector has got a potential for development and changing other industries subsequently.

Keywords: Customer Related Management, Global Value Chain

JEL Classification: E19, O11, O14

1 Introduction

In general, information technologies are becoming prevalent and abundant and used across all activities in economy. Rather little attention was given to its impacts. (Egan, 2008; Klein, Duggal, & Saltzman, 2004; Koesler, Swales, & Turner, 2016). Special focus is given to electricity consumption and environmental issues (Hertwich & Peters, 2009; Mach, Weinzettel, & Ščasný, 2018; Samson & Kol'vekova, 2009) and some authors focus on adverse effects that may be linked to information technology use or misuse (Mikhaylina, Palaščáková, & Zlobin, 2017).

In order to understand better why there is some connection between Customer Related Management (CRM) and Input-Output Analysis (IOA) one can point out the Six Dimensions of Global Value Chains (GVC) Analysis that has two elements. One element is Global referring to top-down approach and the other is Local element referring to bottom-up approach (Gereffi & Fernandez-Stark, 2016). The first one comprises: Input-output structure of a GVC, Geographic scope, Governance structure and latter one: Upgrading, Local institutional context, Industry stakeholders. While upgrading includes a use of information technologies as well as

distribution, marketing and management that is one of the fruits of GVC. This very fact gave an inspiration for organizing the paper in two perspectives: (1) global, (2) local.

In this broad context the paper`s goal is to provide relevant empirical data on final use in the Information technologies industry for Slovak republic. Subsequently, a co-authorship allowed to extend the topic for another standpoint on CRM behold in Ukraine.

2 Final demand and use in top down and bottom-up perspective

As referred before there exist top down and bottom-up perspective on Global Value Chains (GVC). In order to find GVC one has to apply an IOA, where the Leontief inverse matrix is crucial for identification of the production efficiency. This production efficiency starts from companies, where all employees have to team up for this goal in any kind production process. Also for this reason there are two parts of analysis in the paper: (1) one is a Slovak perspective on final demand; (2) the other – Ukrainian perspective describes rather practical use of technologies by companies in terms of CRM.

In following text there is an emphasis put on final demand that creates substantial part of IOA as can be seen from formula (1). Z represents the value of purchases of industry i output by industry j and there is an vector of total industry outputs x and finally the f_j is industry j`s sales to final demand (Miller & Blair, 1985, p. 185). The same is expressed in matrix form of second (2) formula.

$$x_j = z_{j1} + \ldots + z_{jn} + f_j \qquad (1)$$

$$x = Zi + f \qquad (2)$$

Following this, paper focuses on final demand f, moreover only in one industry that is linked with technologies to certain extant. This is industry number 37 in classification of Input-Output industries, which is to be found under number 64 in International Standard Industrial Classification - ISIC (Yamano & Ahmad, 2006a). This was a cause for the view of the paper to be quite narrowed, but detailed for Slovak Republic in 2011.

2.1 Slovak perspective of final demand – top down perspective

Final demand focuses on commodities of each of the sector, in ICIO there are 48 industries covered by statistics. Final demand has got its components, however only 10 countries report on them separately according to (Yamano & Ahmad, 2006b) . Final demand data were found in (Yamano & Ahmad, 2006b) data of OECD Inter-country I-O Database 2016 - ICIO. The industry classification of the database (2006 and 2002 editions) is based on the ISIC Rev. 3 systems, meaning that it is compatible with the OECD and its structural analysis (STAN) industry database.

The structure of data allows a solid knowledge for examining the final demand of particular industries. As seen in Figure 1, the linkage of final demand exists with Czech Republic (55.931 Mil. USD), Italy (12.034 Mil. USD) and Austria (9.203 Mil. USD), to name but a few. First one to mention should have been Slovakia itself for providing 1 481.194 Mil. USD of the production to final demand. Russian Federation is responsible for amount of 0.561 Mil. USD and is followed by countries: Spain, Netherland, France, Sweden, China and so forth. In Figure 2 there are more details visible after excluding Slovak Republic contribution to the final demand.
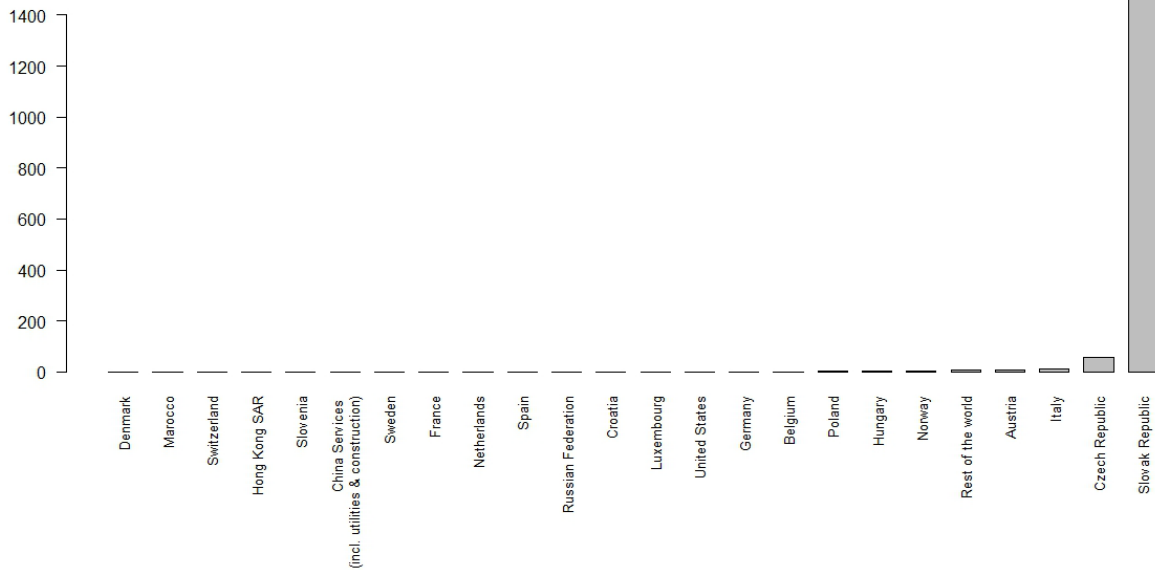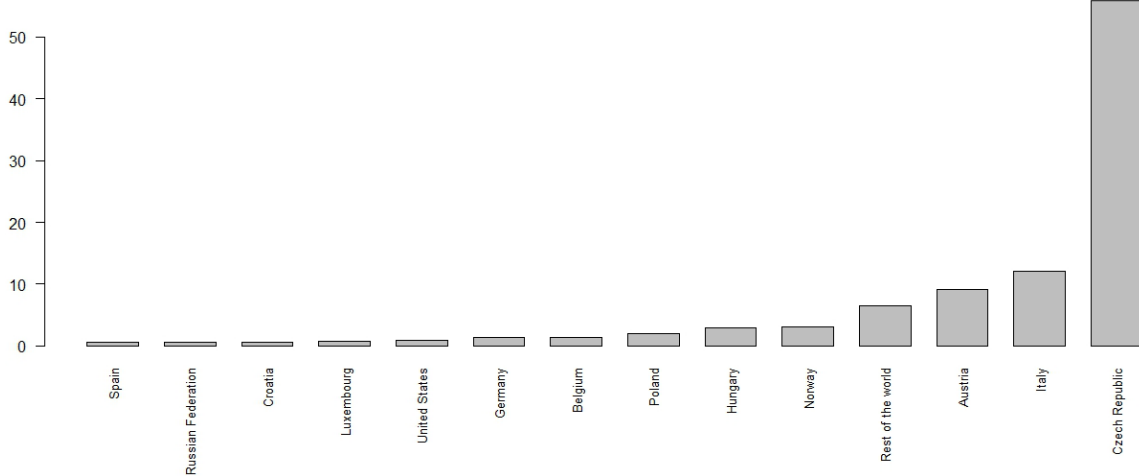
Figure 1 Focus on Post and telecommunications sector final demand contribution with Slovak Republic (at basic prices)
Source: own elaboration based on STAN database 2018, available at http://oe.cd/icio/. Copyright 2016 by OECD, STAN database.

Figure 2 Focus on Post and telecommunications sector final demand contribution without Slovak Republic (at basic prices)
Source: own elaboration based on STAN database 2018, available at http://oe.cd/icio/. Copyright 2016 by OECD, STAN database.

It is not only a final user, who is to blame for failure of information technology`s devices, both supplier and purchaser can be fault equally, also when using Customer Related Management (CRM) systems (Reicher, Komáromi, & Szeghegyi, 2015) that is discussed further.

2.2 Bottom-up approach: Ukrainian perspective of Costumers Relation System - CRM

Swift development and effective business in Ukraine becomes impossible without the introduction of modern information technologies (IT). These ensure the integration and

connection of enterprises with the external environment, improve the quality of services, transfer of large amounts of information, increase the speed of service and efficiency of activities, the ability to take into account the needs of each individual client. Marketing development is characterized by the emergence of a concept of partnership relations, and the functionality of CRM-systems is no longer sufficient to support effectively the management of relations of this type. Correctly chosen approach to automation of relations towards clients is a prerequisite for effective work of an enterprise and for increasing its competitiveness. In this regard, studying the issue of the effectiveness in business management with the implementation of information and communication technologies is relevant and required.

A study of the progress of the world's leaders and national experience in the realm of managing effectiveness in business processes would make sense in the context of the state policy regarding informatization of the economy in European countries. In the conditions of global networking of the production process, production is increasingly moving from highly developed countries to developing countries. Expansion of global value chains creates powerful challenges for transition economies, which requires an appropriate correction or changes of economic policy. Current stage of economic development, changes are implemented by means of modifying the existing state of relations. In the transformation context of economic relations, the effective use of information technology becomes one of the most important factors for survival of enterprises. In the conditions of fierce competition, the introduction of information technologies contributes to an increase in profitability of a modern enterprise that subsequently also leads to the improvement of the business development in general.

Significant contributions have been made in research of problems and prospects of customer relations and the effectiveness of their management through the use of information technologies, such as: (Beglarashivili, 2012; Guzhva, 2001; Kryuchkova, 2010; Lyshinska, 2015; Matviyiv, 2010; Orlikovsky, 2014; Sharapa, 2009; Sheremet, 2014; Zaharchenko, 2012) and others. Researchers explained theoretical and applied aspects of the experience of implementing automated information technologies for successful management of customer relationships. It should be noted that most authors do not consider advantages and disadvantages of existing modern information technologies, peculiarities and specifics of their implementation in activities of enterprises. There is missing systematization and comparison of problems regarding implementation of information technologies in the enterprise in general.

Problems of effective relationship management with potential clients and assessing the effectiveness of the implementation of information technology remains insufficiently developed by scholars and needs further research. Moreover, in Ukraine these issues are not favoured for investigation. It is rather issues such as using information technologies as means of increasing the enterprises efficiency.

In the scope of the paper`s purpose is to structure best practices in the effective management of customer relationships, approaches that are determining the value of partnerships; enhanced by theoretical frameworks of building CRM-systems; generalization of software characteristics used in modern enterprises; formulation of the feasibility method for the sake of implementing information technologies as a direction of the enterprise optimization.

Marketing of relationships (marketing of partnering relationships - MPR) is a broad concept with "absolutely elastic" (Egan, 2008, p. 10) boundaries. Due to the fact that many academics and practitioners have diverged opinions abut this concept it is complicated to develop a single universally accepted approach. On the other hand, this divergence allows us to explore the

concept in all depths and diversity inherent in it (Mikhaylina et al., 2017). Strengthening the globalization processes of industries has contributed to the growth of the role of international unions, integrating themselves in order to reduce the cost of production, reducing transaction costs and creating competitive end products.

In recent scientific literature, three different ways of describing the organization of partnerships in modern enterprises can be found. Over the last few years, the role of global value chains has grown significantly in world trade, bringing together manufacturers, suppliers and consumers around the world. First, using three levels as shown in Table 1, (Vash, 2002, p. 14).

Table 1 Three levels of organization of partnership relations at modern enterp

Characteristics	Level 1	Level 2	Level 3
Main connection	Financial	Social	Structural
Degree of individual service	Low	Moderate	From moderate to high
Potential support of competitive advantage	Low	Moderate	High

Source: adapted from (Vash, 2002, p. 115)

In this case, the organization of partnering relations is represented by three levels, which is passed by the partner / consumer in the process of formation and maintenance of mutually beneficial relations with the company. At first, the interest of stakeholders is based only on financial benefits. Over time, partnerships between companies increase the social link, that is, commitment to the company, loyalty, which leads to the individualization of customer / partner services and allows the company to rely on its cooperation in the future.

Partnering relationships with customers lead to a common goal, which guarantees a closer relationship than just cooperation. CRM-systems are based on four components that partially allow achieving improvement in customer relationships.

1. Marketing Automation (MA) – is a system that automates marketing operations, simplifies information processes, allows you to plan marketing and analyze the results effectively;
2. Sales Force Automation (SFA) – is a system for automatization of trading agents, which allows you to predict and analyze sales, compile accounts, take profit and losses into account, and automatically prepare commercial offers;
3. Customer Service & Support (CSS) –is a system of automation of customer support and customer service, which includes: monitoring of the orders passage; means of customer service control; knowledge base of typical problems associated with the use of goods (services), the means of their solutions
4. Quality Management (QM) – is a system for maintaining the quality of goods and services.

In the scope of the global market development recent trends indicate the following decisive factors in the competition for the future: the speed of expanding the functionality of the Enterprise resource planning (ERP) system and adapting it to the needs of the client; speed of system implementation; the quality of work on expanding capabilities, adaptation and implementation of ERP-system; the abilities of manufacturers to provide integration in their Enterprise resource planning - ERP, CRM, Supply Chain Management - SCM and e-commerce systems. The analyzed software is presented in Table 2.

Table 2 General characteristics of the software used in modern enterprises

Standard	Short characteristics
RosettaNet	A standard based on the use of XML, focused solely on the integration of supply chains of industrial companies (B2B) of related industries (vertical standard).
Open Applications Group	An important function of OAG is the ability to add individual business applications without replacing the whole complex after the introduction of OAG
BizTalk Framework	Developed to support the creation and maintenance of XML data schemes that provide integration of e-business applications.
Open-EDI Reference Model	Uses the operating level of business representation that takes into account the semantics of data in transactions and the associated data exchange, as well as the rules for conducting transactions.

Source: own

Other example is the rental market that is developing rapidly through the Internet of various ASP software (Application Service Providing / Provision). ASP is the technology of using information technology elements on a rental basis (do not be confused with Active Server Pages (ASP) - Microsoft technology for Windows systems, which allows you to create dynamic Web pages).

A return to an increasing interest in ASP was inspired by: (1) the final formation of the consumer market and the adoption of the paradigm of overall cooperation in terms of creating cost chains, (2) the development of outsourcing and customer relationship management systems. ASP constitutes the part of business management systems in the European Union as shown in Table 3.

For a modern enterprise in the international market, we propose use of the data warehouse concept, where the data warehouse performs functions necessary for the preliminary preparation and storage of data for the Decision Support System (DSS). All this data is collected from the enterprise management system or the enterprise's database itself. Usually in the process of implementing CRM-systems there is a need to overcome resistance to change, to re-engineering business processes, to selection of large arrays of customer information and selection of automation technologies (Ackoff, 1967).

Table 3 The most common ASPs as customer relationship management solutions in the USA and the UK

Solution	Functionality
SAP (mySAP), People Soft, Lawson	Corporate Information Systems (CRP) for integrated automation of management of business processes of companies that are part of the package "Logistics".
Siebel, Sales Logix	CRM-class systems. Automation of client relationship management (customers)
MS CRM, MS Exchange, MS SQL Server, MBS	Microsoft's line of solutions. Comprehensive (integrated) ASP solutions based on the products of the same manufacturer
Data Center, Data Warehouse, Call Center	Centers and data warehouse for the sharing usage of suppliers and consumers of goods and services, call centers to work with orders and customer requests

Source: adapted from (*Use of corporate information systems in the planning, accounting and analysis of joint stock companies*, 2011, p. 166)

Based on the analyzed data, we can build a mechanism for automated customer relationship management, aimed at understanding how to make a positive contribution for achieving goals of the enterprise through causal relationships. Also in this way one can identify the benefits of IT implementation as well as the associated costs. Many studies (Ackoff, 1967; Egan, 2008; Guzhva, 2001; Maksimov, 1999; Sharapa, 2009; Vash, 2002) focus on generic performance rates as an indicator of the contribution of IT to success of enterprises, for example, an increase in market share, turnover or profit.

After conducting appropriate diagnostic procedures, one obtains results upon which one can present the model, the mechanism of IT implementation in enterprises for managing customer relationships. Figure 3 shows how this mechanism works. The mechanism begins with setting the purpose of the enterprise, which specifies the goal of automation (T. V. Yanchuk, 2015; T.V. Yanchuk, 2017).

The next step in this mechanism is to take into account the principles of the enterprise, which include the principles of cost-effectiveness, compatibility, regularity, flexibility, control and protection. When managing the relationship with customers, it is necessary to evaluate them. There are several methods of evaluation: investment, quantitative and qualitative analyses.

This mechanism continues by creating a common system of actions in order to determine allowable deviations from the plan, and to evaluate the project's effectiveness. During the whole mechanism, it is necessary to take into account the leverage, such as: organizational, financial-economic, informational, technical and technological. The basis of using the mechanism of customer relationship at modern enterprises is to optimize the activity and increase the efficiency of the enterprise as a whole.

Ensuring the effectiveness of business processes is one of the main tasks of any enterprise. In era of shared economy and its features, the implementation of this task is influenced by several external and internal factors that contribute to increasing costs and reducing revenue in the enterprise. Taking into account the importance of ensuring efficiency for enterprises, there is a need to refine, systematize the basic principles and methods of managing the efficiency of the enterprise. The cost-benefits ratio is one of the proper ways to analyse the practical experience of implementing IT for the management of relationships that is considered to be generally accepted approach to the interpretation of efficiency (Maksimov, 1999; "Salesforce Names Bret Taylor President and Chief Product Officer and Names Alex Dayon President and Chief Strategy Officer," 2017). However, it is a mistake to focus only on the assessment of this indicator, because measuring the effectiveness of the implementation of information technologies is somewhat limited in this approach. Because the impact of information technology on the profitability of an enterprise is mediated by improving the management of business processes of the enterprise, increasing the competence of employees and customer satisfaction (T.V. Yanchuk, 2017).
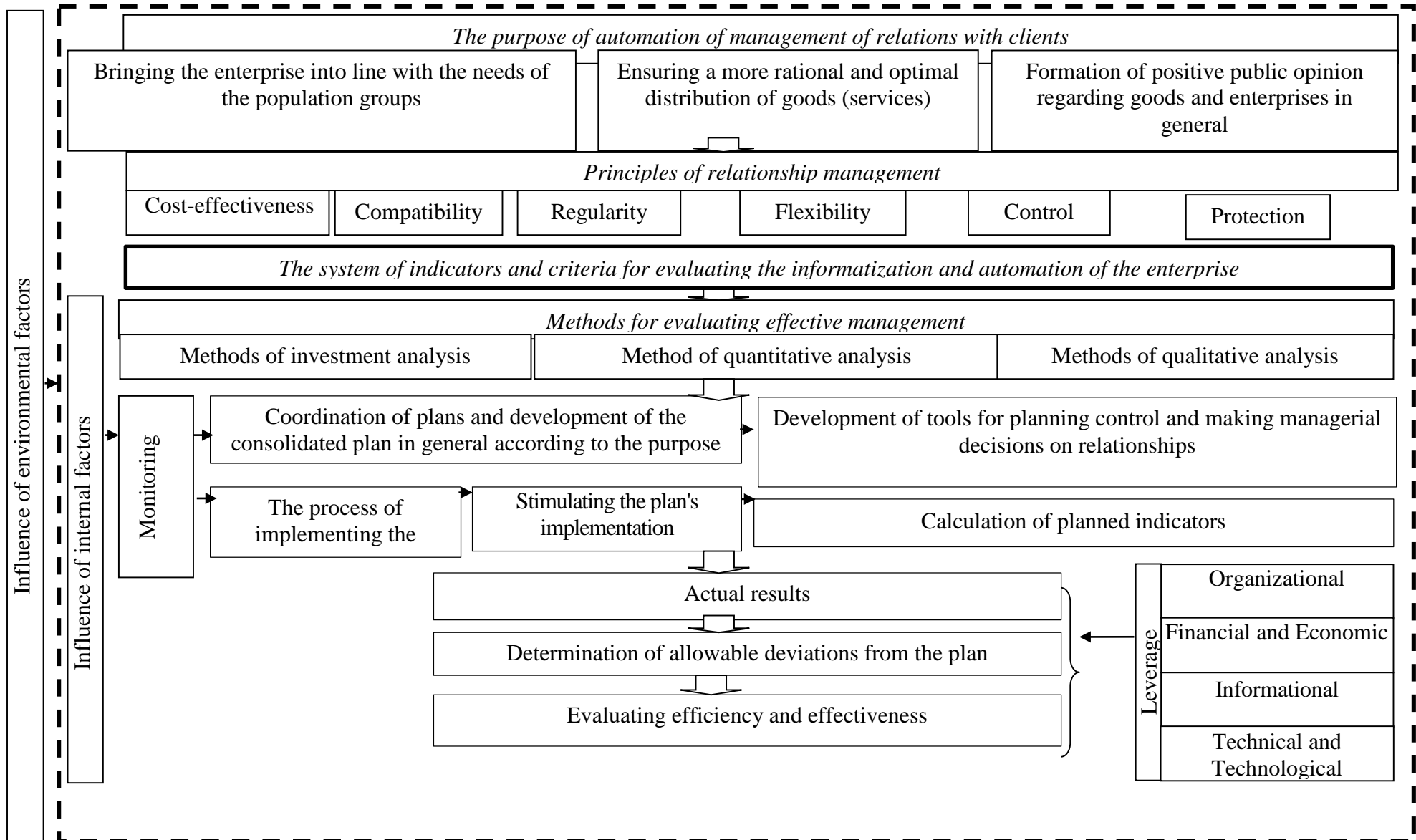
The purpose of automation of management of relations with clients

| Bringing the enterprise into line with the needs of the population groups | Ensuring a more rational and optimal distribution of goods (services) | Formation of positive public opinion regarding goods and enterprises in general |

Principles of relationship management

| Cost-effectiveness | Compatibility | Regularity | Flexibility | Control | Protection |

The system of indicators and criteria for evaluating the informatization and automation of the enterprise

Methods for evaluating effective management

| Methods of investment analysis | Method of quantitative analysis | Methods of qualitative analysis |

Influence of environmental factors

Influence of internal factors

Monitoring

Coordination of plans and development of the consolidated plan in general according to the purpose

Development of tools for planning control and making managerial decisions on relationships

The process of implementing the

Stimulating the plan's implementation

Calculation of planned indicators

Actual results

Determination of allowable deviations from the plan

Evaluating efficiency and effectiveness

Leverage

| Organizational |
| Financial and Economic |
| Informational |
| Technical and Technological |

Figure 3. Model of the mechanism of automation of the relationship between the enterprise and its customers

Source: own

3 Conclusion

Paper was describing both global and local perspectives of Global Value Chains. The issue was approached from broad context of economy with respect to the information technologies that are an overlapping linkage towards suppliers and purchasers in all industries. Information technologies was a lens that provided a close-up especially in Slovak Republic in 2011. There was no surprise to find the main contributing countries to be Czech Republic, Italy and Austria as the closes neighbours in geographical sense.

One of main outcomes is noticing a few particularities in final demand of only one industry in Slovak Republic that is mainly focusing on automotive production in its economy. By pointing out CRM importance and challenges that it encompasses, it is obvious that this sector has got a potential for development and changing other industries subsequently.

As for the information technology use in enterprises the Ukrainian perspective provided many recommendations that can serve as inspiration for further studies. Its main conclusion could be summarized as follows. Modern information systems (ISs) should be Web-oriented, which means that all ERP-system modules should have Internet-orientation, should support integration with e-business applications, further diversification of ERP-systems development and division of labor, and globalization of business development. Mechanism of automation of customer relationship management and practice gives enterprise an opportunity to develop an algorithm for creation of a holistic, interdependent system of normative, informational and instrumental means for solving problems. As a result of CRM it is possible to achieve the information-analytical management of the department with all departments in the enterprise. Implementation of the automated system will help entrepreneurs navigate the world of information services, solve the issues of packaging the information base of the enterprise and increase the efficiency of the use of information resources in the management of relationships with customers. However, in itself, information technology can not be the only tool in achieving the goals set. It is necessary to consider all the resources that will be used for the effective operation of the information system. Company executives have to pay close attention to improving marketing research with the use of various software tools that are pretty much in the information market.

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The situation of men and women in the labor market in Poland

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Abstract

In recent years, one may observe an increase in the labor market participation of women. The reasons must be sought in the processes of transformation of the traditional society into the industrial one, which is characterized by an increase in the percentage of people employed, including women and an increase in the level of their education, changes in the value system, where women's economic work has become an essential value for them. The diversity of the economic activity of men and women generates changes in the functioning of the labor market and family. The objective of the considerations presented in the paper has been to identify different determinants affecting the economic activity of men and women in years 2014-2016. There has been shown the unemployment rate, which reached a historically low level, which is probably the right moment for the government to focus on people who not only do not work but even do not look for work. In here, there has been formulated the hypothesis that gender may significantly influence their economic activity. The applied research methods have been based on the literature studies and the statistical data by GUS (Central Statistical Office), PARP (Polish Agency for Enterprise Development), Eurostat, the Ministry of Family, Labor and Social Policy and other studies.

Keywords: Labor Market, Economic Activity, Unemployment Rate, Remuneration, Employment Rate

JEL Classification: J24

1. Introduction

In Poland, like in other European countries, the situation of women in the labor market differs from the economic situation of men. (http://praca.interia.pl/news-kobiety-i-mezczyzni-na-rynku-pracy) Women often work in other professions and industries than men and have different remuneration and working time. This diversity is also conditioned by other characteristics such as education, involvement in family life or even expectations of life. One of the essential reasons for these differences are historical grounds where the women's right to work professionally did not use to be so obvious as it is now. (Kobiety i mężczyźni na rynku pracy, 2017, pp. 2-3)

The objective of the paper has been to identify different determinants affecting the economic activity of men and women in years 2014-2016. There has been shown the unemployment rate, which reached a historically low level, which is probably the right moment for the government to focus on people who not only do not work but even do not look for work. Referring to the issue of the analysis of the economic activity of men and women in the paper was determined by the fact that this activity occupies a particular position in the processes of human resources management and is a very important factor influencing the level, the style of life of many people. The applied research methods have been based on the literature studies and the

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statistical data by GUS (Central Statistical Office), PARP (Polish Agency for Enterprise Development), Eurostat, the Ministry of Family, Labor and Social Policy and other studies.

2. Economic activity of the population

An important factor of the development of Poland is the economic activity of the population, in particular, the changes in gainful employment and employment structure. This activity is identified with the performance or readiness to perform work in exchange for the equivalent in the form of wage or a non-wage form. (Kotlorz, 2007, p. 12) The study of the economic activity allows the identification of three groups characterizing the labor market: the employed, the unemployed and the economically inactive (Badanie Aktywności Ekonomicznej Ludności jako podstawa modernizacji statystyki pracy, 2017, p. 15) One of the most commonly used indicators of the activity of the population is economic activity expressed by the proportion of the population working or searching for work. Economic activity is affected by demographic, social and economic factors; including age, gender, education, place of residence and local labor market. (Witkowski, 2017, p. 15)

Economic activity rate expresses the share of economically active people (total or a specific group) in the number of the population aged 15 and over (total or a specific group). (Współczynnik aktywności zawodowej http://rynekpracy.org) When analyzing Table 1 it can be seen that in years 2014-2017 the women's economic activity rate (total) slightly increased and in 2017 it amounted to 48.4%; also for men, the rate increased to the level of 65.2% in 2017. When comparing those data it can be clearly noted that all the time there was a difference between women and men amounting to about 17%. In turn, when analyzing the economic activity of working-age men and women it can be clearly seen that the difference remained, although it was at a slightly lower level of 11%. The reasons should be sought in the fact that, among the society, the traditional family model is still active, although it is slowly becoming to change.

Table 1 Economic activity rate by gender in Poland in years 2014–2017

Years	Total		Working-age	
	women	men	women	men
	%			
2014	48.5	64.7	70.3	78.3
2015	48.4	64.6	70.3	78.8
2016	48.3	64.8	70.6	79.4
2017	48.4	65.2	71.1	80.2

Source: *Aktywność ekonomiczna ludności Polski,* 2018, p. 30,35

Both in the case of men and women, age significantly affects the economic activity of those people. (Czapiński, Panek, 2009, p. 119) According to Table 2, the largest probability of economic activity is among people aged 35-44 whereas later it falls down. In addition to that, it could be observed that, for working-age women, the rate increased by 0.8% in the surveyed years and, for men, by 1.9%; the men's economic activity was higher than the women's economic activity, which was indirectly associated with the established pattern of the traditional family.

Table 2 Economic activity rate by age in Poland in years 2014–2017

Years		Economic activity rate								
		Total	15-24	25-34	35-44	45-54	55-59/64	60/65 and over	15-64	Working-age 18-59/65
		men								
2014		64.7	38.4	92.8	92.9	84.6	58.5	7.6	47.6	78.3
2015		65.0	38.5	92.8	93.2	85.4	59.1	8.2	75.3	78.8
2016		65.1	39.1	93.5	93.0	84.8	60.4	9.1	76.0	79.4
2017		65.1	39.6	93.3	93.4	84.8	61.8	8.8	76.8	80.2
		Women								
2014		48.5	27.5	79.2	82.0	78.8	53.8	6.8	61.5	70.3
2015		48.6	26.7	77.7	82.1	78.7	57.3	7.6	61.7	70.3
2016		48.3	28.7	76.7	80.0	78.8	59.5	8.0	62.0	70.6
2017		48.0	30.0	75.0	80.5	79.3	60.3	8.0	62.3	71.1

Source: Aktywność ekonomiczna ludności Polski, 2018, p. 69

When analyzing in detail the economic activity rate of men and women in the cross-section of the surveyed years, it could be noted that the lowest rate was recorded for men and women aged 60-65 – about 9%, followed by people aged 15-24, where the rate for men amounted to nearly 40%, and for women, it did not exceed 30%. In turn, the highest rate was for men aged 15-44, amounting to slightly more than 90% and, for women, the rate was about 80%. The obtained data confirm that men aged 35-44 were a more active group. The total number of economically active women, in particular aged 25-34, decreased, which was often associated with the care for elderly family members or other professional or personal reasons. (Czarnik, Turek, 2015, p. 8 et seq.; Wskaźnik zatrudnienia osób w wieku produkcyjnym wzrośnie do 71 procent, http://praca.gazetaprawna. pl)

3. Labor market indicators

Statistical data concerning the labor market are the basic element of many fields of the policy of Poland and other countries. Employment rate, determining what percentage of the population aged 15- 64 works professionally is extremely important in here since it is used to study trends in labor markets. (Dane statystyczne dotyczące zatrudnienia, http:// ec. europa. eu/eurostat/)

The employment rate of the working-age population (i.e. aged 15-64) in Poland steadily increased, which is a positive phenomenon. Additionally, it can be seen that there were more working men than women and the difference amounted to 14-23% in the surveyed years. Like in the case of economic activity rate, there were the fewest employed people aged 60/65 whereas the most economically active people were the group of people aged 35-44. (Table 3)

According to the Minister of Family, Labor and Social Policy, Elżbieta Rafalska, "employment rate will increase to 71% by 2020 and it is possible since the growth rate is higher than its average in the EU. Moreover, the data from the labor market clearly indicate that the Family 500+ program does not adversely affect the activity of women in the labor market". (*Wskaźnik zatrudnienia osób w wieku produkcyjnym wzrośnie do 71 procent,* http:// serwisy. gazetaprawna.pl)

Table 3 Employment rate by gender and age in Poland in years 2014–2017

Employment rate by gender and age									
Years	Total	15-24	25-34	35-44	45-54	55-59/64	60/65 and over	15-64	Working-age 18-59/65
men									
2014	59.8	30.5	85.2	88.2	80.1	54.7	7.1	69.2	72.3
2015	60.6	30.8	57.7	89.1	81.6	55.9	8.1	70.1	73.4
2016	61.6	32.9	87.8	89.7	81.5	57.6	9.0	71.8	75.0
2017	62.2	34.0	89.0	90.4	82.3	59.7	8.7	73.4	76.6
women									
2014	44.3	21.0	71.3	76.0	74.0	50.0	6.7	46.0	64.0
2015	45.2	21.2	71.3	77.3	74.4	54.6	7.4	57.2	65.1
2016	45.5	24.1	71.6	76.3	75.6	54.9	7.8	58.4	66.4
2017	45.8	25.4	71.7	77.0	76.9	58.1	7.9	59.4	67.7

Source: Aktywność ekonomiczna ludności Polski, 2018, p. 75,78

A large impact on the economy of the country is exerted by the size of unemployment rate (Kucharski, 2017), which is calculated as a percentage share of the unemployed in the number of the economically active population. Its increase usually leads to an increase in the level of inflation, which is directly related to a decrease in the value of money. When unemployment rate reaches a very low level one may observe the economic growth as well as GDP growth. The growth of these two factors results in an increase in the standard of living of the population, they become richer, which winds up the economy. (Milewski, Kwiatkowski, 2017, p. 48; Begg, Fischer, Dornbusch, 2014, p. 145)

In Table 4, the total unemployment rate for men and women steadily decreased, which should be considered a positive phenomenon. The reason for such an indicator is a very fast technological development, introduction of various types of modernization in workplaces thus creating completely new positions and a greater need to employ new people. And also an improvement in the labor market was associated not only with a larger number of new jobs but the quality of jobs also changed. Additionally, the unemployment rate for men and women aged 15-24 was the highest, which resulted from lower qualifications or professional experience required by employees in relation to the youngest group.

Table 4 Unemployment rate by gender and age in Poland in years 2014–2017

Unemployment rate by gender and age						
Years	Total	15-24	25-34	35-44	45 and over	15-64	Working-age 18-59/65
men							
2014	7.6	20.9	8.2	5.1	5.7	7.7	7.7
2015	6.8	20.0	7.6	4.5	4.7	6.9	6.9
2016	5.4	15.9	6.0	3.6	4.0	5.5	5.5
2017	4.4	14.2	4.6	3.2	3.0	4.4	4.5
women							
2014	8.7	23.7	10.0	7.4	5.9	8.8	9.0
2015	7.1	20.7	8.2	5.9	4.8	7.2	7.3
2016	5.7	16.2	6.6	4.7	3.8	5.7	5.9
2017	4.6	15.3	4.5	4.3	3.0	4.7	4.8

Source: Aktywność ekonomiczna ludności Polski, 2018, p.81,84,87

Employment rate for people aged 15-64 in Poland against the background of the EU countries amounted to 66.1% in 2017, in EU 15 – 67.9%, and in EU 28 – 67.6%. Therefore, the employment in the Community increased, however the target set in the Europe 2020 strategy is still distant for some countries since the employment amounts to less than 75%. (*W Szwecji*

wskaźnik zatrudnienia to ponad 81 proc. Jak wypada Polska?, http://forsal.pl/artykuly) For that reason, the objective of the Europe 2020 strategy was translated into national targets depending on the situation and abilities of each Member State. Nowadays, a quarter of the Member States have achieved the objective in the field of employment for 2020. The following can be distinguished in here: Sweden (81.2%), Germany (78.7%), Great Britain (77.6%), Denmark (77.4%), The Netherlands (77.1%), Czech Republic (76.7%), Estonia (76.6%) and Lithuania (75.2%). Also Malta is very close to the national target (only by 0.4%). On the other hand, the lowest employment rate is recorded in Greece (56.2%) followed by: Croatia (61.4%), Italy (61.6%) and Spain (63.9%). In Poland, the employment rate amounted to 66.1% in 2017, which means an increase by 1.6% compared to the previous year. (Ząbkowicz, 2016, p. 256; Komunikat Komisji Europa 2020, 2010) In order to achieve the target of 71%, set for Poland in the Europe 2020 strategy, there is still 4.9% missing. (Table 5)

Table 5 Employment rate for the age of 15-64 in Poland, EU15 and EU28 in years 2014-2017

Employment rate for the age of 15-64				
Specification	Years	Poland	EU 15	EU 28
Total	2014	61.7	65.5	64.8
	2015	62.9	66.1	65.6
	2016	64.5	67.0	66.6
	2017	66.1	67.9	67.6
Men	2014	68.2	70.5	70.1
	2015	69.2	71.1	70.8
	2016	71.0	72.0	71.8
	2017	72.8	72.8	72.9
Women	2014	55.2	60.5	59.5
	2015	56.6	61.2	60.4
	2016	58.1	62.1	61.4
	2017	59.5	62.9	62.4

Source: Aktywność ekonomiczna ludności Polski, 2018, p. 88

Additionally, Table 5 indicates that an annual upward trend can be seen both among men and women. In the case of men, the employment rate in Poland amounted to 72.8% in 2017, which amounts to an increase by 1.8% compared to 2016. In the case of women, the employment rate also increased in the surveyed years and it amounted to 59.5% in 2017. The presented data also indicate that the difference between the employment of men and women decreased, which resulted from breaking the traditional way of life and the related greater economic activity of women. The smallest difference between the employment rate of men and women can be seen for the age of 20-64 of only 1.9% in favor of men in Lithuania (74.3% for women compared to 76.2% for men). The other countries where the difference was small were: Latvia (2,9%), Finland (3.3%) and Sweden (3.8%). The largest gap (27.6%) between the level of employment of men and women was in Malta where slightly over half of women worked professionally (55.5%) whereas the indicator for men amounted to 83.1%. (*W Szwecji wskaźnik zatrudnienia to ponad 81 proc. Jak wypada Polska?,* http://forsal.pl/)

Another Table 6 shows the unemployment rate for Poland against the background of EU 15, EU 28 in years 2014-2017, where it can be seen that this rate steadily decreased, which was the resultant of a decrease in the inflow to unemployment with a simultaneous increase in the outflow. An increase in the number of deregistration cases resulted from the activation of an increasing number of the unemployed. (*Bezrobocie w lutym spadło, a do końca roku ma być jeszcze lepiej,* https://businessinsider.com.pl)

Table 6 Unemployment rate in Poland, EU 15 and EU 28 in years 2014-2017

Unemployment rate				
Specification		Poland	UE 15	EU 28
Total	2014	9.0	10.5	10.2
	2015	7.5	9.8	9.4
	2016	6.2	9.1	8.6
	2017	4.9	8.2	7.6
Men	2014	8.5	10.5	10.1
	2015	7.3	9.7	9.3
	2016	6.1	8.8	8.4
	2017	4.9	8.0	7.4
Women	2014	9.6	10.6	10.3
	2015	7.2	9.9	9.5
	2016	6.2	9.3	8.8
	2017	4.9	8.5	7.9

Source: Aktywność ekonomiczna ludności Polski, 2018, p. 90

When focusing further attention on unemployment, in particular long-term unemployment, it is defined as the unemployment of ineffective job search (remaining in the records of the unemployed). (Wojdyło-Preisner, 2009, pp. 18–22.) Long-lasting unemployment is often defined as long-term unemployment (Bronk, Wiśniewskiego, Wojdyło-Preisner, 2014, p. 9), i.e. referring to the period longer than 12 months. The data presented in Table 7 indicate that the total long-term unemployment steadily decreased, from the level of 3.8% in 2014 to the level of 1.5% in 2017, which is a positive manifestation of the activity of the State policy. Additionally, it could be seen that the unemployment achieved a similar level to the unemployment of men in spite of the fact that it began with a higher level, which must have resulted from the fact that women showed greater willingness to get a job and thus greater entrepreneurship in search of it. (Lisowska, 1998, pp. 13-14) In addition, such a situation must have been affected by an increasingly higher education of women and a change in the traditional image. (Borowska, 2013, p. 152)

Table 7 Long-term unemployment rate (12 months and more) in Poland in years 2014-2017

Long-term unemployment rate (12 months and more)				
Specification	Year	Poland	EU 15	EU 28
Total	2014	3.8	5.2	5.0
	2015	3.0	4.7	4.5
	2016	2.2	4.2	4.0
	2017	1.5	3.7	3.4
Men	2014	3.7	5.2	5.0
	2015	2.9	4.7	4.5
	2016	2.2	4.1	3.9
	2017	1.6	3.6	3.3
Women	2014	4.1	5.2	5.0
	2015	3.0	4.7	4.5
	2016	2.1	4.3	4.0
	2017	1.5	3.8	3.5

Source: Aktywność ekonomiczna ludności Polski, 2018, p. 90

In Table 8, the issue of the economic activity of men and women taking into account the level of education is referred to. The data indicate that in 2017 the most active group of working people and not working but interested in getting a job among men were people with higher education (84.7%), general secondary education (67.5%), and the least active group was men with lower secondary education, primary and incomplete primary education. In turn, when analyzing women, the most active group of women was women with higher education (77.6%), and the least active was women with lower secondary education, primary and incomplete

primary vocational (10%), general secondary education (40.4%) and basic vocational education (43.7%). Therefore, the conclusion is that the achieved level of education significantly affected the economic activity of women. Also, it can be seen that the unemployment of women was slightly higher than that of men, which must have resulted from the fact that women get a job more and more frequently than a few years ago. Additionally, it can be seen that the unemployment of men and women majorly affected people with lower secondary education, primary and incomplete primary education.

Table 8 Economic activity rate and unemployment rate for people aged 15 and more in Poland in 2017

	economic activity rate		unemployment rate	
	men	women	men	women
	%		%	
Men/women	65.1	48.0	4.4	4.6
Higher	84.7	77.6	2.0	2.6
Post-secondary	74.1	56.7	4.5	4.1
Secondary vocational	73.4	51.5	3.6	5.1
Secondary general	67.5	40.4	4.6	7.1
Basic vocational	66.0	43.7	5.5	6.5
Lower-secondary, primary and incomplete primary	25.2	10.0	11.4	10.6

Source: Aktywność ekonomiczna ludności Polski, 2018, p. 115

When concentrating the further attention on the economic activity in relation to marital status it can be observed that both married men and women (69.6%; 55.8%) were the most active group, i.e. being married significantly positively affected their economic activity. (*Stan cywilny a sytuacja zawodowa Polaków*, http://www.egospodarka.pl) Another economically active group was divorced people or separated ones who were also characterized by a high indicator (63.8% - women, 64.3% - men). In turn, the group of widowers and widows (11.2% - women, 17.1% - men) indicated the lowest economic activity, which must have been the result of the fact that widowers and widows are mostly elderly people, thus the ones not so actively searching for jobs. In addition, it can be clearly seen that the total unemployment rate for men and women in relation to marital status was similar and additionally, it can be noted that the lowest level of this indicator was indicated for the group of married people and the highest – for single people. (Table 9)

Table 9 Economic activity rate and unemployment rate by marital status of people aged 15 and more in Poland in 2017

	Economic activity rate		Unemployment rate	
	men	women	men	women
	%		%	
Men/women	65.1	48.0	4.4	4.6
Single	60.9	50.0	9.4	8.4
Married	69.6	55.8	2.2	3.2
Widower/widow	17.1	11.2	2.5	3.9
Divorced/separated	64.3	63.8	5.2	6.9

Source: Aktywność ekonomiczna ludności Polski, 2018, p. 124

Economic activity is also affected by the amount of remuneration which motivates for further work and search of it by the unemployed. The data presented in Figure 1 indicate that women earned by about 800 PLN (about 19%) less than men, i.e. in general, women in Poland, regardless of the level of education, seniority, occupation etc. get lower salaries than men. The differences in remuneration are noticeable at all levels of management, irrespective of seniority. (*Ile w Polsce zarabiają kobiety?, http*://superbiz.se.pl/)
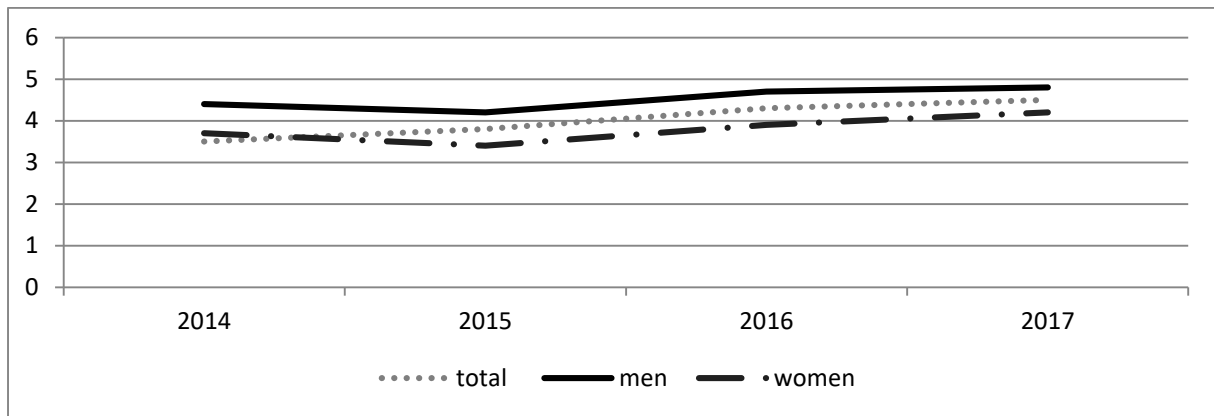
Figure 1 The structure of average monthly gross wages of employees in Poland in years
Source: Sedlak&Sedlak

The wage gap in Poland suggests that in spite of the fundamental structural changes in the economy and the institutional ones in the labor market, unjustified differences in remuneration of men and women still remain at a relatively high level. (*Nierówności płacowe kobiet i mężczyzn,* 2015, p. 4; Słoczyński, 2012, p. 158)

Conclusions

The favorable economic conditions in the Polish economy lasting for a few years affected the stable growth in employment and a fall in unemployment. However, there is still a lot of work ahead of the Polish government to stimulate economic activity, including, in particular, the economic activity of women close to retirement age since Poland belongs to the group of the countries with the lowest indicator, which means that, in Poland, women still take up employment much more rarely than men. This is, among others, associated with the existing, in the previous retirement system, opportunities to leave the labor market or a stable income, health condition, pressure related to the working environment or family duties. There can also be seen the problems of entering the labor market by young people who do not have sufficient education and experience, which should be the subject matter of some further inquiries of the author.

According to the author, low economic activity in Poland is significantly affected by little flexibility of employers who relatively unwillingly, compared to the other EU countries, employ part-time workers. Such a form of employment allows for combining work with child upbringing (or care for elderly people).

Summing up, since the beginning of the transformation of the political system, one of the most discussed problems has been unemployment. The indicators of economic activity remained in its shadow. For this reason, politicians caring about unemployment statistics often encourage people to end their economic activity. Nowadays, Poland cannot afford to ignore the problem of the low level of economic activity any longer. If we want the standard of living in our country to equalize the one in the countries of Western Europe we should stimulate the activation of women and elderly people, therefore, the issue requires further research, i.e. in-depth analyses concerning different institutional solutions supporting the economic activity.

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Analysis of the Influence of Sustainability on Profitability Ratios of Switzerland Pharmaceutical Companies

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Abstract

Nowadays most of the companies which implement sustainability in their activities are facing the assessment of the results issue. Sustainable companies run their business while combining environmental, social aspects and achieving economic benefits. The increased demand for assessment of sustainability activities has resulted in an increasing interest in a relation between sustainability and the company's financial results. The question of sustainability's impact on a company's financial results is relevant and widely recognised. Moreover, companies which percept sustainability as an important element of competitiveness and pay a lot of attention to implement it in all their business activities, quietly pose a question, how to develop sustainably and still remain profitable. The aim of the article is to analyse the influence of sustainability on Switzerland pharmaceutical companies' financial profitability ratios. Invoking the Sustainable Value Added method and regression analysis the influence of sustainability, expressed as Sustainable Value, on a company's financial ratios is hypothesised. The results disclose that there is no strong dependency between sustainability and financial profitability ratios of all analysed companies. Several aspects, which could course the results, in a form of discussion, were distinguished and could lead to further researches.

Keywords: Sustainability, Profitability Ratio, Sustainable Value Added, Opportunity Cost, Return to Cost Ratio

JEL Classification: Q56, A10

1 Introduction

A growing number of companies have integrated social and environmental aspects in their daily activities and according to KPMG (2013), the level of global sustainability reporting is rapidly growing, what helps to compare the results of companies' sustainability easier. Business leaders have begun to perceive corporate sustainability as an opportunity rather than as a necessity – gradually redefining the way that businesses interpret and create value (Berthon, Abood & Lacy, 2010; Ludema, Laszlo & Lynch, 2012). Groenewald and Powell (2016) carried out the research related to the relationship between sustainable development and company's financial

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performance and the results show that companies should focus on sustainability because it can translate into financial rewards.

In order to evaluate the influence of sustainability of corporate financial results, first an ability to assess all activities of the sustainability of a company is needed. Estimating corporate sustainability has been a challenge ever since the concept first appeared at the beginning of the 90's. There was at least one point of merger common to all various studies: sustainability cannot be measured as easily as financial performance and it is much more elaborate. Nowadays, the sustainability report is well known as the tool to assess and express the activities of the company. Sustainability report increasingly becomes a trend and a necessity for progressive companies to inform about their performance of economic, social, and environmental, as well as to all stakeholders of the company (Chariri & Firman, 2009). There are many traditional sustainability measurement instruments, but the most of methods require experts' analysis, are combined and complex models, requiring information which is not easily available, or do not show results in monetary terms. As it is almost impossible to compare the results of company's profit with the results of greenhouse gas emitted, the volume of water company consumes or employees' welfare, an opinion exists that it is very complicated to measure company's sustainability results. Galant and Cadez (2017) have analysed measurement approaches for a relationship of corporate social responsibility and financial performance and revealed that one of the problems is standardisation and disclosure for reporting would not only be beneficial for valid testing of the relationship, but also for stakeholders. Dimitrov and Davey (2011) state that the full consequences of conducting business have not been reflected in the financial statements as companies have been able to measure their profit success by excluding the bulk of transactional costs from social and environmental aspects. Although there are many methods and indices that help to assess companies' sustainability, it should be emphasized that it was never easy and is still complicated to accomplish, as it often shows only how sustainability activities are conducted without revealing how it affects the company's financial results

In this paper, sustainable value approach is supported and Sustainable Value Added (further SVA) method is chosen to use as representative for sustainability performance of the analysed companies. SVA measures the efficiency of using environmental, social and economic resources and express all results in monetary terms (Advance, 2018). Four profitability ratios, Return on Assets (further ROA), Return on Equity (further ROE), Return on Capital Employed (further ROCE) and Return on Invested Capital (ROIC), which are identified as having an effect on sustainability, are selected for the research. Three Switzerland pharmaceutical companies: Novartis, Roche, and Straumann, which carry out sustainability activities, for the period 2006-2016 are analyzed. Azim and Azam (2013) based on KPMG reports of the international survey of corporate sustainability, stated that there is a growing interest for corporate sustainability in the pharmaceuticals business.

The goal of the paper is to evaluate the sustainable activities of the analysed companies using monetary expression and to establish possible effect of sustainability on the company's profitability ratios.

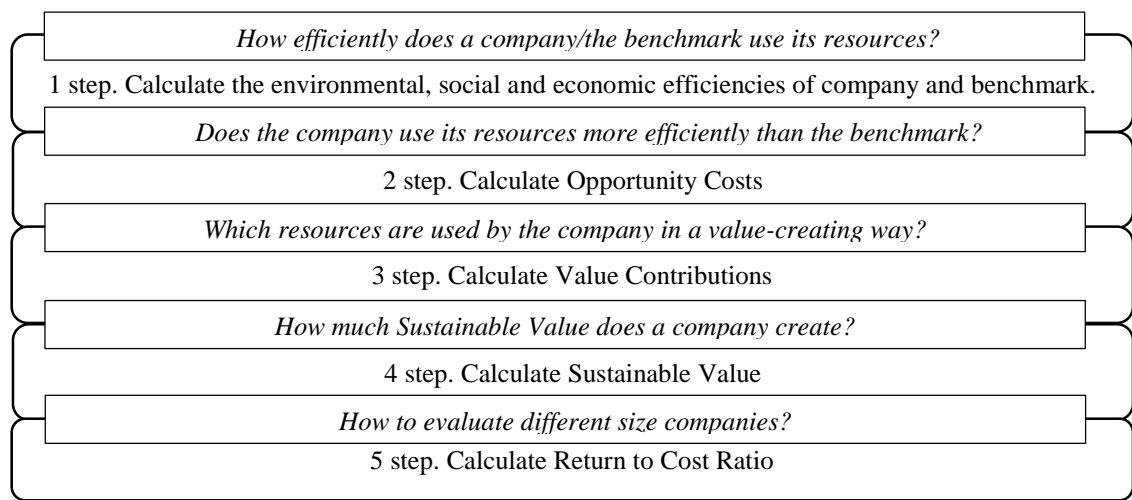**Hypothesis:** There is the influence of sustainability, expressed as Sustainable Value, on the company's profitability ratios.

2   Literature Analysis

2.1 Theoretical Analysis of Corporate Sustainability and Financial Performance

Companies' sustainability means an effective use of economic, social and environmental stock in the present, which assure the growth of the corporate and the refinement of society and the environment in the future. That is why corporate sustainability can't be seen only about ensuring financial growth for the company in the future. It means an effective use of economic, social and environmental capital in the present, which guaranteed the increase of the firm and the improvement of society and the environment in the future. According to Dillyck and Hockerts (2002) when transposing this idea to the business level, corporate sustainability can be defined as meeting the needs of a firm's direct and indirect stakeholders, without compromising its ability to meet the needs of future stakeholders as well.

Implementing corporate sustainability requires its representation in all business levels in the case to reduce complexity and achieve effective changes (Sukitsch, Engert & Baumgartner, 2015). Eccles, Ioannou and Serafeim (2014) have presented different authors' (Godfrey, 2005; Margolis & Walsh, 2007; Porter & Kramer, 2006; Freeman, Harrison, Wicks, Parmar & de Colle, 2010) opinion that companies can directly create value for shareholders meeting the needs of stakeholders through the implementation of sustainability activities into their daily life, such as investment in employees training. Lloret (2016) pointed out several perspectives of the approach, which is aligned with a business case for corporate sustainability. One perspective based on Eesley and Lenox (2006), Freeman et al. (2010), Henriques and Sadorsky (2008) opinion and supports stakeholder management, which requires that companies act responsibly toward consumers, investors, and the government and responsibly manage internal firm affairs by motivating employees in ways that create value for the company. Another perspective is embodied in the literature on financial and environmental performance (Clarkson, Li, Richardson & Vasvari, 2008, King & Lenox, 2001, Orlitzky, Schmidt, & Rynes 2003) and suggest that environmental performance and financial performance correlate. Ciasullo and Troisi (2013) support idea of corporate sustainability as "holistic vision" and state that although the prime responsibility of a firm is generating profits, its contribution to socio-environmental development, through integrating sustainability as a strategic investment in its core business, complies with legal expectations and invests "more" into human capital, environment, and stakeholder relations. Groenewald and Powell (2016) suggest perceiving the success of the sustainable development initiatives as not only to the environment and social media, but as the company's financial benefit as well.

2.2 Theoretical Analysis of Influence of Sustainability on Corporate's Profitability Ratios

In the chapter before the sustainability influence on a company's financial performance and its indicators were defined. This chapter will present the literature analysis clarifying which profitability ratios, as part of the financial performance of a company, could be affected by sustainability performance and should be taken for further research.

Table 1 Analysis of Profitability Ratios and Effect of Sustainability

Name	Definition	Sustainability effect (Yes/No)
NPM	Net profit margin is the ratio of net profits to revenues for a company or business segment.	No
GPM	The gross profit margin represents the percent of total sales revenue that the company retains after incurring the direct costs associated with producing the goods and services it sells	No
OPM	Operating profit margin is a margin ratio used to measure a company's pricing strategy and operating efficiency.	No
NOPAT	Net Operating Profit After Tax is a more accurate look at operating efficiency for leveraged companies, and it does not include the tax savings many companies get because of existing debt.	No
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization stands for earnings before interest, taxes, depreciation and amortization.	No
EBT	Earnings Before Tax is a line item on a company's income statement that shows how much the company has earned after the cost of goods sold (COGS), interest, depreciation.	No
ROA	Return on Assets measures the net income produced by total assets during a period by comparing net income to the average total assets.	Yes
ROE	Return on Equity measures a corporation's profitability by revealing how much profit a company generates with the money shareholders has invested.	Yes
ROCE	Return on Capital Employed measures a company's profitability and the efficiency with which its capital is employed.	Yes
ROIC	Return on Invested Capital gives a sense of how well a company is using its money to generate returns.	Yes

Source: compiled by authors based on Barnett and Salomon (2012) Eccles et al. (2014) Adhima (2012), Adeniyi and Fadipe (2017), Makori and Jagongo (2013), Margolis and Walsh (2003), Orlitzky et al., (2003), Waddock and Graves (1997), Callan and Thomas (2009), Chen, Feldmann and Tang (2015)

Eccles et al. (2014) have analysed High Sustainability companies (with a substantial number of environmental and social policies adopted for a significant number of years) and Low Sustainability companies (that adopted almost none of these policies) and the conducted research showed that High Sustainability companies usually shows better performance results, when accounting rates of return, such as ROA and ROE are considered and that this outperformance is more pronounced for firms that sell products to individuals, compete on the basis of brand and reputation, and make substantial use of natural resources. Barnett and Salomon (2012) support the idea that if sustainability activities are measured in ROA and net income, the success on financial performance directly depends on how well a company able to gain advantage from their social responsibility efforts. Chen et.al. (2015) have analysed the relationship between disclosures of corporate social performance and financial performance and revealed that some social performance indicators display a significant and positive correlation with ROE. Despite many authors (Callan & Thomas, 2009; Orlitzky et al., 2003; Waddock & Graves,1997; Adhima 2012) supporting the idea, that there is a positive relationship between the company's sustainability and financial performance, there are another groups of authors (Adeniyi & Fadipe, 2017; Makori & Jagongo, 2013; Margolis & Walsh, 2003) neutral or neglecting the positive relation between company's sustainability and financial performance.

To summing up the theoretical literature analysis, two relevant aspects should be combined. Invoking the method of sustainable activities assessment, which expresses all results in monetary terms and profitability ratios, which theoretically could be affected by sustainability, the paper hypothesizes that:

Hypothesis: There is the influence of sustainability, expressed as Sustainable Value, on the company's profitability ratios.

3 Methodology

3.1 Sustainable Value Added as Sustainability Evaluation Method

Sustainable value approach first was introduced as a new approach to measuring corporate contributions to sustainability by Figge and Hahn (2004a) and called Sustainable Value Added (SVA). This method has specifics in its measurement way, consist of 5 steps (Fig.1.) and measures the usage of dimensions in the same way as companies currently assess the return on capital employed (Figge, 2001; Figge & Hahn, 2004a; Figge & Hahn, 2005).

| *How efficiently does a company/the benchmark use its resources?* |
| 1 step. Calculate the environmental, social and economic efficiencies of company and benchmark. |
| *Does the company use its resources more efficiently than the benchmark?* |
| 2 step. Calculate Opportunity Costs |
| *Which resources are used by the company in a value-creating way?* |
| 3 step. Calculate Value Contributions |
| *How much Sustainable Value does a company create?* |
| 4 step. Calculate Sustainable Value |
| *How to evaluate different size companies?* |
| 5 step. Calculate Return to Cost Ratio |

Figure 1 Basic Steps of Sustainable Value Added Method calculations
Source: compiled by authors based on Figge and Hahn (2004), Liesen, Müller, Figg, and Hahn (2009)

The SVA answers the following question: What is the value that has been created or destroyed because a company has used some resources as opposed to these resources being used by other companies? In other words, a positive (negative) Sustainable Value shows if a company has covered the opportunity cost of its economic, environmental and social resources (Figge, 2001; Figge & Hahn, 2004b; Figge & Hahn, 2004a). The SVA shows how much value a company has created or destroyed with the use of its economic, environmental and social resources. More precisely, the SVA tells us how much more or less return a company has achieved with its set of resources compared to the benchmark. It thus represents the excess return on the resources a company has achieved compared to the benchmark that has been chosen. Before the calculations of Sustainable Value start, a benchmark should be chosen.

3.1.1 Benchmark for Sustainable Value Assessment

The analyses of sustainable value can be accomplished using different benchmarks. National economies or sectorial averages can be chosen. In this research, the average performance of Switzerland economy was used for benchmarking, including these main Switzerland sectors: oil and gas, pharmaceuticals, engineering, paper, and utilities. This benchmark has been chosen in order to assess the effectiveness of the company not only in the pharmaceutical sector, but also in comparison with other sectors in the country. Benchmark efficiency defines a barrier that companies must pass in order to create Sustainable Value. In order to calculate benchmark, the following equation was used (Advance-project, 2006):

$$Benchmark = \frac{Gross\ Domestic\ Product\ of\ Switzerland}{Amount\ of\ t\boxtimes e\ resource\ of\ Switzerland} \qquad (1)$$

The benchmark is the chosen object, that each pharmaceutical company is compared with. In this research, the Switzerland Gross Domestic Product (GDP) was selected as a benchmark and Gross Value Added (GVA) as the return figure used on the company's level.

3.1.2 Selection of the Indicators for Assessment

In order to select the indicators for the analysed pharmaceutical companies, the analysis of the German chemical company's Sustainable value study (Liesen et al. 2009) was taken as the base to select appropriate indicators. With reference to this, nine different resource indicators were used in this study. These indicators were classified into 2 economic (2 for Switzerland and 2 for company level), 2 social and 5 environmental indicators (Table 2):

Table 2 Classification of Selected Indicators for the Analysed Companies and the Benchmark

Economic indicators	Environmental indicators	Social Indicators
Gross Value Added	CO2 emission	Number of Employees
Total assets	NOx emission	Work-related accidents
Gross Domestic Product of Switzerland (for a benchmark)	Sox emission	
The total wealth of Switzerland (for a benchmark)	Water used	
	Waste generated	

Source: compiled by authors based on Advance (2018), Liesen et al. (2009)

Due to the lack of statistical information and data from financial and sustainability reports of the analysed companies, the indicators not for all years were received.

3.1.3 Application of Sustainable Value Added Method

1 and 2 steps. Opportunity Costs indicate the value that would have been created by an alternative use of capital. In Sustainable Value Added method opportunity cost is calculated through efficiency multiplied by the amount of resource created by the Novartis (Advance-project, 2006). In order to calculate Opportunity Cost the following equation should be used:

$$Opportunity\ Costs = Efficiency * Amount\ of\ resources\ from\ the\ analysed\ company\ (2)$$

The efficiency reflects how efficiently the benchmark uses each resource. The efficiency is calculated using the following equation (Advance-project, 2006):

$$Efficiency = \frac{GDP}{Amounts\ of\ resources} \qquad (3)$$

3 and 4 steps. For this objective, the opportunity cost for each resource should be taken away from Gross Value Added of the company. The result of this step is called Value Contribution (Advance, 2018). From this result, it is clearly seen what kind of value a company creates with a resource compared to the benchmark. The Value Contribution thus shows how much more or less return the company has generated with the resource in comparison to the benchmark (Advance-project, 2006):

$$Value\ Contribution = Return\ of\ analysed\ company\ (GVA) - Opportunity\ Costs\ (4)$$

When Opportunity Costs are found, how much sustainable value the company creates could be calculated. Sustainable Value measures whether analysed company uses their resources more efficiently and creates more value compared to the benchmark. In this case, Sustainable Value is calculated using the following equation (Advance-project, 2006):

$$Sustainable\ Value = GVA - \left(\frac{Opportunity\ cost}{Amount\ of\ resources}\right) \qquad (5)$$

Likewise, to calculate Sustainable Value the sum of the value contributions by the number of resources considered is divided.

5 step. Return to Cost Ratio (RCR) compares the return of the company to the return of the benchmark, which would have created with resources of the company Opportunity Costs. When a company has positive Sustainable Value the RCR is calculated by dividing the return of the company by the Opportunity Costs. When Sustainable Value of the company is negative the RCR is calculated by dividing Opportunity Costs by Gross Value Added of the company (Advance-project, 2006). When RCR>1 it reflects that a company is using its resources more efficiently than the benchmark, and when RCR<1 it shows that a company is using its resources less efficiently than the benchmark.

3.2 Selected Company's Profitability Ratios

Four accounting-based measures, namely, ROA, ROE, ROC, and ROIC have been used as proxies for financial performance. Accounting-based measures have been used because the audited accounting data is likely to be authentic and credible and is not influenced by market perceptions or speculations, and is thus considered less noisy in comparison tomarket-basedd indicators like stock returns, share, profit, prices, etc. (Lopez, Garcia & Rodriguez, 2007).

Table 3 Equations for Selected Profitability Ratios

Ratio	Equations
ROA	$ROA = \dfrac{Net\ Profit}{Total\ Assets}$
ROE	$ROE = \dfrac{Net\ Income}{Sharesholder'sEquityy}$ $Shareholder'sequity = Total\ assets - Total\ liabilities$
ROCE	$Return\ on\ Capital\ Employed = \dfrac{Net\ Operating\ Profit\ (EBIT)}{Total\ Assets - Current\ Liabilities}$
ROIC	$Return\ on\ Invested\ Capital = \dfrac{Net\ Income - Dividends}{Total\ Capital\ Invested}$ $Total\ Capital\ Invested = Debt + Equity$

Source: compiled by authors based on Jewell and Mankin 2011; Circiumaru, Siminic, and Marcu, 2010; Rutherford 2002; Damodaran 2007

Correlation analysis is used to quantify the association between two continuous variables-independent and a dependent variable. Association means that correlation shows if the independent variable will affect the dependent variable. In this research independent variable will be the sustainability valuation method Sustainability Value (x), which express the results in a single integrated monetary measure. Dependent variables will be four companies' financial performance ratios: ROA (y_1), ROE (y_2), ROCE (y_3), ROIC (y_4). Overall Sustainable Value has been used as representative for the sustainability performance of the company.

4 Research on Influence of Sustainability on Profitability Ratios of Switzerland Pharmaceutical Companies

4.1 Description of the analysed companies

This paper analyses three Switzerland pharmaceutical companies: Novartis, Roch, and Straumann. Novartis provides innovative healthcare solutions that address the evolving needs of patients and societies. Headquartered in Basel, Switzerland, Novartis offers a diversified portfolio to best meet these needs: innovative medicines, cost-saving generic and biosimilar pharmaceuticals and eye care. Novartis has leading positions globally in each of these areas. In 2017, the Group achieved net sales of USD 49.1 billion, while R&D throughout the Group amounted to approximately USD 9.0 billion (Novartis, 2018).

The second company, Roche is a leader in research-focused, headquartered in Basel, healthcare with combined strengths in pharmaceuticals and diagnostics. Roche is the world's largest biotech company, with truly differentiated medicines in oncology, immunology, infectious diseases, ophthalmology, and neuroscience. Roche is recognised as a leader in Corporate Governance and Sustainability. Roche is listed on the FTSE4 Good Indices and is the 2014 Super Sector leader for healthcare in the Dow Jones Sustainability Indices (DJSI) (Roche, 2018).

As a leading dental provider, Straumann is renowned for innovation and quality backed by scientific evidence. To drive mission further, Straumann and its partners have united to form the Straumann Group. The Straumann Group research, develops, manufactures and supplies dental implants, instruments, prosthetics, biomaterials and digital solutions for use in tooth preservation, regeneration, restoration, and replacement, in close and long-term collaboration with leading clinics, institutes, universities, networks and communities. Headquartered in Basel, Switzerland (Straumann, 2018).

In this research, Straumann is indicated as a small size company comparing to Novartis and Roche. It is due to the reason that Straumann generates and emit fewer resources, assets and etc. This company was chosen with the purpose to examine how a 10 times smaller company could be sustainable effective and how it could influence the research results comparing to two much bigger companies, Novartis and Roche.

4.2 Calculation of Switzerland Benchmark

In this research Switzerland economy was chosen as a benchmark. Despite all the data was publicly available, unfortunately not all year's data was provided. Gross Domestic Product per unit of the resource by the Switzerland economy was calculated. Table 3 shows how much CHF was used per each resource.

Table 4 The results of data calculation of Switzerland benchmark for period 2006-2016

Dimensions	Economic	Environmental					Social	
Indicator / Year	Total Wealth CHF ratio	CO_2 emission, CHF/t	Nox emission, CHF/t	Water used, CHF/m3	Waste generated, CHF, kt	Sox emission, thousand CHF/t	CHF/ Number of employees, number	CHF/Accidents at work, number
2006	0	8585	4624667	484	157817	30475456	98921	0
2007	0	9939	5325927	547	173936	39755295	108245	0
2008	0	9652	5430333	543	0	39095207	105765	6323211
2009	0,26	11244	6575565	626	196568	52409602	117553	6927536
2010	0,26	11713	7266693	696	205645	53799010	125765	7158996
2011	0,21	15087	9263905	825	248895	77836529	148435	8069637
2012	0,23	14009	8857465	804	233238	72506287	140134	7600816
2013	0,22	14144	9194384	845	0	76835684	142279	7766903
2014	0,19	15749	9988830	877	245286	86069209	144034	7921713
2015	0,20	15086	9691178	825	0	82184212	144826	7987521
2016	0,26	16960	10895107	979	0	92399451	162818	0

Source: compiled by authors according to Eurostat (2017)

The benchmark was calculated as follows, for example: in 2016 Switzerland emitted around 45 million tonnes of CO_2 and created GDP of 769 641 million CHF, so the result is that Switzerland economy in 2016 created 16960 CHF per tonne of CO_2. And it means that Switzerland emitted less CO_2 and earned more. For the whole 10 years' period, it is seen that the amount per resource was growing constantly. The number of employees was growing as well and due to this fact also accidents at work automatically increased. There is a lack of data for accidents at work for the year 2006, 2007 and 2016, but the rest of the period, 7 years, was used for calculations. In the next subchapter, Switzerland benchmark for SVA method application for Novartis, Roche and Straumann companies will be used.

4.3 Application of Sustainable Value Method

In this subchapter, all the other steps of the SVA method for Novartis, Roche, and Straumann will be applied.

2 step. Opportunity Costs.
In this research, the return, which the analysed company by using different social, environmental and economic resources, creates was compared to the return that the benchmark would have created with these resources. It means Opportunity Costs of analysed companies for the indicated 8 resources were founded (Table 4, 5 and 6).

Some exceptional cases for Novartis should be pointed out with calculations of Total Assets, Waste generated and Accidents at work. In the period 2006-2008 Switzerland did not provide any Wealth data, while Novartis shows Total Assets for the whole period. That is why it is not able to calculate the return. In such case Opportunity Costs for 2006-2008 for Total Assets are equal to zero. The same situation is for Waste generated, due to the lack of data, Opportunity Costs for Waste generated are equal to zero. The more difficult situation is for Accidents at work, as Novartis emit this data only for period 2008-2011, so it means that Opportunity Costs for Novartis accidents at work can be evaluated only for 4 years.

Table 5 The results of Opportunity Costs calculations of the resource use by Novartis

Dimensions	Economic	Environmental					Social	
Indicator/ Year	Total Assets, million CHF	CO_2 emission, million CHF	Nox emission, million CHF	Water used, million CHF	Waste generated, million CHF	Sox emission, million CHF	Number of employees, million CHF	Accidents at work, million CHF
2006	0	41664	1576	43373	38084	2570	11673	0
2007	0	48982	1904	44831	44512	3109	11878	0
2008	0	52207	1924	51006	0	2935	12001	764
2009	24948	45645	1967	52927	28143	3931	11916	823
2010	29887	46909	2181	72933	30465	4238	12397	847
2011	22907	67549	2854	82854	34252	5348	16436	531
2012	27374	63139	2601	74854	29944	4583	16375	0
2013	25255	63487	2633	79054	20992	3581	16541	0
2014	21904	67126	2696	76274	18759	2267	16903	0
2015	23639	62896	2543	75154	0	1623	16819	0
2016	32600	69265	2745	80732	0	1478	20005	0

Source: compiled by authors according to Novartis Annual Report (2006-2016).

Roche Opportunity Costs (Table 5) for accidents at work are shown almost for the all period of 10 years, expect 2006, 2007 and 2016. Some data also missing for NOx emission and Waste generated.

Table 6 The results of Opportunity Costs calculations of the resource use by Roche

Dimensions	Economic	Environmental					Social	
Indicator/ Year	Total Assets, million CHF	CO_2 emission, million CHF	Nox emission, million CHFF	Water used, million CHF	Waste generated, million CHFF	Sox emission, million CHFF	Number of employees, million CHF	Accidents at work, million CHF
2006	0	8413	1013	2081	11343	457	7357	0
2007	0	10460	900	1257	9679	477	8508	0
2008	0	10252	1048	1303	0	391	8470	2997
2009	19643	11840	1881	1754	9323	472	9581	2716
2010	15743	12615	1904	2504	11571	377	10143	3093
2011	12688	15548	2057	2723	13512	623	11894	3147
2012	15039	14059	2250	2413	12140	363	11503	3344
2013	13413	1432	2087	2956	12647	538	12105	2733
2014	14365	14524	2537	2630	14456	430	12748	2954
2015	14819	13665	0	2889	0	0	13287	3139
2016	19708	14527	0	3034	0	0	15313	0

Source: compiled by authors according to Roche Annual Report (2006-2016).

The calculated Roche Opportunity Costs show increasing trend of each resource, so an assumption could be done that despite the company's Total Assets increase, it takes into account the saving environment parallel. The number of accidents also has a tendency to increase, but it is affected by the increasing Number of employees.

Table 7 The results of Opportunity Costs calculations of the resource use by Straumann

Dimensions	Economic	Environmental					Social	
Indicator/ Year	Total Assets, million CHF	CO2 emission, million CHF	Nox emission, million CHFF	Water used ,million CHF	Waste generated, million CHFF	Sox emission, million CHFF	Number of employees, million CHF	Accidents at work, million CHF
2006	0	69	0	8	19384	0	151	0
2007	0	79	0	13	26281	0	212	0
2008	0	30	0	15	0	0	233	0
2009	211	34	0	17	26998	0	255	0
2010	220	37	0	22	31351	0	297	0
2011	167	47	0	26	43516	0	364	0
2012	179	40	0	26	36722	0	353	0
2013	220	43	0	26	0	0	315	0
2014	221	74	0	26	38877	0	344	0
2015	205	80	0	41	0	0	503	0
2016	280	103	0	60	0	0	618	0

Source: compiled by authors according to Straumann Annual Report (2006-2016).

For all period of 10 years Straumann does not show any data on NO_x emission, SO_x emission, and Accidents at work. To follow that with no NO_x, SO_x emission, and Accidents at work, the Switzerland economy (benchmark) wouldn't have created any return.

3 step. Value Contribution.
As it was clarified above Value Contribution is used to clarify, which resources are used in a value-creating way. The Value Contribution of Novartis for the Total Assets in 2009, 2010 and 2016 was negative. This means that Novartis has created 3316million CHF in 2009, 3186 million CHF in 2010 and 5136 CHF less return than the benchmark would have created with this amount of Total Assets. For the whole 10 years period Novartis didn't create any positive return for CO_2 emissions, so Novartis has not covered the Opportunity Costs of the CO_2 emissions it has caused.

Analysing the Value Contribution of Roche, the situation much better than Novartis. Roche has created less return than the benchmark would have created only in 2016 for total assets, in 2011 for CO_2 emissions and in 2014 for Accidents at work. For the Number of employees, Waste generated and SO_x emissions in 2015 the Value Contribution equals the return (Gross Value Added), as Roche did not show this data, so Opportunity Costs are zero. The same situation is for 2016. For CO_2 emission, SO_x emission, NO_x, Water used and Accidents at work Value Contributions were high. The high Value Contributions created with these resources in 2016 can be assigned to the product portfolio of Roche, which did not require large quantities of resources that year.

As Straumann, due to its less used resources and less generated earnings, was identified as a small size company, the Value Contribution also shows smaller amounts of each resource. Straumann produces positive Value Contributions from all the analysed resources, expect the Number of employees in 2016. In another way, it could be said, that Straumann has been used resources in a value-destroying way in 2016 for the Number of employees. It means that in 2016, the Number of employees' resource was less efficient compared to the benchmark.

4 step. Sustainable Value
Table 7 shows an overview of the all Sustainable Value created by all three pharmaceutical industries during the period from 2006 till 2016. The changes of positive Sustainable Value for

all three companies ranges from 23 million CHF to 22884 million CHF, negative Sustainable Value reaches -5078 million CHF in 2011 by Straumann.

Table 8 Calculated Sustainable Value of Novartis, Roch, and Straumann

Year/Name	Novartis Sustainable Value, million CHF	Roche Sustainable Value, million CHF	Straumann Sustainable Value, million CHF
2006	23	19538	-2236
2007	-911	22884	-3079
2008	5235	12761	317
2009	337	13489	-2962
2010	1719	9040	-3497
2011	2051	7365	-5078
2012	1538	10711	-4257
2013	2521	11615	357
2014	3609	7360	-4479
2015	4598	12958	420
2016	1611	13087	482

Source: compiled by authors

Even though the Sustainable Value of Novartis is fluctuating, but it became more stable from 2010 till the end of the period. In 2008 Novartis created a Sustainable Value of 5235 million CHF, this means generated 5235 million CHF cash flows more than the benchmark would have generated with the same amount of resources. It happens after a negative Sustainable Value in 2007 (Table 7, marked in red), which was below the benchmark. Roche generated positive Sustainable Value for all 10-year period. The best year for Roche was 2007 when generated highest Sustainable Value of 22884 million CHF. Straumann creates positive Sustainable Value only in 2008, 2013, 2015 and 2016. All other years of analysed period, Straumann created negative Sustainable Value. There are several reasons for it, Straumann is the smallest company from all 3 analysed companies, it's profit 10 times smaller comparing to Novartis and Roche and Straumann started to work actively implementing sustainability into company's activities only a few years ago. Due to different Sustainable Value results and the size of the analysed companies, it is difficult to compare the apply the Sustainable Value approach. For the final comparison, Return to Cost Ratio should be calculated.

5 step. Return to Cost Ratio
It is important to emphasize that the amount of Sustainable Value directly depends on the size of a company and Total Assets it generates. In order to solve this problem the RCR is used. It compares the return of the company to the return the benchmark would have created with resources of the company's Opportunity Costs (Table 8).

As not in all 3 analysed Switzerland pharmaceutical companies Sustainable Value is positive (Table 7), it means not each company uses it's resources efficiently. The results of RCR show, that Roche uses its resources more efficiently than the benchmark. In 2006 and 2007 Roche was 6 times more efficient as the benchmark. Novartis creates positive Sustainable Value almost for all period, except in 2007 (Table 8, marked in red), when it used resources 1.05 times less efficiently than the benchmark. Even though Straumann is the smallest analysed company in this research, it shows the best RCR result for the analysed period. Which is in 2008 even exceed the ratio of 10:1, and reflect than the company uses its resources more efficiently that the benchmark. However, looking from another perspective, Straumann didn't provide data for NOx emission, Sox emissions and also didn't count any data for Accidents at work. This could

be the reason for the prevention of the results, what course such negative Sustainable Value and inefficient use of resources almost all the period.

Table 9 Return to Costs Ratio of the analysed companies

Year/Name	Novartis RCR	Roche RCR	Straumann RCR
2006	1.0: 1	6.10: 1	1: 11.4
2007	1: 1.05	6.90: 1	1: 13.4
2008	1.35: 1	5.17: 1	10.1: 1
2009	1.02: 1	2.89: 1	1: 7.2
2010	1.07: 1	2.25: 1	1: 8.1
2011	1.07: 1	1.95: 1	1: 12.6
2012	1.06: 1	2.40: 1	1: 11.4
2013	1.10: 1	2.94: 1	5.7: 1
2014	1.14: 1	1.65: 1	1: 10.7
2015	1.20: 1	3.17: 1	5.1: 1
2016	1.06: 1	2.99: 1	4.6: 1

Source: compiled by authors

5 Analysis of Sustainability's Influence on Profitability Ratios of Switzerland Pharmaceutical Companies

In this chapter, in accordance with the hypothesis, the connection between Sustainable Value and profitability return ratios by using the correlation coefficient and regression analysis is carried out. Table 9 shows Novartis, Roche and Straumann Sustainable Value correlation with 4 profitability return ratios ROA, ROE, ROCE, and ROIC.

Table 10 Correlation significance verification by using p-value

Ratio	p-value	Correlation	Correlation significance
Novartis ROA	0,22	0,40	Not significance
Novartis ROE	0,16	0,45	Not significance
Novartis ROCE	0,34	0,32	Not significance
Novartis ROIC	0,49	0,23	Not significance
Roche ROA	0,584	0,19	Not significance
Roche ROE	0,065	0,57	Significance
Roche ROCE	0,05	0,61	Significance
Roche ROIC	0,10	0,51	Significance
Staumann ROA	0,56	0,12	Not significance
Strauman ROE	0,81	0,08	Not significance
Strauman ROCE	0,95	0,02	Not significance
Strauman ROIC	0,45	0,25	Not significance

Source: compiled by authors

Most of the results show low and very low correlation. Only Roche Sustainable Value correlation with ROE, ROIC and ROCE have a medium correlation, but there are no results for strong correlation at all. Medium Sustainable Value correlation is disclosed to be 0,57 for ROE, 0,61 for ROCE, and 0,51 for ROIC. To determine whether the correlation between variables is significant, the significance level of p-value should be compared. As in the research relative small sample of data is used, it is assumed that the correlation is statistically significant with the p-value ≤ 0,1. From the table 9, it is seen that significant correlation is for ROE, ROCE and ROIC ratios. For the further analysis correlation of ROE, ROCE and ROIC ratios are taken. Next, regression models only with significant correlations will be presented (Table 10).

Table 11 Regression analysis of Roche ratios

Name	Ratio	a	b	Regression equation ($\hat{y} = a + bx$)
Roche	ROE	0,84	$-2,84 * 10^{-11}$	$\hat{y}_1 = 0,84 - 2,84 * 10^{-11}x$
	ROCE	0,29	$-5,87 * 10^{-12}$	$\hat{y}_2 = 0,29 - 5,87 * 10^{-12}x$
	ROIC	0,26	$-3,92 * 10^{-12}$	$\hat{y}_2 = 0,26 - 3,92 * 10^{-12}x$

Source: compiled by authors

In all three equations related to ROE, ROCE and ROIC ratios, it is seen that coefficient near x is very small. In the ROE equation, the coefficient for Sustainable Value is -2,84*10^(-11). The coefficient indicates that for every additional CHF in Sustainable Value it can expect ROE to increase by an average of -2,84*10^(-11) Sustainable Value. The situation for ROCE and ROIC is very similar. All regression equations have very small and negative coefficient near x. When there is a negative coefficient, we have an inverse relationship. It means for every unit increase in Sustainable Value, it is expected a unit decrease in profitability ratio.

The correlation analysis disclosed only 3 from 12 analysed medium correlations, which were significant. Regression analysis showed the inverse relationship with very small and negative coefficients. To summarize the carried out analysis, the conclusion should be made, the hypothesis, - there is the influence of sustainability, expressed as Sustainable Value, on the company's profitability ratios, should be rejected.

6   Conclusions and Discussions

From the theoretical point of view, the main advantage of Sustainable Value method, which measures sustainability for all dimensions and gives results in monetary terms, can be seen by combining corporate sustainability assessment with traditional value-based financial performance analysis. It was revealed that theoretically sustainability has an influence on profitability ratios ROA, ROE, ROCE, and ROIC. These profitability ratios were chosen to use for the research, which aim was to support the hypothesis, that there is the influence of sustainability, expressed as Sustainable Value, on the company's profitability ratios.

Starting the research, Sustainable Value method using 8 different environmental, economic and social resources in three different Switzerland pharmaceutical companies, Novartis, Roche, and Straumann, over the 10-year period from 2006 to 2016 was applied. The results disclosed that only Roche creates positive Sustainable Value over the whole period and uses its resources more efficiently than the benchmark. Novartis creates positive Sustainable Value almost for all period, except in 2007, when it used resources 1.05 times less efficiently than the benchmark. In this case, Straumann, indicated as the smallest company from all three analysed companies, creates most of the negative Sustainable Value in the analysed period and use its resources less efficient than the benchmark. Several reasons could influence such results, Straumann is didn't provide all the necessary data for the research and it started to implement sustainability into business activities only several years ago, so can't be named as the leader of sustainable development among these three pharmaceutical companies.

Correlation and regression analysis show, despite Roche Sustainable Value and ROE, ROCE and ROIC ratios, there is no strong dependency between sustainability and financial profitability ratios of all analysed companies. Due to the weak significance of correlation, only three regression equations for Roche Sustainable Value and ROE, ROCE and ROIC rations were built. Which showed the inverse relationship with very small and negative coefficients.

Comparing the results of correlation analysis with the results of Sustainable Value, one coincidence should be highlighted, Roche is the only one company, from all three analysed companies, which show the significance of correlation and has created positive Sustainable Value over the whole period. As well, Return to cost Ratio of Roche is the highest, what shows that the company uses its resources more efficiently than the benchmark constantly over the analysed period.

To summarize the carried out analysis, the conclusion should be made, the hypothesis, - there is the influence of sustainability, expressed as Sustainable Value, on the company's profitability ratios, should be rejected. The following aspects should be distinguished, which could course the results:

In the research, a relatively small sample of data was used. Bigger and more explicit sample, full data of necessary information could lead to better results.

In the Sustainable Value calculations, the GDP of Switzerland was taken as the benchmark. To take a bigger amount of pharmaceutical companies for the research and change the benchmark to an industrial one, could be seen as a future research option.

For correlation and regression analysis Sustainable Value, as the representative for the sustainability performance of the company has been used. From a theoretical point of view, Sustainable Value as the monetary expression is a positive aspect in order to evaluate sustainability of a company, but we would suggest to leave an open question for the further researches and discussion if Sustainable Value is the best option to use as the representative for sustainability performance of the company in the analysis of influence.

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Projections of DC scheme pension benefits - the case of Slovakia

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Abstract

New IORP II Directive, effective since 2019, lies down new information requirement on all pension providers. The directive requires all providers to supply the members and savers with Pension Benefit Statement on a regular basis. Pension Benefit Statement should inter alias contain the projections of future pension benefits or pension pot than can be reasonably expected at the moment of retirement. However, the directive does not provide any further technical specification on the methods and processes of pension benefits projections. Our motivation is to contribute to this issue and present possible approaches on pension benefits projections. Complexity of pension benefits projections requires to take into account not only expected returns on various asset categories, but also the correlation among other variables such as expected life-cycle income, probability of non-contributory periods due to the unemployment and decisions on the saving strategy. Our results provide indications on the possible solutions and compares the projected pension benefits according to the suggested methodology with back-tested results using real supplementary pension funds operating in Slovakia.

Keywords: DC scheme, IORP II Directive, Pension Benefit Statement, retirement.

JEL Classification: J26, J32, H75, E17, C53.

1 Introduction

Slovak old-age pension system is based on the multi-pillar approach, which consists of three main pillars:
- Pillar I – State pension organized as a mandatory Pay-As-You-Go (PAYG) scheme,
- Pillar II – Funded pension organized as a voluntary funded Defined contribution (DC) based scheme,
- Pillar III – Supplementary pension saving (SPS) system organized as a voluntary individual pension DC based scheme.

Pension reform started in 1996 with the introduction of SPS, which at that time (1996 – 2009) was organized as a voluntary pension pillar offering life insurance contracts. Since July 2009, the system has been changed to a funded saving scheme and Supplementary pension funds (SPFs) are now offered to the savers (employees). Employer could contribute on behalf of his employee to the pillar as well, and the scheme is now considered occupational pension scheme. SPFs are managed by supplementary pension asset management companies (SPAMCs). Pillar

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II was introduced at the beginning of 2005 and is known as "1bis pillar", as individual retirement accounts of savers are funded via redirected social security contributions.

The current pension system does not provide individuals the information which income can expect in retirement. The new EU regulation for SPS systems aims to provide, besides transparency in the provision of information during saving, also the provision of projections concerning the payment of benefits from the system. The current draft Institutions for Occupational Retirement Provision (IORPs) directive does not specify the method of projections for expected amount of pension payable from the pension savings.

Our motivation and aim of this article is to contribute to this issue and present possible approaches on pension benefits projections. For the needs of fulfilling the aim of creating a simple model based on three approaches to simulate the income trusts and subsequent applications for three types of savers with different income and educational profile. Aim of the paper is to show advantages and disadvantages of different types of simulation methods with a view to providing the most accurate current information regarding the estimation of future pension benefits.

2 Literature Review

This article has been inspired by a new set of requirements in the area of transparency laid down by the new legislation about occupational pension schemes and numerous discussions and work on this issue during the last year. Institutions for Occupational Retirement Provision (IORPs) are financial institutions which manage collective retirement schemes for employers, in order to provide retirement benefits to their employees (the scheme members and beneficiaries). Occupational pensions, which include an employer contribution, are known as the "second pillar" of pension systems, the "first pillar" being state-based social security pensions, and the "third pillar" being non-compulsory private pension savings by individuals. There are some 125,000 such funds operating across the EU. They hold assets worth €2.5 trillion on behalf of around 75 million Europeans, which represents 20% of the EU's working-age population.

Occupational pensions are private, normally pre-funded, supplementary pension plans linked to an employment relationship. Many (but not all) occupational pensions are regulated at EU level by the Directive on Institutions for Occupational Retirement Provision (or 'IORPs'). On 27 March 2014, the European Commission proposed a revision (IORP II) of the current IORP Directive. The Commission noted there had been significant developments since the original legislation in 2003 and that the proposal would make occupational pension institutions better governed, more transparent and increase their cross-border activity, strengthening the internal market.

Based on the comparison of key legal and operational principles, Slovak Supplementary Pension Asset Management Companies fall under the scope of IORP II definition of IORPs and thus the new directive shall apply also to them.

According to the articles 26 and following of the Directive (EU) 2016/2341 of the European Parliament and of the Council of 14 December 2016 on the activities and supervision of institutions for occupational retirement provision (IORPs) (European Parliament, 2017), the new information requirements focuses on current members (savers), where the IORPs are obliged to provide projections of future pension benefits via Pension Benefit Statement (further only "PBS") on a regular basis. However, there is no standardization of the PBS format, layout or content. Implementation of IORP II goes with no full harmonisation, but minimum

harmonisation (Art. 36/3) and there will be no delegated acts, but exchange of best practices (Art. 39/2) on the implementation of PBS. PBS aims to support informed decision-making about (i) pension adequacy (answering the question "Do I need to save more to maintain my standard of living after retirement?") and (ii) investment strategy (answering the question "Is my investment approach right?").

Based on the EIOPA recommendation, the PBS should not only be seen a legal document, but also a tool to improve financial planning and ultimately pension adequacy (EIOPA, 2018). Thus the PBS should be created by two dominant approaches: financial engineering and behavioral economics. While the first one is tied to the methods of future pension benefits´ projections, the second one focuses on how to present the information to the regular savers (Šebo, 2018). Regarding the projections, EIOPA (2018) requires using economic scenarios only for schemes where the member bears the risk. Assumptions have to be presented in a clear and understandable format, while leaving the room for IORPs to decide, whether deterministic or stochastic approach will be used. However, the recommendation is to integrate the PBS also with the 1st pillar pension schemes including 1bis pillar. Projections as well as disclosure requirements should pay attention to the costs paid by a saver. Behavioral side of the PBS should be taken into account by layering information and to include more detailed information on the PBS elements, but all basic PBS information should be in Layer 1. There should be consistency between electronic (online) form of PBS and printed form of PBS.

As our focus is on the first approach – projections of future pension benefits involving financial engineering methods, the methodology part of the article deals with the analysis and outcomes of using three major techniques of financial modelling.

3 Methodology

Presented methodology consists of 5 parts. 1st part defines life-cycle income function for 3 selected individuals according to their wage and education profile. 2nd part discusses in more details the forms of contributing to SPF. 3rd part contains a detailed description of the 3 simulation methods used to estimate the future yields for stock and bond of SPFs including inflation and the 4th part contains a description of the savings scheme with implemented contributions, SPFs returns, and a fee policy reflecting the current SPS setting. The last 5th part focuses on the evaluation criteria of results obtain by implementing simulation methods.

Let us have life-cycle income (LCI) functions of 3 example individuals, where LCI functions are defined by their previous income, education level and age of an individual. We consider a full career (without the existence of risk of unemployment) and the total saving period of 40 years (the length of the career for single-person types is different, but for the sake of the model, we fix 2018 as the year of entry into supplementary pension savings for all individuals). Table 1 presents the achieved education level for each individual, including their income profiles, the initial annual wages, the number of saving years, SPS entry age and respective retirement ages.

Table 1 Input data for 3 types of individuals

Education level	Wages profile	Starting annual wage (w_1)	Saving period (T)	Entry age into SPS system (x_1)	Retirement age (x_T)
Elementary	Minimum wage	5 220 € (monthly wage 435 €in 2017)	40 years	25	65
High school	Average wage	11 448 € (monthly wage 954 €in 2017)	40 years	25	65
Master's degree	1,2 x average wage	13 740 € (monthly wage 1 145 €in 2017)	40 years	25	65

Source: Author´s, 2018

Income estimation for analyzed individuals will be realized through the model of the lifetime income function of the individual presented by Guvenen (2009) and Guvenen and Smith (2014) and detailed for the conditions of the Slovak Republic by Balco, Šebo, Mešťan and Šebová (2018) and Šebo, Melicherčík, Mešťan and Králik (2017). LCI model is based on the anticipation of an individual's future income from his age and education, abstaining from both expected and unexpected shocks such as unemployment, disability, pregnancy, etc. The model uses the long-term data from the American Community Survey (ACS, 2014) when estimating the income functions, as there is no longitudinal data series for Slovakia. Individual nominal income w in education level j and time t is represented as $w_{j,t}$, τ_t represents inflation rate over time t. Let $t \in \{1,2,...,T\}$; $T = 40$ and indicates a serial number of the saving rate. Simulated expected future income is calculated as follows:

$$w_{j,t} = \begin{cases} w_{j,t}; \ t = 1 \\ w_{j,t-1} * \omega_{j,t}^* * (1 + \tau_t); \ t \in <2, T> \end{cases} \qquad (1)$$

$\omega_{j,t}^*$ denotes the real annual wage increase of the individual with the appropriate education j at time t, calculated as

$$\omega_{j,t}^* = \begin{cases} 1; t = 1 \\ \dfrac{\tilde{y}_{j,x_t}^*}{\tilde{y}_{j,x_{t-1}}^*}; t \in <2, T> \end{cases}. \qquad (2)$$

Formula (2) is taken from the research of Šebo, Virdzek and Šebová (2015) and Guvenen and Smith (2014). $\tilde{y}_{j,x_t}^*$ and $\tilde{y}_{j,x_{t-1}}^*$ indicate individual income for each education level j and age x in time t and $t-1$.

2nd part of the methodology focuses on the contributions C into SPS system for individuals on yearly basis. Contributions paid to the SPS system come from individuals (also referred to as employees) or their employers and can be expressed in relative terms (wage percent), in absolute terms (fixed amount) or combination (employee contributions in relative terms and employer's contribution in absolute terms or vice versa). In this article we work only with relative contributions to SPS system both for individual (employee) and employer. Relative annual contribution of an employee is presented as $c(ee)_t$ and employer´s contributions as $c(er)_t$. Contribution rate is equal both for individual and employer and equals 3 % for each t. Contribution fee is equal to 0 % in SPS system so contributions payed into SPS system are fully invested. We mark total contribution rate in relative terms as c_t and it equals to 6 %. It is calculated as:

$$c_t = c(ee)_t + c(er)_t = 3\% + 3\% = 6\% \qquad (3)$$

Total contribution in absolute terms is calculated as follows

$$C_t = c(ee)_t * w_{j,t} + c(er)_t * w_{j,t} \qquad (4)$$

The 3rd methodology part focuses on three simulation methods which could be used in SPS system to forecast future SPFs returns. As we mentioned in chapter 1, current IORPI I legislation does not provide any specification nor suggestions on simulation methods that should be applied for future payments projections in SPS system. We used three different methods from the simplest way to the most difficult way:

- *[I.]* Linear projections method based on past annual performance of pension funds,
- *[II.]* Monte Carlo simulation method based on average past annual returns of pension funds,
- *[III.]* Resampling of historical block of data consist from almost 100 years of stock and bonds annual returns (including annual inflation rate) for US market.

In this module we work in each method with three potential scenarios:
- Neutral scenario (calculate as 50th percentile)
- Optimistic scenario (calculate as 75th percentile)
- Pessimistic scenario (calculate as 25th percentile)

In this article we use strictly publicly available data about selected SPFs – one stock fund and one bond fund according to highest cumulative return from inception of fund (1st July 2009). Data are available on public website ManazerUspor.sk. Considering the cumulative returns, we have chosen following pension funds for further analysis:
- Stock fund – Growth contribution SPF NN (Rastový príspevkový DDF NN),
- Bond fund – Comfort life 2030 contribution SPF Tatra banka (Comfort life 2030 príspevkový DDF DDS Tatra banky).

First projection method is based on linearized assumption about future returns. This approach is based on the very simple principle that the future (in a certain time horizon) will bring the same average returns as it was in previous periods. However, considering empirical evidence, financial markets developments and returns are not strictly linear, thus assuming a fixed rate of returns in each of the further periods is a massive simplification that might lead to misleading results. The method based on linearized returns for 3 scenarios uses empirical returns of analyzed pension funds. This method is used, for example, in the development of key investor information (KID) for Packaged Retail Investment and Insurance Products (PRIIPs) according to Regulation (EU) No 1286/2014. In view of the PRIIPs KID methodology, the Market Risk Measurement (Market Risk) approach is used to define the standard deviation, which calculates the optimistic and a pessimistic scenario. At the same time, other approaches, such as VaR (Value-at-Risk), can be used. Also, in the case of credit risk involvement for the bond part of the portfolio, a Synthetic Risk-Reward Indicator (SRRI) is created, which defines the risk categories for the investment and defines the risk-return profile of a financial instrument. Restrictions on the PRIIPs of KIID methodology from an individual perspective are based on the non-disclosure of the overall portfolio structure.

In our case, we use slightly modified PRIIPs KIID methodology. For chosen scenarios, first we calculate annual empirical returns *r(I,s(b))ₙ*, than average annual empirical return $\bar{r}(I, s(b))$ and annual standard deviation *SD(I,s(b))* for selected funds from 2009 to 2017 ($n \in \{1,2,...,8\}$). Average return and Standard deviation will be calculated as follows:

$$r\big(I, s(b)\big)_n =$$

$$\frac{P_n}{P_{n-1}}$$

$$(5)$$

$$\bar{r}\big(I, s(b)\big) = \frac{\sum_{n=1}^{N=8} r(I, s(b))n}{N} \qquad (6)$$

$$SD\big(I, s(b)\big) = \sqrt{\frac{1}{N}\sum_{n=1}^{N=8}\big(r\big(I, s(b)\big)_n - \bar{r}(I, s(b))\big)^2} \qquad (7)$$

Expected returns for three types of scenarios are calculated as follows:

- Neutral scenario – historical average annual return $\bar{r}\big(I, s(b)\big)$ both for selected stock *(s)* and bond *(b)* and calculate future annual return will be $r\big(I, s(b)\big)_t = \bar{r}\big(I, s(b)\big)$
- Optimistic scenario – historical annual return $\bar{r}\big(I, s(b)\big)$ and 0,5* SD*(I, s(b))*; future expected annual return are calculated as: $r\big(I, s(b)\big)_t = \bar{r}\big(I, s(b)\big) + 0,5 * SD\big(I, s(b)\big)$,
- Pessimistic scenario –historical annual return $\bar{r}\big(I, s(b)\big)$ and - 0,5* SD*(I, s(b))*; future expected annual return are calculated as: $r\big(I, s(b)\big)_t = \bar{r}\big(I, s(b)\big) - 0,5 * SD\big(I, s(b)\big)$

In order to present projections in real terms, we use target inflation rate according to ECB at level $\tau(I)_t = 2$ %. Table 2 below provides historical annual average return and standard deviation for selected stock or bond fund with expected future annual return for all scenarios.

Table 2 Historic annual average return and standard deviation and scenarios average return

	Stock fund	*Bond fund*
Historic average annual return	7,77 %	4,11 %
Historic average standard deviation	8,26 %	2,58 %
Optimistic scenario projection	11,90 %	5,39 %
Neutral scenario projection	7,77 %	4,11 %
Pessimistic scenario projection	3,64 %	2,82 %

Source: Author´s, 2018.

Second simulation method used to forecast future fund returns is Monte Carlo. According to Wiersem (2008), Vajargah and Shoghi (2015) and Rubinstein and Kroese, (2017) Monte Carlo simulations are used to model the probability of different outcomes in a process that cannot easily be predicted due to the intervention of random variables. It is a technique used to understand the impact of risk and uncertainty in prediction and forecasting models. For this article, we will use the geometric Brownian motion (GBM), which is technically a Markov process. This means that the stock price follows a random walk and is consistent with (at the very least) the weak form of the efficient market hypothesis (EMH) – past price information is already incorporated, and the next price movement is "conditionally independent" of past price movements. The formula for GBM can be found below, where P is the fund price, $\bar{r}\big(I, s(b)\big)$ is the expected return, $SD\big(I, s(b)\big)$ is the standard deviation of returns, t is time, and ε is the random variable of Wiener´s process, where $\varepsilon \sim N(0,1)$:

$$r\big(II, s(b)\big) = \frac{P_\Delta}{P} = \bar{r}\big(I, s(b)\big)\Delta t + SD\big(II, s(b)\big)\varepsilon\sqrt{\Delta t} \qquad (8)$$

We make 1000 simulation of future 40 years fund returns both for stock and bond fund. To present projections in real term values, we use target inflation rate according to ECB at level $\tau(II)_t = 2\%$.

Third simulation method in our article is called resampling. The purpose of this method is to use a long historical block of returns, possibly any other macroeconomic indicators necessarily for calculation. This method is described in detail by Šebo, Melicherčík, Mešťan and Králik (2017) and Balco, Šebo, Mešťan and Šebová (2018). This method works with 98 years block of historical financial series data (from 1919 to 2017) consisting of:
- Stock returns represent annual historic returns from index Down Jones Industrial Average 30 (DJIA 30) from 1918 to 2001, and from 2002 to 2017 we use annual returns for ETF DIA which are market traded ETF tools which copy DJIA30 index structure.
- Bond returns represent annual historic returns from 7 – 10 US treasury bond from 1919 to 2001, and from 2002 to 2017 we use annual returns for ETF IEF which invest into US treasury bonds with 7 – 10 years duration,
- Inflation rate represent annual changes in US customer price index (CPI) from 1919 to 2017.

All datasets described above are available in the FRED database operated by the FED branch in St. Louis. This dataset (called block (B)) consists of 3 columns represented by Inflation rate, stock and bond annual returns from 1918 to 2017. We divide this original block of data into 36 shorter blocks of data based on the business cycle types using methodology of National Bureau of Economic Research, which provides information on US Business Cycle and Expansions and Contractions. We get 18 blocks (B_G) representing growth periods (expansions) and 18 blocks (B_D) representing declining periods (recessions). Then we start with generating 40-year long blocks containing annualized returns of stocks, bonds and inflation. Overall, we get 1000 new data series for bond, stocks and inflation. We mark annual forecast return for stock and bond as $r(III, s(b,))$ and inflation rate as $\tau(III)_t$. In the table below we summarize the advantages and disadvantages of three simulation methods.

Table 3 Advantages and disadvantages of using selected simulation methods

	Advantages	*Disadvantages*
Linear forecast method	- simple access and implementation - reflects portfolio structure of selected pension fund - works with empirical data	- simplifying reality - overvaluation or understatement of future returns for projections over a longer period
Monte Carlo simulation method	- based on historic fund performance - results (projections) can be "probability weighted"	does not reflect the relationships between financial instrument returns and inflation over the time
Resampling	reflects relations between stock and bond returns and inflation rate	most difficult simulation method (numerically, computationally, etc.)

Source: Author´s, 2018

4th methodology part focuses on presenting formulas for saving scheme with implemented contributions, SPFs returns for different simulation methods and fee policy reflecting current SPS settings.

Supplementary pension fund management companies apply two types of fees – management fee and performance fee. Simulation methods presented in the 3th deliver gross returns. However, to present final pension pot after 40 years of saving, we need to adjust the gross

returns by applying fees charged on the account of savers. Process of fee implementation is presented in a paper by Mešarová, Šebo and Balco (2015) where they transformed gross returns $r(i,s(b))$ into net returns $r^*\big(i, s(b)\big)$ where $i \epsilon \{[I.], [II.], [III.]\}$ and indicate type of simulation method as follows:

$$r^*\big(i, s(b)\big)_t = r\big(i, s(b)\big)_t - F^M - F_t^V \qquad (9)$$

where $F^M{}_t$ represents management fee. The management fee charged by pension fund management companies is applied on assets under management and the level of fees are as follows:

- 1,4 % p.a. for $t = 1$ (2018),
- 1,3 % p.a. for $t = 2$ (2019),
- 1,2 % p.a. for $t \in \{3, T\}$ (2020 and later),

F_t^V represents performance fee, which represents costs charged by an investment manager for generating positive returns. The fee can be charged only if the fund performance reaches new highs and therefore standard high-water mark principle applies. Performance fee is currently 10 % of the difference between new and old highs and it calculated as follows:

$$F_t^V = \begin{cases} 0,1\left(\frac{P_{t-1}\left(1+r_t^1\right)}{\max P} - 1\right); under\ the\ condition\ P_{t-1}(1 + r_t^1) > \max P \\ \qquad\qquad 0 \end{cases} \qquad (10)$$

The value of saving at the end of saving period S_T is calculated as follows:

$$S_{T=}\ \sum_{t=1}^{T} C_t \left(1 + r^*\big(i, s(b)\big)_t\right)^{T-t} \qquad (11)$$

The 5th methodology part focuses on the evaluation the results achieved by applying three types of projections. First indicator to evaluate the results is the savings performance (SP_T). It can be viewed as a ratio of final savings value and paid contributions. Savings performance indicator is calculated as follows:

$$SP_T = \frac{S_T}{\sum_{t=1}^{T} C_t} - 1 \qquad (12)$$

Second indicator is called annual pension benefit (PB_T). It is the amount of annual pension paid out for a fixed period of 20 years. It is calculated as follows:

$$PB_T = \frac{S_T}{20} \qquad (13)$$

4 Results

The results for the projected pension pot values for three projections methods and three income type individuals are presented in this chapter. Used tables show only neutral scenarios for projections, however, we present nominal as well as real (inflation adjusted) values.
We also present the histograms, where one can see the distribution of projected values for bond as well as stock pension fund. Logically, the method of linearized assumptions has only three bars, one for each scenario.

Table 4 below presents results for an individual with elementary education. Every projection method delivered different results even in the case of contributions and final wages. Linearized assumptions method as well as Monte Carlo method uses the same inflation rate that is linearized for the whole saving period. However, resampling method uses historical inflation data, which is on average higher than the assumption of 2 % p.a. used by linearized and Monte

Carlo methods. Using resampling method produces higher expected pension savings by almost 7 000 €compared to linearized assumption and Monte Carlo methods when the bond fund is used as a pension vehicle for the whole saving period of 40 year. However, savings performance indicator shows that the return on savings in bond fund would be between 60 – 65 %, which is not a significant difference. On the other hand, the difference among nominal value of pension savings is significantly higher when the stock fund is used as pension vehicle for the whole saving period. Even there are no significant differences among linearized assumption and Monte Carlo method, resampling method delivered significantly lower expected values of pension savings. Average savings performance indicator for stock fund and for resampling method was 166 %, while for linearized assumption method the indicator was 338 %, respectively 332 % for Monte Carlo method. This indicates that resampling method has more conservative set-up for stock performance due to the higher empirical volatility compared to the assumptions used for linearized assumption and Monte Carlo method. It should be noted, that linearized assumption method as well as Monte Carlo method uses estimates for returns and volatility from a specific time period from the past, which might be at that time overestimated when longer periods are considered. The second aspect of analyzing the results is to show, what would be the real value of pension savings when the pension pot is adjusted for inflation. In this case, the difference among pension savings when the stock fund is used for the whole saving period is even more significant and reaches almost 50%. Resampling method therefore provides very conservative predictions for stock funds and narrows the difference between bond and stock fund saving strategy, which might be in contrast to mainstream expectations for bigger differences when bond or stock fund is used for a very long investment (saving) period.

Table 4 Results for individual with elementary education (neutral scenario)

		Linear projection	Monte Carlo projection	Resampling
Nominal value				
	Contributions	21 528,51 €	21 528,51 €	25 049,23 €
	Last Wage	1 100,61 €	1 100,61 €	1 371,81 €
Bond fund	*Saving*	34 660,73 €	34 528,30 €	41 499,67 €
	Annual Pension benefits	1 733,04 €	1 726,42 €	2 074,98 €
	Saving performance	0,61	0,60	0,65
Stock fund	*Saving*	94 308,42 €	92 907,44 €	65 524,95 €
	Annual Pension benefits	4 715,42 €	4 645,37 €	3 276,25 €
	Saving performance	3,38	3,32	1,66
Real (discounted) value				
	Contributions	10 014,14 €	10 014,14 €	9 047,10 €
	Last Wage	511,96 €	511,96 €	511,96 €
Bond fund	*Saving*	16 122,68 €	16 061,08 €	15 455,40 €
	Annual Pension benefits	806,13 €	803,05 €	772,77 €
Stock fund	*Saving*	43 868,22 €	43 216,55 €	23 883,49 €
	Annual Pension benefits	2 193,41 €	2 160,83 €	1 194,17 €

Source: Author´s, 2018.

To inspect the differences among results when resampling method is used, we present the distribution of savings performance below (see Figure 1), where the "y"-axis shows the relative

frequency of savings performance and "x"-axis shows the savings performance. Inspecting bond fund suggests that there are no significant differences in the distribution of saving performance when Monte Carlo or resampling method is used, where the later one has slightly higher spread of results. In contrast to the bond fund savings performance distribution, stock fund savings performance distribution has higher kurtosis and is concentrated around the average when Monte Carlo method is used compared to the resampling method. To summarize the findings for resampling method, we can expect distribution to be more uniform than log-normal when this method is used for stock funds (stock returns) than for bond fund (bond returns).
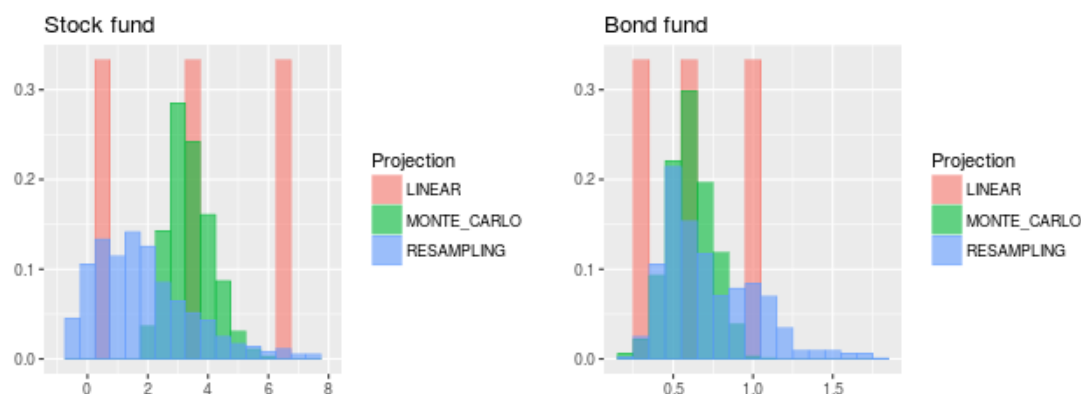
Figure 1 Histogram represent relative frequency of saving performance indicator for individual with high school education
Source: Author´s, 2018.

Results for an individual with full high-school education, where the life-cycle income function is more concave, suggest that the savings performance indicator will be a little lower than in the previous case. This is due to the life-cycle income function causing that rising wage later in the career would cause higher contributions and overall higher values of savings, but on the other hand, the performance would be lower due to the higher weight of higher contributions paid later in the career. And again, we see significant differences among pension pots when resampling method is applied.

Table 5 Results for individual with high school education (neutral scenario)

		Linearized assumptions	Monte Carlo	Resampling
		Nominal value		
	Contributions	55 562,72 €	55 562,72 €	64 902,39 €
	Last Wage	2 823,61 €	2 823,61 €	3 519,37 €
Bond fund	*Saving*	88 566,08 €	88 257,20 €	106 223,07 €
	Annual Pension benefits	4 428,30 €	4 412,86 €	5 311,15 €
	Saving performance	0,59	0,59	0,63
Stock fund	*Saving*	235 641,62 €	232 393,09 €	167 475,73 €
	Annual Pension benefits	11 782,08 €	11 619,65 €	8 373,79 €
	Saving performance	3,24	3,18	1,61

		Real (discounted) value		
	Contributions	25 845,39 €	25 845,39 €	23 383,01 €
	Last Wage	1 313,42 €	1 313,42 €	1 313,42 €
Bond fund	Saving	41 197,13 €	41 053,45 €	39 501,27 €
	Annual Pension benefits	2 059,86 €	2 052,67 €	1 975,06 €
Stock fund	Saving	109 610,34 €	108 099,27 €	61 198,93 €
	Annual Pension benefits	5 480,52 €	5 404,96 €	3 059,95 €

Source: Author´s, 2018.

Figure 2 below presents the distribution of pension pot projections, where the resampling method delivers significantly lower expected values for stock fund savings performance.
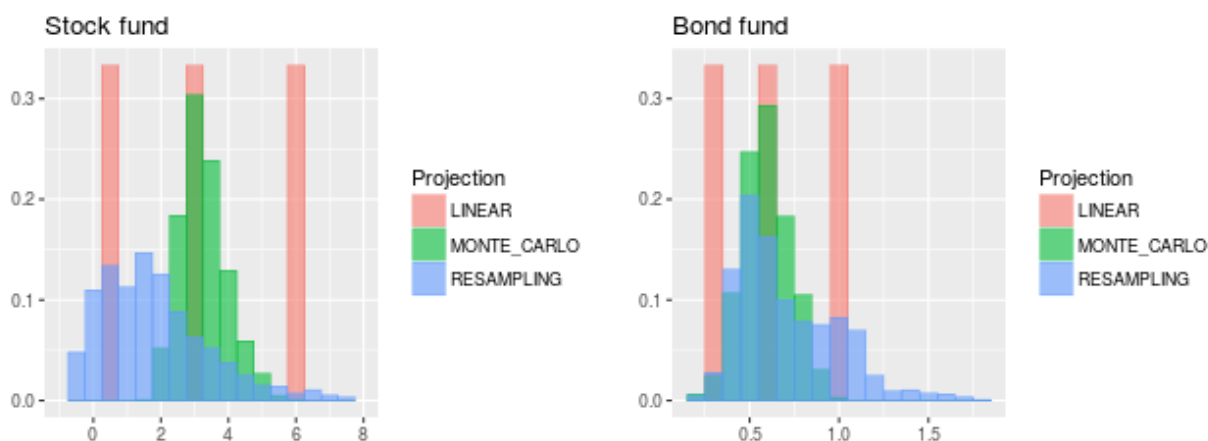
**Figure 2 Histogram represent relative frequency of saving performance indicator
for individual with high school education**
Source: Author´s, 2018.

Table 6 Results for individual with master's degree education (neutral scenario)

		Linearized assumptions	Monte Carlo	Resampling
		Nominal value		
	Contributions	75 510,09 €	75 510,09 €	88 178,71 €
	Last Wage	3 698,69 €	3 698,69 €	4 610,08 €
Bond fund	Saving	120 217,75 €	119 809,68 €	144 360,77 €
	Annual Pension benefits	6 010,89 €	5 990,48 €	7 218,04 €
	Saving performance	0,59	0,59	0,62
Stock fund	Saving	317 327,13 €	313 224,85 €	228 134,94 €
	Annual Pension benefits	15 866,36 €	15 661,24 €	11 406,75 €
	Saving performance	3,20	3,15	1,61
		Real (discounted) value		
	Contributions	35 124,04 €	35 124,04 €	31 754,93 €
	Last Wage	1 720,47 €	1 720,47 €	1 720,47 €
Bond fund	Saving	55 920,12 €	55 730,31 €	53 694,65 €
	Annual Pension benefits	2 796,01 €	2 786,52 €	2 684,73 €
Stock fund	Saving	147 606,93 €	145 698,73 €	83 250,99 €
	Annual Pension benefits	7 380,35 €	7 284,94 €	4 162,55 €

Source: Author´s, 2018.
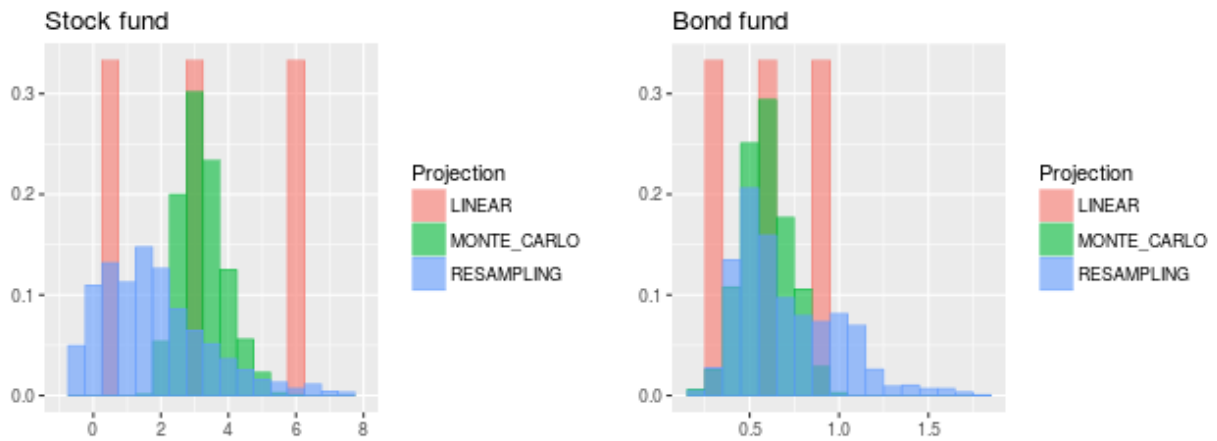
**Figure 3 Histogram represent relative frequency of saving performance indicator
for individual with master's degree education**
Source: Author´s, 2018.

The last individual possesses the highest educational level - Master´s degree. This corresponds to the steepest life-cycle income curve. This again lowers the overall savings performance indicator as the highest contributions are paid later in the work career and thus these contributions do not have enough time to deliver higher returns when volatility of stock fund is considered. And again, we can see the significant differences among distribution of projections when resampling method is applied for stock fund.

5 Conclusion

The article presents an introductory investigation into the three methods used for pension savings projections. As the IORP II directive starts to require pension providers to project expected value of savings at the end of savings period – at retirement – our aim was to provide some insights into the methods and expected results when the methods are applied.

As we have used empirical data for last 9 years for the estimation of values for the linearized assumption method as well as for the Monte Carlo method, it can be said that the period of last 9 years has been extraordinary for stock and bond returns and do not correspond to the longer (100 years) averages. As the linearized assumption method is easy to understand, the results can be significantly misleading when the assumptions are made based on very short empirical data sets or based on empirical returns of pension funds. This method cannot deliver probability weighted scenarios and therefore significantly limits the soundness of results. Monte Carlo method as a widely used projection method is prone to the data used for the estimation of distribution and thus might deliver either underestimated or overestimated results. Resampling method on the other hand is quite complicated method and requires very long financial data series. However, it can deliver sound and understandable results.

We can conclude that the resampling method, which uses very long data series, delivers projections that can be more conservative, but on the other hand are based on empirical data and therefore can be more trusted.

Even if we understand the simplification of our models, the results can serve as good basis for decision makers when the projection methods will be considered. Further analysis and investigations should focus on implementation of various shocks into the life-cycle income curve that are present on the labor market (unemployment, sickness, maternity), which might

decrease the overall value of pension savings, but at the same time bring the projection closer to the expected reality.

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Negative externalities reduction of business entities ownership high concentration and debt burden

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Abstract

The defining features of the established corporate environment in Ukraine are the high level of accumulated debt load at a high ownership concentration. The presence of such features exacerbates one another negatively both for business entities (which has manifested in the additional complication of already limited access to external financing and the reduction of potential investment financing opportunities) and for the national financial market as a whole (due to development stagnation of its key segments: corporate rights market and debt financing market). As a result, there is the problem of a "closed circle", the negative consequences of which are most acutely felt by external small companies with growth prospects, which have a high investment need, but cannot meet it. Reducing the negative externalities of high concentration of ownership and debt burden for national business is possible by strengthening institutional support of the financial market from the standpoint of balance between access to financing and protection of investors' rights, which confirms the experience of some emerging economies, primarily Brazil, Argentina, Poland and South Korea. Among the key growth points for Ukraine in this direction are the stock trading liberalization and diversification, the stimulation of entry into the capital of new participants, the improvement of legal and informational support for investment contracts, ensuring the right to convert liabilities into equity, enhancing the soundness of decision-making on lending and strengthening the exchange of credit information.

1 Introduction

In terms of unevenness and transformational national economy development, it becomes a priority to reduce a negative impact of corporate sector functioning endogenous factors. Especially, business entities are subject to a restrictive impact on capital market factors, in particular, the securities market and bank lending, the development of which is still disproportionate. At the same time, the degree of access to financial resources determines the possibility of realizing investment needs, and consequently, qualitative development and business value increasing.

 Researches in the field of business entities financial architecture, as a systems of internal structural characteristics determining the financial activity implementation, allowed to identify the companies' ability to adapt internal characteristics in terms of requirements of the national corporate sector, on the one hand, and access to financing in conditions of friction and high cyclical financial market, on the other. At the same time, it should be noted that companies' financial architecture hallmark in Ukraine is the over concentrated ownership structure and the extremely high level of accumulated debt (the results of financial architecture cluster analysis found that for 39 out of 100 companies are

characterized by the presence of two of these signs at once). Such architectural features include the factors of financial constraints, which manifests in the companies' complexity of external capital access and, accordingly, "underinvestment". But furthermore, it produces a cumulative reciprocal impact on the financial market by development blocking of its individual sectors, which as a result, narrowing the access channels for all other participants in financial relations, thus forming a closed circle.

The issue of ownership structure is one of the key aspects of the subject of research in the field of corporate finance, because the prism of agency conflicts and related costs has an impact on the effectiveness of the implementation of corporate strategy, and therefore on the market value of business. The authors confirm the existence of a positive effect of the concentration of ownership on company's effectiveness in transition economies. At the same time, in recent years there is evidence that even in countries with a weak financial markets development as well as information and legal institutions, such effect is not monotonous: excessive concentration level increase can be justified only in the short-term prospect as an instrument for reducing the corporate conflicts, solutions implementation accelerating, opportunism and external acquisitions protection. In the long term, the direction of such influence is changing, as further increase in the level of concentration narrows the horizons of potential external sources of financing of investment needs of the business.

On the other hand, the issue of ownership concentration has considered from the standpoint of factors that determine it. On this occasion, the research by La Porta R., Kabeza-Garcia L., Dolgopyatova T. and others authors who assess the company's ownership concentration level of in different countries in dynamics and analyze microeconomic factors (size, prospects of growth, level of debt, type of owner, market position, etc.) or macroeconomic (legal, political, cultural, ideological, etc.) most importantly determine the formed tendencies.

While paying due attention to the scientists' contribution to the development of this field of study, it should be noted that the discovering of relationship between the corporations ownership concentration and the features of financial market, as one that determines their mutual formation and determines the general problems of access of business entities to financial resources, remains superficial. Consideration of the two issues mentioned above within the framework of one problem provides an opportunity to assess more fully the depth of the negative consequences of such problems in the corporate sector of Ukraine for the financial market and its participants. Furthermore, drawing from the experience of countries with similar characteristics, to find directions and develop proposals to reduce negative externalities. Such preconditions determined the purpose and relevance of the chosen topic of study, the practical significance of which is increasing in the context of reforms and institutional transformations in Ukraine.

2 Internal affairs of the influence on access to financing and its cost for companies
2.1 High concentrated ownership structure of companies
Ownership structure in the corporate sector of Ukraine was formed as over concentrated. Mass privatization, which since the time of independence had to create a wide range of shareholders of corporate enterprises, was ineffective. In response to the actual dysfunction of the legal institutions, the lack of opportunity through the dividends to realize ownership rights against the backdrop of a transformation downturn and high inflation, processes of concentration of a large stock in the hands of a consolidated shareholder's small group or one shareholder. The main stimulus was the need to establish or maintain a legitimate control over the activities of companies and financial flows. The first stage of redistribution of capital continued until the early 2000's and determined widespread hostile takeovers and voluntary exit from business with a premium for control. The completion of the financial crisis of 2008-2009 in Ukraine provoked a second stage of consolidation and re-privatization: in terms of reducing the financial stability of individual companies and strengthening the expansive interests of powerful business groups, processes of corporate integration gave intensification, primarily through mergers and acquisitions. Nowadays, corporate sector entities are

at different stages of completing the fundamental market restructuring of business. Less investor-friendly companies and industries continue the process of concentration of ownership and control that leaders of adaptation have already completed. The trend to a slight decrease in the ownership concentration level in Ukrainian corporate sector (on the background of capital market integration into world financial markets) gives reason to believe that the limits of the ownership concentration in Ukraine have achieved, although they remain excessively high.

The assessment of the ownership concentration in the corporate sector has carried out by the author within the framework of the analysis of the dynamics of the financial architecture of business entities in Ukraine. Taking into account the size of business as a determining factor in shaping the features of financial architecture, a representative sample of 100 companies from different sectors of the real sector of the joint-stock economy sector was divided into two sub-assemblies: larger in aggregate assets and smaller. Thus, it was found that from 2008 to 2012, the average volume of the controlling block of major shareholders of large business increased from 69.80% to 75.75% (in 2015 it amounted to 75.08%), which confirms the high concentration of ownership structure (Figure 1).
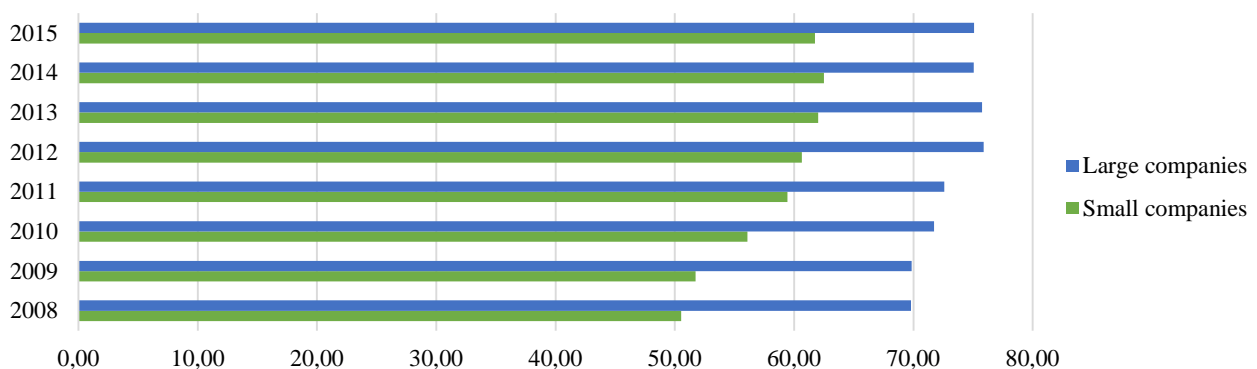
Figure 1 Dynamics of concentration of ownership of corporate sector entities in Ukraine by size in 2008-2015
Source: https://smida.gov.ua/db/emitent

The average level of concentration of ownership of smaller assets of business entities was relatively lower – 61.74%, but also marked by a growing trend of consolidation of ownership and its more rapid pace. In addition, among the relatively small entities of the corporate sector, more than doubled the number of companies with a missing controlling stake in the dominant shareholder (50% + 1 share), most of which still hold a blocking package (25% + 1 share) – Figure 2.
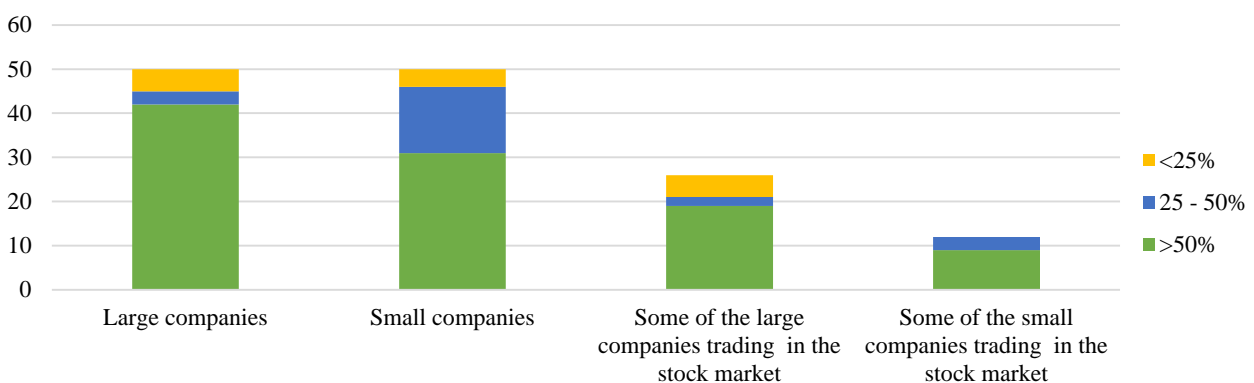
Figure 2 Distribution of Ukrainian corporate sector entities of different sizes by the shares of the dominant shareholder, including those that are participants of the stock market
Source: https://smida.gov.ua/db/emitent

As it is observed, more than half of large companies are participants in Ukrainian stock market organized trading (listed on the stock exchange): among them are companies with low and middle level of ownership concentration, and about half with a highly concentrated ownership structure (>50%). This indicates a predominantly small volume of shares issued for sale on the stock market, which does not actually change the nature of joint stock. Among the small entities of the corporate sector, only one fifth of the sample was found to be part of the stock exchange. At the same time, the fact that companies with a low ownership concentration (<25%) do not participate in stock, as well as does not participate the vast majority of companies with an average concentration (25-50%) is indicated. Such observations allow to determine that:

1. the level of ownership concentration is substantially high but uneven in the corporate sector of Ukraine and remains higher for the largest companies of the real sector;
2. the reduced concentration of companies ownership is not always achieved by the placement of shares on national stock exchanges, indicating a weak institutional development of the stock market (high share of over-the-counter trade). The reasons for this are the complexity of compliance with the requirements of registration and listing, as well as high costs of placement of securities issues on exchanges;
3. an alternative tool in terms of increasing the share of public participation in the financing of Ukrainian companies is direct foreign investment, which is realized through appropriate funds. In 2014, due to the general deterioration of the investment climate in the country, the volume of direct foreign investments has decreased by almost 10 times, however, 5 of the 27 investigated companies with less concentrated ownership structure have foreign investors owning shares through direct investment funds.

Thus, high ownership concentration has dual consequences on the micro and macroeconomic levels:

- corporate governance facilitating and agency costs reduce for companies in terms of imperfect markets and weak institutions;
- financial market development blocking due to the deterioration of the quantitative and qualitative composition of its participants, reduces the scale and liquidity of the market, which ultimately constrains the channels of redistribution of capital and hinders the investment process. The most negative effect of this manifests externally - on the activities of small and medium-sized businesses, companies of a new formation, which work in promising areas and cannot meet the need for access to external capital in order to finance further development.

It has to be noted, that the high ownership concentration of corporate sector entities in Ukraine carries a complex system of direct and indirect negative consequences, which are reflected in the weak institutional development of the financial market and reduce access to resources in various sectors. In turn, the weak development of the financial market, primarily the capital market, increases the limits and risks for companies, which prompts them to continue the process of concentration of ownership or maintain its high level in order to protect private capital. So, consider the main directions of such a two-way causal relationship:

1. Non-compliance with the requirements of the listing procedure, which essentially reduces the share of guaranteed quality and liquidity securities in the stock market of Ukraine. In addition to the requirements for the volume of equity capital of issuers, annual income, capitalization, corporate governance and disclosure, the NCSSF standards prescribe requirements for the ownership structure of issuers that meet similar listing standards on the stock exchanges of developed countries where ownership concentration is not a problem (Table 1). Obviously, a high concentration of ownership (70-75% in the corporate sector) is a significant limitation of public offering of shares on national stock exchanges. It should be noted that by the end of 2016, only the 8 stock issuers to the second level listing list are included, based on which quotes exchange indices are calculated. The high dependence of the indices on the current

performance of a small group of companies results in their high volatility and a major factor in the low market liquidity.

Table 1 Comparison of listing requirements regarding the ownership structure of joint stock companies submitted by Stock Exchanges, including alternative ones in different countries

Name of stock exchange, country	Stock exchange segment / level of listing	Standards in the area of ownership structure of issuers
PFTS, Prospect, Ukrainian Stock Exchange, Ukraine	1 level of listing	Minimum of 25% of shares in circulation, no more than 50% of shares in the hands of the two largest shareholders
	2 level of listing	2 level of listing Minimum of 10% of shares in circulation, no more than 50% of shares in the hands of the two largest shareholders (with the exception of restricted shares and shares owned by the state)
Warsaw Stock Exchange (WSE), Poland	Basic listing, alternative site New Connect	At least 25% of shares in circulation, the number of shares - at least 500,000 units. The total value of which is not less than 17 million euro (at the price of the last sale or at the price at the time of issue)
Hong Kong Stock Exchange, China	Listing A	Minimum of 300 shareholders, no more than 50% of the shares in the hands of the three largest shareholders
	GEM, an alternative site	Minimum of 300 shareholders
London Stock Exchange, UK	Listing A	The number of shareholders is not regulated, at least 25% of the shares must be in public ownership
	AIM, an alternative site	No regulations
NASDAQ, USA	1 listing level	Minimum 2200 shareholders, number of shares in a public share - 1250000 units
	2 level of listing	Minimum of 400 voting shareholders, the number of shares in a public share - 1100000 units
	3 level of listing	Minimum of 300 voting shareholders, the number of shares in a public share is 1,000,000 units
NYSE, USA	Listing A	International shareholders: 5000. National shareholders, according to the schemes: a) 2000 voting shareholders; b) 2,200 shareholders, the volume of trading in 100,000 shares per month; c) 500 shareholders, the volume of trades 100,000,000 shares per month
	ARCA, an alternative site	No regulations
Singapore Stock Exchange, Singapore	Listing A	25% of issued shares owns at least 1000 shareholders. Minimum 500000 units. or 15% of the shares issued belongs to at least 500 shareholders
	SESDAQ, an alternative site	
Tokyo Stock Exchange, Japan	National companies 1 level of listing	Number of shares in circulation <30,000 units, - number of shareholders ≥ 2200; the number of shares in circulation of 30,000 - 200,000 units, the number of shareholders ≥ 2,300 + 100 shareholders for each additional 10,000 shares issued
	National companies with 2 levels of listing	Number of shares in circulation ≥ 9999 units. - number of shareholders ≥ 800; the number of shares in circulation is from 10000 to 19999 units, the number of shareholders is ≥ 1000; the number of shares in circulation ≥ 20,000 units, the number of shareholders ≥ 1200 + 100 shareholders for each additional issue of 10,000 shares

Source: Materials of the information site Ernst & Young: IPO insights Comparing global stock exchanges

2. The risk of expropriation (ousting) of minority shareholders. In joint-stock companies, the law must guarantee at least the minimum standards of protection of the rights of shareholders who join the company through the purchase of shares and not always have the opportunity to negotiate with other parties regarding the scope of their rights. However, in Ukraine, due to the lack of a public corporate sector, the provisions of the Law "On Joint Stock Companies" have borrowed from developed jurisdictions and cannot be adapted in practice to local specifics, thus losing their original content. Of the all the rules relating to the rights of minorities, including cumulative voting and participation in management, only the permission the issuance of shares to be sold at any time are practically fulfilled, but due to the lack of both real public value of shares and mechanisms her fair valuation, they are redeemed at an undervalued (often nominal) price. Therefore, the risk of

expropriation of minority shareholders in Ukraine remains high and affects not only stock market participants but also the direct investment market.

3. The low quality corporate governance, information asymmetry and opacity, informal relationships between resource owners and the associated moral hazard are derivative characteristics of high ownership concentration, which, in imperfect markets create the problem of multiple agency costs and increase the financing costs. An open information environment can bring the market value of financing closer to its objective value and allow investors to better assess the value of companies, its risks and prospects. Information asymmetry, on the contrary, leads to deterioration in the capital distribution, increase in the gap between the costs of internal and external financial resources, increasing the costs of financial constraints.

2.2 Propositions in the field of negative externalities reduction of business entities ownership high concentration

The lack of effective access to external financing in the form of participation of portfolio and direct investors in the capital of corporations determines the subsequent process of concentration of ownership, or maintaining its high level with all derivative negative effects for the financial market and its participants. As a result, the problem of a "closed circle" arises, the solution of which can been found in the complex transformation of the institutional space of the Ukrainian capital market, while respecting the principle of preserving the balance between accesses and protecting investors' rights.

It is obvious that the development of a financial market of any country is directly proportional to the level of its macroeconomic development, and the model of the financial and legal system with the type of joint stock ownership inherent in it is a historically determined factor. At the same time, there is an experience of countries with growing capital markets where it has been possible to significantly reduce the concentration of ownership in the corporate sector and to expand access to equity financing for national business through a systematic institutional transformation of the stock market at the level of all its participants. Particularly illustrative about this is the example of Brazil as a country, where, in less than a decade of the 2000's there was a transition from the family model of ownership to the spray. There were created conditions for the annual entry into the market of new companies through an IPO (for initial conditions of low capitalization and speculative nature of the stock market, ownership of "families" and "magnates", lack of corporate governance standards, high shadowing and offshore capital).

Therefore, we will highlight the main areas that have helped launch the investment process in Brazil, change the paradigm of its joint-stock ownership, and can been used in certain areas of growth of the capital market in Ukraine:

- the launch of special listing segments for companies of the highest corporate efficiency (Level 1, Level 2, Novo Mercado), based on the main stock market of the country, in order to confirm the high market price of their shares and attract investors by promoting transparency, reliability and prestige of the stock market;
- Appointment of a separate Novo Mercado segment for the initial public offering of shares (IPO) of new companies with the highest corporate standards under the rule of "one share - one vote". The initial placement of shares in this segment provides the opportunity for founders to get the maximum sales bonus, which immediately greatly increases the prestige of the IPO;
- joining the main stock exchange of the country (BOVESPA) with other exchanges, which contributed to the unification of listing standards and the consolidation of the interests of all participants in a single space. The effect of such an association was to increase the total volume of trades on the market by 35% relative to the previous level;
- providing of the market makers' institution – officially authorized organizations whose purpose is to facilitate the increase of liquidity of the established group of assets. The role of market makers

at BOVESPA is played by the members of the stock exchanges, brokers and dealers, investment banks, universal banks that manage portfolio investments - they all bid on a daily basis with a firm offer of a certain number of assets, thereby setting quotations on securities, low-liquid assets, protecting the market from temporary downturns;

- dissemination of legal practice for the conclusion of a document "joint stock agreements" in companies where shareholders are majority shareholders and minority shareholders owning shares both with voting rights and without. This is an effective mechanism for coordinating joint control in joint-stock companies, which allows from the outset to establish the scope of rights and obligations of all parties and prevents expropriation and opportunistic behavior in conditions of insufficient legal protection from the state;
- corporation charter expansion in terms of protection against acquisitions, acting as an additional tool for protecting the rights of shareholders from reducing their share in the equity capital. Unlike "stock agreements", which are concluded between the owners and are not necessarily open to the public, the company's charter is mandatory for disclosure of a public document.

Particular attention has been paid to the concept of a mini-IPO, which is widely used on the many stock exchanges basis in the world, and allows increasing the availability of finance in the stock market for small and medium-sized businesses. Thus, according to global statistics of the World Federation of Stock Exchanges, 47% of listed companies have a minimum capitalization (up to USD 65 million) and sell shares on 35 alternative stock platforms for small firms. Conducting a mini-IPO by Ukrainian companies, subject to proper institutional support, can be considered as one of the alternative bank lending instruments for attracting investment capital based on an expanded range of shareholders. The ability to implement mini-IPOs by Ukrainian companies requires integrated institutional support, which includes:

- legislative possibility of direct primary public shares placement on foreign exchanges without of holding company creation, which will reduce the costs of such placement up to 10% of the issue volume and increase the availability of such placements for smaller companies;
- within the framework of the Ukrainian stock market integration into world capital markets, the application of IOSCO standards and recommendations by the International Organization of Securities Regulators, the involvement of a European IPO advisory corps:
  - nominated advisor or nomad (coordinating intermediary between the issuer and the market);
  - a licensed broker (conducting transactions on the stock exchange);
  - an auditor (conducting a financial statements independent assessment and provides support for the financial information disclosure);
  - a legal adviser (overseeing the company's compliance with public offering regulations.
- creation and development of alternative exchange platforms for small companies public offering (including primary) in Ukraine, which stipulate the replacement of stringent listing conditions of the main segment with the requirements of a high-quality and expanded business plan while maintaining high transparency of information as well as creating a more flexible regulatory environment for small and medium enterprises;
- developing a culture of justice by educating investors and emitters about maximizing the benefits of the stock market and ensuring greater access to data from research on capital markets;
- rethinking tax breaks in order to eliminate the benefits of debt burdens on equity and stimulating long-term investment, especially in emerging companies.

On the other hand, the development of the Ukrainian stock market from the point of integration into world markets involves listing companies listed on the Ukrainian exchanges and having demonstrated successful placement experience on foreign exchanges. First, it concerns Ukrainian corporations located on the London, Warsaw and Frankfurt exchanges (about 40 companies). In this regard, such initiatives of the NCSSMF deserve attention:

- dual listing procedure on simplified terms – automatic inclusion of non-residents' shares prior to Listing 1, subject to the conclusion of 10 agreements during the last six months amounting to over UAH 1 million, and to level 2 - subject to a corresponding volume of transactions above UAH 250 thousand;
- improvement of infrastructure provision: establishment of correspondent relations between the National Depository of Ukraine and the depositories of the respective sites (Euroclear in Poland, CREST in the United Kingdom), currency regulation in matters relating to the purchase of shares of foreign issuers and receipt of dividends by shareholders in foreign currency.

2.3 High debt burden of companies

Another feature of the corporate sector in Ukraine, which has significant barriers for both the sustainable development of business entities and for the financial market of the country, is the maintenance of a high debt level in the company's financial structure. So, if the reduce of opportunities for attracting share capital is linked to the problem of the formed over-concentrated ownership structure, limiting the possibilities of financing investments by attracting borrowed resources is closely linked to the problem of excessively high financial leverage.

According to preliminary estimates, the part of debt capital in the financing structure of Ukrainian companies is on average 72%. Furthermore, the largest corporations support the debt at the level of 40 - 50% permanently, adjusting it according to the change in the investment need, while the rest of the companies tend to increase the part of debt financing because of its accumulation at 80% and above, including periods of economic recession. Combined with a substantially low or negative financial result, it minimizes company's financial sustainability and creditworthiness, eliminates the possibility of financing investments in expanded production. Since the main source of targeted financing in Ukraine is bank loans (92% as at 31.12.2016), it is expedient to examine the relationship between the indicators of the business entities financial condition, their ability to attract credit resources, as well as disparities in the banking lending market, which have been especially intensified during crisis periods.

In the aggregate structure of financing sources in investments by domestic business entities, bank lending has a small part, which grows in economically stable years (to 17.1% in 2012) and decreases in recession (to 7.6% in 2015).

Table 2 Interconnection indicators of the bank loans market development of the and business entities in Ukraine in 2008-2015

Years	Investments in fixed assets, financed by bank lending			Volume of bank lending to the real sector,% of GDP	Average weighted annual interest rate on loans, %	Companies Financial Leverage (Borg / Assets), %	Cost-effectiveness of companies operating activities, %
	% of total investments	% of total bank lending	% of GDP				
2008	17,3	15,2	4,3	59,9	17,5	62,5	3,9
2009	14,2	12,9	2,4	57,5	19,8	63,0	3,3
2010	12,3	17,1	9,0	50,8	14,4	62,7	4,0
2011	16,3	15,9	8,0	48,7	16,4	63,3	5,9
2012	17,1	14,7	6,8	44,8	14,7	62,2	5,0
2013	15,3	21,9	5,9	47,4	14,9	65,8	3,9
2014	9,9	34,0	5,2	56,9	18,9	75,6	-4,1
2015	7,6	37,8	4,6	55,0	21,3	71,6	1,0

Source: Official site of the State Statistics Committee of Ukraine; Official site of the National Bank of Ukraine

The confirmation from the monetary statistics is the ratio of the bank corporate lending to GDP at 4.6% in 2015, while the part of total bank loans to non-financial corporations in the country's GDP is

55%. It suggests that current loans prevail with a significant gap in the bank's customers needs structure. We also note that the main external constraints in the long-term target lending is the high market price of credit resources (especially in crisis), which is shaped by the increased financial risk of most market participants. Thus, the accumulation of extremely high debt levels by business entities, as well as the inability to timely adjust it not only reduces the ability to attract borrowed resources to the extent necessary, but also produces a reverse cumulative effect on the funding access narrowing for all market participants and, finally, stagnation the corporate lending market as a whole. However, low access to finance is among the aspects of the business environment, which is most often seen as an impediment to the company's growth. It is also anticipated that financial barriers reducing is particularly beneficial for small and emerging companies.

2.4 Propositions in the field of negative externalities reduction of business entities high debt burden

The negative externalities of high debt burden in the company's capital structure have connected with credit risk increase in the financial system. It manifested in creditors costs rising through increasing of borrowers monitoring, large part of problem loans, high credit resources prices, taking into account a high risk premium and, as a result, a significant reduction in access to financial resources for all market participants. It makes companies impossible to meet their investment needs through debt financing channels. Basing on the positive experience of developed and developing countries in institutional support to the financial sector to expand access to finance, we will focus on the following areas most relevant to the Ukrainian business environment:

- ensuring the right to convert debt into capital. Converting liabilities to the creditors for their contribution to equity of the borrowing company is an effective debt management tool (from the position of bankruptcy preventing and financial stability restoration), which simultaneously promotes the expansion of the shareholder range, reducing the ownership concentration. Stimulating of such tool introduction at the national level can serve as a positive signal for foreign investors. The transformation of previously declared but not fulfilled debt with the ended limitation period of the share in the equity capital is able to reduce the potential risks from bankruptcy, will allow to receive certain control over economic activity with the ability to take measures to restore the company's financial position. In a broader sense, this will reduce the withdrawal of foreign investment capital from the country. Positive experience in this area, along with the most developed countries of the EU, has demonstrated by Poland, where "debt-to-equity conversion" became possible and actively used since 1993. This type of debt restructuring implies two alternatives:
  1. The equity restructuring of the entity, which changes its ownership structure between the "old" and "new" owners. In this case, the object of the transaction are the company's shares (or shares pre-repurchased by the company), which are transferred to creditors as a liability fee;
  2. Replenishment of the equity by conversion of debt into equity. In this case, the repayment of debt takes the form of contributions to the equity, which has accompanied by the purchase of shares of additional issue.
- improving of credit registries, credit rating systems and facilitating the exchange of credit information. Credit registries play a significant role in the development of lending technologies and represent a powerful institutional tool for expanding business access to financing. Thus, on the one hand, credit registries provide significant benefits and optimize the work of creditors, as shown in:
  1. Facilitating the procedure for checking and evaluating the borrower's credit history, reducing it to automaticity. Creation of credit points system based on credit registers helps to predict loan repayments and helps to select high risk borrowers without reducing the total access to loans;
  2. Reduce creditor's losses for arrears due to increased accuracy of decision-making on the coordination of the issuance of loans. In addition, more complete information (for both payments and non-payments), which is contained in the credit register, helps the lender to

reduce penalties and increase the volume of lending. As lending increases, credit registers should be regularly updated with information from credit bureaus and private rating agencies;

3. Reduce losses in the financial system by improving the exchange of credit information between creditors. Reducing the risk of lending to all segments of borrowers opens up space for the development of areas previously not involved in individual banks. Moreover, increasing the openness of credit information can help to reduce the non-systematic risks of equity investments in companies.

On the other hand, the development of credit registries and the expansion of high-quality credit information provides benefits for borrowers, in particular:

1. Reduces the value of loans, reduce the amount of aggregate transaction costs when attracting borrowed resources, as well as fines for late payments. As a result, lending is becoming popular and affordable. Consequently, the experience of Argentina shows that the implementation of Basel III recommendations on the obligatory participation of banks in credit registries has allowed to reduce the amount of fines by borrowers by a quarter, which resulted in the use of credit products by 60% of the sample companies compared to 40% at the beginning of the study;

2. Facilitates borrowers' credit repayment initiatives, which is especially relevant for small firms, and positively affects their investment attractiveness.

- increasing the presence of foreign banks in the banking system. Foreign banks that come from more developed countries bring capital and innovative service technologies to the recipient's banking system, but the impact of increasing their presence on access to financing of local companies can only be assessed in the long run. Thus, large foreign banks, instead of the partnership, prefer to verify the information of credit registers, and therefore focus on lending to large corporations, bypassing the segment of small and medium-sized businesses. At the same time, foreign banks always create price and non-price competition in the banking sector, which ensures: 1) the gradual reduction of interest rates by local banks; 2) development and development of small and medium-sized lending by local banks and gaining competitive advantages in this segment.

- facilitating the development of bond financing. In the conditions of high macroeconomic risks and shortcomings of the information environment, banks instead of long-term loans prefer short-term, which allows the restoration. It allows controlling the lending and retain the ability to influence the management of companies. As a result, a significant gap between the amount of short-term and long-term bank lending and low part of credits used to finance investments. Thus, a potential alternative to long-term bank lending can be bond financing, as shown by the experience of South Korea during the banking crisis, when bank lending has completely replaced by a bond. Obviously, such funding at first will meet the needs of the largest corporations or information-transparent companies with the lowest business risk. At the same time, it will create incentives for obtaining bond financing and increase price competition in the debt financing market. The main barrier to the functioning of the private bond market for emerging economies is the weak development of the securities market, the lack of necessary institutions for supporting securities transactions and the poor legal protection of minority investors.

3 Conclusion

The defining features of the established corporate environment of Ukraine are the high level of accumulated debt and the high ownership concentration. The presence of such features exacerbates one another negatively both for business entities (which has manifested in the additional complication of already limited access to external financing) and for the financial market of the country as a whole (due to stagnation in the development of its key segments: corporate rights market and debt financing market). As a result, there is the problem of a "closed circle", the negative consequences of which are

most acutely felt by external small companies with growth prospects, which have a high investment need, but cannot meet it. Reducing the negative externalities of high ownership concentration and debt burden for national business is possible by strengthening institutional support of the financial market from the point of ensuring a balance between access to financing and protection of investors' rights. It confirmed by the experience of some emerging economies, primarily Brazil, Argentina, Poland, Southern Korea. Among the key growth pillars for Ukraine in this direction is the liberalization and diversification of stock trading, stimulation of entry into the capital of new players, improvement of legal and informational support for investment contracts, ensuring the right to convert liabilities into equity, enhancing the soundness of decision-making on lending and strengthening the exchange of credit information.

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Foreign trade and balance of trade of Slovakia by value added

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Abstract

The aim of the paper is to compare the export, import and balance of trade of Slovakia according to the gross (traditional) expression and according to the relatively new approach – based on value-added, using the OECD Trade in Value Added (TiVA) database. On the basis of the decomposition of gross exports and gross imports of Slovakia for the period 1995-2011 into components according to the flows of domestic and foreign added value in exports and imports, the paper identifies Slovakia's participation in global value chains. The observed growing differences in the bilateral foreign trade relations of Slovakia in terms of value added, compared to the traditional results, point to the fact that Slovakia is increasingly becoming part of simple and complex global value chains. Based on a comparison of gross trade balances and value added trade balances between Slovakia, the world, OECD countries and non-OECD countries, the most frequent situations for the monitored period and the substantial change that occurred in 2011 are identified.

Keywords: Export, Import, Vertical International Division of Labour, Added Value, Global Value Chains, Gross Balance of Trade, Balance of Trade by Value Added.

JEL Classification: F10**,** F19, F62

1 Introduction

The economy of Slovakia has changed since its inception in 1993 - the transformation of the centrally planned economy into a market economy has created the possibility of engaging more intensely in the world economy, in which significant changes related to processes of globalisation have also been made during this period. Slovakia is a small economy whose development is dependent on foreign markets, so engaging in a modern, "new" international division of labour is an essential way of existence, growth and development.

The aim of the thesis is to find and compare the development of foreign trade and balance of trade of Slovakia according to traditional measurement and value added. We are basing this on the fact that in assessing the export, import and balance of trade of Slovakia we cannot ignore the parallel changes happening in the international division of labour, which are reflected in the deepening of the vertical division of labour between countries and the associated phenomenon of global value chains (GVCs). The GVC concept changes the view of export, import and balance of trade. Traditional indicators need to be confronted with value-added indicators that provide a more realistic view of the country's participation in the international division of labour.

2 Foreign trade measurement in the context of GVC status and balance of trade by value added

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According to Leamer (2007), the globalisation of the world economy acquired new features that were linked to the intensification of international trade and the fragmentation of production among countries within the global value chains. Hernández, Martinez-Piva and Mulder (2014, p. 21) report two significant changes over the past decades, which have significantly affected international trade and production. The first is the ever-increasing interdependence of the world markets, and the second is the emergence and growth of global value chains. International fragmentation of production has been the subject of many studies that have empirically analysed this phenomenon both globally and from the point of view of specific regions.

According to Hummels, D., Rapoport, D., Kei-Mu Yi (1998), a country is involved in vertical specialisation if it is using imported intermediate products for the production of later exported goods, making countries dependent on each other for the production of final goods. Amador and Cabral (2014, p. 4) consider global value chains to be the most important aspect of globalisation today, the OECD (2010, p. 208) describes them as centres of globalisation processes, and Elms and Low (2013, p. 85) view them as a dominant feature of today's global economy. We talk about vertical trade if the following conditions are met:

- the goods (or service) is manufactured in two or more successive stages,
- two or more countries are involved in the production of the product with their added value during the manufacturing process,
- at least one country uses imported inputs in the production process and part of the output is exported. Hummels, D., Ishii, J., Yi, K.M. (2001)

According to Faβe et al. (2009, p.3), the GVC concept was launched for the first time in 1960 in the context of empirical agricultural research to better understand the production and distribution system of agricultural commodities. Slušná, Balog et al., (2015) report that in the 1970s, Hopkins and Wallerstein came up with the concept of commodity chains. The main idea was to trace all inputs, activities and processes resulting in the final commodity. In the 1980s, Porter (1985) introduced the concept of the value chain. In his work "Competitive Advantage: Creating and Sustaining Superior Performance", he focused on activities whereby the company generates added value. He divided these activities into primary and supportive activities. However, the drawback of his approach is that it's solely restricted to the company-level. In the 1990s, Gereffi and others combined the concept of the chain with the concept of added value - Gereffi and Korzeniewicz (1994) - introduced the term value chain. The concepts of commodity and value chain are very similar, but the value chain is more ambitious in that it also attempts to describe the organisation of production (Slušná, Balog et al., 2015, p. 61). Based on this new understanding of globalised production, the value chain describes a range of activities that businesses and workers perform to bring the product from its concept to its end-use and beyond. This includes activities such as research and development, design, production, marketing, distribution and end-user support. Activities that contain a value chain can be performed within one company or divided between different companies. The concept of global value chains captures the current features of the global economy (De Backer, Miroudot, 2012):

- increasing fragmentation of production across countries,
- countries specialise in tasks and functions to a greater extent than in specific products,
- crucial role of global networks, buyers and suppliers.

When determining the factors underpinning the expansion of global value chains, it is difficult to separate those that have determined the growth of international trade from those that have a specific impact on the fragmentation of production. GVCs most prominent "driving forces" in recent decades according to authors are technological advancement, the effect of TNK, declining transport costs, a drop in information and communication costs, and lower political

and economic barriers when it comes to movement of goods, services and capital. Railways and steamers allowed to spatially separate production from consumption, achieve economies of scale, and benefit from comparative advantages. Baldwin calls this phenomenon "first unbundling". Since the 1980s, the rise in inter-product trade, the further reduction of transport costs, the decrease in tariffs, and communication and coordination costs have made worldwide fragmentation of production possible, also known as the "second unbundling". Baldwin (2006) points to the fact that during the first period of globalisation separation (prior to 1980), international competition took place at sector level (e.g. Japanese cars versus Thai cars), whereas during the second period (after 1985), this was happening at the level of production stages (Japanese cars may contain components from Japan and vice versa).

GVCs connect businesses, their employees and consumers around the world. GVCs are often also considered a stepping stone for less developed countries on the way to their inclusion in the global economy, and their involvement in the GVC is becoming a prerequisite for their further development. The involvement of Slovakia through vertical specialisation into the GVC can now also be seen as a way of integrating into the global economy.

2.1 Classification of export and import by value added

International trade is traditionally measured through so-called gross values - the total market value of imports is attributed to only one country of origin. Lamy (2011), however, points out that this approach was appropriate at the time of Ricardo 200 years ago; at present, the concept of the country of origin is outdated as products are produced under the GVC and several countries are involved in the production process and individual production phases, with the country of origin being the country which places the final product on the market. Traditional business statistics are often misleading.

Gross recording of trade flows and the fact that exports increasingly form inter-company inputs from abroad make it difficult to identify the real export of the country. Conventional business statistics are not capable of detecting the industries that add value. Gross trade flows do not take into account the fact that the growth of intermediate product trade makes it more difficult to identify the country's real contribution to final production (FP), does not allow the assessment of the country's share of the created and exported added value that is sent abroad in intermediate products and final goods. In addition to dividing gross exports into the export of intermediate goods and final goods, it is necessary to monitor the contribution of each country to their value. This is only possible by monitoring the value added of the country in export, with domestic value added being present both in intermediate products and in final goods. If several countries participate in the production of an intermediate product, then the intermediate product contains the contributions (value added) of several countries that are subsequently contained in the final output. The intermediate product may pass through one or more countries. Wang, Z., Wei, S., Yu, X., Zhu, K. (2017) illustrate the source and decomposition of the value added production of the final goods in a scheme (Figure 1), according to which they characterise four types of production:
- Type 1: value added originates at home, no cross-border production activity is carried out, and the created VA (value added) satisfies domestic demand.
- Type 2: value added crosses the border, but no cross-border production takes place, all intermediate products are made from domestic sources and meet foreign demand. VA is only exported once, for consumption.
- Type 3: cross-border production takes place, type 3 is linked to the trading of intermediate products and is further divided into two types:

a) value added which is incorporated into the intermediate input absorbed by the direct importer, with cross-border production activities being carried out only within the country of direct import (without further border crossing) - simple GVCs.

b) value added that crosses the borders at least twice to meet both domestic and foreign final demand - cross-border manufacturing activities are carried out in a number of countries - these are complicated / complex GVCs.

The first two types are fully implemented within the country, so we can consider them as purely domestic manufacturing activities. The last type shows the involvement of the country in the GVC through production activities - production is divided between countries. (Wang, Z., Wei, S., Yu, X., Zhu, K. 2017)
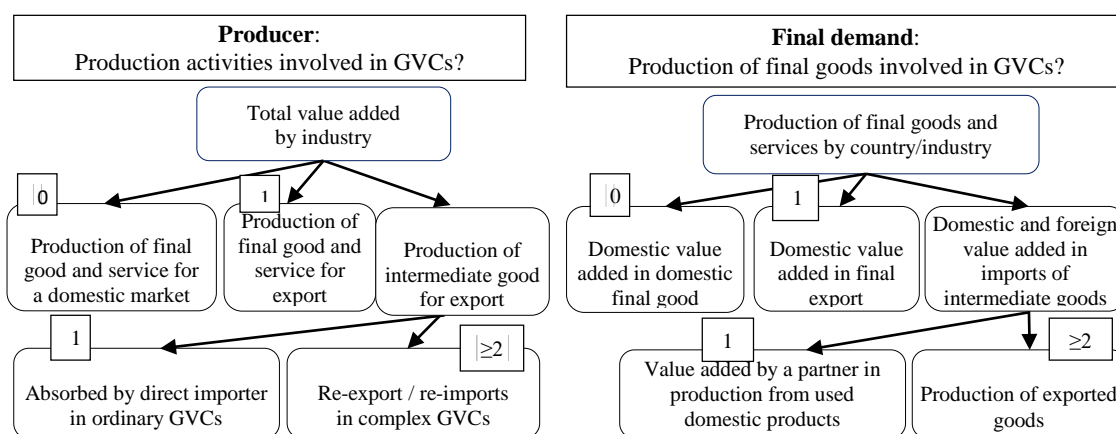
Figure 1 Decomposition of GDP and output of final goods within countries or sectors
Source: Wang,Z., Wei,S., Yu, X., Zhu, K. 2017
Note: "0" - VA that does not cross the border - does not belong to the GVC; "1" VA that crosses borders only once - belongs to a simple GVC; ≥2 - VA crosses the border at least 2 times - belongs to complex GVC.

Koopman, Wang and Wei (2014) described a detailed decomposition of gross country exports as the sum of the various components and quantified the different types of double counting of items – they first divided gross exports into four categories:
1. domestic value added absorbed by foreign countries;
2. domestic value added for the first time exported and then returned home;
3. foreign value added;
4. clean double counting.

This decomposition of gross exports is presented in the diagram (Figure 2). As per this diagram, gross export includes domestic added value, which is consumed abroad (as a final product or as an intermediate product) and is not returned (items 1 + 2 + 3) - its part remains in the first recipient country and a part can be exported to third countries. Under item 3 we already have a situation where a portion of gross export in the global chain is counted multiple times. The foreign GDP in the gross export of item "C" crosses the border at least twice - it is also the source of double counting in official trade statistics (Koopman, Wang, Wei, 2014, p. 25). Double counting occurs in two cases:

- item 6 - in the export of intermediate products which are produced at home and subsequently consumed by one or more importers;
- and item 7 - counting VA in imported intermediate products produced abroad - in one or more countries.
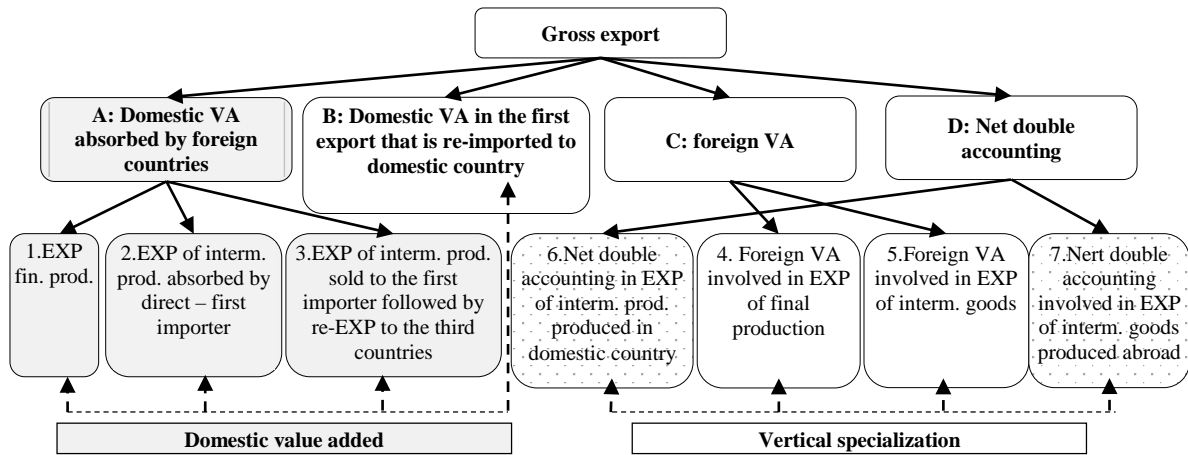
Figure 2 Decomposition of gross export
Source: Compiled by the author according to Koopman, Wang, Wei (2014) and WTO, IBRD / WB, IDE-JETRO, OECD (2017)

All official business statistics are based on gross trade measurements and double counting of the value of intermediates that cross the borders more than once. For the new benchmarking approach as part of the vertical division of labour, the OECD (2018a) Trade in Value Added (TiVA) concept was introduced. Its job is to identify where the added value in global value chains originates and to identify the actual export and import of the country. Javorsek, Camacho (2015) specify that only the value added generated by the country in the manufacture of goods and services for export is recorded as exports. At the same time, using the TiVA concept allows us to find out how total exports are overestimated, to what degree they contain value added, the source of which is outside the domestic economy. (UNCTAD, 2013, p. 1)

The frame presented in Figure 2 creates a precisely defined relationship between the TiVA concept and official trade statistics. Knowing the different, duplicate items recorded in the country's gross export helps to estimate the way the country is involved in global value chains and the depth of their involvement. Countries may, for example, have a similar volume of domestic component in the gross exports of some industries, but the composition of duplicate items may be quite different. Double counting in the country may be reflected mainly in the use of foreign components in the final products exported by the country, while in the second country duplicate counting may occur in the form of domestic added value re-imported and consumed domestically. The authors therefore emphasize that not only the amount of duplicate items but also their structure provide information on the positions of the GVC countries.

2.2 Balance of Trade by Traditional Measurement and Value Added

The country's trade balances are based on the gross commercial value of goods and services leaving and entering the country, which do not adequately capture the fact that some goods and services cross the borders of several countries until a final product is created and subsequently exported. Balancing the value added trade (BOT – Balance of Trade) is the logical consequence of changing a country's export and import perspective when there is multiple export or import of the same value contained in intermediate or final output. Real export and import of a given country do not include items that are counted multiple times for export and import. Nagengast and Stehrer (2015) state that just vertical specialisation is the factor responsible for the difference between BOT by gross measurement and BOT by value added. Johnson and Noguera (2012) emphasise that bilateral trade balances in gross terms may differ materially from bilateral trade balances according to VA:

- Aggregate BOTs (country: the world) are the same in both cases (according to gross expression also according to VA);
- Bilateral BOTs (country: country, or country: grouping of several countries) varies according to gross and VA.

Table 1 The equivalence of gross balance of trade and balance of trade with value added on the World Trade Level according to Benedetta

item	(1) export = (1a)+(1b)+(1c)	(2) import = (2a)+(2b)+(2c)	balance
Gross balance of trade with the world (1)-(2)	(1a) Domestic value added that stays overseas	(2a) Foreign value added that stays home	Domestic value added that stays overseas minus Foreign value added that stays home
	+	+	
	(1b) Domestic value added that will return home in imports	**(2b) Domestic added value that is embedded in imports**	
	+	+	
	(1c) Foreign added value that is embedded in exports	**(2c) Foreign value added that will be embedded in exports**	
Value-added trade balance with the world (1a)-(2a)	(1a) Domestic value added that stays overseas	(2a) Foreign value added that stays home	Domestic value added that stays overseas minus Foreign value added that stays home

Note: gray fields and words in bold = items that are cancelled by export and import.
Source: compiled by the author according to Benedetto, John B. (2012)

In the absence of intermediate trade, bilateral and aggregate balances of trade would be the same. Derviş Kemal, Meltzer, J. P., and Foda K. (2013) explain the case where the total balance of trade of a country (country: world) is the same according to gross reporting and also according to VA, when calculating exports and imports of domestic and foreign goods by value added, imports and exports cancel each other. They rely on the Benedetto table (2012) explaining which components enter the value added export and import and which and why they cancel each other (Table 1):
- The country's gross export consists of three components:
  1a) **domestic** value added remaining abroad;
  1b) domestic value added, which returns home via imports;
  1c) foreign value added incorporated in exports.
- Similarly, the reported gross country import includes:
  2a) foreign value added remaining in the country of import;
  2b) domestic value added of the country included in its imports (it returns);
  2c) imported foreign value added, which is later exported.
Items 1b), 1c) are cancelled out by items 2b). 2c).

Export by value added includes: 1a) only domestic added value remaining abroad. Import by value added includes: (2a) only foreign added value remaining in the country of import. Balance of Trade by VA - is the difference between exports of domestic VAs that remain abroad 1a) and the import of foreign added value remaining in the country of import 2a).

The sum of countries' bilateral balances of trade according to value added (= the sum of bilateral BOTs of one country with all the countries) equals the country's total balance of trade with the world. As a result, the bilateral trade deficit by VA with one country must be offset by changes in other value added bilateral balances of trade. When looking at bilateral balances of trade in gross terms, the surplus of exporters of final products, and the deficits of importers of these products, are found to be exaggerated and overstated, as they also include the added value of foreign inputs. The TiVA concept does not change the country's overall balance of trade but can significantly change bilateral balances of trade - reallocate surpluses and deficits across partner countries.

3 Export, Import and Trade Balance of Slovakia by Traditional Measurement and Value Added

The subject of this part of the thesis is based on the presented theoretical backgrounds on the importance of foreign trade monitoring in terms of value added, to show how foreign trade is being measured by the value added and comparing these results with the foreign trade indicators of the Slovak Republic according to gross expression. At this stage of the analysis, we want to show Slovakia's involvement in simple and complex GVCs by means of a detailed decomposition of gross exports and gross imports into value added components according to Benedetto (2012), whose structure we described in Section 2.2. of this work. We will use the data and indicators of the TiVA database, which was last updated in 2016 and available data for 1995-2011, and we will identify the actual export and import of the SR by VA for all industries. We compare Slovakia's balance of trade:

- total (with the world) by gross measurement with total BOT by value added,
- the balance of trade of the Slovak Republic with a group of OECD member countries (34 countries in total) by gross measurement and by VA,
- the balance of trade of the Slovak Republic with a group of non-OECD countries (27 specific countries + 1 group = rest of the world) by gross measurement and by VA.

Gross exports of Slovakia (EXGR SVK) increased 7 times (Table 2, Table 4), thanks to the fact that the liberalisation of Slovakia's foreign trade (especially after EU accession) allowed for more intensive entry into the vertical international division of labour. Slovakia is more intensely using foreign inputs, which are also used for export goods and services, which suggests that gross exports include, besides domestic VA, also foreign VA (Table 2 and Figure 3). In 1995, 68% of the gross exports of Slovakia accounted for 21% of the domestic value added (EXGR_DVA - Domestic Value Added as a Share of Gross Exports) and 31.79% of the foreign value added (EXGR_FVA - Foreign Value Added as a Share of Gross Exports). With the growth of EXGR SVK, the ratio of values added changed in favour of foreign value added. Over the entire period in gross exports, the domestic VA prevails, but its drops by 14.94 percent for the period 1995-2011 also means an increase in foreign value added in exports (+ 14.94 percents). A rise in domestic value added occurred in 2009 during the financial crisis, but is again decreasing after 2009 and the foreign VA in exports is growing, suggesting the resumption of trade relations within the GVC.

According to Johnson R. C. (2014), the trend of the decline in domestic VA in exports worldwide occurs only after 1990 and suggests that intermediate products are more likely to be included if the product reaches its final form. For example, in the global export, domestic VA in the 1970s and 1980s was about 85%, in 2004 and 2008 this represented only about 70 - 75%. Johnson and Noguera (2012) report that the median of the ratio of domestic value added to gross exports of 94 countries was 0.73 in 2004. There are large differences between countries in the world, according to Johnson and Noguera (2014), ranging from 50-90% and declines were higher in rapidly growing emerging countries. The decline in domestic VA in the exports of Slovak Republic indicates an increasing integration into the GVC and the EXGR_FVA (Foreign Value Added as a Share of Gross Exports) indicator, which is interpreted as an indicator of the country's participation into the GVC. In the years 1995 - 2011, EXGR_FVA increased almost 10 times.

Table 2 Domestic and foreign value added in gross exports of the Slovak Republic 1995 and 2011 (mil. USD, %)

	EXGR SVK, mil. USD	EXGR_DVA SVK/EXGR SVK, %	EXGR_FVA SVK/EXGR SVK, %
1995	10 022,10	68,21	31,79
1996	10 287,60	63,29	36,71
1997	10 959,80	61,85	38,15
1998	12 783,90	59,73	40,27
1999	12 122,70	60,35	39,65
2000	14 120,50	55,90	44,10
2001	15 280,80	52,87	47,13
2002	17 009,80	54,06	45,94
2003	25 162,90	51,69	48,31
2004	31 360,10	53,13	46,87
2005	35 527,90	52,94	47,06
2006	44 489,20	50,60	49,40
2007	59 865,00	51,82	48,18
2008	70 301,90	53,82	46,18
2009	53 138,40	56,64	43,36
2010	59 318,90	54,27	45,73
2011	70 231,90	53,27	46,73
Change 1995-2011	60 209,80	-14,94	14,94

Source: compiled by the author using the TiVA database (OECD b, 2018)

Johnson R. C. (2014) also notes the fact that EXGR_DVA is declining more rapidly in neighbouring countries, countries in the same region, and countries that have concluded regional trade agreements. Slovakia has become a highly open country in the period under review, a substantial part of its foreign trade is being carried out with neighbouring countries and has became an EU member state in 2004, which represents trade in the internal market with far fewer barriers than with geographically more remote non-EU countries.
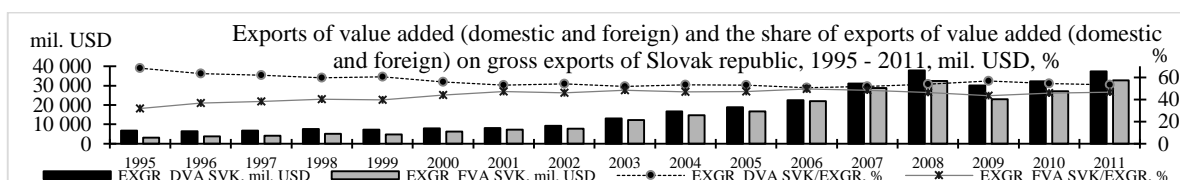
Figure 3 Domestic and foreign value added in gross EXP (mil. USD) and the share of domestic and foreign value added to gross EXP SR 1995-2011 (%)
Source: compiled by the author using the TiVA database (OECD b, 2018)
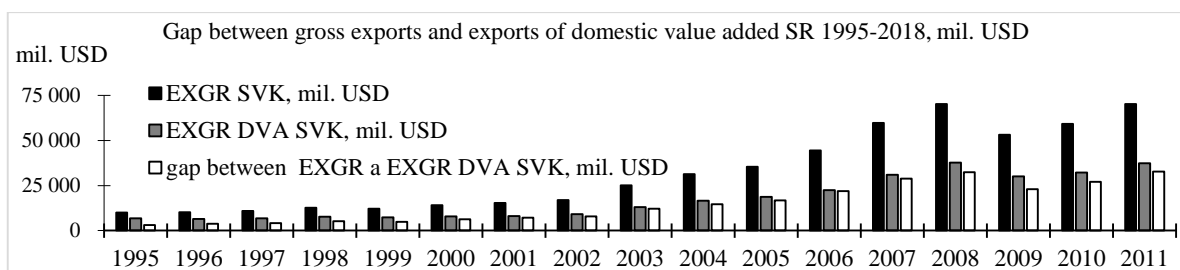
Figure 4 The gap between gross exports and exports of domestic value added SR 1995-2018, mil. USD
Source: compiled by the author using the TiVA database (OECD b, 2018)

Table 3 The gap between gross exports and exports of PH, gross imports and imports of foreign PH, SR 1995-2011, million USD

	EXGR SVK, mil. USD	EXGR DVA SVK, mil. USD	*medzera medzi EXGR a EXGR DVA SVK = EXGR FVA, mil. USD*	IMGR SVK, mil. USD	DFD FVA SVK, mil. USD	*gap betwen IMGR and DFD FVA SVK, mil. USD*
1995	10 022,1	6 836,1	*3 186,0*	9 666,6	6 420,7	*3 245,9*
1996	10 287,6	6 510,7	*3 776,9*	12 674,5	8 845,2	*3 829,3*
1997	10 959,8	6 779,1	*4 180,7*	13 110,8	8 879,3	*4 231,5*
1998	12 783,9	7 635,3	*5 148,7*	15 313,1	10 102,5	*5 210,6*
1999	12 122,7	7 316,2	*4 806,6*	13 115,7	8 264,0	*4 851,7*
2000	14 120,5	7 892,8	*6 227,7*	14 707,1	8 432,9	*6 274,2*
2001	15 280,8	8 078,9	*7 201,9*	17 055,2	9 803,7	*7 251,5*
2002	17 009,8	9 196,0	*7 813,9*	18 872,5	11 010,4	*7 862,1*
2003	25 162,9	13 007,6	*12 155,3*	25 870,5	13 633,0	*12 237,5*
2004	31 360,1	16 663,0	*14 697,1*	32 613,8	17 800,0	*14 813,8*
2005	35 527,9	18 807,3	*16 720,6*	37 911,1	21 060,5	*16 850,6*
2006	44 489,2	22 512,2	*21 977,0*	46 847,3	24 722,7	*22 124,6*
2007	59 865,0	31 021,9	*28 843,1*	60 887,8	31 839,1	*29 048,7*
2008	70 301,9	37 836,8	*32 465,1*	73 037,6	40 291,9	*32 745,7*
2009	53 138,4	30 096,1	*23 042,3*	53 741,5	30 533,0	*23 208,5*
2010	59 318,9	32 190,9	*27 128,0*	59 731,0	32 419,6	*27 311,4*
2011	70 231,9	37 414,9	*32 817,1*	69 926,0	36 883,2	*33 042,8*
Change 1995-2011	60 209,8	30 578,8	*29 631,0*	60 259,40	30 462,50	*29 796,90*

Key: DFD_FVA = foreign value added contained in domestic final demand = foreign VA remaining in the SR = import of foreign VA; gap between IMGR and DFD FVA SVK = domestic VA included in IMP SR (formerly exported) + IMP incl. VA, which is later exported by the SR;

Source: compiled by the author using the TiVA database (OECD b, 2018)
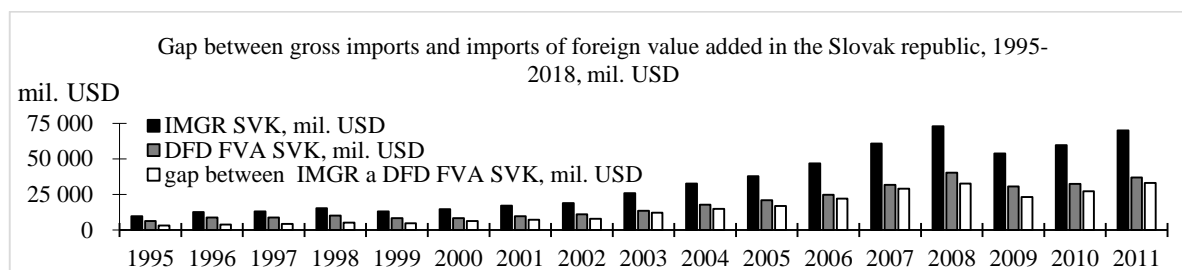
Figure 5 The gap between gross imports and imports of foreign value added SR 1995-2018, mil. USD
Source: compiled by the author using the TiVA database (OECD b, 2018)

The knowledge of EXGR_DVA SVK and EXGR_FVA SVK is not sufficient to fully understand how Slovakia joins the GVC as these indicators do not indicate, for example, whether or not the exported VA remained abroad.

Table 4 Rozklad hrubého exportu a hrubého importu Slovenska podľa pridanej hodnoty 1995- 2011 (mil. USD)

	1. Gross EXP SR, out of which:	1a) domestic VA remeining abroad	1b) domestic VA returning to the SR as part of IMP	1c) foreign VA incorporated into EXP SR	2. Gross IMP SR, out of which:	2a) IMP foreign VA remaining in the SR	2b) domestic VA incorporated into IMP SR	2c) IMP of foreign VA, which the SR later exports
1995	10 022,1	6 776,2	59,9	3 186,0	9 666,6	6 420,7	59,9	3 186,0
1996	10 287,6	6 458,2	52,5	3 776,9	12 674,5	8 845,2	52,5	3 776,9
1997	10 959,8	6 728,3	50,8	4 180,7	13 110,8	8 879,3	50,8	4 180,7
1998	12 783,9	7 573,3	61,9	5 148,7	15 313,1	10 102,5	61,9	5 148,7
1999	12 122,7	7 271,0	45,2	4 806,6	13 115,7	8 264,0	45,2	4 806,6
2000	14 120,5	7 846,4	46,5	6 227,7	14 707,1	8 432,9	46,5	6 227,7
2001	15 280,8	8 029,3	49,6	7 201,9	17 055,2	9 803,7	49,6	7 201,9
2002	17 009,8	9 147,7	48,3	7 813,8	18 872,5	11 010,4	48,3	7 813,8
2003	25 162,9	12 925,4	82,2	12 155,3	25 870,5	13 633,0	82,2	12 155,3
2004	31 360,1	16 546,4	116,6	14 697,1	32 613,8	17 800,0	116,6	14 697,1
2005	35 527,9	18 677,3	130,0	16 720,6	37 911,1	21 060,5	130,0	16 720,6
2006	44 489,2	22 364,6	147,6	21 977,0	46 847,3	24 722,7	147,6	21 977,0
2007	59 865,0	30 816,3	205,6	28 843,1	60 887,8	31 839,1	205,6	28 843,1
2008	70 301,9	37 556,3	280,5	32 465,1	73 037,6	40 291,9	280,5	32 465,1
2009	53 138,4	29 929,9	166,3	23 042,3	53 741,5	30 533,0	166,3	23 042,3
2010	59 318,9	32 007,4	183,5	27 127,9	59 731,0	32 419,6	183,5	27 127,9
2011	70 231,9	37 189,0	225,8	32 817,0	69 926,0	36 883,2	225,8	32 817,0
Change 1995-2011	60 209,8 about 7x	30 412,8 about 5x	165,9 about 3x	29 631,0 about 10x	60 259,4 about 7x	30 462,5 about 9x	165,9 about 3x	29 631,0 about 10x

Source: compiled by the author using the TiVA database (OECD b, 2018)

Intermediate trade can cause the exported VA to return back to Slovakia either in the form of an intermediate product, which will get processed and exported, for example, in the form of a final product. More situations may arise (as described in Figure 1, Figure 2, and Table 1). In Table 4 we describe - according to Benedetto, John B. (2012) - the decomposition of EXGR SVK and IMGR SVK that also allows us to use this data to ascertain Slovakia's balance of trade by gross measurement and by VA. We can see how much of the domestic VA returns to the Slovak Republic, what part of imported foreign value added definitely stays in Slovakia and what part will become part of the export.

Table 4 shows data that measure the foreign trade of Slovakia with the world. According to Table 1, there are therefore items in Table 4 that cancel each other. Real exports of the Slovak Republic by value added include item 1a) - that is, only domestic value added remaining abroad. The real import of the Slovak Republic by value added includes item 2a) - only the foreign value added that remains in the Slovak Republic. However, the export of domestic value added (EXGR_DVA SVK) is divided into two parts: 1a) Domestic VA, which remains abroad + 1b) domestic VA, which returns to the Slovak Republic - export and import of this VA cancel each other out.

In 1995, the Slovak Republic exported domestic VA (EXGR_DVA SVK) worth 6,836.1 million USD, some of which returned to the country (59.9 million USD) in the form of intermediate or final goods. The actual export of Slovak VA, which definitely stays abroad, is 6,776.2 million USD. Over the period 1995-2011, the EXGR increased 7-fold, the export by VA, which definitely stays abroad, increased 5-fold. The exported and imported domestic and foreign

values added exceeded the gross exports of Slovakia into the rest of the world multiple times, with an increase of items 1b), 1c), 2b) and 2c) showing that, apart from the Slovak Republic's involvement in simple GVCs, the country is also becoming a part of complex GVCs. An almost 10-fold increase in foreign VA in the export of Slovakia (1c and its counterpart 2c) shows the growing importance of business networks in the GVC of the world for Slovakia.

Table 5 Balance of Trade of the Slovak Republic and the world, Slovak Republic and the OECD and Slovak Republic and non-OECD by gross measurement and according to VA 1995 and 2011 (mil. USD)

	(1) BALVAFD: SVK:WOR mil. USD	(2) BALVAFD: SVK:OECD mil. USD	(3) BALVAFD: SVK:nonOECD mil. USD	(4) BALGR: SVK:WOR mil. USD	(5) BALGR: SVK:OECD mil. USD	(6) BALGR: SVK:nonOECD mil. USD	(5) – (2) BALGR - BALVAFD SVK:OECD mil. USD	(6) – (3) BALGR - BALVAFD SVK:nonOECD mil. USD
1995	355,5	173,9	181,5	355,5	513,9	-158,4	340,0	-339,9
1996	-2 387,0	-1 977,0	-410,0	-2 387,0	-1 508,0	-879,0	469,0	-469,0
1997	-2 151,0	-1 554,8	-596,2	-2 151,0	-592,9	-1 558,1	961,9	-961,9
1998	-2 529,2	-2 290,3	-238,9	-2 529,2	-1 786,9	-742,3	503,4	-503,4
1999	-993,0	-580,5	-412,5	-993,0	224,4	-1 217,4	804,9	-804,9
2000	-586,6	55,2	-641,8	-586,6	1 014,5	-1 601,1	959,3	-959,3
2001	-1 774,4	-426,3	-1 348,1	-1 774,4	1 436,3	-3 210,7	1 862,6	-1 862,6
2002	-1 862,7	-168,5	-1 694,2	-1 862,7	2 252,5	-4 115,2	2 421,0	-2 421,0
2003	-707,6	686,4	-1 394,0	-707,6	3 084,9	-3 792,5	2 398,5	-2 398,5
2004	-1 253,6	1 193,3	-2 446,9	-1 253,6	4 683,6	-5 937,2	3 490,3	-3 490,3
2005	-2 383,2	804,2	-3 187,5	-2 383,2	5 626,4	-8 009,7	4 822,2	-4 822,2
2006	-2 358,2	1 934,0	-4 292,2	-2 358,2	8 377,1	-10 735,3	6 443,1	-6 443,1
2007	-1 022,8	3 926,3	-4 949,1	-1 022,8	12 627,2	-13 650,0	8 700,9	-8 700,9
2008	-2 735,7	2 055,3	-4 791,0	-2 735,7	8 009,0	-10 744,6	5 953,7	-5 953,6
2009	-603,1	4 300,8	-4 904,0	-603,1	11 396,7	-11 999,8	7 095,9	-7 095,8
2010	-412,1	4 918,9	-5 331,1	-412,1	12 250,9	-12 663,0	7 332,0	-7 331,9
2011	305,8	5 914,5	-5 608,6	305,8	14 582,5	-14 276,7	8 668,0	-8 668,1
Change 1995-2011	-49,7	5 740,6	-5 790,1	-49,7	14 068,6	-14 118,3	8 328,0	-8 328,2

Key: BALGR = gross trade balance; BALVAFD = value added trade balance; is the difference between domestic value added in foreign final demand (FFD DVA) and foreign value added in domestic final demand (DFD FVA).
Source: compiled by the author using data from the TiVA database (OECD b, 2018)

When breaking down the country's EXGR and IMGR in relation to one country or a group of countries, items 1b, 1c, 2b and 2c would not mutually cancel each other as was the case in the decomposition of EXGR and IMGR in relation to the world, as not every domestic exported VA has to return from the country (group of countries) - they can export it to a third country and return it to the country of origin. In bilateral relationships, consideration should be given to the movement of values across the GVS. Therefore, the balance of trade of the SR with the world by gross measurement is equal to the balance of trade according to VA, but already in bilateral trade balances this is not the same (Table 5).

Table 6 shows the decomposition of gross exports and gross imports according to the template by Benedetto, John B. (2012), which we listed in Table 1. We report the Slovak Republic's balance of trade with the world by gross measurement and value added and we compare them for the period of years between 1995 and 2011.

Net exports by VA are equal to net exports by gross measurement - in 1995, these net exports amounted to 355.5 million USD (1.78% of GDP). In 2011, net exports remained positive, but lower - 305.8 million. USD (0.31% of GDP). What we know about the development of foreign trade during the period between those years is that for a long period imports were higher than exports (Table 5). Using the decomposition of gross exports and imports of the Slovak Republic, we have identified which added value moves between Slovakia and the world at least twice, and for the purpose of calculation of net export based on VA we do not take these values added into account as they cancel each other out in the process of export and import.

Table 6 Balance of Trade of the Slovak Republic and the world by gross measurement and by VA and their components, 1995 and 2011 (mil. USD)

Gross balance of trade with the world BALGR = (1) - (2)		(1) export = (1a)+(1b)+(1c)			(2) import = (2a)+(2b)+(2c)			Balance of trade with value added with the world BALVAFD = (1a) - (2a)	
1995	2011	Components of gross export	1995	2011	Components of gross import	1995	2011	1995	2011
355.5	305.8	(1a) Domestic value added that stays overseas	6 776.2	37 189.0	(2a) Foreign value added that stays home	6 420.7	36 883.2	355.5	305.8
		+			+				
		(1b) Domestic value added that will return home in imports	59.9	225.8	(2b) Domestic value added that is embedded in import	59.9	225.8		
		+			+				
		(1c) Foreign value added that is embedded in exports	3 186.0	32 817.0	(2c) Foreign value added that will be embedded in exports	3 186.0	32 817.0		
		(1) gross export = (1a)+(1b)+(1c)	10 022.1	70 231.8	(2) gross import = (2a)+(2b)+(2c)	9 666.6	69 926.0		
Foreign value added that will be included in the Balance of Trade Export with value added with the world BALVAFD= (1a) - (2a)		(1a) Domestic value added that stays overseas	6 776.2	37 189.0	(2a) Foreign value added that stays home	6 420.7	36 883.2	Balance of trade with value added with the world BALVAFD = (1a) - (2a)	
355.5	305.8							355.5	305.8

Source: compiled by the author according to the Benedetto, John B. (2012) scheme listed in Table 1 and data contained in the TiVA database (OECD b, 2018)

Table 7 Balance of trade of Slovakia with the world, with OECD countries and non-OECD countries according to VA and according to gross expression - situation for 1995-2011

No.	BALVAFD SVK : OECD	BALVAFD: SVK: nonOECD	BALGR: SVK : OECD	BALGR: SVK: nonOECD	BALGR ≡ BALVAFD SVK : WOR	Years
1.	+	+	+	-	+	1995
2.	+	-	+	-	+	2011
3.	-	-	-	-	-	1996, 1997, 1998,
4.	+	-	+	-	-	1999, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010
5.	+	-	+	-	-	2000
6.	-	-	+	-	-	2001, 2002

Key: BALVAFD = BOT by VA; BALGR = BOT gross; + positive BOT, - negative BOT;
Source: compiled by the author using data in Table 5

In Table 5 and in the graphs (Figure 6 and Figure 7), we compare bilateral trade balances of Slovakia with OECD countries and non-OECD countries by value added and by gross measurement. We found that over the period 1995-2011 6 different situations occurred, as summarised in Table 7.

The most common is situation No. 4 (Table 7). In the above mentioned years, the total balance of trade of Slovakia with the world was negative (gross and also according to VA), with OECD countries positive (gross, also according to VA), with non-OECD countries negative (gross, also according to VA). This means that a group of countries outside of the OECD was involved in the negative balance of trade of Slovakia with the world. In the last year, 2011, the situation changed considerably – Slovakia, after a long period of time, achieved a positive gross BOT as well as a positive BOT by VA with the world, with the OECD also positive and negative with a group of countries outside the OECD.

Bilateral trade balances of Slovakia according to both approaches show that Slovakia had a negative balance of trade for the whole period (with the exception of 1995) with countries outside the OECD, a negative BOT by VA with OECD countries (excluding 1995 and 2000), but since 2003 the BOT by VA has only ever been positive with OECD countries. However, according to the gross measurement, OECD countries have started to achieve a positive BOT since 1999. The different BOT results according to gross measurement and according to VA point to the need for a deeper analysis of Slovakia's foreign trade relations. By breaking down the gross exports and gross imports into individual components, it is possible to identify the causes of the observed results on the bilateral balances of trade of Slovakia.
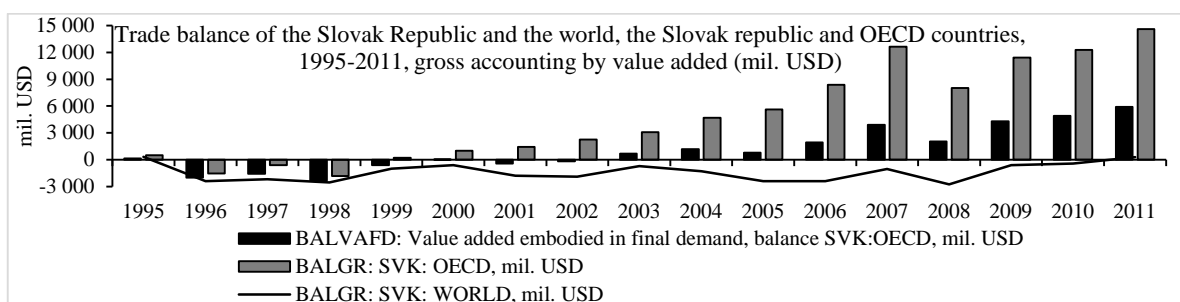
Figure 6 Balance of trade of the Slovak Republic and the world, Slovak Republic and the OECD by gross measurement and according to VA 1995 and 2011 (mil. USD)
Source: compiled by the author according to data from the TiVA database (OECD b, 2018)
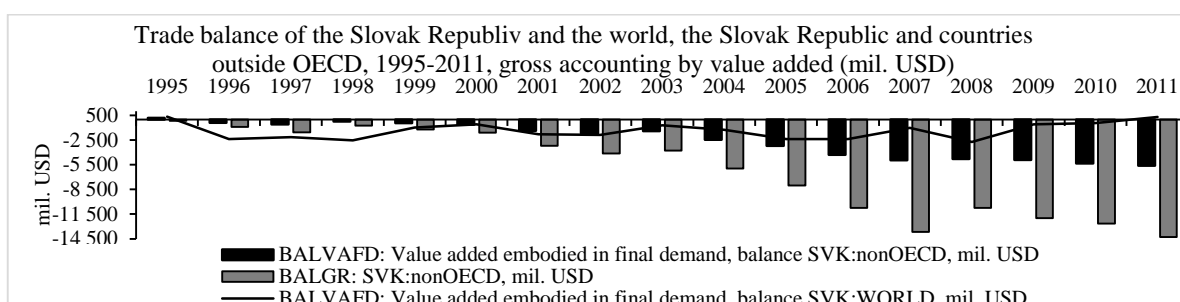
Figure 7 Obchodná bilancia SR a svet, SR a nonOECD podľa hrubého merania a podľa PH 1995 a 2011 (mil. USD)
Source: compiled by the author according to data from the TiVA database (OECD b, 2018)

However, attention should be drawn to the fact that since 1995 we have seen a sharp increase in the difference between the gross balances of trade and balances of trade according to the VA of the Slovak Republic - with the OECD countries in favour of the growth of the positive

balance of the BOT and with the non-OECD countries towards a negative BOT, and we consider these to be mirror differences (Table 5, Figure 6 and Figure 7). With an increase of the positive trade balance of Slovakia with the OECD countries, the negative balance with the non-OECD countries increased (Table 5).
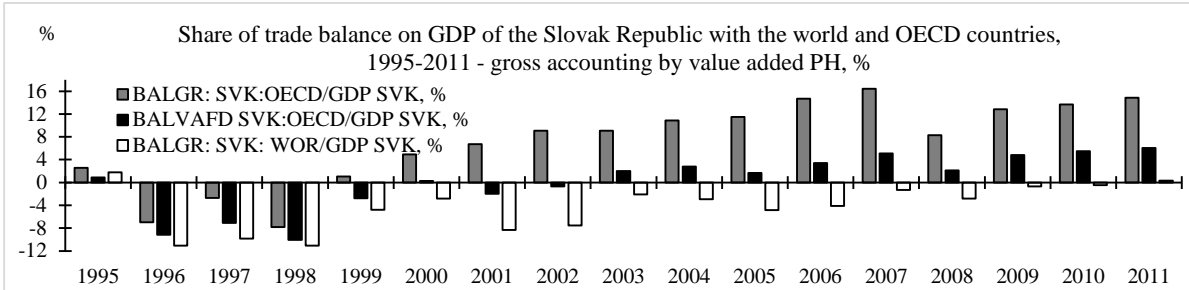
Figure 8 The share of the Balance of trade of the Slovak Republic with the world and with OECD countries on GDP 1995-2011 - Gross and VA, %
Source: compiled by the author according to data from the TiVA database (OECD b, 2018)
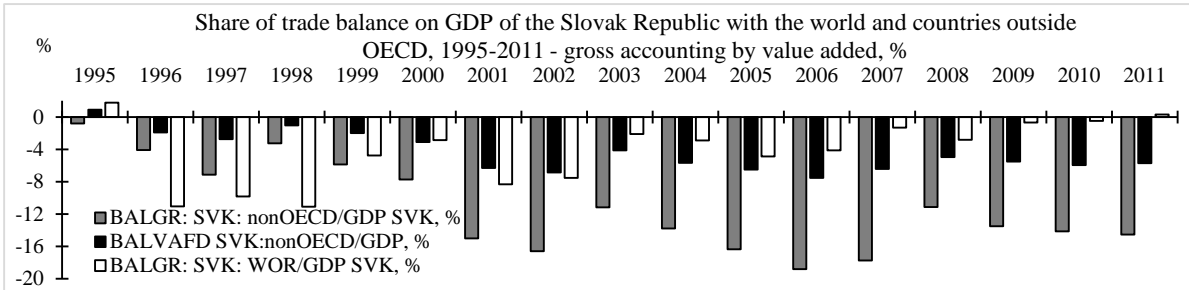
Figure 9 The share of the Balance of trade of the Slovak Republic with the world and with non-OECD countries on GDP - Gross and VA%
Source: compiled by the author according to data from the TiVA database (OECD b, 2018)

The trade surplus with OECD countries and the deficit with non-OECD countries in absolute terms (mil. USD) increased over the reference period. The comparison of the share of the Slovak Republic's balance of trade on GDP with the world, the OECD and the non-OECD by gross weight and value added is shown in the graphs Figure 8 and Figure 9.
The differences between the BOT / GDP ratio by gross - traditional measurement are large. Such a finding raises the need to review the associated macroeconomic problems.

4 Conclusion

The rise in global value chains fundamentally changes the structure of trade flows and makes the analysis of international trade more difficult. It is no longer true that the value of exported goods and services of the country is generated "at home". Traditional gross trade statistics do not reflect the true degree of interconnectedness and interdependence of economies. They do not reflect the actual share of domestic producers and producers from other countries in the final production but also in intermediate products that are subject to export and import.

By breaking down the gross exports and gross imports we found that during the period under review, Slovakia, in addition to the growth of foreign trade itself, reduced the share of domestic value added in exports and proportionally increased the share of foreign added value in exports. This fact indicates that Slovakia's economy is increasingly involved in the vertical division of labour, and in the fragmentation of production between countries.
Within the framework of the export and import of value added there is a repeated shift of the same added value between Slovakia and the world, between Slovakia and the OECD countries

and non-OECD countries, which means that the Slovak economy has become part of simple and complex global value chains.

The observed growing divergences between Slovakia's bilateral gross balances of trade with OECD and non-OECD countries with value-added balances of trade point to the fact that net export earnings should be reassessed because, according to the value added, they are smaller than according to traditional reporting.

Acknowledgements

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Strategies of liquid assets investment by non-profit organization

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Abstract

Non-profit sector is fast growing and developing phenomenon of last decades. It became an inseparable part of economy in many countries and plays an important role in creating working places, satisfying public needs and has a significant share in overall economy. It reaches various spheres such as healthcare, education, culture, environment, development and others. Publications and overall literature about the non-profit sector are becoming more and more plentiful and this sector itself is appealing to create new companies and projects.

Keywords: Non-profits Organization, Business Strategies, Liquid Investment.

1   Introduction

One of the most important parts of a non-profit organization is its management of financial activities. Financial management includes identifying company´s business objectives, defining and measuring its resources, planning various scenarios, budgeting resources to achieve its goals, establishing procedures for collecting and analyzing data, decision-making, controlling the balance and the financial position and allocation of company's financial resources.

The structure of non-profit organizations is different than that in for profit companies. There are two important aspects. Firstly, the main objective is not to earn profit but to accomplish certain mission – help poor, spread knowledge, heal sick but not to "make money" in the first place. Therefore, there are no stakeholders to influence arrangements implementing in order to maximize profits. Secondly, this sector is characteristic with strong public support. A huge part of non-profit companies´ income is represented by financial and non-financial gifts, donations and governmental support. These two aspects make financial management among non-profits different and it requires different approaches.

This paper´s objective is to describe the size, the structure, the investments and expenditures of non-profit organizations by solid empiric indicators in the observed sample. We aim to explain the current situation and investment trends among NPs and identify crucial influencing factors. Also we present the results of non-profit companies´ investments in order to improve general knowledge and understanding of this particular sector´s financial management. And by contributing to this subject we support and encourage other scientific and research capacities to continue and develop these kinds of activities in the future. We focus on investments with liquid assets, assets that can be converted into cash quickly without a lost on its value. Example for

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liquid assets investments are investments in shares of stock, bonds, money market funds and mutual funds etc.

2   Current Global Environment of Non-profit organizations

Current scientific knowledge about non-profit organizations is quite large. The amount and the importance of non-profit organizations have grown significantly in the last century as well as the available literature. In our thesis we were using many different sources to create an objective point of view on the actual situation in the field.

Before 1980 a non-profit research was much more difficult as it is nowadays. This has changed by that year because of a highly research agenda emerged at Yale university, led by a group of social scientists. The primary interest of the Yale Program was to study American philanthropy and to help shape its present and future role in US society. This program began to address the role of non-profit organizations in market economies in a systematic way. Anheier (2005)

One of the most important researches is certainly Johns Hopkins comparative non-profit sector project (CNP). "CNP is the largest systematic effort ever undertaken to analyze the scope, structure, financing, and role of the private non-profit sector in countries around the world in order to enrich our understanding of this sector, and to provide a sounder basis for both public and private action towards it." The purpose of this project is to document, explain, evaluate, and highlight the non-profit sector across the world. CNP started in 1991 and during the time expanded from 13 to 45 countries. 501c Agencies Trust (2017)

Non-profit sector becomes more and more spelled term in nowadays culture. Not just in the literature but the number of new opened non-profit organizations is growing as well. The non-profit sector has grown by 20% over the last 10 years in contrast to a growth rate of about 2-3% in the for-profit sector. Salamon et al. (1999) One of the main reasons of growing trend of this type of organizations is crisis of the state. This crisis is questioning traditional social welfare policies, concerns about the environmental degradation, threaten human health and safety everywhere. Every country is touched at least by one of these dangers however in different measures. While countries on the north are concerned more about environmental policies, on the south we can observe countries struggling with poverty or safety.

3 Non-profit organizations

Even though we defined a non-profit organization, there are many varieties. Known also as the "third sector", the "civil society" or the "voluntary" these notions include many entities - hospitals, universities, social clubs, professional organizations, day care centers, environmental groups, family counseling agencies, sports clubs, job training centers, human rights organizations, and many more.

When regarding non-profit organizations, we can measure them by their influence. At the local level, NP is part of community. They are used for local development and regeneration. We can find many this type of NP in any major cities - in Los Angeles or Milan, among slum dwellers in Cairo or Mumbai or neighborhood improvement schemes in London or Berlin to local councils in Rio de Janeiro where representatives of local nonprofits groups sit next to political party leaders, business persons, and local politicians.

Then we have NP operating on national level. They are involved in health care, welfare, education and public-private partnerships. E.g. private hospital foundations as a means to modernize the National Health Service in the UK, the transformation of state-held cultural

assets into nonprofit museums in former East Germany, and the privatization of day care centers and social service agencies in former socialist countries more generally.

At the international level NP organizations are called INGO - international non-governmental organization. They have outposts around the world to deal with specific issues. The number of INGO increased from 13 000 1981 to 47 000 in 2001. For health there are INGO such as Doctors without borders or Health Right International. For human rights there are Amnesty International, International Federation for human rights or Survival International. There are many more operating in various fields such as education, environment, religion, children and youth and other. Anheier (2005)

Despite of their different purposes, we can find certain common features the NP share:
- **Organizations** – an entity comprising multiple people, such as an institution or an association
- **Private** – they are not possessed by state
- **Not profit distributing** - any profit is reinvested in services or business growth rather than being distributed to shareholders
- **Self-governing** - controlled or ruled by its own members
- **Voluntary** - without being forced or paid to do something. Smith et al. (2006).

3.1 The Non-profit Sector

It is not quite easy to explain why the non-profit sector exists. Furthermore, it significantly participates on every states economy.

U.S. NP EMPLOYMENT vs. EMPLOYMENT IN SELECTED INDUSTRIES, 2010

Industry	millions of persons
Retail trade	14.5
Manufacturing	11.5
NONPROFIT SECTOR*	10.7
Construction	5.5
Finance & insurance	5.5
Wholesale trade	5.5
Transportation	3.9
Real estate	1.9
Agriculture	1.1
Mining	0.7
Utilities	0.6

*50 states and DC
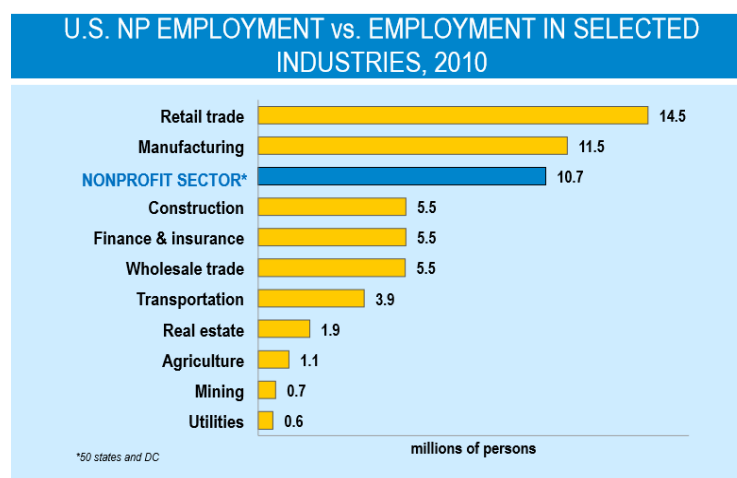
Figure 1 Non-profit sector employment

4 Short-term Corporate Finance and Liquid Assets

Even though there is a huge amount of available literature of liquidity policy and practice, there is just few papers particularly focused on liquidity in non-profits organizations. Notable exceptions are Wacht (1984a, 1984b), Gronbjerg (1991), who notes that growing donative human service organizations require access to liquid reserves to cope with cash-flow problems and Zietlow (1997) discussed also in our paper.

Liquidity is a factor demonstrating company´s ability to receive enough-short term assets to pay short-term liabilities in a certain time horizon. Company must be able to collect enough assets from selling products and services fast enough to finance its operations. We differentiate

market liquidity which defines the speed of buying and selling assets at the market, and accounting liquidity as a measure of company´s ability to pay off debts as they come due, that is, to have access to their money when they need it. In terms of short-term finances, a short-term asset represents an asset that holding lasts at most one year. Accountants use the term "current" to refer to an asset expected to be converted into cash in the next year or a liability coming due in the next year.

4.1 Liquid Assets in Business and Asset management

Liquid asset is an asset that can be exchanged for money in short time period without a loss on its price. Common liquid assets include currencies, commodities as well as debt and equity traded in major exchanges, like the New York Stock Exchange or NASDAQ.

On the other hand, illiquid assets are not quickly exchangeable for money or if they are, they are usually sold cheaper than its true value is. Art, collections, or debt and equity from private, non-exchange traded companies could serve as an example.

Liquid assets have an established market where they are traded. There are many buyers and sellers what ensures that the price of an asset cannot be manipulated. There are two conditions to be classified as liquid asset. First, an asset must be easily transferable for one owner to another and second, liquid asset can be sold without a discount in the price, anyway is considered to be illiquid. Liquid assets pay a lower yield than illiquid assets. This is because investors require higher return on illiquid assets due to increased difficulty of selling it for cash.

Assets are listed in balance sheets by certain hierarchy. At the top, there are the most liquid assets, starting with cash and cash equivalents. Cash is the most liquid asset because it is immediately convertible and widely accepted. Cash is followed by marketable securities, accounts receivable, inventory, fixed assets and goodwill. This classification of assets liquidity is important to creditors and lenders. Amount of liquid assets signifies the ability of company to pay back its short-term debt obligations. To measure these ability liquidity ratios are used. Higher liquidity ratio indicates that a company is more liquid and has better coverage of outstanding debts. However lower liquidity ratios should be a warning sign for investors because it suggests that the company may have troubles meeting its short-term debt obligations and struggle to fund its long-term operations. There are many ratios regarding company´s liquidity and solvency. Among the most common are:

$$Working\ capital = current\ assets - current\ liabilities \qquad (1)$$

Positive working capital indicates that in a case of emergency the company can pay off all of its short-term debts. Current assets are assets that can be exchanged into cash within one year while current liabilities are debts or obligations that are due within one year. A negative working capital suggests that the company is illiquid.

$$Current\ ratio = \frac{Current\ assets}{Current\ liabilities} \qquad (2)$$

Current ratio is the most basic indicator to demonstrate the coverage level of current debts by current assets.

$$Quick\ ratio = \frac{amount\ of\ cash + marketable\ securities + accounts\ receivable}{amount\ of\ current\ liabilities} \qquad (3)$$

The quick ratio differs from the current ratio in that some current assets are excluded from the quick ratio. The most significant current asset that is excluded is inventory. The reason is that inventory might not turn to cash quickly.

5 Conclusion

In both, for-profit and non-profit organizations it is crucial for success to have healthy finances. Non-profit sector is characteristic with its specific products and services and also with its non-commercial status. Even though financial gifts and donations represent a significant part of their income, the biggest part remains the self-financing. Self-financing represent intern form of financing created by company´s own activities. It can be fees collection, renting tangible and intangible property (brand name, know-how) investing, etc. The stronger is the self-financing the strong is the independence of the company.

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Development of financial literacy in preschool age

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Slovakia

Abstract

Financial literacy has a positive impact not only on individuals and their personal decisions, but also on society as a whole. According to different research, Slovakia is below the EU average in terms of financial literacy, and it is therefore very important to focus not only on developing literacy, but developing digital literacy as well as financial literacy. The Ministry of Education, Science, Research and Sports of the Slovak Republic recommends to start already with the development of financial literacy, at the elementary level, in pre-primary education at (preschools) kindergartens. The preschool education of children attending B. Němcovej preschool is concerned on development of positive expressions of children's behavior by internal education project. And one part of the project is specially focused on development of financial literacy of children – the project on which the Faculty of Economics staff takes part – game called "Gold Fever". The paper will present the project itself, its objectives and main outcomes from first realisation of the project.

Keywords: Game-Educational Project, Financial Literacy, Activities, Cooperation, Project-Based Learning

JEL Classification: A29, D12, I25, O15

1 Introduction

According to several studies (Danes and Hira 1987), (Grable and Joo,1998), (Hibbert and Beutler, 2001), (Kerkmann et al., 2000), financial literacy has a positive impact on individuals and their personal decisions, as well as a positive effect on the financial economy and economic growth of the country as a whole. Because of the positive impacts, it is the subject of the interest of several states.

At present, financial education is becoming more and more important, not only for investors, but also for an ordinary family trying to make decisions on how to balance their household budgets, to buy property, to finance education of their children, or to secure income during retirement. The growing sophistication of financial markets means that consumers no longer choose between the interest rates of two different loans or savings plans, but they are offered a number of complex financial instruments for borrowing or saving with a huge range of options. Responsibility and the risk of financial decisions are shifted from government and employers towards employees.

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The responsibilities and risks for the implementation of financial operations and decisions that an individual makes, will have a major impact not only on the future of the individual but also on state as whole (e.g. the current increasing problem of reducing the share of the economically active population and the increasing need to provide pensions for the increasing number of pensioners). If individuals are not able to choose the right savings or investments, they can face the risk of fraud if they are not financially literate. On the other hand, if individuals are financially educated, they are more likely inclined to save and encourage financial service providers to develop products that truly meet the needs of society. This should have a positive effect on levels of investment and economic growth. (OECD, 2006)

The paper objective is to describe financial literacy issues in European Union (EU) space and at the same time the situation in Slovak Republic, in brief. In the content of increasing financial literacy level of Slovak citizens, the Ministry of Education, Science, Research and Sport of the Slovak Republic developed "The national standard of financial literacy", which expands the education system by the aspect of financial literacy. As is recommended, it is necessary to start with education in this area as soon as possible. Therefore, the project "Gold Fever" was designed. The main objective of it is to develop children's financial skills. The project realisation and achieved results will be also the part of this contribution.

2 Research background

In (Basu, 2005), (National Institute for Certified Educational Measurements, 2010) and (OECD, 2006), the financial literacy is defined as the ability to understand the finances, e.g. represents a set of knowledge and skills that enables an individual to make informed and effective decisions and to take effective measures with regard to the current and future use and management of money. Financial knowledge gives individuals the ability to divide their wealth according to the degree of aversion to risk, prevailing economic situation and other personal factors. It also includes everyday processes such as the ability to secure a pension, awareness of the implications of present decisions on future finances, spending decisions, and overview of the labor market. The National Financial Educators Council defines financial literacy as managing the experience and knowledge of financial matters, with the confidence to take effective measures that best match the individual's personal, family, and global goals. (The National Financial Educators Council, 2018)

Financial literacy is structured and composed by three components (Tomášková et al., 2011):
- Monetary literacy — the competencies necessary for management of cash and cashless money;
- Price literacy — the competencies necessary for understanding the price mechanism and inflation;
- Budget literacy — the competencies necessary for the management of the personal or family budget and includes the ability to manage a variety of life situations from a financial point of view.

As is stated in (Insurance Europe, 2017), „*Financial literacy is a core life skill that must be nurtured as early as possible to encourage responsible financial behaviour and to give people the confidence to take control of their finances. Improving the level of financial literacy in Europe is an important societal challenge.*"

In developed countries, financial literacy gains more importance due to new and constantly changing technologies. The Organisation for Economic Co-operation and Development

(OECD) is interested in this field of human life and identified a national strategy for financial education as a nationally co-ordinated approach where is:

- the importance of financial education recognized via definition of financial literacy itself, scope at national level in relation to identified national needs and gaps;
- the cooperation of different stakeholders involved,
- a national leader or co-ordinating body is identified,
- a roadmap to achieve specific and predetermined objectives within a set period of time establishes; and
- a guidance to be applied by individual programmes in order to efficiently and appropriately contribute to the national strategy provided. (Insurance Europe, 2017)

From that point of view, the crucial part seems to be important to incorporate the financial education into national school programmes across whole EU. That is why it was decided to develop and publish a plan to increase financial literacy and improve financial education strategies. In November 2007, The European Commission published "The Survey of Financial Literacy Schemes in the EU27" (Habschick et al., 2007). This document provides an overview of financial literacy in the countries of the European Union. The study has shown that the importance of financial literacy is increasing both for the EU institutions and for the players on the market. (Habschick et al., 2007) Based on this documents, many EU member countries have already recognised the need to raise financial literacy levels and developed appropriate national strategies for financial education (Figure 1).
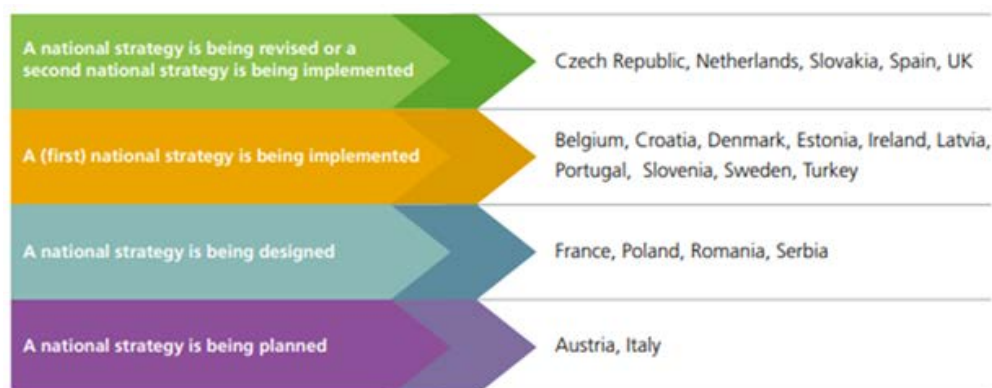
Figure 1 Level implementation of national financial literacy strategies
Source: (Insurance Europe, 2017)

In European Union we could find world's best performers (Sweden, Denmark) as well as those that score below global average (Romania, Portugal) in financial literacy rankings. (Batsaikhan and Demertzis, 2018) Based on these facts European Commission covers various kinds of activities concerned on raise of financial literacy level of EU citizens, especially low-income individuals, women, young people and less educated people tend to consistently underperform in literacy tests, for example eFinLit project (developing online educational platform in financial literacy field), Consumer Classroom (website for teachers across Europe which aims to promote consumer education in secondary schools by providing resources and tools) and EPALE (Electronic platform for Adult Learning in Europe proposes on-line courses in financial education field).

At the same time, many EU member states spread such kind of information via variety of channels (websites, online tools, information campaigns, financial literacy days/weeks, museums, etc.) not only for adults but also devoted to children and young people (OECD,

2016). Based on (Habschick et al., 2007) there are two core and one non-core schemes we located in Slovakia. One targets children through schools, the other core scheme addresses young adults directly.

3 Financial literacy and financial education in Slovak republic

"The national standard of financial literacy" defines financial literacy at Slovak republic is understood as the ability to use the knowledge, skills and experience to effectively manage its own financial resources in order to ensure life-long financial security for self and household. Financial literacy is not an absolute state, it is a continuum of abilities that are conditioned by variables such as age, family culture, or place of residence. Financial literacy is an indication of a state of constant development that enables each individual to respond effectively to new personal events and constantly changing economic environment. (Ministry of Education, Science, Research and Sport of the Slovak Republic, 2017b)

According to research (OECD, 2017) (the latest PISA monitoring on financial literacy), Slovakia is placed below the EU average in the field of financial literacy (Figure 2).
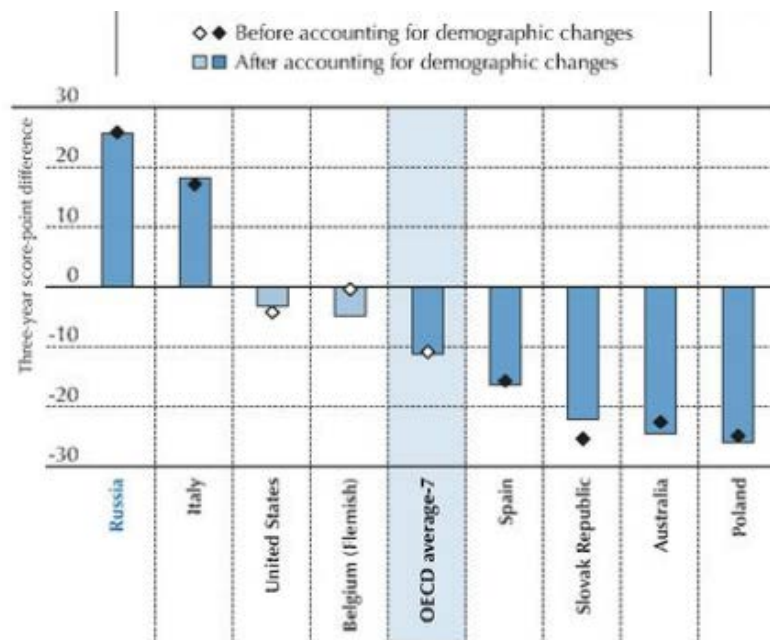
Figure 2 Change between 2012 and 2015 in mean financial literacy performance
Source: (OECD, 2017)

As is shown in above figure, compared to 2012, the value of Slovakian financial literacy continues to decline. It is therefore very important to focus not only on the development of ordinary kinds of literacy (literacy itself, digital literacy) but also on the development of financial literacy as well. The low level of financial literacy brings with it consequences not only for the individual but for the whole society. It is therefore obvious that the management and promotion of financial education is the role of the state and goverment. Ministry of Education, Science, Research and Sport of the Slovak Republic, in co-operation with the inter-ministerial expert group, has therefore prepared "The National Standard of Financial Literacy". This document contains, in addition to a developed model of education for pedagogical staff for financial literacy issues, also a strategy of education in the financial area for lifelong guidance, including a standard in the national qualifications system. (Ministry of Education, Science, Research and Sport of the Slovak Republic, 2017b)

"The National Standard of Financial Literacy version 1.2" (Ministry of Education, Science, Research and Sport of the Slovak Republic, 2017b) is divided into topics that contain partial competencies. Individual competencies contain expectations regarding the knowledge, skills and experience that graduates should meet, such as: finding, evaluating and using financial information; know the basic rules of managing their own finances; learn to recognize risks in managing their own finances; set financial targets and plan to achieve them; to develop the potential for self-reliance and the capacity to enhance; effectively use financial services; to meet its financial obligations; to know the conditions, excluding the failure of an individual and a family; understand the basic concepts of finance and the world of money; orientate in financial institutions (NBS, commercial banks, insurance companies and other financial institutions) and issues associated with the protection of consumer rights and be able to exercise these rights. Expectations are divided into reference levels according to the International Standard Classification of Education (ISCED):

- ISCED 1: 1st grade of elementary school,
- ISCED 2: 2nd grade of elementary school and lower grades of 5 to 8-year grammar schools and conservatories,
- ISCED 3: 4-year grammar schools, higher grades of 5 to 8-year grammar schools and conservatories (UNESCO, 2015)

Besides official education institutions, the financial education is cover by various supportive initiatives and project covering not only children and young people but also adult Slovak citizens.

3.1 Education towards financial literacy in Slovak preschools

With the development of financial literacy, at elementary level, it is recommended to start already in pre-primary education at preschools. (Ministry of Education, Science, Research and Sport of the Slovak Republic, 2017a). Given that "The National Standard of Financial Literacy" clearly defines the educational model in this area just from the school age of the child, the way in which the financial literacy in the preschool will be developed, remains at the preschool itself. From the point of view of the specifics of the preschool age, the development of financial literacy can not be implemented separately, it has to overlap across all learning areas and their effective integration should work in education and training.

The main method for developing financial literacy at this age is the game, linked to the direct experiences of children from their ordinary life. One of the forms of a thoughtful, systematic and purposeful development not only of financial literacy but of the overall development of a child's personality is a project. The project is characterized by the selection of the elements that are stacked into the system, taking into account the relationships towards the given objectives, emphasizing the game as the main activity of the child. The selection and arrangement of the games are directed by the teacher and they should be interesting for the children and stimulate the activity and the discovery process.

3.2 Internal education-gaming project of preschool B. Němcová of Košice

At the preschool B. Němcová of Košice, during the whole academic year, the education-gaming project "Poďme sa spolu hrať" ("Let's Play Together") is realized. Through games that are interconnected, systematically graded, positive behavioral habits are developed in children, such as establishing friendly contacts, being able to agree, mutual help, sharing the toys, self-control, ability to obey, self-discipline, perseverance, ability to complete an activity. At the same time, within the project, financial literacy is also systematically developed. The project is designed as interconnection of games — Shop (Market, Fruits-Vegetables, Game shop,

Christmas market, Grocery, Flower shop, Information center, Ticket office, Pharmacy), Household, Travelling, Library, Environmentalists, Crafts and other different jobs. Via these games children acquire knowledge, skills and experience, such as:

- market, business and social behavior observation,
- identification of coins, banknotes, knowledge of the Slovak Republic currency, design of money, the way how are the money, wallets, payment cards made,
- ATM observation and the principle of money collection,
- development of a playground — a game, symbolic money and goods,
- knowledge of basic occupations, crafts, value of money in relation to paid work,
- the ability to divide, save, manage, borrow, trust,
- obtaining information through information and communication technologies, comparing with own experience and with other sources and others.

Financial literacy within this framework is related to terms of family, dignity of a person, healthy lifestyle, work, employment, leisure, hobbies, duties, dressing, transportation, travel, nature, poverty, wealth and more. Important ways of developing financial literacy are games, fairy tales, stories, proverbs, pendants and positive patterns in everyday life. The project greatly affects value orientation, creating positive values that are important for the quality of life of a child in the society's perspective. A short-term project was prepared in connection with the aforementioned education-gaming project and its realization confirmed the importance of preparation, system and quality in the education and training activity.

3.3 "Gold Fever" project

"Gold Fever" project was realised in garden of preschool B. Němcovej 4 of Košice under cooperation of preschool and Faculty of Economics, Technical university of Košice. The main objective of the project was to develop basic financial skills by playing the game — earn the money and spend the money of your own decision.

Project realisation could be summarised into 5 main phases containing different activities (Figure 3).

Figure 3 Schematic illustration of the project Realisation
Source: own

After the game was prepared, the children were presented with the basic rules of the game. Consequently, they were briefly introduced where they could get the money and where to spend them. During the whole game, children worked with a special currency (created for the project purposes only) named "Boženka", respectively they could also use their own credit card specially designed and issued for this purpose. Every child had its own account in bank (online database registering all transactions during project), where the necessary transactions took place

according to the activity of the child, i.e., credit or debit notes. For the entire game, the children had a time limit of 2.5 hours. During the game, children separately decided how to get money, how to spend them, and whether they would use cash or a credit card for transaction operations. In case of finance shortage at account, children were informed about the deficit and navigated to one of money-making location. In case of interest, the children could visit the bank, where they could visually check the account status or insert, resp. withdraw cash from their account.

3.4 Results

Children earned 1913 coins in total and spent 904 coins. The remaining currency units were saved at their bank accounts. The available game time was used differently, some children, as soon as they got enough money, went to the spending place and after a minute they went back to get more money. Some children first went through all the earnings positions, and spent the next part only on spending. There were children who spent much more time spending and their spending was minimal.

From all children, the most active in getting money were 5-6-year-olds (Figure 4 left). The least earned 2-year-olds, they needed help of adults. Because of age, it's natural, that the attention and focus of these children is considerably lower and they spent the most time searching for treasure (golden stones) and spent most of their earnings in the shop (it was a demonstration in the past of the skills gained from the game Shop).

The similar situation came out also in case of spending, where 6-year-olds spent much more money — their spending represents 44,69% of all spent money and they are followed by spending of 5-year-olds (31,64%). Again, the least spent 2-3-year-olds; they needed help of adults.
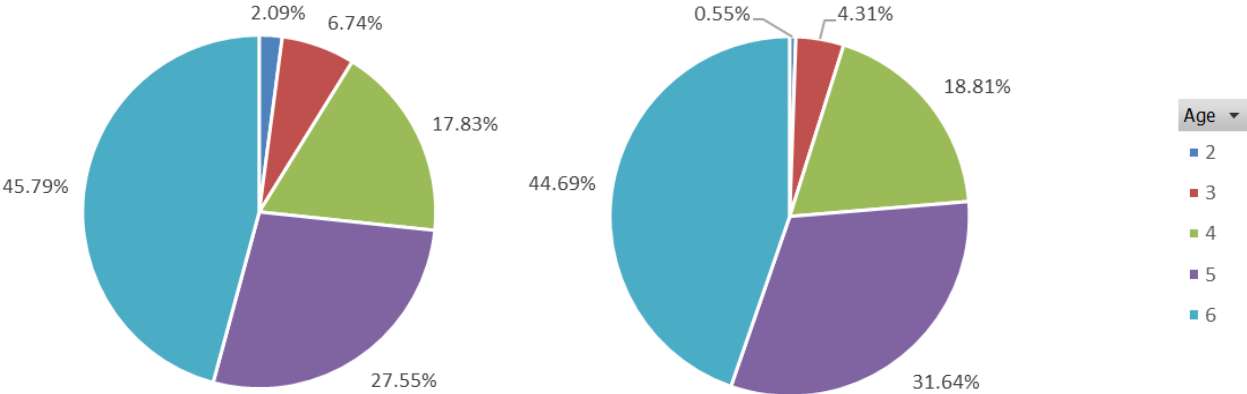
Figure 4 Participation of children in income (left) and outcome (right) by age
Source: own

Based on the obtained data, it can be stated that the most finances were earned by the children for the treasure hunting (searching for the gold stones), at least the children's money was gained by the logical activity (folding Tangrams). Figure 5 shows the percentage of other activities on the overall earnings method relative to the child's age.
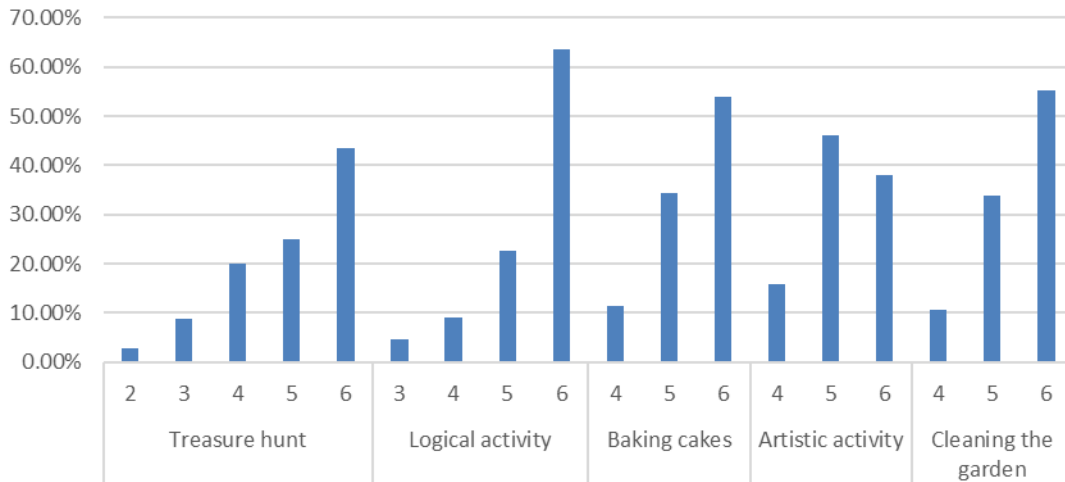
Figure 5 Percentage of children on individual income activities by age
Source: own

On the other hand, it was very interesting to analyse how the children spent their earned money. Most children spent money in the shop. It was up to 42.70% of total spendings. In car rentals, children spent 25.77% of their expenses, followed by cableway with 16.81%, nail painting and make-up represents 7.74%, and 6.97% of children spent money on target shooting with the toy gun. As in the case of income, it was interesting to track the results of the percentage representation of individual spending activities with respect to the age of the child (Figure 6). The most of spendings were realised by 5-6-year-olds, while the smallest, 2-3-year-old children, had the least expenses, and did not paid for advantage of some of activities (for example, the cableway).
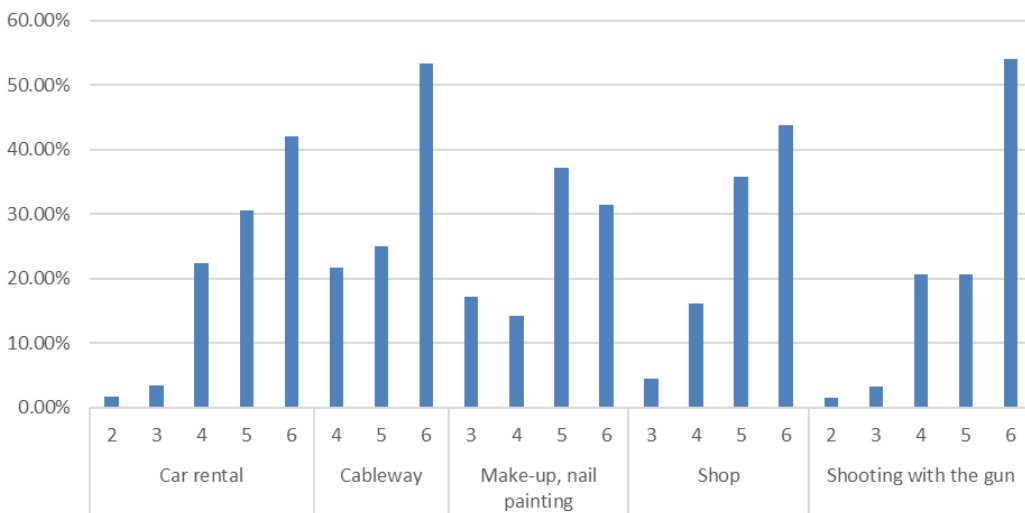
Figure 6 Percentage of children on individual outcome activities by age
Source: own

The project and its outputs directly affected children, teachers and parents. The implemented games did not bring the final solutions to the children, but encouraged them to actively solve problems and to discover. During the games, children had the opportunity to see and test themselves how digital technologies blend into real life with their game (the mobile app was used to check children's account status). The game brought them possibility to use their knowledge and skills in cooperation, complying the rules and focusing on the game.

The project provided the opportunity to concentrate attention on the child, but also on the groups on the practical activities of the children. The development of financial literacy has an overlap in all educational areas. Teachers had the opportunity to see and use various educational strategies, the preparation of the environment, the use of tools, including information and communication technologies.

The project realisation provided another way how to create space also for preschool parents' cooperation (the project was designed as practical realisation of some parents' idea). Parents have found that developing literacy at an elementary level is possible and necessary also in preschool age. By presenting the project at the preschool environment, the parents were informed how their children could develop their financial literacy by using easy rules and games. The greatest benefit, however, is the child as a source of information, abilities, experiences and emotions.

4 Conclusion

Preschool age is an important period that provides many opportunities and challenges for build a foundation not only for elementary school education but also for later quality life in a society. Preschool is an institution that creates the conditions for optimal development of the child. From the point of view of financial literacy, it is the foundation of financial literacy, financial habits and orientation in the financial world. Early childhood children start to perceive money, banks, banknotes, coins, payment cards and ATMs. A preschool-age child acquires the basics of mathematical knowledge and skills that build on mathematical thinking, logical thinking, numerical comprehension, simple number operations, algorithmic thinking, what is necessary also for higher level of financial literacy (OECD, 2017). However, financial literacy in preschool can not suffice only with numbers; it is a wider context than orientation in the financial world, products, services, but also the development of the ability to choose the best solution, to consider circumstances, to compare with personal experience, the ability to decide.

This paper presents our practical experience with financial literacy development via gaming project "Gold Fever". Its realisation was benefit for all participators – children, teachers and parents. And at the same time it was an example how can cooperate educational institution from different parts of educational system using different educational access. The cooperation on expert and collegiate level created project that points out and promotes a wide range of opportunities for developing children's competences in the field of financial literacy.

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Impact of selected indicators on savings in the capitalization pillar of the pension system in Slovakia

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Abstract

The aim of this paper is to analyse the impact of fees and incomes on the final amount of pension savings. The subject of the study is overall analysis of the issue in the field of old-age pension savings, focusing on the final amount of pension savings. The analysis also includes changes in factors that affect the final amount of pension savings. The analysis and comparison of pension fund performance were created using the Sharpe Index. In addition to the assessment of pension funds based on the Sharpe Index, amount of pension savings calculations were created on the basis of current legislative conditions. Changes in individual factors and their impact on the final amount of pension savings were also examined. The effort was to highlight how the selected factors affect the final amount of pension savings on the saver´s personal pension account in the second pillar of the pension system in Slovakia.

Keywords: Pension System, Second pillar, Capitalization Pillar, Pension Funds, Sharpe Index, Fees, Incomes.

JEL Classification: H55, J32, C60

1 Introduction

Over the past two decades, as part of the reforms to strengthen the sustainability of pension systems, several Member States have sought to involve the social partners and individual citizens more systematically in the pension system by extending the role of savings, privately managed schemes. Pension provision, which is financing from private sources, can was considered as contributing to the provision of adequate and sustainable pensions, as it is mentioned document of European Comission (2010).

The amount of a person's savings account depends on the current legislation in force which concerns the second pillar, and on the savings assessment strategy (Does a saver have a positive/neutral/averse relationship to risk?). This relation particularly determines to which funds savers invests its money for assessing and subsequent reinsurance in old-age. It is

important at first to evaluate the performance and risk of pension funds, for example, using the Sharpe index. Using the Sharpe index has inspired by the Study of Mutual Fund Schemes: An Empirical Evidence, available in the Social Science Research Network. Authors of the Study: An Emperical Evidence suggested a simple approach to measuring the performance of mutual funds using the Shapre index and Treynor index. In our study, we suggest an approach to measuring the performance of pension funds using the Sharpe index.

Introduction should provide wider context, substantiation of the need of writing and publishing the paper, its goal.

2 The pension system in Slovakia

In Slovakia, the pension system consists of three pillars:
- I. pillar (mandatory):

The first pillar is PAY-AS-YOU-GO pension system, administered by the Social Insurance Agency.
- II. pillar (mandatory):

The second pillar is private, capitalization pillar administered by pension fund management companies. It has been working in Slovakia since 1 January 2005.
- III. pillar (voluntary):

 A person can also be retired in supplementary pension insurance, regardless of whether a person decides to enter the 2nd pillar or remains contributing only to the Social Insurance Company (1st pillar). The third pillar is dministered by the supplementary pension companies.

In private pension savings, also called the second pillar, the saver pays the costs in the form of three types of fees, the height of which is provided by law:

- Fee for managing a personal pension account, which may not exceed 1% of the amount of contributions credited to the unrecorded payment account, before credited pension units are credited to the personal pension account of the contributor.
- Fee for managing a pension fund may not exceed 0.3% of the average annual pre-emptive net asset value of a pension fund.
- Fee for valuation of pension fund assets. It changes every working day according to the formula stated in the law (in percentage terms it is 10% of the realized valuation of the assets in the fund).

Fee for valuation of assets in the pension fund can only be charged by the pension fund management companies when the assessment of the assets in the pension fund according to the formula given in the law will have a positive value.

Each pension management company is obliged to create four types of pension funds:
- Growth pension fund,
- Balanced pension fund,
- Conservative pension fund,
- Index pension fund.

Pension funds are different in the composition of their investment policy, which is associated with different levels of risk for each of them. Legislatively, there is also a limited possibility to be in an unsecured or non-guaranteed pension fund for several years before retirement, and with

the approaching retirement age forecast, resources need to be transferr from unsecured or non-guaranteed pension funds to a guaranteed (conservative) pension fund.

2.1 Sharpe index

Horáček writes "the Sharpe Index (SR, Sharpe Ratio) or the Volatility Ratio is the premium rate for the risk exposure of the portfolio. Sharpe index was created by prof. William Sharpe, who was one of the three economists who received the Nobel Prize for economics in 1990 for their contribution to the theory, which is called Modern Portfolio Theory. The Sharpe index is calculating according to the formula 1.

$$SR\_i=(r\_i^d-r\_f)/\sigma\_i \hspace{2cm} (1)$$

where:
r_i^d – average asset return,
r_f – risk-free interest rate,
σ_i – standard deviation.

Horáček also writes "the Sharpe index is used to determine how well the portfolio's return compensates the investor for the risk involved. This indicator takes into account the risk profile of the investment. The Sharpe index is an indicator that compares to the Sharpe index of another fund or benchmark. The higher the Sharpe Index, the greater the return per unit of total risk the investor has received. The negative value points to the fact that non-zero risk means that the investment will yield less return than a risk-free asset. Sharpe index greater than 1 is good, more than 2 very good, and more than 3 is considered excellent." Horáček, (2010)

For the calculation of the Sharpe index, it was necessary to collect the data for the period from the beginning of the second pillar, from 2005 to the present, until 2017. Data were reached primarily from the National Bank of Slovakia database and from the data available on the Savings Manager website and from the European Central Bank database. It was necessary to calculate the cumulative average annual return. Income returns data for each fund was published on a daily basis and it was necessary to adjusted it on an annual basis. With adjusted data, it was possible to calculate cumulative average annual returns.

Cumulative average annual returns has been calculated for all types of pension funds that pension management companies in Slovakia offer - growth, balanced, conservative and index pension fund. Briefly, we present the calculations for the Growth Pension Fund offered by six pension management companies on the Slovak market.
An overview of the average annual returns of the growth pension funds of all pension management companies can be seen in Table 1. The average annual return of growth pension funds was between 0,159% (AEGON Growth Pension Fund in 2009) to 3,531% (VUB Growth Pension Fund in 2017). The lowest standard deviation (volatility) was reached by Poštová banka's growth fund (1,611%), but despite the lowest volatility, this fund did not reach the highest value of the Sharpe index. The second lowest volatility (1,720%) reached the Aegon Growth Pension Fund and did not reach the highest (best) value of the Sharpe index. The AXA growth fund, with a Sharpe index of 1,301 and a volatility of 1,812, which is the third lowest volatility of the funds compared, reached the highest value of the indicator.

Table 1 Performance of Growth Pension Funds in % (2009-2017), Standard Deviation and Sharpe Index

	Aegon	Allianz	AXA	DSS Poštová banka	NN	VÚB
2009	0,159	0,879	0,737	0,407	0,437	0,701
2010	0,280	0,963	0,799	0,520	0,575	0,863
2011	0,383	1,042	0,898	0,629	0,700	1,031
2012	0,547	1,181	1,027	0,781	0,857	1,242
2013	0,709	1,357	1,198	1,002	1,038	1,496
2014	0,952	1,718	1,478	1,323	1,357	1,921
2015	1,358	2,318	1,908	1,804	1,844	2,555
2016	1,633	2,691	2,255	1,899	2,205	2,971
2017	2,038	3,324	2,645	2,207	2,708	3,531
Volatility	1,720	2,581	1,812	**1,611**	2,140	2,550
Sharpe Index	0,350	0,552	0,632	**0,547**	0,472	0,596

Comparing performance of pension funds with the Sharpe index was determined by a pension fund management company, which manages the most efficient old-age pension savings funds. Based on the results, we chose one pension management company. Historical returns of selected pension management company were applied to calculations on the model sponsor.

3 Factors affecting the amount of pension savings

Table 2 shows an overview of the factors that, according to the author Pavlikova (2007), affect the amount of saver´s personal pension account over the period from 2005 to 2017 (present). The model saver has entered the old-age pension saving scheme (second pillar) at the age of twenty-two in 2005 (from the beginning of the second pillar). The average nominal monthly wage in the Slovak Republic in euros for the selected period was reached from the archive of the Statistical Office of the Slovak Republic (2018). The annual growth rate of the nominal wage in the Slovak Republic in % was calculated according to the macroeconomic forecasts of the Ministry of Finance of the Slovak Republic (2018). The amount of contribution to the second pillar, Social Insurance Fee, fee for managing personal pension account, fee for managing pension fund and fee for valuation of pension fund assets were mainly derived from the Old-Age Pension Savings Act. Information about the most significant legislative changes in old-age retirement savings were reached from the Ministry of Labor, Social Affairs and the Family of the Slovak Republic (2018).

The data in Table 2 is showing in the monthly amount. Due to the long-term review, it was necessary to convert this data into an annual base for calculating the amount of savings on a personal pension account.

We assume, that the variables affecting the final amount of pension savings are the number of contributing years to the second pillar, the average nominal wage in the Slovak Republic expressed in euro, the annual growth of the average nominal wage in the Slovak Republic expressed in %, the amount of the contributions to the second pillar, the monthly social security fee, fee for managing personal pension account, fee for managing pension fund, fee for valuation of pension fund assets and pension fund incomes. The data source was the Act on Old-age Pension Savings, the Statistical Office of the Slovak Republic and the Ministry of Finance. The model saver has not reached retirement age (he entered the second pillar as a twenty-two year in 2005 and can retire in 2045) we had to estimate the data after 2017 for the next period. For example, an estimate of the average wage was calculating by averaging the year-on-year change in the average wage (from 2005 to 2017). The same procedure was also

using for the variable incomes of pension funds. Estimates of variables that represent the costs for the saver were determined differently. In the future, it is possible to change the amount of contributions and fees because they are affected by legislation in force. Limits for fees are currently set by law at the maximum level. The evolution of the amount on the final pension account has been monitored for the reduction of fees (fees may also be increased). Changes in the height of variables affect the final amount of pension savings.

Table 2 Overview of the factors affecting the amount of pension savings

Age	Year	Average nominal monthly wage in the SR in €	Annual growth rate of the nominal wage in the SR in %	Contribution to the second pillar / mth.	Social Insurance Fee / mth.	Fee for managing personal pension account / mth.	Fee for managing pension fund / mth.	Fee for valuation of pension fund assets /mth.
24	2005	**573,39**	9,16%	9,00%	0,50%	**1,00%**	**0,075%**	5,60%
25	2006	**622,75**	8,61%	9,00%	0,50%	**1,00%**	**0,075%**	5,60%
26	2007	**668,72**	7,38%	9,00%	0,50%	**1,00%**	**0,065%**	5,60%
27	2008	**723,03**	8,12%	9,00%	0,50%	**1,00%**	**0,065%**	5,60%
28	2009	**744,50**	2,97%	9,00%	0,50%	**1,00%**	**0,025%**	5,60%
29	2010	**769,00**	3,29%	9,00%	0,50%	**1,00%**	**0,025%**	5,60%
30	2011	**786,00**	2,21%	9,00%	0,50%	**1,00%**	**0,025%**	5,60%
31	2012	**805,00**	2,42%	4,00%	0,50%	**1,00%**	**0,025%**	5,60%
32	2013	**824,00**	2,36%	4,00%	0,25%	**1,00%**	**0,025%**	10,00%
33	2014	**858,00**	4,13%	4,00%	0,25%	**1,00%**	**0,025%**	10,00%
34	2015	**883,00**	2,91%	4,00%	0,25%	**1,00%**	**0,025%**	10,00%
35	2016	**912,00**	3,28%	4,00%	0,25%	**1,00%**	**0,025%**	10,00%
36	2017	**954,00**	4,61%	4,25%	0,25%	**1,00%**	**0,025%**	10,00%

Source: Custom processing based on available data

Table 3 shows the sum of the contributions to the capitalization pillar (second pillar), the amount of fees, the amount of savings, the amount of the final (assessed) savings and the % of the savings assessment by the different risk relation.

The relationship to risk is different for each saver. There is a saver who has a negative relationship to risk and his savings is assessing only in the conservative pension fund or has a positive risk relationship, and his savings first assess on the growth pension fund and 10 years before retirement the pension fund moves annually to a guaranteed fund (provided by law) by 10% intervals. Or has a positive relationship to risk and invests its savings first in the growth pension fund, from 2012 (from the beginning of index funds) invests savings in the index pension funds and 10 years before retirement, their saving from the index pension fund moves annually to the guaranteed fund by 10% per year (this is set by law).

The saver is part of the second pillar for 40 years. Historical data was available in twelve years. It was necessary to estimate 28 years to the future. Estimates of pension fund returns were based on averages and conversions on an annual basis. We also used estimates from the financial analyst Marián Búlik.

In the first situation, the saver is assessing its savings in the Growth, Index and Conservative Retirement Fund. The average cumulative annual return on indexed pension funds was 3.99%.

In the second situation was the income 5% (according to Marián Búlik's estimation). In the third situation was the income 7% (according to Marián Búlik's estimation (2018)). In the last situation, we have increased the income estimated by financial analysts by 1% to 8%.

Table 3 The amount of savings on the final personal pension account and different risk relation

Pension fund	Contributions	Fees	Savings	Assessed Savings	% of the Savings Assessment
Conservative	43 383,51	564,38	42 819,13	43 527,21	1,65%
Growth	43 383,51	564,21	42 819,30	43 323,06	1,18%
Index (3,99%)	**43 383,51**	**565,06**	**42 818,45**	**44 098,97**	**2,99%**
Index (5,00%)	**43 383,51**	**565,14**	**42 818,37**	**44 336,57**	**3,55%**
Index (7,00%)	**43 383,51**	**565,24**	**42 818,27**	**44 811,71**	**4,66%**
Index (8,00%)	**43 383,51**	**565,28**	**42 818,23**	**45 049,27**	**5,21%**

Source: Custom processing based on available data

4 Conclusion

The content of the article is an analysis of old-age pension savings (second pillar), focusing on the impact of fees and incomes on the final amount of pension savings. A saver is assessing his savings in pension funds. Incomes for the saver mean the incomes of individual pension funds. It is not necessary to say that revenue represents an increase in finance, but the return on investment does not always reach positive value. The financial crisis that shook the financial markets in 2008 marked the value of savings in second or third pillar. In the second pillar, costs are incurring by the saver in the form of fees (Social Insurance fee, fee for managing personal pension account, fee for managing pension fund and fee for valuation of pension fund assets). The amount of the fees is setted by the Act on old-age pension savings at the maximum amount, so retirement management companies can also set lower fees. All pension management companies have decided to set a maximum amount of fees. At present, it is not possible to talk about competition in the form of reduced fees. To select the "right" pension management company Sharpe index was using. We assume, that the variables affecting the final amount of pension savings are the number of contributing years to the second pillar, the average nominal wage in the Slovak Republic expressed in euro, the annual growth of the average nominal wage in the Slovak Republic expressed in %, the amount of the contributions to the second pillar, the possibility of transferring savings within one pension management company to different pension fund, or transfer to another pension management company and also incomes and fees. Legislatively, there is also a limited possibility to be in an unsecured or non-guaranteed pension fund for several years before retirement, and with the approaching retirement age forecast, resources need to be transferr from unsecured or non-guaranteed pension funds to a guaranteed (conservative) pension fund. After the entry into the labor market, a saver should assess savings in more risky pension funds, such as index pension funds. The results of the calculations point to the highest final level of pension savings for the index fund. If the fee for the managing of the personal pension account and the fee for the managing pension fund is reducing, the final amount of the pension savings increases. In the recent past, fees have been reduced. Fees are currently set to the same amount, although the legal limits are set, not the specific values. When selecting a pension management company, it is currently important to choose the one that achieves in the long time of period a positive appreciation of savings on the saver´s account.

Better assessment can bring better opportunities for retirement. Positive revaluation can be lead to pension funds, which are also associated with higher risks. In a short time period can be achieved negative incomes. Therefore, the state does not allow to being in risk funds in a period close to reaching the planned retirement. The State safeguards the savers against market fluctuations. There is an option to change your pension management company. In a period of less than one year the change of the pension management company is free of charge. The saver has limited options to influence the amount of fees, but the fee for the index fund is lower (0.2% per annum) as a fee for a conservative, balanced and growth fund (0.3% per annum). On the other side, this fund is riskier and the contributor pays a higher Fee for valuation of pension fund assets.

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Duration analysis as a dynamic method of interest rate risk management in bank

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Abstract

The article outlines the application of the duration analysis in the risk management of interest rate in the bank's balance. It appears that the utilization of the duration method in evaluating risk associated with the interest rate can significantly support the process of managing such risk and especially create the basis for more precise estimate of the impact of interest rate fluctuation in large fixed income portfolios on financial result. The key objective is to explain how this dynamic method could be practically used, when measuring the interest rate risk of fixed income financial instruments. The evaluation of interest rate risk was conducted on the basis of financial reports of a selected cooperative bank with the use of the duration method and traditional gap method to determine the mismatch in the term re-forecasting of assets and liabilities.

1 Introduction

The financial services sector represented by banks and financial institutions has an important impact on the development of the debt market. Even more, important for those entities is the problem of adequately forecasting the risk of interest rate. Other entities small or medium businesses or even large producing, servicing and trading companies, even if they recognize interest rate risk, they very often don't devote resources to analyzing it (Kalinowski, 2009, p. 95-117). Banks are a separate case where interest rate risk is next to credit risk and liquidity risk, or currency risk a key element of banking risk (Jackowicz, 1999, p. 31-41). Measuring this type of risk comes down to the utilization of gap analysis of mismatch of maturity terms revaluation of assets and liabilities. Such thesis refers, especially to banks, which lead a traditional banking practice, such as cooperative banks, which do not have particularly sophisticated and advanced methods of analysis and assessment of such risk. Other methods, if they find application in those businesses, then they usually do it in a limited way - generally in the assessment of single financial instruments or their portfolios, and not in terms of assessing the balance of the bank.

In this article the nature of the duration analysis was shown, in its application in managing of the bank's balance on the account of interest rate risk in fixed income area. The author recognized, that the tool has imperfections, nevertheless the research on interest rate risk could significantly support the process of management of such risk, and most of all creates the basis to a more precise assessment of the sensitivity of the financial result and capital with relation to interest rate movements for businesses with large portfolios of fixed income instruments.

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2 The essence of the duration analysis

Investment risk is discussed if and when the difference between the estimated rate of return of the given financial instrument and the actual rate of return is positive. The risk is a consequence of the interest rate change in financial market and is indissolubly related to financial instruments, which value is dependent on the shaping of interest rates. The influence of interest rate changes on the financial situation of the business and especially a bank, could be both negative and positive. In result of an unfavorable shaping of interest rates the financial result and equity capital of the entity could decrease. However, interest rates changes could turn out to be positive for the business and it is dependent on the direction of the change and relationship between assets and liabilities.

The basis of duration analysis is an indicator, which has time dimension (D) and is calculated in the following way[2]:

$$D = \frac{cA\sum_{t=1}^{m} t(1+r_0)^{-t} + Am(1+r_0)^{-m}}{cA\sum_{t=1}^{m}(1+r_0)^{-t} + A(1+r_0)^{-m}} \qquad (1)$$

where:
A - nominal value of the debt instrument,
c - fixed nominal interest of the financial instrument (for all t=1, ..., m),
m - the duration of the financial instrument,
r_0 - market interest rate.

Value D is calculated according to formula above and was first coined in American literature by R.F. Macaulaya (Macaulay, 1938, p. 44) as duration and is most commonly currently used literally as such. From a formal point of view, the indicator constitutes weighted average of terms of payments from the ownership of debt investment, which weights are the current values of these benefits. Based on this formula, key determinants of duration for debt instruments include:

- payment schedule - interest and resulting from the redemption of financial instrument,
- the duration of the financial instrument until maturity m,
- the coupon rate c,
- the market interest rate r.

So that an investor could limit the interest rate risk, he would need to accordingly with the duration analysis precisely define the factors shaping the average horizon of the investment such so that the duration of investment matched the investor's intended plan. Investment strategy based on the indicator D suggests that an investor could reduce the risk of interest rates change by choosing such a debt investment for which D will be compatible with his investment horizon. In such situation in the event of interest rate change the investor will receive a return at least equal to the return calculated when making the investment. Indicator D defines the moment in the duration of the debt investment, during which, this investment achieves its final value on the minimum level.

Assuming the investor's initial capital K_0=1,000 PLN, which he intends to invest in bonds with fixed interest for eight years and current market interest rate amounts to r_0=0.08, then the

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[2] Broader on the subject of deriving formula for D for single debt instruments and their portfolios see (Pielichaty, 2012, p. 69-91).

calculation of the investment's duration D, which according to the duration strategy will ensure immunization against interest rate change in the market, will be the following:

$$D = \frac{1}{1,000}\left(0.08 \times 1,000 \sum_{t=1}^{8} t \times 1.08^{-t} + 1,000 \times 8 \times 1.08^{-8}\right) = \frac{6,206.37}{1,000} \approx 6.2$$

This means that if the buyer of the given bond with coupon interest c=0.08, which is the same as the market rate r_0, and expiry term m=8, the investor intends to close it after time T=6.2, then the investment will be fully immunized against interest rate risk change. In table 1 final values were calculated for T=6.2 against various levels of interest rate r.

Table 1 Final value of the investment at floating level of market interest rate for T=6.2

r	0.05	0.06	0.07	0.08	0.09	0.10	0.11
$K_{6.2}(r)$ -PLN	1,615.6	1,613.4	1,612.0	1,611.5	1,611.8	1,613.0	1,615.0

Source: own work

According to data when market interest rate won't change ($r=r_0=0.08$), then the investor will achieve the smallest final value of the investment PLN 1,611.5 calculated according to formula:

$$K_0(1 + r_0)^D = 1000 \times 1.08^{6.2} = 1,611.5 \; PLN$$

Average term of redemption (D) is defined by that moment during the investment term, where interest and currency effects mutually compensate one another, the real value is not smaller than the one set when investment was made.

3 Research methodology

This research was conducted on the example of selected cooperative bank X[3]. In the study, the data coming from the balance of losses and gains, were done for a specific balance day. The empirical data used in calculations related to the position of assets and liabilities with fixed interest.

The calculation of duration gap was conducted so that after working out the average weighted terms of maturity (or redemptions) and nominal interest rates in a given group of loans and deposits at a specified cash flows - internal rate of return was calculated for the entire portfolio of assets and liabilities at fixed interest. In order to calculate the duration gap it was assumed that the changes in revenues and interest costs are connected to changes in market return rate- understood as average weighting to maturity term of assets/ redemption of liabilities offered by the bank.

In this article, the results were presented only for the influence of interest rate on the interest result of the bank. To assess the impact of interest rate change (Δr) on the interest result of the bank, using duration analysis, the following formulas were used to calculate interest revenues (PO) and costs (KO) changes over the course of a year:

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[3] Due to a lack of suitable authorization, the author is unable to quote the real, full name of the bank.

$$PO = PV_A \times (Number\ of\ days\ in\ a\ year - D_a) \times \Delta r \qquad (2)$$

$$KO = PV_P \times (Number\ of\ days\ in\ a\ year - D_p) \times \Delta r \qquad (3)$$

where:

PV_A − current market value of assets,

PV_P − current market value of liabilities,

D_a, D_p − Macaulay duration accordingly for assets and liabilities.

From the difference between the above equations the whole impact of interest rates change on the interest result of the bank (WO) was calculated[4]:

$$\Delta WO = PV_A \times (Number\ of\ days\ in\ a\ year - D_a) \times \Delta r - PV_P \times (Number\ of\ days\ in\ a\ year - D_p)(4)$$

Equation (4) has a value that more broadly describes the phenomenon of net revenue changes due to the influence of interest rates change. Not only the changes of revenues but also costs are considered as well as changes of the market values for assets and liabilities.

This research was conducted with the use of duration analysis as well as classic gap method of mismatch, which is commonly used in banks, especially those banks that lead a traditional banking practice. It is based on the collation of positions of assets and liabilities in specified time ranges according to the change in value and gauging a cumulative gap of the assumed maturity terms, consequently showing the impact of the mismatch on the equity capital of the bank and financial result in a changing interest rate environment.

4 Research results

In table 2 the results of calculations were collated in order to assess the sensitivity of the financial result of the bank to interest rates change using gap analysis and duration analysis.

Table 2 The influence of change in interest rates on the bank's financial result- comparative juxtaposition

Itemization	Changes in interest (percentage points)							
	−0.5	−0.75	−1	−2	0.5	075	1	2
The change in financial result–gap analysis (PLN)	523197	784795	1 046394	2092787	−523197	−784795	−1046394	−2092787
The change in financial result– duration analysis (PLN)	582442	879146	1179565	2407154	−571023	−851245	−1133790	−2223900
Change difference (PLN)	59245	94351	214782	314367	47826	-66450	-87396	131113

[4] On the subject of deriving formula (2), (3) i (4) see (Uyemura, Deventer, 1997, p. 96-97) and (Iwanicz-Drozdowska, Nowak, 2002, p. 94).

Participation of difference of changes in equity capital (%)	0.35	0.55	1.27	1.86	-0.28	-0.39	-0.51	-0.77

<div align="center">Source: own work</div>

Data presented in table 2 lead to the following conclusions:

- Conducted calculations show differences in the impact of interest rates changes (accordingly by +/- 0.5, 0.75, 1 and 2 percentage points) on the financial result depending on the chosen method.
- In the case of the duration analysis, interest rate changes have a greater effect on the level of financial result of the bank, compared to what the gap analysis shows. The table shows that the differences shape in the range of PLN 60,000 for a lower interest rate to about PLN 314,500 in the case of the highest possible interest rate change. The differences in the measurement of the financial outcomes due to interest rate changes are caused by the changing values of monies in time and the duration analysis taking into consideration that the revenues (costs) change if products are renewed during interest rate change.
- In the duration analysis the changes in the financial result in a bank caused by an increase or decrease of interest rate by the same number of basis points are asymmetrical, which is concluded from the convex function of the price of financial instruments or their portfolios[5].
- If the changes in interest rates are meaningful, the differences in assessing the impact of such change on financial result when comparing the two methods are quite significant (reaching PLN 314,367 and negative PLN 131,113, when interest rates changes by approximately negative 2 or 2 percentage points, which constitutes approximately 1.86% and 0.77% change in the equity capital of the bank respectively), which indicates, that the duration analysis appears to be a more precise method, and therefore more effective tool in managing interest rate risk than the gap analysis.

The classic gap analysis has significant deficiencies. The results calculated with gap analysis are useful to generally conclude the magnitude and type of the risk of interest rate. However, the method does not consider the fluctuation of the value of monies in time and initial net values. Another limitation is the fact, that the gap method does not take into consideration the future structure of assets and liabilities in the bank's balance. The significant imperfection of the method influencing the result of the calculations is the fact of subjective (flexible) choice of terms of assets and of liabilities actualization in analysis[6].

These drawbacks of gap method of mismatch, or at least some of them can be managed by the duration analysis as it takes into consideration the changing value of monies in time and both

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[5] Relative changes in pricing are larger in the case of interest rate decline than in case of its increase by the same number of basis points (see Fabozi, Fong, 2000, p. 45-50).

[6] The selection of term ranges of remeasuring could have an important influence on the results of the study. Moreover, the method's assumptions that the measurement follows in the middle of a given time range is also imperfect. Actual re-measurement of the majority of the positions of assets at the beginning of each range and position of liabilities at the end could lead to a mistaken quantification and assessment of interest rate risk. In these conditions a financial institution will not be protected against interest rate change even if gap is maintained at zero-level (neutral).

the time of cash flow occurrence and size of the cash flow. The duration analysis also avoids issues related to optionally matched intervals of terms. Moreover, changes of assets and liabilities structure could be considered.

The duration analysis brings information on the holistic exposure of the bank's balance position, considering thus the existence of the duration gap. The key question set for the method concerns the influence of interest rates level on the interest financial result and the change in values of the equity capital (Heffernan, 2007, p. 147).

The dynamics of the market and fluctuations of interest rates could be adequately captured using the duration analysis, especially for long term financial instruments with fixed income. With the use of duration analysis, a bank could completely manage assets and liabilities, by checking the mismatch of weighted average of maturity terms of these assets and liabilities.

5 Conclusions

On the basis of considerations presented in this paper, it will be legitimate to conclude that contemporarily the duration analysis could be a good tool to use when forecasting interest rate risk of fixed nominal income instruments or their portfolios. The effectiveness of this type of analysis in uncontested in limiting and monitoring the risk of interest rates change, which is a peril to fixed income instruments.

The research can serve as an inspiration to conduct other studies which object could be the following:

- the significance of transaction costs in assessing the interest rate risk in Poland (verification of the soundness of hypothesis that they are irrelevant),
- establishing a limit to the change of interest rates,
- establishing the influence of other existing types of risk in fixed income market on the practical possibilities to utilize the duration analysis.

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Size as a determinant of the effective corporate tax rate

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Abstract

The aim of the article is to point to the size of the company as one of the determinants of the effective corporation tax rate. Current empirical research has achieved various results in the context of the impact of the company's size to ETR. It is important in what period and for which country or group of countries, the impact is analyzed. This leads to opposing claims. Studies show a positive, negative but also no impact of the company size on ETR. The size of companies is also closely linked to subsidies and incentives from individual governments. The subsidies received and the tax incentives significantly affect the overall tax burden on companies.

Keywords: Effective Corporate Tax Rate, Leverage, Inventory, Debt, Capitalization.

JEL Classification: H20, H21, H25

1 Introduction

The effective corporate tax can be considered as one of the tools by which an investors localize their investment. The notion of a statutory tax rate and effective corporate tax are not equivalents. The statutory corporation tax rate is determined by policy makers, while many variables are included in the calculation of the effective tax rate.

One of the most important determinants that affects the ETR, is the size of the company. Various authors point to the different relationship between size and the ETR. Kim and Limpaphay (1998), Richardson and Lanis (2007), Delgado, et. al. (2012) in their studies write about negative relationship between these variables.

Richardson and Lanis (2007) examined the situation in Australia. The study results indicate the existence of a significantly negative relationship between ETR and the company size. The other determinants included in the analysis were capital structure and asset combinations. The relation between ETR and capital structure is a significant negative. A significant negative relation is also found between the ETR and the combination of assets. Their range lacked the foreign operations and ownership of companies. These factors may also affect the ETR.

Kim and Limpaphay (1998) analyzes the relation between ETR and the size of companies in emerging economies. They conclude that in these countries exists a negative relation between company size and the effective tax rates. This is the opposite of the US. This finding is sensitive to the choice of effective tax rates and study periods. We can say that large companies in a sample have lower tax rates than small companies. These results may indicate that large companies in developing countries are able to use their economic power to influence the legislation and obtain favorable tax treatment. On the other hand, the results may show the fact

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that the national governments use fiscal policy to support a specific economic goals. In this way, the government can provide to specific firms an additional tax benefits lead to the low effective tax rates. The results may also reflect the ability of the large companies to use tax-cutting strategies. In addition to size, the authors have also pointed to profitability, which they also consider a potentially relevant factor in explaining effective tax rates. The importance of the leverage as another determinant does not have strong empirical support in these countries.

Delgado, Fernandez-Rodriguez and Martinez-Arias (2012) investigated the US listed companies. They studied the period from 1992 to 2009. For research, the economic and financial structure of companies as well as their profitability were important. The results point to the non-linear relation between size and ETR. Similar relations were found for debt and capital intensity. This study also points out the smaller companies are subject to the greater tax burdens.

The negative dependence between ETR and the company size is statistically significant in three out of five cases in a study by Derashid and Zhang (2003). To the analyze were entered the Malaysian companies listed on the Stock Exchange in Kuala Lumpur between 1990 and 1999. In Malaysia, the hypothesis of "industrial policy" is in force, not the "political cost" hypothesis. Evidence certainly does not rule out the idea the big companies have greater influence in Malaysia. The reason is probably the explicit industrial policy adopted by the Malaysian government. An important role is played by the inclusion of companies in sectors (including size) that would allow companies to pay a less effective tax. Not all profitable companies pay more effective tax. After adjusting the size and sector in which companies exist, the companies pay significantly less effective tax with a high return on investment. One explanation may be that the firms tend to be profitable, although they do not favor industrial policy. This result show the industrial policy is to "pick" the winners of efficiency or competitiveness. Manufacturing companies and hotels in Malaysia still pay significantly less effective tax than any other company. The results can be explained by a long-term industrial policy to protect the manufacturing sector, as well as the government policy from 1990 to promote a tourism.

Other authors, such as Kim and Limpaphay (1998), Noor and Fadzillah (2010), write about positive correlation between ETR and company size.

Kim and Limpaphay (1998) focused on the situation in Hong Kong, Korea, Malaysia, Taiwan, and Thailand. The relation between ETR and company size was measured by quantitative regression. The results were compared with the US companies. They found a positive relation between ETR and company size. The results indicate that large american companies suffer from "political costs". The applicability of this hypothesis is examined in the context of emerging economies.

Noor and Fadzillah (2010) analyzed the relation between the ETR and the size in two different tax systems in the period 1993 to 2006 and 2001 to 2006. Analysis of the change in ETRs of listed public companies in two tax regimes in Malaysia has produced interesting results. This study found the ETRs are lower than the STR in the both tax regimes. The result supports the theory of political costs that suggests the larger companies have higher ETRs. Lower ETRs are also strongly associated with highly indebted companies, higher investments in fixed assets, and lower investment in inventories. This study also found the companies with higher return on assets face a lower ETR. The results indicate the companies in the area of trading and services, real estate and construction face a higher ETR.

2 Company size and tax incentives

In many countries, a smaller firms are backed by government incentives. This issue has been addressed by several economists, for example Noor and Fadzillah (2010), Janssen et. al. (2000, 2012), Hsieh (2012), Liu and Cau (2007), and others. Government incentives provided to smaller firms meet the purpose of promoting regional development or improving the business environment. However, the government's incentives to large firms are able to reduce unemployment, improve the purchasing power of the population.

Janssen and Buijink, in collaboration with Scholsom (2012), have conducted research in companies located in the Member States of the European Union for 7 years (1990-1996). Their research estimated the ETR from the financial statements. The aim was to compare the STR in the EU countries where each company has its seat. The difference between STR and ETR provides information on the extent of tax incentives provided by governments within the EU. Tax incentives are above the directly observable differences in STR between EU Member States. The use of tax incentives varies considerably from one Member State to another. Providing tax incentives does not have the effect of offsetting the ETR between the EU member countries.

Hsieh (2012) attempted to identify a change in the sensitivity of ETR to return on assets, capital intensity, inventory intensity, leverage and company size by quantile regression. Key empirical results point to the fact that not all big companies have political power. The question is who can get the maximum benefits from tax preferences.

The context of the existence (or not) discrimination of Dutch companies in the period 1994 to 1998 was dealt with by Janssen and Buijink (2000). The aim of the study was to examine the scope of the horizontal equality of Dutch corporate tax. Their selected variables were seven company characteristics (company size, capital intensity, range of foreign operations, company performance, leverage, public company and listed company) and five control variables (net operating losses, negative tax costs, interaction between net operating status losses and the state of negative tax costs, interaction between the state of net operating losses and the size of the firm and the interaction between the state of negative tax costs and the size of the firm). Empirical results confirm the Dutch corporate tax system provides companies a substantial sums of the tax subsidies and the tax system is relatively neutral.

According to Liu and Cao (2007), the ETR tends to be less for firms with surplus labor, which may be related to the government's incentive policies to promote employment. The effects of the profitability and ownership structure of the ETR differ depending on the external tax environment and appear to be positive as all companies use tax incentives.

Table1 – A review of literature on ETR

Author	Year	Title
Stickney, McGee	1982	Effective corporate tax rates the effect of size, capital intensity, leverage, and other factors
Collins, Shackelford	1995	Corporate domicile and average effective tax rates: the cases of Canada, Japan, the United Kingdom and the United States
Gropp	1997	The effect on expected effective corporate tax rates on incremental financing decisions
Gupta, Newberry	1997	Determinants of the variability in corporate effective tax rates: evidence from longitudinal data
Kim, Limpaphayom	1998	Taxes and firm size in Pacific-Basin emerging economies
Janssen, Buijink	2000	Determinants of the variability of corporate effective tax rates: evidence for the Netherlands
Bauman, Schadewald	2001	Impact of foreign operations on reported effective tax rates: interplay of foreign taxes, U.S. taxes and U.S. GAAP
Buijink, et. al.	2002	Evidence of the effect of domicile on corporate average effective tax rates in the European Union
Derashid, Zhang	2003	Effective tax rates and the "industrial policy" hypothesis: evidence from Malaysia
Harris, Feeny	2003	Habit persistence in effective tax rates
Richardson, Lanis	2007	Determinants of the variability in corporate effective tax rates and tax reform: evidence from Australia
Liu, Cao	2007	Determinants of corporate effective tax rates: evidence from listed companies in China
U.S. Senate	2008	Effective tax rates are correlated with where income is reported
Rohaya, et. al.	2010	Corporate tax planning: a study on corporate effective tax rates of Malaysian listed companies
Noor, Fadzillah	2010	Corporate tax planning: A study on corporate effective tax rates of Malaysian listed companies
Hsieh	2011	New evidence on determinants of corporate effective tax rates
Kubátová	2011	The comparative analysis of specific effective average tax rates of corporation in the EU countries in years 1998-2007
Delgado, et. al.	2012	Size and other determinants of corporate effective tax rates in US listed companies
Wu, et. al.	2012	State ownership, tax status and size effect of effective tax rate in China
Janíčková, Baranová	2013	Impact of effective tax rates and its components on foreign direct investment - the case of the EU member countries
Rodríguez, Arias	2014	Determinants of the effective tax rate in the BRIC countries
Delgado, et. al.	2014	Effective tax rates in corporate taxation: a quantile regression for the EU
Leszczlowska	2016	Provisions for future liabilities and effective corporate income tax rate

Source: own collaboration

State-controlled companies show a different size impact on the ETR. The theory of political costs and the theory of political power are two views on the impact of the company's size on the effective tax rate in existing literature. The ETR size effect can be further explored by focusing on the relation between firms and government. It was found, if firms do not have an advantageous tax status, the company's size is positively linked to effective tax rates for private firms and negatively links to state-controlled firms. The results show the political cost theory explains the relation between size and ETR for privately managed firms, while the theory of political power explains the relation to state-controlled firms. For firms that already have preferential tax status, there is no significant relation between their size and tax burden (Wu, Wang, Luo, Gillis, 2012).

In 2002, a study was completed by Buijink, Janssen and Schols, which sought to measure a real corporate tax worldwide for companies based in all EU Member States on the basis of information from the financial statements. The provision of tax incentives varies considerably between the EU Member States. These tax incentives do not have the effect of offsetting the real EU tax rate. The actual tax burden on businesses is more different between EU Member States than STR. The limitation of this study, it is focused only on listed companies. The results could be significantly affected if unlisted companies also entered the analysis. They would provide a more balanced picture of the tax burden on the business in the EU.

Monitoring a ten-year period in a study by Fernández-Rodríguez and Martínez-Arias (2014) showed there is a significant drop in the STR, especially in Russia and China. ETR values are not reduced by the same ratio. It remains similar in China, while STR decrease. In China, there may be an increase in the tax base and the reduction or elimination of tax incentives. Comparing the STR and ETR rates, we can see a big difference. The listed companies in the BRIC countries bear a lower tax burden. An exception is Russia, where that is the opposite.

3 Correlation between ETR and size

In the 1990s, Gupta and Newberry (1997) looked at this issue by analyzing the impact of determinants on average tax rates since the introduction of the 1986 Tax Reform Act (TRA86). The study results suggested no correlation between ETR and company size. Companies with a longer history entered to the analysis. There is a correlation between the ETR and the capital structure of the firm, the structure of assets and efficiency.

The range of the corporate tax system neutrality was empirically investigated in a study by Stickney and McGee (1982). The analysis was focused on the differences in ETR between large US firms which can be systematically linked to company size, degree of capital intensity, the scale of foreign operations, participation in natural resources, and the degree of leverage. Cross-platform statistical tools are used to assess the combined effects of these possible explanatory variables. Empirical results show the companies with the lowest ETR tend to be highly indebted, heavily capital intensive and involved in the natural resources sector. It appears the participation and size of foreign subjects do not have a dominant position in explaining differences in ETR.

The panel data of 425 listed companies on the Chinese stock market during the 1998-2004 seven-year period using the random effect model showed the size does not have a significant impact on the ETR. A similar impact is also seen in the case of the capital intensity of these listed companies. The influence of the leverage effect as an another determinant, is negative and significant (Liu, Cao, 2007).

According to Fernández-Rodríguez and Martínez-Arias (2014), the size affects the tax burden in the BRIC countries. The analysis in the period 2000-2009 shows the neither leverage nor profitability affect the tax burden in three of the four countries. They conclude the only one variable is significant in all countries of the BRIC group, that is the stock intensity.

4 Conclusion

The impact of the size of companies as one of the possible determinants of effective corporation tax is not unambiguous. It varies according to the geographic location of the companies, but also the time the data is entering the analysis.

The analysis by Fernández-Rodríguez and Martínez-Arias (2014) illustrates the above assertion in countries grouped in BRIC. Research shows the larger companies are subject to greater control in Brazil and China and have a higher tax burden. Companies with a higher leverage effect are in Brazil and China. Companies that have a stronger relation to inventories are in India. A smaller tax burden is in Russia. Larger ETRs are reaching companies in Brazil and China. The authors claim the tax burden in a year, depends on what it was in the previous year.

The size of companies is not the only one determinant that has entered into analyzes in previous empirical research. Authors of various studies, also focus on leverage, capitalization, debt, inventory, foreign company activities, and so on. It is the foreign activity of companies that is very important for payment of the taxes. Large corporations are able to place their non-taxable income in a country with the lowest tax rate.

Collins and Shackelford (1995) examined the impact of ETR on foreign company's activities. However, foreign activity is one of the several characteristics of the company that affects the ETR. One of many determinants which may have such an effect for both local and international companies, is size. There may be economies of scale in investing to the tax planning.

The combination of the size of companies, its strengths in the national and global markets, access to subsidies and tax incentives, as well as foreign companies' activities affect the level of effective corporate tax rates.

Acknowledgements

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The model of non-profit hospitals valuation

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Abstract

This unique role of the hospital entities, makes it difficult to assess them as a common enterprise. On the other hand, hospitals are the subject of market processes such as sales, privatisation, mergers and acquisitions, therefore, a major concern is to estimate their values. In this paper we propose a new method of non-profit hospital valuation which is based on the modification of the classical DCF model, based on AHFCFF (adjusted for hospital free cash flow for firm). AHFCFF includes correction which are important from the point of view of non-profit hospital, as well as social benefits which should be estimated for every project which generates social outputs. We also deal with the problem of the cost of capital. We discuss whether not- profit and profit hospitals really differ from each other in meaningful ways.

Keywords: Valuation, Non-Profit, For-Profit Hospitals, Social Benefits

JEL Classification: G32, I15, M21

1 Introduction

Hospitals serve a unique role in the health systems, by providing of life-saving services, what absorbs more than half of the funds in most health systems. From the point of view of local communities' access to hospital services is crucial. This unique role of the hospital entities, makes it difficult to assess them as a common enterprise, whose goal is to bring profits to the owner. On the other hand, hospitals are the subject of market processes such as sales, privatization, mergers and acquisitions, therefore, a major concern is to estimate their values.

We should be aware, that from the perspective of financial management, there are generally three types of hospital nonprofit, for-profit, and government (local authorities)—own (Horwitz, 2005). The form of activity is very important from the point of view of hospital behavior, its reaction to the changes on the market, available sources of funding, a range or a type of offered services or even the quality of provided benefits.

The quest for profit influence a scope of provided benefits. Usually for-profits are most likely to offer relatively profitable medical services, while government/public hospitals offer a higher range relatively unprofitable services (Horwitz, 2005). For-profit hospitals treat less complex cases (McCue & Nayar, 2009). That's way public hospitals generally offer better access and quality of care, as well bigger amou[1]nt of charity care (Rosenau & Linder, 2003). As a result

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public, or non-profit hospitals often play a role of the provider of last resort by providing charity services, or services which costs are underestimated by a payer and, and the same time necessary from the point of view of local society. In this sense there are obliged to put the public interest over profit objectives (Cho & Hong, 2018). This difference is reflected in financial flows. While for-profit hospitals seek for profits or accountancy benefits for their owner, non-profit entities usually drive their results toward zero profit, which is intensified by increased public funding (Verbruggen & Christiaens, 2012).

The aim of this research is the analysis of the valuation process for non-profit / public hospitals. We propose a new method of non-profit hospital valuation which is based on the modification of the classical DCF model. The theory and practice of hospitals valuation draws attention to the problems related to: the history (or lack of history), a solid foundation of the cash flow projection and the cost of equity forecasts. The future performance of small companies is less certain then big companies, but still we can estimate future cash flows and goodwill using standard approaches (Damodaran, 2009) – in the case of hospital industry it is very multifaceted due to their complexity and uniqueness, far less mass transaction comparing to other subjects on the market, the difficulty of objective measurement based largely on subjective assumptions of analysts, as well as high uncertainty and unmeasured of valuation inputs. It is also important, that the process of non-profit hospital's valuation, as a project that produces social outputs, should allow to take account of social benefits in estimated financial flows (Wheeler & Clement, 1990).

The article presents the concept of valuation methods which seems to be an interesting tool that can be effective especially for owners who want to determine the value of its activity for informational purposes, planning the development or transformation into commercial entities. We assume two types stakeholders who might be interested in hospital's valuation:
- owners (municipality, the State)
- private investors.

In this study we assume public hospitals are always non-profit oriented, comparing to for-profit hospitals which seek for investment's return. We do not introduce any distinction based on a form of activity (companies or non-companies).

The paper is organized as followed: after the introduction (section 1) we discuss the modification of DCF method for non-profit hospitals (section 2) which is followed by conclusions (section 3).

2. DCF method for profit and non-profit hospitals

The literature suggests three main methods of business valuation: asset-based approaches, market approaches or methods based on the analysis of the discounted cash-flows (DCF) which seem to be the most popular. In this paper we propose a modified DCF method which takes into account the specific nature of the functioning of the non-profit hospitals.

2.1 Model

Generally, in the DCF method, the enterprise value is equal to the sum of all of realized investment projects, which is the sum of the discounted cash flows, according to the formula 1:

$$V = \sum_{i=1}^{N}(NPV_i + I_i) = \sum_{i=1}^{\infty}\frac{FCFF_i}{(1+WACC)^i} = E + D \qquad (1)$$

where:
FCFF- free cash flow,
WACC – the discount rate, (Weighted Average Cost of Capital)
D – debt
E- equity market value
NPV – net present value
I - investments

The effectiveness of the method of discounted cash flow (DCF) depends on the possibility of identifying the value drivers related to the launch of new products or new markets, or projects which aim at the improved management. The presence of important value drivers is generally determined by the present phase of the company's development (Rappaport, 1986): These are the key value drivers:
1) the increase in sales,
2) the cash rate of profit (operating profit margin),
3) the actual tax rate,
4) working capital (without stocks representing a negligible position)
5) capital expenditure (investments in fixed assets),
6) structure and cost of capital (*WACC*),
7) a period of competitive advantage,
8) emploee development investments,
9) community benefits.

As distinct from commercial companies, the competition in the sector of hospitals is not too intense, and so it can be assumed that the increase in cash flow (revenue and expenditure) is stable with decreasing growth rate number, directly in proportion to GDP growth (Siedlecki & Papla, 2016), due to a limited number of potential patient. Depending on the system of health care financing, an important barrier for revenue growth also creates the limited funding of benefits (Siedlecki et al., 2017). In the case of non-profit / public hospitals an essential function plays community benefits (Nicholson et al., 2000), which local society benefits from hospital's activities.

According to that, we can assume that this area of activity can be described by the logarithmic of logistic function of growth (Siedlecki, Papla i Bem, 2018). And so, on the basis of the above, we can presuppose, that the DCF for hospitals can be written as follows:

$$V = PV(FCFF) + PV(CB) = \int_t^\infty f(t) \cdot e^{-WACC \cdot t} dt + \int_t^\infty g(t) \cdot e^{-WACC \cdot t} dt \ (2)$$

where:
PV (FCFF) - present value of FCFF community benefits,
PV (CB) - present value of community benefits,
f(t) – function of cash flow (ANOPAT),
g(t) – function of value community benefits.

2.2 Cash flow estimations
Determination of cash flows and their forecast is one of the most important and the most difficult tasks in the valuation of an enterprise. For the valuation of a company we frequently use free cash flow (FCFF) – those, that a company may allocate to capital's donors who finance its activities.

Analyzing the factors driving enterprise value, it can be concluded, that their impacts on cash flows is very strong. Using the above factors (compare the section 2.1) we can estimate the free cash flows for the company in the following way:

$$FCFF_i = (cash\ income - cash\ outflow) = [Revenue \times EBIT\ margin \times (1 - Tax) + \Delta Net\ Working\ Capital] \quad (3)$$

Like in the case of enterprises, in the case of hospitals, the most important factor in valuation which shape the hospital's value are: sales income and their rate of growth, as well as the operating profit margin.

According to some authors (Damodaran, 2002), in the case of hospital cash flows can be restricted to the corrected NOPAT because investment and expenditure in working capital are virtually nonexistent.

This seems to be a debatable approach because, although the hospital, particularly public or non-profit, is not a manufacturing company, however, according to some research trade receivables and liabilities represent a significant value (Siedlecki et al., 2017). Hence in our further considerations, we used the revised NOPAT (ANOPAT) taking into account investments in net working capital (NWC).

In the hospital's sector, it doesn't matter for-profit or non-profit one, one of the most important element (which in the literature of the manufacturing companies is often marginalized) is human capital, as well as in the case of IT service companies or financial sector's enterprises. (Damodaran, 2009). It is educated staff what build a significant future value of hospital.

Social benefits are another, crucial element, which must be taken into account when we deal with the valuation of a non-profit hospital (Bradley et al., 2018). Social benefits are relatively difficult to measure, but their total omission leads to a significant underestimation of the company. In order to valuate social benefits, we employ methods similar to the Cost-Benefit Analysis (CBA), however, in this study we present a simplified approach that does not require spending on, for example, surveys. To distinguish between FCFF for commercial companies from FCFF for non-profit hospitals we introduce AHFCFF (adjusted for hospital free cash flow for firm), according to the following formula:

Sales revenue (sales services + benefits) – operational costs
= EBIT profit margin = NOPAT[2]
+ Corrections:
      + Depreciation
      - Change in receivables
      + Change in trade payables
      + Employees development expense in current year
     - Amortisation of employee expenses
= AHNOPAT

In the case of non-profit hospitals, when we calculate AHNOPAT we must correct tax-related flows. If the hospital is owned by a public body (the local government or the State), it means that taxes are, in the same way as dividends, "paid to the public/society". Within the theory of

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[2] In many countries, as well as in Poland, non-profit hospitals benefit from tax exemptions related to the statutory activities

business valuation these are cash flows for owners (Nicholson et al., 2000). In addition, in some countries, for example in Poland, there is an income tax exemption for non-profit hospitals. Therefore, in this case, instead of NOPAT we can use the EBIT.

The most important, from the perspective of the hospital's finances, is a real estate tax, which reduces FCFF in the case of commercial hospitals, while it does not matter for public ones. The lack of taxes does not mean that the not-for-profit hospitals have higher profits, because EBIT margin may be lower due to, among other things, no additional earning opportunities, medical procedures with are not cover by the payer3, the obligation to provide unprofitable but necessary procedures. These additional costs and expenses should be included in the process of valuation (separately, or as a correction of AHNOPAT) as social benefits.

In practice, in public hospitals, we can often observe a messy legal and organizational status, leading to a lack of control and generating additional unreasonable costs, which in turn reduces their value (Wedig, Hassan & Sloan, 1989).

As community benefits (CB) this part of the hospital, which is associated with the provision of medical services (corrective and preventive) in response to the needs of the local community can be considered. Such benefits are provided despite the lack of clear financial incentives or can even generate losses. In terms of the USA community benefits are subject to strict categorization, because this activity combines with the ability to obtain tax exemptions. CB can include:
1. free of charge medical activities provided on the basis of charities (e.g. participation in preventive actions during mass events),
2. benefits that were originally treated as paid, and a bill was not issued or its execution was suspended, due to the patient's difficult financial situation,
3. benefits granted to patients under the contract with a public payer, however, above a limit indicated in a contract;
4. participation in the education of medical staff (internships, residencies, the ability to raise competency for external staff),
5. scientific research.

This activity is important both for the for-profit and non-profit hospitals (Bradley, Darrell, Hossein and Anderson, 2018), but it should be noted that, for example, in the United States in the year 2012, non-profit hospitals are characterized by higher relationship of CB to total revenue (on average 7,5%) than for-profit hospitals (Young, Chou, Alexander, Lee and Raver, 2013). The significance of CB in the activities of hospitals is significantly diverse - in the USA hospitals from the highest decile achieve 20% of CB in earnings, while those from the last one - only 1%. For this reason, the inclusion of CB in the hospital valuation must be subject to individual assessment.

Another important problem in the value estimation lies in the fact, that we usually assume higher efficiency of private operators, what is not always true in the case of hospital industry – Horwitz and Nichols (2009), suggests, that the operating margin for for-profit and non-profit hospitals is virtually the same while McCue and Nayar (2009) conclude that for-profit hospital generate a substantially higher cash flow margin by controlling their operating costs.

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[3] In the case of Poland these are benefits which are above a limit specified in a contract (which can be partially paid, or not paid at all). In the case of other countries it might be charitable benefits.

However, in the case of hospitals we can often observe another dependency. Public hospitals often offer a higher quality of the treatment processes, provide benefits of higher degree of specialisation or more complex, which in most cases is associated with higher costs (Herrera et al., 2014), (Shugarman, Nicosia & Schuster, 2007). A partial these effects are translated by the community benefits discussed above.

Investments in personnel and equipment - in private hospitals, the main motivation is profit, which is reflected in the valuation of the entity, while in the case of public hospitals, when the cash surplus occurs - funds are invested, regardless of whether it will bring profit in the future or only increase the quality of treatment. In terms of restrictions on commercial activities and not enough flexible public budgets, the investment opportunities - in order to increase revenue – are very limited. Private entities can allocate free resources on activities which bring direct benefits for owners, while the public hospitals are, in practice, deprived of such opportunities.

2.3 Cost of capital

The cost of capital is the expected rate of return for capital donors, so owners and creditors. The most commonly used measure of the cost of capital is a weighted average cost of capital (WACC):

$$WACC = \frac{D}{V} k_d (1 - T) + \frac{E}{V} k_s$$

(4)

where:

k_d – cost of debt,

k_s – cost of equity,

T – income tax rate,

E - total shareholder's equity,

D – debt

V – enterprise value.

In the case of for-profit hospitals, WACC, hence the structure of capital and cost of capital shall be as estimated in the same way, as in the case of commercial enterprises. The cost of the debt shall be determined on the basis of bond yields or credit cost. While the cost of capital should be estimated using e.g. the CAPM model (Damodaran, 2002), what is the effect of the fact, that owners require an appropriate rate of return as exchange investors:

$$k_e = k_{rf} + \beta(k_{rf} - k_m)$$

(5)

where:

k_{rf} - risk free rate,

β - measure of market risk based on rates of return for the company and the market index.

For non-listed hospitals β can be estimated as the book value:

$$\Delta\ average\ value\ of\ for_{profit} hospital's\ income = \beta \times average\ value\ of\ listened\ companies + \alpha$$

(6)

So in this case, unlike companies and private hospitals, we notice, that the cost of capital is lower than the cost of debt for public hospitals, what is in conflict with the theory of corporate finance. It follows that the WACC for public hospitals should be lower than the WACC for private ones.

So the problem of the proper estimations of the cost of equity for public hospital appears. In the case of the adoption of the cost approach, the cost of equity capital can be estimated cost as a local government unit of raising capital in the form of e.g. municipal bonds (Gapenski & Pink, 2007). In the literature the cost of equity usually referred to the rate of return required by the owner, that can be achieved by investing in a company or instruments characterized by a similar risk level (Duliniec, 2007). Hence, a major problem, from the point of view of methodology, is that the local government is the owner of hospitals not from financial motives, but from the need to provide medical care to the local community. That's why estimating of the cost of equity, as the cost of a rate of return from alternative form of investments is inadequate. Local government does not invest its free resources on the capital markets, which is why the estimation of cost of equity based on the model of CAPM should not be applied.

Therefore, in the case of non-profit hospitals, the cost of debt is equal to the interest rate of the loan, while the cost of equity is equal to the average interest rate of the municipal bonds (rate of return required by the "owners") (Wedig, Hassan & Sloan, 1989). Non-profit hospitals, from which are technically owned by the local government, in fact are owned by the society which passes its right to the decision making to local authorities or the State.

Another difference is the lack of interest tax shield, because, as mentioned earlier, taxes can be thought of as a form of a dividend to be paid to the public.

3. Conclusion

Valuation of the not-for-profit (public) hospitals belongs to the very difficult and, at the same time, the essential challenges of financial management. By analyzing the literature, we notice a small amount of publications dealing with this issue.

We should keep in mind that the objectives of the valuation depend on the entity for which it is prepared. For the private investor the purpose and the methodology of the hospital valuation is the same as in the case of any other company. Otherwise it looks from the point of view of the public hospital's owner. According to some authors (Wedig, Hassan & Sloan, 1989) it is difficult to determine precisely who is the owner of non-profit hospital, however, we treat it as an entity which is owned by the society represented by the local government or the State (Nicholson et al., 2000). In this case, in addition to aims like the sale (or privatization) the restructuring can be distinguished, as well as management or hospitals' merge. In this case, it seems that the existing valuation models do not fully work.

In the paper we propose the concept of valuation of nonprofit hospitals using the modified DCF method. As result from presented analysis, the proposed method for cash flows, cost of capital and social benefits estimation appears to be useful both for the local authorities, but also for the local community and private investors. We can also hypothesize, what in future studies should be reviewed, that because the social benefits are large, along with the low cost of capital, the value of the public hospitals to the society in Poland is higher than for the private investor. Perhaps this is the reason for a insubstantial amount of sale or privatized public hospitals.

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Entrepreneurship education in Europe

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Abstract

According the 2014 World Bank's study, over the last 20 years, ENTREPRENEURSHIP EDUCATION AND TRAINING (EET) programs have mushroomed, given their promise and potential to promote entrepreneurial skills and attitude. While the number of such programs continues to expand worldwide, global knowledge about these programs remain thin. Entrepreneurship is one of the eight key competences for Lifelong Learning Recommendations 2006/962/EC of the European Parliament and of the Council of 18 December 2006. The Author highlights the dual character of enterprising, provides a definition on entrepreneurship education and summarises the main policy background on entrepreneurship in the European Union. The Author compares the characteristics and trends of the entrepreneurial curricula in Europe and the USA. The second part of the paper some best practices are presented from the International Centre for Entrepreneurial Studies in Osijek (Croatia), the V4 countries (the Czech Republic, Hungary, Poland and Slovakia) and FELU (Faculty of Economy of the University of Ljubljana, Slovenia). Finally, the European Entrepreneurship Education Network (EE-HUB) highlights the Policy Recommendations.

Keywords: Entrepreneurship, Entrepreneurship Education, Key Competences of The LLL, Dual Characteristics of Enterprising, Best Practices in Entrepreneurship Education in CEE.

JEL Classification: I23, L26, M13, M56

1 Introduction

Navigare necesse est vivere non est necesse ("to sail is necessary; to live is not necessary") said the ancient Romans during the late Republic in the 1st century BC, who, during a severe storm, commanded sailors to bring food from Africa to Rome.

Undertaking/enterprising is necessary; it is a must in our globalized world today. It is the time to wake up political and Government leaders to move from its lukewarm place the European economy, which is in the state of suspended animation and promote entrepreneurship in order to make the new and enlarged Europe a favorable place to work and live. Rediscovering the entrepreneurial spirit of Europe through better regulation, education, access to finance and innovation are the primary goals.

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2 Methodology

The paper summarizes general knowledge on education and learning, highlights the Key Competences for LifeLong Learning, and present the field of entrepreneurship is holistic and interdisciplinary in nature. These are important to understand the various entrepreneurial curricula in the EU countries.

3 Analyses

3.1 Education and Learning

The old Latin saying **non scholae, sed vitae discimus** summarizes my entire view of education. We do not learn (and teach, too) for the school but for the life. This is the motto for many schools, all over the world. This is what we should be doing in the process of rehabilitation and development of the education system in all market economies to move towards and meet the criteria to be competitive in our globalized world.

Education can be said to be a process through which a society passes on the knowledge, values and skills from one generation to another. Learning can be defined as the acquiring of new skills, knowledge, and values. Learning is knowledge gained through experience, and education is knowledge gained through teaching. Education can be said to be well organised, whereas learning is something that is related to an individual's perception.

There is not much difference between knowledge and education as both are correlated to each other. The primary difference between the two is that education is formal process whereas knowledge is informal experience. Education is acquired through the formal institutions like school, colleges and universities, whereas knowledge is gained from the real life experiences. Hence education is a process of gaining knowledge for some useful application whereas knowledge is facts acquired from good education, peers, consultations and extensive reading.

Education and learning are on one side synonym terms, but education is more than just learning. It is about presenting knowledge, raising somebody to my level, doing, relating and becoming. Education is contextual. Education is also sharing the teacher's personal experience with the disciple and sharing the experience of one generation with another. The word education implies not only the academic routine of delivering certain knowledge, fostering some skills and training specialists in various fields or subjects, but also it is strategic task of the development of the whole culture to.

Despite several decades of reform, public education in world-wide is criticized by the society for not teaching all children effectively. Consistently poor test results and low graduation rates attest to this.

As globalisation continues to confront the European citizen meets new challenges and this is why they need a wide range of key competences to adapt flexibly to a rapidly changing and highly interconnected world. Education has a key role to play in ensuring that citizens acquire key competences to enable them adapting to such kind of changes.

Since the turn of the millennium the word has been experienced significant changes. From one side we are witness of significant scientific and technological innovation, the labour market also going through significant changes. Due to automation and robotics manual operations become vulnerable. Many jobs are simply disappearing and the knowledge, the skill and

competence become more important. The digital society opens wide perspective for the emerging citizens especially the newcomers of the Y and Z-generations.

3.2 Key Competences for Lifelong Learning

In 2006, the European Parliament and the Council adopted a Recommendation on Key Competences for Lifelong Learning.

The Commission Communication on "Strengthening European Identity through Education and Culture" calls for investing in people and their education and to make sure that education and training systems help all learners the knowledge, skills and competences that are deemed essential in today's world.

"Education and culture are the key to the future – both for the individual as well as for our Union as a whole. It is how we turn circumstance into opportunity, how we turn   mirrors into windows and how we give roots to what it means to be 'European', in all its diversity. When Europe's Leaders meet in Gothenburg this week, we must seize the opportunity and make sure education and culture are the drivers for job creation, economic growth, social fairness and ultimately unity"(President Juncker, 14 November 2017).

Competences are defined here as a combination of knowledge, skills and attitudes appropriate to the context. Key competences are those which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment.

The European Reference Framework of Key Competences for Lifelong Learning defined eight key competences:
- Communication in the mother tongue;
- Communication in foreign languages;
- Mathematical competence and basic competences in science and technology;
- Digital competence;
- Learning to learn;
- Social and civic competences;
- Sense of initiative and entrepreneurship; and
- Cultural awareness and expression.
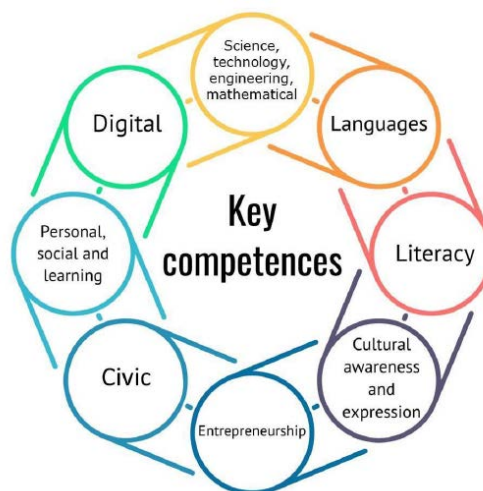
Figure 1. Organic Structure of the EU Key Competences
Source: European Commission, 2006 and 2018.

The Key Competences create an organic structure. They are similar to a snake that bites its own tail. Every element of the circle is equally important and we can't neglect one of these concepts.

The 2006/962/EC Recommendation defines the Sense of initiative and entrepreneurship as „the individual's ability to turn ideas into action. It includes creativity, innovation and risk-taking, as well as the ability to plan and manage projects in order to achieve objectives. This supports individuals, not only in their everyday lives at home and in society, but also in the workplace in being aware of the context of their work and being able to seize opportunities, and is a foundation for more specific skills and knowledge needed by those establishing or contributing to social or commercial activity. This should include awareness of ethical values and promote good governance."

„Necessary knowledge includes the ability to identify available opportunities for personal, professional and/or business activities, including 'bigger picture' issues that provide the context in which people live and work, such as a broad understanding of the workings of the economy, and the opportunities and challenges facing an employer or organisation. Individuals should also be aware of the ethical position of enterprises, and how they can be a force for good, for example through fair trade or through social enterprise."

„An entrepreneurial attitude is characterised by initiative, pro-activity, independence and innovation in personal and social life, as much as at work. It also includes motivation and determination to meet objectives, whether personal goals, or aims held in common with others, including at work."

3.3 Dual Character of Enterprising

Entrepreneurship is the engine of the economic and social development. Entrepreneurship is not a personal characteristic. The *role of entrepreneurs* is to identify the opportunities, grasp those, and use every means of resources to implement and exploit the potentials

An entrepreneur may be defined as a person who is able to look at its surrounding environment, identify opportunities to mobilize and marshal resources, implement actions to utilize those opportunities. The term is used in broad sense and includes persons working in SMEs and large enterprises, co-operatives and governments. From the society points of views entrepreneurs may be considered as persons who improve the social and economic conditions in local communities.

"Entrepreneurs are people who have the ability to see and evaluate business opportunities; to gather the necessary resources to take advantage of them; and to initiate appropriate action to ensure success."(ILO Definition)

"Entrepreneur is a person who warms up the cold water poured on his own suggestion with his enthusiasm, generates steam and gets on by it. Personal initiative is the driving force not the system."(Definition by Antal Szabó)

Szabó (2008) highlights the duality character of enterprising and business management. The organized knowledge necessity to run an undertaking, like problem solution, technology, customer, quality, marketing, sales, costs, revenue, accountancy etc. we refer SCIENCE. It can be learned and acquired. The human element of building a business, which is hard to see and measure are considered as ART. Such features are vison, brand, philosophy, foresight, culture. In this context *science* and *art* are not mutually exclusive but are *complementary*. These elements in PRACTICE should be executed to get the right things done consequently and

successful over a long period of time. Entrepreneurs with own enthusiasm and initiative incorporate this phenomenon and successfully could run their businesses.

One of the most sophisticated skills required for an entrepreneur is the strategic planning. It is nothing else than decision making today to solve the problems which will be happen tomorrow.

The field of entrepreneurship is holistic and interdisciplinary in nature. The common European understanding of entrepreneurship as a key competence highlights the dual focus. Firstly, the development of entrepreneurial attitudes, skills and knowledge should enable the individual to turn ideas into action. There is one of the great myths that entrepreneurship is concerned only with the creation of new business. However, secondly, entrepreneurship is related not only to economic activities and business creation, but more widely to all areas of life and society. The reality is that entrepreneurship is about a way of thinking and behaving. Entrepreneurship is not only related to economic activities and business creation, but more widely to all areas of life and society. Innovative and creative action can be taken within a new venture, or within existing organizations (Eurydice, 2016).

Ten years after the 2006/962/EC the European Commission realized that there is a need to improve and polish entrepreneurship as a competence and develop a reference framework describing its components in term of knowledge, skills and attitude, a provide European citizens a more appropriate tool to describe and develop this key competence. In January 2015, the European Commission the Directorate General for Employment, Social Affairs and Inclusion (DG EMPL) launched the Entrepreneurship Competence study (EntreComp). The EntreComp aims to establish a bridge between the worlds of education and work and to be taken as a reference de facto by any initiative which aims to foster entrepreneurial learning.
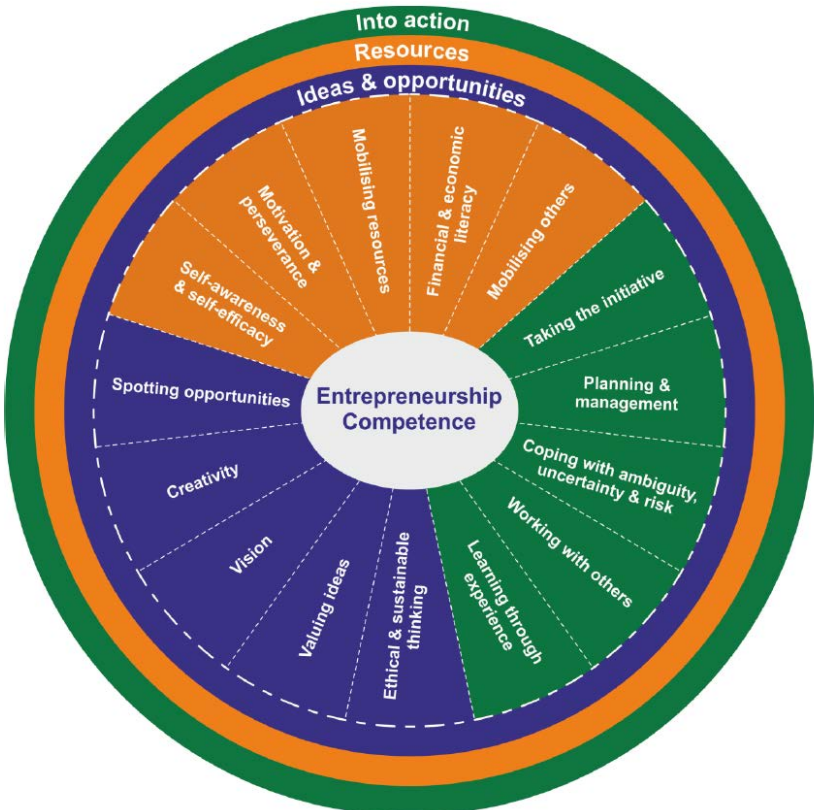
Figure 2. Areas and Competences of the EntreComp conceptual model.
Source: European Commission, 2016.

The EntreComp Framework is made up of 3 competence areas and 15 competences as illustrated below. The competence areas are:
- Ideas and opportunities,
- Resources and
- Into action.

Each area includes 5 competences, which, together, are the building blocks of entrepreneurship as a competence. The framework develops the 15 competences along an 8 - level progression model. Also, it provides a comprehensive list of 442 learning outcomes, which offers inspiration and insight for those designing interventions from different educational contexts and domains of application.

3.4 What Is Entrepreneurship Education?
- *„Entrepreneurship education is empowered individuals for striving after the opportunities regardless of resources*" (Howard H. Stevenson, professor emeritus at the Harvard university)

- *„The main goal of entrepreneurial education is to develop some level of entrepreneurial competences."* (OECD)

Guiding principles of entrepreneurship education should focus on five main targes:
Innovation and entrepreneurship remain sources of paramount importance in matters of employment and economic growth and hence constitute the basis for increased societal welfare. According to the 2014 World Bank study „over the last 20 years, ENTREPRENEURSHIP EDUCATION AND TRAINING (EET) programs have mushroomed, given their promise and potential to promote entrepreneurial skills and attitude. While the number of such programs continues to expand worldwide, global knowledge about these programs remain thin."

At time being many international, regional, national, and local actors are taking part in entrepreneurship education (EE) and entrepreneurship education and training (EET). Today, EET is recognized as an important field to develop skills and key competences. Taken as a whole, EET represents both academic education and formal training interventions that share the broad objective of providing individuals with the entrepreneurial mind-set and skills to support participation and performance in a range of entrepreneurial activities.

Concerning EET the World Bank classifies two related but distinct categories: education and training programs. Both categories stimulate entrepreneurship, however they are different in their programs and outcomes. The entrepreneurship education programs focus on developing knowledge and skills on or the purpose of entrepreneurship. On the other hand, the entrepreneurship training programs focus on developing knowledge and skills for those who intend to start a business or startups and operating already enterprises. The figure below shows the difference between the two programs.

In 2012, the World Bank has been launched a robust start process in implementing its new Education program within the framework of the new Sector Strategy 2020: Learning for All. The Bank's core objective is to help countries improve Learning for All. Learning - not only schooling - is critical for children and youth to succeed. And learning for all - giving not just some but all children an opportunity to learn. The strategy calls for:
- Investing early, because the foundational skills acquired early in childhood make possible a lifetime of learning

- Investing smartly, because investments that prioritize learning and skills development, and
- Investing for all, targeting girls and disadvantaged populations, because a nation can prosper only when all children enjoy an opportunity to learn.
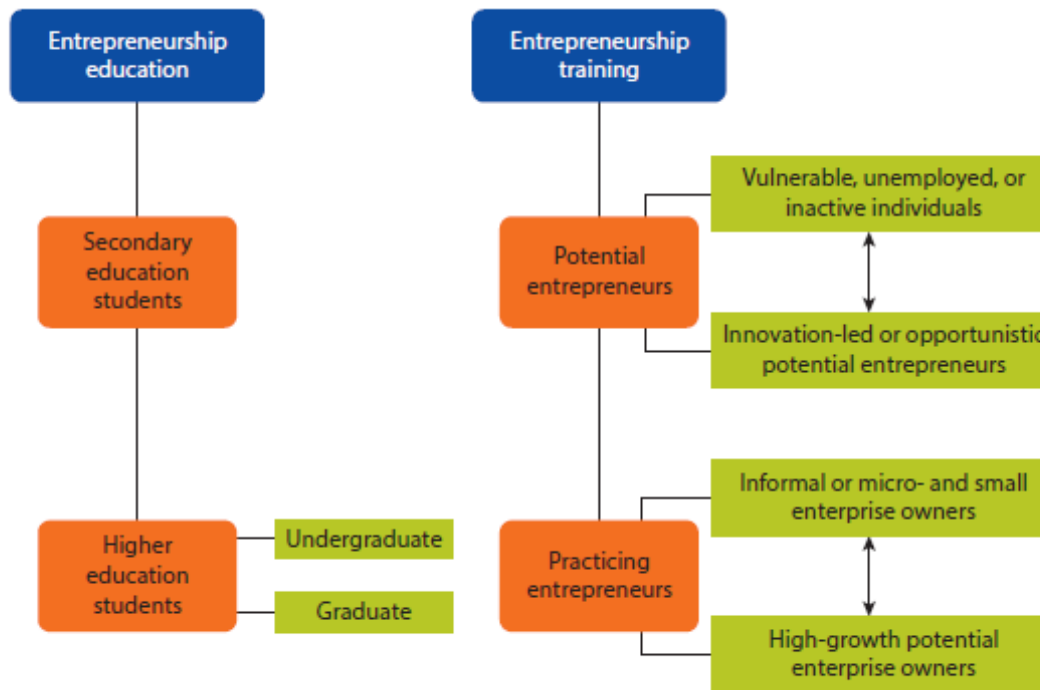
Figure 3. Classification of the Entrepreneurship Education and Training Programs
Source: The World Bank, 2014.

Based on my research and teaching experience the specific problems and recommendations concerning entrepreneurship teaching are summarized as below:

- **Entrepreneurship can be thought/learned in early age**

Children at early and preschool age are very sensitive to various game activities allowing children to acquire some basic knowledge, skills and attitudes. When they are playing shopkeepers or various household mechanic performances, they can learn of some ideas of business activities without talking about business. As a good practice the „Children's Entrepreneurship Week" has been carried out in Croatia in 2009 (see Jasna Peklic – Dinka Vujatovic, 2014). It is launched by the Ministry of Economy, Crafts and Entrepreneurship (now the Ministry of Entrepreneurship and Crafts) with the aim of educating the public about the need for education for entrepreneurship from an early age. [2]

Entrepreneurship should be fostered from childhood. Teaching children about business at a young age is important for the future of business as a whole. When kids are experiencing in money management and organizational skills, they can also apply the skills they have learned to their personal lives. I remember the first school task for my 13-year-old daughter in Geneva, when the form master bought 100 roses at the wholesale market from CHF 50 and distributed those among the children and gave them the task go home, knock at the door of the neighbours or accost the people in front of shops and offer them to buy it, while informing them that you

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are student of the School of Secheron school and collect money for class excursion at the end of the school year. It was a real marketing task with greeting, introduction, selling and financial activities. The students collectively multiplied the cost of roses tenfold.

- **It must be taught in an enterprising way**

You cannot teach entrepreneurship in classical academic methods. It is neither a lexical learning nor reciting poetry.

An ornithologist known everything how does a bird fly, however he will never have the ability to get up. The teacher who never sold a T-shirt on the street, has no experience to hand over experiences on entrepreneurial knowledge.

- **It must contain both knowledge and practical elements**

Because of the dual character of entrepreneurship, a good entrepreneurial education should contain both scientific respectively knowledge base curricula, as well as practical element. the traditional form of formal lectures seems still to be predominant in many entrepreneurial curriculas. Case studies as a teaching methodology can serves as a dualities of entrepreneurial education. The advantages of case study based teaching methodology in transmitting theoretical knowledge and describing practical skills in entrepreneurship is described, based on the evidence in state of the art entrepreneurship research literature. The content of case studies allows for addressing both knowledge ("know what") and skills ("know how") relevant in entrepreneurship.

The ERENET Network a few years ago prepared a guide on how to prepare a case study. The aim was to select university faculties from V4 + Slovenia, prepare national cases on make a joint case study library useful for spreading out knowledge on entrepreneurship specialties and learn how to make a business in these countries. Unfortunately, due to lack of interest the project failed.

- **It should be delivered in a cross-curricular manner**

Entrepreneurship is a subject which is not crystal-clear. The humour says that „who know does, who don't know teaches. It a modification of the Greek philosopher Aristotle: „Those that know, do. Those that understand, teach". Teacher is not a job, it is an amazing carrier for those who know their skills, talent, passion, motivation.

Albert Einstein spent lot of time of his career at universities. His saying is often quoted which undermines that importance of teaching by teacher: "If you can't explain it simply, you don't understand it integrate content from each subject into one course. In doing so, student develop creative and critical thinking, problem solving, they gain more authentic learning experience and have more control over their learning well enough."

Entrepreneurship training should be carried out not only as a standalone curse, but rather though integrated courses. Teachers and experts from different departments should work together to develop curricula that

- **There should be an interaction with the business community**

In the light of the current EU educational policy, all institutions of higher educations shall provide students with an opportunity to take courses in entrepreneurship, preferable at credit granting levels.

International surveys show that the entrepreneurship education should be consolidated on the cooperation between three major actors:

- The Public Sector – through long-term policies, strategies in development of national economy;
- The Education Institutions (universities, high-schools, business schools) – though accumulation of research- and teaching-based knowledge and development of student competence; as well
- The Business Sector – active actors in the national economy, which is ready to contribute with their resources and competences to research and education projects.

3.5 Good Practices In Entrepreneurship Education In Central- And Eastern-Europe

There are many institutions and universities offering entrepreneurship education in Europe. It this Chapter the author focuses on presentation on the entrepreneurship education and training programs in the Central- and Eastern-European countries, first of all Croatia, the V4 countries - Czech Republic, Hungary, Poland and Slovakia, and Slovenia.

It goes without saying that effective and high-quality entrepreneurship education has a positive impact on students´ motivation to start-ups and become successful entrepreneurs. Thus, the entrepreneurship education should be considered a topic of highest priority among educational institutions, including universities.

The author convinced that the entrepreneurial education at the UNESCO Chair in Entrepreneurship of Josip Juraj Strossmayer University in Osijek, the Faculty of Economics of the Faculty of Ljubljana , as well as several universities in the V4 countries, like the University of West Bohemia, Faculty of Economics - V4 Scientific Centers for the Enhancement of Financial Literacy and Entrepreneurship Education in the Czech Republic, the Faculty of Business and Economics of the University of Pécs and the Óbuda University in Hungary, the Department of Entrepreneurship and Innovation at the Cracow University in Poland, as well as the Technical University of Kosice in Slovakia could be considered as best practices in entrepreneurial education in Central- and Eastern-Europe.

The International Visegrad Fund finance a strategic scientific project between 2014-2016 project. The main purpose of this research survey was to provide analytical overview and cross-country comparison of the current state of teaching entrepreneurship at universities in V4 countries and to collect examples of best practices of entrepreneurship education at university-level from all the four countries. Dana Egerová - Iveta Ubrežiová - Witold Nowiński - Csilla Czeglédi and others made suggestions and recommendation for developing and improving entrepreneurship education in V4 countries based on research findings.

The project was coordinated by the University of West Bohemia (CZ). Project partners were the Szent István University, Gödöllö (HU), WSB University in Poznań, the State School of Higher education in Oświęcim and the Pedagogical University of Cracow (PL) and the Slovak University of Agriculture in Nitra (SK).

The conclusions of the V4 studies are the following:

- The entrepreneurship education is not treated as a priority by V4 governments. This calls for reflection whether other strategies of these countries can be achieved without a major change in the mentality as well as entrepreneurial skills of university graduates.
- Moving along the path of growth based on knowledge requires entrepreneurs with a high

level of knowledge and skills.
- The position of entrepreneurship education in National Qualification Frameworks seems to be the strongest in Poland. In case of the Czech Republic and Hungary they refer mostly to business and economics related fields of study. It is highly recommended that all V4 countries introduce learning outcomes related to entrepreneurship education to all areas of study.
- Generally, in all V4 countries university education is harmonized with the Bologna process. In Slovakia and Hungary state and public institutions dominate the market while in the Czech Republic and Poland there are more private institutions providing higher education;
- Entrepreneurship education in surveyed study programs are mostly "about" entrepreneurship, rather than education "for" entrepreneurship. In all subjects, the focus is mainly on the academic side of entrepreneurship, there is more theory, and less practice;
- With regard to teaching methods, the traditional teaching methods, such as lectures, seminars and group work are most common in entrepreneurship education. Action – oriented methods, such as creative thinking, analytical thinking, team work, case studies, projects, and workshops are used less frequently and are least popular.
- If university graduates could combine their functional knowledge of their specific field of study with the willingness and skills to undertake entrepreneurial activity, strategies aimed at strengthening innovation and SME sector would be supported substantially.

The research indicates that much more needs to be done in order to create an institutional climate supportive for such objectives.

CROATIA – INTERNATINAL CENTER FOR ENTREPRENEURIAL STUDIES (ICES) [3]
By the end of 80′s a small group of researchers at the Department of Economics in Osijek started to research entrepreneurship. UNESCO Chair in Entrepreneurship of Josip Juraj Strossmayer University in Osijek located at the Faculty of Economics in Osijek operates since February 2008. Professor Slavica Singer, Ph.D. was appointed UNESCO Chair in Entrepreneurship. The purpose of the Chair shall be to promote an integrated system of research, training, information and documentation in the field of entrepreneurial studies.
ICES's specific objectives are:
- To develop new faculty in entrepreneurship education, through a Ph.D. program focused on theoretical and practical issues of building an enterprising society.
- To develop the pedagogical skills of the faculty in entrepreneurship, based on an experimental classroom approach.
- To legitimize entrepreneurial studies in the portfolio of university based educational activities.
- To develop executive programs, based on on-going assessments of entrepreneurs' needs, jointly with the local Center for Entrepreneurship in Osijek. The Graduate program Entrepreneurship organized Department of Economics in Osijek In cooperation with professors from: St. Louis University, Yale University , DePaul University, University of Wisconsin, Ohio State University, University of Missouri, Naropa University, USA Univerza v Ljubljani, Slovenia, Durham University, Great Britain, Turku School of Economics and Business Administration, Finland, Alpen-Adria Universitat Klagenfurt, Austria, University of Pecs, Hungary and with support from the Center for Entrepreneurship Osijek and Open Society Institute New York

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[3] See at http://www.ices.hr/en/

The managing director of the ICES program is Slavica Singer, Professor Emeritus of Entrepreneurship programs at the J.J. Strossmayer University, former Head of all university entrepreneurship. In year 2000 she and her team were pioneering in entrepreneurship education in Croatia, by starting the first graduate program in entrepreneurship.   In   2010,   the doctoral program ENTREPRENEURSHIP AND INNOVATIVENESS has been started. From 2002 she leads Croatian Global Entrepreneurship Monitor research team and she chairs Research and Innovation Advisory Committee to the Board of the Global Entrepreneurship Research Association. She is the member of Croatian Competitiveness Council and Club of Rome, Croatian Chapter. For her contributions to the development of university based entrepreneurship education, in 2008 she was awarded with the UNESCO Chair in Entrepreneurship Education, and in 2010 with the honorary doctorate by the University of Turku, Turku School of Economics.

FACULTY OF ECONOMICS AT THE UNIVERSITY OF WESTERN BOHEMIA [4]
The Faculty of Economics was founded in 1990. In 1991 it became one of the founding faculties of the newly established University of West Bohemia in Pilsen. Over the years, it has gained a position of a representative university institution, which can boast of its own well qualified staff and external lecturers and of good material back-up for teaching and researching activities. Within the study activities, the Faculty now offers more economics programmes leading to both Bachelor and Master degree and therefore more specialized fields of study. It uses both locations in Cheb and in Pilsen to collaborate with the regions in specializations and cross-bordering and international cooperation. The focus on the issues of the European Union is an important innovation factor, together with the use of information and communication technologies (ICT). The Faculty has all necessary facilities for lectures as well as for self-study. The Faculty offers Business Economics and Management in all university level (bachelor, master and doctoral studies program).

FACULTY OF BUSINESS AND ECONOMICS OF THE UNIVERSITY OF PÉCS [5]The Faculty of Business and Economics was established in 1970, is the second oldest School of Economics in Hungary. With more than 3,000 students it offers up-to-date education and research in Business Sciences and the comprehensive theoretical, methodological and practical knowledge ensures our students' success in their career. The school's wide range of international partnerships, with 73 European and several non-European universities, allow 15-20% of our students to spend at least one semester abroad. To broaden their opportunities, we have established strong collaboration with the business and entrepreneurial environment. The outstanding number of highly qualified faculty and the doctoral students at FBE are active and respected participants who integrate very well into social and economic research in Hungary and abroad.
The Faculty of Business and Economics provides full educational programs in English at Bachelor, Master and Doctoral levels and BA and MA double degrees in German. The English language BA Business Administration and MSc Enterprise Development and Entrepreneurship programs are validated by Middlesex University (UK) and so students are awarded both English and Hungarian degrees. The Business Degree Programs in English are internationally recognized joint business degree programs that were first launched in 1996 with a solid foundation of cooperation by the University of Pécs, and Middlesex University (UK). The BA and MSc degrees which graduates receive open the door to global careers. [6]

[4] See at https://www.dfek.zcu.cz/en/divize.php?shortcutdiv=KPM
[5] See at http://ktk.pte.hu/en/ffisc2018/university-pecs-faculty-business-and-economics
[6] See at http://ktk.pte.hu/en/applicants

The entrepreneurship education program is managed by Dr. Habil. László András Szerb, Hungarian research team leader of the Global Entrepreneurship Monitor and co-actor of the Global Entrepeneurship Index (GEINDEX). This index as developed jointly by Pro. Szerb and Prof. Zoltán Ács, Leader of the GEDI Institute in Washington D.C.

ÓBUDA UNIVERSITY - KELETI FACULTY OF BUSINESS AND ECONOMICS [7]

The Óbuda University was founded in 2000 as *Budapest Tech* (Hungarian: *Budapesti Műszaki Főiskola*) with the merging of three polytechnical institutes (*Bánki Donát Technical College*, *Kandó Kálmán Technical College*, *Light Industry Technical College*). With nearly 13,000 students it is one of the largest technical universities in the country. Having complied with the requirements, the institution was promoted to university status on 1 January 2010 under the name of *Óbuda University*.

The Faculty managed by Dr. Habil Lazányi Kornélia offers training courses in compliance with the Bologna System. In the new educational structure, the first level is basic training (BSc, BA). Such first degree courses focus on practical professional training demanded by potential employers, and at the same time provide a good grounding for theoretical knowledge enabling students to further their studies on a Master's degree course (MSc, MA) if desired. In the linear training system such a Master's course normally takes 4 semesters. After graduating from a Master's, a student can start working or opt to continue with his or her studies by applying to enter a PhD programme, the peak of tertiary education. The Faculty offers the following courses:

1. Technical Management (BSc),
2. Business Administration and Management (BSc),
3. Commerce and Marketing (BSc),
4. Business Informatics (BSc)
5. Business Development (MSc),
6. Teacher of Engineering (engineering manager) (MA).

Students must obtain 210 credits during the 7 semesters of BSc and BA courses, while 120 credits are necessary on the 4-semester Master's courses. The courses are tailored to the demands of the labour market. Life-long learning is a basic principle encouraging the up-date of knowledge, the acquisition of new skills and abilities as well as professional competences. It is also necessary to gather practical experience during on-site practice.

THE DEPARTMENT OF ENTREPRENEURSHIP AND INNOVATION - CRACOW UNIVERSITY OF ECONOMICS

In Poland the practice of entrepreneurial education at universities depends on the decision of the particular university. In some universities there are special departments of entrepreneurship and entrepreneurship, but in some universities entrepreneurship is not taught as a separate subject. The Entrepreneurship is an obligatory subject only for the major "management" at graduate studies (MA / MSc). At other economic majors "Entrepreneurship" is optional.

At Cracow University of Economics (CUE) students of the major "management" according to the Higher Education Standards are obligated to pass the course entrepreneurship at second level of studies (master studies). Additionally, the students of the major "economics" can choose "entrepreneurship and innovation" as the specialization track. At each major the faculties offer various specialization. Each track is offered both on first (bachelor) and second

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[7] See at http://kgk.uni-obuda.hu/english/faculty

(master) level of studies. At the major "economics" there is entrepreneurial specialized program called "Entrepreneurship and Innovation" specialization managed by Prof. Krysztof Wach.

The Department of Entrepreneurship and Innovation offers the specialization "Entrepreneurship and Innovation" for the students of the major "economics" for both undergraduate (BS) and graduate (MS.) students. Every year about 60 full time students choose the specializations, which lasts 4 semesters at undergraduate studies (BS) and 3 semesters at graduate studies (MS.). Entrepreneurship and Innovation is also offered as the academic course at PhD studies. Last academic year the e-learning project on innovation "iCOLL" has been started financed the European Union.

The Project iColl, "Innovation through collaboration" is a project coordinated by the Hochschule Reutlingen, in Germany, and with six other partner institutions: Open University (UK); the Vytautas Magnus University (Lithuania); the Corvinus University of Budapest (Hungary); the Cracow University of Economics (Poland); the Marmara University in Istanbul (Turkey) and the Steinbeis Hochschule of Berlin (Germany). There is also a non-EU partner (self-financing) (Kent State University, from the United States). The project aims at exploring the subject of "innovation" in an international business studies curriculum through innovative forms of learning and training for future international managers. The outputs of the project include cross-cultural collaborative virtual seminars, training courses, evaluation of cross-cultural approaches to innovation, a dynamic knowledge base, international workshops and a website. The project is outlined in the European Commission Press Release IP/05/1349, Brussels, as of 2005.

TECHNICAL UNIVERSITY OF KOSICE – TUKE [8]
TUKE is a full-fledged university with strong technical orientation. The Faculty of Economics offers EE curricular, in particular courses in entrepreneurial management and developing entrepreneurial skills. The main emphasis of entrepreneurship education at TUKE is on extra-curricular activities. These include:
- A training programme and a linked start-up weekend for students to develop their own business ideas and start-ups (the AZU initiative), [9]
- Infrastructure to coach individual start-up projects in the Start-up Centre, and [10]
- A special orientation is the Eastcubator business incubation program. [11]

SLOVENIA - FACULTY OF ECONOMICS OF THE UNIVERSITY OF LJUBLJANA (FELU) [12]

The FELU is both a national leader and an internationally recognized academic and research institution in the fields of business and economics. We strive to become perceived as the world-renowned institution for the quality of our academic programmes and achievements in education and research. FELU's vision is by 2025 to be the school of choice among business and economic schools in Central and Eastern Europe for doing research, learning and creating sustainable development solutions.

[8] See at https://www.tuke.sk/wps/portal
[9] See at www.azu.sk
[10] See at http://kosice.startupweekend.org/
[11] See at http://www.eastcubator.sk
[12] See at http://www.ef.uni-lj.si/about_the_FELU and https://www.youtube.com/embed/2UEM2d9JrV4

Design thinking (DT) is a strategy to promote entrepreneurial skills in European schools. The essence of the design thinking approach is the focus for enhancing entrepreneurship in four areas: creativity, risk-taking, problem solving and cooperation. DT is a cognitive process while working on project. In contrast with design methods employed in engineering, design thinking takes human centered approach in problem solving. Problems are visualized in more holistic way. The design thinking approach is very good presented by Ister Val and others.

- The Faculty of Economics of the University of Ljubljana (FELU) offers courses on undergraduate, graduate and MBA level in EE, including specialisations in entrepreneurship.
- In 2006, FELU introduced the Design Thinking approach to EE. DT student teams generate business ideas, develop entrepreneurial projects and test prototypes through engaging with customers.
- FELU teachers successfully introduced DT in schools for pupils at the age of 12–15 and for unemployed people as well.
- High student motivation as well as suitable staff and sufficient resources for prototyping are important preconditions for achieving good results in applying DT

3.6 European Entrepreneurship Education Network (Ee-Hub)

The European Entrepreneurship Education NETwork (EE-HUB) is a pan-European body to support entrepreneurship education, which brings together experts who have connections with many organizations, networks and governments. The objective is to develop a pan-European entrepreneurial learning initiative bringing together existing European and national expertise, in line with proposals included in the Entrepreneurship 2020 Action Plan.

The EE-HUB is a 3 years project (2015 –2018) co-founded by the European Commission, Executive Agency for Small and Medium-sized Enterprises (EASME) under the COSME Programme. The consortium managing the EE-HUB is composed of 4 partners: JA Europe, EUROCHAMBRES, SEECEL, EUproVET. Cisco, EY, Intel, Microsoft, Visa, have joined as private sector partners. A pan-European body EE-HUB to support entrepreneurship education is an advisory group for policy-makers. It was launched in 2015 with 40+ experts from 20 countries.

Joanna Drake, Director for Entrepreneurship & SMEs, DG Internal Market, Industry, Entrepreneurship and SMEs of the European Commission sated, that: „*The establishment of the European Entrepreneurship Education NETwork is a further milestone towards a more entrepreneurial Europe. I am confident that this new network hub will help to inspire a change in mindsets, facilitating our readiness for the knowledge society and creating an environment where new idea can prosper.*

The 1st European Entrepreneurship Education Summit took take place on 11-12 July 2016 in Brussels, by gathering academics and experts in entrepreneurship education, policy-makers and government officials, educators, business and NGOs representatives. More than 700 people from more than 40 countries participated at the Summit with participants of all ages from 15 and up. Participants discussed new trends in entrepreneurship education, shared lessons and discussed policy recommendations, showcase innovations and good practices.
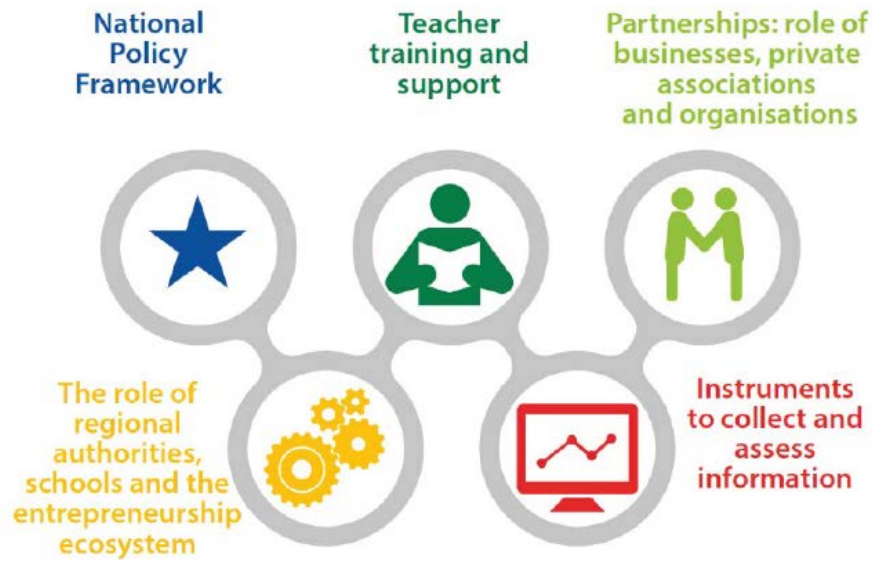
Figure 4. **Building blocks of the EE-HUB**
Source: EE-HUB.EU, April 2017

The EE-HUB Centre for Entrepreneurial Learning aims to drive ambitious goals such as significantly increasing the penetration rate of entrepreneurship education to at least 35% in all member states by 2030. It will also encourage innovative partnerships between the business and education communities at EU and national level.

The EE-HUB policy recommendations were designed based on the success factors of a selection of 60+ 'good practices' identified and reviewed by the EE-HUB experts.

The document includes policy recommendations to:
- European Institutions and bodies
- Governments
- Education Institutions
- Business Community and intermediary organizations

4 Conclusion

Entrepreneurship is a subject which is not crystal-clear. Because of the dual character of entrepreneurship, a good entrepreneurial education should contain both scientific respectively knowledge based curricula, as well as practical element. the traditional form of formal lectures seems still to be predominant in many entrepreneurial curricula.

The Bologna process, which began in 1999, did not achieved its goals. To match materials has been squeezed into the three-year bachelor's degree. The planned standardization of courses has not happened. In the field of entrepreneurship education there is no vision. There is a lack of knowledge on the aim of a three-year bachelor program and what is for the master one.

Case studies as a teaching methodology can serves as a dualities of entrepreneurial education. ERENET tried to launch a project on writing case studies in Central- and Eastern European universities. However, this project did not realized dues to disinterested behaviour of the relevant universities. This subject is still a current topic and the author suggest to develop this idea.

The author convinced that the entrepreneurial education at the UNESCO Chair in Entrepreneurship of Josip Juraj Strossmayer University in Osijek, several universities in the V4 countries, like the Faculty of Business and Economics of the University of Pécs and the Óbuda University in Hungary, the Department of Entrepreneurship and Innovation at the Cracow University in Poland and the Faculty of Economics of the Faculty of Ljubljana based on the Design-Thinking Approach to Entrepreneurship Education could be considered as best practices in entrepreneurial education in Central- and Eastern-Europe.

The ERENET secretariat suggest to initiate the preparation of a book edited by one of the university's department about entrepreneurship education at university level in Central and Eastern Europe. We kindly invite ERENET members to contribute book chapters.

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The impact of the adoption of international financial reporting standards on the financial position and performance of the company

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Abstract

When a reporting entity undertakes the preparation of its financial statements in accordance with International Financial Reporting Standards (IFRS) for the first time, a number of implementation issues must be addressed and resolved. These issues relate to recognition, classification, measurement, and disclosure of accounting items. Adoption of IFRS has an impact on the qualitative characteristics of financial statements. The paper analyzed the impact of adoption of IFRS on the statement of financial position and statement of comprehensive income of the company. Financial indicators were analyzed along with non-parametric results testing.

Keywords: International Financial Reporting Standards, Financial Statements, Financial Position, Performance, Company.

JEL Classification: C12, M21, M 41

1 Introduction

Financial statements prepared in accordance with International Financial Reporting Standards should contain quality, transparent and comparable information relevant to users. International Financial Reporting Standards (IFRS) are intended for capital companies whose aim is to make profits. European Union requires the application of the set of IFRSs for the selected companies as well as those compiled consolidated financial statements. The European Commission announced in year 2000 a new strategy for harmonizing the sense that for instrument control European accounting was selected IFRS. The Accounting Regulatory Committee through the European Financial Reporting Advisory Group (EFRAG) approves the individual standards for use in practice. According the Slovak Act on Accounting No. 431/2002, financial statements under IAS/IFRS prepare banks, asset management companies, insurance companies, accounting entity established by a separate regulation (Slovak Railways Company), companies that have met special requirements, companies that prepare consolidated financial statements, or companies prepare financial statements under IFRS according their optional decision.

When a reporting entity undertakes the preparation of its financial statements in accordance with IFRS for the first time, a number of implementation questions must be addressed and resolved. These questions relate to recognition, classification, and measurement, as well as presentation and disclosure issues. Many authors (Akindele, 2012; Karğin, 2013; Clarkson *et al*, 2011) have pointed out that the adoption of IFRS has improved financial reporting and

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increased its credibility. Authors cited in the article observed the relationship between the book value of equity, market value of equity and earnings per share. Companies that accounted and reported under IFRS were more open to new investors and creditors. In this way, they contributed directly or indirectly to improving their financial position and performance.

The aim of our article is to point to the case of the production company, which is foreign-owned and adopt IFRS. The paper analyzes the financial situation and performance before and after the adoption of IFRS standards. Three ratio indicators and one difference indicator were used for the analysis. The analyzed ten years period was divided into a five-year period prior to the adoption of the IFRS and the five-year period following the adoption of IFRS.

2 Research and results

2.1 Research methodology

The basis for next research in area of impact of IFRS on financial statements was the Ohlson's valuation model (1995, 2001), which expressed share price as a function of current accounting value of equity plus discounted value of future (abnormal) results (Müller, 2014). The adoption of International Financial Reporting Standards has changed the way and manner in which financial statements are prepared, reported and presented. Globalization of capital markets requires a unified global accounting, reporting and disclosure set of standards (Akindele, 2012). This author came to the conclusion that IFRS adoption has helped the company they work for to raise capital from abroad and IFRS also boost investor's confidence to invest in their company. IFRS also make their financial statements comparable, transparent and rich in quality (Akindele, 2012). Karğin, 2013, dealt with research investigating the value relevance of accounting information in pre- and post-financial periods of International Financial Reporting Standards' application for Turkish listed firms from 1998 to 2011. Author explored the impact of IFRS adoption on the relevance of book value and earnings for stock valuation in Istanbul Stock Exchange. He namely explored relations between equity market value with two main financial reporting variables: the equity book value per share (represents balance sheet) and earnings per share (represents income statement). The results showed that value relevance of accounting information has improved in the post-IFRS period (2005-2011) considering book values. Clarkson *et al*, 2011 investigate the impact of IFRS adoption in Europe and Australia on the relevance of book value and earnings for equity valuation. The authors identified countries where mandatory IFRS adoption was required from fiscal year 2005. Countries were divided between Common Law and Code Law. Then authors included firms that switched from their local accounting principles to IFRS. Results showed that adoption of IFRS had a relatively limited impact on the financial statements of Common Law countries. In contrast, they also point to balance sheet conservatism and conservative income measurement in Code Law countries prior to the adoption of IFRS. The benefit of a new set of reporting standards such as IFRS was captured by an increase between book value, earnings and stock price. Müller, 2013, explored through an empirical association study the impact of the mandatory adoption of IFRS starting with 2005 on the absolute and relative quality (measured through value relevance) of financial information supplied by the consolidated accounts for companies listed on the largest European stock markets (London, Paris, and Frankfurt stock exchanges). The results showed an increase of consolidated statements quality (value relevance) once IFRS were adopted, thus suggesting also that the IFRS adoption in Europe led to better complying with the OECD Corporate Governance Principle of high quality disclosure and transparency. The author ascertained that an increase in the quality surplus (increment) supplied by group financial statements compared to parent company individual financial statements once the adoption of IFRS became mandatory for preparing consolidated financial statements.

While accounting quality is appreciated in relation to the informational value of accounting information for investors, lenders and other creditors, the quality metrics developed in the research literature are also tailored in order to assess the usefulness of accounting to all relevant stakeholders (Păşcan, 2015). The qualitative approach in measuring the financial reporting quality observed Yurisandi and Puspitasari (2015). These author led research whether exists any increasing in financial reporting quality after the IFRS adoption using the approach developed by Nijmegen Centre for Economics. They concluded that IFRS adoption increased the quality of financial reporting comparing the financial reporting before the IFRS adoption. Callao *et al,* 2019 observed the quantitative impact of IFRS on financial reporting of European countries and evaluated if this impact was connected with the traditional accounting system in which each country is classified, either the Anglo-Saxon or the continental-European accounting system. The results showed that the adoption of IFRS had had different effects on the financial reporting among countries. The analyzed company produces and sells products in the starch industry. The legal form of the company is a limited liability company and it is foreign owned. The company adopted IFRS in year 2013. Periods for analysis were divided to period before IFRS adoption (2008 – 2012) and a period after IFRS adoption (2013 – 2017). Our intention was to examine the period after the adoption of IFRS in terms of the impact on the financial position and performance of the company.

2.2 Steps in Transition to IFRS

According Mackenzie *et al,* 2012, transition to IFRS involves the following steps:
- Selection of accounting policies that comply with IFRS.
- Preparation of an opening IFRS balance sheet at the date of transition to IFRS as the starting point for subsequent accounting under IFRS.
  - Recognize all assets and liabilities whose recognition is required under IFRS;
  - Derecognize items as assets or liabilities if IFRS does not permit such recognition;
  - Reclassify items in the financial statements in accordance with IFRS; and
  - Measure all recognized assets and liabilities to principles set forth in IFRS.
- Presentation and disclosure in an entity's first IFRS financial statements and interim financial reports.

When preparing the statement of financial position under IFRS, the analyzed company adjusted the amounts in the financial statements. The transition to IFRS resulted in a different presentation of the financial statements under IAS 1 - Presentation of Financial Statements. The transition from the previous standards to IFRS has affected the financial position, financial performance and cash flows of the company. The transition resulted in a decrease in the amount of the assets and liabilities (year 2013). For the same year, comprehensive income was increased. Changes in financial statements in 2013 have opened a new basis for reporting in coming years.
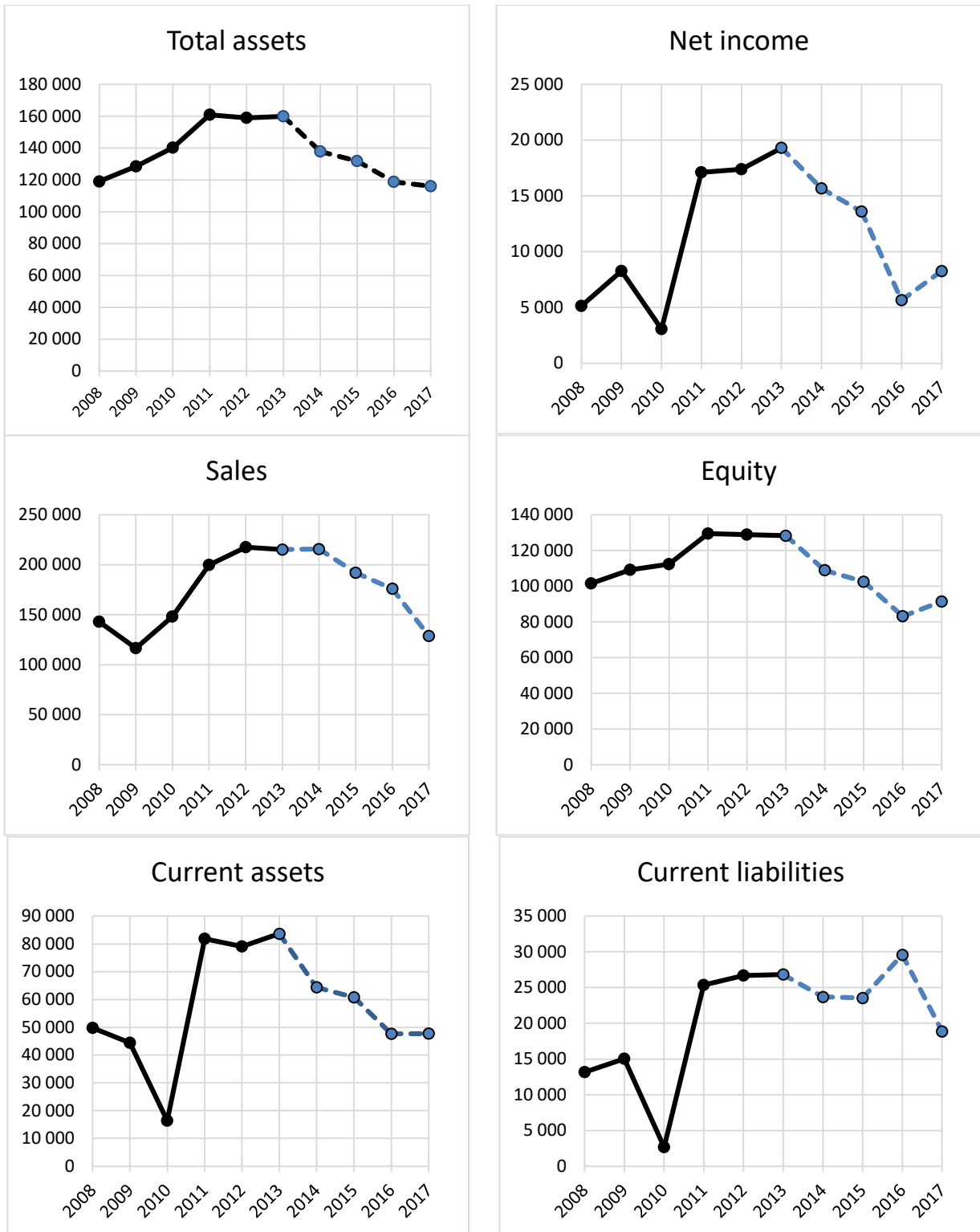
Figure 1 Individual financial indicators – period before IFRS adoption (black line), period after IFRS adoption (dashed line)

Source: own elaboration

The values of selected analytical indicators and their growth during the period of years 2008-2017 can be seen on Figure 1. The highest values were recorded in year 2013 which was the first year of adoption of IFRS.
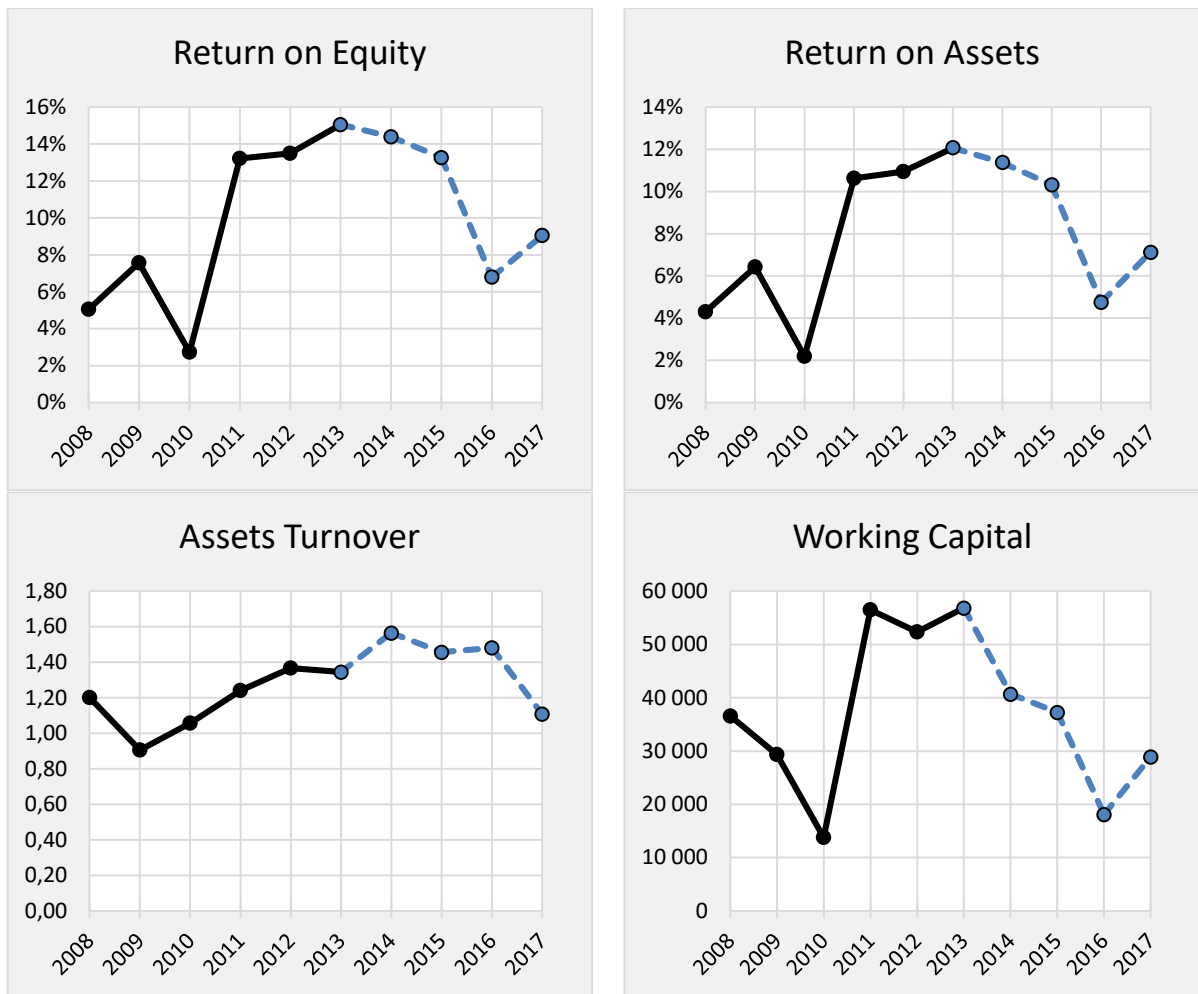
Figure 2 Financial ratios (ROE, ROA, AT) and Working Capital
Source: own elaboration

In order to compare the values of the analytical indicators in two periods, we first calculated their average values (Table 1). As we can see, average values of ROE, ROA and AT are bigger in the IFRS period (years 2013-2017). The average value of ROE increased by 39%, the value of ROA by 32%, the value of AT by 20% and the average value WC decreased by 3,5%.

Table 1 Average values of analytical indicators

	ROE average	ROA average	AT average	WC average
2008 - 2012	0,084	0,069	1,155	37 712
2013 - 2017	**0,117**	**0,091**	**1,391**	**36 355**
	(+39%)	**(+32%)**	**(+20%)**	**(-3,5%)**

Source: own calculation

In order to explore dependencies between values of analytical indicators, we have calculated correlation coefficients. For their calculation, we used Spearman's coefficient and Kendall's coefficient, because we worked with a small range of files (n=10, years 2008-2017). Correlation coefficient values are shown in Figure 3. As can be seen, the strongest and statistically significant dependencies are between pairs of ROE and ROA indicators ($r_s=0,98$ resp. $r_k=0,95$), ROA and WC indicators ($rs=0,86$ resp. $rk=0,68$) and between the ROE and WC indicators ($rs=0,83$ resp. $r_k=0,64$).

Spearman Correlation Coefficients, N = 10 Prob > |r| under H0: Rho=0					Kendall Tau b Correlation Coefficients, N = 10 Prob > |tau| under H0: Tau=0				
	ROE	ROA	AT	WC		ROE	ROA	AT	WC
ROE	1				ROE	1			
ROA	**0.98**	1			ROA	**0.95**	1		
	<.0001					0.0001			
AT	0.55	0.51	1		AT	0.42	0.37	1	
	0.0984	0.1276				0.0892	0.1284		
WC	**0.83**	**0.86**	0.35	1	WC	**0.64**	**0.68**	0.24	1
	0.0029	0.0012	0.3104			0.0095	0.0056	0.3252	

Figure 3 Nonparametric measure of correlation between each pair of financial indicators

High correlation coefficients have confirmed our assumptions in the sense that adoption of IFRS has improved the financial reporting of the company. This finding is supported by correlation between independent items of ROA and working capital indicators, and ROE and working capital indicators. Although the ROA and ROE pointers have the same numerator, they may have a different denominator. In our case, denominators - total assets and equity have had a similar development.

3 Conclusion

The results of the analysis confirmed the previously published papers that the adoption of IFRS improved financial reporting and increased the credibility of the company. Authors cited in the papers (Akindele, 2012; Karğin, 2013; Clarkson *et al*, 2011) observed the relationship between the book value of equity, market value of equity and earnings per share. Companies that made financial statements under IFRS were more open to new investors and creditors. The aim of this article was to point to the production company which adopted IFRS in 2013, how this adoption affected its financial position and performance. We have compared the relationship between indicators of ROE, ROA, Assets Turnover, and Working Capital. The development of indicators after year of 2013 was very interesting. The strongest and statistically significant dependencies were found between pairs of ROE and ROA indicators, ROA and Working Capital indicators, and between the ROE and Working Capital indicators. For the analyzed company, we can conclude that IFRS adoption led to improving of the quality of its financial reporting. On the other hand, the natural limitation of our research was that we analyzed only one company, which adopted IFRS. Our further research will focus on groups of companies that have adopted IFRSs and their impact on their financial reporting.

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Effects of two tax instruments on frequency spectrum utilization

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Abstract

Increasing number of mobile devices represents rising demand for data transfers, which will only increase more in upcoming years. Yet amount of transferred data is limited by available frequency spectrum that is in current state, insufficiently used. From a technological point of view, there are multiple technologies (such as Cognitive Radio, 5G Network, Dynamic Spectrum Access) which enable to introduce mechanisms and new entities in order to increase its usage efficiency. However, from a government perspective it is potential subject of regulation and/or taxation. Well suited tax policy may offer not only sufficient regulation but also new source of public finance. In our paper we propose an agent-based model which enabled us to simulate effects of two tax instruments – tax for unused frequency channels defined as percentage and tax license. Results show impacts of both instruments on network operators and governments.

Keywords: Cognitive Radio, Tax Instruments, Agent-Based Model

JEL Classification: C63, H21, L96

1 Introduction

Ever developing telecommunication technologies, such as 5G network, provide platform for wide range of innovations. High speed, low latency network of new generation will be employed by concept Internet of Thing (Li, Da Xu, & Zhao, 2018). Integral part of next industrial revolution, known as Industry 4.0 is automation, which is based on two aforementioned technologies (Wollschlaeger, Sauter, & Jasperneite, 2017). Prerequisite for 5G network is frequency spectrum, which is a valuable resource used for wireless communication that creates a huge and still growing segment of economy. However, radio spectrum is very limited in its availability. Nowadays, majority of available spectrum is inflexible allocated to licensed primary service providers (PSP) for a long time and just for specific geographic area. These licensed spectrum bands are under-utilized or unoccupied according to available statistics and average usage of them ranges from 15 to 85 percent (FCC, 2002). On the other hand, a small portion of unlicensed spectrum that is used freely, is becoming more and more congested (Akyildiz, Lee, & Chowdhury, 2009). Due to the extensive use and ever-increasing demand for spectrum bands by wireless devices and new applications, the pressing need for more efficient utilization is emerging. One of the promising solutions for spectrum scarcity and associated inefficiency of spectrum usage represents Cognitive Radio (CR) (Mitola, 1999; Mitola & Maguire, 1999). CR devices are able to access and share unused licensed bands

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opportunistically in several ways and utilize them to meet end-users' requirements (Haykin, 2005).

According to a report by Cisco (CISCO, 2017), mobile data traffic has grown eighteen times over the past 5 years and it will further increase seven times between years 2016 and 2021. As a consequence, the significant research endeavour and investments head into the fifth generation networks (Chen & Zhao, 2014). The 5G network is expected to provide very high data rate and guaranteed level of quality-of-service (QoS) by using efficient spectrum management models, Cognitive Radio networks, massive multiple-input and multiple-output (MIMO) and other technologies. It will be a heterogeneous network designed to ensure network coverage with various types of connected devices and diverse applications. It will be spectrum efficient by using non-contiguous spectrum and exploiting dynamic spectrum access (DSA).

One of the solutions to increase efficiency is appropriate regulation at national level. New technologies are often subjects of government interest which is twofold. Firstly, governments used to define policies or regulations in order to gain and preserve their authority. Secondly, governments see such innovations as a potential source of revenue for public finance. Bitcoin is an example where governments demonstrate their interests in both ways (De Filippi, 2014). Issue of efficiency of regulatory policy in telecommunications has been addressed by Hausman (1998), where he proposed lump-sum fee as a source of finance. Proposed fee is compared with existing FCC policies and author concludes, that the fee has "little or no loss in economic efficiency", while providing sufficient funding.

Taxes and fees are not the same thing, yet difference may not be so obvious and may depend on specific situation. Broad definition of both is offered by OECD (1996). Taxes are "...confined to compulsory, unrequited payments to general government." On the other hand, fees are, usually, connected with a specific service or activity which is received in return. However, there are some gray areas where fees are considerable higher than value of received service.

Tax policy is used not only as a source of public finance, but also as a regulatory tool to either encourage or discourage certain behavior. Tobacco taxation is an example how taxes are used to regulate behavior (Bader, Boisclair, & Ferrence, 2011). Another example is taxation of fossil fuel (Wolfson & Koopmans, 1996). However, imposing such taxes may be defended for regulatory or efficiency enhancing purposes, often true motivation is to secure public finance sources (Barnett & Yandle, 2005).

Because taxes belong to significant regulatory tools of fiscal policy, we employ two different tax policy designs in secondary spectrum market as possible ways of giving spectrum users the incentives to use the spectrum resource more efficiently. The first one represents implementation of tax for unused frequency channels and the second one, the approach based on tax license being reduced by portion of successfully utilized frequency channels. These two designs are compared and analyzed from the service providers' and also the whole system's point of view.

Cognitive radio networks and frequency spectrum markets represent systems with increasing complexity of interactions that require implementation of new, effective tool. One of the most frequently used approaches to simulate complex dynamics arising from interactions among large number of entities is agent-based modelling (ABM). Main advantage of ABM approach is possibility to implement heterogeneity and bounded rationality of agents (Axtell, 2000).

Heterogeneous set of agents can be created by different settings of attributes that may have impact on decision-making process of agents and subsequently influence their learning and overall behavior (Macal & North, 2010). To imitate human ability to learn is necessary to implement one of appropriate machine learning methods. Artificial agents in complex systems are able to achieve impulses and interact with their environment and in this way, they improve own decisions.

This paper studies behavior of secondary service providers (SSP) in the secondary spectrum market and proposes agent-based model to simulate effects of two different tax instruments on spectrum usage efficiency.

2 Description of Agent-based model

2.1 Model preliminary

The agent-based model was proposed in order to study an impact of different instruments of tax policies on secondary service providers' behavior and their interactions with end-users. From many different elementary models of spectrum sharing, we chosen to follow a concept of the hierarchical spectrum market structure with three types of agents: the independent system operator so called primary service provider (PSP), secondary service providers (SSPs) and end-users. PSP is just in passive role and the key entities of our interest represent SSPs. PSP is the owner of licensed frequency channels and in case when it is not able to fully use all owned frequency bands, it has an option to reduce number of unoccupied channels by leasing them in the secondary spectrum market. Through dynamic spectrum sharing and open access market concept are these channels available to SPSs whose primary goal does not have to be providing telecommunication services to end-users but gaining own financial benefits. These entities could offer wireless service in limited areas or on a non-permanent basis and they have social or economic objectives on speculating. To eliminate high initial costs associated with building own network infrastructure, the concept of network infrastructure sharing is adopted. It reduces entrance risk and enables market to become more accessible to new entities.

The proposed model of secondary spectrum market can be divided into two parts: the wholesale and the retail market. In the wholesale market, the unoccupied frequency channels, owned by PSP, are dynamically leased by SSPs. Respective transactions are carried out on a real time basis, it means that spectrum contracts are traded dynamically in a matter of days and hours. At the beginning of the trading day, SSPs lease a certain number of channels in advance and utilized them during the following hours in the retail market. The decisions of SSPs regarding number of leased channels are influenced by uncertainty caused by time-varying demand in the retail market and also by implemented type of tax policy. Choosing the optimal strategy that maximizes their profit is possible through implementation of learning algorithm. Pricing strategy of SSPs has to be also adjusted to changing demand in the retail market. For this purpose, the *Successful Ratio* approach was adopted. Behavior of end-users follows the microeconomic utility concept in our model.

2.2 Wholesale market

Via wholesale market, the PSP is able to allocate the unoccupied frequency channels that represent possibility for SSPs. For simplicity, we assume constant number of unoccupied channels offered by PSP for trading. At the beginning of the trading day, each SSP has to decide about number of requested channels that maximize its profit. The number of leased channels k_i represents one of 16 possible strategies while each SSP has the same strategy space: $k_i \in \{0, 2, 4, \ldots, 28, 30\}$ including possibility not to participate in secondary spectrum market at all.

SSPs have ability to learn from their own experiences and choose the optimal strategy from the strategy space.

We applied one of the most powerful tools from adaptive learning area related to the field of learning automata, so called *Linear reward-inaction* algorithm. It belongs to probability-vector approaches while length of this vector of non-negative numbers that sum to 1, corresponds to the number of possible strategies of an agent. Agent chooses one of strategies according to a probability vector, which at every instant contains the probabilities of choosing each action. Critical issue is the updating of probabilities. Very popular is the linear reward-penalty algorithm. Whenever an action is chosen and succeeds, the probability of performing that action is increased, but when is chosen and fails, the probability of performing the other action is increased. This algorithm has better performance than choosing strategy at random, but it is not optimal because it has no absorbing effect and always executes wrong action with nonzero probability. For this reason we have decided to use the linear reward-inaction that, on the other hand, has desired absorbing effect because a probability is only increased by chosen strategy which succeeds. At the start of the simulation, the probability distribution of the strategies s_i is uniform (i.e., $s_i(j) = 0,0625$ for all j). It is iteratively updated according to the Eq. 1 until the increment in the probability vector is negligible and the learning process stops.

$$s_i^{+1}(k) = \begin{cases} s_i(k) - \eta R_i(k)s_i(k) & if\ k \neq j \\ s_i(k) + \eta R_i(k)\sum_{k \neq j} s_i(k) & if\ j = k, \end{cases} \qquad (1)$$

where η is learning parameter ($\eta \in \langle 0,1 \rangle$) and $R_i(k)$ represents the payoff of the i-th SSP received by playing the k-th strategy. Payoffs represent the response (i.e., reward) to the corresponding action from the stochastic environment and help to choose the subsequent action. Through a series of interactions with environment, the provider finally approaches to optimal behavior. However, the calculation of SSP's payoff at the end of period depends on implemented tax instrument.

a) Tax license
The first design of proposed tax policy is so called tax license. It is common to have license fee being paid to the government for the privilege of being able to practice spectrum trading. It is implemented as a nominal fee for all potential participants of spectrum market, which may be reduced afterwards. Then the payoff of a SSP is calculated as follows

$$R_i(k) = \sum_{j \in C_i} p_{i,j} - p_l \frac{h_i(k)}{k}, \qquad (2)$$

where C_i denotes number of end-users connected to the i-th SSP, $p_{i,j}$ represents retail price paid by j-th end-user to i-th SSP for one-hour connection, p_l denotes fixed value of tax license paid by each SSP and $h_i(k)$ expresses number of unutilized frequency channels of the i-th SSP playing strategy k (i.e., at the beginning of day SSP has leased k frequency channels). With increasing number of utilized channels, the SSP's costs are decreasing.

When there are n SPSs participating in spectrum trading, tax license produces revenues on the system level, which is calculated

$$T = \sum_{i=1}^{n} p_l \frac{h_i(k)}{k}. \qquad (3)$$

b) Tax for unused frequency channels

The second approach is based on a tax rate associated with unused frequency channels. In the case, when SSP has leased more channels than is able to utilize, for each unused channel he has to pay a tax. In this situation, the SSP's payoff is calculated according to following formula and depends on a tax rate chosen by government.

$$R_i(k) = \sum_{j \in C_i} p_{i,j} - h_i(k)r, \qquad (4)$$

where r denotes tax rate for one unused frequency channel per one period.

Revenues from the tax paid by SSPs for inefficient spectrum usage represent contribution to the public authority and can be expressed as follows

$$T = \sum_{i=1}^{n} h_i(k)r. \qquad (5)$$

2.3 Retail market

In the retail market the transactions between service providers and end-users are carried out. The whole concept of this market is derived from (Gazda, Kovác, Tóth, Drotár, & Gazda, 2017). End-users are able to capture signal quality and price for connection required by providers. They try to satisfy their need (connection to the network) while maximizing QoS and minimizing their costs. Network switching mechanism, that represents end-users' ability to choose provider in the real-time, enables them to increase their utility $U_{i,j}$ depending on the distance $d_{i,j}$ from the j-th provider's base transceiver station (BTS) (see Equation 6). With increasing distance, the QoS is decreasing.

$$U_{i,j} = e^{-\alpha d_{i,j}^{\beta}}, \qquad (6)$$

where α, β are utility function parameters that set the shape of the utility function. Sensitivity of utility function to these parameters setting is shown in Figure 1.
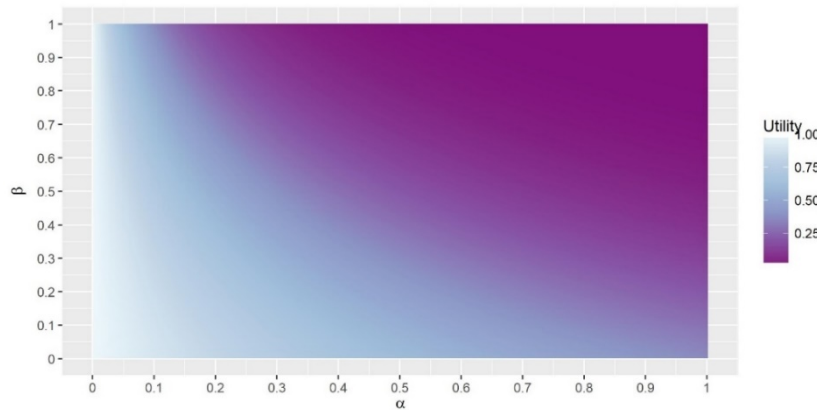
Figure 1 Sensitivity of the utility function to parameters α and β
Source: Own construction

Also the sensitivity to a price for one-hour connection $p_{i,j}$ has to be implemented. To accomplish that, each end-user has assigned acceptance probability $A_{i,j}$ that expresses the probability to accept an offer of the j-th SSP given by following formula

$$A_{i,j} = 1 - e^{-cU_{i,j}^{\delta}(1-p_{i,j})^{\gamma}}, \qquad (7)$$

where c is an appropriate constant and $\delta, \gamma > 0$ are the parameters describing the sensitivity of the end-user to both utility and price, respectively (see Figure 2).
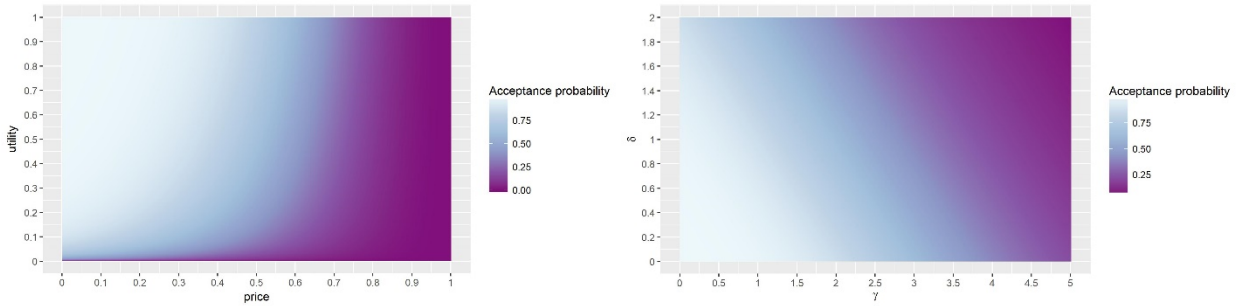
Figure 2 Sensitivity of acceptance probability to price/utility and γ/δ, respectively
Source: Own construction

SSPs providing services to end-users lease a certain amount of frequency channels. Their primary goal is to maximize own profit by efficient utilizing leased channels. However, the market demand is uncertain as a result of cognitive capabilities of end-users' devices and network switching technology. As the consequences, SSPs have to dynamically plan a sufficient number of frequency channels in advance and dynamically adapt prices in real-time to accommodate demand in the retail market. To accomplish that, the mentioned pricing method called *Successful Ratio* was adopted. Each SSP calculates its retail price at the beginning of each period according to following formula

$$p_i = p_{i,t-1} + \left(\psi_{i,t-1} - 0.5\right)\mu, \tag{8}$$

where $\psi_{i,t-1}$ is acceptance ratio of i-th SSP's previous price defined as shown in the Table 1 and μ denotes price shaping parameter.

Table 1 Acceptance ratio of SSP based on total leased channels and number of end-users trying to connect

$BW_{avail,i}$	S_i	ψ_i
$= 0$	$= 0$	$^1/_2$
> 0	$= 0$	0
> 0	> 0	$\dfrac{S_i^{idle \to conn}}{S_i}$

Source: Own construction

where S_i represents number of end-users trying to connect to i-th SSP, $S_i^{idle \to conn}$ is the number of end-users successfully connected (they change state from *idle* to *connect*) to i-th SSP and $BW_{avail,i}$ is total number of channels leased by i-th SSP in the wholesale market.

3 Simulation results

In this paper we analyzed two different tax instruments applied for participants in the secondary spectrum market and associated impacts on their behavior. For this purpose, the agent-based modeling methodology was used.

Agent-based simulations were conducted in software NetLogo (Wilensky, U., 1999) and each of them consists of 100 000 simulation rounds while first 30 000 rounds were disregarded to ignore the non-stationary development. One simulation round (so called tick) represents one trading day and consists of 24 hours. One hour is the minimum connection length and trades in the retail market run once an hour. The simulations for 21 different tax rates and 21 different values of tax license were performed, while each simulation was run ten times with the same parameter settings. In our model, we assume one dimensional space with five SSPs located along the line and the end-users are uniformly distributed across this line. Different location of SSP leads to different size of demand in the retail market and in this way the heterogeneity of service providers is simulated. The settings of all parameters are shown in Table 2.

Table 2 Parameter settings

Parameter	Symbol	Value
Number of SSPs	n	5
Number of end-users	-	200
Starting retail price	p	0.02
Utility function parameter	α	0.01
Utility function parameter	β	0.8
Acceptance probability function parameter	γ	2.4
Acceptance probability function parameter	δ	0.55
Acceptance probability function parameter	c	8
Activation probability	Pr_{act}	0.75
Disconnection probability	Pr_{disc}	0.5
Linear reward-inaction learning parameter	η	0.004
Number of SSP strategies	-	16

Source: Own construction

Tax belongs to one of traditional tools used for affecting and changing the behavior among taxpayers. Usually, governments levy taxes in order to fund various public expenditures and provide sufficient amount of public goods. From this reason, the tax revenue is very important indicator that can be analyzed. It is straightforward, that higher tax rate for unused channels or value of tax license leads to higher tax revenues but with decreasing increments (see Figure 3). One of the most famous concepts is Laffer curve that illustrates relationship between rates of taxation and the associating levels of tax revenue. In our model, the typical Laffer curve is not observed; it does not fall towards to zero revenue after intermediate rate of taxation in both types of taxation.

The noticeable reduction in the rate of growth is caused by continuously increasing costs associated with higher tax burden. Providers require less and less frequency channels in the wholesale market in order to minimize number of unutilized channels and to reduce their tax costs. But in the case of high taxation, it is not possible for providers to compensate costs in form of paid tax or tax license by revenues from utilized frequency channels. According to the results of our simulations, we can see differences between these two tax instruments. When the tax license is implemented, the reduction in the rate of growth of tax revenues is more noticeable. In the situation, when the value of tax license is higher than 500 currency units, the tax revenues stop to increase and stay almost at the same level. Tax revenues are less affected by increasing taxation when the mechanism of tax for unused frequency channels is applied.

Each type of tax mechanism influences provider's behavior, but in different way. This fact is depicted in Figure 4. Tax license has almost the same effect on all providers regardless of their

location. On the other hand, effects of tax for unused frequency channels takes into account the location of provider. Providers with leased frequency channels on BTS located in peripheral areas that typically face lower demand (red and orange one), contribute to source of public finance with lower amount of money than the others. Providers with higher demand face higher demand uncertainty and often require more channels than are able to utilize in the retail market. Higher absolute number of unused channels leads to higher costs when the mechanism of tax rate for unused channels is applied. On the hand, tax license takes into account relative ratio of unutilized channels to total leased channels but not the absolute value of them. However, tax for unused channels creates higher tax revenues than tax license on average.
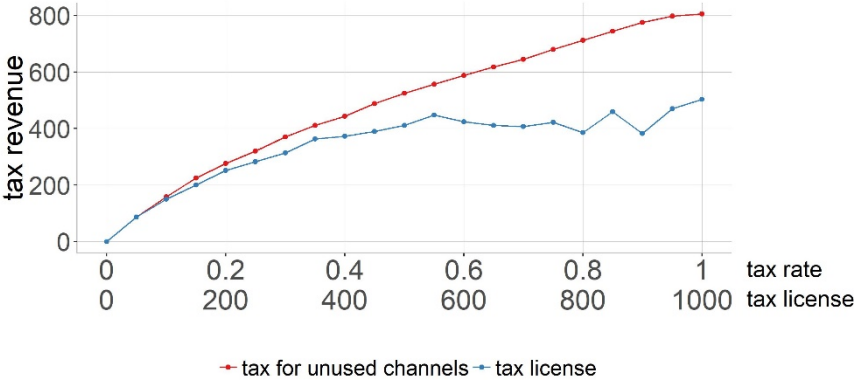
Figure 3 Tax revenue based on tax percentage or amount of tax license
Source: Own construction
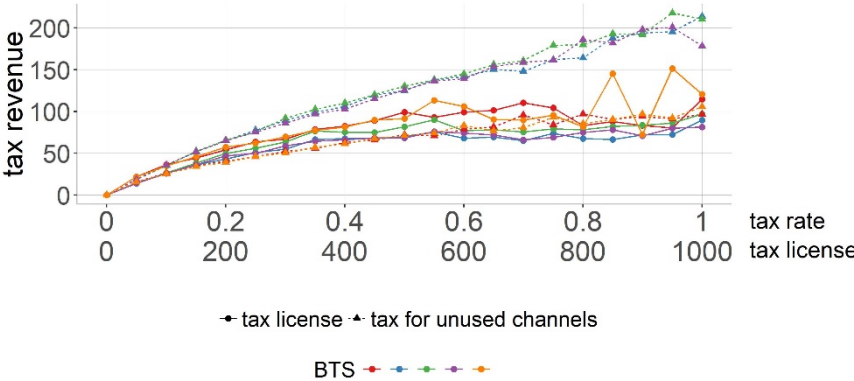
Figure 4 Tax revenue from individual BTSs based on tax percentage or amount of tax license
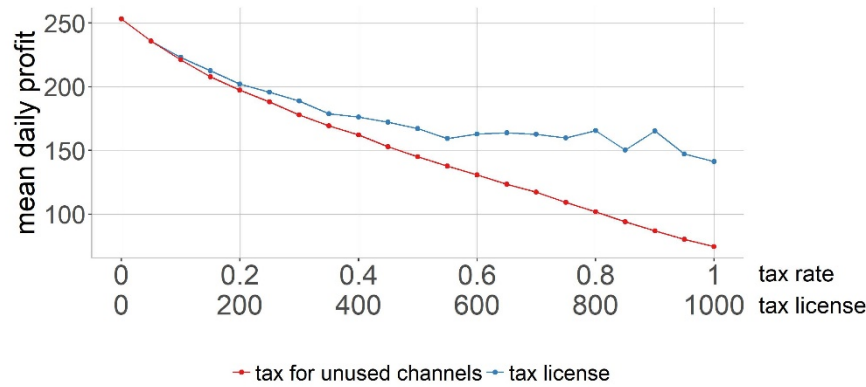Source: Own construction

The scarcity of frequency spectrum leads to main goal of spectrum management that is increasing efficiency of spectrum utilization through more flexible and dynamic spectrum access as well as different tools that create incentives to use spectrum more efficiently. Thus, the indicator of spectrum usage is very important aspect that represents accomplishment of this main objective. It is expressed as a ratio of frequency channels successfully utilized in the retail market to total number of channels required in the wholesale market. According to Figure 5 showing mean spectrum usage per active provider, the spectrum usage raises with increasing tax burden. It is a consequence of lower demand in the wholesale market. In a case of low taxation providers require more channels than they are able to utilize because they have to be prepared for time variance in demand for telecommunication services and unused channels do

not create high additional costs in this situation. On the other hand, the higher taxation means higher costs associated with inefficiently used channels, thus providers require just as many channels as they need to accommodate the demand in the retail market.

Differences between implemented mechanism are not very significant (see Figure 5). Mechanism based on tax license can reach slightly higher spectrum usage in situation of low tax burden. According to Figure 6, it is caused by providers that leased frequency channels at BTS located in peripheral areas. When tax license is more than 600 currency units, these providers with lower demand no longer participate in spectrum trading (see Figure 6, there are missing observations for red and orange provider) because costs in form of tax license are very high for them and they are not compensated by a revenues from providing services to end-users. As the result, the competition among service providers is reduced and demand for the others providers' channels increases. Due to this fact, they are able to utilize more channels and reach higher spectrum usage than in the case of tax for unused channels.
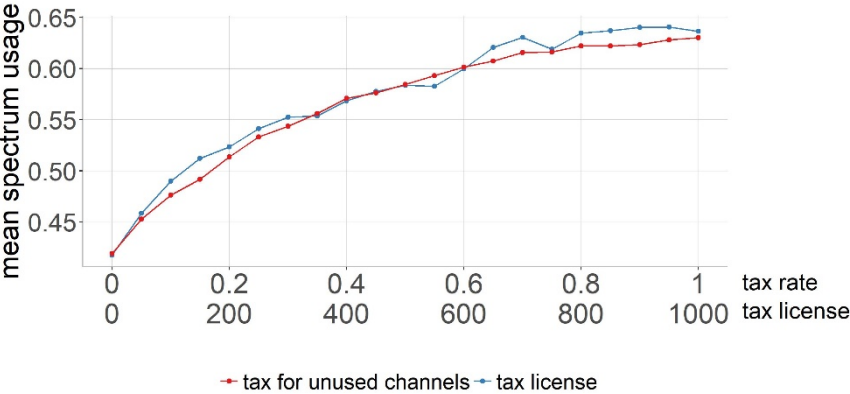
Figure 5 Mean spectrum usage based on tax percentage or amount of tax license
Source: Own construction
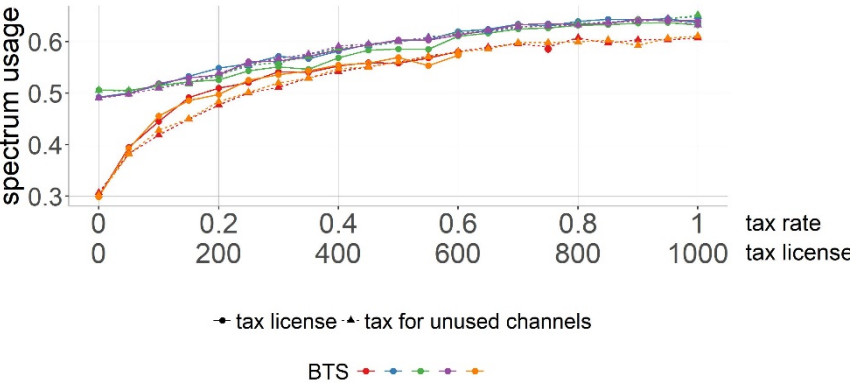
Figure 6 Spectrum usage of individual BTSs based on tax percentage or amount of tax license
Source: Own construction

The term overall spectrum usage represents utilization of all unoccupied frequency channels owned by PSP. For simplicity we can assume constant value of spectrum hole, i.e., constant number of unoccupied channels each trading day. Under this assumption, the taxation has negative effect on overall spectrum usage when there are no new entities in the market and the number of SSPs stays the same. It is a consequence of providers' effort to minimize costs

associated with inefficient utilization of channels that leads to their lower demand in the wholesale market. By this action, they are trying to reduce the possible loss caused by inability to utilize leased channels. On the other hand, the higher taxation motivates providers to use leased channels more efficiently that makes additional spectrum available for additional users or for new services. The main objective of tax policy makers is to find trade-off between maximizing spectrum usage and minimizing tax burden for providers that can discourage them from spectrum trading. Differences between two applied mechanisms are not significant and are depicted in Figure 7.
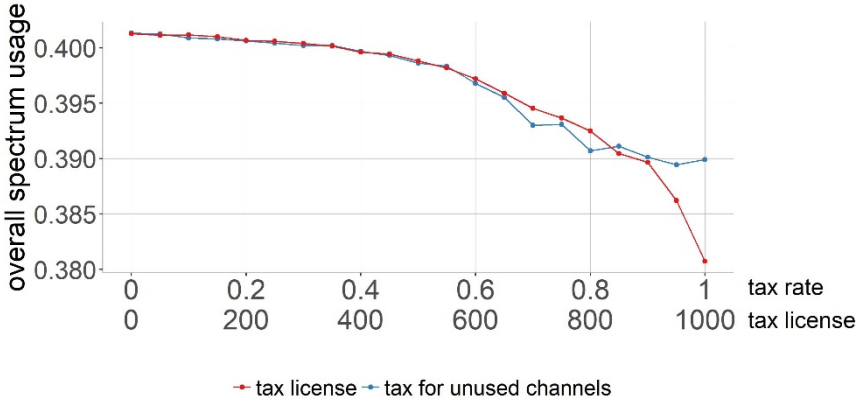
Figure 7 Overall spectrum usage based on tax percentage or amount of tax license
Source: Own construction

From providers' point of view, the value of daily profit is very important factor. Results of our simulations show negative impact of taxation on daily profit of active provider. Naturally, the higher costs associated with taxation, the higher profit reduction. When the mean daily profit per provider is analyzed, there is obvious difference between two implemented instruments. Daily profit decreases by increasing tax rate more significantly than by increasing tax license. In contrast to the mean provider's daily profit, interesting conclusions can be derived from the impact of taxation on individual provider behavior. In a situation of tax license, the mean daily profit per active provider is less affected by increasing tax costs, but this shape of curve is caused by forcing the providers with small demand out of the market. These providers are not able to compensate costs in form of tax license by revenues from spectrum utilization and even by increased retail prices required per connection are operating at a loss. On the other hand, the daily profits of other providers do not fall, on the contrary start to increase very slightly after reduced competition in the market and this fact increases mean profit per active provider from the whole system's point of view. The situation is quite different by implementing tax for unused frequency channels. Daily profits of all providers are reduced and those providers with small demand react even less sensitively. The competition among providers is not reduced, all of them keep to operate in the market and are profitable regardless their location and corresponding demand.

Figure 8 Mean daily profit based on tax percentage or amount of tax license
Source: Own construction
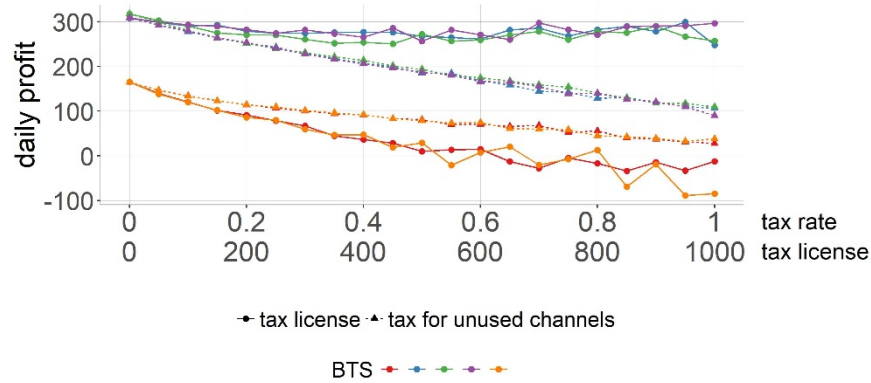
Figure 9 Daily profit of individual BTSs based on tax percentage or amount of tax license
Source: Own construction

4 Conclusion

This paper analyzed effects of two different applications of tax policy designs for accomplishing the main objective of spectrum management – increasing efficiency of spectrum usage. Tax license and tax for unused frequency channels were chosen as potential tools to regulate behaviors of spectrum market participants in desired way. To take into account the complex aspects of trader's behavior such as autonomy, bounded rationality, heterogeneity or ability to learn, the agent-based model was proposed. According to the results of our simulations, two implemented approaches have similar impact on the system as a whole but they distinguish in effects on individuals. Positive impact of both tax instruments on spectrum utilization was confirmed. Implementation of taxation tools leads to more efficient utilization of owned channels by providers that creates new opportunities for additional market participants, subsequently creates more competitive environment and increases overall spectrum utilization. On the other hand, the higher taxation also creates discouraging effects and unbearable tax burden can eliminate participation in the spectrum trading. From the government's point of view, imposing new taxes represents new source of income which is appealing and, in a long run, inevitable. As a result, the optimal tax policy application represents key issue necessary to be addressed. Simulations show that the main difference between two analyzed tools is in their response to the provider's location and corresponding demand size. Tax license forces providers with lower demand out of the market, reduces competition in the market and also leads to lower tax revenues. One of the main goals of relatively new emerging

concepts of small cells and HetNets is to expand network coverage and increase capacity in geographical areas with lower demand. From this reason, tax license seems to be a less appropriate tool. On the other side, tax for unused frequency channels imposed on all providers does not create pressure on them to leave the market.

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The Transfer Law in German professional Football and the influence to Transfer Market

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Abstract

Since the middle of the 90s, the development of transfer prices has taken on ever greater proportions. Even before the Bosman ruling, football players had to fear for the release of the club and the associations in the event of a change of club and fear for their future in the event of a negative decision, but now the balance of power between player and employer has balanced itself again. As a result of the stronger negotiating position, the salaries and market prices of the players have also risen over the years. As a result, financially weak clubs in particular, which do not have the financial capacity, are becoming increasingly marginalised in sporting terms. These clubs in particular have the opportunity to make a profit from the high transfer prices, at least on the revenue side, provided they have a good and active talent factory.

Keywords: Borussia Dortmund, Bosman, Bundesliga, FIFA, Transfer Market, UEFA

JEL Classification: G10, J40, K31

1 Introduction

In 1995, the Bosman ruling essentially changed transfer law in professional football. This had a decisive influence on both the playing and the economic aspects of the clubs. The transfer of Neymar jr. with EUR 222 million represents the provisional high point of this development. Although this article deals with the transfer situation in German professional football, the Neymar transfer also had a direct influence on the German transfer market. Due to the high transfer income of the Neymar deal, FC Barcelona set out in search of a new young talent. The future player should not only be offensively strong, but also match FC Barcelona playfully. The Catalans found what they were looking for at the traditional German club Borussia Dortmund. Ousmane Dembélé left the club for Spain for 105 million euros. Depending on FC Barcelona's success, the transfer sum could increase by a further 40 million euros in the next few years.

The objective of this article is to deal with the legal structure of transfers in professional football in Germany. At the same time, the development of transfers in Germany since the Bosman ruling is examined in more detail.

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2 Transfer in professional football

### 2.1 Definitions and Terms

2.1.1 Professional Sport

In common usage we speak of professional when something is of special quality (Skuballa, 2006). This can be a specially crafted wristwatch or a very well prepared meal. This term is particularly associated with a specialism (Skuballa, 2006). Professionalism clearly distinguishes itself from dilettantism and poorly executed activities (Skuballa, 2006). In football, the term Pro is used for players who can easily earn a living with it. This is possible in some leagues from the third league onwards.

2.1.2 Association Structure in Football

The FIFA (Fédération Internationale de Football Association) was founded in 1904 in the Netherlands and is the world football federation. It has 6 continental federations with a total of 211 affiliated national federations.

The six continental federations are:
- Asian Football Confederation (AFC; 47 members)
- Confederation of African Football (CAF; 56 members)
- Confederation of North, Central American and Caribbean Association Football (CONCACAF; 41 members)
- Confederación Sudamericana de Fútbol (CONMEBOL; 10 members)
- Oceania Football Confederation (OFC; 11 members)
- Union of European Football Associations (UEFA; 55 members)
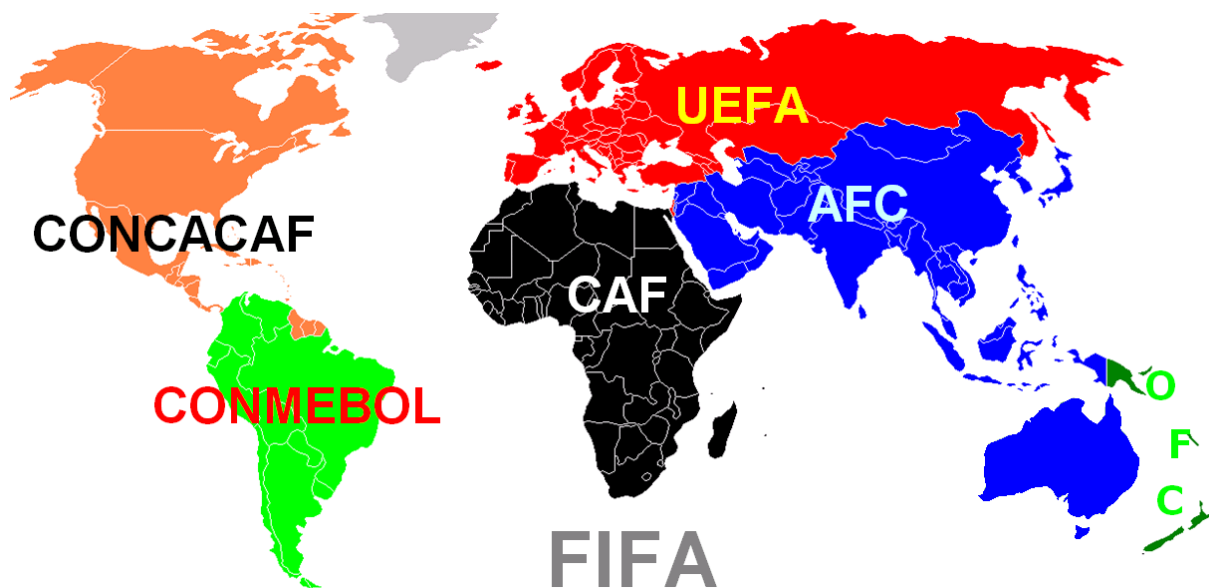
Figure 1: Structure of the FIFA Association
Source: https://upload.wikimedia.org/wikipedia/commons/7/75/FIFA_Kontinentalverb%C3%A4nde.PNG.

As the supreme football organisation, FIFA has many tasks. The organisation of major tournaments such as the World Cup is one of them. It is also FIFA's biggest source of income. In addition, FIFA exchanges information with the continental associations and discusses the future of football in various committees. FIFA is also responsible for transfers between national associations. This is to ensure that transfers between clubs take place in a more transparent manner and under the rules of compliance.

2.1.3 Transfer

In professional sport, the term "transfer" generally refers to the transfer of an athlete from one club to another club (Stopper and Karlin, 2018). In football, the transfer of a player to another club is usually associated with the payment of a transfer fee (Seip, 2017). This is due if the player changes to another club before the end of the contract term of his employment contract (Stopper and Karlin, 2018). The previous club terminates the employment contract with the player before the end of the contract and receives a so-called transfer compensation payment from the new club.

A transfer can be carried out between national clubs which, for example, belong to the German Football Association (DFB). The German national player Mats Hummels, for example, switched from Borussia Dortmund to FC Bayern Munich for 35 million euros in the Bundesliga for the 2016/2017 season.[3] It is also possible, however, for a player to switch from a national club to an international club. An example of this is the transfer of player Christiano Ronaldo from Spain's top club Real Madrid to the traditional Italian club Juventus Turin for 117 million euros.[4] The player switched between the Spanish Football Association Real Federación Española de Fútbol and the Italian Football Association Federazione Italiana Giuoco Calcio.

2.2 Historical Development of Transfer Law in Germany
2.2.1 3+2 Rule

In 1991, UEFA negotiated the "3+2" rule with the European Commission. It provided for the clubs to sign and employ EU nationals in any number. It had to be borne in mind that a maximum of three of these players and two national footballers could be used in the game. A player was considered to be a national footballer if he had played for five years without interruption for a club belonging to the national association. Of the five years, three must have been active in the youth, i.e. eligible to play, completed (Summerer, 2014).

2.2.2 Bosman-Ruling

In 1995, the European Court of Justice (ECJ) issued a landmark ruling for future transfers in the form of the Bosman ruling,[5] according to which a player who is a member of an EU member state and whose contract had expired may no longer be required to pay a transfer fee from the releasing club in the event of a cross-border transfer within the EU (Stopper and Karlin, 2018). This ruling has often been referred to as a judgement of the century (Hilpert, 2007), because it had far-reaching consequences for professional football.

The ruling was preceded by a failed transfer of the Belgian professional footballer Jean-Marc Bosman. He wanted to change from the Belgian club RC Liège to the French club US Dunkirk. In contrast to today, where players can move freely to another club after the expiry of the contract without the latter requiring a release declaration from the losing club, the transfer regulations of the Belgian football association Union Royale Belge des Sociétés de Football-Association (URBSFA) required a release declaration from the losing club in order for the player to receive a new playing licence after the transfer (Summerer, 2014). In order to obtain this release declaration, Club US Dunkirk was obliged to pay the RC Liège a transfer fee in the form of training compensation. With this the clubs wanted to secure themselves financially on the one hand and on the other hand to be fairly compensated for the development of a young

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[3]Transfer Fee by Mats Hummels, https://www.transfermarkt.de/mats-hummels/transfers/spieler/39728, recently viewed at 31.08.2018.

[4]Transfer Fee by Christano Ronaldo 2018, https://www.transfermarkt.de/cristiano-ronaldo/transfers/spieler/8198, recently viewed at 31.08.2018.

[5]ECJ Verdict, Union Royale Belge des Sociétés de Football Association ASBL v Jean-Marc Bosman (1995) C-415/93.

player as well as for the further development of an established player. However, the contract between the two clubs was not concluded because the Liège RC doubted that the US Dunkirk would not be able to provide the financial means for the transfer. It so happened that Jean-Marc Bosman's club failed to apply to the Belgian Football Association for the necessary release certificate. As a result, the contract between the two clubs was not concluded and even after further failed transfer attempts, the player was ultimately unable to pursue his profession as a professional footballer. This had financial consequences for Jean-Marc Bosman and he sued for damages.

Not only players of the Belgian Football Association were disadvantaged by this regulation. Players from other European associations, such as the German Football Association, were also restricted in their freedom to conclude contracts. Either the dictated contracts of the clubs and associations were accepted as players, or it was no longer possible to pursue one's career as a professional football player. This course of action represented a huge cut in private autonomy and shifted the weight of power in favour of the association (Samstag, 1995). Accordingly, the decision of the European Court of Justice was of great significance.

The European Court of Justice ruled on 15.12.1995 that the transfer provisions and aliens clauses in the contracts of the football associations violated the right of free movement under Art. 48 EEC Treaty (now Art. 45 TFEU). The right guarantees that every employee who has a European nationality may not be placed in a worse position than a national in terms of job choice and employment conditions. The associations had at least hoped to be able to justify the foreigner clauses (Summerer, 2014). In this way they wanted to take advantage of the national aspect by arguing that this would preserve the association's ties to its country and thus guarantee identification with the public. Furthermore, the associations argued that the aliens clause ensures that the number of potential national players is maintained if enough local players are allowed to play in the higher leagues. Furthermore, the clause serves as a sporting balance between the clubs. It was foreseeable that these arguments would no longer stand the test of time and would no longer be appropriate for the progressive development of Europe. In its judgment, the European Court of Justice excluded national teams from the scope of Art. 45 TFEU because of their sporting and non-economic characteristics, but completely rejected this in the case of club teams.

Looking back at the verdict, one comes to the conclusion that FIFA had misjudged the situation until the verdict was pronounced. It is no different to explain why FIFA failed to seek a settlement with the plaintiff Jean-Marc Bosman until the decision of the European Court of Justice. This forfeited the possibility of postponing the European Court of Justice's landmark decision for several years until the final opinion of the Attorney General Carl Otto Lenz (Hilpert, 2007).

3 Effects of the Bosman ruling
3.1 Effects on the Associations
The associations initially saw no need for action as a result of the court ruling. Only when the EU Commission increased the pressure on them did it see UEFA forced to change its rules. In February 1996, the Commission decided to lift all restrictions on foreigners in club competitions. This then led to far-reaching changes in the subordinate associations and their affiliated clubs.

3.2 Effects on the Clubs

The Bosman ruling had far-reaching consequences for the clubs. If in the past, under the protective cover of the associations, they could more or less freely dispose of the players and collect a guaranteed transfer fee, the balance of power between the player and the club has been balanced again. The player and his manager have been given even more contractual poker power than in the past. Possibly because the clubs have increased the players contract duration in response to the Bosman ruling. In this way, they wanted to ensure that a guaranteed transfer fee could be collected when a player changed (Haas and Martin, 2011). True to the motto - the longer the contract period, the higher the transfer fee. Since the players were again more restricted in their freedom of movement, they could be paid significantly higher player salaries. After all, with a long contract term and particularly good performance, they could miss out on a better salary offer from another club. From 1995-2008 alone, these rose from 550000 EUR to 1.3 million EUR (Haas and Martin, 2011). That makes an increase of 136.36 percent within 14 years.

3.3 Effects to Transfer Prices

While in the past the clubs and their players were mainly concerned with sporting success, culture has changed considerably to the effect that money now governs the direction of professional football. Of course, the focus is still on sporting success, but over the years the clubs have changed into business groups that have to cope with increasing pressure from the public (Karsch, 2005). In transfer decisions in particular, their own economic interests play a far more important role than the interests of the fans. They would prefer their club to keep a top performer instead of handing him over to another club for a lot of money. Since the Bosman ruling in 1995, a lot has happened in the world of football transfers. In the past, players were only allowed to change clubs for a transfer fee at the end of a contract, but now they can change clubs without major restrictions. One of the consequences of this decision was that the transfer expenses for footballers increased year by year (Haas and Martin, 2011). In the summer of 2017 alone, Brazilian footballer Neymar switched from the Spanish top club FC Barcelona to the French sheikh club Paris Saint-Germain for the unimaginable sum of 222 million EUR. The transfer prices that are called today are only oriented to a certain extent to the football skills of a player. Rather, it is about the commercial marketing of the respective star and the resulting profit maximization. Of course the prices for an exceptional athlete like Ronaldo are justified, since he not only improves the team performance playfully, but also demonstrably brings success to the club. However, the prices for average players are now hardly affordable for smaller clubs.

As can be seen very clearly from Figure 1, transfer prices rose sharply in the mid-1990s. This was triggered on the one hand by the Bosman ruling and on the other by the Internet.

While the Internet was still in its infancy in the year of the Bosman ruling, the potential marketing of a player has developed rapidly and has now reached astronomical heights. In the past, players were marketed via analogue media such as newspapers, magazines and posters. Now, clubs and their partner sponsors can reach many more fans, i.e. potential customers, through the digital age. Media such as Facebook, Twitter and Instagram play a particularly important role in this. Christiano Ronaldo alone has almost 319 million followers worldwide.[6] In second and third place respectively are Neymar with about 192 million and Messi with 178 million followers.[7] This explains why Juventus Turin spent the high transfer sum of 117 million

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[6]https://www.fussballdaten.de/social/spieler/, recently viewed at 31.08.2018.
[7]ibid.

Euros for a 33-year-old player. This gives the club and its sponsors far more opportunities to address new customers and open up new markets.

History of the football transfer record
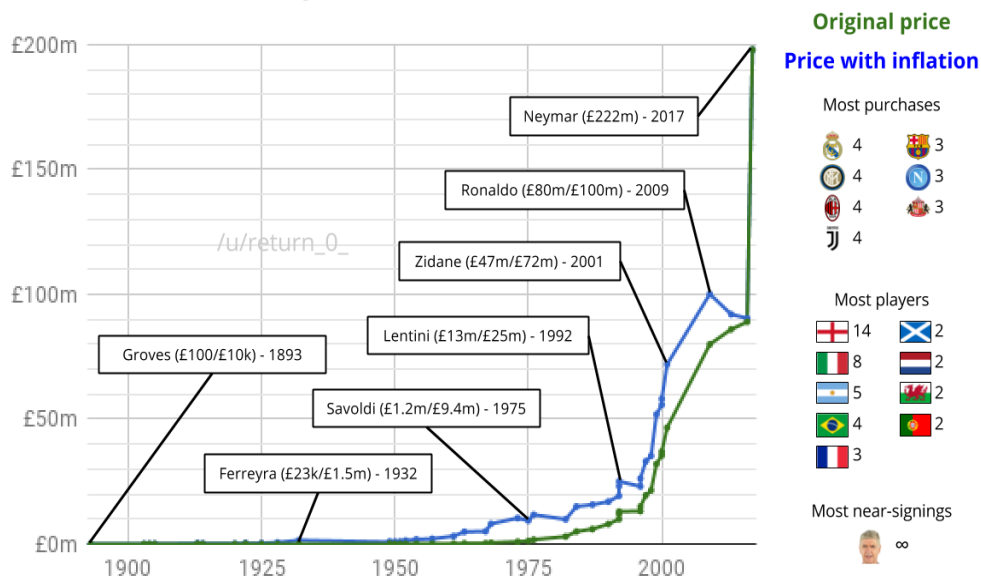
Figure 2: History of the football transfer record.
Source: https://i.imgur.com/JC8gmXU.png.

3.4 Disadvantages for Bundesliga Clubs

The high transfer fees, which also entail problems, remain undisputed. The competitiveness of the clubs in particular, which cannot cope with the high transfer sums, is lagging behind expectations. This can be seen very clearly from the performance of German Bundesliga clubs in international competitions. Apart from FC Bayern Munich's success in the Champions League, in the unique "German Classico" against Borussia Dortmund in 2013, and the lost final in 2012, there were hardly any relevant and presentable successes in this competition. The track record of German clubs in the Europe-League is even more depressing. No German team has reached the final since summer 2010.[8] The last successes are even further behind. In 1995 FC Bayern Munich and a year later FC Schalke 04 last won the Europe-League (formerly UEFA Cup). In contrast, the rivals from Spain and England won the Europe-League title a total of 12 times. Nine of the titles were won by Spanish teams. This shows that, apart from FC Bayern Munich and Borussia Dortmund, no Bundesliga club can compete against leagues that are willing to pay high transfer sums for very good players.

3.5 Advantages for Bundesliga Clubs

The high transfer expenses of the top foreign clubs may have a negative impact on the Bundesliga clubs in international sporting competition, but they are at least financially positive. The listed football club Borussia Dortmund in particular has benefited greatly from this development in recent years. The high demand from abroad for talented players earned the club a lot of money. The major media transfers of recent years were Pierre-Emerick Aubameyang (63.75 million EUR)[9] and Henrikh Mkhitaryan (42 million EUR)[10], led by the young French

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[8]https://www.transfermarkt.de/europa-league/abschneiden/pokalwettbewerb/EL, recently viewed at 31.08.2018.
[9]Transfer Fee by Pierre-Emerick Aubameyang, https://www.transfermarkt.de/pierre-emerick-aubameyang/transfers/spieler/58864, recently viewed at 31.08.2018.
[10]Transfer Fee by Henrikh Mkhitaryan, https://www.transfermarkt.de/borussia-dortmund/rekordabgaenge/verein/16, recently viewed at 31.08.2018.

talent Ousmane Dembélé (105 million EUR). Aubameyang and Mkhitaryan moved to the top English clubs FC Arsenal and Manchester United respectively. These three players alone brought the club a turnover of 210.75 million EUR. This money will benefit financially weaker clubs. The SC Freiburg football club is one such example. As is well known, SC Freiburg and Borussia Dortmund have had a long transfer relationship since the 1990s. While the club's turnover in the 2016/2017 financial year amounted to 63.4 million EUR,[11] SC Freiburg was already able to book 1/3 of its turnover in the next financial year for the transfer of Maximilian Philipp. In the summer of 2017, Philipp transferred to Borussia Dortmund for 20 million EUR.[12] One year later, SC Freiburg was able to further increase its sales by transferring the central defender Caglar Söyüncü. It also seems that word has spread in the motherland of football that the club has a very good talent factory. The English club Leicester City bought the player for 21.10 million EUR.[13] This represents an absolute record for the club. The high revenues open up enormous opportunities for such a club. The management can invest the money in expanding the infrastructure, reducing liabilities or continuing to invest in the development of new talents.

4 Conclusion

The research work began with the question of the extent to which the Bosman ruling affected transfer prices for football players. It was found that transfer prices have risen exorbitantly since the 3+2 regulation and the Bosman ruling. The effects are particularly serious for financially weak Bundesliga clubs when it comes to their performance in international competition. Small clubs can only profit from the high prices if they can sell a talent for a good price to a financially strong club. This gives the Bundesliga the opportunity to use the capital of the top European clubs for necessary investments and to prepare for future crises.

Further research should focus on the current transfer policy and the legal framework. In particular, the focus should be on financial fair play and 50+1 regulations of the German Football Association.

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[11]Revenue SC Freiburg, https://de.statista.com/statistik/daten/studie/312328/umfrage/umsatz-des-bundesligisten-sc-freiburg/, recently viewed at 31.08.2018.

[12]Transfer Fee by Maximilian Philipp, https://www.transfermarkt.de/maximilian-philipp/transfers/spieler/143891, recently viewed at 31.08.2018.

[13]Transfer Fee by Caglar Söyüncü, https://www.transfermarkt.de/caglar-soyuncu/transfers/spieler/320141, recently viewed at 31.08.2018.

Development of valuation multiples - empirical analysis of the EURO STOXX600

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Abstract

In our contribution, we have examined the EV sales multiple in the periods from 1995 to 2017 for the companies of the EURO STOXX600. This was based on Section 11 (2) of the German Valuation Act. In addition to the development of the multiplier, the individual sectors were used to enable a valuation of the companies. The EV sales multiple was based on the average multiples of the Thomson Reuters Business Classification (TRBC) of the Business Sector and the Industry. The Industry Multiple should theoretically be better suited as it is better able to map the company profile. We found that the Industry Multiples have a smaller deviation from the respective share price.

Keywords: Valuation, Multiples, EURO STOXX600.

JEL Classification: (G12, G24)

1 Introduction

During their great boom in the New Economy, multiplier methods enjoyed great popularity, above all because of their simple application, high practicability and the possibility of evaluating companies despite a poor level of information (Coenenberg, A. G., Schultze, W., 2002). After the fall of the New Market, the frequency of use of multiplier methods also declined. True to the motto "Back to the Basics", the company valuation again concentrated on profit-oriented methods. The new inheritance tax reform law, which came into force on 1st January 2009, and the associated amendments to the Valuation Act have once again brought the multiplier methods back into the focus of valuation. In the context of the text of the law, it prohibits the asset value methods applied to date with regard to company succession and prescribes the application of comparative value methods instead.

Section 11 (2) of the BewG states: "Shares in corporations (...) shall be valued at their fair market value. If the fair market value cannot be derived from sales between third parties less than one year ago, it must be determined taking into account the earnings prospects of the corporation or another recognised method customary for non-tax purposes in ordinary business transactions; (...)".

The objective of this article is based on two pillars. On the one hand on the practical simple operational readiness of the multiplier procedures. On the other hand on the evaluation

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capability of these multiplier procedures granted by the law in Germany. In this article, the validity of the multiplier methods over time for the EURO STOXX600 companies in the period 1990 to 2018 is examined. This is done in the context of different modelling of the input variables.

2 How the Multiplier Methods Works

The popularity of the use of multipliers in practical company valuation can be explained by the simple conception of the methods. The multiplier methods are based on the "Law of one Price". The intention is to award the same assets the same prices (Coenenberg, A. G., Schultze, W., 2002). In effect, the unknown value of the company to be valued (target company) is derived from known values of comparable companies (target company). References whose values are publicly available on the market are suitable for this purpose. Therefore, the multiplier methods are also referred to as the market approach (Bausch, A. (2000), p 450 and Moser, U., Auge-Dickhut, S. (2003), p. 213). In practice, two different multiplier methods are used, which differ in the origin of the known enterprise value:

- Comparable Company Analyses (CCA) obtains the reference values from the traded values of listed companies.
- In Comparable Transaction Analyses (CTA), the reference values correspond to the actual prices paid for past acquisitions. (Bausch, A. (2000), p 450)

In all multiplier methods, the known value of the reference company that serves as the tax base is linked to a selected and known reference value of the company. This produces the multiplier that gives these methods their name. The value of the target company is then derived from the corresponding reference value of the target company. The value of the target company is thus approximated by that of the reference company. The mathematical principle on which the valuation is based is the rule of three. For the reference enterprise (R), the ratio between enterprise value and reference value corresponds to the same ratio of the target enterprise (T). In order to determine the unknown value of the target company, the equation simply has to be converted accordingly.

$$\frac{Company\ Value_R}{Firm\ Specific\ Variable_R} = \frac{Company\ Value_T}{Firm\ Specific\ Variable_T} \qquad (1)$$

$$Company\ Value_T = \frac{Company\ Value_R}{Firm\ Specific\ Variable_R} \times Firm\ Specific\ Variable_T \qquad (2)$$

$$Company\ Value_T = Multiple \times Firm\ Specific\ Variable_T \qquad (3)$$

The multiplier methods are based on the central assumption of the average infallibility of the market. Only individual companies would be misvalued by the market. As market-oriented valuations, they are attributed an extraordinarily high degree of objectivity in contrast to the future success value methods. However, the basic assumption of future success values stands in contradiction to this. As a result, markets make short-term mistakes, so that a market-oriented valuation in euphoric stock market times (bull market) leads to rising company values and in pessimistic stock market times (bear market) to falling company values (Coenenberg, A. G., Schultze, W., 2002). This value sensitivity of the multiplier methods is one of the central points of criticism of their informative value. The enterprise value determination by the multiplicator methods begin with the selection of the correct procedure. Against the background of Section 11 (2) BewG, Comparable Transaction Analyses can be neglected from both a practical and a scientific point of view. There are two reasons for this. Since the prices of company acquisitions are not always published and the trend is to reveal less and less transaction information, often

not enough reference values can be found. In addition, according to Section 11 (2) BewG, purchases may not be made more than one year ago, so that the database is further limited. From a scientific point of view, it should also be noted that further effects such as synergies and negotiating skills are taken into account in the published prices. In the context of the focus on Section 11 (2) of the Valuation Law on which this contribution is based, however, there are neither negotiations nor synergies, since in the case of inheritance only the owner changes. Accordingly, only Comparable Company Analyses is suitable for valuation purposes. The decisive advantage of the CCA as a valuation method is that company shares are traded almost daily on the stock exchange in the form of shares. On the one hand, a sufficient database of reference values is available, and on the other hand, these are "stand-alone" values that are created solely by supply and demand. (Coenenberg, A. G., Schultze, W., 2002). Once the decision has been made about the methods used, the multipliers to be used must be identified and the composition of the peer group determined, so that nothing stands in the way of a consistent valuation through a comparison procedure.

2.1 Identification of the multipliers

Conceptually, the determination of enterprise values is focused on a core variable, the multiple. The linear relationship between company value and reference value assumed by the multiplier maps the value driver models of the reference company to the target company. It is therefore advisable to select the reference variable whose value drivers have a sustained influence on the enterprise value. In practice, it is not possible to record all value drivers of a target company whose enterprise value is being sought using just one multiplier. As a rule, the use of several multipliers is recommended. As important value drivers of the target company, at least growth and risk should be considered. The valuation dimension to which the multipliers relate must also be determined. Multipliers can relate to both equity and total capital. From a practical point of view, total capital multipliers (entity approach) are recommended, since for multipliers that refer to equity capital (equity approach), the reference companies must have a similar capital structure to the target company and practically identical value drivers. The decisive advantage of the total capital multipliers is therefore their ability to react less sensitively to differences in the value drivers of the reference and target companies than is the case with the equity multipliers. The three total capital multiples established in practice refer to the reference figures revenue, EBITDA and EBIT. The relationships are

$$\frac{EV_R}{Sales_R} = \frac{EV_T}{Sales_T} \tag{4}$$

$$\frac{EV_R}{EBITDA_R} = \frac{EV_T}{EBITDA_T} \tag{5}$$

$$\frac{EV_R}{EBIT_R} = \frac{EV_T}{EBIT_T} \tag{6}$$

where *EV* (enterprise value), total enterprise value, sales, revenues and EBITDA as well as EBIT represent the operating results of the company before interest, taxes, depreciation and amortization and only before interest and taxes. The EV/SALES multiple takes the sales prices into account, while the EV/EBITDA multiple and the EV/EBIT multiple also take the company's costs into account. The individual corporate risk is included in the company's own capital structure. Thus, both growth and risk are taken into account accordingly.

2.2 Selecting the Peer Group

The probability of the existence of a reference company with value drivers equal to those of the target company tends towards zero. The recourse to only one single reference entity implies the risk of valuation errors. As a result of the objective of determining a fair value on the basis of the multipliers, one refers to a group of comparable companies (so-called peer group). The selection of the peer group, i.e. a group of reference companies, is the most difficult task in the implementation of multiplier methods. It requires knowledge of the characteristic features of the valuation object, as this is the only way to find suitable references. However, since in inheritance cases the own company is valued and not a potential object of purchase, there is no significant obstacle to obtaining this knowledge. The characteristic features can be both qualitative and quantitative. In addition to sector affiliation, company size, market position, current life cycle phase, geographical distribution, growth rate, risk structure or distribution network, there are many other characteristics that can be compared (Böcking and Nowak, 1999; Coenenberg and Schultze, 2002). However, companies will never be found in which all characteristics match. It is therefore at the discretion of the evaluator to what extent a match appears to be suitable. The most important selection criterion, however, should be industry affiliation, since it is assumed that industry-dependent growth and profit developments are equally shared (Böcking and Nowak, 1999).

A weighting of the respective multiples on the basis of the relevance of the contained value drivers must be reconsidered. Similar to the weighting of the peer group companies a weighting of the multiples used can be carried out (Moser and Auge-Dickhut, 2003; Coenenberg and Schultze, 2002). Since, however, both the popularity of the multiplier methods and one of their strengths are based on their simple applicability and thus the limited possibilities of manipulation, the present article refrains from a complicated weighting and carries out a simple average calculation.

2.3 Determining the enterprise value

If a peer group with several reference companies was selected, the previously selected multiples are determined on this basis. In accordance with the entity approach underlying this contribution, the reference values refer to the total enterprise value, which in the case of listed reference companies is equivalent to the enterprise value. This is obtained by multiplying the number of shares issued by the current share price (market capitalization) and adding the net financial debt.

However, this determination of the value of the reference companies can lead to the already mentioned over- or undervaluations. Stochastic fluctuations in share prices caused by pure speculation are problematic. A way out of this problem would be to determine the market capitalization not on the basis of the current share price but on the basis of the average share price of the previous year. In this way, short-term capital market bubbles can be smoothed out. This procedure would also be compatible with the provisions of the legislator, which prescribes sales between third parties less than one year ago as the basis. A corresponding intention is assumed here with regard to the subsequent empirical examination of the meaningfulness of the multiplier approaches. If we now divide the enterprise value by the respective reference figure, for example by sales, EBIT or EBITDA, we obtain the respective multiple. Some previous literature recommends determining each multiplier individually by the one reference company whose value drivers best match the respective value drivers of the target company (Moser and Auge-Dickhut, 2003). However, since it is unlikely to find a reference company where a value driver fully matches that of the target company, it makes more sense from a practical point of view to determine the multipliers over all the reference companies found and then to calculate

an average. In order to obtain the desired value of the equity capital of the target company, only the various multipliers have to be multiplied by the respective reference values of the target company and then the debt capital of the company has to be deducted.

Table 1 Multiple Calculation based on Peer Group Companies

Reference Company	SALES	EV	Multiple
Company A	120,00	100,00	0,83
Company B	80,00	90,00	1,13
Company C	90,00	80,00	0,89
Company D	140,00	140,00	1,00
Company E	50,00	60,00	1,20
Average Multiple			1,01
Target Company			
SALES			100,00
EV (= SALES * Average Multiple)			101,00
Net Debt			10,00
Equity Value (= EV - Net Debt)			91,00

Source: Own Calculation

A weighting of the respective multiples on the basis of the relevance of the contained value drivers must be reconsidered. Similar to the weighting of the peer group companies a weighting of the multiples used can be carried out (Moser and Auge-Dickhut, p.21). Since, however, both the popularity of the multiplier methods and one of their strengths are based on the simple applicability and thus the low possibilities of manipulation, the present article refrains from a complicated weighting and carries out a simple average calculation (Coenenberg and Schultze, 2002).

3 Informative value of multiplier methods - empirical analysis of EURO STOXX600 companies

3.1 Data Basis and Methodology

The aim of the empirical analysis is to test the suitability of the multiplier methods and to analyze two new approaches empirically. In the present study the Comparable Company Analyses is tested on a sample of 600 listed companies of the EURO STOXX600. Market capitalization serves as a reference to the determined company values. The data on which this study is based originates from the capital market database EIKON by Thomson Reuters. The valuation date is the 31.12. of each year. The period under review is from 1995 to 2017.

The industries and sub-industries are used as proxy for the use of peer groups. First, the Thomson Reuters Business Classification (TRBC) of the Business Sector. On the other hand, the TRBC Industry. The TRBC of the Business Sector comprises 26 business sectors. The TRBC Industry contains 106 industry groups. Thus, when determining the multiple, the focus is exclusively on the industry affiliation as a relevant parameter. The size criteria and exact orientation of the business model are ignored.

For this reason, the entity approach is based on multiples. Thus, a differentiated comparison of capital structures can also be dispensed with. Turnover is used as the reference figure.

The *EV* sales multiple is determined from the data according to the following relationship. Approach 1 corresponds to the usual application of Comparable Company Analyses based on the TRBC Business Sectors. The *EV* of the reference company (EV_R) is determined on the basis of the current market capitalization plus debt. The EV is always determined as of December 31 of a year. The current sales revenues of the relevant year ($Sales_{R, t,}$) are used as the reference value. The multiplier (M) is calculated:

$$\frac{EV_R}{Sales_R} = \frac{MCap_{R,t} + Debt_{R,t}}{Sales_{R,t}} = EV - Sales - Multiple_{R,t} \tag{7}$$

In addition, the sector multiple is determined for the TRBC Business Sector:

$$EV - Sales - Multiple_{R,t,TRBC-Sector} = \frac{1}{n}\sum_{i=1}^{n} \frac{MCap_{i,t} + Debt_{i,t}}{Sales_{i,t}} \tag{8}$$

Where t corresponds to the individual years from 1995 to 2017 in the form of periods and i corresponds to the respective company in a TRBC Business Sector.

The same procedure is used to calculate the multiple on the basis of the TRBC Industry.

Missing values were not taken into account in the calculations. Similarly, data records were adjusted where either negative sales or negative market capitalization were present, as these by definition should not exist.

3.2 Results

The results obtained show that the average EV sales multiples have risen since 1995 to 2017. However, there are some sectors, such as banking, holding companies, retailers or real estate, which have above-average multiples.

In the next step, the market capitalization of the companies is calculated on the one hand on the basis of the TRBC Sector and on the other hand on the basis of the TRBC Industry Multiplier. The TRBC Industry would have better prognosis, because it relies on more detailed peer companies. As reference value, we use the market capitalization as at 31 December each year. We test against this value.
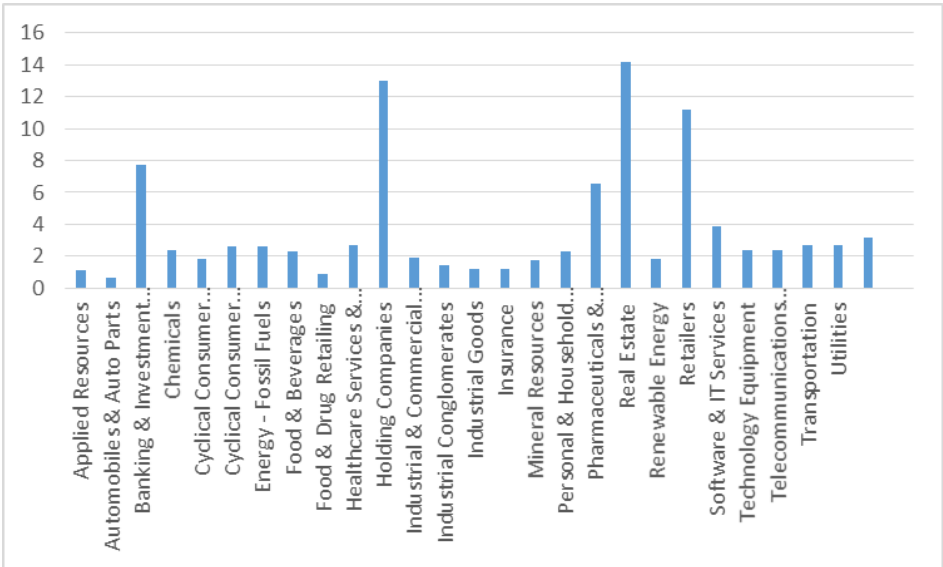
Figure 1: Industry Sector: 1995 - 2017 Average yearly EV-Sales-Multiple
Source: Own Calculation

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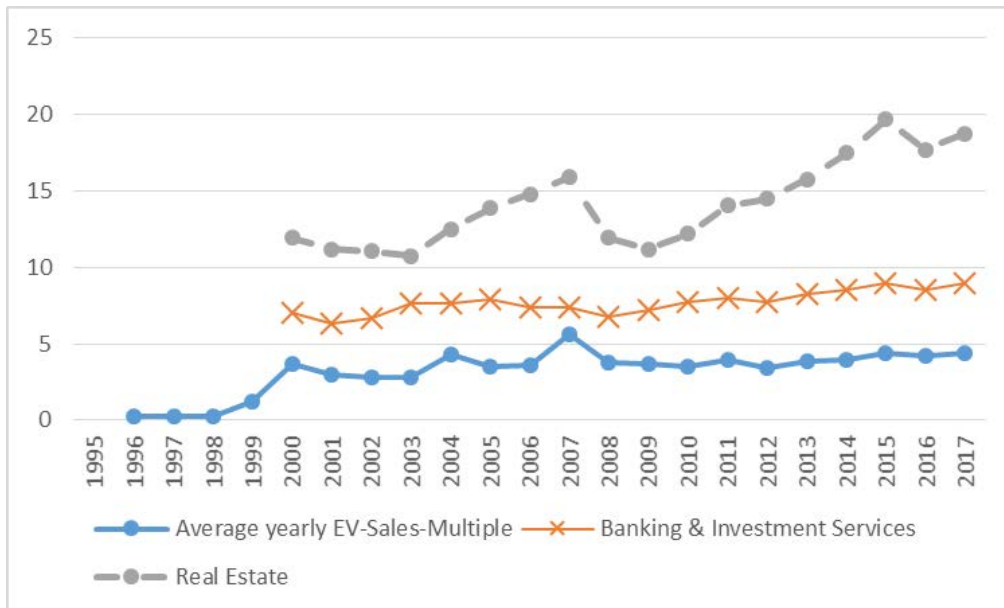
Figure 2: Average yearly EV-Sales-Multiple (All Industry Sectors)
Source: Own Calculation

Table 2 t-Test: Two-Sample Assuming Unequal Variances

Mean is in thousand Euro	Mcap - Mcap[Business Sector]	Mcap - Mcap[Industry]
Mean	20.097,85 €	10.826,28 €
Variance	5815753822,49	2679266366,54
Observations	8595	8595
Hypothesized Mean Difference	0	
Freiheitsgrade (df)	15126	
t-Stat	9,3260	
P(T<=t) one-tail	0,0000	
t Critical one-tail	1,6450	
P(T<=t) two-tail	0,0000	
t Critical two-tail	1,9601	

Source: own calculation

The statistical analyzes show that the TRBC Industry method has significantly less deviation of the calculated from the actual market capitalization. For example, the average deviation of the market capitalization calculated on the basis of the TRBC Industry Multiples is just under EUR 11 million compared to the actual market capitalization. However, this comparison includes both over- and undervaluation. Thus, it is important to consider the absolute amounts of the deviations. If the absolute amounts of the deviations are considered, the TRBC Industry Method is a significant better valuation approach. Even though the average deviation rise to EUR 17 million

Table 3 t-Test: Two-Sample Assuming Unequal Variances (absolute differences)

Mean is in thousand Euro	Mcap - Mcap[Business Sector]	Mcap - Mcap[Industry]
Mean	25.943,76 €	17.068,17 €
Variance	5546567511,38	2505131843,76
Observations	8595	8595
Hypothesized Mean Difference	0	
Freiheitsgrade (df)	15042	
t-Stat	9,1701	
P(T<=t) one-tail	0,0000	
t Critical one-tail	1,6450	
P(T<=t) two-tail	0,0000	
t Critical two-tail	1,9601	

Source: own calculation

Conclusion

Against the background of the German Valuation Law, this article should recall the scientific findings on multiplier methods and compare them with their practical relevance. The practically unattainable requirements on the reference company as well as the key figures to be identified and value-driving are often circumvented by averaging. Nevertheless, the references and key figures that best meet the conditions set should be used. Furthermore, two new approaches to multiplier calculation were presented in order to reduce the criticism resulting from the volatility of the capital market. On the basis of a sample of 600 companies listed in the EURO STOXX600, the two methods based on the TRBC Sector and TRBC Industry and the general suitability of the Comparable Company Analyses were then tested. The results showed that the Comparable Company Analyses generally lead to a suitable approximation of the company value. However, it also became clear that the usual application leads to systematic over- or undervaluations according to the current mood on the stock exchange. On average, the TRBC Industry approach led to statistic significant better results in comparison with the TRBC Sector Approach. Finally, it should be noted that this study should be tested with a specific company peer groups and the analyzed period should be separated in optimistic and pessimistic stock market periods.

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Blockchain Technology for Real Estate Management

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Abstract

The real estate sector is strongly influenced by a lack of transparency, long-lasting transaction processes and a limitation of ownerships. To substantiate this statement, the consulting firm Booz&Company published already in 2011 a report 'measuring industry digitalization', according to which the real estate sector is one of the least digitized industries. Recent market developments show that use cases in the field of real estate management show high potentials for innovative business models by using the so-called blockchain technology. As Ragnar Lifthrasir, founder & chairman of the International Blockchain Real Estate Association (IBREA) stated: "By using blockchain technology, we can reduce costs, stamp out fraud, speed up transactions, democratize investing, increase financial privacy, internationalize markets, reemphasize equity, and make real estate a liquid asset." Further, the World Economic Forum published a report in 2015 'Deep Shift Technology Tipping Points and Societal Impact', according to which ten percent of the global GDP will be stored in blockchain solutions by the year 2027. The objectives of the present paper are to list possible use cases of blockchain technology in the real estate sector and outline the underlying theoretical foundations.

Keywords: blockchain, technology, real estate, management. innovation

JEL Classification: R30, O32, O31, D53, E22, P45

1 Introduction

In the present contribution, the possibilities of using blockchain technology in real estate are evaluated. It could be stated that existing use cases are classified into four main categories 'land register/proof of ownership, property transactions, market places and investment/crowd-ownership'. With regard to the stated objectives of the present contribution, first the theoretical foundation of the blockchain technology and subsequently fundamental market information on the real estate sector are presented. In conclusion, existing use cases of blockchain technology in the real estate sector are analyzed and potential research fields are defined.

Beginning this contribution with the year 2008, when Satoshi Nakamoto published his white paper about "A Peer-to-Peer Electronic Cash System" (Nakamoto, 2008) also called "blockchain", which was the starting point for a digital revolution "as large as the original invention of the internet" (Gupta, 2017; Naughton, 2013).

2 Blockchain technology

Blockchain a "decentralized, chronologically updated database with a network-based consensus mechanism" (Mitschele (n.d.)) allows "a complete and unchangeable transaction history" (Hosp., 2017). A blockchain facilitates online transactions by acting as a secure, digitized, decentralized, public ledger, whereas a block represents the current part of the

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chain. The identical data is shared across multiple computers and changes are replicated as each node is synchronized with each other. (Dudgeon, 2018)

The Ethereum blockchain is the most used platform to deliver and manage the token offer through Smart Contracts, particularly the ERC-20 Token Standard Contract (Fenu et al. (n.d.)). The ERC-20 Contract allows an easy creation of new tokens, issuing a given no. and trading them with Ethers – the Ethereum cryptocurrency, which has a monetary value according to a given exchange rate. The blockchain is constantly growing by the addition of 'completed' blocks onto the chain. A blockhain is created by the connection of these blocks in chronological order of time. Each block contains a "hash" – meaning that every transaction or piece of information on the chain can be traced back to the original block. To be more specific, the "hash" is an encryption of the details of the transactions details. In addition to that, the decentralized nature of the blockchain protects the blockchain from hackers and changes (Dudgeon, 2018) and eliminates the need for trust towards a single administrator. (Nowinski, 2017)

Blockchain requires a quite strict verification process to create a new transaction record, which leads to a significant latency of confirmation time. It takes approximately ten min for a transaction to be confirmed and simultaneously thousands of nodes are running to compute and verify transactions. This time and storage space consuming process limits to a large extent (Zhao, 2016). Figure 1 illustrates the general process of blockchain transactions in terms of a six steps approach, shown below.
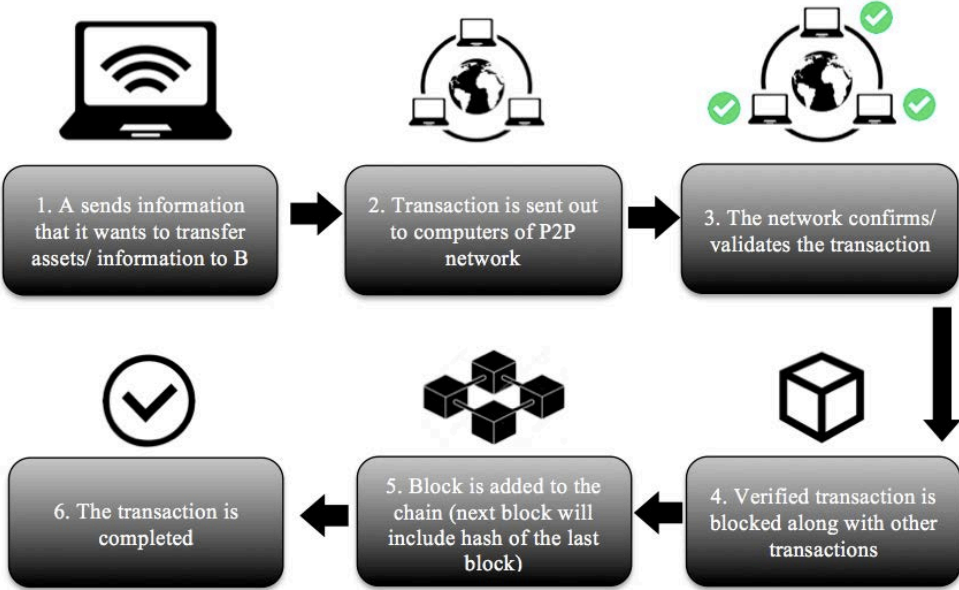
Figure 1: The Blockchain - Process
Source: Nowinski, 2017

According to the World Economic Forum by the year 2027 ten percent of the global GDP will be stored in blockchain solutions (World Economic forum, 2015). Hence, the opportunities and up-scale potentials attracted worldwide investors and peaked its highest point of attention at the beginning of the current year with a market capitalization of almost USD 800 billion (Coinmarketcap, 2018). Value-driver of the blockchain technology are the so-called cryptocurrencies. Driven by the ever-growing demand for business models based on sharing economies and a call for economic equality (Rhonheimer, 2017), caused by limitations of traditional centralized eco-systems, cryptocurrencies meet these needs. They offer a

transparent exchange history, a sustainable storage space for purchasing power and serve as valid processor units. Nevertheless, the emerging debate about the legitimacy question, whether cryptocurrencies' values have an actual intrinsic value or lead to the next financial crisis (Katz, 2017), a clear answer can be provided: Most coins actually do not have any intrinsic value yet, since their underlying assets are missing or on the other hand, the business models are still in the developmental phase (Bloomberg, 2017).

Therefore, credible calls for regulatory intervention and even more important valid informative enlightenment become louder. Hence, renowned experts, such as *Vitalik Buterin*, founder of *Ethereum* (Segarra, 2017), or *Julian Hosp*, co-founder of *TenX* (Barzilay, 2017), are pointing out that the actual value of cryptocurrencies is based on their intrinsic value according to the underlying business models. (Hosp, 2017) First applications with a proof-of-work are published and might give an outlook towards the future success of blockchain-based business models, such as the prominent, previously released '*CryptoKitties*' application running on the *Ethereum blockchain* (Bowles, 2017). Although undoubtedly '*CryptoKitties*' is just a 'virtual game', the *New York Times* stated that "every new technology gets a game that helps bring it careening into the mainstream" (Bowles, 2017).

3 Real Estate market

Recent market developments show that especially the real estate sector shows a high potential for so-called 'tokenized business models' (Deloitte, 2017). No other investment class offers such a lucrative opportunity, as it implicates sustainable growth rates, increasing cash-flows and even more important, a trustful security feeling, which becomes an increasingly pronounced matter with significant emphasis. (Wetzel, 2016)

Referring to the argument of sustainable growth rates, it is remarkable that the housing prices increased over the last 25 years by an average growth rate of 2.3 percent p.a. (Statista, 2017), which is slightly below the average inflation rate of 1.7 percent p.a. (Statista, 2017). Comparing it to a contemporaneous investment in the German stock index (*DAX*), which would have led to a spread profitability of 6.1 percent, it is important to consider the significantly lower price volatility of real estate investments. (Deutsches Aktieninstitut e.V., 2016)

To visualize the development, the following chart shows the overall development in the past quarter of the century.
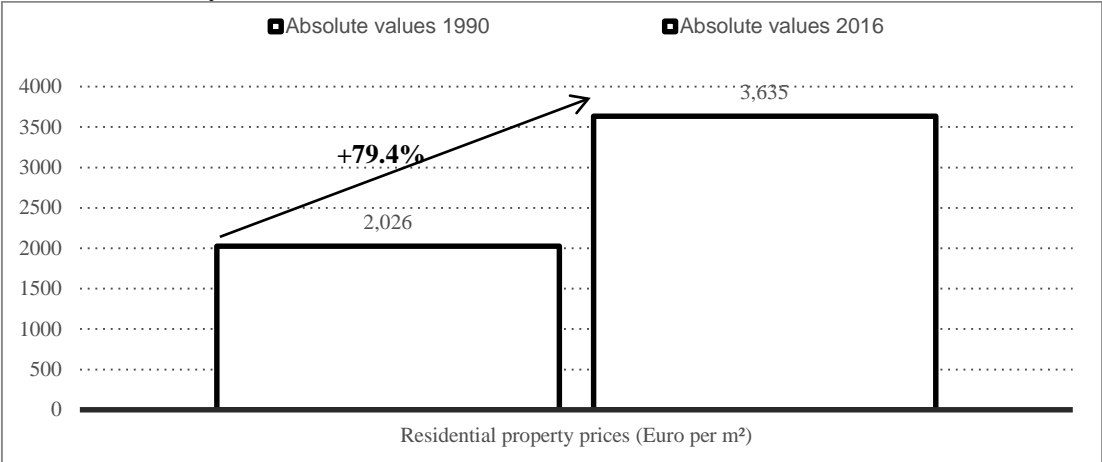
Figure 2: Development of residential property selling prices
Source: Statista, 2017

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As the prices for residential properties increased overall by 79.4 percent, shown in figure 2, a similar tendency can be stated by considering the rental income development. In fact, first-time rental prices increased by 63.6 percent and re-rental prices increased by 100 percent, as the next chart shows.
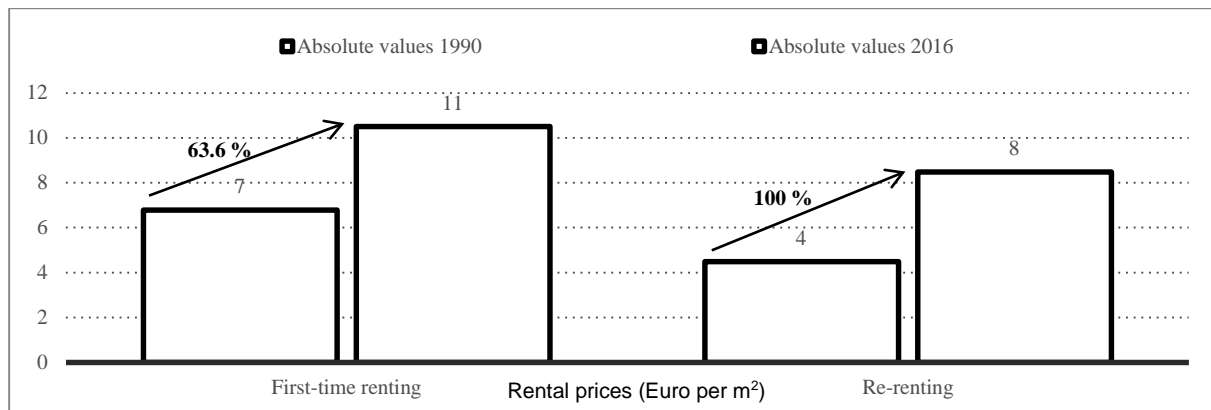
Figure 3: Development of residential property rental prices
Source: Statista, 2017

Explanation attempts might be based on the everlasting basic human need of housing according to *Abraham Maslow*, the on-going influx process for the metropolitan regions (Nier, 2017), the fact that construction activities are still behind the expected investment-volumes, the rent utilization level is going to improve constantly, the demographic changes lead to a high demand of single households and the development of the unemployment rate, which has a significant impact on the real estate market. (Wetzel, 2016)

But the real estate market is confronted with a major challenge, as it remained almost untouched by the '*Digitalisierung 4.0*' (PwC, 2016) and is currently one of the least digitized industries of the German economy (Strategy&, 2011). This backlog led to circumstances that the sector is strongly influenced by a lack of transparency, long-lasting transaction processes and a limitation of ownerships. (JLL, 2016) On the other hand, setting up and concurrently managing real estate assets include high barriers, which cause cost intensity, high time requirements and regulatory work.

Hence, smart solutions need to be found, as *Ragnar Lifthrasir*, founder & chairman of the *International Blockchain Real Estate Association (IBREA)* stated: "By using [blockchain], we can reduce costs, stamp out fraud, speed up transactions, democratize investing, increase financial privacy, internationalize markets, reemphasize equity, and make real estate a liquid asset." (Lihthrasir, 2016)

4 Blockchain Technology for Real Estate Management

### 4.1 Analysis of existing use cases and potential research fields

"If the internet brought us near instant communication,
then the blockchain brings us near instant digital asset transfer,
asset movement and security of data movement." (Ward, 2017)

- Simon Taylor (former executive of Barclays)-

In line with the above mentioned estimation of the World Economic Forum (2015), the blockchain technology allows unlimited data- and asset transfer with "a complete and unchangeable transaction history" (Hosp, 2017), which is defined as the process of the so-called 'tokenization of assets'. It comprises the technological approach for all assets, such as real estates, shares, bonds and gold, to be integrated into an unlimited eco-system based on the blockchain technology (Hosp, 2017).

The real estate sector, which has traditionally always been an investment classification of high interest due to its comparable sustainable growth rates, increasing cash-flows (Statista, 2017) and even more important a trustful security feeling (Wetzel, 2016), took a leading role in recent announcements of upcoming initial coin offerings (Wetzel, 2016; Popper, 2017). Supported by the formation of the *International Blockchain Real Estate Association (IBREA)*, which is a "member-focused advocacy, educational and trade organization dedicated to implementing blockchain in real estate" (IBREA, n.d.), the vision of blockchain as a disruptive, revolutionary technology invention, may soon become reality for the majority of real estate companies. *Achim Jedelsky*, head of Processes/IT at *Daimler Real Estate* and Berlin chapter head of the *IBREA* (n.d.), stated in his speech at the *EXPO Real (2017), European's leading real estate exhibition,* that blockchain integration processes empower people to safely and easily buy and sell properties whenever and from wherever they want to, without the dependency of third party agents. (Jedelsky, 2017) Further, the *IBREA* states on its website: "Blockchain offers an open source, universal protocol for property buying, conveyancing, recording, escrow, crowdfunding, and more. It can reduce costs, stamp out fraud, speed up transactions, increase financial privacy, internationalize markets, and make real estate a liquid asset." (IBREA, n.d.)

Since the scope of blockchain applications is broad, figure 4 tries to offer a contemporary market overview of blockchain-based property projects.
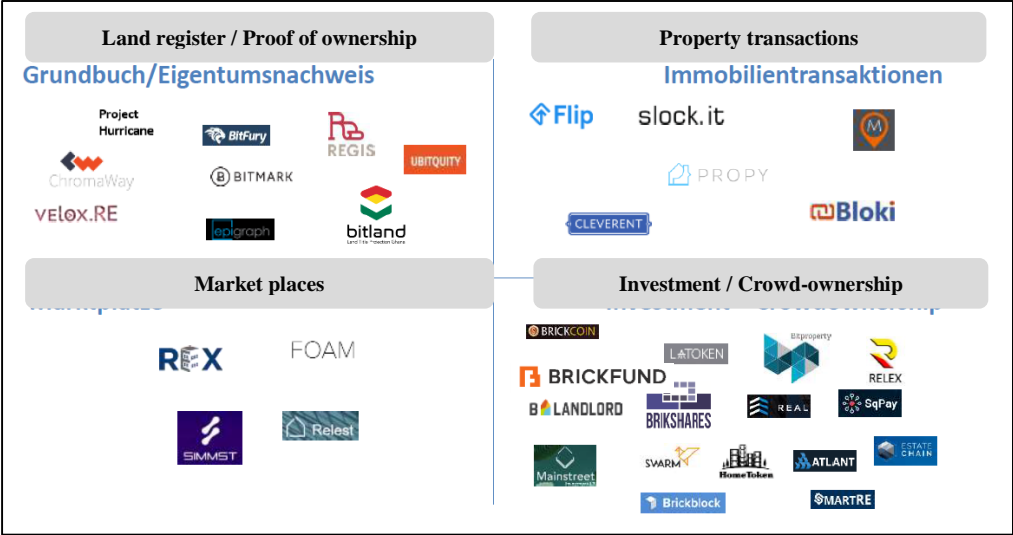
Figure 4: Market overview of current blockchain-based property companies
Source: Jedelsky, 2017

The shown figure was created in the end of the year 2017 and does not purport to be complete due to the rapid market growth. Nevertheless, it shows a high concentration of companies in the field of 'Investment / Crowd-ownership', which represents the intended doctoral study case about blockchain-based asset and portfolio management in the best possible way. These

companies produce not only the most advanced progress, but also socially compliant applications, which are in line with the general shift towards sharing economies. (PwC, 2015)

The above mentioned circumstances offer far-reaching business transformation potential and consequently market growth in unexplored economic areas (Deloitte, 2015). It allows real estate management to become an immediate and fully transparent process with large up-scale potentials, since "digital assets are the foundation of the new economy." (Deloitte, 2015)

Formally, real estate management is essentially connected to the circumstance of representative or direct 'ownership', which is defined in terms of real estate as the ultimate and exclusive right conferred by a lawful claim or title, and subject to certain restrictions to occupy, possess, rent, sell and use an item of property. (Deloitte, 2015)

According to natural characteristics of properties, such as significantly higher values in comparison to bonds, shares or gold, as well as an oligopolistic market structure, the scale of 'property ownerships' traditionally has been limited to a small group of investors. Unlike with the blockchain technology, which would offer a revolutionary process to decentralize and overcome these challenges, the following figure rudimentarily shows main advantages for the management of real estate assets.
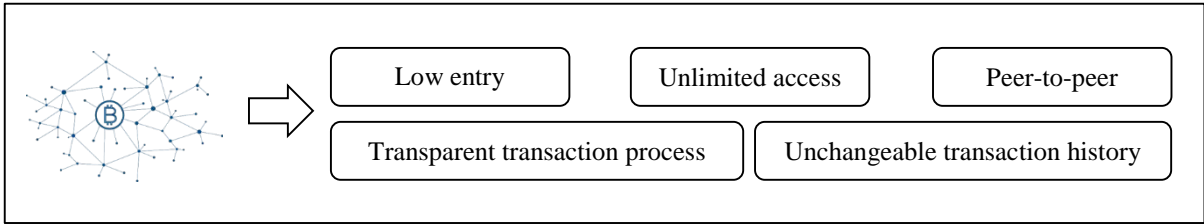
Figure 5: Major advantages for blockchain-based real estate management
Source: Iconomi, n.d.

In detail, the blockchain technology set of various advantages, which are (REIDAO, n.d.):
- **Affordability**
Based on the tokenization model, real estate can be put up for sale in the form of tokens. These tokens represent the portions of the properties.
- **Diversification**
Instead of putting one big amount of capital to a single real estate, a diversification of the investment into smaller pieces of many real estates is possible.
- **Liquidity**
Each ownership token can be independently traded, which creates a lower point of entry to own a piece of a real estate, compared to the traditional way, and makes real estate a liquid asset.
- **Versatility**
The assets' ownership tokens can be transferred, inherited, or used as collateral. It is basically a store of value that is backed by real world's real estate.
- **Global access and expenditure**
A valid, global access to real estate markets is especially for small- and mid-cap investors an important advantage.

First prototyped real estate management blockchain applications are in progress, such as the Singapore-based project, called *REIDAO*, which is "a technology firm, building on the

Ethereum blockchain to change and disrupt the real-estate vertical. *REIDAO* uses digital assets to democratize access to real estate opportunities." (REIDAO, n.d.)

The following figure gives an overview of the described research case and the crucial concept of the intended doctoral study topic.
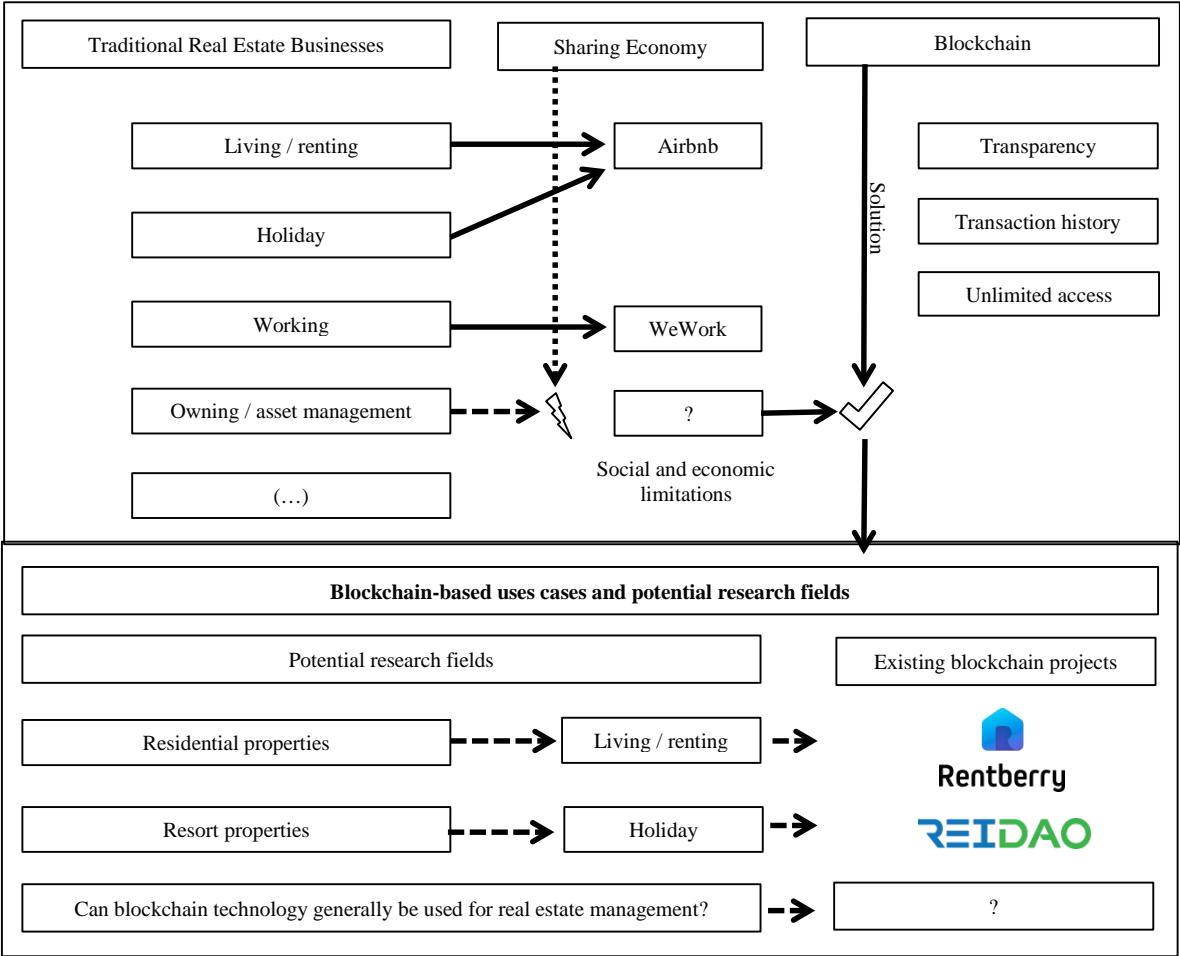
Figure 6: Existing use cases and potential research fields
Source: Own research

Conclusion

Blockchain technology "has the power to transform the asset management value chain – and the firms that adopt it early will reap the rewards." (Deloitte, n.d.) Consequently, pioneering activities are of importance, as most of blockchain-based business cases still require fundamental research cases, while firms, institutions and universities around the world are vying for innovation processes. (Deloitte, n.d.)

In conclusion, distributed ledgers have the ability to replace the traditionally intermediary centralized system in the real estate sector (PwC, 2016) and solve the existing lack of transparency, long-lasting transaction processes and a limitation of ownerships (JLL, 2016). "By using [blockchain], we can reduce costs, stamp out fraud, speed up transactions, democratize investing, increase financial privacy, internationalize markets, reemphasize equity, and make real estate a liquid asset." (Lifthrasir, 2016)

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Economic Issues and Public Finance

Input-Output Analysis of Slovak Automotive Industry

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Abstract

Increasing fragmentation in global production has allowed countries to export more and to rely less on domestic inputs for production. The analysis of the position and the importance of individual industries in the national economies brings important information on how these various industries are linked together. It also helps to understand the impacts of the structural changes on the evolution of value added as well as the creation of employments. Despite the great openness of the Slovak economy, most of the value added is still generated by domestic sectors. As a result, the domestic value added of exports, generated in Slovakia, represents only 26%. The aim of this article is to investigate the multiplication effects of automotive industry for Slovak economy based on the input – output approach. The data cover period 2000-2014 and come from World Input–Output Database (WIOD). The results show that Slovak automotive industry generates low product multiplication effects for Slovak economy and cannot by marked as a key industry in case of Slovak republic.

Keywords: Input-output model, Global value chains, Automotive industry, WIOD, Multipliers

JEL Classification: F14, F62, C67

1 Introduction

Since the 1980s, the rise in trade with intermediates, the further reduction of transport costs, the fall in tariffs, communication and coordination costs have made it possible to fragment the production all over the world (so-called "second unbundling"). Before 1980, international competition took place at the sector level (e.g. Japanese versus Thai cars); after 1985 it was already at the production level (Baldwin, 2011). One possibility for company to succeed is to deliver inputs from other, more efficient manufacturers within the domestic economy or on an international scale. Global value chains (GVCs) connect companies, their employees and consumers all around the world. For many countries, GVCs represent a kind of springboard for integration into the world economy and the necessary condition for their further development (Staritz, Reis, 2013). The countries compete in quality of institutional relations and in which segment of the chain will operate on their territory. Despite all the expected benefits, engaging in GVCs can also cause costs and risks. Fragmentation of the production process across different countries has led to a significant restructuring of production processes at global and regional levels, thereby increasing the trade in intermediate products at different stages of production. Dynamic growth of trade with intermediates is a natural consequence of the GVCs.

Increasing globalisation of production raises the question whether the conventional trade statistics cannot provide a misleading perspective of the importance of the trade for economic growth and income generation (Maurer, Degain, 2010). Even policy makers are increasingly

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aware of the need to complement traditional statistics with new indicators that will capture the current reality of global production (OECD, WTO, 2012). Nowadays, the concept of country of origin is outdated as production process within the GVCs is spread across many countries (Lamy, 2011).

One possibility for wider evaluation of the benefits of international trade is input-output analysis that focuses on the mutual linkages between economic sectors. The intersectoral flows of products and services are registered, simultaneously by origin and by destination (D'Hernoncourt, Cordier, Hadley, 2011). Based on these linkages, it is possible to evaluate the structure of the economy, or overall impacts of changing demand in various sectors of national economy. Using the demand-side model, different kinds of I-O multipliers can be generated, i.e. output multipliers, income multipliers, employment multipliers and import multipliers. They can be viewed as summary measures used to estimate the likely effects of economic change. For this reason the study of multipliers is often called as impact analysis (Pissarenko, 2003).

Therefore, this article will be interested in the evaluation of the Slovak automotive industry via input-output analysis. The technical, allocation and import coefficients as well as input, output and import multipliers will be analysed. The data cover the period of 2000-2014 and come from World Input–Output Database (WIOD).

This paper is divided into five sections. Following the introduction, the relevant empirical literature is reviewed in Section 2. In Section 3, we provide a description of characteristics regarding automotive industry. Section 4 provides main results of input-output analysis with an overview of input-output model that we employ. Finally, concluding remarks are made in Section 5.

2 Literature Review

As already mentioned, traditional methods of measuring the performance of the economy and its sectors can provide distorted information for political decisions (Lábaj 2014; Habrman 2013). An examination of the relative importance of individual sectors of the economy in international production chains may be an alternative to assessing the processes, links and impacts of changes in the economy and the subsequent impacts on economic growth (Jones, 2013). Increased attention has been paid to inter-sectoral links in identifying key sectors that have been important for economic development and growth of the country since the 1950s. This issue has again come to the forefront of attention in regards to the analysis of fragmentation of production chains, the interdependence between economies and industrial clusters (Drejer, 2002).

In empirical literature, we can often encounter an input-output analysis based on the use of input-output tables (IOTs) that provide information not only on inter-sectoral flows, but also on value added and economic growth (Backer and Miroudot 2014). For example, Johnson and Noguera (2012) have pointed out that a significant portion of value added can be concentrated in non-industrial sectors that provide materials and services for the higher levels of the production process. Such information suggests the character and power of domestic cross-industry links (Hirschman, 1958).

IOT can also track socio-economic impacts and evaluate the impact of offshoring production activities on the labour demand (Hijzen, Swaim, 2007). Foster- McGregor, Stehrer and de Vries (2013) studied the link between offshoring and the skill structure of labour demand for 40 countries and 35 industries over period 1995-2009 using data from WIOD. Their results indicate

that offshoring has impacted negatively all-skill levels, the largest impact was observed for medium-skilled workers. Hertveld and Michel (2013) focused mainly on the contribution of offshoring on the fall of the low-skilled workers. Los, Timmer and de Vries (2015) analysed the impact of foreign demand on Chinese employment creation by extending the global input–output methodology. They found that between 1995 and 2001, fast growth in foreign demand was offset by strong increases in labour productivity and the net effect on employment was nil. Between 2001 and 2006, booming foreign demand added about 70 million jobs. These jobs were overriding for workers with only primary education. Since 2006 growth in domestic demand for non-tradables has become more important for job creation than foreign demand, signalling a rebalancing of the Chinese economy.

As recent studies for the Slovak economy show, exports generate lesser effects than domestic demand. Despite the great openness of the Slovak economy, most of the value added (even GDP) is still generated by domestic demand (58-63 % of the value added) while exports generate the remaining part (37-42 % of value added). Production for the domestic market generates higher effects than output for export. A deeper look at the sectorial structure of the economy shows that the three most exporting sectors – "Automotive", "Electrical and Optical Equipment" and "Basic metal and fabricated metal" account for up to 50 % of the economy's exports, but only 40 % of the effects of all exporting sectors on value added and employment. This is mainly caused by the automotive industry, whose production is highly fragmented, and therefore domestic value added of the export generated in Slovakia represents only 26 % (Habrman, 2013). The Slovak economic and industry reconstruction during the years 2000 was concentrated on machinery industries especially on automotive industry. As the central Europe attracts automotive companies and their subcontractors for the logistic and low-costs reasons, at the end of the years 2000 the domestic product, employment and economic growth is becoming more and more influenced by this industry. The study of the importance of the automotive industry for the Slovak economy in 2012 stated that 9 % of total employment in the Slovak economy, direct and indirect, depended on the automotive industry. The share of value added generated by the automotive industry in total national value added was over 11 %. The value added generated directly by automotive industry was 4 %. The automobile industry generates directly and indirectly 17 % of the Slovak economy gross production and creates more than 200,000 jobs (Luptáčik et al., 2013). Therefore, in order to maintain and increase the positive effects of automotive industry on the Slovak economy, it is necessary to increase the share of domestic value added in gross exports (which will increase the industry's anchoring in Slovakia) and to move towards higher value added activities within the GVCs (Slušná, Balog, et al.,2015). At present, the Slovak economy does not have adequate compensation for the automotive industry. This strong orientation towards one sector of the economy may hinder the development of other sectors (Morvay et al., 2015).

3 Stylised facts about Automotive Industry in Slovakia

The automotive industry in Slovakia can be labelled as the flagship of Slovak export and the driving force behind the development of the economy. It is the most important Slovak industry in terms of both gross and value added exports. It accounts for up to 25 % of the total gross exports of Slovakia, but due to the high share of foreign value added its share on domestic value added is "only" 3.84 % as a result of the low value added per unit of production (12 %) (Table 1).

The automotive industry in Slovakia is represented not only by four automotive manufactures. The growing production has supported the development of domestic subcontractors for

materials, goods, technologies and services. There is a vast network of suppliers who are involved in the GVCs to act vertically, but also create horizontal clusters (Šestáková, 2014).

Table 1 The shares of Slovak automotive industry on value added, gross output, export and employment in 2000 and 2014

	2000	2014
VA automotive/VA	1.88 %	3.84 %
VA per unit of production	0.16	0.12
GO Automotive/GO	4.63 %	12.23 %
EXP Automotive/EXP	18.29 %	25.74 %
EXP Automotive/GO automotive	62.16 %	75.36 %
EMP automotive/EMP	1.03 %	2.82 %

Source: own calculations based on data from WIOD

Note: VA = gross value added, GO = gross output, EXP=Export, EMP=employment, LAB = Labour compensation, CAP = Capital compensation

Therefore, the question is whether Slovakia's narrow specialisation in the automotive industry is advantageous; or rather it represents a trap with many risks. Furthermore, the basic function of GVCs is to optimise the ratio of inputs and outputs and maximise the generation of value added. However, in order to contribute to the growth of the economy, it is necessary to redistribute resources, i.e. shift from less productive activities to activities with higher value added. There is a fear among people that with the development of the GVCs their jobs are threatened. But are these general concerns about job losses justified? In the developed economies, the number of jobs in absolute terms has actually slightly declined. However, there have been fundamental changes in the structure of the labour demand from the point of view of activities and qualifications (Slušná, Balog, et al., 2015). The share of production factors in value added creation in Slovakia compared to Slovak automotive industry is shown in Table 2 and 3.

Table 2 Production factor shares

	2000	2014
Total sectors		
LAB/VA	59.08 %	51.60
CAP/VA	40.92 %	48.40
Automotive industry		
LAB/VA	33.97 %	45.74 %
CAP/VA	66.03 %	54.26 %

Source: own calculations based on data from WIOD

Note: VA = gross value added, LAB = Labour compensation, CAP=Capital compensation

The labour share in value added creation during the last fourteen years has diminished in Slovakia. However the automotive industry has seen this share increased, nevertheless, the capital constantly prevails the labour in value added creation. There has been considerable skill upgrading of employment in terms of educational attainment as shown in Table 3. The share of hours worked by low-skilled labour decreased by 5.7 %, while the share of high-skilled labour increased by 5.4 %. The share of hours worked by medium-skilled labour stays constant. Overall employment in automotive industry increased from 21 to 63 thousand employees. Between 1995 and 2009 (these data are available only for period 1995-2009) the share of employment of low-skilled workers in Slovak automotive industry dropped by more than 6.5 %. This fall was offset mainly by an increase in high-skilled workers.

Table 3 The shares of hours worked by labour qualification in total hours

	1995	2009
Total sectors		
H_HS	13.4 %	18.8 %
H_MS	77.1 %	77.3 %
H_LS	9.5 %	3.8 %
Automotive industry		
H_HS	5.2 %	8.3 %
H_MS	84.5 %	87.9 %
H_LS	10.3 %	3.8 %

Source: data from WIOD

Note: H_HS = hours worked by high-skilled persons engaged, H_MS = hours worked by medium-skilled persons engaged, H_LS= hours worked by low-skilled persons engaged. The data are available only for period 1995-2009.

The further investigation will be focused on the impact analysis of automotive industry. This will give us a wider view of the effects of the automotive industry in Slovakia.

4 Methods and results

IOT analysis focuses on the mutual linkages between economic sectors. The intersectoral flows of products and services are registered, simultaneously by origin and by destination (D'Hernoncourt, Cordier, Hadley, 2011). Based on these linkages, it is possible to evaluate the structure of the economy, or overall impacts of changing demand in various sectors in national economy. Input-output framework evaluates two kinds of economic linkages between sectors, i.e. backward linkages, representing demand side, and forward linkages, representing supply side (Lábaj, 2014).

If sector "i" increases its output, it leads to a demand increase in the supplying sectors (whose products are used as inputs to production in sector "i"). This demand relationship is referred to as "backward linkage" (BL). Higher production in sector "i" also means that additional amounts of product "i" are available to be used as inputs to production in the other sectors. In this case the relationship represents the supply side and is referred to as "forward linkage" (FL) (Reis, Rua, 2009; Timmer, 2012). The analysis of the strengths of BLs and FLs allows to identify the most important sectors in the economy. When comparing sectors of national economy, the higher values of the BLs indicate stronger impacts of demand changes in the particular industry. In other word, expansion of its output is more beneficial to the economy, in terms of causing other productive activities. The same concept can be applied to analysis of FL: higher values indicate stronger impacts of the sector, or in other words, the sector is more essential to the economy, in terms of productive activity that it would support. The study of BLs and FLs allows determining which industries can be considered as key industries in terms of demand and supply (Reis, Rua, 2009; Timmer, 2012). In case of an open economy, the imported products should be also taken into account. Increases in production will equally generate additional imports to support it. (Wixted, Yamano, Webb, 2006). The analysis of key sectors can additionally lead to the identification or assessment of how spread are the effects across the economy. It can show whether these effects are associated with individual sectors thanks to the coefficient of variation. This coefficient is a measure of dispersion of these effects. Again both backward and forward coefficients of dispersion of a sector can be calculated. A high backward coefficient of dispersion signifies that a particular sector draws heavily on a small number of sectors while a low value indicates that it draws evenly from the other sectors. Similarly, a high value of forward coefficient of dispersion means that a sector is a supplier to a small number of sectors

while a lower value indicates more even distribution of supplies over the various other sectors in the economy. (Reis, Rua, 2006)

IOT enable to calculate various types of multipliers. Once calculated, I-O multipliers can be used for predicting how changes in the demand for the output of any particular industry would impact on all industries in a national economy. The various multipliers generally remain fairly stable over time. Technological change does not occur very rapidly in most industries, so that it is possible to obtain reasonable results for the latest year even though the latest IOTs may be a few years old. The exceptions would be those industries producing commodities that are susceptible to wide fluctuations in price on the world market, such as petroleum products, and those agricultural industries most affected by adverse climatic conditions (McLennan, 1995).

The output multiplier for an industry „i" is defined as the total value of production by all industries of the economy required to satisfy one extra euro's worth of final demand for that industry's output. All multipliers can be calculated either as simple or total multipliers. In calculating the simple multipliers (also referred to as partial by e.g. Pissarenko, 2003), we effectively assume that the spending of households takes place outside the model and there is no feedback between the household sector and the other sectors (open model). Taking into account households' spending expenditures, we do allow feedback to occur (model is closed with respect to households).

Leontief's input-output model for one region assumes the division of the economy into the n sectors, with the output of each sector being used to satisfy final demand (households, public administration, investment or exports) or used as an intermediate product for the manufacture of other products (in the same or other sectors). Country's gross output can be expressed as column vector:

$$x = \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix} \qquad (1)$$

Final use as the ultimate goal of production serves to satisfy the needs of various economic subjects. Under this notion, we understand the purchase and use of various goods and services by households, investment by firms, final government consumption and export, indicating the final consumption of products and services abroad (foreign demand for products and services). Final demand vector can be written as follows:

$$y = \begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix} \qquad (2)$$

The matrix Z represents the "n x n" input-output (I-O) matrix of coefficients that stand for intermediate use (specifying units of intermediate goods in the production of one unit of gross output). The matrix Z can be written as:

$$Z = \{z_{ij}\} = \begin{bmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{bmatrix} \qquad (3)$$

So country's gross output has to satisfy the following accounting relationship (Koopman et al., 2014):

$$x_1 = z_{11} + z_{12} + \cdots + z_{1n} + y_i$$
$$\vdots$$
$$x_n = z_{n1} + z_{n2} + \cdots + z_{nn} + y_n$$

(4)

The country production system can be written as input-output model as follows:

$$\begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix} = \begin{bmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{bmatrix} \times \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix} + \begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix}$$

(5)

By reorganising the equation (5), the gross output vector X can be expressed as:
$$x = Zi + y$$

(6)

where i represents a unit column vector.

From the intermediate input matrix Z, it is possible to calculate the matrix of technical coefficients noted as A. From the matrix A we can read the structure and volume of direct inputs of different commodities to produce one unit of production in the sector j. For example, we can find an answer to the question as how many agricultural products and minerals are used to produce one unit of production in manufacturing. The individual elements of the matrix A are noted as "aij" and are calculated as follows (Lábaj, 2014):

$$a_{ij} = \frac{z_{ij}}{x_j}$$

(7)

Therefore, the enrolment of the technical coefficient matrix calculation is as follows:

$$A = Z(x)$$

(8)

Using equivalent adjustments, we calculate Leontief's inverse matrix L:

$$x = Ax + y$$ (9)
$$x = (I - A)^{-1}y = Ly,$$ (10)

where *I* stands for unit matrix (n x n) and $(I-A)^{-1}$=L represents Leontief inverse matrix. Leontief's inverse matrix links final demand and production. It represents the overall direct and indirect effects for each sector's production when the final demand increases. If the inverse matrix L is multiplied by individual components of final consumption (for example export), the result will capture the part of the output generated by this component (export). The horizontal sum of the L matrix elements represents the output multiplier, which characterises the need for both direct and indirect inputs if the final demand for one commodity increases by 1. The vertical sum of the Leontief matrix captures the direct and indirect demand of the domestic sector inputs, thus how much domestic output will grow if demand for the sector is increased by an additional unit (Duvajová, 2014).

The following tables (Table 4 and 5) and figure (Figure 1) show the basic characteristics of the Slovak automotive industry from the point of I-O analysis. As we can see, the values of simple

output and input multipliers (som and sim) as well as the values of technical and allocations coefficients (tk and ak) decreased over the period 2000-2014. On the other hand, the values for simple import multiplier (simp) as well as the import coefficients (imk) increased, what points out to the growing dependency of domestic production on imports of foreign inputs (or intermediate consumption coming from abroad).
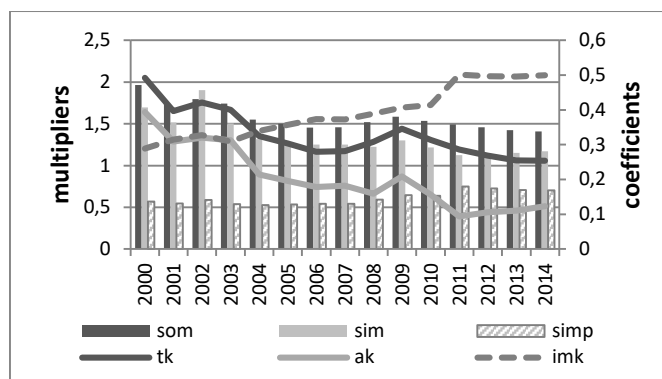

Figure 1 Coefficients and multipliers – automotive industry 2000-2014
Source: own calculations based on data from WIOD

The values show that while in 2000 an additional 1 € of production in automotive industry generated 1.72 € in other supplying sectors, this value was only 1.48 € before crisis and 1.54 € in 2014. In general we can say that this industry generated on average almost 1.60 € of additional demands. Overall, the values decreased by almost 12 % in case of technical coefficients, and by 10.27 % in case of output multipliers.

Looking forward, i.e. from the supply side point of view (input multipliers), 1 € of increased production of this industry created average effects of 1.28 € The decreases for input multipliers and allocations coefficients were the least important, i.e. 2 % and 0.82 %.

The most important change over this period can be observed for import coefficients (20.27 %) and import multipliers 7.92 %. Average import multiplier of 0.74 can be interpreted as the 0.74 € of imported inputs in case of 1 € production increase in automotive industry. It means that the value of imported inputs is rather close to the change of demand that caused it.

Table 4 IO coefficients and multipliers – automotive industry, 2000 -2014

	2000	2007	2008	2010	2014		average	median
Technical	0.4021	0.3156	0.3096	0.3403	0.3544	↓	0.3618	0.3544
Allocation	0.2199	0.1558	0.1510	0.1871	0.2181	↓	0.2033	0.2131
Import	0,2893	0.5125	0.5006	0.4754	0.4853	↑	0.4673	0.4853
Output	1.7218	1.4852	1.4847	1.5376	1.5450	↓	1.5894	1.5528
Input	1.3148	1.1917	1.1864	1.2389	1.2876	↓	1.2876	1.2829
Import	0.6948	0.7612	0.7432	0.5544	0.7498	↑	0.7384	0.7432
nBL	0.9405	0.9429	0.9131	0.9589	0.9844	↑	0.9629	0.9696
nFL	0.6827	0.7267	0.7097	0.7524	0.8078	↑	0.7606	0.7657

Source: own calculations based on data from WIOD

The values of input and output multipliers allow to analyse the industry from their overall importance for the economy, i.e. to determine whether a particular industry can be classified as a key industry. When the values of nBL (normalised values of output multipliers, or backward

linkages) and nFL (normalised values of input multipliers, or forward linkages) are higher than 1, the industry represent the key industry. In our case, we can see that over the observed period neither backward not forward linkages exceeded 1, their average values being 0.96 (nBL) and 0.76 (nFL). As a result, we can say that automotive industry cannot be marked as a key industry in case of Slovak republic.

The backward and forward linkages can also help to assess the extent of the impact of each industry. The variation coefficient for nBL or nFL shows whether the effect of the particular industry are concentrated on the small number of other industries or they are more evenly dispersed or distributed over the whole economy. Higher values indicate stronger connection to a small number of other sectors (smaller number of impacted industries) while lower values are a sign of more even distribution of impacts all over the economy.

Table 5 nBL and nFL variation coefficients (%) – automotive industry 2000-2014

automotive	SR				automotive	SR			
nBL	nBL max	nBL min	nBL average	nBL median	nFL	nFL max	nFL min	nFL average	nFL median
3.66 %	23.06%	1.33 %	4.86 %	3.61%	6.49 %	28.65 %	1.75 %	10.14 %	8.15 %

Source: own calculations based on data from WIOD

As for the automotive industry, the value of nBL variation coefficient 3.66 % is a bit lower than the average value for Slovak economy. The value of nFL variation coefficient is 6.49 %, again lower than the average value of 10.14 %.When we compare these two values to Slovak minimum and maximum variation coefficients, we can see that automotive industry can be viewed as the one that does not impact only a small number of sectors but its effects have a rather even distribution over the other sectors.

5 Conclusion

The automotive industry in Slovakia can be labelled as the flagship of Slovak export and the driving force behind the development of the economy. It is the most important Slovak industry in terms of both gross and value added exports. Therefore, the question is whether Slovakia's narrow specialisation in the automotive industry is advantageous and efficient in terms of structural linkages.

As mentioned before, the conventional statistics can provide a misleading perspective; therefore, the input-output analysis that focused on the mutual linkages between economic sectors was applied. Based on these linkages, it is possible to evaluate the structure of the economy, or overall impacts of changing demand in various sectors in national economy. Using the demand-side model, different kinds of I-O multipliers can be generated, i.e. output multipliers, input multipliers and import multipliers. They can be viewed as summary measures used to estimate the likely effects of economic change. For this reason, the study of multipliers is often called as impact analysis.

Based on the results of I-O analysis we can conclude the growing dependency of domestic production on imports of foreign inputs (or intermediate consumption coming from abroad). It means that the value of imported inputs is rather close to the change of demand that caused it. The values of normalised values of output and input multipliers confirmed that automotive industry cannot be marked as a key industry in case of Slovak republic. When the variation coefficients were compared to Slovak minimum and maximum variation coefficients, we can

conclude that the effects of the automotive industry are not concentrated but more evenly distributed all over the economy.

Acknowledgements

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Cooperatively owned housing and its effect on sale price - empirical case study of Košice

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Abstract

Cooperatively owned housing is on a steady decline in Slovakia, in some regions it still represents a substantial share of the market. It can however represent a significant complication when purchasing the real estate, as mortgage financing can be more difficult to obtain and can present other obstacles down the road related to maintenance, reconstruction or alterations. It is therefore a reasonable assumption that the sale prices for real estate, apartments in our case, would be statistically significantly affected by the mode of ownership. To test this assumption, empirical data containing 840 apartments in total located in the city of Košice was used, confirming the assumption that sale prices are negatively affected in case the apartment is cooperatively owned. Further, price differences between individual city districts were identified.

Key words: Real Estate, Pricing Model, Private Ownership, Cooperative Ownership, Košice

JEL Classification: R32, R31, C31

1 Introduction

Due to a high number of factors influencing the price of real estate, the price variance is relatively large and hard to explain. The method commonly used to apprise real estate are hedonic pricing models, where an econometric model is used with the price as dependent variable and a range of variables important to the buyer as the set of independent variables, allowing the assessment of market price from non economic factors (Oduwole and Eze, 2013). While the method has been used since 1928 (Waugh, 1928), it was first used in real estate pricing in 1967 by Ridker and Henning (Ridker and Henning 1967). While these models try to include as many relevant factors as possible, including among others variables describing the exact location and current state of the real estate, description of the surrounding area, traffic information and many others, they are often plagued by hard attainability of data. Further expanding on this concept are spatially defined models that can be separated into two groups. The first defines a city as monocentric, where the city center is the focal point and the price of real estate reflects travel and transaction cost rising further from the center by gradually decreasing (Alonso, 1964). The second group takes into account the fact that local characteristics do not have to be dependent on the distance from the city center. The study of these specifics started by analyzing environmental factors (Ridker and Henning, 1967) and further expanded into analyzing various socio-economic factors (Lynch and Rasmussen, 2001, Cortes, 2004).

The aim of this study is limited by available data and focuses rather strictly on the ownership status of apartments located in the city of Košice, Slovakia. Of interest are two different ownership states, private ownership and cooperative ownership. While private ownership is the

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dominant mode of ownership currently, in the past cooperative ownership was promoted (or available exclusively) in order to promote affordable housing (Chouinard, 1990, Ebrahim, 2009) or social cohesion (Lang, Novy, 2014), it complicates the sales process currently. This is due to the problem of obtaining a mortgage when using such a real estate as collateral due to the buyer not being a direct owner but rather just buying the right to use the real estate. Our aim is thus to examine, using empirical data, what effect this has on the sale price of apartments.

2 Methods and data description

Empirical data used in this study was obtained from a real estate agency and included the data for 840 apartments sold in Košice between 2011 and 2017 by the given agency. Košice is the second largest city in Slovakia and is located in the eastern part of the country with roughly 240 000 residents. The map and district distribution of the city are available in Figure 1. The available data was distributed among 9 of the city districts (as these 9 are the main population centers consisting of block of flats). The distribution along with the proportion of cooperatively owned apartments is available in Table 1.

Table 1. Empirical data distribution

District	Number of apartments	Cooperative apartments	Cooperative ratio
Dargovskych Hrdinov	113	1	0.88%
Jazero	130	1	0.77%
Juh	94	0	0.00%
KVP	77	8	10.39%
Saca	5	0	0.00%
Sever	92	0	0.00%
Stare mesto	64	2	3.13%
Tahanovce	95	34	35.79%
Terasa	170	3	1.76%

Source: own research

As can be seen, most of the cooperative housing is located in the KVP and Tahanovce districts. The KVP district was constructed between 1980 and 1989 and Tahanovce between 1984 and 1997, containing a high number of first generation residents (they were not sold off or inherited after the initial purchase), resulting in the high number of cooperative owned apartments. As for variables, the empirical data was not comprehensive unfortunately and only contained the following information:

- Sale price - the final price the apartment was sold for calculated per m^2 in EUR.
- Floor space - the total floor space of the apartment, not including a balcony or cellar.
- Rooms - the number of rooms the apartment contains.
- Floor - the floor the apartment is located at in the given block of flats.
- Location - the street the apartment is located at.
- Ownership - the mode of ownership of the apartment before the purchase.
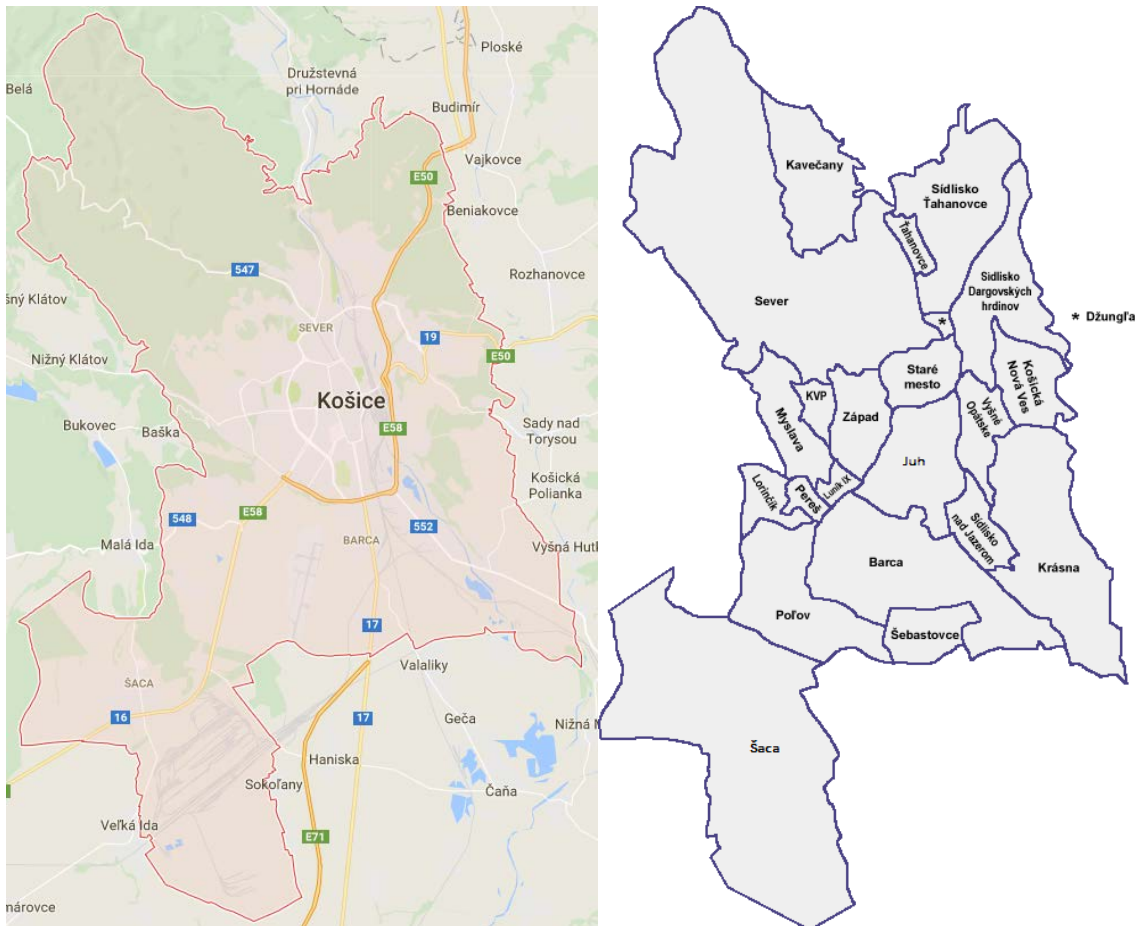
Figure 1. The city of Košice (left) divided into districts (right)
Source: www.google.sk/maps and www.kosice.sk

As was previously stated, this list is not comprehensive enough to enable the construction of a full spatial hedonic pricing model, therefore limiting the scope of the study. Therefore, to identify if the mode of ownership influences the sales price, a basic OLS model was constructed as follows:

$$Price\_m2 = Ownership + Rooms + Location \qquad (1)$$

where

$Price\_m2$ is the sale price of the apartment calculated per m^2 in EUR

$Ownership$ is a dummy variable with values of 0 for cooperatively owned and 1 for privately owned apartment.

$Rooms$ is the number of rooms the apartment contains.

$Location$ is a dummy variable for individual districts the apartments are located in with Sidlisko Dargovskych Hrdinov set as the reference base level.

3 Analysis

OLS model assumptions were tested using the Breusch-Pagan test, Durbin-Watson test and the variance inflation factor. The results are presented in Table 2.

Table 2. OLS model results explaining price per m²

Variable	Estimate	Std. error	t-stat	p-value	
(Intercept)	1124.596	33.74	33.331	0	***
Ownership	56.221	28.129	1.999	0.045968	*
Rooms	-57.611	6.416	-8.98	0	***
Jazero	-4.851	21.534	-0.225	0.821813	
Juh	99.114	23.371	4.241	2.48E-05	***
KVP	49.039	25.128	1.952	0.051331	.
Saca	-311.531	77	-4.046	5.70E-05	***
Sever	81.402	23.531	3.459	0.000569	***
Stare Mesto	116.892	26.214	4.459	9.36E-06	***
Tahanovce	-105.551	25.449	-4.148	3.71E-05	***
Terasa	90.097	20.363	4.425	1.10E-05	***
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					
Residual standard error: 167.4 on 829 degrees of freedom					
Multiple R-squared: 0.2599, Adjusted R-squared: 0.251					
F-statistic: 29.11 on 10 and 829 DF, p-value: < 2.2e-16					

Source: own research

As can be seen, the Ownership variable is statistically significant with a positive estimated coefficient, meaning that according to this model, cooperatively owned apartments have a lower price than privately owned apartments by roughly 56 EUR per m². This result was expected, as was discussed above, due to the higher difficulty of obtaining a mortgage to fund the purchase and additional difficulties related to renovation or modifications of the flat. Another Statistically significant variable was the Rooms variable with a negative estimated coefficient, indicating the at the same floor space it is preferable to have a lower number of more spacious rooms. As for the Location variable, we can see the different average price levels for different city districts. As is to be expected, the Stare Mesto district is the most expensive as it is the city center, with the adjacent districts of Terasa, Sever and Juh close behind. On the other side of the spectrum are the Tahanovce district (partly disconnected from the city center and with a lower socioeconomic level that the rest of the city center) and the Saca district, located at the edge of the city next to the U.S. Steel factory. These results correspond with a previous study performed using empirical data from the city of Košice (Dráb and Horváth, 2015).

Of further interest was the question, if the price difference between the privately and cooperatively owned apartments held true for different apartment sizes (expressed in number of rooms). The apartments were therefore divided according to the number of rooms and each group was then divided according to the mode of ownership. The resulting sets were then compared using the Mann-Whitney U test for statistically significant differences. The price distributions along with resulting p-values can be seen in Figure 2. The results indicate that the price difference between privately and cooperatively owned apartments holds true irrespective of apartment size.
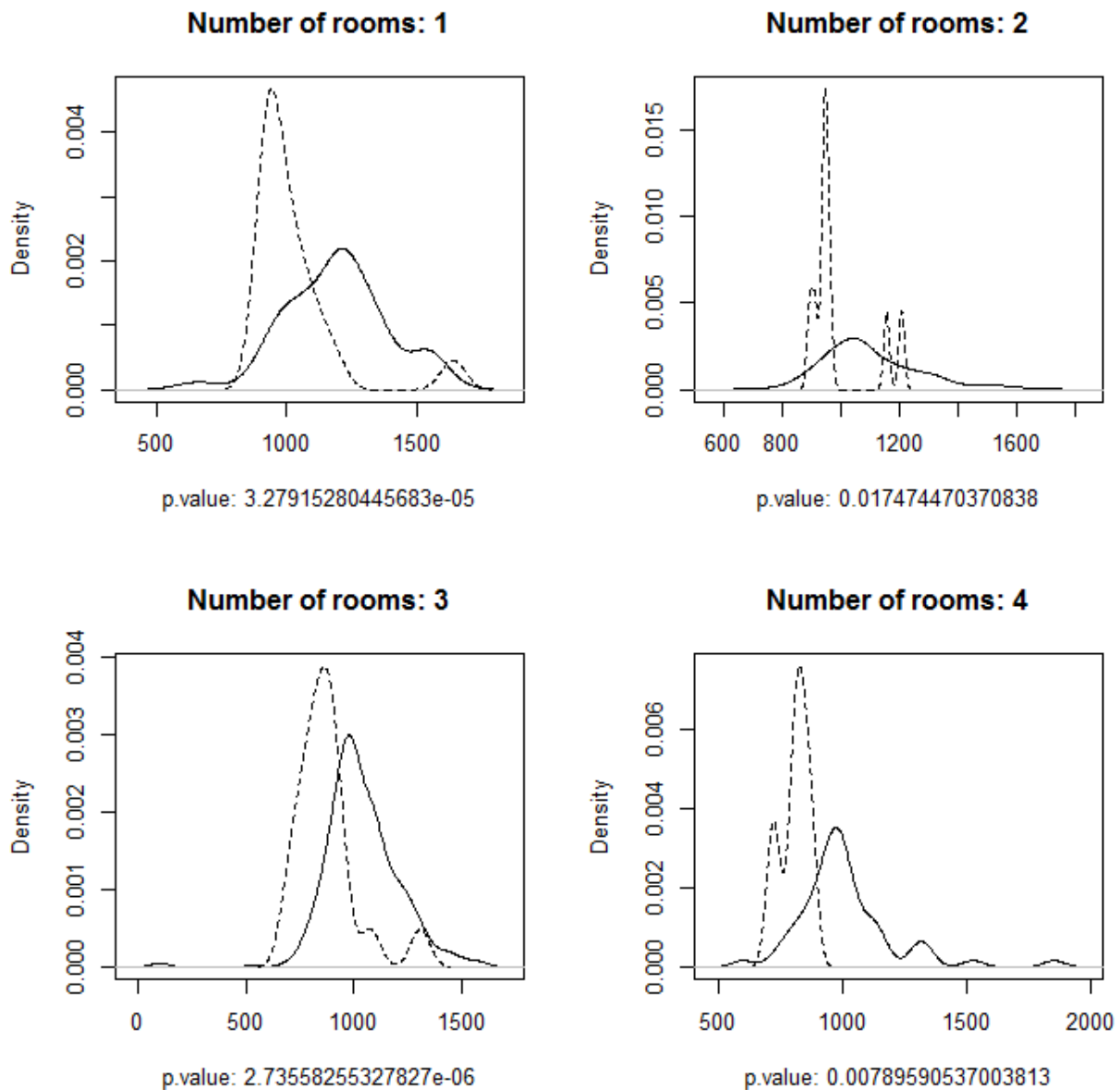
Figure 2. Distribution of price per m² for different apartment sizes and ownership
Source: own research
Comparison of different ownership status (full line - private, dashed line - cooperative) with p-values of Mann Whitney U test for different apartment sizes.

4 Conclusion

The study attempted to evaluate potential sale price differences among apartments caused by the mode of ownership, assuming that cooperatively owned apartments would present statistically significant price due to the added difficulty of financing their purchase in case of mortgage financing and potential future complications with alterations or reconstruction. Utilizing empirical data obtained from a real estate agency, an OLS model was constructed to investigate this assumption. Due to data limitations, it was not possible to construct a full spatial hedonic pricing model. The variable indicating ownership turned out to be statistically significant, confirming the assumption, cooperatively owned apartments presented lower sale prices than privately owned apartments. Further, average price differences between individual city districts were identified, corresponding to previous results.

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Analysis of the audit activity of the supreme audit office in the Slovak Republic and in the Czech Republic for the period 2007-2016

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Abstract

In the paper we describe the scope of the supervisory role and the position of the Supreme Audit Office in two countries - in comparison with each other in the Slovak Republic and the Czech Republic. The analysis focuses on the evaluation of the number of control actions carried out according to their types, as well as on the evaluation of the number of the entities in the public administration that have been inspected, in both countries. The analyzed period is a period of 10 years (2007-2016). In the end, we compare the obtained results, present observations and suggestions

Keywords: Supreme Audit Office, Slovak Republic, Czech Republic, Scope of Control, Public Administration, Control Action

JEL Classification: H72, H73

1 Introduction

The inspection was initiated to compare the state we wish to achieve (desired state) with the currently (existing) one. The latter will be established from execution of specific inspection activities, while the conditions of rationality, compactness and complexity must be met. We can come to two conclusions when conducting the inspection. The first conclusion is that no deficiencies were found during the inspection. On the other hand, the second conclusion is that in course of inspection, deficiencies / differences between the desirable and the existing state of affairs has been found. If deficiencies are detected during the inspection, it is necessary for the supervisory authorities to find why the deficiencies / differences between the two states emerged, who is responsible for these differences and how they can be eliminated, and to determine the means and tools enabling us to achieve the desired state (Balko L., Babčák V., 2009). According to Hrašková (2012), the term inspection means the sum of reviewing activities aim to determine whether all the conditions for the provision of public funds have been complied with.

In public administration, inspection is a specific way of managing public affairs. There must be a comprehensive system of back scrutiny in public administration, which represents the system of public administration audit. The purpose of inspection is to critically assess the state of affairs and remedy deficiencies affecting the performance and the mission of the public administration organization (Tej, 2002). The aim of the inspection is to identify problem areas and opportunities and to recommend measures to improve performance. Correct setting of public

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inspection parameters is one of the government's important tools for detecting hidden systemic risks and preventing crime and fraud (Králik, Kútik, 2013).

Controls carried out in public administration should ensure that all necessary activities are carried out to the appropriate extent and time. It should focus on the identification of facts as a prerequisite for predicting the controlled phenomenon and the correct identification of future goals. It should allow identifying and subsequently removing the negative deviations found during the inspection, generally applying the results of the controlled activity (Maličká 2017), (Rakšnys and Valickas 2016), (Halásková 2017).

Our paper evaluates inspection exercised by Supreme Audit Offices. An important assumption for good functioning of a modern democratic state is inspection of its management by an independent body. To protect public finances, any state that wants to work efficiently needs a competent supervisory institution, independent of the executive. In the democratic world, such institutions are a norm. In all countries reviewed by us, this role is held by similar audit institutions - the Supreme Audit Offices (SAO).

When mentioning inspection, it is important to draw attention to the International Organization of Supreme Audit Institutions (INTOSAI), which is the guarantor of the government audit plan in public administration. This is an umbrella organization for the governmental audit authorities in public administration. The organization derives its purpose from the interest in world inspection and is more specifically engaged in management of state bodies. INTOSAI is deemed to be an independent organization. This organization is known as a professional organization of the supreme audit bodies. Its activity is carried out in cooperation with the United Nations and other bodies specializing in conducting inspections. We can consider Supreme Audit Offices to be elements of this organization with a major role to play in the inspection of state accounts and operations of financial nature. These institutions represent a means of ensuring public accountability and their role is to ensure transparent management of state resources (Ciliková, 2007).

INTOSAI was established in 1953 in Vienna. It was formed by 34 Member States. It is currently made up of 193 Member States. The most important body is the International Congress, which convenes every three years. There are five official languages (English, German, Spanish, French and Arabic). The purpose of INTOSAI is to review public sector management. It cyclically proclaims international directives and publishes manuals on economic and financial management. Among its tasks is also creation of new audit procedures, providing information to its members, and organizing trainings (https://www.nku.gov.sk/intosai).

The aim of the paper is the assessment of audit activities of the Supreme Audit Offices in two countries. We evaluate and compare the number of audit event occurrences and the number of entities audited by the Supreme Audit Office in the Slovak Republic and in the Czech Republic respectively. In order to meet this goal, the paper is divided into three parts. The first part describes the supervisory role of the Supreme Audit Offices in both countries. Types of individual inspections performed by the Supreme Audit Offices are described. The second part analyses and graphically shows the number of audit events and the number of entities audited over a ten-year period. The third part compares and evaluates the results obtained therefrom.

2 Methodology

The data for the analysis were obtained partly from the annual reports of the Institutions and mainly through a controlled interview with the personnel of the Supreme Audit Institutions in each analyzed country. Data reviewed include data on the number of control actions carried out, split into basic types of audits and data on the number of audited entities. The third group is data on the number of complaints from citizens. All data sets are over the last 10 years.

The control scope of the Supreme Audit Office of the SR include all ministries, the government and other central state administration institutions, as well as the municipalities and higher territorial units located in the territory of the Republic and established or with the legal representation of legal entities. Furthermore, there are all legal and natural persons and state-run foundations.

The National Council of the Slovak Republic, by means of a decision, gives the right to the control institution to carry out audits within the scope of control, while overseeing the maintenance of generally binding regulations, efficiency, economy and effectiveness. On the other hand, only the entities of the state administration (ministries, government and other central state administration institutions) are within the controlling competence of the Supreme Audit Office of the Czech Republic, the scope of control does not include the subjects of the territorial administration.

In the Slovak Republic, the formation of the Supreme Audit Office (Najvyšší kontrolný úrad) is regulated in the second section of the third chapter of the Slovak Republic's Constitution. Pursuant to Article 63 of the Constitution of the Slovak Republic, the definition of the status, scope, organizational division, as well as the rules of inspection activity, shall be further stipulated by the law.

This law is the Act No. 39/1993 Statutes on the Supreme Audit Office of the Slovak Republic as amended, which defines the SAO as a state authority independent in its control activity and bound exclusively by law. In carrying out its control activities, the SAO of the Slovak Republic proceeds in accordance with this Act, with the ISSAI international control standards (International Standards of Supreme Audit Institutions) issued by INTOSAI, the International Organization of Supreme Audit Institutions, as well as in accordance with the Implementation Guidelines of the INTOSAI European Standards aiming to develop the INTOSAI standards in more detail and to provide guidance on their practical application.

The scope of the SAO control in the Slovak Republic applies to the government, ministries and other central authorities of the state administration of the Slovak Republic and their subordinate bodies, state authorities as well as legal entities of which the founder or establisher is the central state administration or other state authorities, special purpose state funds, public bodies established by law, legal entities with shareholders that are public institutions, legal entities with one of the shareholders being the state, natural persons and legal entities. In addition, the SAO is authorized to exercise its controlling authority over the municipalities and higher territorial units, legal entities established by municipalities, legal entities established by higher territorial units, legal entities with shareholders that are municipalities and legal entities with shareholders that are higher territorial units.

In the Czech Republic, the existence of the Supreme Audit Office (Nejvyšší kontrolní úřad) is enshrined in the Constitution of the Czech Republic and its activity and powers are governed by the Act No. 166/1993 Statutes on the Supreme Audit Office. The SAO fulfills its role

independently and is independent of all, the legislative, the executive and the judicial branch. Adequate financial independence is an integral part of this arrangement. The only determining authority in this respect is the Chamber of Deputies of the Parliament of the Czech Republic, which also controls how SAO is managed.

The SAO examines the state's management of state property and foreign assets. The SAO in the Czech Republic does not have control over the funds of municipalities, towns and regions or companies in which one of the shareholders is the state or local administration.

The Supreme Audit Institutions in both rated countries divide the controls performed into three types: Compliance audit (control), Performance audit (control), Financial Control.

The primary purpose **of compliance audit** is to verify that the rules and procedures are being implemented by the competent authorities in accordance with applicable laws and regulations. The compliance checks also involve a review of substantive and formal accuracy to the extent necessary to achieve the audit objectives. The compliance checks contribute to increased legal awareness and create an environment that ensures that violations of legislation are minimized and, in case of occurrence, detected early.

The performance check is called the 3E audit (Economy, Efficiency, Effectiveness). The main objective of the **performance audit** is to evaluate the economy, efficiency and effectiveness with which the audited entities manage the assets of the state and other property audited by the SAO and within its jurisdiction. When checking performance, each factor is given a different emphasis, depending on the specifics of the audit. Economy should be taken into account when it is possible for an entity or activity to significantly reduce input costs at a given level of outputs or results. The general risks in this area include, for example, waste, overpayment, overpricing, and the like. Efficiency should be taken into account when it is possible to increase the quantity or quality of the entity's outputs or results, or the outputs or results of an assistance, while not increasing the funds drawn to achieve the purpose. Risks in this area include, for example, loss, suboptimal input / output ratio, slow implementation, and so on. Effectiveness should be taken into account when the entity or the assistance does not produce the expected outcomes, results or impact. Risks in this area, for example, include mistakes in management, shortcomings in the policy design, insufficiently assessed needs, unclear or inconsistent objectives, etc.

Economy denotes the use of funds with the aim to deliver the set results at the lowest possible cost while maintaining the required quality. Economy can also be seen as a sum of management and organizational measures that ensure rational use of financial, material and human resources.

Efficiency denotes the use of funds with the aim to achieve the best results compared to the costs incurred to achieve them.

Effectiveness is the relationship between the planned and actual outcome of the activity pursued.

Financial control is the review of financial statements, bookkeeping system, accounting documents, transactions, including the review of compliance with generally binding legal regulations, evaluation of the reliability of the internal management and control system and the internal audit, expressing opinion on the financial statements, assessment of how the administrator of the state budget chapter meets its obligation to submit the final account, reporting any other significant facts that result from or are related to the audit and which, in the opinion of the SAO, are to be disclosed. The objective is to obtain sufficient and reliable

information as to whether the reported data, in particular those in individual final accounts of the national budget chapters, have adequate reporting power and can be considered credible for the SAO to draw its opinion on the state's final account.

3 The analysis of the number of occurring audit events and the number of entities audited in the Slovak Republic

The SAO audit activity is about monitoring compliance with generally binding legal decisions, effectiveness, efficiency and, of course, economy. In carrying out its activities, this Office draws on internationally recognized audit standards. Its concern are public resources used by entities of self-government, but also those used by public administration organizations in the Slovak Republic and by the entities of public interest. The main task of the SAO is to be the highest authority in the area of audit of public resources. Every year, the SAO is obliged to submit a report on the results of the audit activity it carried out to the National Council of the Slovak Republic within the meaning of Art. 62 of the Slovak Constitution no. 460/1992 Statutes.
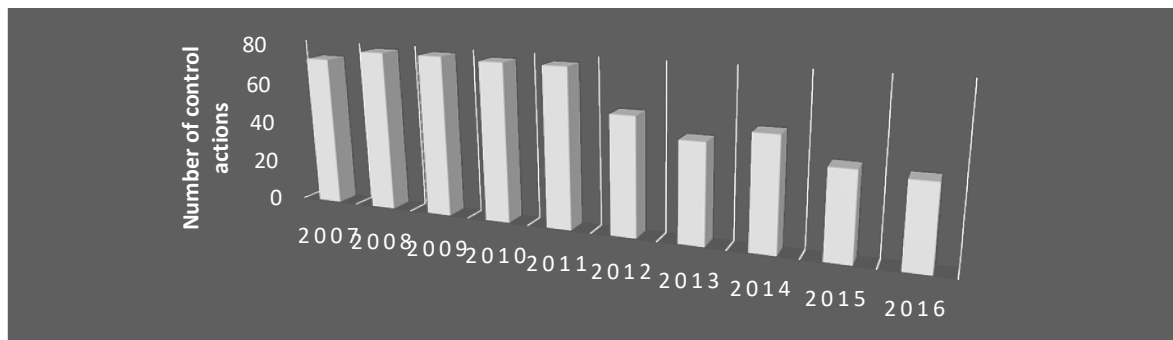
Figure 1 Control actions carried out by the SAO for a period of ten years
Source: Author's own processing

Figure 1 shows the number of audit events of the Supreme Audit Office of the Slovak Republic. On the whole, it can be said that the number of audit events shows a decreasing trend. Most audits were carried out in 2008 and 2009, namely 78 in both years. The least number of audits was carried out in the last year under review - 40. The biggest shift is recorded between 2011 and 2012, where the decline accounts for 26%. This is because, since 2012, the SAO has begun to carry out lower number of audits, but their focus is more complex.

In the more detailed examination of the number of audits occurring in the first year of the analysed period, we find that of the total number of 73 audit events concerning public assets and funds, 44% were factually-oriented audit events with a dominant topic and 28 events focused on auditing management of public assets and funds, representing 38% of the total number. 8% of the events targeted the role of the competent authorities in termination of assistance from foundations of the European Union and how this role was fulfilled. All of the listed audit types are jointly referred to as a compliance check (90%). Other inspections were financial in nature (4%) and still other reviewed performance (6%).

In the subsequent four years, the number of inspections carried out, even in the breakdown by type, was very similar. The SAO SR, however, is specific in the sense that its task is to carry out combined audit types, i.e. checking performance, compliance and financial aspects.

A more detailed analysis of the two most recent years shows that in 2015, 42 audit events occurred. Matching 2014 in the number of inspections, the most frequent audit events were

compliance checks. In that year, 60% of compliance checks were carried out, which is more than half of all the audit events of that year. Another part represented combined audit types, namely compliance checks and financial audit (21%) and performance and compliance check, which accounted for 17% of the audit events of that year. Only 2% of audit events focused on performance check. One of the areas that the SAO has been concentrating on in that year was "Improving Quality of Life", where they focused on the management and handling of public funds and assets. 13 audit events occurred in this area. That year, too, the correct use of euro-funds was the target of several audit events.

According to the audit schedule set out in advance, a total of 37 audit events were to occur in 2016. However, this number changed in course of the year to 40 audit events. The reason for change in the number of audit events was complaints received by the Office, asking it to carry out individual inspections. Compliance checks accounted for almost half of the audit events, making up precisely 46% of the total. Compliance checks and financial audits were again carried out in combination - 28% of all audit events that occurred; 15% of the events focused on compliance and performance check and all audit types were exercised in 10% of the cases, namely compliance and performance check and financial audit. The lowest number of all audit events of 2016 targeted performance.

We also examined how the focus of inspections changed in the 10-year period of the SAO operation. Figure 2 evaluates the distribution of different types of audit events in the two marginal years of the analyzed period. Compliance checks were the most frequent audit events in both years. The change lied in the fact that in 2016, combined inspections were carried out, where the audit office focused on either all types of inspections or only on some of them.

Control eventscarried out by type of control in 2007

Control events carried out by type of control in 20016
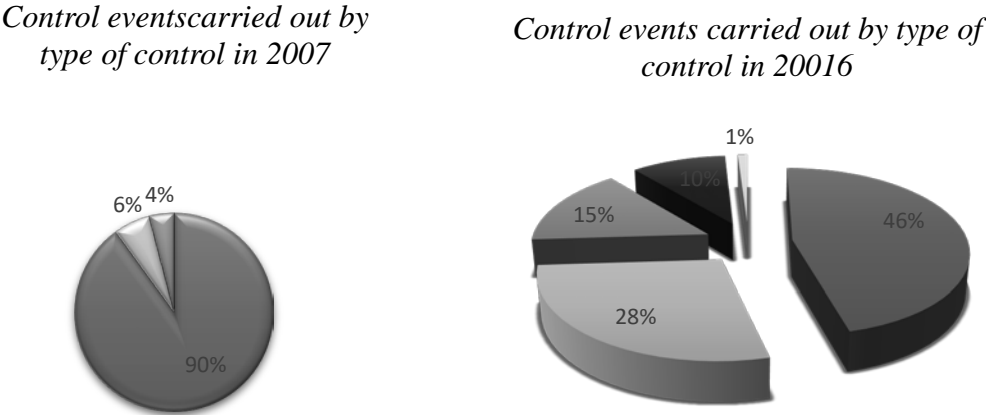
Figure 2 Control events carried out by the SAO SA by type

90% - compliance audit	46% - compliance audit
6% - performance audit	28% - compliance and financial control
4% - financial control	15% - compliance and performance control
	10% - compliance, performance and financial control
	1% - performance audit

Source: Author's own figure

The second part of the SAO performance analysis is the assessment of how many entities were audited in individual years of the analysed 10-year period (2007-2016).
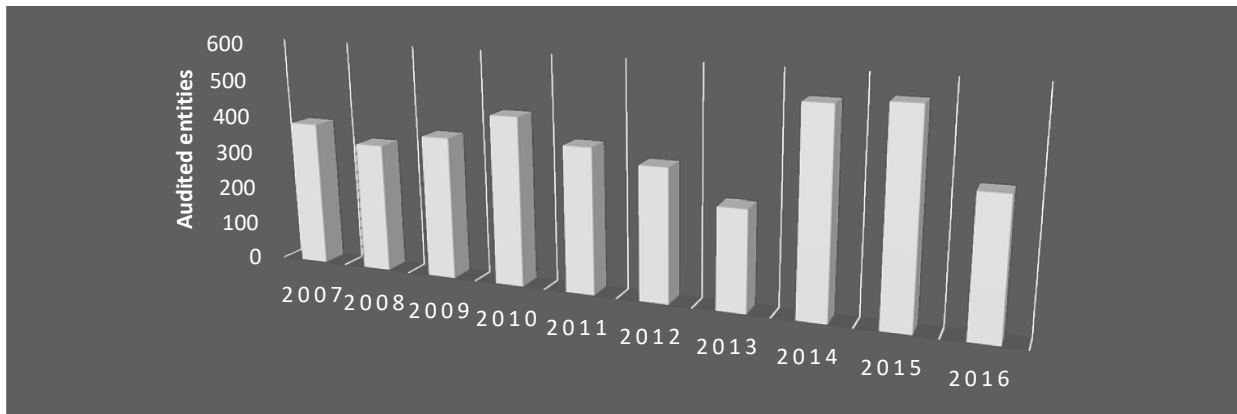
Figure 3 The number of audited entities of the SAO SR in a period of ten years
Source: Author's own processing

Figure 3 shows the number of entities audited between 2007 and 2016. 2015 saw the greatest number of audited entities, when the Audit Office audited exactly 549 of them. 2014 saw only a slight decline in inspected entities. Over the remaining years, the number of audited entities averaged 365. 2013 was the year in which the Supreme Audit Office audited the lowest number of entities. That year, only 268 entities were checked. The biggest leap was between 2013 and 2014, when the number of audited entities increased by 100%. On the contrary, the largest decline occurred in 2015 and 2016, when the number of audited entities dropped by 34%.

By subjecting the first year of the entire period to a more detailed analysis, we found that out of the total of 386 entities audited, most of them were inspected for management of state resources, where the audited entities accounted for 34%. A similar number of entities was audited in the area of self-government (31%). 13,638 violations were detected that year, with the majority of infringements found in the area of violating the Accounting Act. After completing the audit, the SAO makes recommendations to prevent similar errors from reoccurring in subsequent years. That year, 455 opinions and suggestions were submitted in the context of the comments procedure.

We also focused in more detail on the last two years. 2015 saw the greatest number of audited entities over the entire analyzed period, namely 549. Majority of these audited entities (55%) represented self-government entities; inspections focused on management of public finances. In that year, too, the audit office made improvement recommendations. In total, 487 recommendations were submitted that year. At the same time, the audited entities adopted a total of 2,605 measures put to use to remedy the findings and improve the current state. The number of deficiencies found was the same.

Over the last year of the period under review, 360 entities were checked. That year, the SAO SR presented 2,619 findings from the audits it performed. The identified shortcomings related, for example, to misuse of law or to lack of proper management. In order for the audited entities to correct the errors made, 1,656 measures were adopted. To avoid similar mistakes in the future, the SAO made 620 recommendations.

4 The analysis of the number of audit events and the number of entities audited in the Czech Republic

The Supreme Audit Office of the Czech Republic is one of the independent audit institutions, and its main function is to carry out inspections of state management. The mission of the audit office is to provide feedback to founders and state policy implementors on whether public

finances are spent efficiently, effectively and economically and also to inform them whether legally binding rules have been maintained.
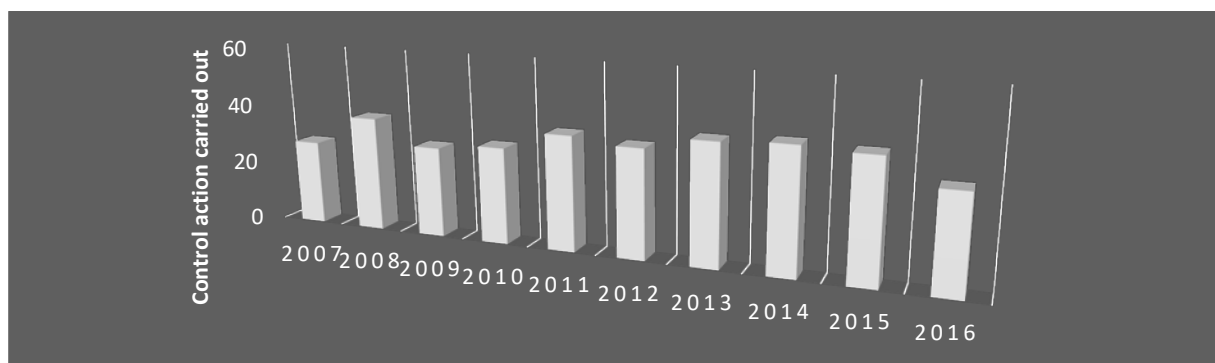
Figure 4 Control actions carried out by the SAO CR in a period of ten years
Source: Author's own processing

Figure 4 shows the number of audit events in the Czech Republic between 2007 and 2016. The greatest number of audit events occurred in 2014 (41 events) and vice versa, the lowest number of events occurred in 2007, which saw 28 events.

From a detailed analysis of 2007, we note that the plan originally envisaged 25 audit events, which changed to 28 during the year. In 2007, 9 audit events were completed, and the rest carried over to the next year. In the final phase, the total of 30 audit events occurred in 2007, as 21 events of the previous year were closed in that year. Audit activity of that year focused in particular on the area of state asset management, with more than half audit events dedicated thereto out of the total number of events closed that year (48%). In addition, audit events targeted expenditure (13%) and revenue (26%) of the state budget, the management of funds provided to this republic from abroad (7%) and other funds (6%).

Even more detailed focus was given to the last two most recent years of the period under review. A total of 36 audit events was closed in 2015. The greatest number of audit events targeted again management of state assets (34%), state budget revenues were the target of another large number of events, accounting for 22%. Other events were devoted to funds from abroad (14%), major investment programs (11%), subsidy policy (11%) and the final state budget accounts (8%).

30 audit events were planned for 2016. Two more were added during the year, so 32 audit events commenced in total. 40 events were completed that year. The audit events focused on similar issues as were addressed in the previous year. The greatest number of the audit office's audit events targeted management of assets of the state (38%) and state budget revenues (24%). Major investment programs 15%, funds from abroad 10%, subsidy policy 8% were subject to other audit events, with the remaining events focusing on the final accounts of the state budget. The results of the audit office work showed that the state managed its economic affairs better that year, causing economic growth.

Another part of the analysis of the SAO CR's work is to evaluate the number of audited entities. Contrary to the activities of the SAO SR, the SAO CR's scope of work is limited only to the field of state administration. Its auditing mandate does not extend to the entities of local self-government. The aim of the audit office is not to find deficiencies at all costs, rather the role of the audit it performs is to review the state's economy and, at the same time, to ensure that the state's economy becomes more efficient year-on-year.
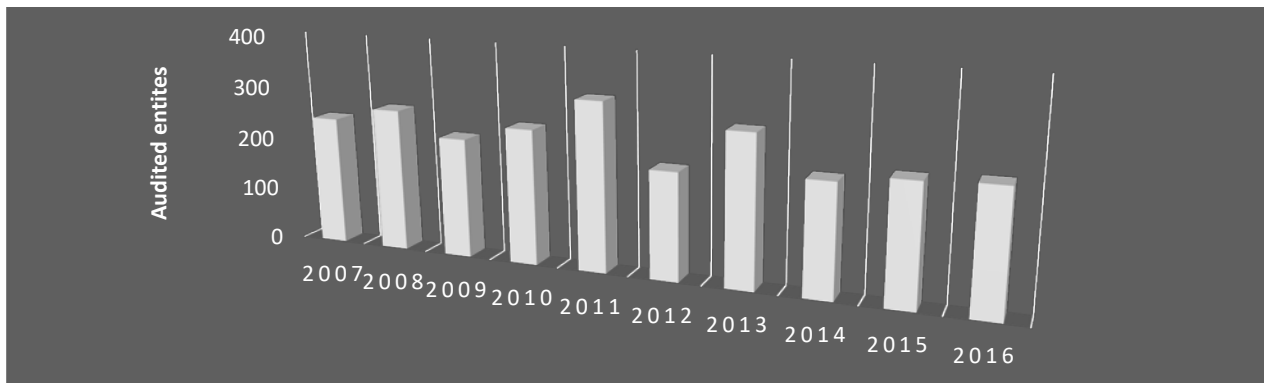
Figure 5 The number of audited entities of the SAO CR in a period of ten years
Source: Author's own processing

In the Czech Republic, the greatest number of entities in the area of state administration, namely 317 of them, were audited in 2011. The lowest number of entities was audited in 2012, when 202 entities were inspected. The biggest leap was seen between 2012 and 2013, when the number of audited entities increased by 40%. The largest drop in the number of audited entities was between 2011 and 2012, when their number decreased by 36%.

In each year, hundreds of deficiencies and mistakes were detected in individual entities in course of their audit. In addition, entities of state administration of the Czech Republic were also inspected. Doubtful items related to minor deficiencies, but a raft of systemic deficiencies was also found. Similar to practice of the Slovak SAO, the Czech SAO, too, makes recommendations to individual entities. Over the entire period under review, on average, 132 systemic recommendations were issued on a yearly basis that resulted in the respective remedial action. Regarding identified shortcomings, on average, 353 were detected annually as a result of audits. The greatest number of identified shortcomings lied in the area of managing assets and financial resources.

5 Comparison of analysis results and conclusions

In the following Figures, performance of SAO in the Slovak Republic and the Czech Republic is compared.
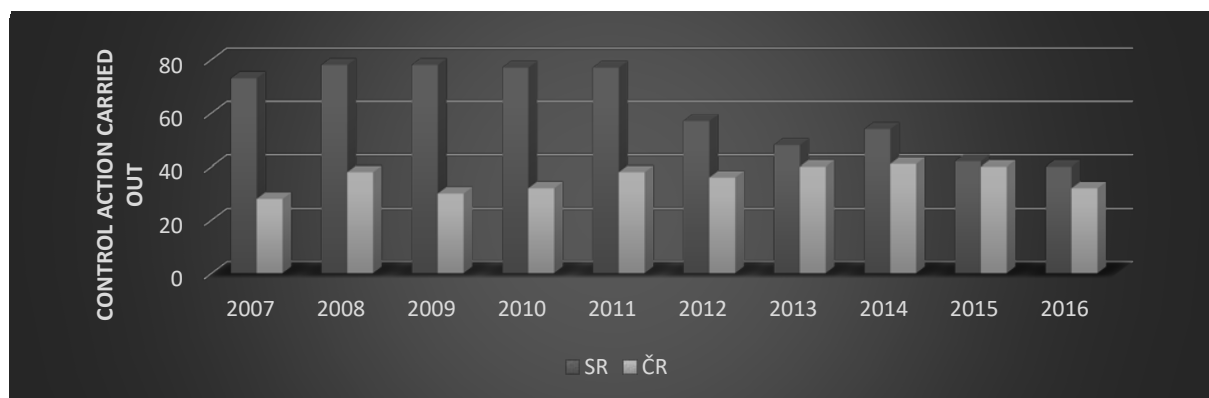
Figure 6 The number of control actions of the SAO and the Czech Republic for 10 years
Source: Author's own processing

It is clear from Figure 6 that the number of audit events occurring over the period under review differed especially in the first years thereof. While over the first five years, 77 audit events

occurred on average in the SR, there were only 33 audit events occurring in the Czech Republic on average per year. That means 44 audit events less. In the second half of the ten-year period, this gradually levelled off, with the annual average difference represented by 10 audit events. The two countries agree on the area of audit events. Over the whole period under review, in both the SR as the CR, the greatest number of audit events targeted management of state assets. The biggest difference between the CR and the SR occurred in the number of deficiencies found. On average, the SAO SR detected 5,160 deficiencies per year, while 369 deficiencies were found on average by the SAO CR on annual basis. However, more than 80% of the deficiencies identified by the SAO were attributed to self-governing entities. The deficiencies found were the same. In most cases, these were violations of the law, lack of proper management, or misuse of resources. The SAO makes recommendations annually to help prevent such problems from occurring in the future. On average, the SAO SR formulated 580 recommendations per year, while the SAO CR made 449 recommendations less. The SAO has an obligation to inform the competent authorities of the shortcomings identified.
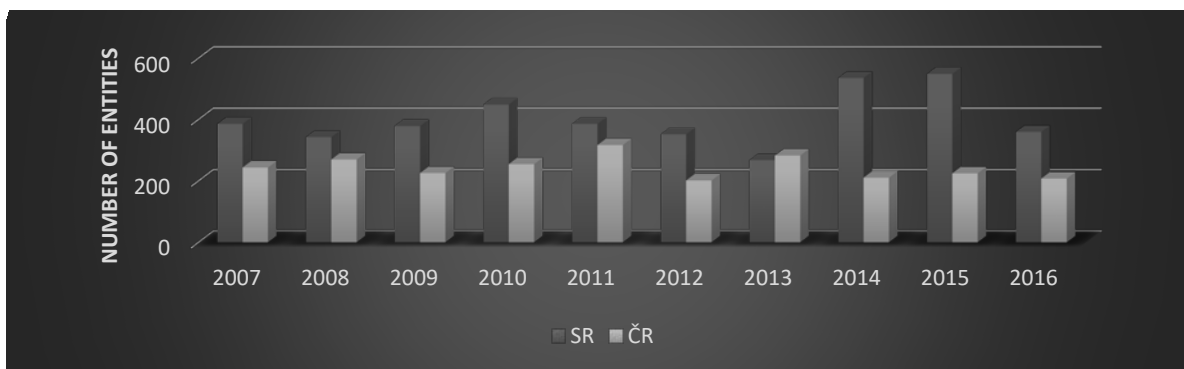

Figure 7 The number of audited entities of the SAO and the Czech Republic for ten years
Source: Author's own processing

In Figure 7, entities audited in Slovakia and the Czech Republic over the period 2007-2016 are compared. Almost in all years, the number of audited entities is higher in the SR.

In total, the SAO SR has the right to check 12,621 entities. Of these, approximately 7,000 entities are from the area of self-government. On average, 400 entities are audited in the SR each year. This shows that only 3.1% entities are checked. Despite the fact that at first glance, it seems to us that a sufficient number of entities is inspected in a year, it is not so in fact. The SAO CR has the right to inspect 5,435 entities and on average, it annually checks 246 of them. This means that about 4.5% of the total number of entities is checked annually. Despite the fact that the SAO CR's inspection mandate extends to only the state administration, it yearly inspects more entities in percentage terms than the SAO SR, competent to inspect the entire public administration.

It is important that there are as many audit events as possible and that as many entities are audited as possible in order to achieve better quality of public administration in both, Slovakia and the Czech Republic. We especially recommend narrower specialization of SAO auditors and increase in their number in the future. At present, the SAO auditors' scope is broad, they must be knowledgeable of various areas - asset management, accounting, labor relations, public procurement. The productivity of work and the quality of the checks carried out would certainly increase if the auditor could focus on one or two areas of expertise.

Based on the analysis results, *it is also possible to pick up pros and cons* of different audit mandate of the SAO in the two respective countries. In view of the broader scope of audit mandate, as is the case in the Slovak Republic (where both the state administration and the self-

government are under the SAO's audit mandate), inspection of public finances as a whole is positively regarded. Audit duplicity, where in addition to SAO, audit is done by auditing bodies of different levels (such as the Government Audit Offices, the Chief Auditor of self-government entities, etc.), is regarded negatively.

6 Conclusion

We have analyzed the activities of the Supreme Audit Offices in Slovakia and in the Czech Republic. By means of analysis we found that the SAO SR's audit role is greater in scope than that of the SAO CR. The SAO in Slovakia has the authority to inspect all public administration entities while the SAO CR inspects only the entities of state administration. The number of audit events were compared, as were the number of entities inspected over a ten-year period. Both countries have similarly distributed individual audit types, and they also apply similar audit procedures. This is mainly due to the fact that the cultural and social foundations stem from the common past of the two countries, which also translates into their further development and direction.

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Impact of external control on the activities of higher education institutions

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Abstract

The main task of control is the timely and cost-effective detection of the deviations that arise in the controlled process and which characterize the difference between the plan and its implementation, their analysis and the adoption of the necessary measures. The contribution is aimed at supporting the management and management of specific subjects - universities. In the Slovak Republic it provides higher education twenty public universities, three state universities and twelve private universities. Public higher education institutions receive funds allocated to the state budget to carry out their activities. For this reason, universities are subject to control over the proper use of the funds to cover costs, to maintain the economy, efficiency, effectiveness and efficiency of their use. At the same time, the contribution points to the reason for the difference between planning and drawing on the funds allocated.

Keywords: Education, Control, Accounting, Financial Statements

JEL Classification: M410, M200

1 Introduction

A public college is a public and self-governing institution that is established and abolished by law. The main activity of such an institution is the provision of higher education, which is not possible without funds. The funds are primarily financed from the state budget. The economical and effective use of these resources is subject to control at different levels - whether internal control (Matešová - Meluchová, 2014) (Krišková - Užík, 2015) within each university, or external control provided by various state institutions.

The contribution focuses not only on the characteristics of the subject, the subject, the reasons for the check, but also on pointing to another approach to understanding the concepts of economy and efficiency in the case of business practice compared to the public administration - with a high school.

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2 Subject of control

The revenues of public higher education institutions are according to §16 par. 3 of Act No. 131/2002 Coll. on Higher Education Institutions, as amended:
a) subsidies from the state budget,
b) tuition fees;
c) study fees;
d) income from further education,
e) the proceeds of public high school property,
f) intellectual property income,
g) revenues from its own funds,
h) other revenues from the main activity of the public higher education institution.

Revenues from public higher education institutions may also be subsidies from municipal budgets and budgets of higher territorial units.

The first group consists of four types of subsidies (subsidies for the implementation of accredited study programs, subsidies for research, development or artistic activity, subsidies for the development of higher education institutions, subsidies for social support for students) - based on the number of students and the share of teachers in science and research of publishing activity from previous periods, the second group is based on income in the given year from received payments from applicants, current students, graduates, as well as graduates from other higher education institutions mainly abroad. Revenue generation in the third group is the lowest compared to the previous two groups.

In order cover the expenditures required for its activity, the public college also uses other resources - whether it owns entrepreneurial activity or subsidies from the budget of municipalities.

3 Object of control

The costs of a public college are the costs necessary to ensure its main activity and development. Since public higher education institutions are among the entities which manage public funds, it is necessary to ensure that they are in control. One of the basic sources of information on the amount of funds allocated and their subsequent drawing is accounting (Kršeková - Pakšiová, 2015). Based on background documents, financial statements are prepared (Kordošová, 2014) which, in the case of universities, take account of the activities of higher education institutions in their structure. Control is carried out by the Supreme Audit Office, which controls the management of:

a) budget resources authorized by the National Council of the Slovak Republic or the Government of the Slovak Republic;
b) property, property rights, funds, liabilities and receivables of the state of public institutions, municipalities, higher territorial units, legal entities with state participation, legal entities with the participation of public institutions, legal entities with property participation of municipalities, higher territorial units, legal entities established by municipalities or legal entities established by higher territorial units;
c) property, property rights, funds and claims granted to the Slovak Republic, legal entities or natural persons in the framework of development programs or for other similar reasons from abroad,

d) property, property rights, funds, receivables and liabilities for which the Slovak Republic has accepted the guarantee,

e) property, property rights, funds, receivables and liabilities of legal entities performing activities in the public interest.

Here, it is possible to argue about the reason for emphasizing the control of the management of claims of any kind, because receivables are part of the assets being controlled. It is also possible to consider - why the control of funds is highlighted, since the funds of public institutions are part of the property and the property is controlled and, in the case of funds provided - these constitute a source of property.

4 Reason of control

In the case of the control of the Supreme Audit Office at public higher education institutions, the observance of the generally binding legal regulations, economy, efficiency and effectiveness under § 19 of Act no.523/2004 Coll. of the Act on the Financial Rules of the Public Administration, as amended:

- Public funds may be used for purposes that are in accordance with specific regulations. The resources of the state budget may be used only for purposes for which they were established by the state budget law for the respective financial year or established under this Act.

- Legal persons and natural persons to whom public funds are provided are responsible for their management and are required to maintain the economy, efficiency and effectiveness of their use when using them; (although here reference is made to Act 502/2002, which was replaced by Act 357/2015 Act on Financial Control and Auditing and on the Amendment of Certain Acts as amended)

- Higher education institutions are among the subjects of public interest (Ondrušová - Kňažková, 2017). A public administration entity, except for a municipality and a higher territorial unit, may receive loans, loans or repayable financial assistance only in accordance with this law; a public higher education institution, a training fund and a public research institution may receive loans under the conditions laid down by special regulations (in accordance with Act No. 131/2002 on Higher Education Institutions). A public administration body may receive a repayable financial assistance from another public body if this repayable financial assistance is used to cover the expenses associated with the implementation of the joint programs of the Slovak Republic and the European Union. A public entity may receive a refundable financial assistance from government financial assets if the government has taken a loan for the purposes for which the repayable financial assistance is provided; for other purposes, the public administration may only receive a refundable financial assistance after prior government approval.

- A public authority may provide loans or loans only in accordance with this or a separate law (eg the State Housing Development Fund).

5 The importance of control

Given that loans were not provided by universities in 2016 (https://www.minedu.sk/vyrocna-sprava-o-stave-vysokeho-skolstva-za-rok-2016/) - part of the control activity is missing.

The amount of long-term bank loans received was determined based on data published in the financial statements (Šlosárová - Bednárová, 2015). A simple comparison of reported data was used to analyze the data (Stanková - Marci, 2016). The data thus obtained is significant (Parajka, 2015) and is the basis for the abolition of control activities around lending. In 2016, €2 285 500 and current bank loans €258 117; which is 0.34% of the total amount of liabilities. Within the overall commitments of the Ministry of Education this amount is negligible.

Table 1 Table Universities / High schools in Slovak republic

Universities / High schools	Long-term financial assets	Bank loans
public high schools		
Univerzita Komenského v Bratislave*	0	0
Univerzita Pavla Jozefa Šafárika v Košiciach	0	0
Prešovská univerzita v Prešove	0	0
Univerzita sv. Cyrila a Metoda v Trnave*	0	0
Univerzita veterinárskeho lekárstva a farmácie v Košiciach	0	0
Univerzita Konštantína Filozofa v Nitre	0	0
Univerzita Mateja Bela v Banskej Bystrici	0	0
Trnavská univerzita v Trnave	0	0
Slovenská technická univerzita v Bratislave	500	84,3
Technická univerzita v Košiciach	0	600 000
Žilinská univerzita v Žiline*	79379	0
Trenčianska univerzita Alexandra Dubčeka v Trenčíne	0	0
Ekonomická univerzita v Bratislave	0	0
Slovenská poľnohospodárska univerzita v Nitre	75347,54	0
Technická univerzita vo Zvolene	0	0
Vysoká škola múzických umení v Bratislave	0	0
Vysoká škola výtvarných umení v Bratislave*	0	0
Akadémia umení v Banskej Bystrici	0	0
Katolícka univerzita v Ružomberku	0	1 485 500
Univerzita J. Selyeho	0	0
State high schools		
Akadémia ozbrojených síl generála Milana Rastislava Štefánika*	0	0
Akadémia Policajného zboru v Bratislave*	0	0
Slovenská zdravotnícka univerzita v Bratislave	0	0

Source: state as of 31.12.2017; * state as of 31.12.2016, source http://www.registeruz.sk

In addition to the correct use of funds, their proper spending to cover costs, it is important to monitor the maintenance of the economy, efficiency, effectiveness and efficiency of their use.

The meaning of these terms under Act 357/2015 on Financial Control and Auditing and on Amendments to Certain Acts as amended:

Economy - spending public finances to carry out the activity or procurement of goods, works and services at the right time, in the right amount and quality at the best price;

Efficiency - the most favorable relationship between the public finances used and the results achieved;
Efficiency - performance of the intended goals and achievement of the planned results in terms of the public finances used;

Efficiency - The relationship between the intended purpose of using public finances and the actual purpose of their use.

From the point of view of business practice (Majdúchová - Rybárová, 2015), the terms are defined as follows:

Economy refers to "doing things economically (economically)," and in general mentions the effort to minimize the resources generated, especially financial resources. From the point of view of managing a business or organization, it is about maintaining low financial costs overall low consumption of resources.

Effectiveness in practice: If it is said in practice to increase efficiency, then it is usually cost minimization or maximization of utility, respectively balancing the adequacy of costs (prices) and total utility. Efforts to increase efficiency are the core roles of each manager. In practice, the use of economic sophistication, efficiency of work, efficiency of public administration, and so on. Achieving high efficiency is the key to success in a competitive environment.

In the world of management, Peter F Drucker's popular quote is: "Efficiency is doing things right; efficiency is doing the right things ".

6 Conclusion

The main significance of any control (Kareš, 2016), including even the highest one, is primarily to identify deviations from the required state. However, with these deviations, it is also necessary to identify the reasons why they occurred at all. Failure to comply with legislation, failure to comply with internal regulations, human factor failure, or illogical fact that prevents the supervised entity - including college - to comply with regulations. At the same time, the deviations generated represent the possibility for regulated entities to modify their internal rules and to align with the required legislation, but at the same time for the controllers, it is possible for the legislators to be alerted to the facts most affected by the emergence of differences.

Terms - economy, efficiency, effectiveness, and efficiency - are fully embedded in their business environment and embedded in the budget environment. In such environments it is not possible to apply them absolutely.

Acknowledgements

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Localization of primary users according to frequency spectrum trading in cognitive radio network regarding alteration of value-added tax rate

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Abstract

The telecommunication industry belongs among the industry sectors with the most dynamically growing importance. A demand for services has increased during the last decades. An actual issue is a development and a deployment of the fifth generation cellular telecommunication network that should be a breakthrough in wireless communication systems. The cognitive radio network seems to be an appropriate solution for the efficient frequency spectrum usage. It represents an intelligent communication system which can adjust itself to the current conditions in the telecommunication network and to dynamically allocate the frequency spectrum bands to users who actually require a way to wirelessly transmit or receive the connections from the primary users. New technologies provide opportunities for new entities to enter the frequency spectrum market. A traditional spectrum allocation based on licences is outdated and inefficient in the present time. Sharing the frequency spectrum channel with unlicenced users can lead to a higher spectrum utilisation. The theoretical background comprises not only a traditional literature review, but also it concentrates on the processes of the frequency spectrum sharing and the frequency spectrum trading. The several economic categories applied in this field are picked up too. The methodology section demonstrates the elementary computational formulas to model the cognitive radio network. The main aim of the paper is to simulate a behaviour of the cognitive radio network users according to the changing environment. As the main tool to regulate the network, the value-added tax rate is applied. The situation in the market is observed in the several ways – by a few technical and economic parameters. There are the nine such indicators regarding the value-added tax revenue, the primary user profit, the cost of transmission with and also without value-added tax, the primary user revenue, a number of unoccupied frequency channels per one primary user, a number of active primary users, a number of connections of secondary user, and the activity duration of primary user. They are expressed by their average values for the particular time period of the simulation run. It lasts for 10,000 time periods. The cognitive radio network model is studied in a field of localisation of the primary users too. Its elementary topology is constructed in a form of a line segment consisted of 100 points to potentially localise the primary users. The same number of secondary users is present in the model. The analysis reveals that the value-added tax rate affects the frequency spectrum market. Also, there is an ecological point of view – the value-added tax rate looks like an appropriate instrument for government to regulate a level of electromagnetic smog.

Keywords: Cognitive Radio Network, Frequency Spectrum, Frequency Channel, Frequency Band, Trading, Sharing, Value-Added Tax, Tax Revenue, Agent-Based Modelling

JEL Classification: C15, C63, H21, L96.

1 Introduction

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The main goal of the cognitive network concept is to increase the use of the frequency spectrum in wireless networks. An accessible radio spectrum is allocated to users on a licence basis. At a certain point, it may happen that the entire frequency spectrum allocated to the particular user is not fully utilised. Such situation can be specified as a spectral hole. From the economic point of view and due to its effect, this spectral hole presents a spectral opportunity. The theoretical view of the cognitive radio network uses these spectral opportunities as possibilities to improve their efficiency and the activities of the whole network as well consequently. The central unit of the wireless network is a cognitive radio transmitter and a cognitive radio receiver that is capable of adapting and intelligently changing the transmission parameters according to the situation in the dynamically changing environment of the telecommunication network. The cognitive radio network offers a way to efficiently share the frequency spectrum among multiple subscribers to improve its use.

The substantial aim of the paper is to demonstrate a behaviour of the cognitive radio network users according to the changing environment from an angle of view of the frequency spectrum owner. This user is represented by the state which issues licences to use the frequency channels. It has also power to alter the value-added tax rate. By this step, it can alternate the environment of the cognitive radio network.

2 Literature Review

Wireless communication technologies have become a key element of the modern society. Volume of cell phone usage overcome all the other devices (Dahlberg et al., 2008). Actually, there are several communication systems which differ in transmission rate, covered area, transmitting power, and support of end user's mobility (Hossain et al., 2009). A traditional usage of the frequency spectrum is defined by Kolodzy et al. (2002) that represents an independent agency of the United States of America government with an aim to regulate the telecommunications sector. According to that model, licences for the frequency spectrum usage are allocated by the government, most often by the auctions particularly.

The cognitive radio network presents a new approach to wireless communication systems, which increases efficiency of the frequency spectrum usage (De Vriendt et al., 2002). According to Buddhikot (2007), licences are the main reason of the inefficiency in the frequency spectrum usage. This traditional model does not allow to utilise the unoccupied licenced frequency spectrum by the secondary users (Celebi and Arslan, 2007). Thomas et al. (2007) define cognitive radio network as a network with the cognitive processes, which are able to sense the actual conditions in the network and based on these conditions, it is able to plan, to decide and to act. The cognitive network is capable of learning from these adaptations and it is able to use this knowledge in the future decisions while following the final objectives (Gezici et al., 2005). Due to the fact that the frequency spectrum is a scarce good, it is necessary to use it efficiently. Cognitive radio provides a solution for an efficient frequency spectrum utilisation by the unutilised frequency spectrum at specified time and in the specified region without the licence owner restrictions (Haykin, 2005).

The economic aspects play a key role for the dynamic access to frequency spectrum because they make a motivation for the licenced users to provide the licenced frequency spectrum to the unlicenced users. Spectrum trading is defined as a process of selling and buying the frequency bands regarding the different dimensions, such as the frequency channels or the time period (Neel et al., 2002). The spectrum trading process can be seen as an element of the spectrum management (Evci and Fino, 2001). The main aim of the seller is to maximise the revenue or profit respectively. On the other hand, buyer would like to maximise utility from a frequency

spectrum utilisation. Cramton and Doyle (2016) design new open network, which allows to anyone to enter into it. Their open access network is inspired by the electricity market, where transformation to open access network has been realised in the recent years. There are the several approaches to model the cognitive radio network (Tonmukayakul and Weiss, 2008). Most of them are based on the agent based modelling. Vološin and Zausinová (2017) use the electricity market model created by Mascem – the multi-agent-based electricity market simulator as a basement for their frequency spectrum market model.

3 Frequency Spectrum Sharing

There are the three basic approaches of spectrum sharing in the cognitive radio network (Hossain, Niyato and Han, 2009):
– public commons model;
– exclusive usage model;
– private commons model.

The public commons model introduces a system where the frequency bands are for free to use and open to any broadcaster. The exclusive usage model applies a frequency allocation based on the licences issued to a specific user by the frequency spectrum owner, that is the particular state. In this case, a dynamic allocation is applied within the handover portion of the frequency spectrum to transmit data in the frequency bands. The private commons model is a way of sharing the frequency spectrum where a number of various users in the same cognitive radio network have different priorities of sharing their part of the frequency spectrum. Usually, a hierarchy level is applied between the network users. The top position is possessed by the primary user who sells the frequency bands to the secondary users on a lower hierarchy level. The space which the primary user sells can be called a spectral hole. The secondary user may be located in the two opposite positions from an angle of view of its behaviour – firstly, as a final user or a consumer and secondly, as a seller who sells the frequency band to the tertiary user. This situation can be repeated again. Hence, the tertiary user can become a final consumer as well. Such a sequence can be followed indefinitely until all the cognitive radio network users reach their desired satisfaction which they enter this process as their aim with.

4 Frequency Spectrum Trading

Frequency spectrum trading represents an operation of a sale or contracting out of a part of the frequency spectrum embodied by the frequency channel. As in every common trade, there are the two parties – seller and buyer. A person holding and selling the certain frequency bands is the seller of the frequency spectrum and is referred to as a primary user. On the other hand, there is a buyer – who buys part of the spectrum for its own usage – and is called as a secondary user (Chu et al., 2010). The primary user requests a price which reflects a satisfaction of the secondary user. The mutual relation is in a form of an inverse proportionality and this influences the behaviour of the involved users.

5 Economic Categories of Frequency Spectrum Trading

The primary goal of the cognitive radio network primary user is to maximise a profit by selling the frequency channels to the secondary users, while the secondary user's objective is to maximise the benefits of the purchased space usage in a form of the telecommunication connections.

The primary user charges a price reflecting an amount of a satisfaction of the secondary user. If the price increases, this value of a satisfaction decreases, considering the buyer has to pay more for the same frequency spectrum bandwidth or needs to meet the requirement of the narrower frequency spectrum bandwidth used for its transmission (Ileri, Samardzija and Mandayam, 2005).

The scope of the cognitive radio network is based on a number of the technical aspects. Economic research focuses on the financial features and a cost of an abovementioned field primarily. Such frequency spectrum trading involves a purchase and a sale of the frequency channels in a cognitive radio network environment. From the economic point of view, there are the several quantifiable variables in a field of the cognitive radio network, which include a primary user's profit, a secondary user's satisfaction, a demand of the secondary users over the frequency spectrum or a supply of the frequency spectrum channels by the primary users.

6 Data and Methodology

Investigation of the cognitive radio network requests more than usual forms of research. This is done because of the fact that such a network is nowhere in use so far. That is why, the data are based on an agent-based modelling approach.

6.1 Methodology

The elementary methodology consists of the several mathematical computations expressing the following economic categories – the main calculations are the primary user profit and the secondary user satisfaction.

The total revenue of value-added tax marked R in the particular time period is computed according to the following formula (Niyato and Hossain, 2008):

$$R = W_1 \, PUC + S \, P - W_2 \, PUC \left(B - \frac{FS - S}{PUC} \right)^2 \qquad (1)$$

where the involved variables mean:
- R – the value-added tax revenue;
- W_1 – the weight for the primary connection revenue and the cost due to degradation of transmission power;
- PUC – a number of the primary user connections;
- S – a supply of the unoccupied frequency spectrum;
- P – a price for connection charged by the primary user to the secondary user;
- W_2 – the weight for the secondary connection revenue and the cost due to degradation of transmission power;
- B – the frequency channel bandwidth required for the primary connections;
- FS – the frequency spectrum bandwidth.

In a case of a proportional allocation of the unoccupied frequency channels among all the connections of the secondary users, utility can be quantified subsequently (Niyato and Hossain, 2008):

$$SUU = SUC\left(SUS + SUC\ln\frac{S}{SUC}\right) - P\,S \qquad\qquad (2)$$

where the involved variables mean:
- SUU – a secondary user utility;
- SUC – a number of the secondary user connections;
- SUS – a secondary user satisfaction;
- S – a supply of the unoccupied frequency spectrum;
- P – a price for connection charged by the primary user to the secondary user.

6.2 The Cognitive Radio Network Model

Our model in this study is applied into the map within the shape of a line. There are 100 primary users and 100 secondary users on the map that are evenly distributed. Each primary user has 10 available frequency channels. The individual secondary users able to occupy a maximum of one frequency channel at each moment. In this case, the simulation last for 10,000 time periods. Each primary user pays a fixed cost of one unit per each time period.

The model is based on the idea that primary users can turn on and turn off their base transceiver stations according to the current market situation. In simple expression, primary user is represented just right by the particular base transceiver station – these terms are equal in the proposed cognitive radio network model. If the active primary user is kept over a number of consecutive periods in a loss, this user will be deactivated. This means a shutdown to prevent a potential loss. If the market is in a favourable moment, a change happens and the primary user with the best assumption to satisfy an increased demand is activated. In the model, these assumptions are set as the largest distance to one from all of the other currently active primary users. An activation and a deactivating of the primary users should lead to cost saving because the cost associated with the operation of the deactivated base transceiver station is negligible and it is considered to be equal to zero in the modelled cognitive radio network.

7 Results

On the basis of the agent-based modelled simulation, an examination of an impact of the change of the value-added tax rate on the frequency spectrum market is carried out. The cognitive radio network is modelled for a whole range of the possible tax rates – from 0 % to 100 % in an interval of one percentage point.

The following technical parameters and the economic indicators are explored in the analysis:
- the average value-added tax revenue;
- the average primary user profit;
- the average cost of transmission with value-added tax;
- the average cost of transmission without value-added tax;
- the average primary user revenue;
- the average number of unoccupied frequency channels per one primary user;
- the average number of active primary users;
- the average number of connections of secondary user;
- the activity duration of primary user.

A very suitable angle of view provides the correlation matrix with all the observed variables in the analysis. It is shown in the table below.

Table 1: Correlation Matrix of the Observed Indicators

	TR	PUP	TTC	TC	PUR	UFC	APU	SUC	PUAD
TR	1	0.50	0.82	0.81	0.60	-0.82	0.15	0.25	0.26
PUP	0.50	1	0.44	0.67	0.99	-0.66	0.92	0.95	0.95
TTC	0.82	0.44	1	0.96	0.52	-0.96	0.17	0.27	0.20
TC	0.81	0.67	0.96	1	0.73	-1	0.42	0.52	0.45
PUR	0.60	0.99	0.52	0.73	1	-0.72	0.87	0.91	0.92
UFC	-0.82	-0.66	-0.96	-1	-0.72	1	-0.41	0.51	-0.44
APU	0.15	0.92	0.17	0.42	0.87	-0.41	1	0.99	0.99
SUC	0.25	0.95	0.27	0.52	0.91	0.51	0.99	1	0.99
PUAD	0.26	0.95	0.20	0.45	0.92	-0.44	0.99	0.99	1

Source: own elaboration by the authors.

Legend for Table 1: TR – the average value-added tax revenue, PUP – the average primary user profit, TTC – the average cost of transmission with value-added tax, TC – the average cost of transmission without value-added tax, PUR – the average primary user revenue, UFC – the average number of unoccupied frequency channels per one primary user, APU – the average number of active primary users, SUC – the average number of connections of secondary user, PUAD – the activity duration of primary user.

Table 1 shows the correlation matrix of the observed technical and economic indicators that depend on the change in the value of value-added tax rate. At first, the highest positive correlation is observed between the average primary user profit and the average primary user revenue. Secondly, correlation between the average number of active primary users and the average number of connections of secondary user follows. Thirdly, relations between the average number of active primary users and the average activity duration of primary user, and consequently, between the average number of connections of secondary users and the activity duration of primary user are recorded.

On the contrary, the highest negative correlation is found between the average cost of transmission without value-added tax and the average number of unoccupied frequency channels per one primary user. There is a weak correlation between a pair of the average value-added tax revenue and the average cost of transmission with value-added tax and the frequency spectrum market size indicators which the average number of active primary users and the average number of connections of secondary user belong to. On the other hand, the tax revenue is strongly correlated with the economic indicators such as the average primary user revenue and the average primary user profit.
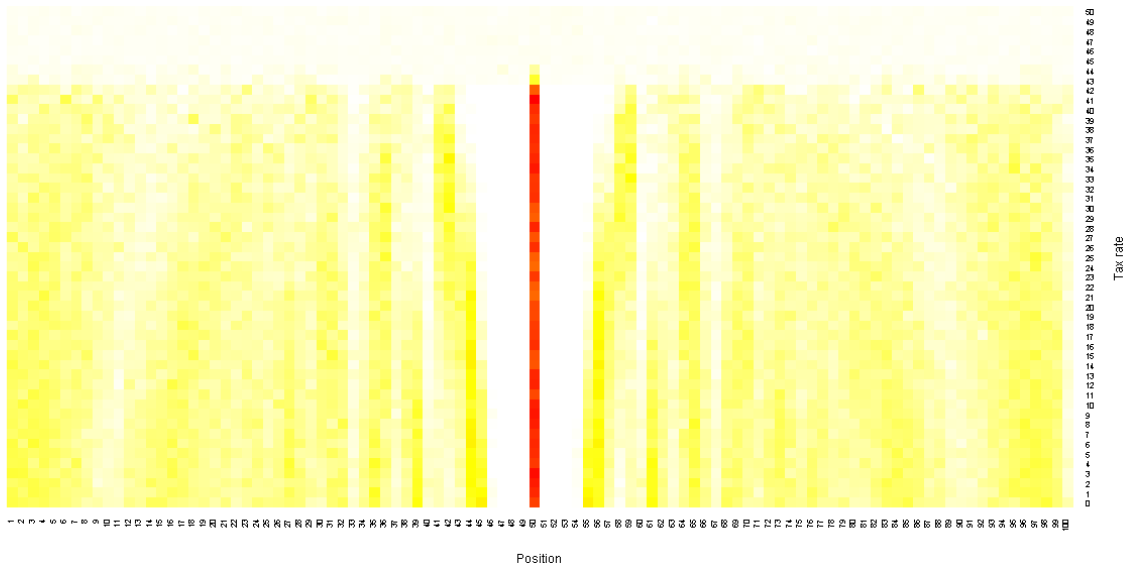
Figure 1: Localisation of Primary Users According to the Value-Added Tax Rate
Source: own elaboration by the authors.

There is to note that the white colour represents no occurrence of the primary user, the yellow colour 400 occurrences of the primary users, and the red colour 800 occurrences of the primary users throughout the whole run of the agent-based modelled simulation.

Figure 1 demonstrates the localisation of the primary users according to the value-added tax rate. It can be seen that all the set of the tax rates can be divided into the two groups. The first group ranges from 0 % to 44 % and the second group from 45 % to 100 % including these values. The first cluster is characterised by a dominant position in the middle with the several other visible positions depending on the value-added tax rate. At zero tax rate, the 14 distinct positions can be observed and they are visualised as dark yellow areas.

The increasing value-added tax rate causes a decrease in the number of the occupied positions. In a case of the positions localised on the edge of the map, they approach the centre of the map and vice versa, in a case of the positions localised nearer to the centre of the map, they go away from these positions towards the edges of the map. In the second set of the value-added tax rates, it is not possible to localise a typical topology because a high value-added tax rate causes a significant market distortion and thus, it prevents a longer period of the continuous activity of the primary users.

8 Conclusion

In this study, an examination of an impact of the value-added tax rate on the frequency spectrum market is carried out. This analysis of the selected technical parameters and the economic indicators demonstrate a level of rate that can influence a situation and a behaviour of the individual participants at the telecommunications market. The rising rate causes a market distortion, which leads to its inefficiency. The policymakers can use the value-added tax as a tool to regulate a number of primary users or base transceiver stations to regulate a level of electromagnetic smog from a technical point of view. This implies that the government should strive for a balance between demand and supply on the market using the regulations for the telecommunications sector as a basic authority in a given field.

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Unconditional guaranteed income – utopia or real solution?

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Abstract

Process automation, robotics work, globalization, changing demographic structure are the key factors that determine the need for redefining the concept of Unconditional Basic Income (UBI). Therefore, along with the fast pace of societal and technical development public finances will soon require restructuring. UBI could be one of the tools, that allow to optimize the redistribution of public funds, obtained from enterprises, which extensively use automatic and robotic production's processes. The aim of this study is to analyze the opportunities and risks related to the introduction of UBI as an instrument of social policy in Poland. We pose the following research hypothesis: H1: the introduction of UBI could provide some savings in the social security system. We find, that, depending on an employed scheme, the introduction of UBI in Poland could generate some savings.

1 Introduction

The world economy changes dynamically. The same dynamics has changing social structure of developed countries. According to that, social security systems should be adapted to social structures and civilization's challenges, that are in front of its face. The current EU systems should be then verified and modified. The increase in a number of people at risk of poverty, including those people who work, growing number of the world's richest people and which possess significant proportion assets, social polarization, creation of wealth resulting from risks which can be traded, and not from production and consumption, progressive process of replacing people with machines, process automation and rationalization of production, are only some of phenomenon, that attest to the changes that have occurred and continue to occur in today's socio-economic system (Baran, 2017).

One of the answers to these problems may be a concept, that since 1980's has gained increasing public support, especially in Europe - the concept of unconditional guaranteed income (UBI) (Widerquist et al., 2013). The introduction of the guaranteed unconditional income would allow redistribution of benefits of automation and globalization, and, at the same time, would be a buffer for systemic risks arising from changes caused by these processes. In addition, its unconditional nature allows you to reduce the poverty trap-is transparent expenditure and not demanding high administrative costs.

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In 1986 the basic income earth network (BIEN) was established – this is the organization aimed at linking groups and individuals around the idea of UBI understood as periodic cash payment for each person individually and unconditionally, no matter whether they work and whether they have other means of livelihood. Members of this organization are academics, students, practitioners involved in social policy, as well as those involved in political, social and religious activity (Basic Income Earth Network, brak daty).

Some countries try to test this idea in practice – in 2016 the Swiss held a referendum on the introduction of unconditional guaranteed income as an instrument of social policy, and in Finland and India government tried to introduce solutions that are derived from UBI (Baranowski i Mika, 2017).

The aim of this research is to present the fundamentals of UBI. We also try to assess, if it is possible to introduce UBI in Poland, taking into account financial stability of the public sector. We pose the following research hypothesis: *H1: the introduction of UBI could provide some savings in the social security system.*

According to the applied methodology, we analyze data describing cost of social transfers in Poland in the year 2017.

2   Unconditional guaranteed income as a part of welfare state

Thomas Piketty (2013) says "a history of wealth's distribution is always a history deeply political". He emphasizes that all decisions in this area are a reflection of country's political concept (liberalism, neoliberalism, collectivism), which is rooted in political background.

One of the concept of the State is welfare state, whereby "welfare" is an ambiguous term. On the one hand, it can directly relate to human wellbeing (well-being), their needs, relationships, mood, and on the other - to the system in which people function (Spicker, 2000). Modern welfare States began to form at the turn of the 19th and 20th century, but their largest boom occurred after the second world war (Czech, 2014). It is understood, that the concept of the welfare state was presented by economist William Beveridge in 1942. Beverigde, based on equal contributions proposed redistributable actions, which were to provide: health care, pensions, retirement, housing conditions and social benefits. The report was treated as a plan and implemented by the Government of Winston Churchill. This started public health care, social housing and a fight against unemployment in the UK. This plan was rooted in the idea that poverty is the result of random cases, and people tend to underestimate the risk, so one should ensure the security of income, and thus protect people from random accidents (Beveridge, 1942). The first time the phrase "welfare state" was used to describe the Labor Britain after 1945. Then this phrase began to be used all over the world, it was taken by politicians, journalists and historians. The term "welfare state" was used in the context of social and economic changes. Social changes were determined by the need for a comprehensive social security's system and equal access to education (Briggs, 1961).

The welfare state, in the narrow dimension, is defined as a state whose budgetary expenditure are the subject of the arrangements in two dimensions: cash benefits to households and subsidies or direct government provision of human services. In the broad sense it can also include the regulation of prices. In the developed OECD countries those expenditure range from 20% to 33% of GDP (Lindbeck, 2006). The crisis of 2008 caused that European countries, including Poland, are facing new challenges from a range of social policy and employment. An attempt to dismantle the welfare state, which in recent years has been mainly initiated by right-wing governments met from social resistance (Wódz, 2014).

Table 1 Social benefits paid by general government

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belgium	15.3	16.7	16.4	16.4	16.9	17.4	17.3	17.2	17.2	17.2
Bulgaria	9.6	11.3	11.8	11.1	11.1	11.8	12.2	12.	11.7	11.5
Czech Republic	11.8	12.9	13.1	13.1	13.1	13.3	12.9	12.4	12.2	11.8
Denmark	14.6	16.6	17.1	17.2	17.3	17.4	17.2	17.1	16.9	16.5
Germany	15.8	17.3	16.7	15.7	15.6	15.5	15.4	15.4	15.5	15.5
Estonia	10.4	13.8	12.7	11.2	10.7	10.6	10.7	11.5	11.9	11.7
Ireland	11.6	14.2	14.2	13.9	13.8	13.1	11.8	8.8	8.3	7.7
Greece	16.0	17.5	17.7	19.5	20.3	19.0	19.6	19.8	20.1	19.3
Spain	12.3	14.4	15.1	15.3	16.2	16.6	16.5	15.8	15.5	15.3
France	17.6	19.2	19.2	19.2	19.5	19.9	20.0	19.8	19.9	19.8
Croatia	12.2	13.7	13.8	14.2	14.1	14.2	14.4	14.5	13.7	13.4
Italy	17.0	18.5	18.6	18.6	19.3	19.9	20.2	20.1	20.0	19.9
Cyprus	10.9	11.9	12.7	13.2	13.2	13.7	14.0	13.9	14.0	13.6
Latvia	8.1	13.0	13.2	11.2	10.3	10.4	10.2	10.5	10.7	10.4
Lithuania	11.5	16.2	14.3	12.5	12.0	11.3	10.9	10.8	11.0	11.0
Luxembourg	14.5	16.6	15.9	15.3	16.0	15.9	15.4	15.2	15.3	15.5
Hungary	15.5	16.0	15.6	15.2	15.1	14.7	13.8	13.0	12.8	12.2
Malta	11.7	12.5	12.2	12.2	12.4	12.1	11.4	10.4	10.0	9.6
Netherlands	9.6	10.7	11.0	11.1	11.4	11.8	11.7	11.4	11.3p	10.9p
Austria	17.6	19.0	19.2	18.5	18.7	19.0	19.1	18.9	18.9	18.3
Poland	14.0	14.5	14.6	13.9	14.0	14.5	14.4	14.3	15.3	15.1
Portugal	14.6	16.4	16.4	17.0	17.6	18.5	17.8	17.4	17.1	16.7
Romania	9.9	12.1	12.8	11.9	11.2	10.7	10.5	10.6	10.7	10.8
Slovenia	14.4	16.1	16.8	17.2	17.1	17.1	16.5	16.1	15.5	14.9
Slovakia	11.7	14.1	14.4	13.9	14.1	14.1	14.0	13.9	13.9	13.5
Finland	14.7	17.3	17.5	17.2	18.1	18.9	19.6	19.8	19.6	19.0
Sweden	13.6	14.8	14.0	13.5	14.0	14.3	13.8	13.4	13.1	12.9
United Kingdom	12.5	14.2	14.4	14.3	14.6	14.2	13.9	13.8	13.4	13.1
Iceland	5.8	7.6	7.4	8.1	7.5	7.0	6.9	6.3	6.0	6.8
Norway	11.4	13.4	13.3	13.1	13.0	13.1	13.6	14.7	15.2	14.9
Switzerland	9.1	10.1	10.1	9.9	10.0	10.2	10.1	10.2	10.4	

Source: Eurostat, 2018

The table 1 presents governmental spending on social benefits (other than social transfers in kind) paid by government are transfers to households, in cash or in kind, intended to relieve them from financial burden of a number of risks or needs (by convention: sickness, invalidity, disability, occupational accident or disease, old age, survivors, maternity, family, promotion of employment, unemployment, housing, education and general neediness), made through collective schemes, or outside such schemes by government units[2]. It is important that that data doesn't cover expenditure other than governmental, for example spend by local authorities. We

[2] According to OECD definition

can observe, that the level of governmental social spending is quite diversified – but generally it is lower in the CEE countries.

Anton Hemelrijck (2002) claims that the welfare states differ in terms of reference and the risks covered by the insurance, the structure, level and source of funding of benefits, frequency of services, family policy, the law regulating employment, industrial relations and administrative structure of the social security.

UBI is one of the elements of the concept of the welfare state. This is the solution that was proposed already in the eighteenth century. In the year 1795 Thomas Paine talked about the need to create a National Fund, under which would be a source of payments *"at the age of twenty one years, the sum of fifteen pounds sterling, as a compensation in part, for the loss of his or her natural inheritance, by the introduction of the system of landed property: And also, the sum of ten pounds per annum, during life, to every person now living, of the age of fifty years, and to all others as they shall arrive at that age"* (Paine, 1797).

Definitions of that concept are numerous. They differ from each other in tiny details. Standing (2009) defines the unconditional guaranteed income (UBI) as a project, under which every citizen or legal resident has the right to collect monthly basic income. This income can be collected in cash or as tax relief. Citizens and residents, regardless of their sex, age, or marital status are entitled to receive this benefit (Standing, Work after Globalization: Building Occupational Citizenship., 2009). On the other hand, Raventós (2007) defining UBI indicates, that this income is paid by the State to all citizen regardless of whether they want to engage in gainful employment, but also regardless of whether there are poor or rich. Similarly, UBI defines Philippe van Parijs (2001) – as a regular tranche of money that is paid to all residents (not just citizens) independently of their material status, whether they live alone or with family's members, and whether you want to work.

3   Arguments for UBI

The idea of unconditional guaranteed income has definitely its proponents and opponents. It is believed that the opinion about UBI depends on the economic views, as well as the right-wing or left-wing political orientation. People with left-wing views point to the advantages of the concepts that are related to levelling inequality. In turn, people with right-wing views treat the concept as expensive and inefficient social program (Gołębiewski, 2017).

Currently we are at the dawn of the technological revolution, and as always in the history, it stimulates similar public discussions, like this one, which takes place today, and involves the concept of guaranteed income. Automation and robotization threaten mass technological unemployment. Among the supporters of the guaranteed income are the major leaders of IT industry – including Mark Zuckerberg or Elon Musk (Szarfenberg, Pieniądze za nic, ale po coś, 2017).

There are several presumptions for UBI implementation. They can be divided into those more abstract, that are the object of philosophical considerations and those more mundane, which are analyzed by economists (Melzochová et al., 2015). Among them there is a human right to protection from deprivation of basic needs, respect for human subjectivity, which is manifested in the delivery of vital plans and freedom from the fear of poverty and exploitation (Szarfenberg, Minimalny dochód gwarantowany, 2013).

UBI is a tool that can ensure citizens' safety. Currently all – both those who are employed on an order contract, work on a contract job - full-time or part-time - or are the beneficiaries of social benefits, live in constant uncertainty. Social benefits are often low, and getting them is burdensome in terms of administrative or legal requirements. Material safety awareness which could be provided by guaranteed income would reduce the personal shame, stress, maintain mental health, whether good interpersonal relationships, that are threatened by conflict related to material standing. Another benefit coming from material security is economic stimulation. Awareness that, at the time of start-up or company's failure an entrepreneur can count on financial resources guaranteed by the State, reduces risk and encourages bold entrepreneurial initiatives. Such a solution would also prevent company's financial drain, especially during the start-up phase and allowed the reinvestment of funds in the growth of an enterprise (Harris et al., 2016).

UBI is also allow to reduce the expenditure on social welfare. This would allow some savings in the State budget. However, it is not possible to achieve as an instant result. The process of gathering of cost savings, resulting from the replacement of welfare benefits by UBI is based on a possibility to reduce the costs of administration and reduction of social abuse. Today's social assistance system allows for the growth of undeclared economy, that is a consequence of a new grey area intended to allow receiving a stream of social benefits and the wages coming from undeclared economy. In addition, UBI can be understood as a dividend from social wealth accumulated over the centuries of development (Standing, Uniwersalny dochód podstawowy to nie socjalizm, 2016). The unconditionality of income allows to reduce administrative costs - It does not require a continuous assessment of the eligibility of the individual beneficiary. The selective checking of the income level, in the case when it is a backbone of paid benefits, is particularly difficult because its volume is dynamic and its part can be unreported. Benefits paid only to a defined group of beneficiaries are at risk of improper selection of a target group. Another advantage of the unconditional nature of social benefits is the lack of stigma. Benefits granted on the basis of the nationality or place of residence allow to eliminate the sense of shame associated with the obligation to prove hardship (Perkiö, 2014). According to that, economic theories and empirical studies show that a better tool for social support are cash grants, like the basic income, to in-kind transfers that are often part of the social security – such as housing allowances (Melzochová et al., 2015). It is also a benefit which ensure the basic means of subsistence, thereby this is an effective measure to prevent social stratification.

Critics of the UBI highlight the potentially negative impact of such a provision in the labor market. However, studies of Marx and Peters (2008) carried out on a group of lottery winners does not show a tendency to leave the job or a significant reduction in working hours. From the point of view of economy UBI can bring some positive effects like a demand injection. UBI may also be a panacea to the demographic problems of ageing Europe – as a benefit paid also to women who gave up their work for the care of children and doing household (Surdykowska, 2006).

Mark Zuckerberg, one of the current industrial reformers and creator of Facebook, during Harvard graduation speech enumerated the ways for the creation of the new world and society – UBI has to be one of the measures, that it should finance by people like him – who, through new solutions introducing automation and robotizations of processes lead to change of the shape of the labor market, what can increase the risk of technological unemployment (Zuckerberg, 2017). On the other hand, Steinvorth (2014) indicates that increasing automation and robotization does not necessarily mean drastic changes in the demand for labor - together with the process of industrialisation the demand for quantity and better quality of goods increases.

In addition, he points to the arguments of critics of UBI, that unemployment in the 20th century do not increase continuously. The rise of unemployment occurs at the time of the crisis, but immediately after it, when the economy strengthens, unemployment falls. He also underlines, as an argument against UBI, that the job market is followed by a permanent change - a part of the professions are created while some disappear for good. Despite this, unemployment today is more on the level of the year 1970 (Cowan, 2017).

UBI has a potentially large impact on the labor market. It enables employees of least-privileged professions to decide whether they want to continue their work, or only use UBI (Baranowski and Mika, 2017). In this way it is also an example of increased individual liberty. Time resulting from the lack of professional activity can be employ to increase competence, training and education, and thus can have an impact on the efficiency of employees at the time of the return to the labor market. This is a particularly important issue in the context of economic change. The dynamics of the labor market will increasingly require from employees flexibility and new skills or change of the industry or sector (Surdykowska, 2006). In addition, UBI can trigger redistribution of existing jobs among the economically active people. Reduction of working time by the working population, that is, reducing the supply of their work, could open a market for the unemployed. In addition, it enables the elimination of the institutional barriers which is the unemployment trap. Its unconditional nature is an incentive to work, not demotivating unemployed through loss of benefit to the taxed wage and acceptance of the work always will increase the purchasing power of the household (Marx and Peeters, 2008).

There are several positive effects that could be driven by UBI. One should, however, ask a question about the source of its funding. Financing of UBI can generally come from one of three sources: the replacement of expenditure on social benefits, increase the public debt of the country or increase its revenue, that is, the growth of taxes (Baranowski and Mika, 2017).

4   Arguments against UBI

Despite the many advantages, no country was able to deploy a social tool as UBI. An example would be a rejection of UBI in the national referendum in Switzerland. Ryszard Szarfenberg (2017) identifies the causes of such result in negative campaign linking the introduction of guaranteed income with the influx of "lazy" immigrants. On the other hand, there is the example of Iran, where the government in 2011 year decided to withdraw from the subsidization of energy prices. In return, began to withdraw every citizen compensation for price growth equal to 10% of the minimum wage.

The reasons for the negative attitude to UBI is a lot. The ground of part of them are rooted in political conditions. Most of the revenues in the state budget in Poland (about 89%) comes from the taxation. A large part of them are indirect taxes, which is mainly a tax on goods and services. An increase in indirect taxes would be the most severe for the poorest social groups. In turn, an increase in direct taxes as a source of financing of the guaranteed income is problematic from a political point of view. Such financing would be felt by all groups in society, and this would result in a decrease in the electorate of the policy option, which would employ such a solution (Baranowski and Mika, 2017). The replacement of the expenditure on social welfare benefits with UBI is associated with the inability to raise the political electorate through the granting of social benefits for individual social groups (Standing, 2016).

Among the arguments against UBI there are also those associated with the economic aspect of the state's, or economy's functioning - in the case of the financing of UBI with taxes, there is a risk of economic slowdown (Surdykowska, 2006). Additionally, UBI financed by increased

taxes could stimulate the growth of grey area and could be an incentive for illegal employment of workers. There is a risk that the motivation of citizens to acquire new qualifications would drop, and the market would suffer from the lack specialists. As an argument against one also indicate the risk of influx of immigrants who would take advantage of UBI. The massive influx of immigrants, in turn, would increase the cost of financing of the UBI (Schneider, 2017).

In addition, opponents of the idea argue that it is an idea contrary to the principles of justice and work ethic. The introduction of guaranteed income also promote the formation of dual society in which some people will work and live from highly paid work, and the rest will base on low-income UBI temporarily extended by low remuneration from odd jobs (Surdykowska, 2006). Others raise the risk of massive shortages in the labor market (Marx i Peeters, 2008). Opponents of UBI indicate also the risk that the amounts paid under the UBI would be insufficient to survive. Most of the proposals of UBI oscillates around $10.000 per year. Guaranteed income does not differentiate, however, the amounts granted for the members of society. In the same way it supports poor people – for example single parents or people with disabilities - and those privileged (Harris & Bierema, 2016). Most opponents of the idea of the UBI believe that people would be demotivating to work. Currently, it happens that those, benefiting social services, does not want to take low quality work in exchange for a little more money. Basic income is, however, the benefit which can be, or basically should be, combined with additional earnings. There are few people for which UBI offers a level of income sufficient and corresponding to their needs (Szarfenberg, 2017).

5 Results: Estimate of UBI costs - the case of Poland

The idea of UBI is considered in the context of many countries around the world. The cost of the introduction of UBI was estimated among others in: the Czech Republic, Ireland, Catalonia (Marx and Peeters, 2008), Finland, Switzerland, and even Namibia, India or Brazil (Perkiö, 2014). Poland is a country in which, as in the case of welfare state, the share of social expenditure in GDP is relatively high. Poland is a country where social expenditure consumes 25.8% of GDP - it's more than in other countries of Central and Eastern Europe (24.3% of GDP), but still less than the average for European Union countries (28.2% of GDP). Expenditure on pensions are relatively high in Poland, up 13.5% of GDP, while the share of older people in the population is not yet high.
Introduction of Family 500 + Program, within parents get 500 PLN monthly for a second and each subsequent child and, in the case of low-income families also for the first or only child, caused an increase in social expenditure in the year 2016 in relation to the year 2015 by about 5%. Its share in GDP is 1.2-1.3% (Sawulski, 2017). The administrative cost of this program for the municipalities is of 392.1 million PLN, 2.6 million PLN for counties and 15.8 million PLN at the level of self-government Voivodeships. The Ministry of Family Affaires spends 2,972,831.89 per year to finance this program (Ministerstwo Rodziny, Pracy i Polityki Społecznej, 2018). In addition, expenditure on social policy grows – the government introduces program, under which each pupil receives $300 on school equipment. The estimated cost of the program is 1437.6 million PLN, of which 46.4 million constitute the costs of service (Ministerstwo Rodziny, Pracy i Polityki Społecznej , 2018). There are many others proposals for social benefits for specific groups advertised by the government. Increasing expenditure on social benefits, demographic changes, that will generate greater social security costs and higher administrative costs are a prerequisite to consider alternatives which might be the concept of UBI.

In the study we rely on calculations carried out for the Czech Republic (Melzochová et al., 2015). The cost of the currently spent expenditure is estimated as a percentage of GDP on:

social benefits (other than social transfers in kind) paid by government are transfers to households, in cash or in kind, intended to relieve them from financial burden of a number of risks or needs (by convention: sickness, invalidity, disability, occupational accident or disease, old age, survivors, maternity, family, promotion of employment, unemployment, housing, education and general neediness), made through collective schemes, or outside such schemes by government units (OECD, 2018). We estimate the costs of UBI in two variants: the Irish scheme and the Catalonian scheme.

5.1 The Irish scheme for Poland

One of the ways that we select for the analysis in the case of Poland is the Irish plan (Healy's scheme). This allows us to compare the results with those obtained for the Czech Republic. In order to calculate the cost of UBI in Healy's scheme we assume that the amount of income for children (up to 18 years) as the amount of $500, or about 116 euro. This is adjusted to the current programme 500+ in Poland, but covering every child, not just the second and subsequent. For adults we adopt, as in the case of the Czech Republic, the amount of basic allowance, for which unemployed are entitled, in the qualifying period of 5-20 years. That amount is assumed to be equal to the allowance after 3 months of unemployment - around 152 euro. The average pension, which is adopted as the basic pension in Poland is equal to 498 euro. In order to estimate the annual cost, it is assumed that minors are persons in the pre-productive age (up to 15 years), adults – in the productive age (15-64 years) and pensioners – in the post-productive age (65 years and more). On the basis of the data relating to social benefits paid by general government (tab. 1) we assume the percentage of benefits in Polish GDP (tab. 2).

Table 2 Irish scheme for Poland and Czech Republic

Scheme	Monthly Cash Grant (€) *Pensioners/ adults / minors*	Yearly Expenditures (€billion)	Cost Comparison (UBI scheme as % of present expenditures)
Healy (for Poland)	498 / 152 /116	35,8	53
Healy (for Czech Republic)	402 / 232 / 79	31,2	179

Source: own study

5.2 The Catalonian Scheme for Poland

In the next calculation we use two plans of Raventos - the first is based on granting to all adults (people over the age of 15 years) citizens the minimum wage, and for minors (up to 15 years) - the amount of 100%, 50% or 33% the value for the adults. For the calculation of the Polish variant as the minimum wage we assume the gross amount of the minimum wage in the year 2017 (calculated using the rate of 1 EUR = 4.29 PLN) – it is 466 EUR. As a basic retirement payment we adopt 498 EUR – it is the average pension in Poland in the year 2017 (tab. 3). The second, more conservative Raventos's plan assumes half the minimum wage as a basic income for each adult, and 100%, 50% or 33% of this amount for minors (individuals aged below 15 years) (tab. 3).

Table 3 Catalonian scheme for Poland

Scheme	Monthly Cash Grant (€) *Pensioners/ adults / minors*	Yearly Expenditures (€billion)	Cost Comparison (UBI scheme as % of present expenditure)
Raventos – 1	498 / 466 / 466	77,93	116%
	498/466/233	71,01	105,6%
	498/466/154	68,66	102,1%
Raventos - 2	498/233/233	47,5	70,64%
	498/233/116,5	44,05	65,49%
	498/233/77	42,87	63,75%

Source: own study

Obtained results can be compared with those obtained for the Czech Republic (tab. 4).

Tab. 4 Catalonian scheme for the Czech Republic

Scheme	Monthly Cash Grant (€) *Pensioners/ adults / minors*	Yearly Expenditures (€billion)	Cost Comparison (UBI scheme as % of present expenditure)
Raventos - 1	402 / 314 / 314	42,15	242
	402 / 314 / 157	39,15	225
	402 / 314 / 104	38,16	219
Raventos - 2	402 / 157 / 157	26,7	153
	402 / 157 / 78	25,2	145
	402 / 157 / 52	24,7	142

Source: Melzochová, J. & Špecián, P. (2015). An Estimate of the Basic Income Costs: Case of the Czech Republic. Procedia Economics and Finance (30).

6 Discussion and Conclusions

In the paper the idea of unconditional guaranteed income (UBI) is presented. We analyse the cost of introducing UBI as a substitute for the current social security's system in Poland on the basis of the existing, but not yet implemented schemes, which were used to calculate the cost of the introduction of UBI in the Czech Republic, Catalonia and Ireland.

In the case of replacement of the current social security with proposed UBI schemes, Poland - in contrast to the Czech Republic - would generate some savings. However, the proposed guaranteed income for people in the working age does not meet the criterion of minimum level of subsistence in Poland. This is a consequence of the low unemployment allowance in Poland. According to the plan in which UBI is based on the level of the unemployment allowance, the proposed amount of UBI is about 112 EUR lower than the level of minimum subsistence for a single household. In order to meet their needs of the unemployed would be forced to take additional professional activity. This situation, however, would not feed the unemployment trap and could be an incentive for the long-term unemployed to return to the labor market.

In addition, corresponding with the Polish program of benefits 500 + for the second and subsequent child, the amount spent on people at pre-productive aged would improve the financial situation of households with one child or those that have only one minor child. Such allowance would significantly improve the situation of the parents whose children continue to learn after having 18 years of age (currently those children do not receive any benefits).

In turn, the two Raventos's plans would require, in the case of the Czech Republic, increasing of expenditure on social security. In the case of Poland, the first plan would force some increase in spending, while the second would allow for some savings.

It is important that UBI is not taxed. The value of the adopted income in the Raventos's scheme would correspond to the gross minimum wage in Poland. The amount estimated in the first Raventos's scheme would be higher than the net minimum wage in Poland. This would improve the financial situation of the people with least earnings.

Both Healy's and Raventos's plans require the adoption of the average pension as the basic income. This is due to the need to ensure the social minimum for old age persons, that, more or less, are unable to take professional activity which is available for people in the working age. In the case of pensioners, the question of acquired rights is very important. These people payed high social security contributions and expect to get a suitable amount of retirement, especially that pensioners do not have the ability to generate additional revenue and generate savings.

This analysis has several limitations. The analysis does not include the administrative costs and expenditure of local governments. There have also been estimated effects for the labor market. We also do not analyse the source funding for UBI and amount of income, which would have to be provided in the state budget in order to implement the UBI.

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Long Term Technical Efficiency of Economic Faculties in Slovak Republic

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Abstract

The aim of the paper is to evaluate the efficiency of economic faculties in Slovakia in the long run. Technical analysis is done by Malmquist index. Our input data are from Academic Rating and Rating Agency. Input variables in our analysis are Students and Teachers, and Doctoral study. Output variables are Publications and Quotations and Grant success. We separate data to two homogeneous groups, with aim to get the effectivity assessment in long run. We run analysis of Malmquist index, Catch-up and Frontier-shift. By these three indicators we point out the changes in effectivity of economics faculties in Slovakia. We also determine the cause of these changes. We document relatively stable and unchanging performance of best performing faculties. The moderate differences in long run performance are present in case of faculties with moderate performance. Dramatic changes in performance are observed in case of faculties with weak performance.

Keywords: Data Envelopment Analysis, Malmquist Index, Economic Faculties, Total Factor Productivity, Catch-up, Frontier-shift

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1 Introduction

Data Envelopment Analysis is a non-parametric method that allows to evaluate the efficiency, performance and productivity of homogeneous production units. The first model of DEA analysis was created by Charnes, Cooper and Rhodos in 1978 (CCR model). Another known model is the BCC model developed by Banker, Charnes and Cooper in 1984 (Emrouznejad, 2001). CCR model is based on the Farrell model to measure unit efficiency and maximizes the efficiency of the unit being evaluated. It is assumed that among efficient units, returns to scale are constant and changes in input changes directly outputs. BCC model is modification of CCR model and assumes variable returns to scale (Brožová, Houška, Šubrt, 2003). Above-mentioned

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CCR and BCC models must distinguish between input and output orientations. The SBM (Slacks-Based Measurement) model is an additive non-oriented model and does not distinguish between input and output-oriented models, meaning that SBM model allows us to reduce inputs whilst increase outputs (Jablonský, Dlouhý, 2009).

Data Envelopment Analysis has already been used in many scientific articles that have evaluated the effectiveness of higher education and universities. One of the first articles was (Johnes, John, 1992). Articles have been broken down by different directions and different research focus. Some papers focuse on the teaching and production of students (Abramo, D'Angelo, 2009, Archibald, Feldman, 2008, Agasisti, Dal Bianco, 2009). Faculty papers have been published since 1998 (MCMillan, Datta 1998, Abbott, Doucouliagos 2003, Kao, Pao 2009) and published articles focusing on country comparisons between universities (Breu, Raab, 1994) (Korony, Hronec, 2012). Bayraktar et al. (2013) run Data Envelopment Analysis to measure the relative efficiency of quality management practices in Turkish public and private universities. Authors showed that private universities with higher levels of quality management efficiency on stakeholder-focus indicators achieved better performance in terms of fulfilling the expectations of their stakeholders. Agasisti and Bianco (2006) run Data Envelopment Analysis on 58 Italian public universities. Authors found that the majority of universities perform well for various input and output specifications. Abbott and Doucouliagos (2003) found that regardless of the output-input mix, Australian universities as a whole recorded high levels of efficiency relative to each other. Nazarko et al. (2008) use subsidies as the input and the number of students and scientific grants are treated as the output. Authors showed that the majority of the universities in Poland possesses reserves in technical and allocative efficiency. Sav (2013) run analysis on a dataset consisting of 331 U.S. public universities. Author found that tuition dependency promotes inefficiency while increased government funding yields efficiency gains. Another finding of the study is that investment income appears to have a slight negative effect, albeit statistically weak. Results of the study reveal that public university efficiencies have improved over time. Afonso and Santos (2008) run Data Envelopment Analysis on Portuguese Public Universities. In this study inputs are the number of teachers and universities' spending while the outputs are the undergraduate success rate and on the number of doctoral dissertations. Authors identified well performing universities and those which does not perform well. Breu and Raab (1994) measure relative efficiency of the top 25 universities in the United States. Authors find that the most prestigious universities always generate the highest level of satisfaction among students. The authors suggest that university expenditures should be aimed more at increasing levels of efficiency, rather than to improve the perceived quality. Agasisti and Johnes (2009) use Data Envelopment Analysis to compute the technical efficiency of Italian and English higher education institutions. Authors' results show that institutions in England are more efficient than those in Italy when comparing jointly their performances. Authors also look at the evolution of technical efficiency scores over a four year period, and find that Italian universities are improving their technical efficiency while English universities are obtaining stable scores. Agasisti and Pérez-Esparrells (2007) employ Data Envelopment Analysis to analyse efficiency of Italian and Spanish universities. Authors found that Italian universities are relatively more efficient than those in Spain. Afonso and Aubyn (2005) showed on a dataset consisting of OECD countries, that efficiency in education is in some cases linked to efficiency in the health sector. Jeck and Sudzina (2009) run Data Envelopment Analysis on a dataset consisting of 96 faculties in Slovak Republic. Authors use teaching staff as input variable and number of graduates, publications in Current Contents Connect® and number of patents as output variables. The authors found that one half of faculties in the Slovak Republic are effective. Authors found no differences in efficiency caused by the location of faculties. Authors also argue, that 21 faculties do not reach economies of scale, thus are too big.

The aim of this paper is to study in middle-long term Catch-up and Frontier-shift of economic faculties in Slovakia by using Malmquist index.

2 Methodology

Above mentioned DEA models can be considered static as they do not take into account the development or change of efficiency over time. However, we can remove this deficiency by using the Malmquist index. The Malmquist index was originally constructed on the condition of constant returns. Nowadays, it has several variants, it can be oriented to inputs and outputs, with constant, variable, non-rising or non-declining returns to scale.

This index is spread over the change in efficiency, also referred to a catch-up, and the technological shift, respectively border shift. Table 1 shows an analysis of Malmquist index decomposition values.

Table 1: Analysis of Malmquist index decomposition values

		Change in efficiency (catch-up)	
		≤ 1	$1 \leq$
Technological shift (border shift)	$1 \leq$	Non efficient, but innovative	Efficient and technologically innovative
	≤ 1	Non efficient and technologically lagging	Efficient, but technologically lagging

We find the best performers according to the values of the indicators in the upper right corner. An efficient and technologically innovative Decision Making Unite (DMU) develops the edge of technological possibilities and increases its efficiency. If the value of the change in efficiency is greater or equal to one and the value of the technological shift is equally greater or equal to one, we are talking about efficient units with technological innovations. This group is characterized by new technological processes and approaches that can be evaluated and effectively managed by them in the future.

If the change in efficiency is greater than or equal to one, but the value of the technological shift is less than or equal to one, we are talking about an efficient but technologically lagging unit. These units anticipate an effective future development based on proven technology and management decisions that do not want to use new technologies.

Units that have a technological shift greater than or equal to one but the efficiency change is less than or equal to one, are inefficient but innovative. These units are characterized by the use of new technological processes, yet their management cannot effectively evaluate their decisions.

Worst units with the worst values are in the bottom left corner. These are units that are inefficient and technologically obsolete as these units are not using new technologies, and unfortunately their current management cannot ensure their efficiency. Such units have technological shift values and efficiency changes less than or equal to one.
The Malmquist index is calculated as product of catch-up and boarder shift. If the Malquist index value is greater than 1, we are speaking about improving DMU from the time period t to the time period t+1. This improvement is also called total factor productivity improvement. If the index value is less than 1, there was a deterioration of the total factor productivity of DMU.

We focus our analysis on faculties of economics from 2009 until 2015. In this period, faculties of economics formed specific group in the Academic Ranking and Rating Agency (ARRA) evaluations. We will be monitoring data for the whole period of 2009-2015, so we can achieve the assessment of the effectiveness of faculties of economics in the long run. When analysing longterm data, we will use the Malmquist index, as defined in the first part of the paper.

To monitor effectiveness in the long run, it was necessary to create homogeneous groups, due to the fact that changes were made in the ARRA ratings in certain periods. We divided observations within two homogeneous groups, namely the groups with the years, 2009-2011 and 2012-2015. Changes in the indicators that were performed in a homogeneous group within period are negligible, thus do not affect our findings.

The methodology used by ARRA when it comes to drawing up its ranks is changed every year, but only very small changes are made. The indicators used in the methodology are chosen in such a way that the higher value corresponds to a higher performance. The faculty, which reaches the highest value in an indicator, has 100 points. Other points are assigned by linear interpolation, with 0 points corresponding to the lowest value (ARRA, 2016).

In the Malmquist index, we used ARRA evaluations for input and output data. We have chosen two input and two output indicators, which are:
- Inputs:
  - Students and Teachers
  - Doctoral study
- Outputs:
  - Publications and Quotations
  - Grant success

3 Findings
In following two subchapters, results for periods 2009-2011 and 2012-2015 are separately presented.

Malmquist Index of Faculties of Economics in 2009-2011

In 2009, a new breakdown of the ARRA rankings was created, creating a separate group of faculties with an economic focus. In the homogeneous group in 2009-2011, we monitor the change in DMU (Decision Making Unit) efficiency between 2009/2010, 2010/2011 and 2009/2011. Observed faculties identified by individual DMU number. The total number of faculties in this group is 12.

Specifically, these are:
- DMU 1 – Faculty of Economics, Technical University of Kosice
- DMU 2 – Faculty of Economics and Management, Slovak University of Agriculture in Nitra
- DMU 3 – Faculty of National Economy at the University of Economics in Bratislava
- DMU 4 – Faculty of Commerce, University of Economics in Bratislava
- DMU 5 – Faculty of Operation and Economics of Transport and Communications, University of Žilina
- DMU 6 – Faculty of Business Economics, University of Economics in Bratislava
- DMU 7 – Faculty of Management, Comenius University in Bratislava
- DMU 8 – Faculty of Economic Informatics, University of Economics in Bratislava

- DMU 9 – Faculty of Economics, Matej Bel University
- DMU 10 – Faculty of Business Management, University of Economics in Bratislava
- DMU 11 – Faculty of Management, University of Prešov in Prešov
- DMU 12 – Faculty of Economics, J. Selye University

In this homogeneous group, only two faculties are not present, namely the College of International Business ISM Slovakia in Prešov, because of fact, that it obtained accreditation in 2010, as well as the Faculty of Economics and Entrepreneurship of the Pan-European University, which received accreditation in 2011.

Table 2: Efficiency assessment of economic faculties in 2009-2011

DMU	2009/2010			2010/2011			2009/2011		
	Basic MI	Catch up	Border shift	Basic MI	Catch up	Border shift	Basic MI	Catch up	Border shift
1	0.91	1	0.91	1.11	1	1.11	1.05	1	1.05
2	1.01	1	1.01	1.22	0.93	1.32	1.19	0.93	1.28
3	0.97	1	0.97	0.97	1	0.97	0.91	1	0.91
4	0.69	0.68	1.01	0.87	0.72	1.21	0.6	0.49	1.22
5	0.82	0.95	0.86	1.6	1.51	1.06	1.28	1.44	0.89
6	1.03	1.03	1	1.02	0.9	1.14	1.09	0.92	1.18
7	1.37	1.37	1.01	1.27	1.1	1.16	1.81	1.5	1.21
8	0.78	0.8	0.97	0.89	0.83	1.07	0.67	0.66	1.01
9	1.07	1.1	0.97	1.24	1.11	1.13	1.34	1.21	1.11
10	1.11	1.15	0.97	1.21	1.24	0.98	1.31	1.42	0.92
11	0.2	0.24	0.83	1.66	1.84	0.9	0.28	0.43	0.64
12	2.22	1	2.22	0	0	0	0	0	0

In 2009/2010 we see a balanced distribution of improvement and deterioration of DMUs in MI. Six DMUs reached values ranging from 1.01 to 2.22, with values greater than one, thus we observe productivity improvement. On the other hand, values ranging from 0.2 to 0.97 reached DMUs with productivity degradation between the first and second period. The best value was achieved by the Faculty of Economics, J. Selye University with a value of 2.22 marked in green, while the Faculty of Management, University of Prešov in Prešov had the lowest value and is marked in red. Four units achieved a value equal to one in the catch-up index, what indicates no change in relative efficiency between the first and second period. Likewise, four units reached values above one, while four units reached values less than one. The highest value in catch-up was achieved by the Faculty of Management, Comenius University in Bratislava with the value of 1.37, the worst was Faculty of Management, University of Prešov in Prešov with the value of 0.24. Concerning the border shift, one unit stagnates. Improvements in technology were recorded by four units that ranged from 1.01 to 2.22. Worsening had up to seven units and their values were 0.83-0.97. The Malmquist Index tells in season 2010/2011 that the Total Factor Productivity improvement recorded eight DMUs with values from 1.02 to 1.66, and three units experienced a Total Factor Productivity worsening. The worst unit was Faculty of Commerce, University of Economics in Bratislava with a value of 0.87. We record two values equal

to one in the catch-up, indicating that these units stagnated in relative efficiency. However, we see five units that have improved, their values ranging from 1.1-1.84. The worsening was recorded by three units. The worst of them having a value of 0.72 and a red colour is Faculty of Commerce, University of Economics in Bratislava. In the border shift indicator, it was found that the ratio of units that improved compared to units that deteriorated in frontier technology was 8:3. The best DMU unit is Faculty of Economics and Management, Slovak University of Agriculture in Nitra with a value of 1.32, marked in green. Red coloured is the Faculty of Management, University of Prešov in Prešov, with the worst boarder shift equal to 0.9.

In the last period of the 2009/2011, in which we are looking at the two-year efficiency change, Malmquist Index points out that seven units were rated as units with overall productivity improvements, as their values were greater than one. Four units reached values below one, ranging from 0.28 to 0.91, indicating that they deteriorated in the overall productivity. In the catch-up indicator during this period, there are two units that did not even deteriorate or improve relative efficiency. Four units improved and their values ranged from 1.21 to 1.5. Instead, five units achieved a deterioration in relative efficiency. The worst of these, marked in red, is the Faculty of Management, University of Prešov in Prešov with a value of 0.43. In the last indicator, border shift indicator, we see the highest value of 1.28 of Faculty of Economics and Management, Slovak University of Agriculture in Nitra. The Faculty of Economics and Management, Slovak University of Agriculture in Nitra unit with other six units has improved border efficiency since unit values were greater than one. The lowest value was reached by the Faculty of Management, University of Prešov in Prešov, which was 0.64, and together with the other three units, there was a decrease in technology innovation between the two time periods observed.

The Faculty of Economics, J. Selye University had zero values in the 2010/2011 and 2009/2011 periods, due to the fact that in 2011 two output data and one input data with values equal to zero were inserted into the calculations, so the Malmquist index evaluated it as if it had not been operating in given period.

Malmquist Index of Faculties of Economics in 2012-2015
The homogeneous group of the years 2012-2015 had the same distribution as in previous years, thus we are monitoring the change in DMU unit efficiency in 2012/2013, 2013/2014, 2014/2015 and 2012/2015.
In these four years, there was only one change concerning removal of one indicator from the "Grant success" output group.

In this homogeneous group, we have been focusing at the same faculties as in the homogeneous group 2009-2011, with the same DMUs, but we added two additional faculties, namely:
• DMU 13 – College of International Business ISM Slovakia in Prešov
• DMU 14 – Faculty of Economics and Entrepreneurship, Pan-European University

Table 3: Efficiency assessment of economic faculties in 2012-2015

DMU	2012/2013			2013/2014			2014/2015			2012/2015		
	Basic MI	Catch up	Border shift	Basic MI	Catch up	Border shift	Basic MI	Catch up	Border shift	Basic MI	Catch up	Border shift
1	1.04	1	1.04	1.12	1	1.12	0.98	1	0.98	1.13	1	1.13
2	1.15	1	1.15	1.01	1	1.01	0.9	1	0.9	1.05	1	1.05
3	0.83	0.85	0.98	0.82	0.72	1.13	1.11	1.06	1.04	0.78	0.66	1.19
4	1.05	0.92	1.14	1.07	1	1.07	0.82	0.89	0.93	0.85	0.81	1.04
5	0.97	0.99	0.97	0.85	0.71	1.2	1.08	1.04	1.04	0.86	0.73	1.18
6	1.1	0.95	1.16	0.96	0.98	0.98	1.01	1.01	1	0.99	0.95	1.04
7	0.71	0.6	1.17	0.98	0.99	0.99	0.89	0.99	0.9	0.63	0.59	1.06
8	0.98	0.86	1.14	1.26	1.19	1.06	0.8	0.87	0.93	0.93	0.89	1.04
9	1.07	0.96	1.11	0.93	0.89	1.05	0.82	0.91	0.91	0.83	0.78	1.06
10	0.96	0.98	0.98	0.89	0.79	1.12	1.49	1.61	0.92	1.29	1.24	1.04
11	0.71	0.81	0.87	0.96	0.79	1.21	1.16	1.21	0.96	0.78	0.78	1.01
12	2.09	1	2.09	2.47	1	2.47	1.31	1	1.31	10.9	1	10.9
13	0.17	0.25	0.68	11.01	3.95	2.79	1.52	1	1.52	0.57	1	0.57
14	0.74	0.97	0.76	1.13	0.84	1.35	0.63	0.66	0.95	0.51	0.53	0.97

In the observed period 2012/2013, we can observe the difference in the Malmquist Index. Six DMUs achieved improved Total Factor Productivity when their values ranged from 1.04 to 2.09. The smallest value, the DMU unit of which has the greatest deterioration compared to the remaining seven DMU units, is a value of 0.17 of the College of International Business ISM Slovakia in Prešov. We can see that in this period no unit has achieved an improvement in relative efficiency (catch-up) and only the Faculty of Economics, Technical University of Kosice, Faculty of Economics and Management, Slovak University of Agriculture in Nitra and Faculty of Economics, J. Selye University are stabilised. The remaining eleven units experienced a decline in relative efficiency. The smallest value was 0.25, College of International Business ISM Slovakia in Prešov. At the border shift indicator, the College of International Business ISM Slovakia in Prešov also had the worst value indicated by the red colour. Eight units have seen improvements in frontier technology. Their values ranged from 1.04 to 2.09.

In the period of 2013/2014, the results indicate that seven units improved overall productivity when they reached the Malmquist Index from 1.01 to 11.01 and seven units worsened as their values were less than one. When speaking about catching-up, four units did not improve or worsen as their values were equal to one. The College of International Business ISM Slovakia in Prešov, denoted by the green and Faculty of Economic Informatics, University of Economics in Bratislava, were only two DMUs that has improved. The remaining units with values ranging from 0.71 to 0.99 recorded a decrease in relative efficiency between the two observed seasons. Border shift in this period shows that up to twelve values improved in technology frontier, where the best unit was College of International Business ISM Slovakia in Prešov. The decline recorded only two units with values of 0.98 and 0.99.

The Malmquist index in 2014/2015 shows that seven DMUs have improved in overall productivity but even seven units have deteriorated. Values of DMUs with an improvement were from 1.01 to 1.52, with worsening units having a values from 0.3 to 0.98. In the catch-up domain, we see four units that have experienced stagnation, five units with improved relative efficiency, and five units with impaired relative efficiency. In terms of the border shift results, we observe that four units experienced improved bordering technology. Faculty of Business Economics, University of Economics in Bratislava stagnated when its border shift value equals to one. Improvement recorded College of International Business ISM Slovakia in Prešov with Malmquist index equal to 1.52. The worst value 0.9 reached Faculty of Economics and Management, Slovak University of Agriculture in Nitra and Faculty of Management, Comenius University in Bratislava, which are marked simultaneously in red.

The last observed period is 2012/2015. The Malmquist index indicates that the range of values of 1.05 to 10.9 belonged to improved Total Factor Productivity of four DMUs. The deterioration of Total Factor Productivity had ten units. The worst value highlighted in red is the Faculty of Economics and Entrepreneurship, Pan-European University with a value of 0.51. There are no changes in the four units' catch-up marker and are highlighted in grey. Only Faculty of Business Management, University of Economics in Bratislava with a value of 1.24 recorded an improvement in relative efficiency, the other nine units experienced a deterioration. The border shift shows us values of up to twelve DMUs with improvements in boundary technology. Extremely high value 10.9 was recorded by Faculty of Economics, J. Selye University, marked with green colour. Only two units have seen a decline in frontier technology between these two periods, and the values of these units are 0.59 and 0.97.

4 Conclusion

In the group of observed period 2009-2011, we compared the effectiveness of 12 faculties of economics. In 2009/2010, the largest overall change in efficiency was achieved by the Faculty of Economics of J. Selye University, which marked a major change in obtaining grants and subsidies. The Faculty of Management of the University of Prešov was the worst faculty. This faculty recorded a significant decrease in grant success and did not improve in other factors, which resulted in an overall decrease in the effectiveness of the faculty. In 2010/2011, the Faculty of Management of University of Prešov improved dramatically and recorded the highest overall productivity, mainly thanks to the management of the school, which managed to make the faculty effective by means of good management interventions. The worst overall productivity was recorded by the Faculty of Commerce, University of Economics in Bratislava, whose management dropped from interventions, which resulted in a deterioration in each factor. Compared to the 2009/2011 period, the Faculty of Management of the Comenius University was the best placed in the overall change in efficiency change, and during 2009-2011, it was constantly striving for innovation and good interventions of school management to achieve high overall efficiency. The Faculty of Management of University of Prešov, despite the improvements, was unable to maintain productivity efficiency and was the worst faculty because of inefficient school management interventions, low grant success, but also a low success rate of doctoral study.

In the homogeneous group of faculties of economic orientation, 14 faculties were monitored in 2012-2015. In the period 2012/2013, the highest overall productivity was achieved by the Faculty of Economics of J. Selye University, especially during the period in which it carried out innovations in the area of grants and subsidies, and also increased twice the number of its publications and quotations. The worst faculty was the College of International Business ISM Slovakia in Prešov, where insufficient school management interventions, as well as a drop in

border shift, compared with the year 2012, recorded a high decrease in grants and subsidies. The International Business ISM Slovakia in Prešov in 2013/2014 has greatly increased its efficiency by increasing its productivity in grant success and has also increased its quality of teaching. The lowest total productivity at this time was recorded by the Faculty of Business Economics, University of Economics in Bratislava, when it recorded a decline in all observed areas. The biggest decline occurred in its factors of publications and citations as well as the grant success, and the decline in the rate of the doctoral study. Bad school management interventions have also contributed to the lowest value of productivity. In the 2014/2015 period, College of International Business ISM Slovakia in Prešov again, as in the previous observed period, achieved the greatest change in efficiency when it integrated innovations from the previous year. The worst faculty in overall productivity has been the Faculty of Economics and Entrepreneurship of Pan-European University, which has made little improvement in PhD studies, but has seen a significant decline in the success of publications and quotations and in grant success. The last compared periods 2012/2015 show us the change in efficiency for this whole period, where the greatest change was recorded by the Faculty of Economics of J. Selye University. The greatest increase has been achieved in the quality of students and professors, the grant success and the increase in the number of publications. On the other hand, the Faculty of Economics and Entrepreneurship of Pan-European University became the worst, when its decline in productivity caused by bad management interventions, which significantly reduced the number of publications and of obtained grants.

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The measurement of patient satisfaction as a tool towards quality improvement: A literature review and analysis

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Abstract

Many world studies deal with the relationship between the medical device and the satisfaction of the patient. Healthcare needs to be sustainable because it faces increasing demands and diminishing resources. Sustainability considers the needs of future generations without compromising the needs of current generations. The interest in quality in the health care sector has rapidly risen over the past decade. This paper reviews the literature measurement of patient satisfaction as a tool towards quality improvement, describes measurement methods and offers a view of the future.

Key words: Patient satisfaction, Quality improvement, Healthcare.

JEL Classification: I10, I15

1. A tool for quality control

The US Agency for Healthcare Research and Quality defines quality health care as "doing the right thing, at the right time, in the right way, for the right person—and having the best possible results." Quality was first studied as an industrial process in 1931 by Shewhart. Shewhart's concepts include identifying customer needs, reducing variations in processes, and minimizing inspections. Influenced by Shewhart's work, Deming recognized quality as a primary driver for industrial success and subsequently introduced these methods to post-World War II Japanese engineers and executives. Applied strategically, these methods produced considerable growth in the Japanese automobile industry and subsequent worldwide recognition for quality.

Healthcare industries have seen recent movement towards continuous quality improvement and this has gained momentum since 1990. The interest in quality in the health care sector has rapidly risen over the past decade. Recently healthcare regulators shifted towards a market-driven approach of turning patient satisfaction surveys into quality improvement tool for overall organizational performance. Patient satisfaction surveys have gained increasing attention as meaningful and essential sources of information for identifying gaps and developing an effective action plan for quality improvement in healthcare organizations. Patient satisfaction is multidimensional aspect, vital key marker, an important indicator for measuring the quality in health care. Patient satisfaction affects clinical outcomes, patient retention, and medical malpractice claims. It affects the timely, efficient, and patient centered delivery of quality health care. Patient satisfaction is thus a proxy but a very effective indicator to measure the success of doctors and hospitals. Patient satisfaction is one of the established yardsticks to measure success of the services being provided in the health facilities and critical issue for healthcare

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providers. It is a complex attitude because a multitude of variables have been identified as its predictors. Diversity in patients' demographics also mods their perceptions about hospital facilities and services.

2. **Systematic review of controlled trials**

Measuring patient satisfaction is not an easy task. It requires
a) a clear definition of the objectives;
b) the identification of the target populations;
c) well defined tools and ways to collect the data;
d) a strategy for analysing the data and its utilization.

It can focus on the process or the results of care. It also allows patients to evaluate received services and treatments. Basically, there are two approaches for evaluating patient satisfaction-qualitative and quantitative. The quantitative approach provides accurate methods to measure patient satisfaction. Standardized questionnaires (either self-reported or interviewer administrated or by telephone) have been the most common assessment tool for conducting patient satisfaction studies. There is a great variation in questionnaires as instruments of measuring patient satisfaction. The spectrum includes: Instruments provided by private vendors, which are usually not published and their reliability and validity are not clear. Secondly, there are quite a number of publically and standardized instruments such as patient satisfaction questionnaires; PSQ-18 and consumer assessment health plans (CAHPS). Such instruments have the advantage of good reliability and validity; however, offer limited scope of survey questions. Some authors report that patient satisfaction studies have a real impact on the attitudes and behaviours of health professionals and are prone to induce improvement measures in the health services.

Faezipour and Ferreira performed a rigorous review of literature, analysed and studied the previous works, and determined the top-level factor categories that contribute to healthcare sustainability. These factor categories include patient, provider, resource, quality, financial, and environmental/energy. These factor categories are interconnected and align with the three sustainability pillars and other major categories in healthcare.

Gill and White present a review of literature related to patient satisfaction and discuss the role of perceived service quality in patient satisfaction. Methods have been developed to measure patient satisfaction in healthcare.

The work of Hulka et al. provide the initial approach to measure patient satisfaction in the healthcare area with the development of a scale to measure attitudes toward physicians and primary medical care.

Ware and Snyder developed the "Patient satisfaction Questionnaire, which helps whits planning, administration and evaluation of health service delivery programs.

Larsen et all developed the "Client Satisfaction Questionnaire", which is an eight-item scale for evaluating general patient satisfaction with healthcare services.

Chahal developed a tri-component model that considers the loyalty of patients towards using the same provider.

Brady and Cronin developed a model that considers attitude, behaviour, and experience (interaction quality); ambient conditions, design, and social factors (physical environment quality); waiting time, tangibles and value (outcome quality).

Daoud-Marrakchi et al. developed the Tunisian Measurement Scale to determine patient satisfaction based on reception, nursing care, information, comfort, food, and invoice service in the Tunisian Patient Clinic.

The Consumer Assessment of Healthcare Providers and Systems (CAHPS) is one of the tools applied for measuring patient satisfaction with quality of care. These surveys ask patients to report their experience with healthcare. The Agency for Healthcare Research and Quality (AHRQ) has been the lead developer of this program and the program has become an important national effort to measure and report the patients experience from healthcare.

Hu et al. developed Taiwan Customer Satisfaction Index (TCSI) to measure patient satisfaction in Taiwan. TCSI is the modification of American Customer Satisfaction Index (ACSI) that is used to assess patient satisfaction in hospitals in US. ACSI produces scores on four levels: national, sector, industry, and company/agency. It consists of 10 sectors and 47 industries. One of the sectors relat customer satisfaction in each of these sectors and industries and produces scores for the causes and consequences of customer satisfaction and the relat.

Finally measuring patient satisfaction allows the identification of possible problems and suggests ways of improving the quality of care or public health interventions. Patient satisfaction measuring tools are numerous and vary accordingly to the field to be investigated.

3. **Patient reported outcome measures, barriers of use**

Clinicians are often reluctant to use PROMs routinely because they fear it will add to their workload rather than make them more efficient and effective. Furthermore, many clinicians who do spend time talking to patients contend that they already understand their patients' problems and do not need additional information from them. Patients generally welcome systems that routinely use PROMs. However, they say that patient reporting systems must be used well and not misdirect the focus of the clinical encounter, burden patients, or focus only on factors that have value to clinicians. Nelson and colleagues present two cases from Sweden and the United States that show routine use of PROMsin primary and secondary care. Both systems were developed by experienced, practising physicians and share similar objectives but the design differs.

4. **Looking to the future**

In the past 2 decades, innumerable advances have occurred in medicine and technology. However, the health care system continues to perform far below acceptable levels in the areas of ensuring patient safety and addressing patient needs. The publication *To Err is Human* from the Institute of Medicine galvanized health care system response and public demand for change when the US population learned that medical errors cause 44,000 to 98,000 deaths annually. The abyss between what physicians know should be done for patients and what is actually done accounts for more than $9 billion per year in lost productivity and nearly $2 billion per year in hospital costs. Despite complex medical environment, physicians rely primarily on paper tools, memory, and hard work to improve the care given to patients. However, creation of reliable and sustained improvement in health care is difficult with use of traditional methods. Improvement often requires deliberate redesign of processes based on knowledge of human factors (how

people interact with products and processes) and tools known to assist improvement. The clear ethical imperative to enhance the quality and safety of care and meet external accreditation requirements and consumer expectations requires physicians to address quality of-care issues systematically. The goals of this review are to provide clinicians with sufficient information to understand the basics of quality improvement (QI), highlight the basics of major improvement methodologies, provide a starting point for improvement projects, and stimulate further inquiry into QI methodologies currently being used in health care. Emerging information and communication technologies are spurring the development of new systems designed to capture and use the patient voice. However, the extent to which these systems can improve care will depend on how effectively clinicians respond to the patient voice. Future systems for incorporating the patient voice and patient reported outcomes into office practice need to be based on fundamental principles of patient centred care such as the timely explanation of information based on patient need and delivery of the information in a way that can help patient stake effective actions to protect their health and wellbeing. Perhaps patient satisfaction could be considered in the future as a right to health indicator making its contribution in monitoring the progress states have achieved in regard to implementing the right to health for the populations they are in charge of.

5. **Conclusion**

The literature suggests that patient satisfaction studies have a potential political, social and ethic impact, which strengthens their usefulness as a monitoring tool of the right to health. There is a relationship between the quality of health service with health patient satisfaction seen from the dimensions of responsiveness, reliability, assurance, empathy, and tangibles. Patient satisfaction builds on ethical, deontological and moral foundations. The principles of autonomy (free choice, participation, etc.), beneficence and non maleficence (scientific soundness, technical competency, capacity to empathy, etc.) should be respected by health professionals and be an integral part of the mechanisms of implementation and surveillance quality of care and basic rights of patients. Indeed, patient satisfaction studies do yield valuable information on accessibility / inaccessibility to quality health care as well as on true/fake patient participation, adequate/inadequate circulation of information and appropriate/ inappropriate allocation of resources, ultimately being of interest to health policy decision makers. A summary of the research conducted systematic review, showed a positive effect on the quality and service excellence to client satisfaction. There are very few published studies reporting of the improvements resulting from feedback information of patient satisfaction surveys, and in most cases, these studies are contradictory in their findings.

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Political Budget Cycle in Slovakia: The Impact on Public Deficit Generated on the Central Government Level

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Abstract

The intention of re-election is a strong motivation of political incumbent to make arrangements in the field of fiscal policy. Such an opportunistic behaviour of the political incumbent might result in changes of main macroeconomic categories or in public expenditure and public deficit. In the theoretical literature, the first situation is known as political business cycle and the second as political budget cycle. In this paper the political budget cycle in Slovakia is investigated focusing on public deficit generated on the central government level. The research hypothesis expects that in the period of election the budget deficit increases. The basis of the expectation resists in the augmented activity of the government in the field of public expenditure in the period of election. This might cause an increase in public deficit. The regression analysis is provided by using a data for the government at the central level. Results point to the statistically significant impact of the election period on the deficit. The relation between the election year variable and deficit of the central government is negative, in case of pre-election year it is positive and the relation between the sum of election and pre-election years and public deficit generated on the central government level is again negative.

Keywords: political budget cycle, budget deficit, central government, elections.

JEL Classification: H72, D72

1 Introduction

The literature focusing on the political business cycle and political budget cycles was introduced by Nordhaus (1975), Tufte (1978), Rogoff and Sibert (1988) or Rogoff (1990). These authors describe a behaviour of political incumbent in terms of manipulating fiscal categories. The theory distinguishes among two main approaches (Alesina and Roubini, 1992). An opportunistic approach focuses on seeking to be re-elected (holding an office). A partisan approach describes a situation, when different parties maximize different objectives (left and right wing parties). An opportunistic behaviour is explained e.g. by Drazen and Eslava (2010) as fiscal expansion, when the incumbent increase public expenditure (or expenditure categories with visible impact on citizens – citizen friendly fields of expenditure as social service, housing etc.) in aim to win the next elections.

In the current empirical research, the investigation of political budget cycles is mainly based on a panel data approach. A strand of literature makes an empirical research on a sample of developed countries (e.g. OECD countries as Brender and Drazen, 2004) with an increased interest in transition economies of Eastern Europe (Shi and Svensson, 2002a, 2002b, 2006; Brender and Drazen, 2004; Akhmedov and Zhuravskaya, 2004). The described phenomenon of increase in public spending and deficits in election years is connected with new democracies. Strand of scientific literature focuses on investigating the political budget cycle on local level

of government. Bonfatti and Forni (2017) are searching for political budget cycle at the local level in Italy. Political budget cycle and budget deficits in connection with arrangement of tax rates is investigated in Alesina and Paradisi (2015) on the sample of Italian cities. Other related literature includes a wide scope of the problem in the question. E.g. Manjhi and Mehra (2015) provide an analytical solution of the partisan and opportunistic incumbent in the presence of ant-incumbency. Lici and Dika (2014) provide a survey of the empirical literature focusing on the political budget cycles. Mink and de Haan (2006) mention, that budget deficit increase in electoral years. Additionally, a significant but small partisan effect on fiscal aggregates is present.

The aim of the paper is to investigate, whether there is present a behaviour of central government characterized by the literature as opportunistic behaviour of the political incumbent. Paper seeks for the negative relationship between the election period and the public deficit generated on the central level of government in Slovakia.

The paper is organized in a following manner. The introduction is followed by the chapter, where methods and data are described. After, the chapter of results and discussion presents main findings of the research. Conclusion, acknowledgement and references close the paper.

2 Methods and Data

Basic research assumption stresses the presence of the political budget cycle in Slovakia (hereinafter SR) considering the central government level. The behavior of the political incumbent at the central government level might influence the fiscal policy in the period of parliamentary election. The election variable is expressed as a dummy variable. It achieves value of 1 in the election period, otherwise 0 (mentioned in Lici and Dika, 2016, used by Alesina and Paradisi, 2015; Brender and Drazen, 2004; Shi and Svensson, 2002b, etc.). Alternative variables are often involved to the investigation. In this paper, two additional election variables are employed. The pre-election year dummy variable achieves 1 in the period one year before parliamentary elections, otherwise 0 (emulated from Manjhi and Mehra, 2015). The summary election variable captures the pre-election and election year valuated by 1, otherwise 0. Basic OLS estimation follow the equation mentioned in Lici and Dika (2016, p. 370). As the literature review shows, the dependent variable in the case of political budget cycle is often expressed as government expenditure, government revenue (or government tax revenue) or budget deficit (Brender and Drazen, 2004; Lici and Dika, 2016). In this paper the dependent variable is expressed using the budget deficit indicator. It is constructed as the budget deficit of the central government as % of the GDP (as introduces also e.g. Shi and Svensson, 2002b). If the relation between the election period variable and public deficit is negative, it might indicate, that in the election period the difference between government revenue and government expenditure decreases, thus the deficit increases (while the deficit is calculated as government revenue minus government expenditure). A set of control variables is involved to the estimation. Their choice is inspired by the paper of Tujula and Wolswijk (2004) or Agnello and Sousa (2009). The positive sign of coefficient is expected in case of inflation rate and openness, negative in case of interest rate and the growth of GDP per capita. The inflation rate variable is expressed as annual average rate of change of the all-items HICP. Interest rate is expressed as EMU convergence criterion bond yields. Openness is constructed as sum of Export-to-GDP and Import-to GDP. Growth of the GDP per capita is computed at the base of gross domestic product at market prices and total population on 1 January. Annual data cover period of 1997-2017 and are extracted from the Eurostat database (2018). The coalition creator´s orientation is also involved to the research. Right wing party variable (eventually left wing party variable) is constructed as dummy variable and achieves value 1 if the coalition is arranged by a right wing

party, otherwise 0 (same in the case of left wing party winner). Correspondent data are extracted from Husárová (2014) and Vylsdkyvolieb.sk (undated). This variable is involved to the estimation to capture the potential partisan effect, as mention also Alesina and Paradisi (2015), earlier Alesina and Roubini (1992).

3 Results and Discussion

The development of the central government total expenditure end total revenue is displayed in the Figure 1. In the SR, over the entire monitored period of 1997-2017 the central government total expenditure exceeds the central government total revenue, thus the deficit is generated. In the period of the SR´s EU accessing process the deficit decreased and attacked the Maastricht criterion. However, the deficit generated by the central level of government creates the predominant part of the public deficit, the Maastricht criterion must be satisfied by the total government public deficit (see Figure 2).
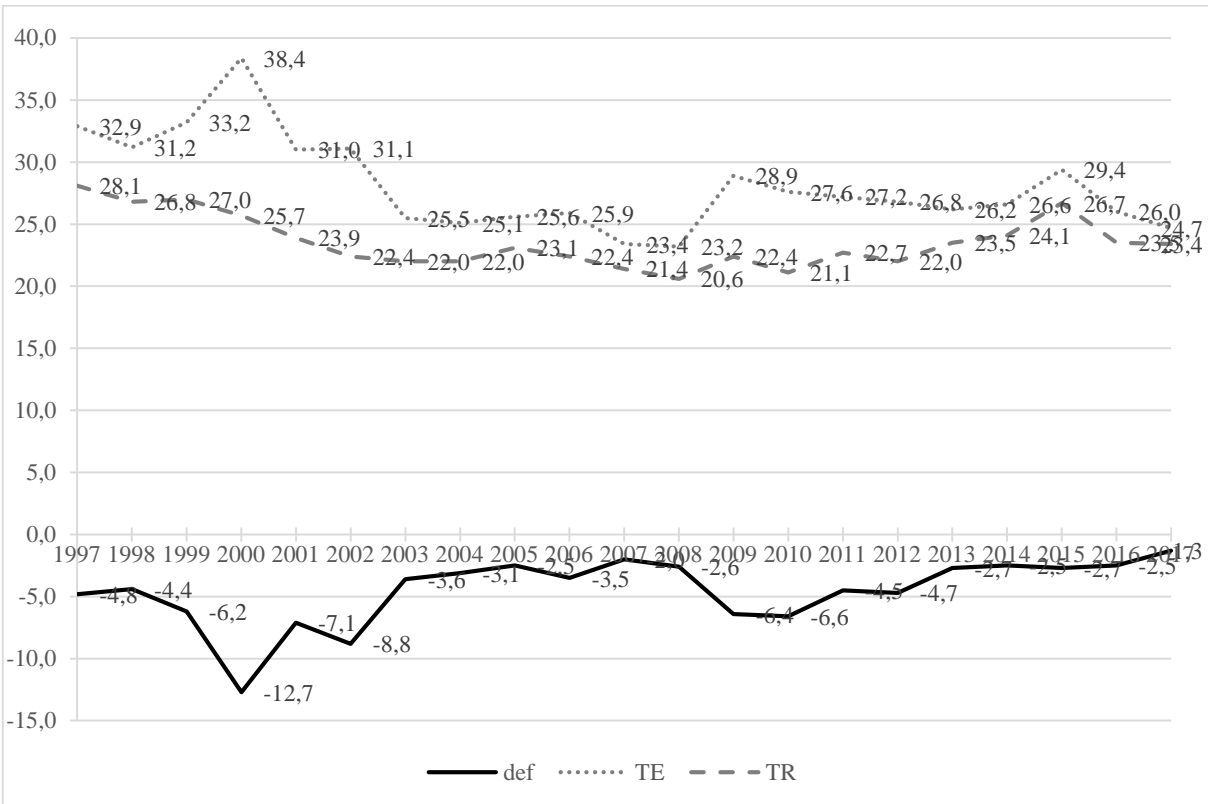
Figure 1 Development of central government total expenditure, total revenue and deficit/surplus (as % of GDP)

Source: own, according to Eurostat

The central government deficit increased since 2008 in the period of financial crisis. Since the economic recovery in 2013 (Morvay et al., 2014) it decreased under the level of 3% of GDP again.
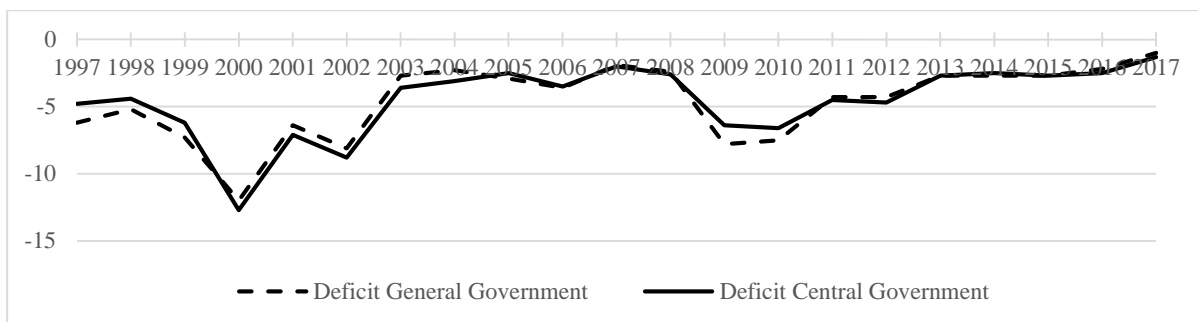
Figure 2 Comparison of general government deficit and central government deficit (as % of GDP)
Source: own, according to Eurostat

Development of deficit generated by the central government level and its annual change is shown in Figure 3. The Figure 3 also shows the period of elections and a period of pre-elections. It is observable, that the central government deficit growths before the parliamentary election in 1998, 2002, 2006 and 2012. Its increase in a pre-election period is observable only in 2005 and 2015.
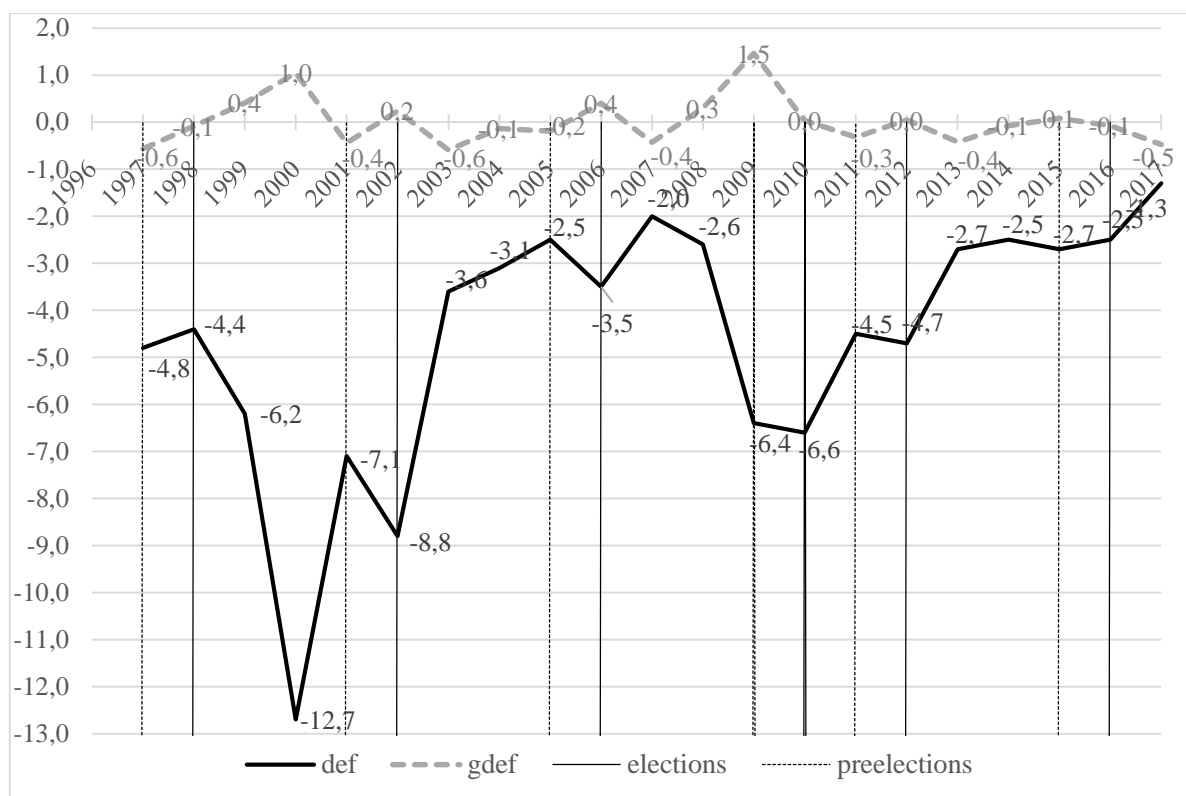
Figure 3 Development of central government deficit (as % of GDP) and its annual change with accent on the election and pre-election period
Source: own computation

According to the Figure 3, general tendencies point to the increase of deficit of central government in the election year and its decrease in the pre-election year. Results of estimations investigating the relationship between the deficit generated by central government level and elections show similar findings. The dummy variable of election year is statistically significant with opposite sign of coefficient in case of pre-election year variable. The election dummy variable constructed as sum of election and pre-election year is also statistically significant with negative sign of coefficient (see Table 1).

Table 1 Estimations of the relation between election variables and central government deficit (including right wing parties dummy)

	Election year		Pre-election year		Election+pre-election year	
	Coeff.	Signif.	Coeff.	Signif.	Coeff.	Signif.
Model OLS, using observations 2001-2017 (T = 17) Dependent variable: central government budget deficit-to-GDP HAC standard errors, bandwidth 1 (Bartlett kernel)						
Variable	Coeff.	Signif.	Coeff.	Signif.	Coeff.	Signif.
const	−6.5686	***	−5.6556	***	−6.0022	**
gGDPpc	11.8295	***	14.9840	***	9.8602	***
inflation	0.2939	***	0.4063	***	0.3289	***
interestrate	−0.7700	***	−0.9691	***	−0.8027	***
openess	0.0297	***	0.0212	**	0.0273	**
Right wing	−0.7310	**	−1.1268	***	−0.6995	
elections	−1.3325	***	0.9734	**	−0.6402	*
adjR2	0.9356		0.8701		0.8260	
DW	2.3218 (p-value=0.4876)		2.4740 (p-value=0.6472)		2.5253 (p-value=0.5970)	
BP	p-value=0.1904		p-value=0.6795		p-value=0.2502	
Reset test	p-value=0.1770		p-value=0.1782		p-value=0.6618	
VIF test	gGDPpc	1.332		1.602		1.722
	inflation	2.929		2.766		3.198
	interestrate	3.983		3.846		4.589
	openness	4.116		4.054		4.235
	right wing	2.243		2.275		2.453
	elections	1.098		1.302		1.799
*** denotes significance at the 0%, ** at 5% and * at 10 % level of significance.						

Source: own computation

The relation between the election year variable and budget deficit generated at the central government level is negative, thus the budget deficit increases in the election year, what confirms the assumption given hereinbefore. This assumption is not satisfied by using the pre-election variable. The total effect of the election period captured in the sum of election and pre-election year on central government budget deficit is negative, again confirming the assumption.

The set of variable included to the estimation to control the central government budget deficit partially satisfies expectations. The growth of the GDP per capita behaves oppositely to general expectation given e.g. by Agnello and Sousa (2009) about its negative impact on public deficit. The explanation might be found in the work of Tujula and Wolswijk (2004). They argue that the growth of the GDP per capita might have positive impact on public deficit in developing countries because of the need of investments made by the government. In the monitored period, the SR overcame the transition process and turns from developing country to developed one. This might cause the positive sign of the coefficient of this variable. In accordance with expectation behaves the sigh of coefficient of the inflation rate (+), openness (+) and interest rate (-). Statistically significant is also an effect of the coalition parties´ orientation. As Table 1 shows, the impact of the right wing parties on central government budget deficit is negative. Because the left wing party variable is substitute to right wing party (the party which forms the

coalition is either right or left wing), the impact of left wing parties is opposite, thus positive (see Table 2). In this context it is necessary to make a remark on two important events in the SR economic development. During the government of the right wing party, first, the public sector, public finance and public administration reforms were realized and investments were made (late 90´s of 20st century and the beginning of the 21st century) second, the economic expansion was interrupted by the financial crisis in 2008-2009. In these two periods the central government budget deficit increased.

Table 2 Estimations of the relation between election variables and central government deficit (including left wing parties dummy)

Model OLS, using observations 2001-2017 (T = 17)					
Dependent variable: central government budget deficit-to-GDP					
HAC standard errors, bandwidth 1 (Bartlett kernel)					
	Election year		Pre-election year		Election+pre-election year	
Variable	Coeff.	Signif.	Coeff.	Signif.	Coeff.	Signif.
const	−7.3000	***	−6.7824	***	−6.7017	***
gGDPpc	11.8295	***	14.9840	***	9.8602	***
inflation	0.2939	***	0,4063	***	0.3289	***
interstrate	−0.7700	***	−0.9691	***	−0.8027	***
openness	0.0297	***	0.0212	**	0.0273	**
left wing	0.7310	**	1.1268	***	0.6995	
elections	−1.3325	***	0.9734	**	−0.6402	*
adjR2	0.9356		0.8701		0.8260	
DW	2.3218 (p-value=0.4876)		2.4740 (p-value=0.6472)		2.5253 (p-value=0.5970)	
BP	p-value=0.1904		p-value=0.6795		p-value=0.2502	
Reset test	p-value=0.1770		p-value=0.1782		p-value=0.6618	
VIF test	gGDPpc	1.332		1.602		1.722
	inflation	2.929		2.766		3.198
	interestrate	3.983		3.846		4.589
	openness	4.116		4.054		4.235
	left wing	2.243		2.275		2.453
	elections	1.098		1.302		1.799
*** denotes significance at the 0%, ** at 5% and * at 10 % level of significance.						

Source: own computation

4 Conclusion

Behaviour of the political incumbent might result in changes of main macroeconomic categories or in public expenditure, public revenue and public deficit. If there are changes in public finance categories, the political budget cycle might be present. Political incumbent might manipulate the fiscal policy in aim to hold an office (opportunistic behaviour) or to perform the partisan objectives (partisan approach). In this paper the opportunistic behaviour is taken into account and the negative relationship between the election period and the public deficit generated on the central level of government in the SR is investigated during a period of 1997-2017. Results of the OLS estimation confirm the expectation about the presence of the political budget cycle at the central level of government. The relation between the election year variable and budget deficit generated at the central government level is negative, thus the budget deficit increases in the election year. This assumption is not satisfied by using the pre-election variable.

The total effect of the election period captured in the sum of election and pre-election year on central government budget deficit is negative, again confirming the assumption.

The set of control variables meet the expectation given in the related literature. The relation between the growth of the GDP per capita and central government budget deficit is positive, what might be explained by the character of the monitored period. It contains the period of transition and its overcome. In accordance with expectation behaves the sigh of coefficient of the inflation rate, openness and interest rate. The relation between the inflation rate and central government budget deficit is positive. The relation between the openness variable and budget deficit is positive. The relation between the interest rate and budget deficit is negative. Statistically significant is also an effect of the coalition parties´ orientation. Correspondingly to the economic development in the SR and the realization of massive public sector reforms, the government of the right wings parties is connected with increase of central government budget deficit.

Acknowledgements

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Upgrading Opportunities of Value Chains in Organic Market Development

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Abstract

Currently, organic agriculture is becoming a worldwide movement with the legal framework and highly developed global value chains. The following article aims to analyze the effectiveness of organic products market's functioning in the case of the Slovak Republic and Ukraine on the base of integral assessment method and conducted sociological research of demand for organic products and to work out the upgrading procedures for generating additional income and improving partnership along the value chain. "C-segmentation" method is used for identification of main segments of potential consumers of organic products that directly affect the creation of added value on the retailing stage of organic food production. Based on this analysis, the paper focuses on proposing product, process and functional upgrading measures for further GVC development as well as value chain mapping for the organic market.

Keywords: Organic Agriculture, Organic Market, Organic 3.0 Concept, Agricultural Value Chains, Value Chain Mapping, Sustainable Development.

JEL Classification: M31, O13, Q13

1 Introduction

Organic production concept appeared at the beginning of 20th century as a pioneer vision of ecologically balanced organic farming based on the principles of health, ecology, fairness and care. The main differences of organic agriculture from conventional one concern the application of natural methods and sustainable techniques to provide consumers with safety food almost excluding the bad influence of human mankind on the environment.

Since the beginning of the 21st century, we have been observing the stable growth of demand for organic products both in western European countries and in the USA, and its indicators essentially exaggerate the rise in organic agricultural production in the same areas. The conducted surveys (Willer & Lernoud, 2015) have proved that the cumulative market growth for organic food over the past 15 years achieved 374 per cent while the cumulative organic production growth in the world was 292 per cent.

The rapid growth of organic products market became possible due to the dynamic global value chain development both in conventional agriculture and organic one. An agricultural

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value chain is a combination of related actions that link producers, processors and consumers and at the same time provide the increasing of agricultural product's value thanks to effective cooperation of different actors within the chain. An aquiculture value chains usually consist of a vast range of activities including (Norton, R., 2014): development and dissemination of plant and animal genetic material, input supply, farmer organization, farm production, post-harvest handling, processing, provision of technologies of production and handling, grading criteria and facilities, cooling and packing technologies, post-harvest local processing, industrial processing, storage, transport, finance, and feedback from markets.

Thus, the usage of value chain approach is very important method for analyzing organic market development as it helps to identify critical needs and weak points along the organic food chain and work out the upgrading procedures to add more value and generate additional income for all chain's participants. The main goal of this article is to review the application of value chain concept to organic market development. There is a parallel goal to follow the impact of the selected indicators on the effectiveness of organic food market both in the Slovak Republic and Ukraine and on their base to investigate opportunities of value chains for upgrading organic production in these countries. The aim of the usage of advanced international experience is to contribute to the sustainable organic agriculture development through building effective partnership along the organic agriculture value chain.

2 Literature Review

During one hundred years' evolution (Table 1) organic agriculture has moved from progressive idea to worldwide movement with legal framework and highly developed global value chains. The evolution of organic agriculture (Organic 1.0 – Organic 2.0 – Organic 3.0) had greatly influenced the evolution of general agriculture concepts especially in the epoch of global changes (Agriculture 3.0). Since 2015 we observe the new paradigm shift addressing challenges of organic agriculture's global development towards bringing it out of its current niche into the mainstream (Reganold, J.P. & Wachter, J.M., 2016). At the same time the organic farming and food sector is currently competing with other sustainability initiatives and solving the problems of transparency and safety of value chains (Niggli et.al., 2015).

The conducted surveys of developing countries (Del Prete et al., 2016; Swinnen and Vandeplas, 2014) have proved that even in the case of participation in upstream production in low value added stages of agro-food global value chains (GVC) it is of great importance for that countries to develop stable global linkages and thus provide structural transformation, inclusive growth in the region, access to technology transfer, know-how of best management practices and foreign direct investments, improvements in the quality of agricultural products and changes in trade patterns. At the same time, the improvements in technologies and other inputs as well as participation in the export chains provide important spillovers on small-holder farmers and local communities by generating higher incomes, larger productivity and improving the food security situation of rural households.

Table 1 Concept of agriculture and its organic niche development

Development of agriculture concept	Development of organic agriculture concept
Agriculture 1.0 Subsistence farming based on traditional rural practices adopted to local needs and regional peculiarities. Agriculture is more likely lifestyle not investment. There are a lot of small farms that have low productivity and high share of hand labor.	**Organic 1.0** The appearance at the beginning of the 20th century holistic, ecologically balanced organic approach (pioneer vision) to farming based on combination of traditions, innovations and science, regenerative practices, biodiversity preservation, principles of health, ecology, fairness and care.
Agriculture 2.0 Industrial farming based on the technology and chemistry development. This type of agriculture is characterized by consolidation of farmers with different companies (chemical, seed, fertilizer, equipment, retail). The main priority is to increase output with less input. The quality of production is not high. As a rule big farms have narrow specialization.	**Organic 2.0** The period of global organic movement birth (IFOAM creation in 1972), organic market creation, adoption of legal framework for organic production (standards, regulations, cortication logo), development of organic value chains.
Agriculture 3.0 Sustainable farming (agroecological model of agrobusiness) based on food sovereignty, energy-efficiency, innovations and high level of business process' integration in one chain. The main priority is product quality. The main focus is sustainability and value creation.	**Organic 3.0** A new paradigm (since 2015) shift addressing challenges of organic agriculture's global development and the aim to bring it out of its current niche into the mainstream. This stage is characterized by global value chains' development and the leading role of organic agriculture in the popularization of such progressive movements as agroecology, fair trade, biointensive farming low external input sustainable agriculture, and others.

Source: authors compilation of Arbenz, M., Gould, D. and Stopes, C. (2016), Reganold, J. & Wachter,J. (2016)

Hower, the GVC's influence on countries' social and economic development strongly depends on the phases in the maturity of value chains. Cattaneo and Miroudot (2015) classify three main phases in GVC life cycle with a focus on local market's development: i) a predation phase in which developing countries are confined to exporting raw materials and importing processed goods and services; ii) a segmentation phase in which developing countries benefit from the delocalization of certain production activities, mostly to serve local markets; iii) and a consolidation phase in which local innovation turns into export of processed goods and services to other developing and developed countries. As it is clear from given above statements the third phase is the most disable for any country taking part in agro-food GVC.

3 Methodology and data sources

The main goal of the paper is to use value chain approach for analyzing organic market development in the Slovak Republic and Ukraine. There are several research methods that were used to evaluate the current trends and the effectiveness of organic products market's functioning with the focus on critical needs and weak points along the organic food chain:

(1) Integral assessment model was developed by the authors for evaluating the effectiveness of the organic products' market functioning on the base of three components (economic, social and ecological). The system of indicators reflecting the efficiency of the functioning of the organic products market includes 7 indicators (X1-X7): retail sales, number of organic producers, agricultural production index, per capita consumption, employment in the agricultural sector, GDP per capita, organic share. The comparison with other European

countries helps to answer the question how the existing potential of organic value chains is used in the case of the Slovak Republic and Ukraine.

(2) Sociological research was held with the purpose to determine the level of awareness of the population about the essence and benefits of organic products and to identify the critical characteristics of existing demand for it. The developed questionnaire consisted of 14 questions of open and closed type and was divided into three parts: a) general information about the respondent (gender, age, occupation and wages); b) questions about traditionally produced agricultural products with the focus on their price and quality; c) questions aimed at determining the respondents' level of awareness about the concept of "organic products" and their readiness to increase their costs for buying organic products. The sociological survey covered respondents of different age groups from 18 to 82 years old: 48% - young people (18-30 years); 37% - adults (31-49 years); 15% - mature people (50 years and older). At the same time, among respondents there were 54.9% employed respondents, 35.6% students and 9.5% pensioners.

(3) "C-segmentation" method (so called correlation segmentation) was used for identification of segments of potential consumers of organic products that directly affect the creation of added value on the retailing stage of organic food production. The purpose of segmentation was to evaluate the ability of different consumer groups to purchase organic products and on the achieved results to upgrade the marketing strategy for further popularization of this type of products. As segmentation indicators we used the age of consumers, their level of knowledge about organic products and the price they are ready to pay for the quality of products. Each answer was assigned an appropriate serial number. The results of encrypted responses were entered into the corresponding array in MS Excel, on the basis of which the connection between the investigated features was determined. As a result of using "C-segmentation" method, three main consumer segments have been defined.

Statistical and factorial basis of the study consists of legislative and regulatory documents, statistical materials of the International Federation of Organic Agricultural Movement IFOAM, the Food and Agriculture Organization of the United Nations (FAO), the Research Institute of Organic Agriculture (FiBL), financial reporting of organic producers, information and analytical newsletters and reviews, scientific articles of domestic and foreign scientists, the results of observations of the authors.

4 The model for assessing the efficiency of regional organic markets

Efficiency is one of the main characteristics of the development of a particular sector of the economy, which takes into account the efficiency of information processes in the industry, ensures the growth of profitability and rational use of labor, financial, material and other resources. In the production of agricultural products, the efficiency of production means obtaining the maximum amount of products with the least cost of land and managerial resources, as well as with minimal monetary costs and labor costs (Osovska, 2007).

We have created the method for assessing the effectiveness of the functioning of organic products market on a global level, which consist of three components: economic, social and ecological. Generalized index of indicators of the organic market efficiency is calculated by the formula:

$$I_{OM} = \sqrt[3]{I_{ECON} \cdot I_{SOC} \cdot I_{ECOL}} , \qquad (1)$$

Legend:
I_{ECON} – index of economic efficiency; I_{SOC} – index of social efficiency; I_{ECOL} – index of ecological efficiency.

The levels of economic, social and environmental efficiency are determined using the following scale:
if $0{,}5 \leq I \leq 1$, then the level of efficiency is high;
if $0{,}25 \leq I < 0{,}5$, then the level of efficiency is medium;
if $0 \leq I < 0{,}25$, then the level of efficiency is low.

We will calculate the generalized index of the organic market efficiency in the Slovak Republic, in Ukraine, and other European countries, and determine the level of efficiency and position of the Slovak Republic and Ukraine in the ranking for the three components. The results of calculations are presented in Fig. 2.

The Slovak Republic is among the main competitors of Ukraine in the market of organic products. The analysis makes it possible to conclude that the level of the development of markets for organic products in the Slovak Republic and Ukraine is similar and corresponds to a low level (for Slovakia 0,16751, for Ukraine - 0,11141). Thus, the Slovak Republic is on the 25th place among the analyzed countries, Ukraine - on the 31st.

The index of ecological efficiency in the Slovak Republic by the scale is medium (0.26180), but it is one of the highest among the analyzed countries, since the share of organic area in Slovakia is 9.9%. At the same time, in Ukraine, the index of ecological efficiency is low and is only 0.02361 because of the small share of organic area (0.89%). The index of economic efficiency in the Slovak Republic is low (0.23719), which is related to the general decline in agricultural production in the country by 11% in 2016. In Ukraine, economic efficiency is higher (0.2828) due to the country's significant agricultural potential (production of this type increased by 6.3%). For both countries, there are a small number of organic producers and an insufficiently developed domestic consumer market.

The index of social efficiency in the Slovak Republic is low (0.07569) due to the fact that the country's agricultural employment is only 3.3% of the employed population. In Ukraine, the medium level of social efficiency (0,20711) is ensured by the fact that employment in agriculture is 16% of the employed population.

The Slovak Republic is among the main competitors of Ukraine in the market of organic products, other competitors are Russia, Belarus, Kazakhstan, Romania, Italy, Moldova, Bulgaria, Czech Republic, Turkey. Despite the fact that consumption of organic products per capita in the Slovak Republic and Ukraine is increasing every year, they are the lowest among all the analyzed countries. At the same time according to IFOAM there are 431 producers of organic production in the Slovak Republic comparatively to 294 in Ukraine or almost 1.5 time more while the amount of agricultural organic land in the Slovak Republic (187024 hectares) on the contrary is almost twice less than in the Ukrainian case (381173 hectares). Based on the results of the conducted analysis, we can conclude that both countries underutilize the existing potential for agricultural farming and have a vital need in further upgrading of agricultural value chains.
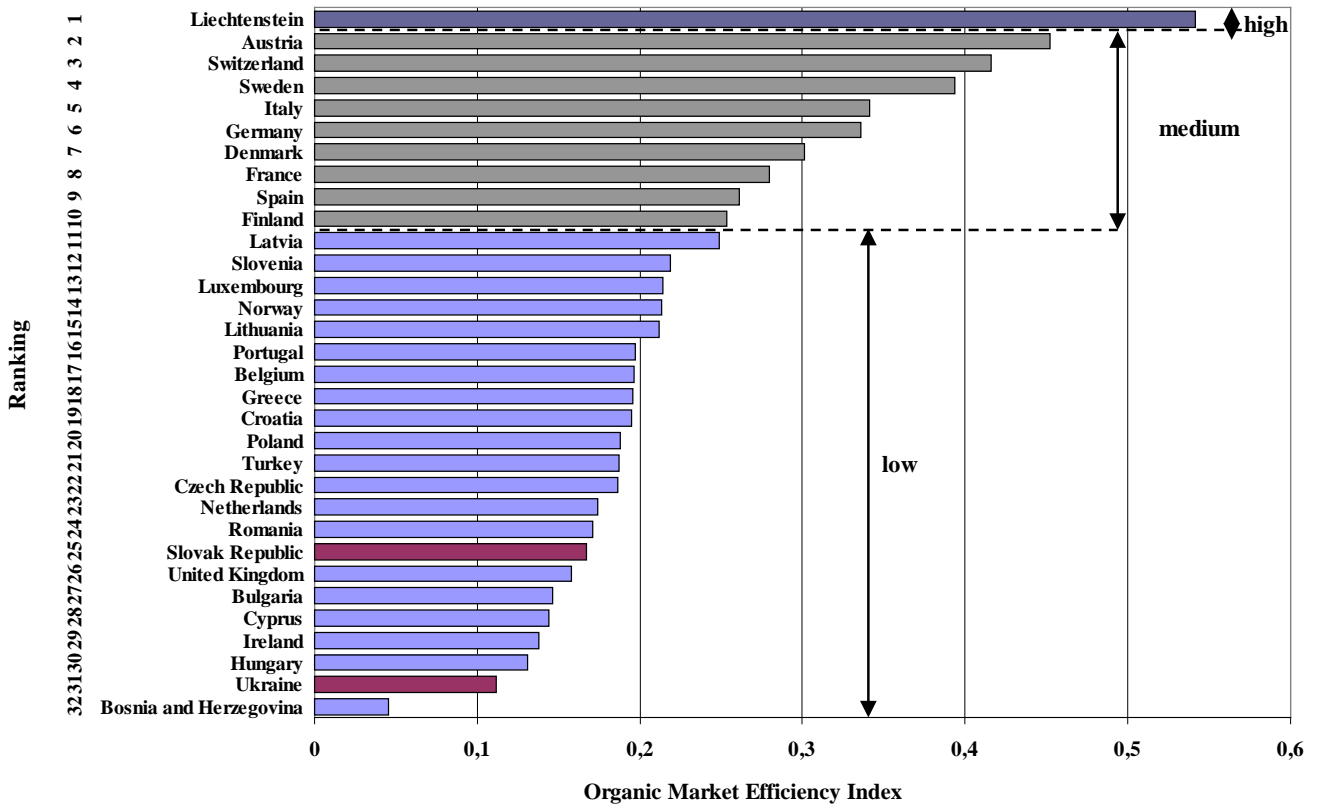
Figure 2 Graphic representation of and the ranking of European countries by the level of organic market effectiveness

Source: built by the authors on the basis of their own calculations

5 Functional upgrading of organic production on the base of marketing research

In economic literature we find examples when the US, Greece and Spain, organic farms are 22–35% more profitable than conventional farms (Crowder & Reganold, 2015). Profitability of organic products exceeds profitability of traditional products, which is directly related to the added value created along the chain. We analyzed this phenomenon on the case of a leading Ukrainian-Swiss agrarian company PJSC "EthnoProduct" operating in the market of organic products since 2008. Certification of land and production has begun since 2008. By this time, the company was engaged in traditional agriculture. In 2010, TM "EthnoProduct" organic milk appeared in stores for the first time. The analysis of products profitability indicators for 2003-2017 showed that before the introduction of organic production, the enterprise had a profitability at the level of 7-10%, and after switching to organic production since 2010, the profitability indicator began to increase with each passing year and reached the level of 20.4- 71.4%. However, we should note that this level of profitability is achieved mainly due to the export of organic products, because in the domestic market of Ukraine demand for this type of products remains insufficiently high.

The profitability of organic products significantly exceeds the same indicator in conventional agriculture due to the existing margin on organic products. In European countries, average prices for organic crop production are very high. In almost all EU countries, the average prices for organic wheat are by 50-200% higher than for traditionally produced, on potatoes - by 50-500% or even more. Average price margins for organic livestock production are much lower. Prices for organic milk on average are higher by 8-36%, on organic pork - by 20-70%

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(OECD Workshop on Organic Agriculture, 2003). However, according to European scientists, the justified margin on organic products is 20-30% (Tomashevska, 2013).

In 2017, by means of specially developed questionnaires, we conducted a market study of the behavior of potential and existing consumers of organic agricultural products in Ukraine and the Slovak Republic. The selected respondents were students and their parents with the average and low level of salary as organic products are more expensive in comparison with traditional ones and we would like to know the opinion of this group of people. Detailed results have been published in another article, meanwhile, Table 2 presents the results, which correlate mostly with the topic of this article.

Table 2 The size of margin for organic products the consumers are ready to pay

Margin	Number of respondents	Share of responses,%
Less than 10-20%	131	47,6
Within 20-40%	90	32,7
Within 40-60%	25	9,1
Within 60-90%	2	0,7
Twice or more	2	0,7
I do not want to pay more for organic produce	25	9,1
Total	275	100,0

Source: authors` survey

Functional upgrading of organic production value chain could be made throught marketing and desing. For better undestanding the needs of consumers we conducted the sociological survey which covered 275 respondents of different age groups from 18 to 82 years old. During the analysis, it was found that 80% of consumers of agricultural products during the purchase first of all pay attention to the quality of products. At the same time, 90.9% of respondents claim that they are willing to pay more for the quality of products.

The results of "C-segmentation" method show that the closest connection (r = 0.2) was between the age of respondents and the price they are ready to pay for organic products. Significantly smaller, but still important, is the relationship between age and knowledge level about organic products (r = 0.02). So, for the purpose of segmentation, we have analyzed two types of interconnections: (1) "age of respondents - price"; (2) "age of respondents - knowledge about organic products".

For this purpose, grouping of responses in these two directions was carried out. Groups with the highest value were highlighted as a separate segment of the organic market. On the results of the survey three main consumer segments were defined:

1. Youth (most promising) - 18-30 years old (students and adults who start making money. People who pay attention to a healthy lifestyle (attend sports clubs, gyms) but with limited financial freedom. tend to be ambitious, socialize in social networks, or at least know about organic products and are willing to pay by 40% more for it). *Possible methods of functional upgrading along value chain:* bright packaging, advertising in social networks, on television, emphasis on fashion consumption and the benefits of consumption.

2. Adults (prospective) - 31-49 years old (responsible attitude to health, pay attention to the composition of food, live in cities, educated, have a life experience, already built a carrier. The people of this category have an income growth and sufficient financial capacity, but they

are willing to pay for organic products by 30% more). *Possible methods of functional upgrading in value chain:* advertising on TV, billboards, fairs about benefits of cooking, better taste, qualitative composition of organic products, sustainability and protection of environment.

3. Mature people (over time, will be promising) - 50 years and older (have accumulated capital, but seek to save it). *Possible methods of influence:* emphasis on childhood tastes and environmental protection and improvement of health through consumption of products.

Thus, the survey showed that the most promising segment of organic products consumption form young people aged from 18 to 30, which are more ambitious and follow global trends. That means that functional upgrading should be focusing on marketing and design techniques that are most suitable for that age group.
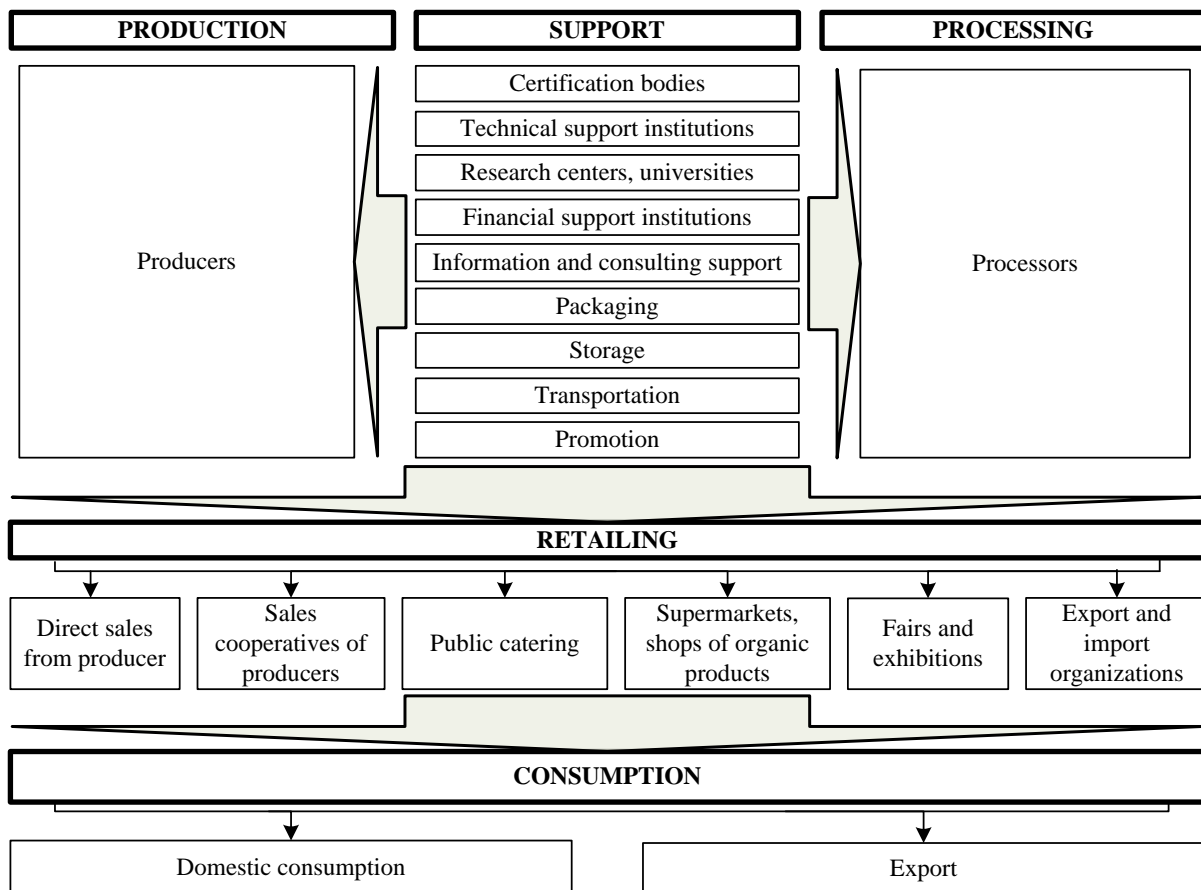
6 Building an effective partnership along the organic agriculture chain

A 'value chain' in agriculture identifies the set of actors and activities that bring a basic agricultural product from production in the field to final consumption, where at each stage value is added to the product (FAO, 2005). Typically, value-added chains include the following stages: design, production, marketing, distribution and after-sales service (Kondratyev, 2014). However, the specific nature of organic food production put forward special demands for organic value chain mapping (Figure 3).

The conducted analysis of Ukrainian organic market along value chains has led us to the following conclusions:

1. The economic costs along the value chain include expenditures for: organic seeds, fertilizers, equipment, certification, marketing, packaging, storage and transportation. But, the most value is added (as the practice in Ukraine shows) on the stage of certification of organic production.
2. The margins for organic products is introduced basing on the following peculiarities of production:
    a) a lower yield of fodder crops leads to a decrease in the production of livestock products;
    b) organic production is more labor-intensive and affects the growth of wage costs;
    c) in organic farming, each animal has a larger area of premises than in the traditional one; consequently, the required feed base per area for each animal should be higher than in the traditional farming;
    d) about one third of the area of organic farming should be planted with legumes, which causes higher costs for the distribution of these products;
    e) the processing of organic raw materials is more expensive because all the processing ingredients must also be organic;
    f) certification costs are included in the cost of production;
    g) constant control should be provided at each stage of production.
3. The most important actors within the value chain are input suppliers, farmers, consultancy services, financial services (micro-credit, investment, trade finance), certification bodies, store keepers, transporters, processors, traders, retailers, consumers. The value chain will function effectively only in the case if each chain actor does a good job adding real value to the product, and if each actor does this in a profitable way.

PRODUCTION | SUPPORT | PROCESSING

Producers

Certification bodies
Technical support institutions
Research centers, universities
Financial support institutions
Information and consulting support
Packaging
Storage
Transportation
Promotion

Processors

RETAILING

| Direct sales from producer | Sales cooperatives of producers | Public catering | Supermarkets, shops of organic products | Fairs and exhibitions | Export and import organizations |

CONSUMPTION

| Domestic consumption | Export |

Figure 3 Value chain map for organic market
Source: built by the authors

Effective partnership along the organic chain could be build only in the case of mutually beneficial cooperation of all stakeholders involved both into value chains.

Conclusion

Value chains in organic market have already a great importance and will continue to grow in the future. On the base of marketing research of organic production we can conclude that it is necessary to take active measures for stimulating consumption of organic products on the domestic organic markets of the Slovak Republic and Ukraine. It will create potential for growth of regional value chains and organic market as a whole.

At the same time, more deep involvement of the Slovak Republic and Ukraine into global value chains could result in increasing demand for organic food, additional income, job creation, technology transfer, management innovations, quality improvement, change in trade patterns etc. Global value chains should be regarded as a driver for developing and upgrading of organic agricultural production. The main upgrading opportunities of GVC include:
1. Process upgrading (new equipment, quality control, decreasing of delivery time and waste reduction, new management techniques, workforce training, social responsibility practices etc.).
2. Product upgrading (new seeds, new cattle breeds, more sophisticated and with better quality products on the base of R&D etc.)
3. Functional upgrading (entering new markets, launching of new brands, design development, innovative marketing activities etc).

Acknowledgements

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Changes in the Slovak economy structure

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Abstract

The differentiated development of productivity and employment over the last two decades, the crisis and the measures taken at the time of recovery have led to significant changes in the different parts of the economic structure both in Slovakia and in other EU countries. The aim of the article is to examine the change in the structure of the Slovak economy in its basic segments. The development of segments is assessed by the creation of gross added value (in current prices) and employment in the period 1995 to 2016. Development in Slovakia is confronted with the development of the EU-15. Based on the findings, we note that, from the point of view of all 22 years of development, the structural gap between the SR and the EU-15 has diminished, but since the outbreak of the crisis, this gap has increased.

Keywords: Structural gap, GVA, Employment, Slovakia, EU-15, Structural deviation.

JEL Classification: L00

1 Introduction

Slovakia, as well as other European countries, changed very significantly under the influence of both external and internal political and socio-economic factors. As a result of these factors, changes in the structure of the economy took place. The aim of this article is to find out how the structure of the economy changed in its basic segments (10-branch structure). The development of individual segments of the structure of the Slovak economy is assessed in the period from 1995 to 2016.

When assessing the development, we monitor: the growth rate of the individual value added segments, how the share of individual sectors in value added and employment changes, we examine the year-on-year changes after 2008 in order to assess the impact of the recession on the segments. We compare the results with the EU15. We assume that segments - "C" (F in NACE rev.2) and "IC" (J in NACE Rev. 2) - will clearly dominate the growth rate of added value. In addition, we assume that the development in the Slovak Republic will confirm the pan-European development where the faster growth of value added and employment will be in the services sector compared to the industry in the monitored period. At the same time, we assume that, compared to the results of Slovakia and the EU-15, it will be obvious that Slovakia is moving closer to the EU-15 average.

2 The rate of Gross Value Added (GVA) growth in the different segments of the economy

The economic development of Slovakia has changed significantly in individual time periods. At the transformation stage (1995-2000), the average growth rate was 9.8% per year.

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Significantly, the added value increased in the "BS" and "C" segments, followed by the growth of gross added value in the "OS" and "IC" segments. The increase in GVA in the service sector was mainly related to the development of private business services. On the one hand, there has been an increase in the number of small and medium-sized enterprises that have provided services in the past provided by the state. On the other hand, there were also areas of service that were not needed or not provided in the past (such as ICT-related services in particular). There has also been a positive development in the "IC" segment and has been mainly linked to Slovakia's efforts to catch up with Europe and the world in terms of ICT equipment and accessibility and access to the Internet.

Table 1 Gross Value Added Growth Rates_ Slovakia

	1995-2000	2001-2004	1995-2004	2001-2008	2005-2008	1995-2008	2009-2011	1995-2011	2012-2016	1995-2016
TVA*	9.8	10	9.9	10.4	10.8	10.2	1.1	8.5	2.8	7.1
AFF*	4.8	8.2	6.3	9.7	11.3	7.9	(-3.1)	5.8	5.1	5.6
I*	7.8	20.7	13.6	15.7	10.7	12.7	(-2.8)	9.8	(-2.1)	6.9
M*	8.7	9.8	9.2	9.5	9.3	9.2	1.3	7.7	4.3	6.9
C*	18.6	6.4	13.2	15.1	23.7	16.4	(-0.9)	13.2	0.4	10.1
TS*	10.8	9.7	10.3	10	10.4	10.3	0.2	8.4	3	7.1
IC*	15.5	12	13.9	11.9	11.8	13.3	4.4	11.6	1.9	9.3
FIA*	(-8.9)	29.7	8.3	18.1	6.5	7.7	10.3	8.2	(-0.1)	6.2
REA*	14.3	9.8	12.3	8.6	7.3	10.8	0.7	8.9	3.9	7.7
BS*	18.9	8	14.1	12.3	16.6	14.9	1.7	12.4	7.4	11.2
PS*	11.2	8.5	10	8.4	8.3	9.5	4.2	8.5	3.9	7.4
OS*	16.0	11.2	13.9	11.7	12.1	13.3	16.5	13.9	(-3.0)	9.9

* TVA = Total Gross Value Added by Industry; AFF = Agriculture, forestry and fishing (A in NACE rev.2); I = Industry (B,D,E in NACE rev.2); M = Manufacturing (C in NACE rev.2); C = Construction (F in NACE rev.2); TS = Traditional services (G,H,I in NACE rev.2); IC = Information and Communication (J in NACE rev.2); FIA = Financial and Insurance Activities (K in NACE rev.2); REA = Real Estate Activities (L in NACE rev.2); BS = Business Services (M, N in NACE rev.2); PS = Public Services (O,P,Q in NACE rev.2); OS = Other Services (R,S in NACE rev.2)

Red Colour = decline or the slowest growth; Green Colour = the fastest growth or significant growth

Source: own calculations based on Statistics1, 2018

The high growth rate of GVA in the "C" segment (Table 1) can be mainly related to the drive to build motorways, which were one of the main intentions of the then government. However, their funding has not provided clear and transparent rules. As a result, they were significantly overpriced and the state was unable to finance further construction under these conditions. This development was also associated with financial problems and resulted in a partial collapse of the "FIA" segment. As reported by Miklos (2001), the economy in 1995-1996 recorded strong credit expansion in the domestic banking market. The volume of loans increased by SKK 100 billion (EUR 3.3 billion) over two years. The poor financial situation of businesses, the inefficient management of credit finance, as well as high interest rates have resulted in the financial collapse of many businesses and the accumulation of bad credit in the banking sector. As a result, the banking sector was on the verge of the financial crisis, due to the inability of businesses to repay their loans. However, the situation has been gradually stabilized through reforms. Already in the next period (2001-2004), the FIA segment recorded the highest average growth rate of GVA. The reduction in interest rates, the stabilization of the business environment, also by reducing the tax burden on business entities and the recovery and privatization of the financial sector helped to achieve this result.

Segment "I" was the second in terms of GVA growth mainly due to developments in energy. As stated by Cár (2007), the liberalization of energy prices, which took place in Slovakia in

2002-2003, led to the partial or total elimination of price and tariff distortions in the network industries. The result was a significant increase in the prices of individual energies (electricity - on average 19.82%, natural gas - 32.7%, heat - 100 SKK / GJ (by 3.32 EUR / Gj), water and sewerage - 30-35 %). In this case, we are talking about rising prices and not increasing volumes. Among other things, the "C" segment has significantly slowed down over the period of sharp growth due to limited access to construction financing and low demand from households to invest in real estate.

When comparing the second period with the first period, we note that none of the segments recorded a decline in GVA, although some segments experienced a slowdown in growth. The economy benefited from positive developments in markets throughout Europe, the adopted economic reforms have been successful and restrictive fiscal and monetary policy settings have created favorable conditions for a positive development of the overall structure of the Slovak economy.

This optimistic setting continued in 2005-2008. The economy grew to 10%, and the positive moods were mainly in the "C" segment. Especially in the household sector there has been a significant building boom, supported by low interest rates on mortgage loans. New highway projects have helped the C-segment quickly develop it. However, growth has stopped the financial crisis. In 2009-2011, the "AFF, I and C" segments were the ones that slowed down the most, and even recorded a decline. However, in the recent period (2012-2016), the "A" segment also recorded positive developments, mainly due to the return to projects directly geared to investing in this segment. From the overall results, we note that the service sector grew faster than the manufacturing sector over the whole of the reporting period. The exception is segment "C", which recorded the second highest average growth rate of GVA.

The growth rate of GVA of the EU15 countries was significantly slower than in Slovakia over the whole reporting period. The slightest growing segment was the "AFF" segment in each period except for crisis years. (Table 2) As Gabrielova (2012) points out, development in European countries is characterized by the fact that service segments have maintained a more rapid growth of GVA over the long term compared to GVA growth rates in industry. The fastest growing segments include "BS" and "IC" segments. The same segments are fastest growing in Slovakia as well, but they are also complemented by the "C" segment, which is not in the forefront in other countries.

Table 2 GVA Growth Rates_ EU-15

	1995-2000	2001-2004	1995-2004	2001-2008	2005-2008	1995-2008	2009-2011	1995-2011	2012-2016	1995-2016
TVA*	5.1	3	4.2	3.2	3.3	3.9	0.3	3.2	2.5	3
AFF*	1.6	0.8	1.3	(-0.3)	(-1.4)	0.5	1.3	0.6	0.6	0.6
I*	4.1	1.1	2.8	1.9	2.7	2.7	(-0.2)	2.2	2.4	2.2
M*	4.2	0.7	2.6	1.4	2.1	2.5	(-0.1)	2	3	2.2
C*	4.1	4.5	4.2	4.5	4.6	4.3	(-3.4)	2.9	1.2	2.5
TS*	5.5	3.5	4.6	3.9	3.1	4.1	(-0.02)	3.3	2.4	3.1
IC*	9.6	4.7	7.4	3.6	2.6	5.9	0.04	4.8	3	4.4
FIA*	4.4	6	5.1	4.6	3.3	4.5	1.7	4	1.4	3.4
REA*	6	3.6	4.9	4.3	5	5	0.4	4.1	2.8	3.8
BS*	8.2	3.7	6.2	4.4	5.2	5.9	0.2	4.8	3.8	4.6
PS*	4.8	4.6	4.7	4.1	3.5	4.3	2.2	3.9	2.1	3.5
OS*	6	4	5.1	3.7	3.3	4.6	1.2	3.9	2.3	3.6

* TVA = Total Gross Value Added by Industry; AFF = Agriculture, forestry and fishing (A in NACE rev.2); I = Industry (B,D,E in NACE rev.2); M = Manufacturing (C in NACE rev.2); C = Construction (F in NACE rev.2); TS = Traditional services (G,H,I in NACE rev.2); IC = Information and Communication (J in NACE rev.2); FIA = Financial and Insurance Activities (K in NACE rev.2); REA = Real Estate Activities (L in NACE rev.2); BS = Business Services (M, N in NACE rev.2); PS = Public Services (O,P,Q in NACE rev.2); OS = Other Services (R,S in NACE rev.2)

Red Colour = decline or the slowest growth; Green Colour = the fastest growth or significant growth

Source: own calculations based on Eurostat1, 2018

3 The share of individual sectors in GVA and employment

In terms of the share of individual segments in the total GDP and employment, the differences between the EU-15 and Slovakia are significant. In the Slovak economy, the "M" and "TS" segments have the largest share of the GVA. Their combined share represents more than 43% of the generated GVA over the entire period. Even the development in the field of employment confirms the leading position of these segments in the economy. Nevertheless, in the "M" segment, neither in terms of GVA nor in terms of employment, Slovakia currently does not reach the 1995 level. In the case of the "TS" segment, the situation is different. There in the field of employment the Slovak economy has the largest increase in the number of employees from all segments. We believe that this development was mainly marked by a significant positive development in the field of automotive production and sales. The results showed a significant increase in the share of employment in the "PS" segment, but slightly declining in terms of GVA compared to the "M & TS" segments. The smallest share of the GVA has the "OS" segment; in the case of employment it is in the "REA" segment. (Table 3) However, if we look at the overall change in segments, in three cases, the fall in the share of GVA was also accompanied by a decrease in the share of employment. These are the segments "I", "M" (here was the largest decline in GVA shares) and "AFF" (the largest drop in employment from all segments). (see Table 3) The largest increase in the share of employment is recorded in the segment "TS", which is a consequence of the sharp development of the automotive industry in Slovakia and thus the increased demand for employees in this area. (Luptáčik et all., 2013) In the "C, IC, BS and OS" segments we have a positive development in terms of both GVA and employment, with the most pronounced in the "BS" segment. The overall results show that the share of services in employment in the economy is increasing and the share of not only the manufacturing sector in both GVA and services is gradually increasing.

Table 3 The shares of individual sectors in GVA in current prices and total employment in Slovakia

	1995		2000		2004		2009	
	VA	E	VA	E	VA	E	VA	E
	%	%	%	%	%	%	%	%
TVA; TE*	100	100	100	100	100	100	100	100
AFF*	5.6	9.6	4.4	6.2	4.1	4.7	3.3	3.5
I*	5.9	3.6	5	3.7	6.6	3.0	6.5	2.3
M*	25.7	26.2	23.9	24.5	23.5	24.0	17.7	21.8
C*	5.2	6.5	7.2	6.0	6.1	6.8	9.7	8.5
TS*	21.9	19.6	22.7	22.9	22.4	25.1	21.7	27.0
IC*	2.9	2.0	3.6	2.2	3.9	2.0	4.7	2.4
FIA*	6.1	1.4	2.2	1.8	3.8	1.6	3.9	1.9
REA*	6.8	0.9	7.9	0.9	7.8	0.8	7	0.9
BS*	4.2	5.2	6.2	6.8	5.7	7.1	7.51	8.6
PS*	14	22.5	14.8	22.4	14	21.9	14.8	20.4
OS*	1.7	2.7	2.1	2.5	2.2	2.9	3.1	2.7

	2011		2016		1995-2016		Change	
	VA	E	VA	E	VA	E	VA	E
	%	%	%	%	φ (%)	φ (%)	Δ (%)	Δ (%)
TVA; TE*	100	100	100	100	100	100		
AFF*	3.4	3.3	3.7	3.1	4.2	5.0	(-2)	(-6.4)
I*	5.5	2.3	4.3	2.0	5.6	2.9	(-1.6)	(-1.5)
M*	21.1	21.7	22.6	21.9	22.4	23.6	(-3.1)	(-4.3)
C*	8.9	8.0	7.9	7.2	7.6	7.1	2.6	0.6
TS*	21.4	27.0	21.6	26.4	22.1	25.0	(-0.3)	6.8
IC*	4.4	2.5	4.2	2.8	4	2.2	1.3	0.8
FIA*	4.2	1.8	3.6	2.0	3.7	1.8	(-2.5)	0.6
REA*	6.7	1.1	6.5	1.1	7.2	0.9	(-0.2)	0.2
BS*	7.2	9.0	8.9	10.4	6.5	7.7	4.7	5.2
PS*	14	20.5	14.7	20.2	14.1	21.1	0.7	(-2.3)
OS*	3.2	2.7	2.1	2.9	2.6	2.6	0.3	0.2

* VA = Value Added; E = Employment; TVA = Total Gross Value Added by Industry; TE = Total Employment;
AFF = Agriculture, forestry and fishing (A in NACE rev.2); I = Industry (B,D,E in NACE rev.2); M =
Manufacturing (C in NACE rev.2); C = Construction (F in NACE rev.2); TS = Traditional services (G,H,I in
NACE rev.2); IC = Information and Communication (J in NACE rev.2); FIA = Financial and Insurance Activities
(K in NACE rev.2); REA = Real Estate Activities (L in NACE rev.2); BS = Business Services (M, N in NACE
rev.2); PS = Public Services (O,P,Q in NACE rev.2); OS = Other Services (R,S in NACE rev.2)

Red Colour = decline or the slowest growth; Green Colour = the fastest growth or significant growth

Source: own calculations based on Eurostat1, 2018

For the EU-15, the "TS" segment is a steadily contributing factor in generating GVA. This segment is also most involved in employment. At the same time, it is also one of the segments in which the share of GVA increased over the entire period, and this positive development was also supported by an increase in the share of employment. (see Table 4) In addition to the crisis period, "I" and "PS" segments are also high on the GVA. For both segments there is also a relatively large share of employment, although in the "I" segment in particular, this share lags behind the share of the "TS" segment. In the area of the smallest share, the shares are different. The smallest portion of the GVA has the "AFF" segment and its share is gradually decreasing. In the case of employment, the smallest share of the "REA" segment, but this share is slightly increasing. For both variables, there is a consensus that the "BS" segment in GVA and employment has the largest increase in the share. It is clear from the results that in the EU-15, the industry sector records a decline in both added-value and employment, while the share of services in both indicators is gradually increasing.

Table 4 The shares of individual sectors in GVA in current prices and total employment in EU-15

	1995		2000		2004		2009	
	VA	E	VA	E	VA	E	VA	E
	%	%	%	%	%	%	%	%
TVA; TE*	100	100	100	100	100	100	100	100
AFF*	2	3.9	1.7	3.3	1.5	3	1.2	2.7
I*	19.4	16.4	18.4	15.3	17.1	14.1	15.7	12.9
M*	16.4	15.2	15.6	14.2	14.3	13.1	12.6	11.8
C*	5.1	6.3	4.8	6.3	5.1	6.4	5.2	6.3
TS*	15.8	20.6	16.1	21.1	16.4	21.7	16.4	21.9
IC*	3.3	2	4.1	2.4	4.4	2.5	4.4	2.6
FIA*	4.6	2.7	4.1	2.6	4.6	2.6	5.1	2.6
REA*	8.7	0.7	9.1	0.8	9.3	0.9	10	1
BS*	7.2	7.2	8.3	8.9	8.6	9.7	9.1	10.9
PS*	15.1	19.9	14.8	19.8	15.8	20.6	17.3	21.5
OS*	2.8	5	2.9	5.3	3	5.6	3.2	5.9

	2011		2016		1995-2016		Change	
	VA	E	VA	E	VA	E	VA	E
	%	%	%	%	φ (%)	φ (%)	Δ (%)	Δ (%)
TVA; TE*	100	100	100	100	100	100		
AFF*	1.3	2.6	1.2	2.5	1.5	3	(-0.8)	(-1.4)
I*	16.3	12.5	16.3	12	17.3	14	(-3.1)	(-4.4)
M*	13.3	11.4	13.6	11	14.4	12.9	(-2.8)	(-4.3)
C*	4.8	5.9	4.5	5.4	4.9	6.1	(-0.6)	(-0.9)
TS*	16.1	22.1	16.1	22.3	16.1	21.6	0.3	1.7
IC*	4.3	2.6	4.3	2.7	4.2	2.5	1	0.7
FIA*	4.8	2.5	4.5	2.4	4.5	2.6	0.3	(-0.3)
REA*	10	1	10.1	1	9.6	0.9	1.4	0.3
BS*	9.2	11.5	9.8	12.5	8.7	10.1	2.5	5.3
PS*	16.9	21.9	16.6	22.1	15.9	20.8	1.5	2.2
OS*	3.1	5.9	3.1	6	3	5.6	0.3	1

* VA = Value Added; E = Employment; TVA = Total Gross Value Added by Industry; TE = Total Employment;
AFF = Agriculture, forestry and fishing (A in NACE rev.2); I = Industry (B,D,E in NACE rev.2); M = Manufacturing (C in NACE rev.2); C = Construction (F in NACE rev.2); TS = Traditional services (G,H,I in NACE rev.2); IC = Information and Communication (J in NACE rev.2); FIA = Financial and Insurance Activities (K in NACE rev.2); REA = Real Estate Activities (L in NACE rev.2); BS = Business Services (M, N in NACE rev.2); PS = Public Services (O,P,Q in NACE rev.2); OS = Other Services (R,S in NACE rev.2)

Red Colour = decline or the slowest growth; Green Colour = the fastest growth or significant growth

Source: own calculations based on Eurostat1, 2018

4 Annual changes of GVA and employment in the post-crisis period

The crisis that the world experienced in 2008-2009 has had a significant impact on the overall structure of individual economies. We were interested in whether individual segments were able to achieve their pre-crisis level of GVA and employment in the post-crisis period. As we can see in Table 5, the crisis significantly affected the production segments, but did not touch the service significantly (Table 5 - 2009/2008). In both indicators, segment "M" was affected by the crisis to the greatest extent. The same result applies to both Slovakia and the EU-15. We note that the crisis has hit the EU-15 economy more broadly than in the case of the Slovak economy. Except for two exceptions ("FIA" and "PS" segments), all other EU-15 segments showed a decline in GVA and employment (exceptions were the "PS" and "OS" segments). In the case of the Slovak economy, only 6 segments were such that their performance deteriorated as a result of the crisis, and in only four segments there was a fall in employment. However, it should be noted that the Slovak "AFF and M" segments have fallen significantly more than any other EU-15 segment.

Table 5 Annual changes of GVA and employment

	Slovakia						EU-15					
	2009/2008		2011/2008		2016/2008		2009/2008		2011/2008		2016/2008	
	VA	E	VA	E	VA	E	VA	E	VA	E	VA	E
	%	%	%	%	%	%	%	%	%	%	%	%
TVA; TE*	93.4	98	103	98.3	118.1	103.3	93.9	97.8	100.5	100.1	109	101.3
AFF*	76.3	94.8	85.2	89.2	106.4	88.6	87.3	98.2	102.1	98.0	118.9	100.2
I*	97.6	95.2	91.4	92.4	81.7	87.3	88.4	94.9	98.4	99.8	112.9	100.4
M*	74.4	89.2	97.4	89.2	120	94.6	86.9	94.4	98.3	99.7	113.5	100.4
C*	95.7	103.6	97.1	95	97.8	91.8	91.6	93.8	89.9	97.1	97.4	100.7
TS*	92	100	100.1	100.2	115.6	103	95	98.2	99.7	100.5	106.4	101.7
IC*	110.1	102.8	113.5	108.8	123.7	125.9	95.8	98.9	100	101.6	106.8	102.1
FIA*	112.2	100.4	134.1	98.8	132.8	112.7	104.5	99.2	105	99.6	103.4	99.9
REA*	96	99.1	102	121.5	113	128.3	93.8	96.5	100.8	100.3	111.6	101.2
BS*	100.2	104.2	105.2	109.2	150.2	132.4	93.1	97.6	100.3	102.6	111	102.9
PS*	108.6	100.3	112.9	101.1	136	104.5	102	101.7	106.7	99.9	107.2	101.2
OS*	135.8	107.5	154.9	108.3	114	122.9	98.6	100.0	103.6	100.3	107.9	100.8

* VA = Value Added; E = Employment; TVA = Total Gross Value Added by Industry; TE = Total Employment; AFF = Agriculture, forestry and fishing (A in NACE rev.2); I = Industry (B,D,E in NACE rev.2); M = Manufacturing (C in NACE rev.2); C = Construction (F in NACE rev.2); TS = Traditional services (G,H,I in NACE rev.2); IC = Information and Communication (J in NACE rev.2); FIA = Financial and Insurance Activities (K in NACE rev.2); REA = Real Estate Activities (L in NACE rev.2); BS = Business Services (M, N in NACE rev.2); PS = Public Services (O,P,Q in NACE rev.2); OS = Other Services (R,S in NACE rev.2)

Red Colour = decline or the slowest growth; Green Colour = the fastest growth or significant growth

Source: own calculations based on Eurostat1, 2018

The second wave of the crisis still did not allow a return to pre-crisis values. The results indicate that service segments have been better able to cope with the situation as a manufacturing industry (Table 5 - 2011/2008). For most segments, the post-crisis period did not only lead to a return to pre-crisis production, but even to a significant improvement in performance and employment compared to 2008. (Table 5 – 2016/2008) However, from the point of view of the Slovak economy, the "I" segment faces a significant problem to return to their original values. Nonetheless, Morvay (2017) states that value added growth in industry of 1.78 p. b contributed to the growth of value added in 2016, mainly due to the growth in the value added of the manufacturing industry. From the EU-15 perspective, the "C" segment has problems returning to pre-crisis performance. The productivity gains and employment in the AFF segment are very positive, both in Slovakia and in the EU-15. In the case of Slovakia, despite the fact that the share of agriculture in the total GDP in the Slovak economy is low (around 4%), significant GDP growth in this sector in 2016 led to agriculture contributing to an overall growth of 14.2%, thus 0.45 p. b. (Morvay, 2017)
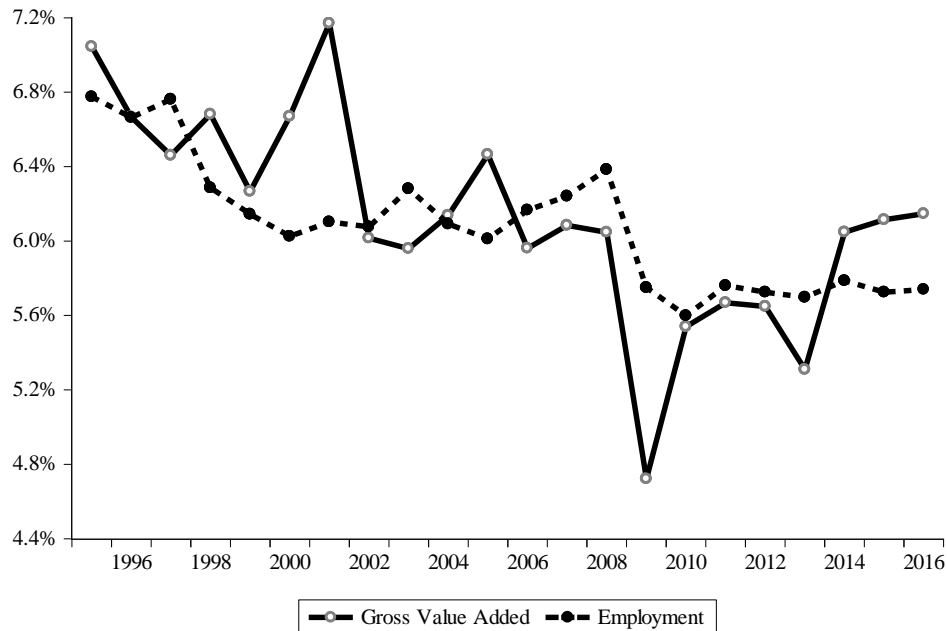
5 Development of the structural gap between Slovakia and the EU-15 in the period 1995-2016

The aim of the analysis of the structure of the economy is to find a setting that would help bring the performance of the economy closer to the level of the most advanced states. The structural gap is one of the indicators of the state of the economy, which can be measured globally by the structural deviation indicator. We used the Dujava (2010) procedure to calculate it between Slovakia and EU-15 in GVA and employment:

$$s = 100 * \sqrt{\sum_{i=1}^{11} h_i * \left(\frac{VA_{i;SR}}{VA_{SR}} - \frac{VA_{i;EU15}}{VA_{EU15}} \right)^2} \qquad (1)$$

$$h_i = \frac{1}{2} \left(\frac{VA_{i;SR}}{VA_{SR}} + \frac{VA_{i;EU15}}{VA_{EU15}} \right) \qquad (2)$$

where s - structural deviation indicator; h_i - i - th sector; $VA_{i;\ SR}$ - the GVA in the SR "i-th" sector; VA_{SR} – the total GVA in SR; $VA_{i;\ EU15}$ - the size of the GVA in the EU15 "i-th" sector; VA_{EU15} - the total GVA in the EU 15. The volume of the structural wobble index is increasing with the growing differences between the share of individual sectors in the economy of the Slovak Republic and the EU-15 economy. (Dujava, 2010) For the calculation of the structural deviation in employment, the GVA is confused for employment.

Figure 1 The structural gap between Slovakia and the EU-15 in the period 1995-2016
Source: own calculations

The results confirm our assumption that the structural gap between the SR and the EU-15 in both GVA and employment has decreased since 1995. Whereas in 1995 the value of both structural deviations was 7%, in 2016 it was around 6% lower.

However, if we only focus on the post-crisis period, we say that the structural gap between the SR and EU-15 under GVA is increasing. While in 2009 it reached 4.7%, it was 6.1% in 2016.
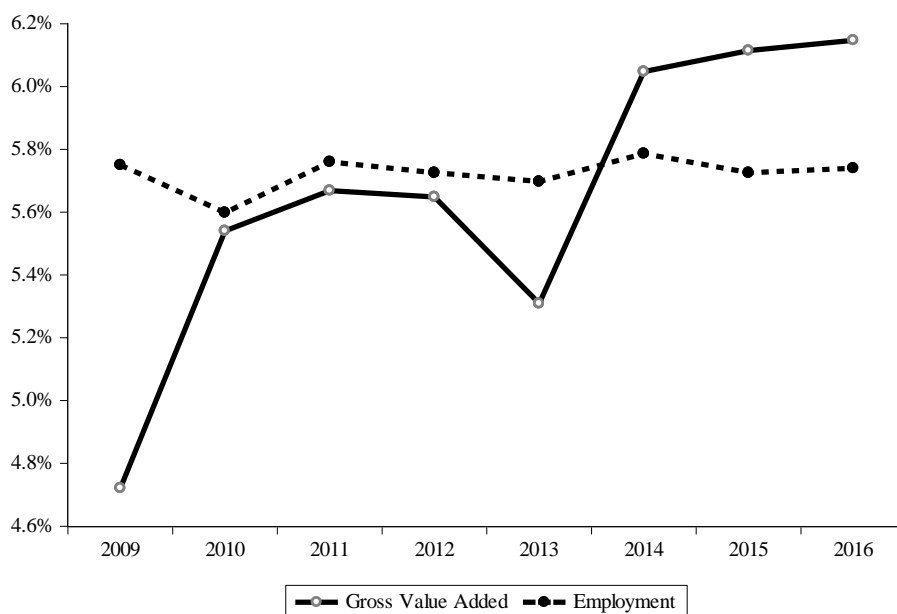
Figure 2 The structural gap between Slovakia and the EU-15 in the period 2009-2016
Source: own calculations

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The structural employment gap has approximately the same value over this period. Nor is there a violent reaction to the crisis period.

6   Conclusion

When examining the structure of Slovakia's economy, we relied on two basic variables - gross added value and employment in individual segments of the economy. As Slovakia is a country that is still trying to get closer to the developed countries, we compared the results of the Slovak economy with the results of the EU-15 average. As the results show, the growth rate of gross value added was highest in both Slovakia and EU-15 for the "BS" segment. A relatively high growth rate is also achieved by the "IC" sector, which is understandable and expected in the information society. However, our assumption of the dominant position of segment "C" in the GVA has not been confirmed. From the point of view of the individual segments of the GVA, we note that the smallest share in Slovakia was the share of the "OS" segment over the whole period. In the EU-15, the smallest share was the "AFF" share. In Slovakia, the "AFF" segment did not exceed 6%, but it was a segment with a significantly decreasing share of total GVA (-2%). From the employment point of view, the share of the "REA" segment was the smallest, both in Slovakia and in the EU-15. In Slovakia, however, the share of the "M" segment declined sharply, while in the EU-15 it was the segment "I". On the contrary, the share of the "BS" segment grew most markedly in both countries. These values are also a confirmation that the share of the service sector is growing steadily. Gradually, Slovakia is experiencing a situation where service rates increase both in GVA and in employment. The situation in the EU-15 is the same. Our conclusion does not entirely agree with the opinion of Gabriel (2012), which in the case of Slovakia reached the opposite conclusion. As emerged from our conclusions, the crisis has hit the manufacturing sector, both in added value and in employment. Here is also the difference between the EU and Slovakia. The EU-15 has been hit only moderately but essentially in all segments. The Slovak economy suffered a strike only in some segments, but the hit was very strong. Finally, we can conclude that for the entire monitored period we can state the gradual approach of Slovakia to the EU-15 average. On the other hand, since the end of the crisis, the structural gap has grown again, which should be avoided in the future.

Acknowledgements

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The propensity of university students to work during their studies

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Abstract

The paper is focused on the working patterns of university students in Košice. The data comes from the representative survey with the students of the Technical University of Košice. It provides information about the share of working students and their incomes. The objective of the paper is to explore the propensities of particular groups of students to work according to different characteristics (gender, year of study, faculty etc.). To explain the differences between working and not working students was used the logistic regression. The paper concludes that there is a strong relationship between propensity students to work and the year of the study.

Keywords: higher education, university students, working while studying, student income, year of the study

JEL Classification: D12, I25

1 Introduction

The relationship between higher education and work was investigating deeply in economic research. The growing number of university students in general have an undesirable impact on the local economy. The student´s expenditures are considered as an additional income for the local economy of the city or region where the university is located. This finding has been well described in a plenty of studies e.g. (Rehák, et al., 2015) Students work also affect the local labor market. There is evidence that students are displacing other workers from the local labour market and that the people displaced are amongst the most vulnerable labour market participants. (Barke, et al., 2000) the

There is a strong connection between the university curriculum and the "employability" of a university´s graduates. Student employability may be enhanced by work experience during the study. (Di Paolo & Matano, 2016) (McGregor, 2015)

This topic is interesting for the academy as well as for the government. Therefore in some countries there is continually conducting research about the student income and their expenditures. Such as the latest governmental research about the university, students in Great Britain realised in 2014/2015. The survey showed that the earnings from paid work were a significant source of income for many full-time students. Just over half of full-time students were working (52 %) in Great Britain during the academic year. The average amount received in earnings among those at work was around £3,300. There was a small increase in the proportion working continuously across the academic year and in the average hours worked per week compared with the findings of the previous research in 2011/2012. (Maher, J. et al., 2018) Very little research about the expenditures and revenues of university students exists in Slovakia. In 2015 was published the research study about expenditures of students based on the

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data collected among students of the University of Economics in Bratislava and of the Technical University of Košice. (Šebová, 2015)

In the paper, we present the findings of incomes of students based on the same survey taken at the Technical University of Košice in 2015. The novelty of the study is a deep insight into the propensity of university students to work during their studies.

We try to answer the following questions. What are the differences between working and not working students? Is the level of the student´s income affected by the locality? How are the structure and the level of income in different years of the study?

Probabilistic model based on logistic regression was developed for prediction the propensity of students to work.

2 Literature review

Scientific papers and studies related to students' income and expenditure are focusing on several research problems e.g.:
- revenues of students and their impacts on the local labor market,
- student attitudes towards debt,
- financial literacy and gender impact on personal financial concepts,
- the nature and consequences of fixed-term employment,
- how working affects the academic results of working students,
- problems related to combining of work and study,
- impact of university students' spending on the local economy.

In Great Britain are published usually reports presenting findings from the studies of the income, expenditure and debts of university students e.g. (Callender, 1999), (Warhurst, et al., 2009), (Maher, J. et al., 2018) Although there is a different funding system for higher education, the results of these studies are of interest to us to understand the factors that influence the propensity of students to work. They usually analyzed the structure and level of revenues and expenditures of university students had in general. (Johnson, et al., 2009) Studies about financial literacy indicated that students are often aware of the impact that financial problems and debts may have on their further study. (Davies & Lea, 1995)

Studies focused on the level of debt resulted in the fact that students generally belong to a relatively low-income population. These studies also focused on the financial literacy of college students and also analyzed the influence of gender on personal financial concepts. (Chen & Volpe, 1998), (Davies & Lea, 1995) Attitudes to student debt were compared between students from England and New Zealand in (Agnew & Harrison, 2015). Females were less likely to see the future benefits of higher education than their male counterparts. (Agnew & Harrison, 2015)

Other studies investigated the effects of work on students'studies. (Di Paolo & Matano, 2016), (Barke, et al., 2000), (Jewell, 2014), (Lammont & Lucas, 2006), (Manthei & Gilmore, 2005), (McGregor, 2015), (Joensen, 2009). They analyse the share of students involved in the labor market, the types of jobs performed and the level of remuneration. They were focusing on the interaction between employment and study in terms of time, impact on the achieved education and individual development of the student. According to recent studies the proportion of working students is increasing. (Di Paolo & Matano, 2016) There are positive as well as negative finding in this field. (Joensen, 2009) Students who combine work with study could facilitate the better transition from school to the labor market. The human capital theory assumes a positive relationship between work during study and future labor market outcomes, as student employment increases the specific human capital during the study by gaining relevant

work experience and practical skills. Also there was found the positive relationship between student employment and labor market outcomes, as it increases the chances of employment by the same employer as during the study. (Di Paolo & Matano, 2016)

On the other hand students stated that their studies had been negatively affected by their paid work. (Barke, et al., 2000), (Lammont & Lucas, 2006), (McGregor, 2015), (Di Paolo & Matano, 2016) The negative impact of employment during the study on academic performance is due to the time-sharing between study and work. This impact may vary according to the working intensity. The results of the studies show that the results are mainly hampered if the students are full-time working. All studies show that it is essential to take into account the specific features of work carried out during higher education. It brings a better understanding of the effects of student employment on their academic performance and on the future success of graduates in the labor market. (Di Paolo & Matano, 2016)

There were published plenty of studies about expenditures of university students. For example (Yayar, et al., 2016) analysed the consumption expenditures of the turkish students. The income-expenditure functions of the students and income elasticity were estimated with the help of Engel's functions. Based on the survey they observed that the income elasticity values related to alcohol-tobacco, household goods, hotel-restaurant, chance-games, and sports expenditures were higher than 1, and the income elasticity values related to the other expenditure items were lower than 1. (Yayar, et al., 2016)

The local economic impact studies are investigating the short-term impacts of the university based on the additional incomes for the local economy connected with the existence of the university e.g. (Caffrey & Isaacs, 1972), (Sigfried, et al., 2007), (Kotosz, et al., 2015), (Valero & Van Reenen, 2016) It is based on the expenditures spent by students, employees, visitors and university on the services and goods. Long-term effects are attributed to the increase of high skilled labor force, development of knowledge, the rise in productivity and economic growth. (Rehák, et al., 2015)

2.1 Data and Methods

A survey was fielded to the students of Technical university of Košice between April and May 2014. A multistage stratified sampling method was used to select the study population. The gained study sample was representative in terms of faculty and year of the study.

In the year 2014, 10 643 students were studying at TUKE at all stages of the study, of which 9 140 were in full-time form and 1,503 in the external form of study. Only full time students were included in the research. The size of the sample was 1525 students it means a 99 % confidence level and a 3% margin of error.
The questionnaire was designed to acquire data about expenditures and revenues of students. The survey was distributed electronically to all students of the Technical University based on the MAIS university database. In total, 1 525 questionnaires were obtained, of which 1 519 were valid. The survey questionnaire contained 23 questions, which were focused on five issues.

The first part focused on the attractiveness and importance of the Technical University for the students. They were asked what they will do if the university will be not presented in Košice city. The second part brought into focus the incomes of students. Next part dealt with the level and structure of the expenditure, which students spent in Košice. In the fourth part, the respondents were asked about their activity in the labor market. The last part of the

questionnaire included general information about the respondent, the gender, age, place of temporary and permanent residence, faculty, year of the study etc.

Table 1 Descriptive of the sample

Gender	
- Male	52%
- Female	48%
Level of the study	
- Bachelor study level	64%
- Master study level	33%
- Doctoral study level	3%
Staying of students	
- Permanent residence in Košice	27%
- Daily commuting students	44%
- Students staying in a dormitory	9%
- Students staying in a rented accomodation	20%
Working during studies	
- Yes	42%
- No	58%

Source: own compilation

In the analysis, we were investigating the incomes of students. Total monthly student incomes amounted to 407 025 Eur. The largest item with a share of 30% was income from parents. Earnings from summer brigades followed approximately the same share (24%). Income from employment was with a share of 23%. Only 16% of the total income was income from the scholarship. The lowest incomes were money gifts (3%), other income (3%) and sales and rental income (1%).

Table 2 Descriptive statistics. Student´s incomes from labor according to the year of the study

	Working	Min income	Max income	Mean	Median	Standard deviation
1st year (bachelor)	33,5%	5	600	107	83	105
2nd year (bachelor)	36,7%	10	950	119	100	110
3rd year (bachelor)	41,1%	10	1000	136	100	129
1st year (master)	**54,6%**	10	1100	**180**	**130**	168
2nd year (master)	50,5%	5	1000	179	120	175

Source: own compilation

There were significant differences in the propensity of students to work and in the monthly income from labor according to the student´s year of the study. Students studying at the master level reported the higher average income from labor in comparison with students at master level. The highest share of working students (54,6%) was in the first year of master study. In this year of study earn students also the highest average salary. The share of working students is increasing since 1st year of bachelor study till 1st year of master study. In last year are working fewer students (50,5%). This year is demanding for them, they have to write the final thesis. It looks like students slightly prefer learning in the school before working.
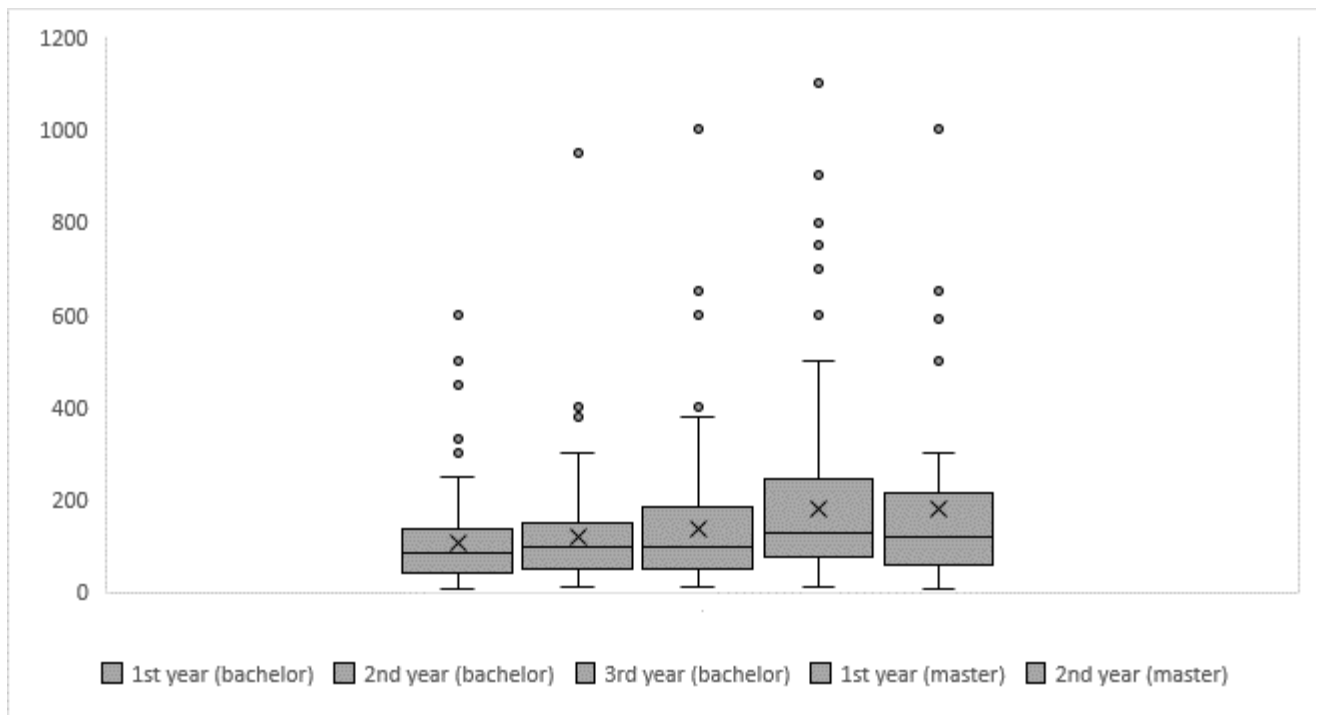
Figure 1 The distribution of students' revenues according to their year of study
Source: own compilation

The boxplots in Figure 1 confirm the trend of increasing incomes in every next year of study peaked in the first year of master study.

In the analysis, we were interested if there are significant differences between students working and those who do not work during their studies. We examined the following research questions:
1. Which students (according to their socio-demographic characteristics) are working during their studies?
2. Is there any relation between locality of students staying (permanent residence in Košice, living in a dormitory, commuting student) and its propensity to work?
3. How does the student's propensity to work vary by the year of study and faculty?

In our analyse we used the logistic regression to explain the relationship between the propensity of students to work and their socio-demographic characteristics. Using the logistic regression was appropriate because of the dichotomous character of the dependent variable Y = working/not working during studies.

2.2. Results
Based on these questions, we have compiled a general regression model that we have gradually modified in a desirable form that yielded results. We tested the model in the SPSS environment. The primary characteristics we have included in the model (independent variables) were:
- The faculty (8 faculties),
- Staying in Košice during the study (Four cathegories: Permanent residence in Košice, Daily commuting students, Students staying in a dormitory, Students staying in a rented accomodation),
- Permanent residence (Four categories: Permanent residence in Košice, Resident from surrounding cities, Resident from surrounding villages, Foreign students),
- Gender (2 categories),
- Year of the study (5 categories),

- Amount of revenues from parents (continuous variable),
- Amount of expenditures (continuous variable).

Logistic regression function of Model I.:

$P(Y) = \beta_0 + \beta_1 Faculty + \beta_2 Staying + \beta_3 Gender + \beta_4 Permanent\ residence + \beta_5 Year\ of\ the\ study + \beta_6\ Revenues + \beta_7\ Expenditures$

The results of the model are described in the following Table 3. Based on the parameters "gender" and "permanent residence" there was no significant differences observed in the model I. as to whether the student is working or not working. Therefore we have chosen to exclude these two variables from our model. The results of model II. are presented in Table 4.

Table 3 Results of the model I.

	Wald Chi-Square	df	Sig.
(Intercept)	,000	1	,999
Faculty	14,700	7	,040**
Staying in Košice during the study	8,851	3	,031**
Gender	,018	1	,892
Permanent residence	2,310	3	,511
Amount of revenues from parents	43,549	1	,000***
Amount of expenditures	45,481	1	,000***
Year of the study	37,014	7	,000***

*p<0,1; **p<0,05; ***p<0,01;

Source: Own compilation

Table 3 Results of model II.

	Wald Chi-Square	df	Sig.
(Intercept)	,000	1	,999
Faculty	13,032	7	,071*
Staying in Košice during the study	48,945	3	,000***
Year of the study	38,809	7	,000***
Amount of revenues from parents	44,978	1	,000***
Amount of expenditures	46,258	1	,000***

*p<0,1; **p<0,05; ***p<0,01;

Source: Own compilation

According to F-statistic both models are significant (p-value=0,000). For a given set of data the better fitting model was model I. according to the slightly lower values of compared information criteria:

- Model I. (AIC = 1776; BIC = 1902)
- Model II. (AIC = 1806; BIC = 1912).

A closer look at the results enable us to formulate following interpretation of results:

- Even though the faculty indicator was not a statistically significant parameter in the model as a whole, one of the faculties that are characterized in Table 4 has a statistically significant impact on whether a student is working or not. It is a Faculty of Arts whose p-value (0.021) was lower than the significance level ($\alpha = 0.05$). Therefore, we can argue that students from the Faculty of Arts are almost three times more likely to work than students from other faculties.
- The second indicator we are dealing with is where a student lives during its study. According to the results of logistic regression analysis, high statistical significance has emerged in those students who have permanent residence in Košice. These students are about twice as likely

to be employed as students living in a dormitory, commuting students or students renting a room.

- The student's propensity to work has a strong relationship with the year of the study. High statistical significance was demonstrated at three years of bachelor study (p-values: 0.006, 0.003, 0.001) and two years of engineering grade (p-values: 0.000, 0.000). We see that these values have gradually fallen, with which the probability of employability has increased steadily. The values of their individual regression coefficients are gradually increasing together with the increasing year. Students of the first year of the bachelor's degree have approximately 5 times the chance to work. Students in the second year of bachelor's degree are slightly increased to 5.41. Students of the third year of bachelor degree have up to 6.4 times higher the chance to work. Higher-level students, engineers, in the first year are up to 10 times more likely to work. Subsequently, in the second engineer's year, this chance is reduced to 8, which probably means that students of the last engineering year devote more of their free time to study, which will subsequently have a positive impact on their chances of completing their studies.
- Parental income and student expenditure have p values below the significance level (α = 0.05), therefore we consider these independent variables to be statistically significant. Income from parents shows a negative regression coefficient. This means that if parental income increases the propensity of the student to work decreases. However, the regression coefficient is very low (-0.01), indicating a weak tendency.
- The relation between expenditures of student and the propensity of work is positive but also weak (regression coefficient 0.00).

Table 4 Results model I.

Parameter	B	Std. Error	Hypothesis Test			Exp(B)
			Wald Chi-Square	df	Sig.	
(Intercept)	-2,78	0,64	18,96	1,00	0,00	0,06
[Faculty=1]	0,25	0,27	0,87	1,00	0,35	1,29
[Faculty =2]	-0,12	0,30	0,15	1,00	0,70	0,89
[Faculty =3]	0,08	0,25	0,11	1,00	0,74	1,09
[Faculty =4]	0,11	0,23	0,24	1,00	0,62	1,12
[Faculty =5]	-0,24	0,28	0,74	1,00	0,39	0,78
[Faculty =6]	0,32	0,23	1,85	1,00	0,17	1,37
[Faculty =7]	1,04	0,45	5,30	1,00	0,02**	**2,84**
[Faculty =8]	0[a]	.	.	.	.	1,00
[Staying =1]	0,83	0,17	24,90	1,00	0,00***	**2,29**
[Staying =2]	-0,14	0,16	0,81	1,00	0,37	0,87
[Staying =3]	0,02	0,24	0,00	1,00	0,95	1,02
[Staying =4]	0[a]	.	.	.	.	1,00
[Year of the study =1]	1,61	0,58	7,62	1,00	0,01**	**5,00**
[Year of the study =2]	1,69	0,58	8,53	1,00	0,00***	**5,41**
[Year of the study =3]	1,87	0,58	10,57	1,00	0,00***	**6,50**
[Year of the study =4]	2,34	0,57	16,52	1,00	0,00***	**10,35**
[Year of the study =5]	2,17	0,58	13,86	1,00	0,00***	**8,75**
Amount of revenues from parents	-0,01	0,00	44,98	1,00	0,00***	0,99
Amount of expenditures	0,00	0,00	46,26	1,00	0,00***	1,00
(Scale)	1[c]					

*p<0,1; **p<0,05; ***p<0,01;

Source: Own compilation

3   Conclusion and discussion

Using simple descriptive statistics and logistic regression analysis, we have come to a few conclusions. Based on data from a survey conducted in 2014, we found that during this year, 42% of students of Technical university of Košice had term-time jobs or having worked at sometime during the academic year up to the time of the survey. The participation of students in the labor market was lower in comparison with recent studies form Great Britain e.g. 52-62% (Maher, J. et al., 2018), (McGregor, 2015). The tendency to work more during higher grades of the study was similar in our case comparing to british studies. (Maher, J. et al., 2018) (McGregor, 2015) (Barke, et al., 2000). Our results confirm that students of the first year of the bachelor's degree have the lowest propensity to work. The highest propensity to work have students in the fourth level of study. Suprisingly students who live in Košice have two times higher chance to work. We expected differences in the characteristics and behaviour of students living with parents compared with those who live away from their family home during studies. But we expected the opposite result - that students living away from their homes would have a higher propensity to work based on their greater autonomy. Residence and year of the study were significant indicators which influence the propensity to work also in foreign studies e.g. (Barke, et al., 2000). Unlike other studies, the influence of gender has not been confirmed in our case.

There would be required deeper analysis about kind of the jobs and their impacts of the study results of working students what could be the next step in our research.

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Organisational culture management in small and medium-sized businesses

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Abstract

The aim of the paper is to present findings of theoretical and empirical studies conducted to identify the specificity of managing organisational culture of small and medium-sized businesses. The methodology of the theoretical and empirical studies adopted in the paper is based on literature study and statistical analysis of the findings of a diagnostic survey. Organisational culture management in the context of the functioning of small and medium-sized businesses is a vital area worthy of special attention. Analysis of research findings shows that the subject of organisational culture management in small and medium-sized businesses has not been much explored.

In the long run, appropriate management of organisational culture may have an impact on work effectiveness, performance and development of pro-innovation culture, where knowledge sharing and cooperation are crucial.

Keywords: Organisational culture, Organisational culture management, Small and medium-sized businesses, Organisational culture management methods, Pro-innovation culture

JEL Classification: L10, M12, M14, M54

1 Introduction

Organisational culture is one of the major factors that impact the functioning of an enterprise. Until the 1980s it was underestimated by management theoreticians and practitioners alike. This was due to the fact that, as a rule, organisational culture is invisible. It is a set of values - often considered obvious - assumptions and common unspoken expectations. Organisational culture provides unwritten principles of conduct at a workplace, of which employees are often not fully aware.

Every organisation has certain standards, values and attitudes that are accepted by most (if not all) employees. For a small or medium-sized business in particular, organisational culture may constitute a factor influencing its competitiveness. In the conditions of highly unstable environment and increasing competition, only those enterprises are likely to survive and

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further develop that focus on being increasingly competitive through proper knowledge management and search for and implementation of various innovations, as activity in the area of innovations allows enterprises to be more competitive. Knowledge, trust and knowledge-based innovativeness are viewed as a basic element of entrepreneurship and, at the same time, a source of competitive advantage. And appropriate management of organisational culture, where initiation of changes is promoted and pro-innovation activities are valued, can help to achieve that.

The aim of the paper is to present findings of theoretical and empirical studies conducted to identify the specificity of managing organisational culture of small and medium-sized companies. The research problem involves analysis of the elements and tools of organisational culture management that are significant in terms of the functioning and development of small and medium-sized businesses. The aim of the empirical studies was to analyse and assess selected elements of organisational culture in the process of management in small and medium-sized businesses. The adopted methodology of theoretical and empirical studies is based on literature study and statistical analysis of the findings of a diagnostic survey.

2 Literature review

2.1 Importance of the organisational culture in small and medium-sized businesses

The issues covering the problems of defining, developing and improving the organizational culture are of interest to many theoreticians and practitioners in the area of management studies.

Regardless of the functions ascribed to organisational culture, numerous authors describe organisational culture as a system (Barney, 1986, p. 656). Organisational culture is both an operational objective and a method to accomplish objectives. It is connected with various factors that contribute to the enhancement of the implementation of acquired knowledge, procedures and principles (Indacochea, M.M.M., Concepción, R.R.F. and Lorenzo A.F., 2018, p. 45).

Organisational culture is increasingly considered to be an important factor that combines all the elements of an organisation into one transparent whole (Todorovic, Zivkovic, Nikolic, V. and Markic, 2012, p. 1760). Understanding the specificity of organisational culture is the key to economic success of every organisation, as it covers all aspects of the functioning of an organisation. It impacts effectiveness, work performance of individuals, engagement and job satisfaction, as well as the planning of and relationship among strategic, tactical and operational objectives and tasks (Rigas and Nawar, 2016, p. 565-567).

Identification and conscious creation of organisational culture is an element of an enterprise's competitive advantage, as it has a significant impact on the functioning of every organisation. This is because it affects not only the inside of an organisation but also its relations with its environment. Organisational culture may be an element facilitating the development of innovative activities. Building a pro-innovation organisational culture is crucial in terms of competitiveness of every business (including small and medium-sized ones), as innovations are often the element that determines a competitive position on the market. With high level of innovation characterising small and medium-sized businesses and impacting their competitive position, it is important for such businesses to manage their organisational culture in a way that will encourage the development of pro-innovation behaviour in their employees. Creation of an appropriate organisational culture enables a free flow of employees' knowledge -

improving their skills and competencies (Smolarek and Sipa, 2015, p. 302) - which also takes place beyond IT systems and "is based on other forms of knowledge codification and expression, i.e. myths, rituals and other cultural artefacts expressing organisational values, beliefs and standards", which means that the culture characterising an organisation includes content that affects the possibility of knowledge management implementation (McElroy, 2003, p. 71). Research shows that organisational culture has the strongest impact on knowledge sharing, acquisition, retention and usage. Although there is evidence for a link between organisational culture and knowledge management, the correlation coefficient value shows that there is enough room for strengthening the causal relationships between these variables (Klepić and Madžar, 2017, p. 265).

With dynamic changes occurring in the business environment, an innovative organizational culture can help a company to adapt to changes more easily. Such culture will be focused on the ability to cope in uncertain situations, on improvement of the communication and decision-making systems, on seeing the information coming from the company's environment as chances that can be used rather than threats, and on implementation of a management style that will enable employee empowerment and cooperation as well as triggering creativity and pro-innovation activities in employees (Gadomska-Lila, 2010, p. 14).

Organisational culture is one of the factors determining proper implementation of HR policy (Smolarek and Dzieńdziora, 2017, p. 284). It is among the more important elements impacting the effectiveness of work in a given enterprise (Pachura and Smolarek, 2018, pp.1122-1123). Modern small and medium-sized businesses very often use outdated tools for human resources management, e.g. in the area of motivation, linking them incompetently to work performance. This is a major problem of most managers and HR management specialists. It often contributes to employees' dissatisfaction, which disturbs the atmosphere and relationships at work, and leads to poorer work performance (Dzieńdziora and Smolarek, 2016, p. 182-189). As a result, the organisational culture does not generate desired results. Error management culture implies that a firm accepts that people make errors and uses organizational practices related to communicating about errors, to sharing error knowledge, to helping in error situations, and to quickly detecting and handling errors to deal with errors (Van Dyck, Frese, Baer, & Sonnentag, 2005, p. 1229).

2.2 Management and methods for organisational culture management from the theoretical perspective

Management of organisational culture takes place in stages and relies on a critical view of the managerial process, human resources, techniques to support communication, and project management. The stages, methods for changes, activity and desired effects are presented in Table 1.

This shows that management of organisational culture involves deliberate modification of standards and values and resulting behavioural patterns in order to establish new patterns of attitudes and behaviour that conform to managers' expectations and are above all more effective, in specific conditions of the organisational culture configuration in an organisation. Inappropriate organisational culture is the most common barrier to generation of ideas and implementation of innovations in an organisation's environment (Mohelska, H. and Sokolova, M., 2017, p. 856). Nowadays, it is considered that the type of culture fostered by the organization can stimulate innovation, since culture influences the behavior of employees. the management style is the first key factor of management, and that business management is responsible to change or promote certain cultural aspects in a productive organization

(Manzanares, 2016, p. 4).

Table 1 Organisational culture management - development stages and changes

Stages	Methods for changes	Activity	Effect
Critical stage		Denaturalisation of the current organisational culture	Elimination of the sense of status quo, disturbed sense of organisational justice and naturalness among employees
Critical stage		Identification of the cultural patterns that sustain the status quo	Self-awareness of the participants of an organisation, discovery of the myths serving the maintenance of power
Transitional stage		Discovery of indoctrination and false awareness, exposure of the ideology	Gaining access to knowledge about social engineering techniques and manipulation to which employees and customers were subjected
Critical stage	Discourse analysis, observations, interviews	Demystification of symbolic violence	Increased knowledge among employees about the mechanisms of the functioning of organisational control
Emancipatory stage	Modification of the mission and strategy as well as management patterns and styles Education and training courses	Organisational democracy, increased employee participation	Implementation of a new strategy taking into account emancipation and humanisation
Emancipatory stage	Change of HRM and organisational structure Further training courses	Revision and modification of HR policy and HRM and organisational structure	The functioning of the new structure that is based on humanisation and emancipation, and takes into account employee participation
Emancipatory stage	Change of cultural patterns, standards and values. Implementation of the training programme	Creation of an emancipatory culture	Implementation of the organisational culture with such values as employee empowerment, equality and justice
Emancipatory stage	Management of the meanings and identity of an organisation. Completion of the training programme	Anchoring of an emancipatory culture	Employees' participation in continuous development of the critical and emancipatory culture

Source: own study based on Sułkowski and Sikorski 2014, pp. 24-26.

To transform the culture is essentially to create it in a conscious and intentional way, *"supporting the development of value systems, creating desired standards of conduct and high achievement standards"*. Cultural values constitute a special level at which organisational culture is manifested and impact the choice from among possible manners, means and objectives of action (Kluckhon, 1951, p. 395).

Methods of organisational culture management involve shaping organisational culture, and are rooted in adopted cognitive assumptions referred to as paradigms. Depending on their knowledge and professional experience, managers choose and use different models and specific methods for organisational culture management. In Poland, the functionalist approach is currently dominating. However, learning about interpretive and critical methods for organisational culture management will enrich management processes and bring new quality to Polish companies.

Methods for organisational culture management are divided into (Sułkowski and Sikorski, 2014, p.11-14):

- Organisational culture management from a functionalist standpoint based on a functionalist paradigm, which distinguishes such stages of organisational culture implementation as: creation of a map of values and standards to be followed, analysis of the relationship between the culture and the company's strategy, organisational structure and power relation, development of the desired state of culture: values, patterns and standards, cultural intervention, re-adjustment of essential elements of the system to the "new" culture, constant monitoring of the effects of cultural intervention and consolidation of the changes made to the organisation (Sułkowski and Sikorski, 2014, p.16-17). The principles applied at the stages of organisational culture implementation are incorporated into the culture management process using proven techniques, which include: redefinition of organisational values, creation of new standards and rules, verification and change of culture elements (Sułkowski, 2012, p. 185-190).

- Organisational culture management from an imperative and symbolic standpoint based on an imperative and symbolic paradigm. Organisational culture management from a critical standpoint based on a critical paradigm. Its basic assumption is inability to establish a single, universal way/technique of organisational culture management. Organisational culture management from an imperative paradigm takes place through identity of organization, management of meaning, enactment, sense-making (Sułkowski and Sikorski, 2014, p.18-19).

- Method of organisational culture management from a functionalist standpoint. The determinants of organisational culture management in this approach are: organisational structure, authority and other subsystems of an organisation, and competitive environment. According to the critical approach, the key to organisation management is emancipation of employees, that is taking a critical view of an organisation to prevent the power from being handed down to the organisational bureaucracy (Sułkowski and Sikorski, 2014, p.24). The biggest barrier to implementing this approach is the interest of the groups holding actual power, as it is them that lose their benefits derived from the functioning of the organisation, owners, entrepreneurs, and mangers.

3 Research into organisational culture management in small and medium-sized businesses

3.1 Methodological research assumptions

Empirical studies constituted a stage of the implementation of the project entitled "Trends and challenges in strategic management of small and medium-sized businesses in Silesian Voivodeship." Quantitative studies were conducted by means of a survey method, using a survey questionnaire as a research tool. The studies were conducted from November to December 2016 on a group of small businesses in Silesian Voivodeship (Poland).

The aim of the studies was, among other things, to analyse and assess elements of organisational culture in the process of management in small and medium-sized businesses. The research subject was the process of organisational culture management.[4]

The general problem was stated in the following question: What elements comprise the process of organisational culture management in small and medium-sized businesses? The sub-problems were stated in the following questions:

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[4] For this paper, only findings connected with selected aspects of organisational culture were analysed.

1. Are SMB managers familiar with the elements of organisational culture in their company?
2. What manifestations of organisational culture management can be seen in small and medium-sized businesses?

The following research hypotheses were formulated:
- H1. SMB managers are familiar with the elements of organisational culture in their company.
- H2. SMB managers can identify manifestations of organisational culture that are present in their company.

The research sample consisted of 320 respondents. The survey was conducted on a sample of random SMB managers based in Silesian Voivodeship.

The profile of respondents was presented based on identification of three basic characteristics, i.e. gender, age and education level. The businesses participating in the survey were in 38.8% of the cases run by females, and in 61.2% of the cases run by males. Respondents had higher education (45,6%), secondary education (39,7%), and vocational education (14.7%). In terms of age, entrepreneurs aged 40-49 (43.1%) dominated. Respondents aged 30-39 accounted for 25.0%, those aged 29 and below constituted 20.9%, those aged 50-59 constituted 6.6%, and those aged 60 and over - 7.5%.

The businesses were characterised based on three variables: size (measured by the number of employees), year of establishment and the geographic coverage of their business activity (Table 1). It is worth noting that the overwhelming majority of the businesses participating in the survey were established in 1996. Micro-businesses (with up to 9 employees) accounted for 69.4% of all the businesses surveyed, small businesses (10-49 employees) represented 27.2%, whereas medium-sized businesses (50-249 employee) constituted 3.4%. Businesses with seats located in cities and cities with powiat (county) rights constituted the biggest group (63.4%). As far as the remaining businesses are concerned, their seats were located in urban-rural gminas (communes) (21.3%) and rural gminas (15.3%). The businesses operated in domestic market (50.3%), regional market (17.5%), local market (26.9%) or international market (5.3%). 55.9% of the businesses operated in one industry, with the remaining 44.1% being diversified businesses. In terms of the length of operation, the businesses can be divided into those established in 1989 or earlier (13.1%), between 1990 and 2000 (47.2%), between 2001 and 2010 (29.1%) and those established in 2011 or later (10.6%).

3.2 Results of research

One of questions in the survey questionnaire concerned the understanding of the concept of organisational culture. Of those surveyed, 31.4% correctly indicated the meaning of the concept of organisational culture as a set of values, standards and mindsets, as well as behaviour of people in an organisation that constitutes a model of behaviour and is reflected in elements identifying the company. Slightly fewer, i.e. 30.0% of the respondents, defined organisational culture as relationships among employees in an organisation, proper way of managing an organisation. 11.4% indicated "a set of beliefs in an organisation." 27.1% selected the answer "I don't know."

The respondents were asked to indicate those elements (of organisational culture) that are present in their company. The distribution of answers is presented in Fig. 1. As many as 53.4% noticed a uniform graphic identification (logo), 41.9% indicated dress code, which is

one of the elements characterising organisational culture and an indirect expression of standards and values, which should be clearly defined and applied in a company where organisational culture management was implemented. 35.3% indicated industry-specific jargon, and 31.9% - non-salary incentives (e.g. gym membership cards). It should be noted that no one indicated the response "None of the above" (0.0%). This confirms research hypothesis *H1. SMB managers are familiar with the elements of organisational culture in their company.*
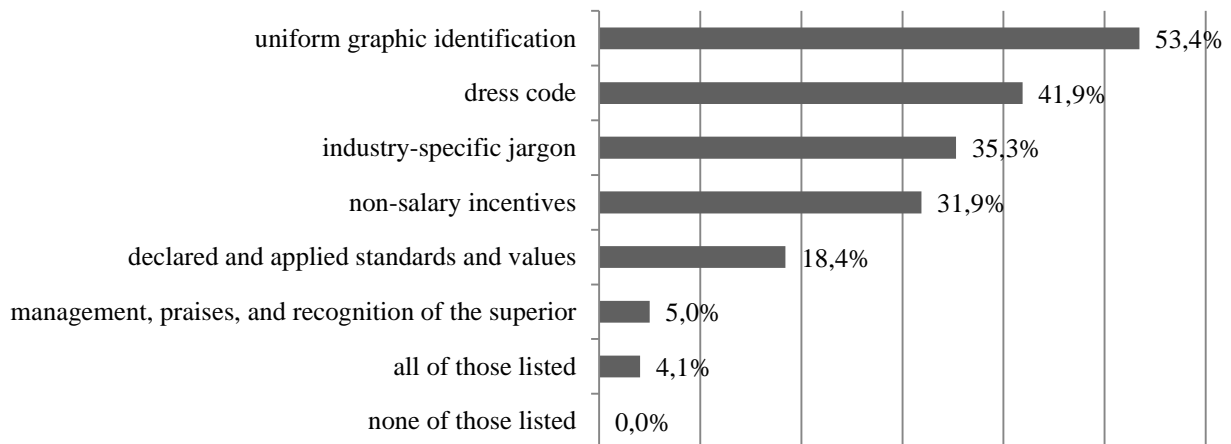
Figure 1 Elements of organisational culture in small and medium-sized enterprises
Source: Own work based on conducted empirical studies.

As far as manifestations of organisational culture in respondents' companies are concerned, the responses were distributed as follows (Fig. 2): only 3.8% were unable to indicate whether and what manifestations are present in their company, whereas 5.3% indicated that none of the listed manifestations was present in their company. The opposite response, i.e. that all the manifestations are present, was indicated by 5.6% of those surveyed. Organisational structure was most often indicated as organisational culture manifestation (44.7%). Thus, over 90% of those surveyed indicated that manifestations of organisational culture are present in their company, which confirms hypothesis *H2. SMB managers can identify manifestations of organisational culture that are present in their company.*
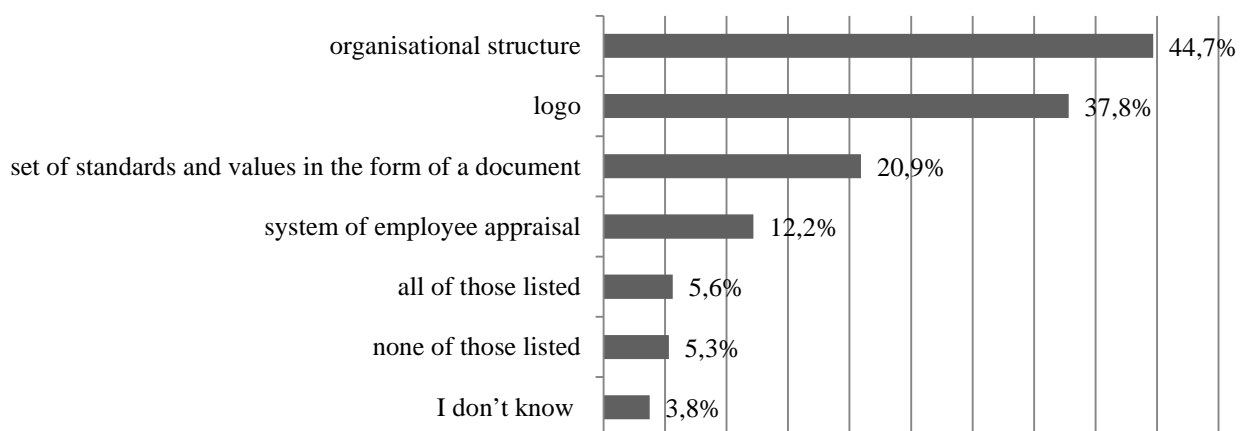
Figure 2 Manifestations of organisational culture management in small and medium-sized businesses
Source: Own work based on conducted empirical studies.

One of important aspects of organisational culture management is possession and knowledge of an ethical code. Small and medium-sized businesses often do not have ethical codes in place (85.6%). Only 14.4% of those surveyed indicated the possession of an ethical code by their company. The respondents were asked what such codes should contain in particular. The structure of responses is presented in Fig. 3.
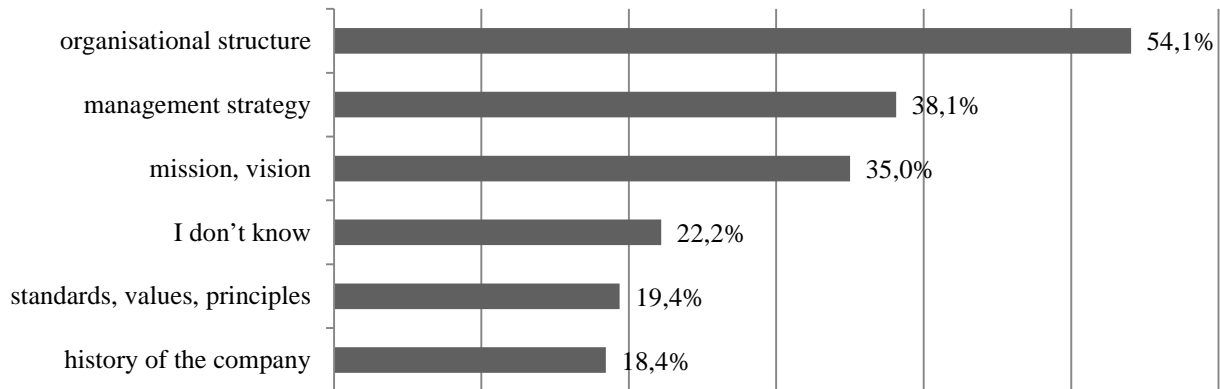
Figure 3 Content of ethical codes according to respondents
Source: Own work based on conducted empirical studies.

Another survey question that was analysed concerned respondents' opinion about whether or not organisational culture can be managed in a company. To this question, 61.6% responded that organisational culture could be managed, 24.4% indicated "Yes", and the remaining 14.1% indicated "I don't know." This may show a low level of awareness among small and medium-sized businesses concerning organisational culture management in practice.

The usefulness of organisational culture management was assessed by respondents rather negatively (60.3%). Only 17.5% of those surveyed assessed its usefulness positively. The remaining 22.2% of respondents did not have an opinion on that matter. This shows little knowledge of the subject of organisational culture management, which has a large impact on the image of an organisation, as well as its functioning.

4 Discussion and conclusion

Our study results are sufficient enough to provide a general perspective on the management of organizational cultures in small and medium-sized enterprises. The assumptions made at the beginning of the research were concerned with a prospect for managing organizational cultures in small and medium-sized enterprises. The review of relevant literature in the field usually shows a number of studies concerning diverse components of organizational culture and their influence on management processes. As K. Serafin observes: "The interest vested in the notion of organizational culture is a result of its multifaceted impact on diversified spheres of organizational life and the business environment; […] it is also related to the provision of systemic solutions in this specific field of action. Data concerning a given organization's culture, its organizational climate, as well as employees' assessments and opinions on themselves, the company and its market chances in the future are all factors that enable making early predictions concerning the company's effectiveness and its sources of successes and failures (Serafin, 2015, pp. 87-99). Similarly, other authors tend to postulate that organizational culture exerts a significant and positive influence on corporate activities and job performance (Neagu, Nicula, 2012, pp. 420-422; Yongxing, Hongfei, Baoguo, Lei, 2017, pp. 708-713). An enterprise which intentionally manages its organizational culture and treat it as a modifiable variable deploy a strategy of management by means of organizational culture (Perechuda, ed., 2000, p. 287).

Organisational culture management in the context of the functioning of small and medium-sized businesses is a vital area worthy of special attention. Analysis of the research findings shows that most respondents are familiar with the definition and elements of organisational culture. They are also aware of the relationships and importance of corporate image, and can identify tools for organisational culture management (though often in a direct way). At the same time, however, over 27% of respondents do not know this concept. This is despite the fact that over 90% indicated the use of culture management tools in their company. This may suggest poor knowledge of the subject of organisational culture management, which, however, has a significant impact on the image of an organisation as well as its functioning.

There are no universal procedures that could ensure development of an organisational culture that is based on trust and knowledge, and at the same time enables corporate image to be properly shaped, both internally and externally. Every organisation needs to come up with solutions that will work for it best. Possible solutions include:
- resigning from imposing ready-made solutions and ways of acting on employees,
- implementing mechanisms that make employees feel that they belong to a bigger group,
- building relationships that are based trust and sense of community,
- propagating communication forms that facilitate knowledge flow,
- creating places and situations that facilitate formal and informal exchange of knowledge,
- encouraging attempts and experiments,
- creating an atmosphere where the value of ideas is more important than where they come from,
- tolerating mistakes made during creative work and helping employees to learn from mistakes.

In the long run, appropriate management of organisational culture may have an impact on work effectiveness and performance. It can also affect human resources management, which, in small and medium-sized businesses, currently does no give enough attention to passing on values and standards. Recruitment and introducing a new employee to their job responsibilities is focused on presenting the most important elements to ensure most effective performance of tasks. Lack of relationships between employees and their line managers results in the lack of an atmosphere of cooperation, which combined with fuelling an atmosphere of competition may contribute to the development of a culture that is not innovation-oriented and does not promote knowledge sharing or cooperation.

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Real Output Dynamics and Current Account Imbalances: Looking for Threshold Effects

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Abstract

Real output is one of the factors which determine current account dynamics. Theoretical approaches to current account point out that an increase in real output leads, through an increase in domestic demand, to higher imports and therefore to an increase in current account deficit. The paper explores the impact of the real output dynamics on current account imbalances and its ambition is to find thresholds effects in this relation. We estimated a panel data threshold model for Euro Area member countries and three non-Euro Area member countries (Denmark, Sweden and United Kingdom) over the period 2001-2016. Our results show that the negative effect of real output growth rate on current account is confirmed only if real output growth exceeds a certain threshold level.

Keywords: real output, economic growth, current account imbalances, import, panel data threshold model

JEL Classification: E30, F32, F41, F43

1 Introduction

Asymmetric external imbalances have become obvious since the establishment of the Euro Area. Increasing divergence in the current account balances between North and South of the Euro Area revealed bottlenecks in the architecture of the single monetary union (Mirdala and Ďurčová, 2017). Recent economic crisis even increased heterogeneity within the Euro Area. Moreover, credibility of the single currency and low interest rate policy encouraged a significant capital flows from North to South of the Euro Area and contributed to the debt accumulation by both private and public sectors.

Intra-Eurozone current account imbalances among countries with different income levels per capita fuel discussions on competitiveness channels under common currency (Belke and Dreger, 2011). Disinflation followed by deflationary pressures induced shifts in competitiveness associated with real exchange rate adjustments through relative price levels. While external imbalances in countries on the periphery of the Euro Area were mainly driven by domestic demand boom fueled by increasing financial integration (Chen, Milesi-Ferretti and Tressel, 2012), the role of changes in the competitiveness of the Euro Area core countries may be disputable. As a result, limited effectiveness of internal devaluation in reducing current account imbalances in the Euro Area could be expected (Sanchez and Varoudakis, 2013). Moreover, asynchronous current account trends between North and South of the Euro Area were accompanied by significant appreciations of real exchange rate in the periphery

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economies originating in the strong shifts in consumer prices and unit labor costs in these countries relative to the countries of the Euro Area core (Holinski, Kool and Muysken, 2012). However, the crucial question that arises from examining external imbalances in the Euro area deals with the key drivers of those imbalances or more precisely, particular contribution of price and non-price determinants of external competitiveness (Lane and Milesi-Ferretti, 2002).

In the paper we examine impact of the real output dynamics on current account imbalances and identify possible threshold effects in this relation. Our motivation is based on the idea that a dynamics of the increase in the demand for imports that follows after an increase in the real output (as a proxy for overall demand) may differ according to the rate of the real output dynamics. As a result, faster growing countries may likely experience deterioration in their current account balance fuelled by induced imports if higher growth rates are not accompanied by higher export performance. We estimated a panel data threshold model for Euro Area member countries and three non-Euro Area member countries (Denmark, Sweden and United Kingdom) over the period 2001-2016. This framework will help us to examine demand driven channel of the current account development in the Euro Area member countries.

Following the introduction, we review the literature in the field of the research in the Section 2. In Section 3 we provide a brief overview of employed methodology based on the threshold model with panel data. Section 4 summarizes the key results and discusses the main outcomes and policy implications.

2 Overview of the Literature

Comunale and Hessel (2014) examined the relative role of price competitiveness and domestic demand as drivers of the current account imbalances in the Euro Area by employing panel error correction models for exports, imports and the trade balance. Their results indicate that although differences in price competitiveness have an influence, differences in domestic demand are more important than is often realized. Gaulier and Vicard (2012) analyzed design patterns of current account imbalances in the Euro Area. Authors investigated that while current account dynamics are correlated with unit labor costs (ULC) and imports, they are not correlated with exports. Losses in cost competitiveness do not appear to have been the cause of deficits, but rather a symptom of a demand shock leading to price-level drift in the non-tradable sector. Chinn and Prasad (2003) examined medium-term determinants of current accounts for a large sample of industrial and developing countries. Their results indicate that the real output growth is positively correlated with current account balances. Rangelove (2014) analyzed relationship between current account imbalances and economic growth during 2008-2009 economic and financial crises for 179 countries. One of the key outcomes of the paper refers to the idea that countries that experienced strong growth just prior to the crisis had an increased risk of suffering after the crisis. The boom prior to the crisis led to imbalances that rendered economies more vulnerable.

Holinski, Kool and Muysken (2012) documented a growing divergence between current account imbalances in northern and southern euro area countries from 1992 to 2007. Authors suggest that systematic monitoring of external imbalances and implementation of better coordinated policies to prevent the emergence of unsustainably large imbalances in the euro area is advisable. Blanchard and Milesi-Ferretti (2009) examined global imbalances focusing on origins and implications of current account imbalances and associated capital flows adjustments. Sharp increase in investments during the periods of fast GDP growth rates (even

fuelled by widen fiscal deficits) are inevitably followed by deterioration in the current account balance. While recent economic crisis initiated adjustment process of global imbalances (especially in developed countries), authors suggest to increase private and public savings and employ policy driven adjustments from export-led toward domestic-demand driven growth in a number of emerging countries to prevent an re-emergence of excessive current account deficits.

3 Data and methods

Our panel data model covers the euro area countries (without Latvia, Lithuania and Estonia) and three non-euro area countries (Denmark, Sweden and United Kingdom) over the years 2001-2016. We aim to reveal whether the impact of real output growth rates on current account varies with different values of output growth. Our objective is therefore to determine an impact of real output growth on current account balance (in percentage of GDP) and to find possible threshold effects of real output in this relation. For these purposes, we estimate a threshold model for panel data proposed by Hansen (1999). We use a threshold model to see whether the estimated regression function (i.e. an estimated relation between real output growth and current account) is the same for the whole data sample or it differs in different intervals of real output growth. These intervals are set by the values of threshold variable (i.e. real output growth in our case), which are directly estimated by the threshold model.

Hansen (1999) developed a threshold model for panel data with fixed effects, which takes into account an individual country specific effect:

$$y_{it} = \mu_i + \beta_1' x_{it} I\left(q_{it} \pounds \gamma\right) + \beta_2' x_{it} I(q_{it} > \gamma) + e_{it} \qquad (1)$$

A panel data set is in form of balanced panel; i denotes a country and t denotes time; y_{it} is dependent variable; x_{it} is an independent variable, which impact depends on the estimated values of the threshold variable q_{it}. I (.) is indicator of the function.

According to Hansen (1999), we can rewrite the model:

$$y_{it} = \begin{cases} \mu_i + \beta_1' x_{it} + e_{it}, & q_{it} \leq \gamma \\ \mu_i + \beta_2' x_{it} + e_{it}, & q_{it} > \gamma \end{cases} \qquad (2)$$

The estimated values of threshold variable (γ) classify a whole panel data set into two regimes. If real values of threshold variable (real output growth) are smaller than γ, the relation between x_{it} (real output growth) and y_{it} (current account) is described by the estimated regression coefficient β_1. If real values of threshold variable are higher than γ, the relation between x_{it} and y_{it} is described by the estimated coefficient β_2. Threshold model therefore enables to estimate two different regressions (β_1, β_2) depending on the interval values of threshold variable (γ). (Hansen, 1999)

Our threshold model, which determines an impact of real output growth on current account, is defined as:

$$CA_{it} = \mu_i + \beta_1 GDP_{Gi,t-1} I\left(GDP_{Gi,t-1} \leq \gamma\right) + \beta_2 GDP_{Gi,t-1} I\left(GDP_{Gi,t-1} > \gamma\right) +$$
$$+\theta_1 BB_{i,t-1} + \theta_2 NEER_{i,t-1} + \theta_3 OPEN_{i,t-1} + \theta_4 GAP_{i,t-1} + \theta_5 SAV_{i,t-1} + \theta_6 INFL_{i,t-1} + e_{it} \qquad (3)$$

CA denotes current account balance (in percentage of GDP). GDP_G is gross domestic product (in constant prices, annual growth, %). GDP_G is a regime-dependent variable because the estimated coefficients (β_1, β_2) depend on variable's classification in the first or the second interval, which are determined by the estimated values of threshold variable. Note that GDP_G is also defined as a threshold variable in our model. Furthermore, we include other control variables, which explain the evolution of current account balance: budget balance (general government primary net lending / borrowing, in percentage of GDP; BB), nominal effective exchange rate (42 trading partners; NEER), trade openness (in percentage of GDP; OPEN), output gap (in percent of potential GDP; GAP), gross national savings (% of GDP; SAV) and inflation rate (consumer prices, annual, %; INFL). These variables are regime independent ones, as their estimated coefficients $(\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6)$ are the same in both intervals of GDP growth. In order to avoid an endogeneity bias in threshold model, each independent variable is lagged by one year (applied e.g. by Nickel and Vansteenkiste, 2008; Baum et al., 2013). Our data are retrieved from International Monetary Fund database – WEO database. Data of nominal effective exchange rate and trade openness are based on Eurostat database.

4 Results and discussion

Before the estimation of threshold model, we estimate panel data model without threshold effect:

$$CA_{it} = \mu_i + \beta_1 GDP_{G\,i,t-1} + \beta_2 BB_{i,t-1} + \beta_3 NEER_{i,t-1} + \beta_4 OPEN_{i,t-1} + \beta_5 GAP_{i,t-1} +$$
$$+ \beta_6 SAV_{i,t-1} + \beta_7 INFL_{i,t-1} + e_{it} \tag{4}$$

Results for panel model without threshold effect are summarized in the Table 1. The estimated model indicates no significant impact of GDP growth on current account balance at 5% level (see β_1 in Table 1), which supports our idea to look for possible threshold in this relation, above which there would be negative and statistically significant relation between two variables.

Estimated coefficients for remaining endogenous variables are quite similar with estimates for the model that includes threshold effect in GDP that is why we provide summarizing comments on all calculated results below Table 2.

Table 1 Impact of GDP growth on current account: FE and RE models without threshold effect

		FE model	RE model
Intercept			-20.324 ***
GDP_G	β_1	-0.220 *	-0.249 *
BB	β_2	0.030	0.041
NEER	β_3	0.024	0.051 *
OPEN	β_4	0.037 ***	0.019 ***
GAP	β_5	-0.567 ***	-0.587 ***
SAV	β_6	0.579 ***	0.657 ***
INFL	β_7	-0.248 *	-0.300 *

Notes: Dependent variable: current account balance (percentage of GDP). ***, **, * denote statistical significance at 1%, 5%, 10%. FE model = Oneway (individual) effect within model, RE model = Oneway (individual) random effect model (Swamy-Arora's transformation). In FE model, statistical significance of estimated coefficients is corrected by Driscoll and Kraay (1998) robust covariance matrix estimator, which is consistent with cross–sectional and serial correlation and by Arellano (1987) robust covariance estimator, which allows a fully general structure, i.e. heteroscedasticity and cross–sectional correlation. The results are same for both robust covariance matrix estimators. In RE model, robust covariance matrix estimator by Arellano (1987)

was used. There is no co-linearity between independent variables. According to the Hausman test (Hausman, 1978): chisq = 25.62 (p-value = 0.0006), the usage of panel data model with fixed effects is preferred to the random effect one.

Table 2 Impact of GDP growth on current account: threshold model estimates

		Coefficients	(Error)
Threshold estimate: $\lambda = 2.992$			
Regime-dependent variables			
GDP_G (if $GDP_G \leq 2.992\%$)	β_1	-0.103	(0.083)
GDP_G (if $GDP_G > 2.992\%$)	β_2	-0.395 ***	(0.099)
Regime-independent variables			
BB	θ_1	0.047	(0.050)
NEER	θ_2	0.006	(0.025)
OPEN	θ_3	0.043 ***	(0.011)
GAP	θ_4	-0.525 ***	(0.062)
SAV	θ_5	0.549 ***	(0.070)
INFL	θ_6	-0.288 **	(0.121)

Notes: Dependent variable: current account balance (percentage of GDP). ***, **, * denote statistical significance at 1%, 5%, 10%. We used heteroscedasticity-consistent (HC) standard errors to calculate p-values. There is no multicolinearity between independent variables. The estimated model is a panel data model with fixed effects.

Table 2 presents the estimation results of threshold model for panel data (see eq. 3). The model estimated one threshold of GDP growth at 2.992% and divided our data sample in two intervals. If GDP growth is smaller than 2.992%, there is no significant impact of output growth on current account. The impact becomes statistically significant and negative, if GDP growth exceeds 2.992% (Table 2, $\beta_2 = -0.395$). Here, an increase of GDP growth by 1% deteriorates current account balance by 0.395%.

The impact of budget balance on current account is not statistically significant, which means that we cannot confirm the validity of twin deficit hypothesis (for twin deficits issue see e.g. Forte and Magazzino, 2013; Holmes, 2011; Trachanas and Katrakilidis, 2013). This result is in accordance with other studies rejecting twin deficit hypothesis (e.g. Algieri, 2013). The impact of nominal effective exchange rate on current account is also not statistically significant. This results is consistent with empirical results of IMF report on global imbalances (IMF, 2014), which concludes for no impact of exchange rate on current account in post-crisis period. Further, an increase in trade openness has a positive impact on current account balance, which is in accordance with other empirical results (see e.g. Nickel and Vansteenkiste, 2008). As expected, an increase in output gap, i.e. an increase in positive gap between real output and its potential level, deteriorates the current account. The same empirical result is obtained e.g. by Nickel and Vansteenkiste (2008), or Šuliková and Tykhonenko (2017). An increase in national saving is positively related with current account balance, which is in line with theory of current account determination (see e.g. Algieri, 2013). Finally, an increase of inflation significantly deteriorates current account balance.

Table 3 Robustness check of estimated threshold model

	Model 1	Model 2	Model 3	Model 4
Threshold estimate	**λ = 2.992**	**λ = 2.028**	**λ = 2.992**	**λ = 2.992**
	Coefficients	Coefficients	Coefficients	Coefficients
Regime-dependent variables				
GDP_G (if $GDP_G \leq \lambda$)	-0.103	-0.019	-0.111	-0.105
GDP_G (if $GDP_G > \lambda$)	-0.395 ***	-0.342 ***	-0.374 ***	-0.400 ***
Regime-independent variables				
BB	0.047	0.046	0.027	0.047
NEER	0.006	0.056 **		
REER			0.017	
OPEN	0.043 ***		0.046 ***	0.044 ***
GAP	-0.525 ***	-0.579 ***	-0.572 ***	-0.522 ***
SAV	0.549 ***	0.550 ***	0.538 ***	0.549 ***
INFL	-0.288 **	-0.280 **		-0.299 ***

Model 1 corresponds to the estimated threshold model in Table 2.

Source: Author's calculations, output from R

To test the robustness of our empirical results we have estimated the threshold model considering a different choice of endogenous regime-independent variables (Table 3). Robustness check generally confirmed estimates from our baseline model because the changes in coefficients are only negligible.

Table 4 summarizes distribution of countries across both regimes considering estimated threshold for a GDP growth. Our results indicate that the most of the countries from our sample did not reach estimated GDP growth threshold at the beginning of the observed period. As a result, growth patterns in these countries harm their external balances with less intensity. However, increasing number of countries crossed our threshold during the second half of the pre-crisis period that corresponds to the empirical evidence on demand-driven origins of external imbalances and their deepening in the Euro Area (Holinski, Kool and Muysken, 2012). Moreover, it is not surprising to observe a presence of periphery, more open as well as some of Central and Eastern European countries (CEEC) in the group of countries above our estimated threshold for a GDP growth. Reduction of current account imbalances since the beginning of the crisis period was associated with deterioration of GDP growth rates in the most of the countries from our group that is why the number of the countries above the threshold level for a GDP growth clearly decreased. While the crisis period generally intensified cross-country expenditure shifting (Gaulier and Vicard, 2012), reduced growth patterns of GDP cooled down excessive current account imbalances in the Euro Area via reduced demands for imports.

Table 4 Percentage of countries corresponding to the particular regime of GDP growth

GDP_G	Threshold estimate: λ = 2.992	
	≤ 2.992%	**> 2.992%**
Relation between GDP_G and CA	not significant	negative ($\beta_2 =$ -0.395***)
Year	**Percentage of countries in each interval**	
2002	74%	26% (CYP, GRC, IRL, SVK, ESP)
2003	68%	32% (CYP, GRC, IRL, LUX, SVK, SVN)
2004	74%	26% (GRC, IRL, SVK, ESP, UK)
2005	47%	53% (e.g. CYP, GRC, IRL, ESP, …)
2006	63%	37% (CYP, IRL, LUX, MLT, SVK, SVN, ESP)
2007	32%	68% (e.g. CYP, GRC, IRL, ESP, …)
2008	26%	74% (e.g. CYP, GRC, IRL, ESP, …)
2009	79%	21% (CYP, MLT, SVK, SVN)
2010	100%	0%
2011	74%	26% (DEU, LUX, MLT, SVK, SWE)
2012	95%	5% (DEU)
2013	100%	0%
2014	89%	11% (LUX, MLT)
2015	79%	21% (IRL, LUX, MLT, UK)
2016	68%	32% (IRL, LUX, MLT, SVK, ESP, SWE)

Note: corresponds to the threshold model estimation in Table 1. GDP growth is lagged by one year in our model, i.e. year 2002 corresponds to the GDP growth from 2001.

Source: Author's calculations, output from R

Number of countries above estimated threshold level for a GDP growth during the post-crisis period generally increased. However, even fast GDP growth rates during this period did not cause deterioration in the current account balances in these countries especially due to higher dynamics in export performance (Kang and Shambaugh, 2013). Moreover, traditional deficit countries from the pre-crisis period seem to benefit from lower rates of GDP growth (they are not present in the second interval of our distribution of countries that are above estimated threshold) during post-crisis period as they have managed to run sustainable current account development.

5 Conclusion

Examination of determinants of the current account development revealed interesting implications of the demand-driven causes of excessive external imbalances in the Euro Area member countries and three non-Euro Area member countries. Our results generally confirmed deteriorating effect of the GDP growth on the current account. Moreover, estimated threshold for a GDP growth corresponds to recent empirical evidence on the deteriorating effects of fast economic growth on external equilibrium considering that the country may easily experience and even suffer from large current account deficits provided that the design of the GDP growth patterns is not accompanied by corresponding increase in the export performance.

We have estimated panel model with threshold effect as well. It seems that low rates of GDP growth have generally small deteriorating effect on the current account balance. However, higher rates of GDP growth that are above our estimated threshold level are associated with more intensive negative effect on the current account indicating acceleration of demand for

imports. Our results indicate that current account imbalances in the Euro Area during the pre-crisis period originate in the demand-driven economic policies especially in less performing countries at the periphery in the Euro Area. At the same time, the lack of competitiveness in the weaker part of the Euro Area and associated with low export performance even contributed to the emergence and deepening of external imbalances in the Euro Area. Significant deterioration in the real output growth rates during the crisis period clearly contributed to the improvement in the external imbalances especially in the weaker part of the Euro Area due to reduced demand for imports.

Lessons learned and policy implications that result from our key findings are based on designing sustainable economic policies that will improve competitiveness, increase export performance and possibly sacrifice higher rates of GDP growth that would, otherwise, deepen external imbalances with all related negative implications on macroeconomic stability and performance in the future. However, improvements in the bilateral current account imbalances between surplus and deficit Euro Area countries may require employment of appropriate common economic policy mix and possibly adjustments in the institutional architecture of the Euro Area to preserve sustainable long-term convergence of periphery Euro Area member countries to the core countries without occurring excessive external imbalances.

Acknowledgements

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Fiscal Federalism: Content, Models, Problems
(Experience of Russia)

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Abstract

At present, a wide range of problems in the field of fiscal federalism in Russia remains unsolved. These problems are the provision of inter–budgetary transfers, the delimitation of powers and sources of their financial support, etc. The purpose of the study is to analyze the theoretical and practical aspects of fiscal federalism in Russia. The article analyzes the content of fiscal federalism, its place and role in the system of public finance; considers the models of fiscal federalism and the experience of their application in Russia; reveals the shortcomings and problems of the existing model of fiscal federalism in the Russian Federation. No model of fiscal federalism appears to be a guarantee to overcome the problems in the field of public finance, not only because of its inherent limitations and shortcomings, but also because of the specifics of the sectoral and territorial structure of the economy, political, social, natural and climatic characteristics of each state. The effectiveness of fiscal federalism models can be achieved only in the context of an integrated approach, which provides an analysis of the strengths and weaknesses of the current model, its risks, as well as opportunities for development and improvement. The optimization of the current model of fiscal federalism should include: feasibility of desired goals; internal consistency of goals and objectives; ensuring the consistency with the budget policy, as well as with the priorities of socio-economic development; consideration of the territories' specificity; analysis of the experience and practices of other countries.

Keywords: Fiscal federalism, Models of fiscal federalism, Russia.

JEL Classification: E620

1 Introduction

The creation of an optimal model of fiscal federalism in the system of problems associated with the development of public finance in the Russian Federation is definitely a relevant aspect. During the period 1991 - 2017, the conceptual and practical aspects of the organization of budget relations in the Russian Federation have undergone significant changes. These changes, in our opinion, have not always been consistent and logically linked with the overall strategy of the financial system of the state.

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Without denying the significant results achieved in the field of optimization of the mechanism of financial interaction between different levels of government, we should note that currently there is a wide range of problems in the field of fiscal federalism. These problems include the differentiation of powers and sources of their financial support, the provision of inter-budgetary transfers, the creation of incentives to improve the quality of management of regional and municipal finances, etc.

The research of the problems of fiscal federalism is studied in the works of many economists: Inman R. P., Musgrave R. A., Oates W. A., Qian Y., Rodden, J., Shah A., Weingast B. R. and others.

Despite the fact that the works of these and other scientists have made a significant contribution to the development of fiscal federalism, there are many issues that require further analysis.

The combination of the above mentioned circumstances determines the relevance of the study in the field of fiscal federalism, covering both theoretical issues and applied aspects related to the analysis of the current system of fiscal federalism in the Russian Federation.

The aim of the research is to analyze the theoretical and practical aspects of fiscal federalism in the Russian Federation.

In accordance with the aim of the study, the following objectives are set:
- to reveal the content of fiscal federalism, its place and role in the system of public finance;
- to analyze models of fiscal federalism and experience of their application in Russia;
- to consider the shortcomings and problems of the existing model of fiscal federalism in the Russian Federation.

The subject of the research is the system of economic relations arising between public law entities arises between the redistribution of financial resources in order to minimize vertical and horizontal imbalances and create conditions for effective management of budgetary funds.

2 Methods of research

2.1 Content analysis of fiscal federalism

Many Russian and foreign studies have shown that the basis for any changes in the sphere of improving budget relations is an economically justified division of powers and the presence of coordination mechanisms in the sphere of financial and budgetary issues.

The optimal division of powers between public authorities and local authorities, the differentiation of sources of financial support, as well as the formation of effective methods of redistribution of funds are the problems with the solution that is based on the study of the foundations of fiscal federalism.

Despite the fact that the concept of «fiscal federalism» has been used in Russia for almost twenty years, there are no unambiguous approaches to its interpretation.

The interest in the economic and, in particular, financial aspects of fiscal federalism arose in the middle of the XX century. During this period, there were works, the authors of which

tried to reveal the laws of fiscal federalism, to study the conditions that determine the priority of decentralized management model over centralized one[4].

Special literature on the genesis of scientific ideas about federalism reveals the classifications of theories of federalism, for example, their division into concepts of the first and second generation. It is obvious, that this classification is rather conditional, but it allows us to see how the scientific views on the content of federalism have changed and developed. The fundamental classification feature in this case is not the period of the concept, but its methodology and content.

Thus, Weingast B. emphasizes that the first generation of the theory of fiscal federalism is primarily normative and considers the rules and principles that should lead to an increase in the efficiency of the public sector (Weingast, 2009). At the same time, the second generation of the theory of fiscal federalism focuses on the identification of factors that explain the real processes taking place in the public sector. Weingast B. also gives examples of works related to the theory of fiscal federalism of the first[5] and second[6] generations (Weingast, 2009).

In general, the so-called theories of the second generation is characterized by a comprehensive approach, while the theory of the first generation consider a smaller number of arguments in favor of (and against) decentralization. The very concept of decentralization in the works of the second generation is also not limited to the area of public services, and covers the entire system of public management. The second generation studies include the achievements of the economic theory of the second half of the XX century, revealing the problems of information asymmetry, as well as the impact of non-economic factors on the degree of decentralization of management. The works of the first generation consider some «ideal» model of federalism, isolated from the influence of irrational behavior of individual economic entities and the initial conditions that determine the limitations and difficulties of decentralization.

In Russia, the theory of federalism began to develop much later than abroad. Issues of decentralization of management, including public finance, became the object of scientific interest of Russian scientists in the early 1990s, due to the historical features of political and economic development of Russia. The terminology and basic ideas of the theory of federalism were borrowed from foreign scientific publications, but the directions of Russian and foreign studies in this area are somehow different. For example, the works of foreign researchers to a lesser extent than the works of Russian economists reflect such theoretical issues as the essence of fiscal federalism, the principles and components of its content, the correlation of fiscal federalism with other categories.

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There is no legal act giving a clear definition of fiscal federalism in Russian legislation. The proposal to consolidate this term in the Budget Code of the Russian Federation was rejected. This did not affect the scientific and practical interest in the problem of formation and development of fiscal federalism in Russia. In 2001, the Government of the Russian Federation approved the program of development of fiscal federalism in the Russian Federation for the period up to 2005.

There is no clear definition of fiscal federalism in this document. It is defined as «a system of budgetary structure that allows regional authorities to conduct an independent fiscal policy within the framework of legally established budgetary powers» [9]. In addition, the structure of the Program allows the identification of the basic components of fiscal federalism - the budgetary structure, the rights and obligations of public entities on the formation and execution of their own budgets, the separation of powers in the sphere of expenditures, the division of tax powers and sources of budget revenues, the provision of inter-budgetary transfers.

The above mentioned structural elements in different forms are considered by almost all scientists who study the problems of fiscal federalism, which, however, does not ensure the unity of views on the content of this category.

The main approaches to the interpretation of fiscal federalism are the following:
- fiscal federalism as relations between authorities;
- fiscal federalism as a form of budget structure;
- fiscal federalism as a division of powers between authorities (management bodies) on different levels;
- fiscal federalism as a concept (ideology) of formation of the system of budget relations.

It is definite that the existence of different approaches to the definition of fiscal federalism is a consequence of the complex nature of this category. Without denying the scientific interest that each of the interpretations of the fiscal federalism, we should note that many of the proposed and justified provisions are not indisputable.

For example, the definition of fiscal federalism as social relations is not quite correct. Such an approach is contrary to the concept of federalism, which is considered as a form of government. It is more logical and methodologically correct to talk about the impact of the form of government on the system of social and economic relations formed in the state.

We share the position of scientists who consider fiscal federalism as a form of budgetary structure in a federal state. We propose to consider fiscal federalism as a form of building the state's budget system and a set of legally enshrined principles of the organization of budgetary relations arising between public-legal entities on the issues of division of powers and financial support for their implementation, aimed at achieving a balanced economic development and creating conditions for the qualitative performance of tasks and functions by public-legal entities.

2.2 Analysis of models of fiscal federalism

The essence of fiscal federalism is revealed in the unity of two opposite but interrelated categories - centralization and decentralization. Any system of government, including the federal one, is a combination of both decentralization and centralization.

The results of the research allow us to identify at least three groups of prerequisites that determine the priority of a decentralized model over a centralized one.

The first group presents the historical conditions for the formation of the state and the tradition of governance. Regardless of the reforms undertaken by the state, these traditions are maintained in an explicit or implicit form and in any case affect the trajectory of development and political system of the economy and administration of the country.

The second group presents the factors that determine the economic feasibility of decentralization. Central place in that system has the possibility of better inclusion of the preferences of the population when making the decision on the allocation of limited economic and financial resources, thereby reducing the cost of unmet needs.

Political reasons form the third group of prerequisites that determine the comparative advantages of decentralized governance. Their influence reflects in the formation of a balance of political forces at the levels of power and the possibility of inclusion of diverse political positions.

There are a number of other arguments in favour of decentralization of power. In general, it can be said that the proponents of the second generation of the theory of fiscal federalism consider federalism primarily as one of the tools of limiting the power of the state along with the horizontal separation of powers, democratic mechanisms, etc. (Qian and Weingast, 1997).

We should note the mismatch of management in solving certain socially important issues, the increase in costs due to the lack of economy of scale, the appearance of external negative effects due to deliberate and unconscious actions of the authorities (management) of the regions, the risks of increasing disparities in territorial development are among the shortcomings of decentralization (siluans, 2011). The concentration of individual management functions at the federal level can minimize these adverse effects of decentralization.

The variety of systems of fiscal federalism has determined the need for their classification on certain grounds. According to one of the most common approaches, there are three models: competitive, cooperative and mixed that represents the synthesis of both mentioned models.

The competitive model of fiscal federalism is characterized by a high degree of autonomy (independence) of regional authorities in the management of the relevant territory, including the formation of budgets, budget regulation, etc. The powers of authorities of different levels are clearly delimited, and the range of issues related to the joint competence is rather minimal. The regulation of budget revenues is based on the principle of «one tax - one budget» (the principle of separate taxes). Regional authorities have broad powers to develop and implement fiscal policy, including the establishment of taxes on income, property and turnover, regardless of the measures taken by the federal government in this area; the regulation of tax rates, the provision of tax incentives and preferences. The consequence of this refers to a significant differentiation of regions by the nature of their tax policy and taxation conditions, and accordingly, by the level of investment attractiveness (Khristenko, 2002).

The system of equalization of budget provision is absent or developed to a minimum extent. Ensuring the balance of regional budgets and achieving an equal (average) level of budget provision is not the task of the federal centre. Inter-budgetary transfers play a minor role in the formation of regional budget revenues. The provision of inter-budgetary transfers is dependent (to a small extent) on economic development indicators and is based on the program-target method. Funds are allocated for the implementation of development programs on a competitive basis. Thus, inter-budgetary transfers operate mainly stimulating and leveling function.

The advantages of this model include incentives for the territories to conduct an independent, responsible financial and socio-economic policy, broad opportunities for the development and use of the economic potential of the territory. Competitive fiscal federalism virtually eliminates duplication of powers, which, on the one hand, saves money in the public administration sector, and on the other reduces the likelihood of contradictions between federal and regional policies.

However, this model, like any other, has its limitations and disadvantages. An excessively high level of autonomy in public administration and, in particular, tax policy, can lead to a violation of the unity of the economic space and the development of separatist tendencies. In addition, there are risks of social discontent and tensions arising from unequal access to social benefits.

The model of cooperative fiscal federalism presupposes much less independence of regional authorities. Many issues, such as the development and adoption of tax legislation, are addressed through the interaction of authorities at various levels, which ensures the interests of the federation's constituent territories. The scope of joint competence is wider than in the conditions of competitive budget federalism. This means the common practice of joint solution (equity financing) of both regional development projects and national tasks (Khristenko, 2002).

The authorities at the regional level have minimal powers on fiscal regulations: they do not have the right to determine the conditions of collection of taxes (including adjusting tax rates). In the system of taxes there is a prevalence of «joint» taxes, which are distributed between budgets according to the norms. An important role in the regulation of budgets has a system of inter-budgetary transfers, providing horizontal and vertical alignment.

The main advantages of the cooperative model are the guarantee of equal access to social benefits regardless of place of residence and the creation of conditions for balanced economic growth, which has a positive impact on the citizens' living standards.

The main drawback of the model is related to inability to create sufficient incentives to improve the quality of public finance management to economically developed or depressed regions. The first group of regions is limited by the mechanism of redistribution of financial resources accumulated in their territories in favor of the least well-provided regions. These regions have a low activity in the strengthening of the tax potential and efficiency of costs, since their low level of security can guarantee them a greater income than their own fiscal efforts.

Modern research in the field of national features of fiscal federalism proves that, in practice, no country in the world has developed a system that fits perfectly into the framework of a particular model (Inman and Rubinfeld, 1997). At the same time, in some countries there is a clear predominance of signs of cooperative or competitive federalism, while in other countries a kind of balance of elements for both models is achieved (Siluanov, 2011). In this case, it is possible to talk about the so-called mixed model.

Continuing to consider the model of fiscal federalism, we should note that there is a certain interest to classification that is based on the criterion of compliance with the principle of equality. This criterion allows distinguishing the symmetric and asymmetric federations. This asymmetry can be both political and economic one.

The politically asymmetric model of fiscal federalism provides the granting of special status to individual territories. This fact provides for a more favorable regime in the field of fiscal regulation, preferences in relations with the federal center. For example, it is expressed by the empowerment of these members of the federation with greater authority in economic regulation. The economically asymmetric model of fiscal federalism presupposes the division of regions depending on the level of economic development and the use of different schemes and methods in budgetary relations with them. For example, it is expressed by the use of different approaches in the provision of inter-budgetary transfers, the distribution of tax revenues, etc.

The symmetrical model provides for the principle of equality in the political and economic aspects. Its prerequisite is the transparency, clarity and unambiguity of the interpretation of the budget legislation, which establishes the budget powers of public law entities, the order of formation of revenues and expenditures of their budgets, the principles, conditions and methods of distribution of inter-budgetary transfers.

No model of fiscal federalism appears to be a guarantee of overcoming problems in the field of public finance, not only because of its inherent limitations and shortcomings, but also because of the specifics of the sectoral and territorial structure of the economy, political, social, natural and climatic features of each state. That is why all attempts to copy models, successfully implemented in foreign countries, often do not provide the planned result and in some cases increase existing imbalances.

3 Results and discussion. Experience in application of various models of fiscal federalism in Russia and the problems of development at the present stage

Inefficient use of budgetary funds, insufficient accuracy of financial and budgetary forecasts and plans, high risks of loss of fiscal sustainability under the influence of environmental factors and internal contradictions of the Russian economy, inconsistency of financial regulation instruments and other elements of public administration were the most relevant problems of public finance in 1990-2000.

During this period, the asymmetric model of fiscal federalism was developed in Russia. A differentiated approach to the allocation of regional authorities with state powers was activelyused in Russia in the 1990s. The system of relations between the federal center and the constituent territories of Russian Federation at that time is also called «contractual federalism», since the order, mechanisms of inter-budgetary interaction and issues of income

differentiation between the federal budget and the budgets of the constituent territories of Russian Federation were largely regulated by bilateral agreements.

It is rather difficult to give an unambiguous assessment of asymmetric federalism. There is no direct relationship between the principle of equality and the level of socio-economic development of the country. In the Russian Federation, the application of the concept of asymmetric federalism in practice has led to the deepening of structural and territorial imbalances of development and the resulting problems of socio-economic nature. In other countries, such as Canada, where the asymmetric model has been applied, there is also a gap in the level of economic development and fiscal capacity of the territories. However, firstly, the reason for these imbalances is not only the asymmetry of budget powers, but also the impact of natural and climatic factors, the historically established structure of production and population. Secondly, the gap is not critical and does not affect the dynamics of the economic development of the state. Canada is one of the countries with favorable living conditions for the population and a relatively high GDP per capita[74].

Thus, the state that has developed an asymmetric model of fiscal federalism, can be characterized by both positive and negative development trends.

In Russia, the need to overcome the negative consequences caused by the use of asymmetric model of fiscal federalism, led the development of a comprehensive financial reform started at the beginning of the XXI century. In 2001, a program for the development of fiscal federalism in Russia was developed and adopted, which laid the foundations of a mixed model.

The mixed model of fiscal federalism in Russia includes the following features:
- separation of powers, taking into account the criteria of subsidiarity and external effects;
- combination of separate and joint taxes;
- establishment of taxes at the federal level and granting regional authorities the powers to regulate tax rates, tax benefits and other tax conditions;
- application of mechanisms of vertical alignment of budget provision, the use of competitive principles of distribution of inter-budgetary transfers.

Without denying the significant results were achieved in the field of optimization of the mechanism of financial interaction between public legal entities for the period 2000-2014, but we should note that currently there is a large range of problems.

These problems include the following:
The imbalance between the scope and nature of the powers conferred on regional authorities and the means at their disposal.
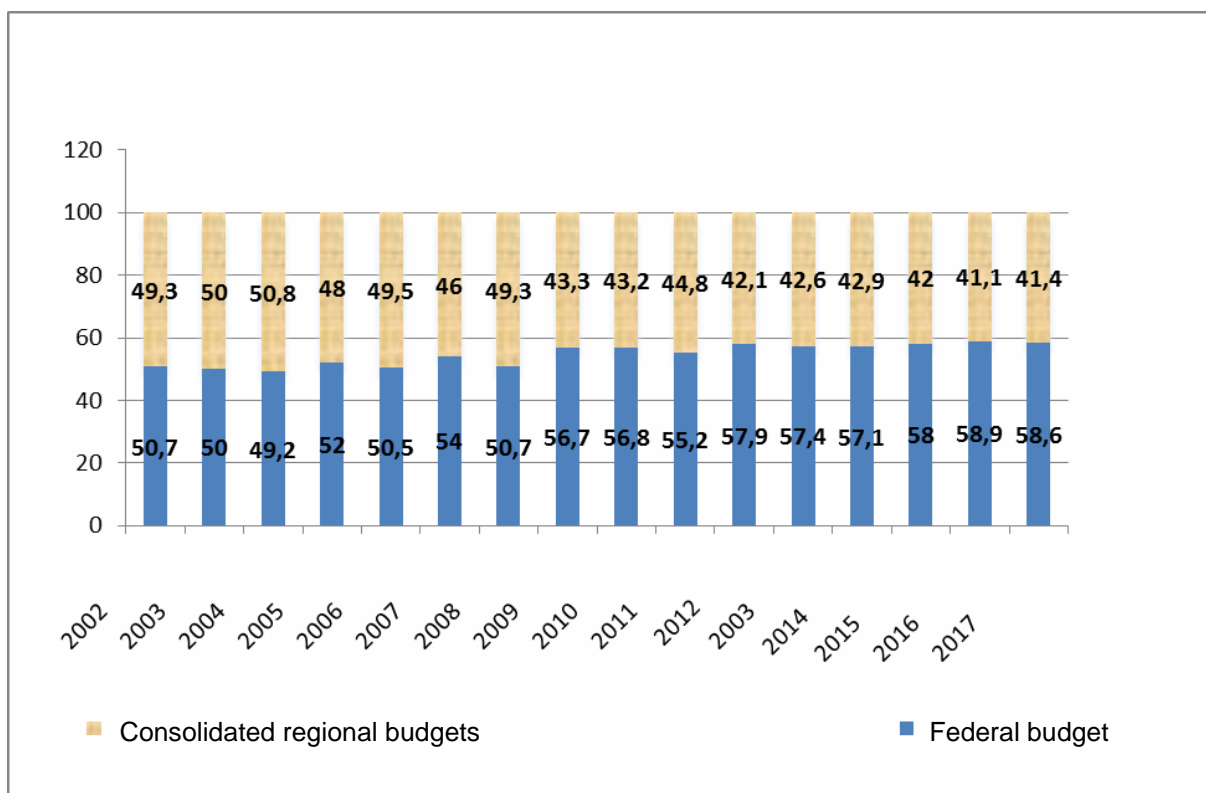
Figures 1 and 2 show the share of revenues and expenditures of the consolidated budgets of the RF constituent territories in the income of the consolidated budget of the RF.

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[7] In 2014, Canada ranked 20th in terms of GDP per capita. For comparison: Germany ranked 18th, Japan ranked 28th, the Russian Federation ranked 49th. GDP based on purchasing-power-parity (PPP) per capita
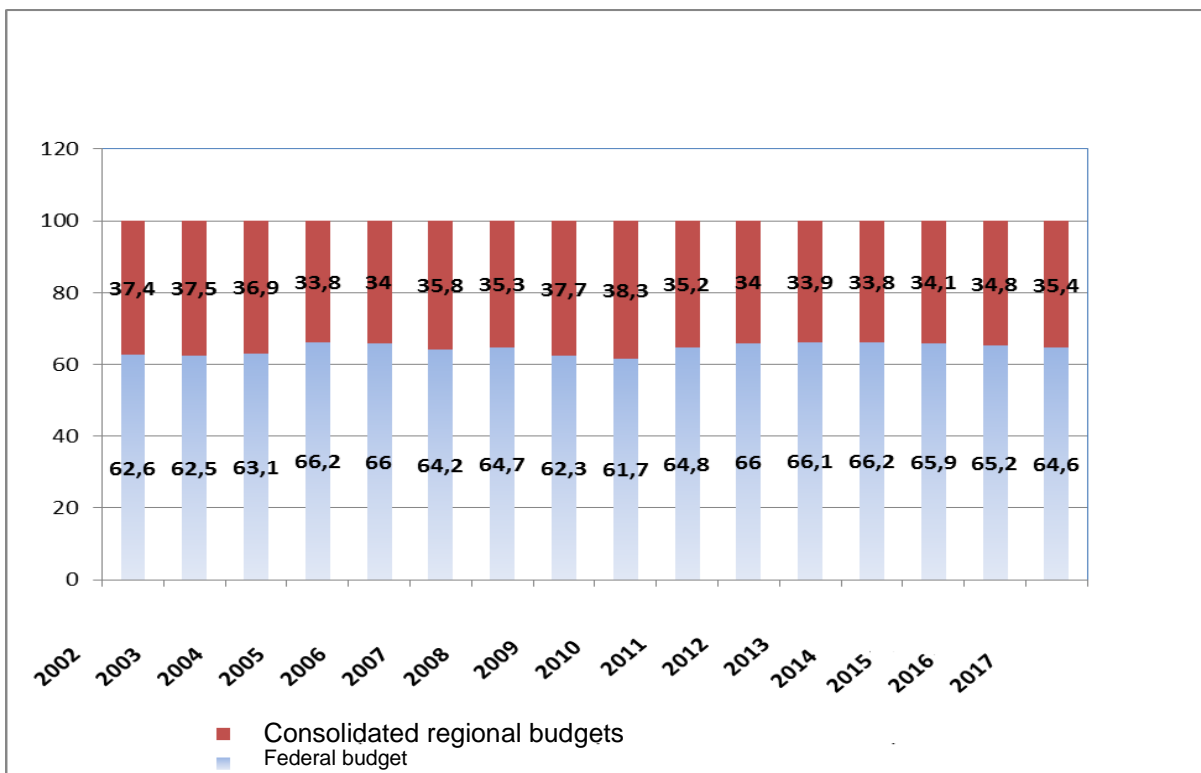
Figure 1 - Share of revenues of the consolidated budgets of the RF constituent territories and the federal budget in total revenues of the consolidated budget of the RF, %
Source: http://protown.ru/information/hide/6386.html

Figure 2 - Share of expenses of the consolidated budgets of the RF constituent territories and the federal budget in total revenues of the consolidated budget of the RF, %
Source: http://protown.ru/information/hide/6386.html

As we can see from figure 1, the proportions of income distribution between the Federation and regional authorities for the period of 2002-2017 are as follows: in different years, from 33.8% to 38.3% of the consolidated budget revenues of the Russian Federation are accounted for the regions' share. According to the figure 2, the proportions in the distribution of expenses are much higher: for the same period of time from 41.1% to 50.8% of the total expenditure of the consolidated budget of the Russian Federation is accounted for the regions' share.

Since 2014, additional changes are envisaged in the differentiation of revenues between budgets of different levels, but none of the planned measures is aimed at strengthening the revenue base of the budgets of the Russian Federation.

Imperfection of the system of inter-budgetary transfers provided to regional budgets from the federal budget in terms of structure, distribution methods and final results.

Since none of the models of fiscal federalism provides an absolute horizontal and vertical balance, the central place in the system of relations between the federal and regional levels of power belongs to the formation of the optimal mechanism of funds' redistribution with the help of inter-budgetary grants. Oates W. A. it identifies three main goals, which are aimed at achieving the use of inter-budgetary grants. These are: the reduction of negative external effects arising in the form of overflow of benefits from the decisions of the authorities of one region to other regions, equalization of the level of budget security of subnational entities (horizontal alignment), as well as the elimination of imbalance in the tax system (vertical alignment) (Oates, 1999). In addition to the above three reasons, modern studies may consider other purposes of using inter-budgetary transfers (for example, smoothing economic shocks in certain regions) (Shah, 2007).

Despite all the transformations in this sphere, the system of inter-budgetary transfers in the Russian Federation remains suboptimal. Table 1 shows the dynamics of inter-budgetary transfers for 2014-2017 from the federal budget of the Russian Federation to the budgets of the RF constituent territories.

Table 1 - Dynamics of inter-budgetary transfers in 2014-2017

Indicator	2014	2015	2016	2017
Inter-budgetary transfers (total), mln. RUB.	**1 577 390,5**	**1 556 282,5**	**1 451 282,3**	**1 628 623,9**
% GDP	2,2	2	1,7	1,8
% total expenses of federal budget	**11,3**	**10**	**8,9**	**9,5**
including:				
Grants, mln. RUB.	**747 124,3**	**659 378,4**	**657 368,7**	**689 557,5**
% in total sum	47,3	42,4	45,3	42,3
Inter-budgetary subsidies, mln. RUB.	**397 446,9**	**361 633,1**	**298 471,5**	**357 935,6**
% in total sum	25,2	23,2	20,5	22
Subventions, mln. RUB.	**338 536,3**	**329 378,8**	**321 755,4**	**325 154,1**
% in total sum	21,5	21,2	22,2	20
Other inter-budgetary transfers, mln. RUB.	**94 283,9**	**205 892,2**	**173 686,7**	**255 976,7**
% in total sum	6,0	13,2	12	15,7

Source: «On the Execution of the Federal Budget for 2014»: Federal Law No. 847442-6 of 25.07.2015
«On the Federal Budget for 2015 and the Planning Period of 2016 and 2017»: Law of the Russian
Federation of December 1, 2014 - Federal Law No. 384.

The share of inter-budgetary transfers of equalizing nature (grants) is 42-47% of the total amount transferred to the budgets of constituent territories of the Russian Federation. In addition, these problems also include: the instability of the regulatory legal and methodological framework for the distribution of inter-budgetary transfers, frequent changes in the order of their calculation and provision; a significant number of inter-budgetary transfers; their granularity (i.e., focus on solving highly specialized, specific task) to warrant the granting of several types of transfers that are similar in their purpose etc. (Tishutina, 2015).

The low level of budget autonomy of the Russian regions, which is manifested in the high dependence of regional budgets on inter-budgetary transfers from the federal budget and the limited rights to use the provided funds. In addition, in the conditions of providing the constituent territories of the Russian Federation with sufficiently broad budgetary powers, there is a significant differentiation of regions in terms of the level of budget provision (table 2).

Table 2-Horizontal imbalance of regional budgets of the Russian Federation in 2011-2016

Indicators	Differentiation assessment, times
Ratio of budget provision between 10 most provided (rich) and 10 least provided (poor) constituent territories of the Russian Federation (before inter-budgetary equalization)	*6*
Ratio of budget provision between 10 most provided (rich) and 10 least provided (poor) constituent territories of the Russian Federation (after inter-budgetary equalization)	*2,5*
Difference in GRP per capita between 5 regions with maximum and minimum indicators	*18*

Source: http://quote.rbc.ru/macro/news/2010/09/15/380150.shtml

In 2011-2016, the gross regional product (GRP) per capita in five regions with a maximum value of 18 times was higher than its value in five regions with its minimum value. The gap between the constituent territories of the Russian Federation in terms of per capita cash income and average monthly wage is estimated in five times. This aspect definitely leads to the differentiation of the constituent territories of the Russian Federation in terms of tax potential and the concentration of the predominant part of income in the budgets of a relatively small number of regions. Thus, according to the data provided in the «Creating Conditions for Effective and Responsible Management of Regional and Municipal Finances, Increasing the Stability of the Budgets of the Constituent Territories of the Russian Federation» state program, 10 regions with the most developed economy accumulate about 45% of tax revenues credited to the consolidated budgets of the constituent territories of the Russian Federation (Government of the Russian Federation, 2013).

The above-mentioned problems show that the application of the mixed model of fiscal federalism for more than 10 years did not fully overcome many negative consequences.

The complexity of solving these problems at the present stage is associated with the need to achieve a balance between several multidirectional goals. On the one hand, currently in the Russian Federation the emphasis is made on competitive mechanisms to support the regions, which in many cases involve competition. On the other hand, the priority is to ensure equality of financial opportunities of the constituent territories of the Russian Federation and to reduce their differentiation in terms of budget provision.

In practice, the most difficult question is to determine the relations between the elements of cooperation and competition. In particular, a high degree of competition is put forward against

the social arguments in the field of public finance, such as the risks of occurrence and deepening of imbalances in the level of social benefits available to residents of various territories, as well as the level of population income, due to these circumstances, the migration of the population to more developed and economically sustainable regions.

In case of solving these problems, it seems appropriate to analyze the world experience of the development of fiscal federalism, its more careful, critical study, both in terms of achievements and problems encountered in the development and practical implementation of certain models and tools of fiscal federalism.

4 Conclusion

The content of fiscal federalism, the experience of various models of fiscal federalism in Russia and the problems of development at the present stage, allow us to draw conclusions of the following nature. The effectiveness of the model of fiscal federalism can be achieved only in the context of an integrated approach, which provides an analysis of the strengths and weaknesses of the current model, its risks, and opportunities for development and improvement.

The optimization of the current model of fiscal federalism should include: feasibility of desired goals; internal consistency of goals and objectives; ensuring the consistency with the budget policy, as well as with the priorities of socio-economic development; consideration of the territories' specificity; analysis of the experience and practices of other countries.

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Business, Entrepreneurship and Start-ups

Is remanufacturing a right step for the solution of the world's ecological problems?

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Abstract

Sustainability means securing the company's long-term success while at the same time helping protect the environment for current and future generations. The interviewed company operating in the automotive industry also focuses on developing products that protect the environment and conserve resources. This makes ecological concerns an engine of innovation and shapes the foundation of the business success of the automotive companies. The objective of the paper is to find out the framework conditions in which the remanufacturing of vehicles and their components makes sense both ecologically and macro-economically. Remanufacturing (Reman) is ecological only if the positive contribution to climate change through the use of old parts is higher compared to the negative contribution to climate change, because of the additional logistics and added value share. As part of the supply chain management, the Reman process is to be classified as part of the closed loop supply chains. In this context, closed loop supply chains include forward-looking supply chains, which include, for example, raw material extraction, production and assembly, as well as the backward supply chains, which are used to bring products back into their original value chain. Throughout the Reman process, cores should not be considered as scrap but as valuable material. Therefore, the cores with the "back in box" concept are to be supplied to remanufacturer. The aim is to supply the cores to the Reman process without further damage and thus to reduce the material costs for new parts. Our research shows that Reman of the examined products can reduce by a significant amount the environmental impact.

Keywords: Corporate social responsibility, Sustainability, Remanufacturing, Business strategy.

JEL Classification: L62, M11, M14, Q20, Q51

1 Introduction

The industrial process of remanufacturing represents an option for the reprocessing of products, which aims to extend the service life. Here, the so-called cores are transferred by a series of refurbishment processes and replacement of non-repairable components by new components in a state in which they meet the requirements of a new product in terms of function, performance and appearance (Toptas, 2018). CLEPA European Association of Automotive Suppliers defines cores as previously sold, used or defective products or components intended for the remanufacturing process. In addition to the restored functional and optical properties, remanufacturing products generally have the same warranty conditions as new products, demonstrating qualitative equivalence and, among other things, the application of standardized manufacturing techniques (CLEPA European Association of Automotive Suppliers, 2016).

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With the remanufacturing of products, we can bring a contribution for material saving and this is reducing C02 emissions in comparison to new parts.

The term remanufacturing is to be distinguished (Boston University, 2003) here from those of other processing variables such as, for example, the reconditioning, the repair or the simple reuse of components and products ("fit and function"). The main differences lie in the degree of dismantling of the products (repair time), the process capability of the manufacturing processes used and the quality requirements for materials and components. At these three levels, Reman has the highest quality standards compared to other methods of work-up (Thierry et al., 1995).
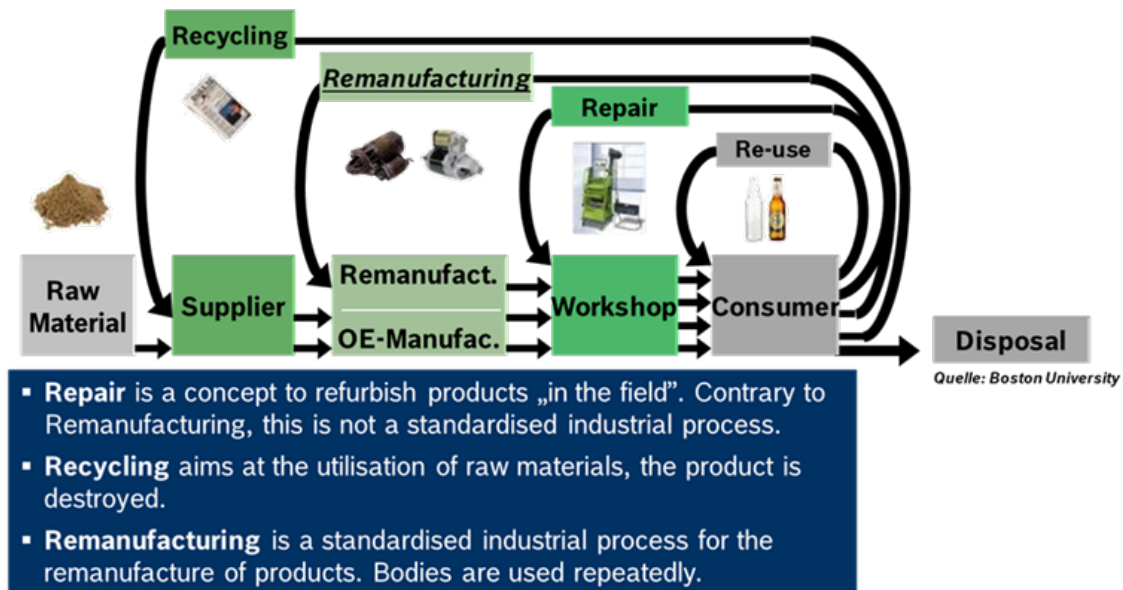
Figure 1 Distinction Remanufacturing vs. Repair & Recycling
Source: Boston University, 2003

As part of the supply chain management, the remanufacturing process is to be classified as part of the closed loop supply chains. According to Seitz (2005), a supply chain consists of several "companies that have material, financial, and information flows between them to ensure the delivery of goods to their customers."

In this context, closed loop supply chains include forward-looking supply chains, which include, for example, raw material extraction, production and assembly, as well as the backward supply chains, which are used to bring products back into their original value chain.

Since the products of the remanufacturing process (Walther, 2010) are made from products that have completed at least one product life cycle and are offered in the same market as the corresponding new products, this is thus located in the area of the backward supply chains (Köhler, 2011).

The goal of this paper is to find out the framework conditions in which the remanufacturing of vehicles and their components is ecologically meaningful. In the context of this paper, the so-called global warming potential was chosen as the basis for the evaluation of the ecological effects, which is the most common method for assessing environmental effects and is given in the unit CO2 equivalents (CO2-eq for short). The global warming potential is the influence that

the emission of substances and chemical compounds has on the atmosphere and thus on the global warming, normalized to the influence of the greenhouse gas CO2.

2 The Process of Remanufacturing in Automotive Sector

Remanufacturing is used today in a wide variety of industries. For example, the core sectors in Europe can be identified as aerospace, automotive, and medical technology. The aftermarket in the automotive sector covers all repair, maintenance and servicing activities for the EU network of vehicles on the road. The European Association of Automotive Suppliers (CLEPA) estimates remanufacturing in this sector is worth €8-10 billion of retail sales, with 27 product groups able to be remanufactured. CLEPA also reports there is potential to reduce CO2 emissions in the EU-27 by 400,000 tonnes. Remanufacturing in this sector is assessed as employing 32,000 people in the EU-27 and employment is increasing as remanufacturing expands. The vehicle components come from the various business sectors as shown in the following figure.
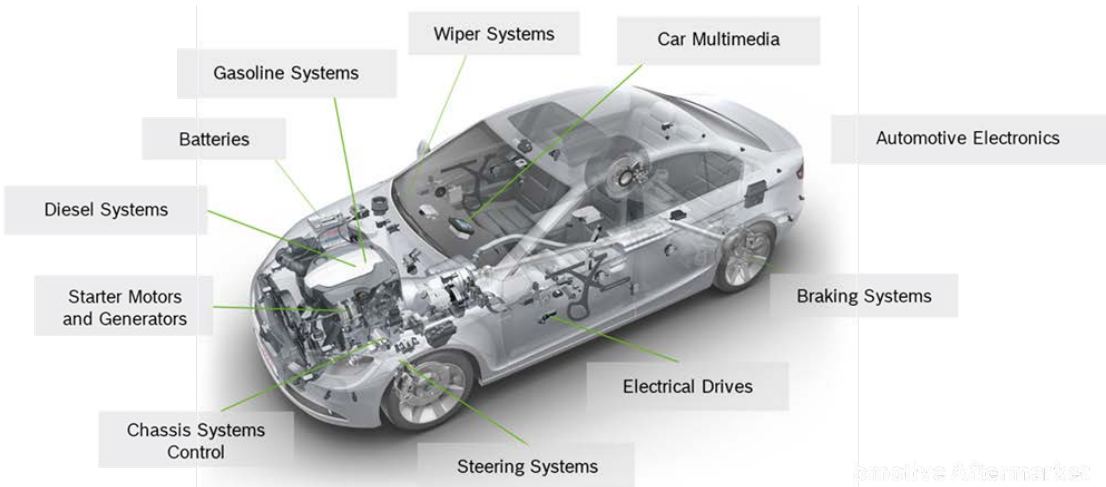
Figure 2 Vehicle components
Source: Toptas, 2018

In general, actors in the remanufacturing industry have to differentiate between the so-called Original Equipment Manufacturers (OEMs), i.e. the companies that produce and distribute the corresponding new products, and non-OEMs. OEM remanufacturing companies have the opportunity, through their activity as original equipment manufacturers of many car manufacturers as well as through their aftermarket organizations, to provide the cores that are essential for the series repair, for example motivated by a deposit system continuously, which is a reliable source. For non-OEM remanufacturing companies, on the other hand, it is possible to obtain the cores directly from the consumer or to obtain the resource for the remanufacturing process via so-called core brokers.

The motives for a remanufacturing company are manifold. Primarily, remanufacturing offers the possibility of offering customers a product that is market-driven for their needs, as a price-reduced alternative to a new one. The reduction of energy consumption and pollutant emissions through the longer use of products and materials contributes to this.
In this way, efforts are being made to counter the depletion of natural resources as a result of rising energy consumption in industrialized and developing countries, without neglecting the demands that customers place on the products. Furthermore, it can be ensured in this way that "advanced materials, including those declared as critical materials", such as silicon, chromium or magnesium, are retained longer within the economic cycle.

In addition to the incentives outlined above, companies are offering further economic potential through the use of remanufacturing. In remanufacturing, one can see opportunities for companies to cut costs by saving on materials. Furthermore, an application of remanufacturing could possibly have a positive effect on the perception of the company by the customer and thus on the acceptance of the company in public. Another potential for cost savings is in the use of used products, as this represents a "valuable source of components". The use and processing of these components reduces the cost of production, which results in a lower price on the market when sold, and thus an advantage for the end customer.

The process of remanufacturing is divided into the five process steps of dismantling the cores, cleaning, testing and repairing or processing the components and final assembly of the product (Priyono, Ijomah, & Bititci, 2015). The production takes place here order-related and divided into corresponding production lots. After dismantling the cores, their components are sorted, i.e., detached from the original core, forwarded and rejoined only during the final assembly, whereby a repaired product usually contains components from different cores (Seitz, 2005). The individual process steps and the production techniques they contain are described in more detail in the following chapters.

2.1 Core Management

The customer informs Remanufacturer that used parts are ready for collection by the regional freight forwarder (Toptas, 2018). The area carrier picks up the cores and delivers them to the regional read stations, where they are identified and evaluated. The regional read stations send the pre-rated cores to the central core sorting center where the final cores are evaluated according to the return criteria. The recognized cores have a deposit value, which is credited to the customer after a positive evaluation within a week (Toptas, 2018).

Throughout the Reman process, cores should not be considered as scrap but as valuable material (Hatcher, Ijomah, & Windmill, 2011). Therefore, the cores with the "back in box" concept are to be supplied to Remanufacturer. The aim is to supply the cores to the Reman process without further damage and thus to reduce the material costs for new parts. The basis for a successful remanufacturing represents the availability of the cores. Thus, the unavailability of cores that is consciously or not deliberately evoked is an important criterion. Therefore, Reman will only become possible after about 3-5 years after a standard operating procedure (SOP) of the products.

For this reason, the availability of the cores is rather small compared to the demand at the beginning of the product life cycle and steadily increases with time.

According to Toptas, the Core quota (Cq) = Core rate is calculated as follows:

$$Cq = \frac{Number\ of\ dismantled\ cores}{Number\ of\ Reman\ products} \qquad (1)$$

The core quota is usually > 1. The higher the core rate is, the higher the overhead for the following processes of remanufacturing. But that means that the sum of the required new components is low. If the core quota is <1, then of course this means that the sum of the required new components is greater and the effort for the serial upgrade is rather low.

2.2 Disassembly of the Cores

In the first process step of remanufacturing, the cores are disassembled non-destructively into their individual components using screw driving processes (Toptas, 2018). Subsequently, assemblies and components are forwarded sorted to subsequent processes. Furthermore, wear and small parts, such as screws, ball bearings or nuts, replaced to 100% and fed together with the defective and non-reusable components and assemblies of waste treatment (Priyono, Ijomah, & Bititci, 2015).

Since core sorting is carried out centrally within a company, disassembly in the factory processes is the first process step, which must be carried out if one speaks of a series repair. Dismantling involves the sum of all the processes required to disassemble a product into assemblies and, if required, into components. Upon disassembly, the individual assemblies and components will not be assessed for usability unless they are deemed non-reusable by the development department (e.g., ball bearings, due to life-cycle impact) or are clearly damaged to the extent that reuse is ruled out.

Depending on which products are dismantled, the manufacturing processes for de-assembly may be different. Thus, screw release processes, dis-soldering, release of welded joints, expressions of ball bearings, components of disassembly can represent. The depth of disassembly of the products, assemblies, and components can also be different from the availability of the components and the employee costs.

Since the products are structurally very different and are subject to different loads due to their use in the field, most dismantling processes are carried out manually or semi-manually (Köhler, 2011).

2.3 Cleaning the Components

The assemblies and components already sorted in the disassembly step are fed to different cleaning processes in the second process step (Toptas, 2018). The basis for downstream jet cleaning processes is first of all the degreasing of the components with hydrocarbon (HC, technical alcohol). Following are various blasting processes with different blasting media, such as glass, ceramics or corundum, mainly the removal of rust, dirt and possibly paint residues. The cleaning methods and blasting media are adapted to the respective components, so that damage during the process can be avoided.

All assemblies that are routed to the various cleaning processes after disassembly are cleaned according to the specifications defined by the process development. The cleaning processes are dependent on various factors, such as material, geometry, type of contamination, etc., and can also pursue different goals.

The main objectives in cleaning are exemption of dirt and grease, loosening of rust and scale. If possible, all objectives are fulfilled by means of a cleaning process, if this cannot be implemented in one process, several cleaning processes can and must be carried out consecutively. As a rule, chemical cleaning agents, liquid media with high temperatures and pressure are used, so the environmental impact of this process is expected to be high.

Upon completion of the cleaning processes, both the result of the cleaning and the reusability of the assemblies and the components are evaluated. The test methods that are used are essentially non-destructive and manual test methods such as visual inspections by employees,

since the mechanized and automated test methods have not been economically feasible due to the variety of products and their components and their variety of test criteria.

2.4 Checking the Components

Following the above-described cleaning of the individual components and assemblies they are forwarded to the so-called module repair. Here, they are first visually inspected according to their specifications, then electrically and / or mechanically tested for reusability.

2.5 Processing of the Components

The components and assemblies identified as reusable in the previous process step of the test are subjected to work-up in the fourth process step of remanufacturing. Hereby, using standard working methods, all wearing parts, e.g. carbon brushes, bushes and bearings are replaced and fixed during the test defects found to ensure the required residual life (Priyono, Ijomah, & Bititci, 2015). Manufacturing processes which are used in this case are, for example, the welding or soldering of connecting elements in electrical lines, as well as machining manufacturing processes for the treatment of surfaces (Sundin, Bras, 2005). The refurbished components are again tested electrically and / or mechanically according to their specifications following the respective process.

In the workup, the goal is pursued, the components that are currently not usable to make usable by replacement processes and thereby reuse the assembly. Thus, e.g. worn in a rotor of a generator of the slip ring, which is replaced by a new slip ring and thereby the rotor is reusable as an assembly.

For this the following processes are necessary. Dis-soldering the slip ring contacts from the rotor, remove the old slip ring and press in the new slip ring which is connected to the rotor by soldering.

When refurbishing, care must be taken to work as efficiently as possible and to reuse as many as possible assemblies or components. If the refurbishment costs are higher than the replacement costs of the assemblies / components, the limit of economic efficiency has been reached. However, this may be necessary if the availability of new components is not given.

2.6 Final Assembly

The last step in the series repair is to assemble the previously refurbished components to the remanufactured product (Toptas, 2018). In the process, the components and wear parts removed during dismantling and testing will be completely replaced by new parts. In addition to this replacement, there will be a grant of newly produced components and assemblies to replace the number of people whose reuse and reconditioning was not possible or unsuccessful, thus enabling production of the requisite batch of production (Köhler, 2011).

It should be noted here that the sequence of operations of final assembly of the remanufacturing product coincides with the final assembly of a newly produced product, since the process specifications to be implemented, such as torques in screwing processes, are identical. The final operation in the assembly line is the electrical test or "final testing" performed according to the new product specifications (Priyono, Ijomah, & Bititci, 2015).

The end product of the remanufacturing process is therefore a product made up of standardized production processes and quality requirements, as well as newly-produced components, and

equivalent in function, performance and quality to a newly-produced product (Ramstetter, 2012).

Installing the repaired and new assemblies and components is the last manufacturing process / value creation process of remanufacturing. The processes of disassembly and assembly are similar to the new goods assembly. Conventionally, screwing, soldering, welding, pressing, etc. are carried out in order to obtain the product from the components. Due to the high variance of the products the above mentioned processes not carried out automatically. Whether a mechanization is performed or not depends on the variable costs and essentially on the employee costs.

Following the assembly, the final test including the product labeling is performed. The above processes ensure that customers receive a product that is equivalent to theirs. These generally have the same warranty quota as the new parts (Toptas, 2018). The packaging can also be carried out so that the value added process can be completed. The packaging can be designed according to the customer's request. The products are then sent either to the distribution warehouses or directly to the OE (S) customer.

Figure 3 Remanufactured products vs. old parts
Source: Toptas, 2018

The figure above shows some remanufactured products compared to the old parts, showing very clearly what the serial upgrade to performance and for a technical loan these remanufactures are indistinguishable from new products. Both visually and technically, the Reman products are of very high quality.

3 Evaluation of the Ecological Aspects - Examples

The result of a comparison calculation for the product "Starter" (new manufacturing, vs. remanufacturing) is in the following table.

Table 1 The comparison calculation for the product "Starter"

Components with the environmental impact	Newman - product	Reman - product
Raw material extraction	9.2895 kgCO2-eq	1.3202 kgCO2-eq
Component production	7.3786 kgCO2-eq	1.0487 kgCO2-eq
Component logistics	0.6328 kgCO2-eq	0.1643 kgCO2-eq
Core - logistics	-	0.8897 kgCO2-eq
Repair processes	-	2.1709 kgCO2-eq
Total	**17.3009 kgCO2-eq**	**5.5939 kgCO2-eq**

Source: Toptas, 2018

From this evaluation, it can be seen that Reman of the examined product can reduce the environmental impact by a total of 67.67%, which corresponds to an absolute reduction of around 11.71 kgCO2-eq.

The environmental impact of Newman starter with a total of 17,30 kgCO2-eq is mainly due to the pollutant emissions of raw material extraction and semi-finished products (53.69%) and component production (42.65%) newly produced components emerge. It should be emphasized that component logistics plays only a minor role with only 3.66% of the total environmental impact. For remanufactured starter, this distribution changes, so that the Reman processes with 38.81% (2.17 kgCO2-eq) have the greatest influence on the reduced environmental impact. Raw material production and semi-finished product production (1.32 kgCO2-eq), Component production (1.05 kgCO2-eq) and component logistics (0.16 kgCO2-eq) are due to the reduction of the required new components as a result of reuse and repair of core components results in a significantly lower environmental impact than the corresponding new productions. The core logistics to be considered, with an environmental impact of 0.89 kgCO2-eq, accounted for 15.90% of the total environmental impact of the series-produced starter.

The result of a comparison calculation for the product "Alternator" (new manufacturing, vs. remanufacturing) is in the following table.

Table 2 The comparison calculation for the product "Alternator"

Components with the environmental impact	Newman - product	Reman - product
Raw material extraction	19.4551 kgCO2-eq	2.1857 kgCO2-eq
Component production	12.0504 kgCO2-eq	1.3538 kgCO2-eq
Component logistics	2.5282 kgCO2-eq	0.2929 kgCO2-eq
Core - logistics	-	1.7313 kgCO2-eq
Repair processes	-	2.4259 kgCO2-eq
Total	**34.0337 kgCO2-eq**	**7.9896 kgCO2-eq**

Source: Toptas, 2018

From this evaluation it can be seen that Reman of the examined product can reduce the environmental impact by a total of ca. 26.04 kgCO2-eq, which is 76,52% based on the corresponding Newman product, which results in an environmental impact of 34.03 kgCO2-eq and the Reman Alternator has a total of 7.99 kgCO2-eq.

The percentages of the environmental components of the examined Alternator, have a similar distribution as in the tested starter. Due to the overall higher weight of the product, the environmental impact of core and component logistics is greater than that of the tested starter.

4 Conclusion

The distinction between manufacturing and remanufacturing is made by the use of new or old parts. While the term "new parts production" is used, remanufacturing is considered to be a product of old parts obtained through a serial repair process. Remanufacturing is an important component of a resource-efficient manufacturing industry (Parker et al., 2015). By keeping components and their embodied material (including 'critical' or 'advanced' materials) in use for longer, significant energy use and emissions to air and water (e.g. CO2 and SO2) can be avoided.

Academic studies show that on an average, 94 percent of an engine can be recovered for remanufacturing. A remanufactured engine saves 55kg of steel and 8.3kg of aluminium, reduces

CO2 emissions by 565kg, NOx by 1kg and sulphur dioxide by 3.9kg. Remanufacturing minimises the impact on the environment, conserves natural resources by reusing raw materials and reduces the generation of waste by keeping old parts out of landfills. In addition to its environmental benefits, remanufacturing provides opportunities for the creation of highly skilled jobs and economic growth. Despite these positives, remanufacturing is an undervalued part of the industrial landscape and an under-recognised, sustainable industry. Activity to promote remanufacturing is currently undertaken on a sector-by-sector basis.

According to the Automotive Parts Remanufacturers Association (APRA), a remanufactured part fulfils a function which is at least equivalent and comparable to the original part. It is restored from an existing part using standardised industrial processes in line with technical specification. A remanufactured part is given the same warranty as a new part and it clearly identifies the part as remanufactured.

As a result of the ecological impacts outlined above in the chapter 3 for companies resulting from the use of remanufacturing, various industries have successfully established remanufacturing. Remanufacturing of automotive components is well established, having been carried out for decades. Although it is well integrated into the industry, few end-users are aware of its prevalence. It is therefore a good example of the transparent integration of remanufacturing into consumer orientated services. Given the market data mentioned and the increasing interest of political actors, such as the G7 Summit Resource Efficiency Alliance, which attaches great importance to "the conservation and efficient use of natural resources throughout their lifecycle", it can therefore be assumed that remanufacturing in the future will gain importance and will continue to establish itself on the market.

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Use of online information sources in purchase decision-making process

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Abstract

The development of the World Wide Web allowed online users to browse the information almost about everything. It is no surprise it is also used in order to search for the information that supports the purchase decision. The main objective of this paper is to analyze the online information sources people use when making a purchase decision and create homogeneous groups of users based on their behaviour. In order to achieve a given objective, the secondary data from Consumer Barometer was analysed. We conducted cluster analysis using k-means algorithm and transformed 56 countries into 3 clusters of users. It was found that brand website, retailer website and search engines are the main source of information in each cluster. Moreover, there was not found a significant difference in the adoption of online information sources between users in Cluster 1 and 2. Even between the Cluster 3 and Cluster 1 and 2, there was found a significant difference only in adoption of several online sources. The results of the study might be used by online retailers in order to focus the right amount of effort and resources into mastering the online sources customers really use.

Keywords: online shopping, online purchase, online information sources, ecommerce

JEL Classification: M31

1 Introduction

As was mentioned by Kakalejčík (2016), online shopping is not a new form of shopping. It already became a regular way of shopping. E-commerce sales (online sales) accounted for approximately 10 % of all retail sales worldwide in 2017. In the US solely, e-commerce retail sales accounted for 2,3 trillion US dollars in 2017 (Statista, 2018b). It is predicted this number will raise to 17.5 % in 2021 (Statista, 2018a). Although majority of retail sales happen offline, the proportion of online sales is so significant it cannot be overlooked. As the Internet has been extending the range of possible shopping channels, it has also penetrated the way people make decisions about product they intent to purchase. Due to the Internet, it is possible to find all kinds of information that supports the purchasing decision ranging from product details to customer reviews.

The Internet is full of user-generated content (Karlíček & Král, 2011) (such as social media, review sites, blogs, video sites, discussion forums, blogs, and more) that allows Internet users to share their ideas, opinions or experience regarding the product. On the other hand, many companies have been trying to leverage their target audience via content marketing (Pullizi, 2015). They use variety of online media (such as websites, blogs, social media profiles, video sites, email and more) to be helpful source of information for their potential customers. This way, they can increase their visibility and build the reputation of thought leaders which might

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result in higher sales of their products. Our previous study (Kakalejčík & Bucko, 2017) shown that the price is the most important factor when purchasing products online. As a response to this customers' need, media such as price comparison sites or auction sites (e.g. eBay) has arisen in order to satisfy the group of customers known as price hunters (users who are seeking for the best price when purchasing the product).

From the previous paragraph, it is obvious that there are plenty of online media that could be used in order to find information about some sort of product customer is willing to buy. However, are they used equally by users in countries worldwide? The objective of this paper is to find the superior media that support decision making regarding the product purchase. Moreover, we strive to find homogeneous groups of users who use the selected online media in the similar way.

There have been several studies that partially match the topic of our research. Study by Criteo (2016) analysed the behaviour of online consumers. It was found that 60 % of shoppers start their buying journey on retail websites. Search engines such as Google, Yahoo! or Bing are starting points of 40% of customers. Results of the study conducted by Ferencová et al. (2015) shown that the decision making of the respondents (176 university students) when purchasing online is mostly supported by information gathered from search engines (94.32 %), website of the seller (82.95 %), price comparison sites (71.59 %), various discussion forums (61.93 %) and deal sites (54.55 %). Many marketers claim the video content is often used as a source of information about the product. Survey of 1,000 consumers conducted by Animoto (2015) revealed that customers want companies that incorporate video into marketing strategies. One of the results said that 4-times as many consumers would rather watch a video about a product than read about it. Moreover, 80 % of consumers say a video showing how a product or service works is important when learning about the company. Study by Lindmark (2015) proved that customers are motivated to search and process customer reviews online for high involvement products. Customers of high involvement products value review quality as an important review factor because they perceive these reviews to be most efficient in delivering accurate product information. These customers mostly use online consumer reviews in the stages of information search and post-purchase in the purchasing process. Another interesting (but slightly unrelated) way to look at online media usage is provided by Goodrich & de Mooij (2013) whose study was focused on cross-cultural differences in both online and offline purchase decision influences based on Hofstede's cultural dimensions.

Although there are many studies with similar subject, we were not able to find a study that would divide users into particular groups based on the use of online media in decision making process during purchase. Therefore, our study contributes to the current knowledge of the discussed issue.

2 Sample, methods and procedures

The main objective of this paper is to analyze the online information sources people use when making a purchase decision and create homogeneous groups of users based on their behaviour. In order to achieve a given objective, the secondary data from Consumer Barometer was analysed. Data in the Consumer Barometer is gathered from two sources:

1. core questionnaire that is focused on the population of adults;
2. connected customer study that is used to enumerate the total audit population and is used to weight the results (Consumer Barometer, 2018).

The sample consists of the nationally representative population (online and offline) with the age of 16+ in each country surveyed except China, India, South Korea, Malaysia, Philippines, Vietnam, and Japan (age of 20+). Sample consisted of 85,180 participants from 56 countries [n(Europe) = 29, n(Asia) = 17, n(America) = 5, n(Africa) = 3, Australia and New Zealand] (Consumer Barometer, 2015).

Surveys were administered by TNS Infratest on behalf of Google. Survey data was collected in all countries via telephone or face-to-face interviewing. Surveys were administered from January to March 2014 and from January to March 2015. For the purpose of this study, we used the answers on question '*Which of these online sources informed your recent purchase, at any stage from getting initial ideas to reaching a final decision?*'

We used cluster analysis (k-means algorithm) to find the ideal number of groups of users with similar behaviour. K-means (MacQueen, 1967) is one of the simplest unsupervised learning algorithms used for the clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain (*k*) number of clusters fixed a priori. The main idea is to define *k* centroids, one for each cluster. These centroids shoud be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest centroid. When no point is pending, the first step is completed and an early groupage is done. At this point it is necessary to re-calculate *k* new centroids as barycenters of the clusters resulting from the previous step. After we have these *k* new centroids, a new binding has to be done between the same data set points and the nearest new centroid. A loop has been generated. As a result of this loop we may notice that the k centroids change their location step by step until no more changes are done. Finally, this algorithm aims at minimizing an objective function, in this case a squared error function. The objective function

$$J = \sum_{j=1}^{k} \sum_{i=1}^{n} \left\| x_i^{(j)} - c_j \right\|^2 \qquad (1)$$

where $\left\| x_i^{(j)} - c_j \right\|^2$ is a chosen distance measure between a data point $x_i^{(j)}$ and the cluster centre c_j, is an indicator of the distance of the *n* data points from their respective cluster centres.

As there was an assumption that variables used for analysis are correlated, we used correlation matrix to confirm/reject this assumption. In case the correlations are present, we will use Cholesky transformation. A variance-covariance matrix expresses linear relationships between variables. Given the covariances between variables it can be written down an invertible linear transformation that uncorrelates the variables. Conversely, it can be transformed a set of uncorrelated variables into variables with given covariances. Cholesky transformation is represented by a matrix that is the "square root" of the covariance matrix (Wicklin, 2012).

Given a covariance matrix, Σ it can be divided uniquely into a product $\Sigma = U^T U$, where U is an upper triangular matrix with positive diagonal entries and the superscript denotes matrix transpose. The matrix U is the Cholesky matrix (Wicklin, 2012). If is defined $L = U^T$, then $\Sigma = LL^T$. This is the form of the Cholesky decomposition that is given in (Golub and Van

Loan 1996, p. 143). In general, Cholesky matrix can be used to create correlations among random variables. For example, suppose that *X* and *Y* are independent standard normal variables. The matrix *U* (or its transpose, $L = U^T$) can be used to create new variables *Z* and *W* such that the covariance of Z and W equals Σ. There exists an inverse operation - the inverse Cholesky transformation, that uncorrelates the correlated variables. We used this method to uncorrelated the variables in the available data.

We could use Mahalanobis distance in cluster analysis, however, we consider it to be more convenient to use the Cholesky matrix after the decomposition - we can use the variance matrix in cluster analysis using Euclidean distance. In order to confirm that the new matrix is an identity matrix, we will use the Bartlett's sphericity test that assumes the correlation matrix is an identity matrix. On the other hand, we are aware we could use exploratory factor analysis in order to eliminate correlations by reducing the number of variables into factors. However, in our recent studies, we experienced the need to completely remove some of the variables from the analysis. As we do not want to loose any variable that can carry an information, we decided to stick to Cholesky decomposition.

In order to analyze the data, we also used descriptive statistics and characteristics (mean, median, quartiles), tables and barplot. The analysis was conducted using R and Microsoft Excel.

3 Results and discussion

As a first step in our analysis, we analysed the variables we used in the further analysis. Table 1 presents the basic characteristics of variables. Variables are presented as a percentage portion of users who selected the medium as an information source for each analysed country. By looking at Table 1, it is possible to spot several outliers in the data. We can see that users in Malaysia are major users of brand website (42 %) as the information source during the purchase. On the other hand, only small portion of users in Kenya use this source of information when making a purchase. It is also possible to see the significant variance when using search engine as an information source. The maximum observed value can be seen by users in Thailand. On the other hand, only 18 % of users in Kenya use search engines during purchase decision-making. Kenya users are among the most inactive users in terms of searching for the information supporting the purchase online. Their behaviour might be affected by the availability of the online information, especially in the local context. This assumption could be an objective of further research in order to support or reject it. There are also other outliers in the data, however, differences are not that significant to be the subject of this study.

Table 1 Online information sources (characteristics in %)

Variable	Min.	1st Quartile	Median	Mean	3rd Quartile	Max
A. Online research on brand websites	5.00	22.00	25.50	25.09	28.00	42.00
B. Online research on retailer websites	6.00	18.75	20.00	20.39	23.00	31.00
C. Search engine	18.00	40.00	49.00	49.79	57.25	77.00
D. Social networks	2.00	4.00	7.50	9.09	12.25	26.00
E. Online video sites	4.00	6.00	9.00	9.41	12.00	20.00
F. Brand pages on social network sites	1.00	2.00	3.00	3.61	5.00	9.00
G. Advice sites/review sites/forums/blogs	1.00	5.00	6.50	7.04	10.00	14.00
H. Auctions or classified sites	0.00	1.00	2.00	2.25	3.00	8.00
I. Price comparison sites	1.00	8.75	11.00	10.84	14.00	19.00
J. Online magazines/news sites	1.00	2.00	3.50	4.18	5.25	11.00
K. Email (eg offers, newsletter)	0.00	4.00	5.00	4.86	6.00	8.00
L. Other online information sources	1.00	3.00	4.00	3.88	5.00	8.00

In order to select a suitable clustering method (and method for data pre-processing) we used the correlation plot (Figure 1) in order to find significant correlations that might affect the results. As can be seen in Figure 1, there are indeed strong, moderate and weak correlations among variables. This supports our assumption and as a next step, we find it suitable to use Cholesky decomposition to transform the data.
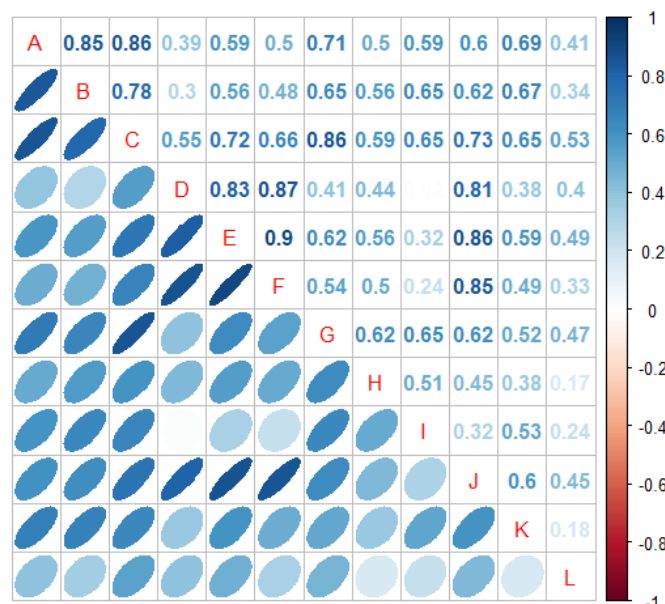
**Figure 1 Correlation plot**
Source: our own processing in R

When applying Cholesky decomposition, we are interested how it changed the nature of the data. To find out if the data is suitable for further analysis, we need to conduct Bartlett's sphericity test. As was mentioned, Bartlett's sphericity test tests tries to accept or reject the following null hypothesis:

H_0: The correlation matrix is an identity matrix.
H_1: The correlation matrix is not an identity matrix.

With p-value of 1, we can support the null hypothesis on the significance level $\alpha = 0.05$. There is no correlation between the variables and therefore, there are in the right state to be used by k-means algorithm using Euclidean distance.

Before the k-means clustering is executed, it is important to find out the suitable number of clusters that should be the outcome of the analysis. As we don't want to select the number of clusters randomly, we decided to use the ratio Between Sum of Squares / Total Sum of Squares (Figure 2). It can be seen that the line breaks at points that suggest selection of three or six clusters to be an outcome of the analysis. As there are only 56 objects for which we need to determine their partition, we chose three clusters to be the optimal number of clusters. Therefore, we are able to continue with analysis and run k-means clustering in order to determine the features of individual clusters.
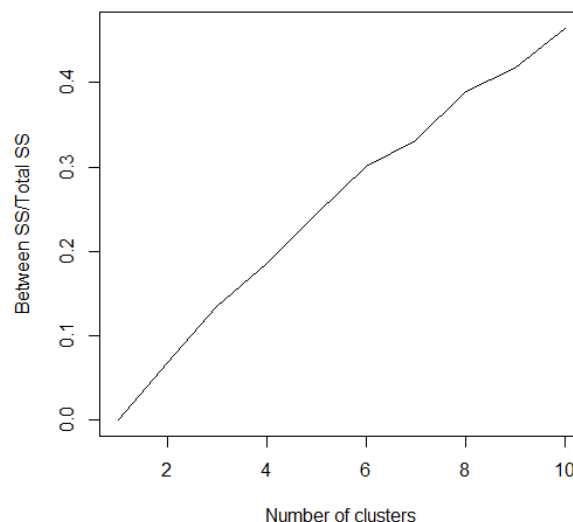

Figure 2 Between SS/Total SS ratio
Source: our own processing in R

By conducting k-means cluster analysis, the following clusters were the results of the analysis:

- **Cluster 1 (23 countries):** Bulgaria, Denmark, Estonia, Finland, Germany, Greece, Ireland, Lithuania, Netherlands, Norway, Portugal, Slovenia, Sweden, Switzerland, Saudi Arabia, Turkey, Argentina, Brazil, United States, Taiwan, New Zealand, Hong Kong, Australia.
- **Cluster 2 (22 countries):** Austria, Belgium, Croatia, Czech republic, Italy, Latvia, Poland, Russia, Slovakia, Spain, Ukraine, United Kingdom, Israel, UAE, Canada, Mexico, Kenya, South Africa, South Korea, Singapore, Japan, Indonesia.
- **Cluster 3 (11 countries):** France, Hungary, Romania, Serbia, Nigeria, Vietnam, Thailand, Philippines, Malaysia, India, China.
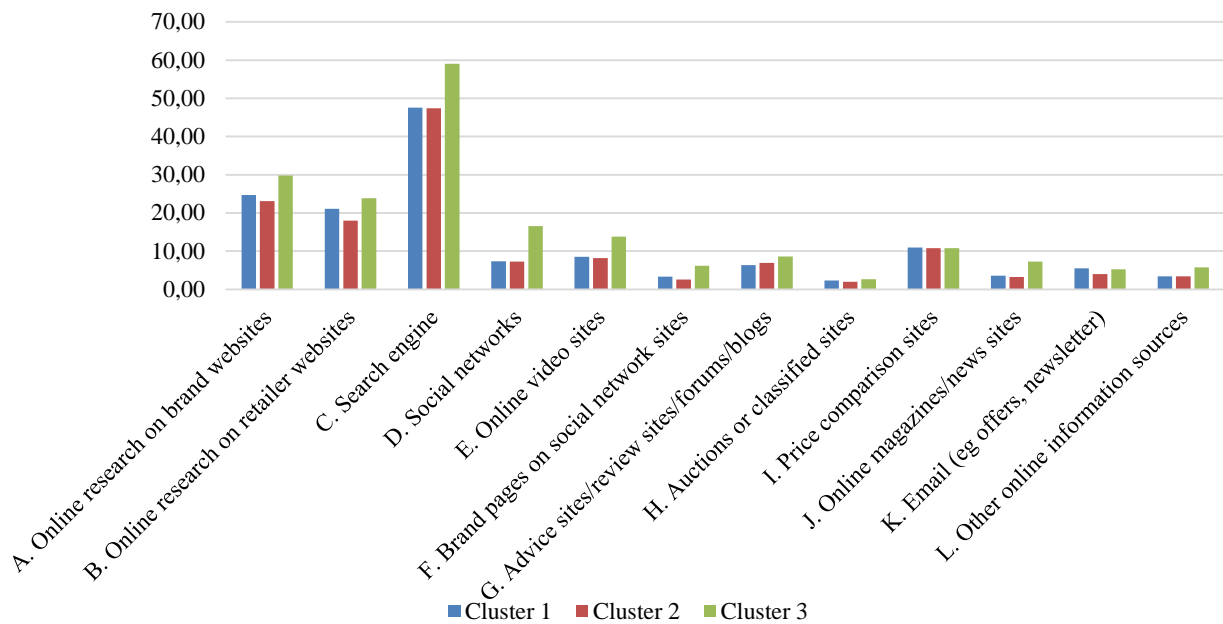
Figure 3 Cluster comparison
Source: our own processing

Figure 3 provides an easy-to-digest comparison of the newly generated clusters. Means of the all observed variables are compared for each cluster. It is possible to see that despite the cluster partition, brand website, retailer website and search engine are the main source of information when making purchase decision. When comparing clusters, it is possible to claim that there is only small difference between Cluster 1 and Cluster 2. However, users in Cluster 3 use brand website, retailer website, search engine, social networks, online video sites and online magazines
/news sites more than other two clusters. However, it is possible to find only small difference in gathering data from advice sites/review sites/blogs, auctions or classified sites, price comparison sites, emails and other online information sources.

Summary of the results:
- There are online information sources supporting purchase decision that dominates each Cluster: brand website, retailer website, search engine. This partially match with results found by Criteo (2016) and Ferencová et al. (2015). Online video sites are not as used as survey by Animoto (2015) predicted.
- There is no significant difference between users in Cluster 1 and 2 when comparing the use of online information sources. Moreover, the difference between these two clusters and Cluster 3 is significant only when comparing use of brand website, retailer website, search engine and social networks. Other differences are not abysmal.

4 Conclusion

As the availability of the Internet and available online media allowed its users to search for information, some of these online sources are used to support purchase decisions. Some of these media have been available almost since the birth of the Internet, some of them has been created while the Internet evolved. The main objective of this paper was to analyze the online information sources people use when making a purchase decision and create homogeneous groups of users based on their behaviour.

In order to achieve the given objective, we conducted k-means cluster analysis on the data gathered from Consumer Barometer. By doing so, we were able to transform 56 countries into 3 clusters with similar behaviour regarding the online information use when making purchase decision. We found out that brand website, retailer website and search engine are the most significant online information sources. Therefore, companies should focus on their online identity (on both their website and websites that sell their products), website user experience and connect with the retailers that are popular among their potential customers. Companies should also take advantage of the enhanced keyword analysis and implement the search engine optimization tactics that would ensure they are visible in the search engine results page of the most adopted search engines. In case that companies are not able to outrank the competition in the search results, they are forced to adopt paid search tools, such as Google AdWords.

We were also able to identify 11 countries (Cluster 3) that has the biggest potential for ecommerce businesses, as the level of the adoption of particular information sources is above the standard that present in Clusters 1 and 2. These progressive markets might uncover opportunities that could boost the online sales.

The limitations of the study are covered by the level of segmentation, as the regional segmentation might cover the hidden patterns of users when making decisions. Also, the questionnaire might not be the best research tool to ask for the online purchasing process. Several tools for digital analysis are available that could track the 'path' to purchase without customer not even knowing. The k-means algorithm has several weaknesses, too, discussed by MacQueen, (1967):

Unfortunately, there is no general theoretical solution to find the optimal number of clusters for any given data set. However, we used the proportion of sum of between sum of squares and total sum of squares in order to determine the best possible number of clusters. The future research might be focused on the elimination of limitations and to find out why some of the countries (e.g. Kenya) don't use the online information sources for purchase decisions more significantly.

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Analysis of investing in Start-ups challenges and perspectives

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Abstract

Currently, technological innovations are the key role in the start of the economy, which change the current view of the nature of production and the structure of the economy. It turns out that the revival of the economy will inevitably be coupled with the introduction of new technologies into practice. An important role in this process is already fulfilled by innovative start-ups, which are focusing on investor circles. The issue of start-ups is not a new thing in this century and nowadays it is a list of problems that need to be solved. With the support of start-up companies, there is also a high risk, which also requires a new look at the form of collective investment and the need to attract investors who are willing to bear this type of risk. The purpose of this paper is to explain the basics and mechanism of the start-up of companies and their role, especially in a small economy, including Slovakia.

Keywords: investing, start-up, crowdfunding, venture capital funds

JEL Classification: G23, G24

1 Introduction

The issue of start-up companies is not an entirely new phenomenon in economic theory. We have met with it in the past in particular as a venture capital stage. The new emerging companies that start their business on the market are funded with venture capitals (Štefko, Fedorko, Bačík 2015). From a technical point of view, the innovation of products, services and technical processes are defined as new and substantially improved. The innovations, the science and research results are linked. In line with international standards, there are several stages of innovation:

1. product innovation - new products,
2. new or substantially improved technological processes,
3. new or substantially altered organization and management models,
4. marketing innovation,
5. ecological innovation.

In recent years, in view of the need to restructure many economies, the organizational structure and funding of start-up companies has been highlighted in view of their growth and the risk associated with this form of business (Štefko, Bačík, Fedorko 2014).

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1.1 Initial financial assistance

Startups usually need financial assistance at the beginning – when the business starts (Dejan, Bačík, Fedorko 2014). They have no sales and do not own almost any property. The bank will not provide them a loan because of the high risk. If the bank provides a loan, only a low amount, therefore the startup in the beginning of the business turn mainly to the so-called "3F": fools, family, friends (sometimes founders are also mentioned). Alternatively, it will use its own financial savings. At a certain startup stage, e.g. making a prototype or testing an interest in a given product/service, this financial support is no longer enough.

The Slovak Business Agency (SBA) focuses on startup assistance based on their individual needs, with the Startup Sharks initiative and its three components: Sharks Pool, Sharks Sea and Sharks Ocean. It is helpful for business people. Valuable information, advice and know-how have a non-quantifiable value. Everybody has the chance to get involved if people want to learn and take advantage of the wide possibilities offered by Startup Sharks.

- Sharks Pool is designed especially for beginners. In this pool of information and educational activities, seminars, webinars, participation in foreign startup events, everyone will find what he/she needs.
- Sharks Sea focuses on mentoring, experts, through which startups can push the boundaries of their knowledge and skills.
- Sharks Ocean is the opportunity to find the right business partners from abroad through foreign traineeships and staying in well-known businesses and business metropolises e.g. Silicon Valley.

1.2 External capital

Another source of funding is external capital. Startupists can most often get the necessary investment from:
- business angels,
- venture capital funds,
- innovative forms of financing - crowdfunding, i.e. mass financing.

The business angel is a person or a group of investment enthusiasts, very often even a traditional business firm that funds its start-up under certain conditions (e.g. requires ownership of a start-up to a certain extent). The start-up first has to convince the business angel about its potential. An angel investor usually perceives investment as a support for an interesting and unique project. It does not only provide financial support for the startup, but it also passes on its valuable experience and mediates a network of important contacts (Fedorko, Bačík, Keruľová 2017).

Venture capital funds consist of money from a variety of sources, whether private or public. Investors are very cautious about investments; they deal with many start-ups during a year and support only few of them. Caution arises from the fact that investors finance the start-up in large volumes and the stage in which the startup is located. Investors enter the start-ups at a later stage of their development when they have their own customers to enter foreign markets. As the title implies, the risk that the startup fails, more precisely that it will not meet the expectations, is big. Investors require a stake in the company to be funded, they acquire a stake in their business, which depends on various factors.

2 Literature review

In economic theory, we meet with many important publications from this area. Ries Eric (2011), who with his publication "The lean startup" drew attention and the New York Times described it as a bestseller. Steve Blank and Bob Dorf (2012) also bring interesting insights into the possibilities and business spheres for start-up companies. Shelters David (2013) focuses on the so-called "seed funding stage", he analyzes its risk level and contemplates the possibility of different forms of financing (Hagyari, Bačík, Fedorko 2016). Nowadays, we also encounter this issue in scientific journals, where we meet the opinions of authors from different worlds (Bačík, Szabo, Fedorko 2014). Also interesting is the approach of Evelyn Derer, Pepukayi Chytakuny and Charl O'Neill (2014), who are also interested in start-up opportunities in less developed countries of the world, such as the dynamically developing South Africa or India. Within Europe, the research output of Tobias Stucki (2015), who, in the example of Switzerland, carried out a 10-year analysis of start-ups and problems in the area of financial security in particular. Problems of funding and control of sustainable start-ups are also addressed by other articles by Roberta Dessi (2005), David Allen and Tomas W. Hall (2007). Within Europe, there is also a specialized institution, the European Private Equity and Venture Capital Association (EVCA), which publishes many interesting start-up information and data files from this region. Similarly, in Slovakia, the Slovak Venture Capital and Private Equity Association (SLOVCA) is operating today, which is already bringing together successful entrepreneurs in start-up companies (SLOVCA 2014). In Slovakia, crowdfunding is still underdeveloped and unfamiliar to the Slovak public. Therefore, Slovak start-ups also place their projects on foreign platforms. However, there are already some Slovak platforms through which projects can be presented (Bačík, Mihal, Fedorko 2015). The most famous portals in the world are Kickstarter and IndieGoGo. The most used Slovak and Czech portals include, for example, www.startovac.cz, www.ideasstarter.sk or www.marmelada.sk (Štefko, Fedorko, Bačík 2016). The project initially sets a goal, for example, collecting 10 000 euro and the date by which this amount is to be collected. If the target amount is not reached, the money will be returned to the people who supported the project (Baeck 2013). The reward for contributing people depends on the amount of the donation. This happened thanks only to obtaining a prototype product. The risk for the promoter is that this product will not work according to its idea, will not perform the functionality, but it can also happen that the resulting product will never be made (Pohlová 2015).

3 Methodology

Investing in start-ups is currently experiencing a huge boom and it suggests that this boom will continue. To map the status of start-ups, we analyzed the Invest Europe portal (2017). The Invest Europe survey was conducted in August 2017 and focused on private equity in Central and Eastern Europe.

The main purpose of this article is:
* Analysis of venture capital investments in the Central and Eastern Europe based on various criteria.

4 Conclusion

Based on the analyses below, we note that in 2016, 100 million €of venture capital (VC) was invested in Central and Eastern Europe that corresponds to the result of 2015 and contains 6% of total private equity investment in the region according to the values. With the 233 CEE companies that receive VC support is the third largest number recorded and represents 69% of the total number of all private investment funds in Central and Eastern Europe invested in 2016.
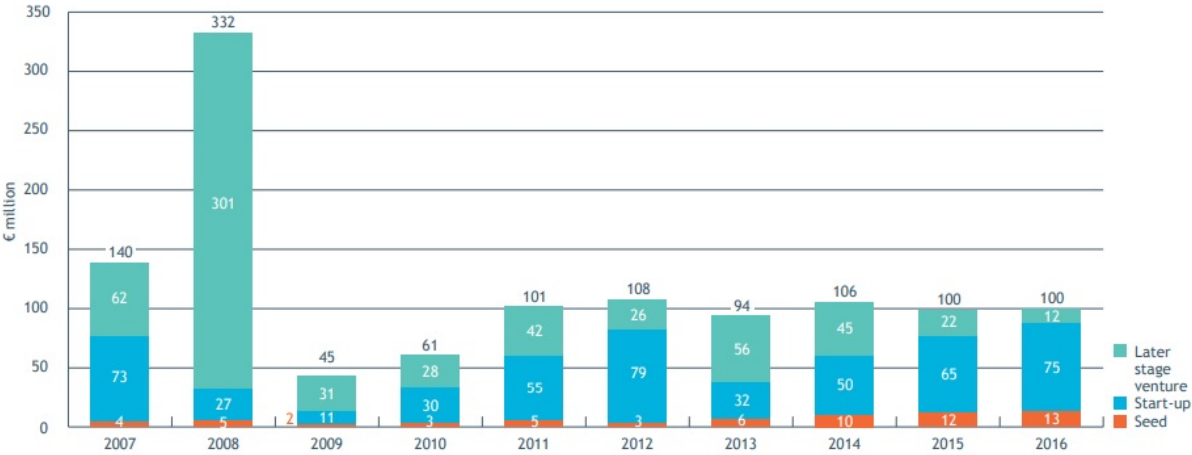
Chart 1 Investing venture capital into startups by stages
Source: Invest Europe 2016

The share of CEE in the total European venture capital investment was 2.3% in 2016, while the region accounted for 7.5% of the total European venture companies that received risky funding. The average venture capital investment in Central and Eastern Europe was 0.43 million euro, less than one third of the European average of 1.4 million euro.
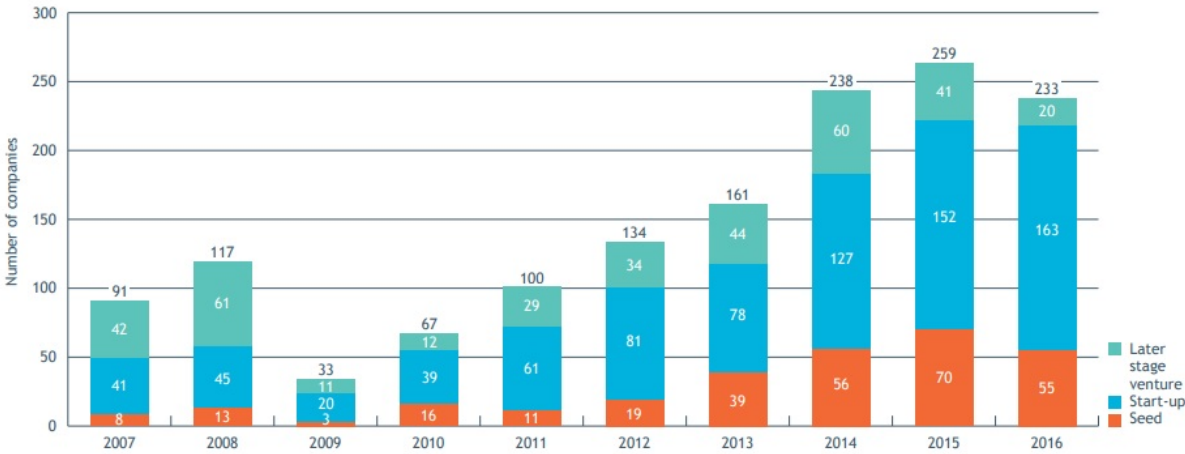
Chart 2 Investing venture capital into start-ups by stages (by the number of companies)
Source: Invest Europe 2016

As in the previous years, the investment in the start-up stage was the largest category of VC, accounting for 75% of the total venture capital investment in Central and Eastern Europe by

value and 70% of the number of companies. The share of start-up investments is rising over the last three years, reaching a level similar to the one recorded in 2012.

	2015				2016			
	Amount (€ thousands)	%	Number of companies	%	Amount (€ thousands)	%	Number of companies	%
Agriculture	2,463	2.5	5	1.9	25	0.0	1	0.4
Biotech and healthcare	12,566	12.6	28	10.8	13,991	14.0	28	12.0
Business products and services	14,796	14.8	43	16.6	11,279	11.2	32	13.7
Chemicals and materials	1,254	1.3	9	3.5	261	0.3	4	1.7
Construction	688	0.7	2	0.8	1,000	1.0	1	0.4
Consumer goods and services	19,007	19.0	51	19.7	16,503	16.5	37	15.9
Energy and environment	821	0.8	7	2.7	3,070	3.1	6	2.6
Financial and insurance activities	2,740	2.7	6	2.3	2,052	2.0	5	2.1
ICT (information and communication technology)	42,568	42.6	105	40.5	48,897	48.8	111	47.6
Real estate	120	0.1	1	0.4	113	0.1	1	0.4
Transportation	3,012	3.0	2	0.8	3,035	3.0	6	2.6
Other	0	0.0	0	0.0	63	0.1	1	0.4
Total investment	100,034	100.0	259	100.0	100,289	100.0	233	100.0

Chart 3 Investing venture capital into start-ups by sectors
Source: Invest Europe 2016

Hungary was the main target of venture capital investments in Central and Eastern Europe in 2016 with 31 million euro, representing 31% of the total regional VC sector. The country also took the leading position as far as the number of companies is historically the highest number of companies (73 VC). The second country is Poland with 21 million euro, which means 21% of the total amount at regional level and 46 companies, although last year it had 88 companies. Together, these two countries accounted for more than half of venture capital in the CEE region in 2016, according to the value and number of companies.

	2015				2016			
	Amount at cost	%	Number of companies	%	Amount at cost	%	Number of companies	%
Trade sale	18,589	73.1	16	41.0	20,580	61.3	16	31.4
Management/Owner buy-back	4,117	16.2	15	38.5	7,198	21.4	13	25.5
Divestment by public offering	0	0.0	0	0.0	2,971	8.9	2	3.9
Write-off	0	0.0	0	0.0	319	0.9	2	3.9
Sale to another private equity firm	0	0.0	0	0.0	300	0.9	7	13.7
Repayment of preference shares/ loans or mezzanine	2,417	9.5	6	15.4	250	0.7	3	5.9
Sale to financial institutions	0	0.0	0	0.0	31	0.1	1	2.0
Other	300	1.2	2	5.1	1,909	5.7	7	13.7
Total divestment in year	25,423	100.0	39	100.0	33,558	100.0	51	100.0

Chart 4 Investing venture capital into start-ups by selling the capital
Source: Invest Europe 2016

Information and Communication Technologies (ICT) are again in a leading position, with 49 million euro invested in 111 companies - almost half of the regional investment in both measurements. Consumer goods and services were the second, up to 17 million euro, invested in 37 companies at around 16%. Total in both countries. Biotech and health care followed with 14 million euro in investments in 28 companies. These three sectors together represented almost 80% of the total investments in enterprises in Central and Eastern Europe by value and number of companies.

Slovakia as a small open economy, which does not have great natural wealth. Its future depend, to a great extent, on new technologies, which will also change the character of the economy. Nowadays, the economy is heavily deformed with a one-sided construction of its cyclical character. Individual investors such as "business angels" would also create suitable conditions for investing in Slovakia. However, there is no collective investment area, which also concentrates considerable financial resources. In practice, however, we meet with several barriers:

- Funding opportunities for start-up companies via mutual funds would require adjustment already in the UCITS IV Directive itself. Since the terms of investment for mutual funds are to a large extent limited by prudent investment rules whereby unit trusts may invest predominantly in publicly traded securities quoted on stock exchanges. Assuming that each newly established company has access to such markets for a certain period of time (e.g. 5 years since stock-based listing requires audited financial statements for several years). It follows that traditional mutual funds do not have the possibility to enter into financing innovative projects often involving high risk.

- We start to hear voices about the possibility of creating a new start-up mutual fund - a special venture fund that would engage in investment and its investments would not have the form of only shares or bonds. Based on the fact that the most recent measures are also a legislative proposal for a new form of capital trading company, which will allow for a flexible setting of relations, the possibility of an investor's entry, but above all the exit from the investment. In this respect, the possibility for such mutual funds to enter into newly created innovative companies should also be taken into account, given the high risk of traditional mutual funds, in particular by diversification.

- In particular, commercial banks (the so-called private banking sector) should be more involved in the start-up support, more precisely, combination of banks - mutual fund. Large banks, which at the same time have considerable experience in investment banking, in which the mutual funds also operate, have the prerequisites for the realization of such investments, including the acquisition of private clients for such activity.

The second phase start-up problem of venture capital is also a focus of the financial theory. The primary question is raising capital, which represents the success of launching innovative projects. The funded system of financing through individual investors, business angels, mainly in Slovakia is hitting the barrier of a small number of such investors as well as the amount of capital associated with a number of start-up projects. It also shows the necessity to implement changes in collective investment legislation at the level of Europe and at the same time to look for opportunities in the creation of specialized funds that will diversify the investments into a number of projects with a different level of risk. An important role in this process should also be played by large banks with a larger number of private investors.

Acknowledgements

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Financial sources – main factor to develop innovation activities in Slovak small and medium enterprises – empirical study

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Abstract

With the development of innovation processes in all types of enterprises the growing role of innovations is evident also in small and medium enterprises (SMEs). To be successful in the future permanent and regular innovation is becoming a competitive necessity. About the factors significant for SME´s innovations there is still a discussion. A growing attention is given to describe what are the key factors significant (contributing) to innovations in SMEs. The aim of the paper is to present the financial sources as one of the key factors significant to develop innovation activities in Slovak SMEs. To fulfil the aim we have conducted in the year 2017 empirical research oriented on identification of key factors and barriers determining innovation activities in SMEs in Slovakia. Partial results of the above-mentioned research will be presented in the article. For primary data collection we have used a questionnaire. Analysis of the data was conducted in statistical system R 3.2.4. The paper is elaborated as a part of the VEGA project 1/0408/18 "Eco-innovations as a part of innovation activities in small and medium enterprises in Slovakia: trends, motives and managerial challenges".

Keywords: small and medium enterprises, innovation activities, financial sources, Slovak Republic.

JEL Classification: L53

1 Introduction

Innovation is meaningful, dynamic, developing process, which result is positive change oriented on improving of transformation process in enterprises and better satisfying of customer needs (Ják, Rydvalová, Žižka, 2005). OECD definition describes an innovation as a restoration and widening of products and markets portfolio, as a new designing, manufacturing and distributing methods, implementation of changes in work organization and labor force skills, etc.

Curret approach to innovations prefers that innovation is a key word for entrepreneur; emphases global approach to innovations as a philosophy (way of managing of enterprises), which influences all parts of transformation process in enterprise (marketing, research and development, planning, manufacturing, managing, etc.) (Adair, 2009). According to Bessant and Tidd (2009) innovation can be for small and medium enterprises a way to gain competitive advantage. Cooke and Wills (1999) stress, that innovations help to reinforce the market position or gain a larger market share, to increase the effectiveness of operations, improve reputation and decrease costs. Innovation is generally considered as an important

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accelerator of the economy and essential prerequisite for the development of competitiveness. High economic growth is associated with significant investment in research, technology and innovation (Šoltés, Gavurová, 2014). The ability to compete in innovations plays very important role as a factor of their competitiveness. To strengthen innovation activities is one of the main task of all types of businesses.

2 Factors determining SME´s innovation

In today´s entrepreneurial practice innovations must be a natural part of any entrepreneurship. Permanent and regular innovation is becoming a competitive necessity (Jones, Miller, 2007); to be successful in the future requires interrupting conventions (Panayides, 2006). There is a time of changes and the only way how enterprise can be successful is to accept these changes, adapt to them and ultilize them (Kressel, Lento, 2012).

With the development of innovation processes in all types of enterprises the growing role of innovations is evident also in small and medium enterprises. SMEs have characteristics that are beneficial from the point of view of innovation processes and can be their innovative advantage compared to large companies, namely: they have flexible and entrepreneurial management structures that allow them to adapt to the changing market, no bureaucracy and administrative constraints, informal and effective internal communication, willingness of managers to take risks, ability to exploit new high-risk markets (Lesáková, 2009), SMEs often do not have the earlier, now partly obsolete generations of technology, so they do not burden the introduction of new technologies. In spite of all above mentioned advantages, small and medium enterprises have also some handicaps – many of them don´t own research capacities and face many financial problems (Lesáková, 2014).

About the factors significant for innovation of small and medium enterprises there is a little empirical knowledge. Research results pay attention to describe the differences in managing innovation in large enterprises to speciafic of small and medium enterprises (Nooteboom, 2008). Few studies were conducted with the goal to discover which factors contribute to innovation efforts by SMEs (Anggadwita, Mustafid, 2014; Bayarçelik et al., 2014; Keizer et al., 2002). Following Keizer et al. (2002) the factors that have effect on innovation can be divided into internal and external, where internal variables (indicators) refer to characteristics and policies of SMEs while external variables refer to opportunities that SMEs can seize from its environment. From the various studies of success and failure in innovation (Birchall et al., 1996; Hoffman et al., 1998; Xie et al., 2013; Szczpeňska-Woszczyna, 2014; Minna, 2014) it is possible to construct checklist of factors effecting innovation activities. For our purposes it will be helpful to build on our own previous research (Lesáková, 2014) and to focus attention on a set of key factors significant for SME´s innovation.

In our paper the SME´s framework is represented by the set of these key factors significant for small and medium enterprises innovation:
- human resources (human potential) – the staff employed, their number, structure and their competences, share of highly educated people, leadership;
- financial resources (financial potential) – their own funds and funds (private and public) available from financial and non-financial institutions;
- technology (material potential) – the state of the machinery, the structure of the production potential, the ability to quickly adapt production to the changing needs of the market;
- cooperation with external entities (enterprises, knowledge centres, universities, research institutions, other stakeholders) – forms of cooperation, participation of SMEs in networks

and clusters, support of partnership building, cooperation between SMEs, research institutions & universities;

- management of innovation activities in enterprises – created vision, clearly formulated goals and strategy, organizational structure, willingness of enterprises to innovate, the level of managing the innovations in SMEs, organizational culture;

- system of governmental innovation support – forms of innovation´s support, the quality and quantity of innovation´s support.

3 Aim, material and methodology

Factors significant for SMEs innovations are still a subject of many discussions. A growing attention is given to describe what are the key factors significant (contributing) to innovations in SMEs. The aim of the paper is to identify what is the significance of financial sources as one of the factors determining the innovation activities in SMEs in Slovakia.

For the collection of primary data we have used a questionnaire. The research was realized in the year 2017 and was oriented on identification of main factors and barriers determining innovation activities in Slovak SMEs. One part of questionnaire was oriented on identification of significance (importance) of financial sources as a factor determining the innovation activities in SMEs. Questionnaires were distributed electronically to 198 enterprises of all size enterprise. Top managers from each enterprise to whom the questionnaire was sent, responded the answers in questionnaire. Sixty-one of the enterprises responded and sent the completed questionnaire. After reviewing each replay we set aside the answers from large companies, as our research was focused on SMEs. At the end we collected 51 valid questionnaires from SMEs. The data obtained via the questionnaire research were processed by using the MS Excel program and software R 3.2.4. We provided the statistical testing of data at significance level ($\alpha = 0.1$).

Our sample included 58.82% micro enterprises, 23.53% of small enterprises and 17.65% of medium enterprises. The research sample consisted mainly of enterprises located in the region of Bratislava (43.14%), which was most likely caused by the highest concentration of enterprises in the region of Bratislava. The second most frequent representation had enterprises from the region of Banská Bystrica (15.69%). In the sample prevailed enterprises (firms) from the sector of machinery industry (29.61%), wholesale and retail (17.65%) and construction (15.69%).

The representativeness of the sample regarding the classification SK NACE (p-value = 0.1594) and region (p-value = 0.2824) has been tested using Chi-squared goodness of fit test. Based on the test results we concluded that our sample of enterprises can be seen as a sample of the entire population of small and medium enterprises.

4 Results and discussion

Main question in the questionnaire was focused on evaluation of factors significant for SME´s innovation in Slovakia. We defined a checklist of a set of 6 key factors: human resources, financial sources, technology, cooperation with another entities, management of innovation activities in enterprises, system of governmental innovation support. Every factor was expressed (transferred) through partial indicators.

We assumed that Slovak SMEs do not evaluate identically importance of individual factors significant for SME´s innovations. To verify this premise the Friedman test was used. Results

gained from Friedman test reject null hypothesis (p-value = 9.066e-14) and support our assumption that in Slovak SMEs there are differences in the perception of key factors significant for SME´s innovation.

Evaluating significance of all individual factors (Table 1) as the most important factor significant for SME´s innovation in Slovakia were identified the financial sources (average 3.568627). 64.71% of enterprises evaluated this factor as the most important. The factor human resources as well as the factor technology have achieved the same average (3.039216), but 20 enterprises (39.22%) considered human resources to be the most important factor that influences innovation activity in enterprise. Technology as the most important factor was evaluated by 15 enterprises (29.41%).

Table 1 Factors determining innovation activities in Slovak SMEs

Factors	The importance of factors				
	The lowest (1)	Lower (2)	Higher (3)	The Highest (4)	Average
Human resources	5 (9.8%)	8 (15.69%)	18 (35.29%)	20 (39.22%)	3.039216
Financial sources	1 (1.96%)	2 (3.92%)	15 (29.41%)	33 (64.71%)	3.568627
Technology	3 (5.88%)	7 (13.73%)	26 (50.98%)	15 (29.41%)	3.039216
Cooperation with external entities (enterprises, innovation centres and universities)	10 (19.6%)	25 (49.02%)	8 (15.69%)	8 (15.69%)	2.274510
Management of innovation activities in enterprises	4 (7.84%)	24 (47.06 %)	13 (25.49%)	10 (19.61%)	2.568627
System of government innovation support	7 (13.73%)	14 (27.45%)	13 (25.49%)	17 (33.33%)	2.784314

Source: own processing.

In the frame of analyzing the factor "financial sources" enterprises had to determine which financial sources they have used to finance their innovation activities during the analyzed period 2010-2015. SMEs had the possibility to select from five various financial sources: own internal sources (profit), own external sources (shares, own capital), external financial sources (credit, loan, EU structural funds, obligation), alternative own external sources (venture capital, business angels) and alternative external sources (leasing, factoring, forfeiting). To evaluate this question we have used Chi-squared goodness of fit test. The test confirmed statistically significant difference in the structure of financial sources used to finance innovation activities between innovative firms (innovation leaders) and low innovative firms (non-innovative enterprises) (p-value = 2.2e-16). While the innovation leaders have utilized various sources to finance innovation activities [own capital (56%), loan guarantee schemes for SME (11.8%), EU structural funds (13.7%), but also venture capital (4%)], in low innovative firms there was used only the own capital.

Interesting was finding that innovative firms perceive access to financial sources to be very important obstacle more frequently than in the firms with low innovation activity. This is due to the fact, that innovative firms view the innovation activity as a permanent and constant part of their strategy. Law utilization of other financial sources by low innovative firms is in many cases the consequence of a pure knowledge about other sources of finance.

The problems with acquiring the financial means for innovation activities force SMEs to innovate predominantly from their own sources. Increasing the spending on innovation activities by SMEs on its own is not sufficient to resolve the existing problems. It is necessary to reconsider the whole entire system of R&D financing which is in urgent need of reconstruction and change.

A special part of our research was focused on identification of the main barriers to develop innovation activities in Slovak SMEs. We defined a checklist of 11 barriers (Table 2) and asked the enterprises to evaluate the significance of these barriers. The list of 11 barriers was elaborated on the basis of the results from our previous research (Lesáková, 2014). We assumed that Slovak SMEs do not evaluate the barriers to innovations as equally significant, and to verify this premise, we used the Friedman test. The test rejected null hypothesis that none of the barriers is seen by Slovak SMEs as more or less important than the others (p-value<2.2e-16) and confirmed our assumption. Table 2 below presents a comparison of the average of individual barriers, standard deviation and median.

Table 2: Barriers to innovations in Slovak SMEs by importance on scale 1 – 4 (4 means the highest importance and 1 the lowest importance)

Barriers	All enterprises	
	Mean (SD)	Median (IQR)
Bureaucracy	3.34 (0.92)	4.00 (1.00)
Corruption	3.14 (1.03)	3.50 (1.75)
Inappropriate system of state support for innovation	3.14 (0.99)	3.00 (1.00)
High costs for innovations	2.98 (0.72)	3.00 (0.00)
Lack of internal financial sources	2.82 (0.97)	3.00 (1.00)
Difficulty in obtaining of external financial sources	2.80 (1.04)	3.00 (2.00)
Insufficiently qualified labour force	2.35 (1.05)	2.00 (2.00)
Lack of knowledge about benefits of R&D in enterprise	2.00 (0.96)	2.00 (2.00)
Lack of willingness to innovate	1.98 (0.98)	2.00 (2.00)
Absence of innovation strategy	1.98 (0.97)	2.00 (1.00)
Lack of cooperation with external entities	1.96 (0.98)	2.00 (1.00)

Source: own processing.

Among the most significant barriers were bureaucracy (3.34) – 29 enterprises (57%) evaluated this barrier as the most serious – then, corruption and state support of innovation activities, which achieved the same average (3.14). 25 enterprises (49%) considered these two barriers very significant. Inappropriate system of state support for innovation activities was marked as a serious barrier by 23 enterprises (45%). On the other hand, lack of cooperation with external entities was marked as the least significant barrier (mean = 1.96).

It can be concluded that a majority of enterprises see the main barriers to developing innovation activities in: 1. bureaucracy and corruption, 2. inappropriate state support of innovation activities, 3. high cost of innovation and 4. lack of financial resources.

The explanation why "bureaucracy" and "corruption" are viewed by Slovak SMEs as the main barriers comes from SME´s experience during the process of acquiring the financial means and developing innovation activities. Enterprises introduced negative experience when they were acquiring means from the funds of the European Union or other public financial sources (bureaucratic administration, corruption, ineffective redistribution of means, as well

as ignorance of their drawing). "High costs for innovation" was indicated also as an important barrier to innovation. Nevertheless, managers should take into consideration that innovation is a prerequisite for obtaining a favourable position in the future.

5 Conclusion

According to the data of Statistical Office of the SR the small and medium innovative enterprises constituted in the year 2015 all together 32% of all enterprises, while the average in the EU in the same period is 49%. Based on the obtained values of the Summary innovation Index 2015 for Slovakia it was 0.34 while the EU average was 0.55 (Innovation Union Scoreboard, 2015).

To improve the share of innovative SMEs it is necessary to identify key factors determining their innovation activity and eliminate innovation barriers. In the article we defined a checklist of a 6 key factors determining innovation activities in SMEs in Slovakia with the aim to identify what is the significance of financial sources as one of the factors determining the innovation activities. Evaluating significance of all individual factors as the most important factor significant for SME´s innovation in Slovakia were identified the financial sources (64.71% of enterprises evaluated this factor as the most important). Interesting was findings that innovative firms perceive access to financial sources to be very important obstacle (more frequently than in the firms with low innovation activity). Enterprises introduced negative experience during the process of acquiring the financial means (bureaucracy, corruption). Majority of enterprises see as the main barriers to developing innovation activities in bureaucracy and corruption, inappropriate state support of innovation activities, high cost of innovation and lack of financial resources. Specifically is the lack of own resources for financing innovation, lack of finance from outside sources and really high costs of innovation, that significantly reduces innovation activity of SMEs, but especially bureaucracy and corruption. A pure quality of business environment is one of the factors which characterize the innovation environment in the Slovak Republic. One emphasizes particularly detrimental bureaucratic and regulatory obstacles of law, inefficient public administration, law enforcement and lengthy judicial procedures and even frequent changes in legislation and lack of transparency as well as huge corruption (Country Report Slovakia, 2016).

Some of the barriers can be eliminated at the enterprise level but most of them require solutions at the state level. Therefore the task for the state is to ensure adequate inputs (sources) for innovation activities and create conditions (environment that can stimulate development of innovation).

Innovation policy in each country has an important role to support innovation. It includes all the instruments and tools which are stimulating innovative development based on support of innovation and creation of pro-innovative business environment. The result of the effective innovation policy could be sufficient investment in R&D and innovations, cooperation with businesses, sophisticated system of support for innovative businesses from the state. Thought Slovakia has adopted a number of strategic documents which should speed up the implementation of innovations into practice, the stated objectives are still impossible to meet and the country lags in the innovation development behind the developed countries.

For the future it will be necessary to mobilise all financial sources in the area of innovation support in order to ensure that innovation activities performed by business entities receive the same level of funding as those in advanced EU countries. In connection with efforts towards

the most effective use of allocated financial resources, an indirect state aid has to be provided to profit-generating projects implemented by SME, i.e. financial engineering instruments such as guarantee funds, credit funds, venture capital funds and municipal development funds. There is an enormous interest of responsible institutions in coordination with the Ministry of Finance of the Slovak Republic to apply the upgraded model of usage of innovative financial tools in order to support innovation activities in SMEs.

Slovakia has set a target to increase expenditures spent on research and development to 1.2% of GDP by 2020. To support the financing of innovations the situation could be changed not only by one way financial support from state budget, but also by increasing resources of businesses that in 2020 should account for 2/3 of the total resources spent on R&D. This implies much greater SME´s involvement in research. The state should adopt measures that would encourage enterprises to a greater extent to be engaged in research, development and innovation. We see the solution also in overall improvement of the business environment (for example through a reduction of indirect taxes – especially VAT rate, in reduction of contribution to social and health insurance companies and in all other areas mentioned above).

Our research is a scan of the current situation of identification key factors and barriers determining innovation activities in Slovak SMEs and offers a lot of space to improve. The biggest limitation of this study is a small sample of SMEs. A small sample of SMEs prevented us from taking our statistical analysis further. Consequently, the presented results should be interpreted primarily from the exploratory point of view. Limitations of our study create opportunities for further research. Firstly, in future research work we should focus on higher number of enterprises, including enterprises of various sizes. Secondly, it would be very interesting to repeat our primary research in other countries than Slovakia for the purpose of making international comparison of identification of key factors and barriers determining innovation activities in SMEs.

Acknowledgements

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The current state of use of ad blocking tools as a central online marketing problem

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Abstract

Purpose: The aim of this paper is to analyse the current issue of using Internet advertising blocking tools and to describe current global trends related to the selected issue.
Design/methodology/approach: Statistical portals and studies have been used to clarify the current state of the selected issue, addressing the issue of ad blocking, from which relevant information has subsequently been used and processed.
Findings: From the results of various analyses, it is undeniable that the number of users of online ad blocking tools is steadily growing, but despite the huge amount of online ads, consumers are willing to show an understanding of less intrusive ad formats.
Research/practical implications: The paper provides an analytical view of the current state of the issue and should induce significant changes in the sphere of digital advertising and should also act as the main source for better understanding of consumer attitudes and preferences related to the perception of ads placed on the Internet.
Originality/value: The article highlights the importance of the growing number of ad formats, which may have a negative impact on the advertising industry.

Key words: Advertising, Banner, Internet, Ad-block, Smartphone

JEL Classification: M31, M37

1 Introduction

At the turn of the millennium, there is a certain drive in the field of online advertising. Big money has been invested in ad campaigns with display ads, but mostly not quite successfully. Ad campaigns were expensive and efficiency was minimal. After staring at the Internet, they look at it from a different angle and look for tools for better ad campaign planning and for more effective Internet advertising effectiveness assessment (Kent 2006). Just as the internet is considered to be the fastest changing medium and the internet advertising market, Janouch (2011) claims to be the most volatile and most responsive not only to the demand of recipients but also to the needs of advertisers.

An advertisement regulates the consumer's attitude towards the product or service it promotes. It creates a so-called personal relationship to the product, which is called the "brand person relationship" (Vysekalová 2003). The customer has the feeling of a well-known brand and thus the trust in the product. Advertising encourages competition and thus maintains the choice of products of the same category and adjusts the pricing policy of competitors. It creates the illusion that it is among the products, services fundamental differences and that consumers have the right choice to help with substantial problems (Burton and Jirák 2003; Štefko, Bačík,

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Fedorko 2014). With modern technologies, Internet advertising can better target consumers, basically crossing traditional advertising and direct marketing (Přikrylová, Jahodová 2010).

According to Janouch (2011) there are hundreds of ways to place our ad and also various forms of advertising. In general, it is always necessary to consider what the goal is. Whether it's to increase traffic, build a brand or sell the product directly. We have to choose another form for final users and others for the company's customers (Dejan, Bačík, Fedorko 2014). It is necessary to reflect on what market segment is our goal - who are our customers, what their behavior is, what portals they visit, what they are looking for, are more active or passive, do they watch news, etc.

The basic layout of the internet advertisement in its traditional forms is simple, basically only two kinds are distinguished, more precisely the textual and graphic advertising. Contextual advertising is built on providing the user, after searching for a keyword, relevant text links. According to Přikrylová and Jahodová (2010) contextual advertising on websites, located on the so-called contextual network, that is, on the partners' web sites, not the search engines. The ad appears on websites where the text content is closely related to the keywords of the ad target. The contextual advertising system offers the use of this functionality for commercial purposes, so that the result display space is divided into unpaid (organic) results and paid commercial results that are made up of advertiser advertisements. Advertisers have space in their keyword search results that they determine themselves (Bačík, Szabo, Fedorko 2014).

Banner advertising can be considered the oldest and most used form of Internet advertising (Janouch 2010). Lábska (2009) states that the basics of the advertisement is that the website is a block of image advertising that, when clicked by a user, redirects it to the advertiser's website. Banner ads allow us to use different kinds of multimedia content such as animations, sounds, videos, etc. However, the effectiveness of this ad is currently declining. In this context, we are talking about Banner Blindness, as the name implies, it is the process of viewing banner ads. The effect of Banner blindness is to significantly reduce the effectiveness of this form of Internet advertising (Karlíček and Král 2011; Hagyari, Bačík, Fedorko 2016). Tondr (2002, p. 35) states that an advertising banner in the Internet environment can take a different form: "from the standard narrow image strips at the top of the website, through various large horizontal and vertical rectangles and squares, to buttons and icons".

Kozoň (2008) divides the forms of internet advertising based on the type of financial evaluation that results from its implementation. The criterion divides the ad according to the amount of funds the publisher receives from the site:
- Based on the number of impressions - the type of ad paying for the display, impressions are calculated based on the 24-hour UIP (unique IP address), i.e. for the same visitor it is paid only once per day,
- Based on the number of clicks - in this case, clicks are applied to different graphic and text banners,
- Based on the sale - the site owner will receive a financial reward only if a visitor who crosses a banner on a single organization's website gets to another website, performs a specific action - order goods, etc.

The effectiveness of Internet advertising is constantly decreasing due to ever-increasing competition among users (Fedorko, Bačík, Kerulova 2017). This situation is mainly due to higher advertising costs and an increasing number of advertising spaces in one place (so Internet users have created some kind of resistance to the ad) Rozhoň (2009).

2 Current state of the issue

Thus, Gladly (Berber 2016), the analysis of which was compiled from a combination of anonymous data from their own Goodblock product and an internal randomized sample survey of 243 users, paid attention to advertising and related Ad-blocking as a serious issue. The results of the analysis point to the fact that most respondents (52.3%) do not like advertising, but realize that many websites are advertising and income-dependent, so they accept them. Depending on the results of the analysis presented, it is indisputable to say that while some online ads are interesting, up to 42% of the respondents feel that there a many ads in the online environment. Less than 5% of the respondents said they absolutely hated the ads. On the other hand, only a small amount (0.8%) of people were seen who, on the contrary, perceived advertising as useful.
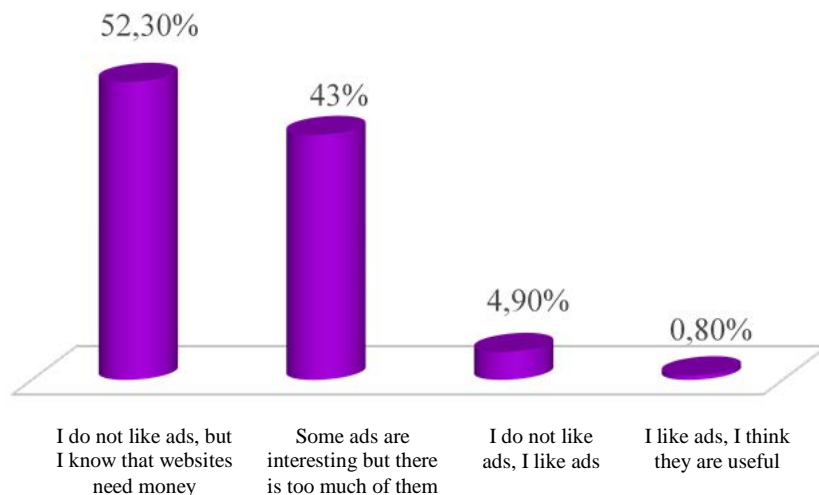

Chart 1 Share of respondents expressing their attitude towards advertising
Source: Berber, 2016

ComScore (2016), with a combined method consisting of passive measurement (a sample of more than 30.000 Internet users) and a panel survey of a sample of 1917 respondents, also focused on the identification of advertising blocks in terms of their demographic characteristics. It has been found that on average, ads are blocked more often by men (18%) than women (15%) and that most people (average 25%) using ad blocking software are 18-34 years old, while for all other groups of respondents surveyed, the Ad-block tool usage rate was recorded at an average of 14%.

At the same time, it is clear from Chart 3 that the highest rate of Ad-Block tool usage was measured in case of men from 18 to 34 years old group with a share of 28% and the lowest rate for all other cohorts with a share of only 15%. The analysis also showed that, as in the case of men, the highest proportion (22%) of ad-block usage was seen in the group from 18 to 34 years old, but the lowest (12%) was seen in case of women in a group from 2 to 17 years old. Other examined age groups of women recorded a 13% share.

The results of the analysis show that for the 18-34 age group, the average ad blocker is well above the average for all AdBoard users registered in Canada. Conversely, the average age of older groups (35-49 years and 50+ years) is below the average number of all Ad-Block users.
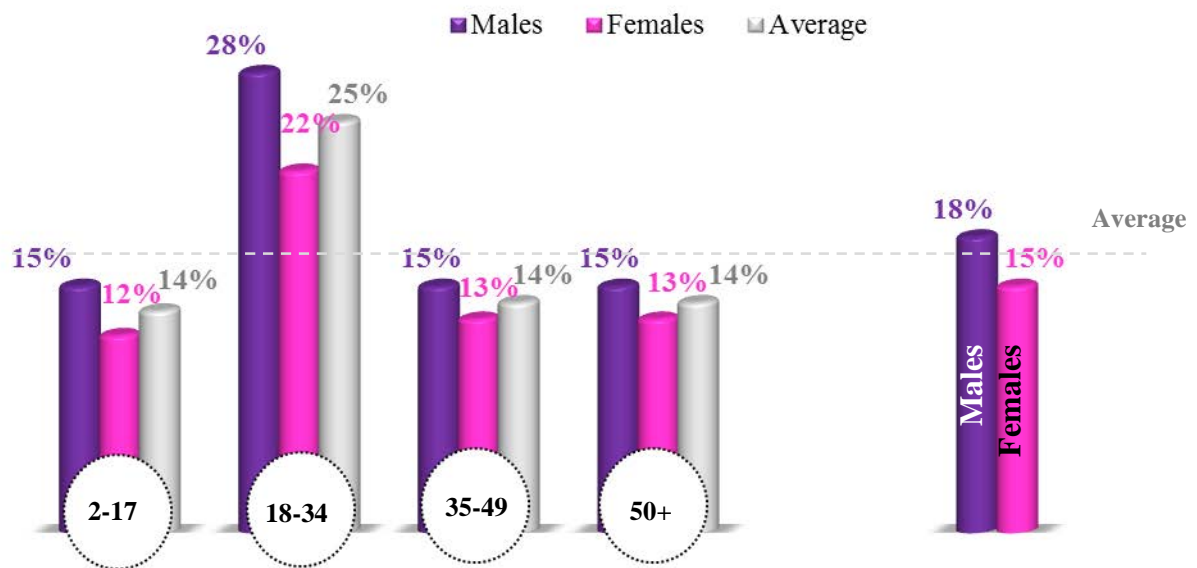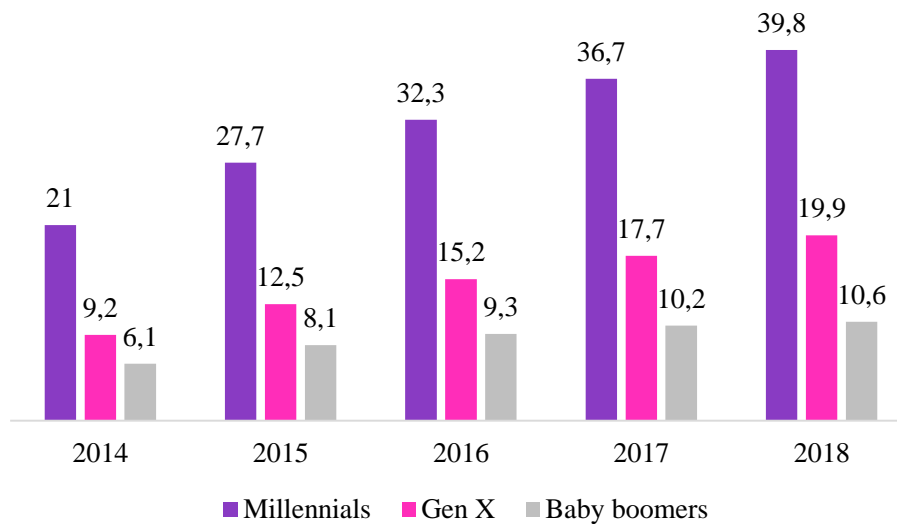
Chart 2 Using ad-block tools in terms of demographic characteristics
Source: comScore, 2016

One of the other analyses that addresses this issue is the Global Web Index (2017). Its results point to the fact that in the first quarter of 2015, less than one third (27%) of internet users installed on their PCs a software to block online ads. In the third quarter of 2016, however, an increase in these users was recorded by 10 percentage points, which clearly showed that the number of ad blocker users on PCs exceeded one third (36%) of the Internet population.

EMarketer (2017a) paid attention to this issue also in terms of generational differences. According to this statistical portal, the largest group of people using blocking tools is made up of users belonging to the Millennials generation. During the monitored period, the number of these users is constantly increasing and in the current year is 39.8 million. Half of the users of blocking tools belong to generation X. The oldest generation, generations known as Baby Boomers, are the smallest group of people (10.6 million) who block ads on the Internet.

The study of the online advertising perception of online advertising is also highlighted by a survey conducted by PageFair (2017), in November 2016 on a sample of 4.626 Internet users across the US who have focused their attention on motivation and Ad-block user instruments. From the results, we can say that the most important reason to install ad blocking software is the distracting online ad formats, as well as the privacy concerns of respondents.

Chart 3 Using Ad-block tools in terms of generational differences (millions)
Source: eMarketer, 2017a

In addition, the analysis has shown that educated people with a bachelor degree 1.5 times more often block the advertising as an average adult person and that 3 times more such people are in the age category from 18 to 24. Moreover, the results of an interpreted survey reveal that the overwhelming majority (74%) of these users admit leaving a webpage if they are unable to view its content due to the installed Ad-block tool. But on the other hand, up to 77% of the blockers declare they are willing to prevent some forms of online ads from blocking.

Based on empirical data from PageFair (2017) gained worldwide by combining different sources such as eMarketer, The Express Tribune, StatCounter or Priori Data, and their subsequent analysis, it is clear that with the increase in the number of ad formats in the online environment, large emerging markets are becoming the driving force behind the rapid growth of Ad-block tools, not only in personal computers and laptops, but are becoming mobile devices with an increasing trend in mobile internet usage.
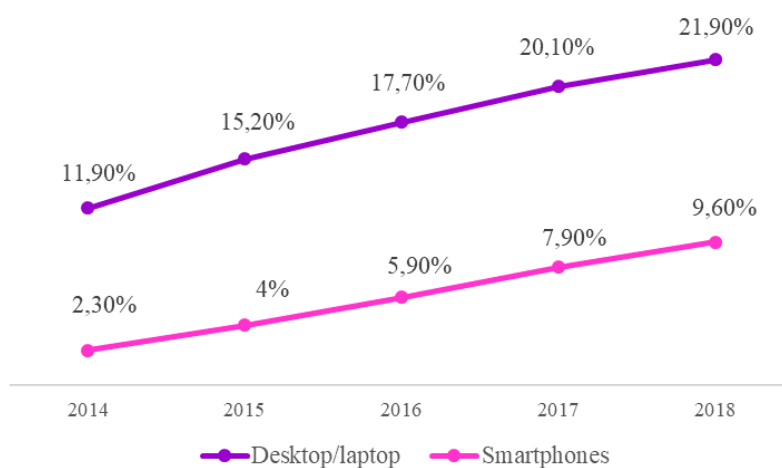

Chart 4 Penetration of the use of Ad-block tools
Source: eMarketer, 2017b

The eMarketer (2017b) portal has also tackled with ad blocking issues, which estimates suggest that the number of users of blocking tools has dropped to 75.1 million people. Chart 4 interprets penetration of ad blocking on individual devices. Obviously, people block ads more on

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desktops/laptops than on smartphones. In the current year, the number of desktop/laptop blocking users ranges at 21.90%, while 9.6% of the population uses ad-block tools in their smartphones. It can be noticed that in the last monitored period, the number of smartphone blockers has increased almost fourfold, while the number of desktop/laptop blockers has been increased by less than twice. According to eMarketer, this is partly because mobile ad blocking is not as effective - especially in applications - as on desktop and laptop.

Another study, which is part of AudienceProject Insights (2016) and which paid attention to blocking ads, revealed the fact that the use of ad blocking across different device types it becomes clear that blocking of ads primarily takes place on desktops used for private matters. A third use ad blocking on private desktops, while just a quarter are blocking ads on desktops used for school or work. While ad blocking is used to a greater extent on private desktops compared to school or work desktops, the opposite is true for tablet and for mobile phones. When looking at these mobile devices we actually see that the use of ad blocking on school or work related devices exceeds the use of ad blocking on private devices. Across the Nordics, 13% are blocking ads on their private tablets, while18% are blocking ads on their school or work tablets. On mobiles used for private matters, 12% are blocking ads, while 14% are blocking ads on their school or work mobiles.
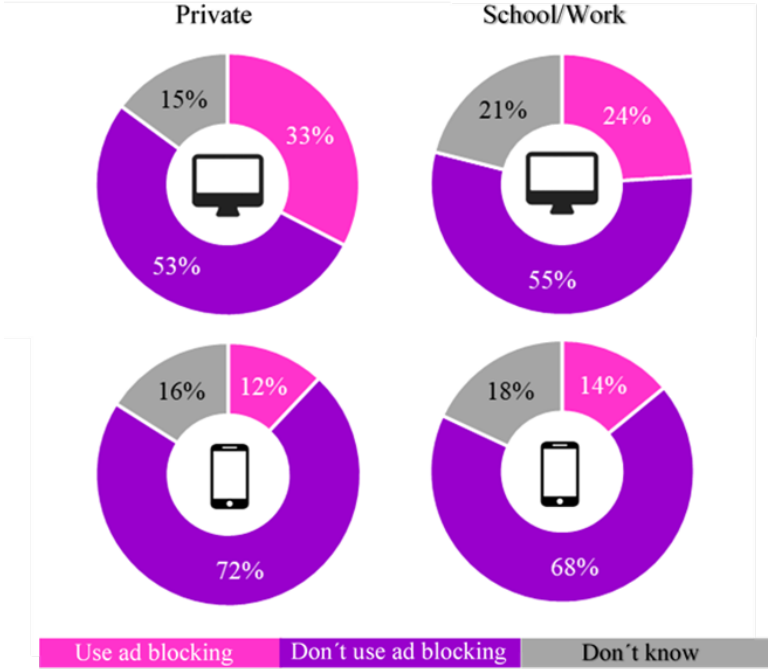
Chart 5 Blocking ads in terms of equipment
Source: AudienceProject Insights, 2016

This issue as well as the attitudes of consumers towards advertising, especially in the online environment, was also addressed by HubSpot Research (2016) with Adblock Plus financial support, and a survey was provided by Survey Sampling International. The structure of this sample consisted of 1.055 respondents from the United States, the United Kingdom, Germany and France, and the survey itself was conducted from May to June 2016. According to its results, up to 73% of the respondents admitted that the most disturbing advertising format for them is pop-up advertising. Only slightly less, 70% of the respondents said they do not like ads on their mobile phones and 57% of the respondents are disturbed before uploading video content. The survey, among other things, reveals that offline advertising is considerably less disturbing to consumers than online advertising. The print advertising in the magazines or

billboards was marked on average by only 19.5% of the respondents, which is in comparison with the pop-up advertising by more than half of the surveyed respondents.
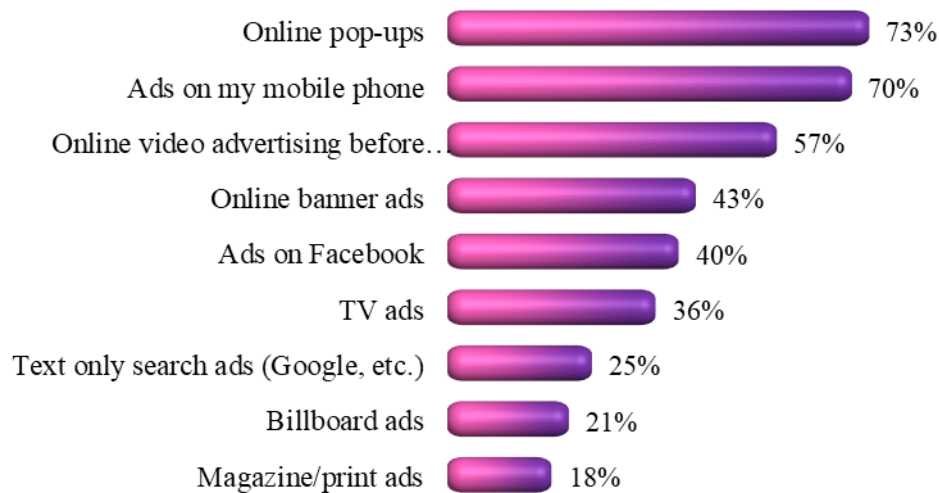
Chart 6 Consumer attitudes to individual ad formats
Source: HubSpot Research 2016

3 Conclusion

According to Karlíček and Král (2011), internet communication is characterized by a number of significant positive features. These include accurate targeting, personalization, interactivity, the use of multimedia content, simple measure of effectiveness and relatively low costs. With the help of internet marketing, new products can be introduced on the market. It is possible to raise awareness about existing products or branding, brand image enhancement or communication with target groups.

At the end of this study, based on the above-mentioned analyses and studies of global nature, it can be stated that online advertising blocking is becoming more and more alarming in the advertising industry. Many companies providing online promotion services face an ever-increasing number of ad-block software users. The above analyses reveal the fact that consumers are willing to understand the less disturbing advertising formats and therefore, based on the above, we declare that when creating concepts of marketing strategies, brands should inevitably respect the values and attitudes of consumers and then reflect them on the basic pillars of individual instruments.

Acknowledgements

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Business Success

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Abstract

This review study focuses on presentation of number of studies which have researched the success within business environment and have presented number of factors which determine success. The study shows, how is business success being defined and what kind of factors play significant functions in achieving success. Furthermore, we have shown what kind of limitation factors play important role from various perspectives significant to business. We have shown that not just supporting studies and views have impact on past research directions of business success but also some contradictory studies were presented which showed how much of consensus on various levels of business success factors were identified. Reviewed studies – over the range of more than 15 years - showed that some attributes of business success remained over longer period of time while other lasted only throughout limited number of years. The presence of corporation on global markets is taken into account via presentation of global value chain variables which create a footprint of factors defining success via businesses. The identified consensus of factors provided solid path towards identification of business success dimensions. At the end, the gained information from various studies reflected importance and interconnectivity of psychological review and business theories. According to identified current trends - based on reviewed studies - we have identified 7 variables which formed main drivers behind achieving the business success.

Keywords: Dimensions of business success, Business environment, Global value chain, Business success variables, New approach,

JEL Classification: Introduction I15, I31

Introduction

Topic of business and opportunity of success in business environment has been studied and researched over last 20 years to a broad extent. Many works have focused on particular aspects which defined business success from singular company or sector views. Other studies have provided views of too narrow look at the more macro looking perspective rather than cross-sectional view of business success via quantifiable and qualitative variables. Therefore, the direction of this study was to focus on initial definition of business success followed by its dimension and at the end the presentation of psychological view on success within business environment.

1 Defining the Business Success

Generic definition of business success defined by Alarape (2007), could be summed up into two points, such as creation of sustainable financial success and focus on creation of sustainable positive effects within surrounding environment. Every business in order to succeed needs to demand significant effort in all aspects and areas which have direct or indirect effects on the business success Jasra et al. (2011). Other study has defined the business success as the

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opportunity and ability to achieve goals and all those goals are mostly measured via profit, size, liquidity, efficiency and market share Lucky (2011).

According to presented aspects, business has achieved success if the operation of the business is effective, efficient, profitable and therefore successful. Number of studies pointed out that business does not just focuses on achieving the success but it's important for any business to identify specific factors which play significant functions Jasra et al. (2011), Ugwushi (2009), Alarape (2007). These studies identified number of factors which significantly influence the effort to achieve success from business stand point. The identified factors which limit achievement of success are: inadequate capital, financial resources, poor strategy, poor management, corruption and weak management experience. Additionally, published by other studies from Lucky (2011), Arowomole (2000) and Ogundele (2007) showed that there is as well another contributor to achieving success, such as social status, infrastructural functionality, educational advantage, ethics, economic prowess and institutional influence.

2 Business Environment and Business Success

Over the time, number of obstacles which increased in business environment and which limit achievement of business success has risen. The business environment has changed as well as other factors which are in some cases dynamic and significantly complex. From the entrepreneur point of view, the most important aspect on which business owners are focused is survival at various levels of competitive markets. In general, literature about business success is mostly focused on achieving information access, financial resources, marketing strategy, business plan, government support and technological resources Jasra et al. (2011).

The work of Audretsch (2005), presented via meticulous research a relationship amongst employees' deployment, ownership and decision making and specific performance of businesses. From this study, we can conclude that ownership has a specific impact on companies' performance. Additionally, business plans play crucial role in achieving success and required performance due to factors such as limitation of the risk profiles which are in many instances associated with specific business activities. Identifiable lacks within business plans were unveiled in study of Chami (2006), as key drivers and deviations from established business plans and therefore it had tendency to deviate from aimed business goals, ergo business success. Sources and relevance of business information plays crucial role in ability to generate success and has direct impact on technological solutions, government rules, sources of inputs, market interactions and overall regulatory policies.

There is a direct correlation between availability and quality of information with characteristics such as media coverage, infrastructure qualities, telecommunication systems, social capital, education and overall network (Deakins, 2006). Information access and possible networking has a direct impact on overall survival and growth of the businesses (Curran, 2007).

2.1 Financial Resources Impact On Business Success

The aspect of financial resources plays significant role in operating business adequately in profitable manner. There are number of types of businesses ranging based on their size from small, to medium and then to large corporation and the size itself can significantly limit and influence the ability of the business to access financial resources needed for operations and possible development focused on growth and innovation (Thurik, 2007). All these aspects have effect on economies of scale, budget control system, size of product line, market exposure and ability to meet consumers' needs. Size of the company limits the marketing approach, therefore it has impact on innovation, creativity and overall competitiveness. Many companies due to this

limitation use single line marketing which in more competitive markets has directly negative impact on business development and research (Robert, 2007). Additionally, to marketing and information sources, technology plays important role due its ability to create close relationships, improve production process and also it improves ability to access the information with respect to speed and accuracy (Curran, 2007).

According to study of Swierczek and Ha (2007), large number of companies face hindrances due to limited access to new technologies mostly due to financials and return on investments reasons. This is mostly visible at the scale of small and medium enterprises whereas the large corporations due to its market share and profitability levels can effectively manage this so call burden. In this situation, the presence of government can provide large help to level at least to some extend the playing field. Based on the research of Curran (2007), it is clearly visible that small and medium enterprises are the key driving force on the field of innovation, creativity, new stream of competitiveness and all of this is executed mostly via small but vital start-up community. Furthermore, derived from the work of Curran (2007), where it is clearly stated that not just large corporation can produce creative approach to competition with positive synergies affecting urban growth and development of communities but also small and medium enterprises tend to positively impact the grow of labour force, creation of innovation and sustainability within economies, employment creation in cities and also rural areas with strong direct and indirect benefits.

The work of Huggins (2007) shows that business plan plays a crucial role in achieving a better performance within business operations and corporation as a whole entity. As mentioned above, presented variable have important role in achieving business success although there are some studies which in some instances dispute the results presented by large number of studies focused on success in business. For instance, the empirical study of Indarti and Langeberg (2007) showed that only a few variable - in their case not all - play a certain role in improving business performance linked directly or indirectly according to presented studies on business success. Due to the partially contradictory results of some empirical studies it is important to examine what aspects of business environment can produce positive or negative impact on business success.

Studies of Hayami (2009) and Verhess and Meulenberg (2009), show that size of exposure of marketing activities depends primarily on size of the company and the size directly influences the technical and marketing resources, market research, customers' incentives, reward programs, access to market and overall brand recognition. Marketing financing and allocation resources to marketing and creative processes is crucial for generation of business growth, connection with consumers and achieving aimed success levels. Additionally, companies' operations and its transition to market operations is as well crucial in order to achieve aimed goals Hayami (2009). Market orientation is defined as business cultural approach to create appropriate behaviour focused on creation of higher value for consumers and this is in positive correlation with overall business performance. According to empirical study from Verhess and Meulenberg (2009), in homogenous market environment it is crucial for businesses to create products or services which provide attractiveness, healthy selection and overall fruitful added value for consumers.

2.2 Global Value Chain and Business Success

Business success is vastly depended on global factors which influence the presence of individual businesses within national and international marketplace. First work solely focused on the global value chain was presented by Hopkins et al. (1977), where the concept of global

value chain was introduced to broader academic audience. The underlying idea of global value chain was to map all existing inputs and production operations which lead to final output. The work Gereffi (1994), showed the structure of global value chain on the back of the clothing industry where the chain of supplies and operations with raw material up to final product were closely monitored. The term global value chain, has been introduced in 1980s, when the boom of academic literature about world business and value chain gained significant traction within academic circles (Porter, 1985).

One the main connecting variables between business success and value chains are overlapping variables. Value chains cover every step which is taken within business and it links to every product or service taken. Simple parts of value chain cover variables such as marketing, distribution, production, research, etc. The simple value chain is based on best added value for business breakdown and then disperse to various global locations which would multiply the synergy effects from exploring that particular location and global perspective. This particular disbursement gives business chance to enhance their position on the global market and to create additional stimulative effects for variables which are key to achieving business success. The following figure shows how are particulars of business separated and then position within global value chain.
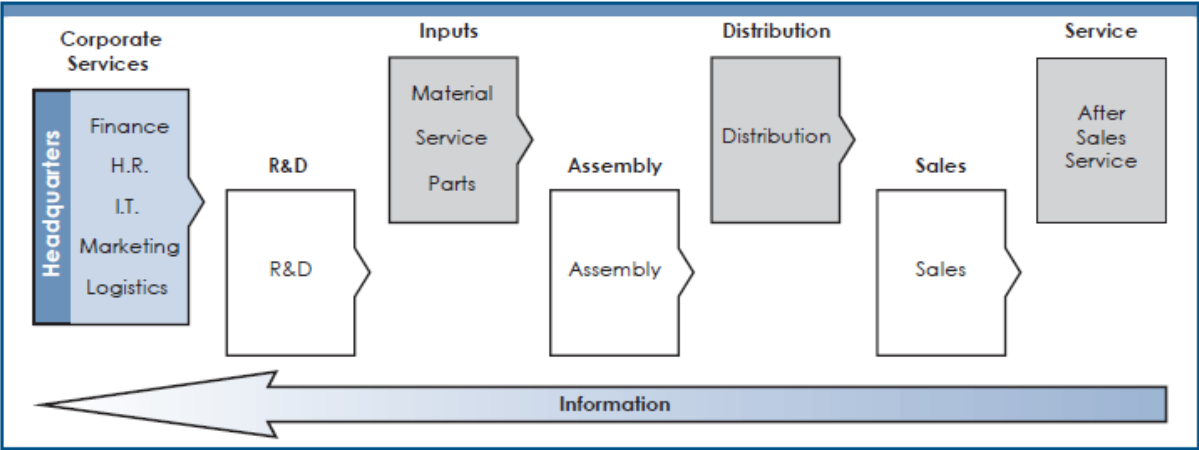
Figure 1 - Global Value Chain Factors
Source: The Canadian Trade Commission Service, 2010

2.3 Business Success Variables

The summary of all above studies show us that business success is directly linked to seven variables which are embedded into business environment and all those variables create a conceptual framework for achievement of business success from business point of view. The following variable create conceptual framework in order to achieve business success: marketing strategy (linked with creativity and competitiveness), entrepreneurial skills, business plan, information access, financial resources, technological resources and government support. The following figure presence the framework of all variables involved in constructing the business success from the empirical point of view and based on studies of Jasra et al. (2011).

Figure 2 - Business success based on framework of conceptual variables
Source: Jarsa et al., 2011

This figure is constructed based on the review of literature and its theoretical base focused on business success. This approach is clearly derived from the environmental approach to all variables which are effecting the business performance and therefore the business success.

The information provided in figures "Global value chain factors" and "Business success based on framework of conceptual variables" show clear overlaps within number of variables such as financial resources, marketing strategy, information access and technological resources. The strong correlation between global value chain variables and business success variables show that business success is fully depended on the level of exposure of business to these factors and how those factors are perceived by the particular business from the stand point of global presence.

Readiness of any corporation for implementation of global value chain and its ability to successfully compete in the global business environment is defined by satisfying the following attributes which are embedded in business success roots. Business success factors provided clear path for creation of three key factors which define the success of global value chain. Those factors are competency, clarity and compatibility. *Competency* is defined as the view firm's core competencies derived from internal business processes. Distinction of those business processes and the ways of innovation provide added value to business operations and create strong comparative advantage within the industry and market. *Clarity* shows how clear and strong has the firm its own business strategy. This business strategy is a clear way for firm to show its mission and vision and to provide high level strategies for achieving presented goals and objectives. Only effective strategy can achieve effective fulfilment of planned steps and to implement specific variables defining business success. *Compatibility* is a key factor which shows how well can particular business engage with other enterprises and how it can form business relations. This factor is essential to effective coordination of existing and to creation of new partnerships. Effective collaboration with other entities create additional driving force behind the overall goal to achieve business success by engaging via effectively set up global value chain variables. The following figure show vein diagram with three variables and how the intersection of those variables defined the space where success can be achieved from the stand point of global value chain and business itself.

Figure 3 - Global value chain (success defining factors)
Source: The Canadian Trade Commission Service, 2010

2.4 Business Success Dimensions

However, the work of Freeman and Beale (1992) showed that all of those variables have to have some core effects on business success dimensions. Based on the work of Freeman and Beale (1992) and presented empirical studies, we have selected the three main dimensions which in line with presented variable created direction for identifying the business success attributes.

Business success dimensions as defined by Freeman and Beale (1992) are: meeting design goals, impact on the customers and generated benefits for the organization.
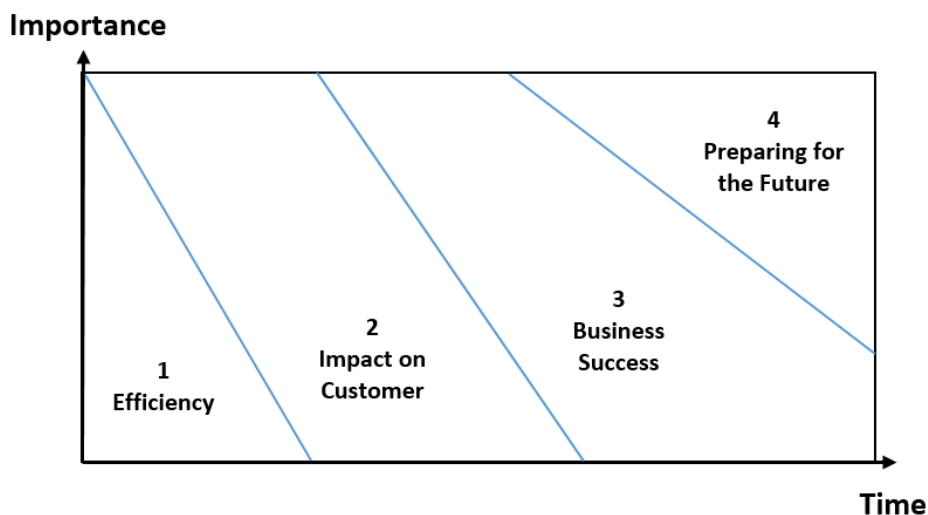
Figure 4 - Importance of Business Success Dimensions
Source: Freeman and Beale, 1992

From the above figure, we can see clearly direction from effective approach to all business success variables presented in above framework. The business success is time-dependable and this creates additional pressures on previous steps perform towards achieving the business success.

The study from Bird, Sapp, and Lee (2001) focused on identification how owner's gender and location of industry are effecting the business success among comparable businesses. Their study showed the main driver towards their research via evaluation of business success by

measuring the gross sales which in even larger sample would be very narrow approach to such a complex issue.

3 New Approach to Business Success

In contrary to generic theoretical approach - although supported by large volume of empirical studies and theoretical studies - there are new approaches to business success via more psychological understanding of entrepreneurs, consumers and constantly changing marketplace.

According to current trends covering not just the business narrow studies but also those involved in psychological reviews, we can conclude that business success is defined in more broadly socially acceptable measures then previously present solely from business stand point.

Based on Newsletter 68 (2013), the current top 5 dimensions of success in business with significant involvement of psychological perspective are:

- creation of happiness via inner driving strength,
- necessity of selecting right personnel into right roles,
- strategic plan with effective implementation,
- management capabilities and leadership improvement on continuous basis,
- according to customer needs continuous improvement of business practices.

Presented theoretical review shows that it is important to present theoretical basis for the research paper in order to get sense of direction towards most suitable and current empirical studies which then give direction to most recent trends within business environment and business success. It is important to understand that this study is focused on creativity inspiration from perspective of success in business environment. In some cases, detailed approach towards some business success theoretical aspects might be overwhelming but it is important to understand that it is necessary to present solid theoretical framework in order to understand concept of business success which has been defined by various fields and from various angles. The research paper without unifying view of this concept wouldn't present the clear path from psychological standpoint in order to research any inclusive attributes involved in business success such as competitiveness, creativity, or current creativity trends within nowadays corporations.

4 Conclusion

Presented review study shows how business success definition differs across various studies and theoretical reviews. There were identified number of aspects which influence business success such as financial resources, access to information, size of the company, surrounding environment, business goals and many others.

Furthermore, there were some particularly different factors which influence business success and this leads to creation of interconnectivity with link to creativity such as innovation, organic growth and technological solutions. Big part in business success for SMEs requires involvement of government and its ability to limit large corporation adverse and sometime monopolistic/oligopolistic influence. The influence of global marketplace is presented via global value chain variables which create a footprint on overall business success via factors, such as compatibility, competency and clarity.

Finally, the study showed that current trends very often push forwards more psychological factors which translates within this study into 7 variables which were defined as main drivers

in order to achieve success. This study provided solid view from theoretical review on success within business environment and it showed that psychological factors behind achieving success could provide further answers about drivers which could generate path towards success.

Business success is very important topic for number of research studies and identification of key drivers and factors plays important role in understanding of significant aspects of doing right decisions in business which eventually leads to fulfilment of desired goals. Psychological view on business success provides additional spectrum of considerable variables which enhance the evaluation and adequacy of all limitations and opportunities for business from psychological standpoint.

Acknowledgements

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Enterprises spin-off and spin-out as a form of cooperation between science and business in Poland

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Abstract

The article describes the essence of spin-off and spin-out firms in Poland. The academic enterprise is a way on the transfer and the commercialization of the knowledge and the technology from the college to the economic practice. A special example of the academic enterprise are companies of the type like spin-off and spin-out. A tool for stimulating academic entrepreneurship is to create conditions for the development and support of innovative spin-off and spin-out business. Creating spin-offs as a result of academic entrepreneurship has been one of important topics for discussion in recent years. The paper outlines the main determinants of spin-off and spin-out firms development processes in Poland. The article shows the importance of spin-off/spin-out enterprises in academic entrepreneurship. Due to the interdisciplinary nature of the problem it can be perceived in various ways. The publication is of an analytical-conceptual character and can constitute a contribution to the discussion on the issues and as the starting point for empirical research. The effective implementation of academic entrepreneurship requires a holistic, integrated approach. Hence the purpose of this paper is to provide, on the basis of the leading literature's analysis in this area and the author's own research, a multi-stage model of academic entrepreneurship, with a special focus on the key factors for its success. The main aim is to identify and analyze the determinants in the creation of spin-offs and spin-out in Poland.

1 Introduction

The rapid advancement of the knowledge-based economy requires intensification of activities in the area of cooperation between science and business. Nowadays, the ability to create knowledge – and especially transform it into new products, services and technologies – determines market success. It is therefore necessary to build and strengthen the bridge linking science and industry with a view to making an economy more competitive. It is important to learn about the mechanisms of transferring the results of scientific research to the economic reality (Skawińska, 2010). Currently, universities in many countries freely and openly cooperate with businesses, instilling entrepreneurial attitudes among their academic staff, PhD students and undergraduates. The traditional university model based on academic research and didactics no longer seems sufficient and is extended to include basics of entrepreneurship, i.e. behaviors are shaped that allow commercialization of the results of academic studies and independent undertaking of business activity (Kwiotkowska, 2013, p. 113-114). Against this backdrop, developing academic entrepreneurship is becoming increasingly important, especially in the context of spin-off and spin-out enterprises (Chyba, 2011a, p. 75). These companies are a significant source of innovation and an important mechanism supporting the transfer and commercialization of knowledge and new technologies from science to business.

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They are formed as a result of entrepreneurial activities pursed by researchers and other academics, using intellectual and organizational resources of the university for economic purposes (Matusiak, 2010, p. 69).

In accordance with the guidelines of the EU policy in Poland, various projects are undertaken whose goal is to bring science and business closer together. However, it turns out it is not all an easy task. Despite the increased efforts, the level of commercialization of knowledge in Poland is still unsatisfactory. Therefore, given the limited development of this type of initiatives in Poland, an interesting research problem seems to be to identify the factors determining the creation and development of spin-off/spin-out enterprises.

Drawing from the leading research trends observed in studies on the creation and development of spin-off/spin-out companies, the purpose of this article is to identify the conditions for the growth of university spin-off and spin-out enterprises in Poland. The first section of this paper discusses theoretical issues related to the functioning of such companies. Subsequently, the factors showing the greatest impact on the development of academic enterprises, in particular university spin-offs and spin-outs, were identified. This publication is analytical and conceptual in nature, and may provide both a contribution to the discussion of the issues raised and a starting point for empirical research. Systematic literature review and case study analysis were used to achieve the objective set out in this paper. The research covered articles appearing in the Ebsco Business Source Complete database, in which the search was run for full-text, peer-reviewed articles published in scientific journals in 2000-2018, containing the following key words in the abstract: *academic entrepreneurship, spin-off, spin-out, commercialization of research results, higher education.*

2 The concept of the functioning of spin-off and spin-out enterprises

In a knowledge-based economy that emphasizes the efficient use of the potential of science, it is necessary to speed up the transfer of knowledge from academic institutions to business entities. One way to achieve this is to develop academic entrepreneurship by creating spin-off/spin-out companies. Many interpretations of the term spin-off/spin-out can be found in the literature[2]. In recent years, this concept has evolved and there is currently no single, good-for-all definition that would describe it in a precise and explicit manner. The term derives from English, meaning a secondary effect or a derivative of the work done. In business language, it

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[2] Authors often use both terms interchangeably, considering them to be synonyms. Sometimes they also use the terms: "academic company", "professor's company". A spin-off/spin-out company distinguishes the founder (academic employee, student or university graduate) and the fact of using intellectual property of universities, which determine the competitive advantage of the company. An important factor differentiating both types of enterprises is the relationship they share with their parent organizations. It should be emphasized that the parent organization may be not only a university, but also other entities, e.g. a research and development facility, a business. A spin-off enterprise is a company originating from a university, organized in the form of a legal company, most often limited company at first and with a large participation of the university and the involvement of its employees, less often in other legal forms and with the participation of employees only. It is set up by at least one employee of an academic or research institution who is a holder of at least a PhD degree. A spin-off enterprise may also be founded by a student or a graduate, always with a view to transferring and commercializing new technologies from science to the economy. A spin-out enterprise differs only in that it is usually independent in organizational terms from its parent (e.g. university) and relies on independent sources of financing. Unlike spin-offs, spin-outs are a new entity founded by an employee or employees of the parent research facility using its potential (intellectual/material resources), but functioning independently (organizationally, formally and legally, financially) from the parent organization - mainly the university (Brodnicki and Grzegorzewska-Mischka, 2016, p. 87; Kumański, 2016, p. 90; Ćwiek, 2012, pp. 414-415; Makowiec, 2012, pp. 107-108; Chrabąszcz 2011, pp. 201-202; Stasiak, 2011; Banerski, Gryzik, Matusiak, Mażewska and Stawasz, 2009, pp. 36-37).

defines an enterprise that branches off the parent company as a result of conducted scientific research. This newly founded company is to a certain extent independent from its parent company. This separation can take many forms, although it most often entails a risk, control and profit transfer to the new company.

The term spin-off/spin-out was first used in the 1950s in the United States. Initially, it referred to innovations generated in the arms industry, especially in aviation and astronautics (the spin-off effect). In the 1960s, the spin-off effect was used in the civilian area to seek new solutions in sales, finance and management. The emergence of a spin-off enterprise was the result of a transfer of technology and knowledge within the framework of research and development projects supported by government and private funds. The involvement of private funds concerned enterprises that decided to base their development on innovation strategies.

Currently, a spin-off/spin-out defines a venture consisting in the creation within the existing enterprise (the parent enterprise) of a new business entity with a varied level of independence. The reasons for a new company to branch off from the already existing enterprise may vary, prompted by a call for more independence or a strong initiative of a certain group of employees. In the literature, there is a number of different opinions regarding the preferability of setting up spin-off/spin-out companies (Furmańczyk and Kaźmierczyk, 2017; Al-Tabbaa and Ankrah, 2016; Buczek and Modrzyński, 2015; Flisiuk and Gołąbek, 2015; Stephan, 2014; Szarucki, 2012; Djokovic and Souitaris, 2008; Clarysse, Wright, Lockett, Mustar and Knockhaert, 2007; Druilhe and Garnsey, 2004).

In foreign literature, the term spin-off/spin-out is interpreted differently. L.M. Lamont describes it as "an innovative enterprise created for the purpose of technology transfer from an industrial enterprise, from research institutes, or from a university" (Lamont, 1972) and an informal transfer process that leads to the creation of new innovative enterprises. E. Roberts and D. Malone indicate that "it is a separate legal entity, based on the technology provided by the parent organization and supported financially, e.g. by a venture capital fund" (Roberts and Malone, 1996). E. Roberts also allows the non-technological nature of the transfer (e.g. only staff). On the other hand, N. Nicolaou and S. Birley argue that the necessary condition for a spin-off/spin-out is the transfer of technology (from the university), but not necessarily the transition from the university to the new entity (Nicolaou and Birley, 2003). S. Birley also emphasizes the importance of the flow of intellectual assets (see: Badzińska 2013, p. 26). S. Davenport, A. Carr and D. Bibby describe the spin-off/spin-out enterprise as "an effective way to develop intellectual property, enabling the growth of scientific capabilities and transfer of technology and innovation" (Davenport, Carr and Bibby, 2002) from the realm of research to business practice. According to D.A. Garvin calling it "one of the possible forms of entering the market" (Garvin, 1983, p. 5). Other authors focus on the important features of spin-offs/spin-outs, which include: transfer of know-how, product attributes, and a completed process of developing new products or processes from an existing organization to a new enterprise. The most inclusive interpretation of the spin-off/spin-out concept covers "all kinds of technological knowledge transfer from an enterprise that has developed its own know-how, to the entity that is to apply it in practice" (Garvin, 1983). Spin-offs/spin-outs are most often established in parallel with the separation and becoming independent of assets in an already existing enterprise. This definition was developed by the American Bank of Boston together with the Massachusetts Institute of Technology (MIT). Although their report does not use the term "spin-off/spin out", only "MIT partner companies", it was recognized that spin-offs/spin-outs are knowledge-based entities created both by university employees and its graduates,

Therefore, spin-off/spin-out entrepreneurship is often referred to as academic entrepreneurship.

According to A. Tübke, a spin-off/spin-out is a restructuring tool in large parent organizations. The division of the parent organization into smaller enterprises is connected with capital and structural dependence. Newly created entities may emerge from both the employees of the parent institution as well as from the external environment (Tübke, 2005). In turn, T.C. Knecht considers spin-offs/spin-outs to be an interface between technology and the market, and between the founders of the new company and investors, arguing that spin-off/spin-out entities arise only when they involve technology and are created in the business environment. Knecht also emphasizes the important role of individuals initiating the process of founding the company and their direct cooperation with investors. In his view, a spin-off/spin-out must result in a clear commercialization of the idea (transfer of knowledge) through founders from research and development centers (Knecht, 2003).

An entirely different interpretation of spin-offs/spin-outs is provided by S. Maselli, who defines them as companies founded by former employees of the parent entity, with the newly created company perceived by him as an innovative enterprise. This new entity should be distinguished not only by an innovative know-how, but more importantly, by a research team (transfer of people) ready to conduct research and development (R&D) works. It is worth noting that this newly founded organization is legally and economically independent, and its creation was previously agreed with the parent entity where its founders were employed. The spin-off/spin-out contract may include conditions for the parent company's involvement both at the stage of creating a spin-off company and during its activity. Thus, the parent entity can support a spin-off/spin-out company in the areas such as: legal, organizational and financial support, access to laboratories and specialized measurement equipment, access to other tangible and intangible resources, access to current results and research. This form of support may be related to the expectations of the parent company with regard to possible benefits. In response to the assistance provided for the emerging spin-off entity, the parent company can expect: a minority share in the spin-off/spin-out company, long-term insight into the company's activity with clearly defined obligations towards the parent entity, access to conducted research studies and results. S. Maselli also draws attention to the continuous motivation of employees by the parent company, aimed at developing entrepreneurial thinking and acting among employees (see: Brodnicki and Grzegorzewska-Mischka, 2015, p. 28).

In Polish literature, the term spin-off/spin-out is associated with a spin-off/spin-out company defined as a new enterprise, created by becoming independent of the employee(s) of the parent company or other organization (e.g. research laboratory, university), using for this purpose the intellectual resources of the parent organization. Founding a company through becoming independent of research institutions or technical staff of large industrial enterprises is often linked with the commercial use of technology, technical knowledge and skills acquired in the parent organization. This process contributes significantly to the spread (diffusion) of new technologies in the economy. In some cases, a breakthrough discovery in a single scientific and research organization may prompt the emergence of a large group of new spin-off/spin-out companies (Głodek, 2010). The creation of a spin-off/spin-out company is accompanied by a transfer of knowledge and commercialization of research studies, referred to in the literature as the technological creative class (see: Brodnicki and Grzegorzewska-Mischka, 2015, p. 28).

All these definitions emphasize the separation of new activities from the parent entity in order to conduct often risky ventures, impossible to implement due to economic or technical constraints. There are two basic areas of separation of spin-off/spin-out enterprises: (1) the public sector (universities, scientific and research institutes); and (2) the private sector (large companies and corporations).

Spin-off/spin-out companies could not be created without an entrepreneurial strategy of the university aimed at ensuring the greatest practical dissemination of its achievements, or aspirations of individual university employees or its students to become independent and pursue business ideas. These companies additionally require the existence of regulations within the university that would be open to such initiatives and that would offer significant support to researchers, especially during the development period.

A spin-off /spin-out company may also be created by separating from the structure of the existing enterprise of a new unit with a varied level of independence, mainly with a view to implementing new, often risky, technological projects. Such company usually deals with a small area of its current activity, becoming a specialist company, and it most often conducts activities in high-tech markets. New entities may be related to the parent entity through capital, either organizationally or personally. Spin-offs/spin-outs are characterized by freedom of action allowing for greater involvement and the possibility of attempting commercialization of research results without burdening the parent company (Badzińska, 2013, p. 25-26).

When analyzing the functioning of spin-off/spin-out enterprises, it should be noted that they can be identified bottom-up and top-down. A bottom-up approach, or "the entrepreneur takes it all", shows full takeover of intellectual property by entrepreneurs and start-ups. The role of the academic center is limited to indirect benefits, such as increased prestige, maintaining contact with the company, and the possibility of receiving new orders. This approach is characteristic primarily of American and British universities (spin-off enterprises). On the other hand, a top-down approach, meaning "the university takes it all", shows the superiority of the interests of the university over corporate managers. In this approach, the university uses its intellectual achievements with the help of a company or management agency. It is the university that determines the directions and shape of a new venture, evaluates the potential of a developed technology, and ultimately decides about its commercialization. Granting authorizations, signing the contract with the entrepreneur and active participation in company management are also handled by the academic centers, with this approach being characteristic mainly of continental Europe (spin-out enterprises) (Kumański, 2016, p. 90; Weiss, 2015, p. 10; Ćwiek, 2012, p. 415).

The separation of a spin-off/spin-out company from a parent enterprise may bring a number of benefits. University spin-off/spin-out companies enable commercialization of research results, creation of new jobs, development of an economic and competitive industrial structure, in which reduction of the organizational structure and of unnecessary positions lead to full process optimization. The development of such undertakings particularly stimulates and supports the financing of research that helps increase economic growth, social welfare and regional development (Steffensen, Rogers and Speakman, 2000) Moreover, spin-off/spin-out companies are a significant source of innovation (Vand de Velde, Clarysse and Wright, 2008; Clarysse, Wright, Lockett, Vand de Velde and Vohora, 2005) and an important mechanism supporting the transfer of academic knowledge to industrial practice (Fontes, 2005; Clarysse and Moray, 2004). In addition, such projects spring from an entrepreneurial

process, based largely on the use of knowledge, especially technology created at universities (Kwiotkowska, 2012, p. 180).

The creation of this type of companies also leads to the following (Makieta, 2016, s. 151; Makowiec, 2012, p. 113; Stawasz, 2007, pp. 266-267):

- bridging the gap between scientific research and the market (correlating research with the market, increased inflow of innovative solutions to the economy, enabling new practical solutions),
- creating companies manufacturing products and services using the latest technologies,
- creating network links between universities and business entities and organizations
- increasing financial incomes of R&D centers and employees,
- increasing the research potential of R&D centers,
- combining theory and practice in the didactic activity of the university,
- raising the competitiveness (brand-building) of a university or a field of study on the market,
- building internal organizational and subjective structures focused on innovative technologies, e.g. business incubators, technology transfer centers,
- clusters, technology parks,
- building network links between universities and graduates, enterprises formed by graduates.
- creating new jobs for university graduates,
- self-employment of academic staff and students and its beneficial effect on reducing unemployment,
- increasing the competitiveness of individual economies.

3 Identifying factors influencing the development of spin-off/spin-out enterprises in Poland

University spin-off/spin-out companies are the main trend of academic entrepreneurship and one of the most active mechanisms of commercialization and technology transfer (Tamowicz, 2006, p. 9). The structure of academic enterprises in Poland does not differ significantly from European standards, where micro-enterprises of approximately 10 employees are predominant (see: Makowiec, 2012, p. 107). In Poland, only a few researchers have so far thoroughly analyzed spin-off/spin-out companies, with the first official publication dating back to 2006 (Tamowicz, 2006). The system of official statistics in Poland does not allow to determine the actual size and dynamics of spin-off/spin-out companies. This makes the picture of the spin-off/spin-out sector rather unclear, while national data are based on incomplete information that cannot always be compared and reliably presented in the statistics (Kumański, 2016, p. 91). In 2015, U. Wnuk and S. Tommei carried out an empirical study, in which they compared the scale of academic entrepreneurship related to leading technical research centers in Poland and Italy. It was found that the number of spin-off/spin-out companies associated with five Italian universities and one research center is more than 10 times higher (300 companies) than for the five best tech universities in Poland, including: AGH University of Science and Technology or Wrocław University of Technology (27 companies) (Wnuk and Tommei, 2015, p. 79) . Z. Chyba identified 55 academic spin-off/spin-out companies in his study (Chyba, 2011b). M. Kaliczyńska and M. Kalinowska estimate that there are approximately 100 spin-off/spin-out companies in Poland (Kaliczyńska and Kalinowska, 2012). Most of them are fruit of research studies conducted at universities and were created with a view to commercializing their results.

An analysis of academic spin-off/spin-out enterprises confirms that they show a particularly high rate of innovation in high-tech industries, including in: biotechnology, pharmacy, telecommunication, information technology, electronics, as well as energy technologies and smart materials (Weiss, 2015, p. 12). University spin-offs/spin-outs in Poland tend to have in common the following (Badzińska, 2013, p. 27-28):

- a relatively high share of expenditure on R&D,
- intensive use of knowledge resources and human capital in building a competitive advantage,
- quick reaction to signals from the market - mobilization of resources,
- a large share of employees with scientific and research experience,
- creating and implementing innovative solutions on the market,
- close ties with scientific and research institutions, serving as a source of innovation and information.

Key features of spin-off/spin-out companies in Poland also include a higher level of innovativeness compared to companies created in a different way and an above-average commitment to technology-transfer processes (Stephan, 2014). The very creation of a spin-off/spin-out company is one of the major mechanisms of technology transfer (De Cleyn, Festel, 2016), plus these companies actively participate in various processes of technology transfer at subsequent stages of their development due to their unique features and the purpose of their activity. According to P. Mustara, both financial success and the position of innovative and competitive spin-offs/spin-outs depend to the greatest extent on their ability to build strategic partnerships and establish cooperation with different groups of entities (Mustar, 1998), and therefore, on the formal and informal efficiency of knowledge transfer processes.

The development of university spin-off/spin-out enterprises in Poland is additionally determined by the applicable legal provisions (*Ustawa z dnia 18 marca 2011 r. o zmianie ustawy – Prawo o szkolnictwie wyższym, ustawy o stopniach naukowych i tytule naukowym oraz o stopniach i tytule w zakresie sztuki oraz o zmianie niektórych innych ustaw*; *Ustawa z dnia 27 lipca 2005 r. Prawo o szkolnictwie wyższym*; *Ustawa z dnia 30 kwietnia 2010 r. o zasadach finansowania nauki*), the actual need for cooperation between scientific entities and enterprises, as well as many other factors which exist in the environment that co-shapes these processes. Recently, most Polish academic universities have launched organizational units to inform businesses about their academic efforts and research outcomes in search for potential clients and new partners. One can, therefore, increasingly often speak of the emergence of academic technology transfer departments, whose performance and development determines the actual opening of the university to cooperation with businesses and the promotion of a practical approach to statutory research and development activities.

Universities were legally obliged to cooperate with the business environment already in 2005 (*Ustawa z dnia 27 lipca 2005 r. Prawo o szkolnictwie wyższym*). At that time, however, the emphasis was on marketing intellectual property, with no mention of the possibility of its implementation in the market through the company itself. Although technology transfer centers and academic business incubators could technically be run as separate legal entities, the inconsistency with other laws and the lack of good practices meant that universities were hesitant to do so. Consequently, spin-off/spin-out companies were exceptionally rare at that time. The changes introduced in the Higher Education Act of 1 October 2011 made consistent the rules for the creation of such companies and encouraged universities to found them.

The amendment to the Higher Education Act (*Ustawa z 18 marca 2011 r. o zmianie ustawy – Prawo o szkolnictwie wyższym, ustawy o stopniach naukowych i tytule naukowym oraz o stopniach i tytule w zakresie sztuki oraz o zmianie niektórych innych ustaw*) provides that a university, in order to commercialize the results of scientific research and development works, should create a commercial law company, called a special-purpose company (Polish: *spółka celowa*). The legislator, therefore, recommends choosing the indirect model of spin-off/spin out companies to allow flexibility in their operation and reduce the risk of the university being directly involved in the innovative undertaking. At the same time, it should be noted that the Act only mentions the examples of tasks of a special-purpose company, so it can be concluded that the road to commercialization leading directly through that company (i.e. without it having to create another business venture) is also possible.

The Higher Education Act also determines the legal form of a special-purpose company, limiting it to one of the types of a limited company or joint-stock company. The decision about founding such companies is made by the Rector with the consent of the university senate. The tasks of special-purpose companies are listed in the Act only as examples, the main of which is the acquisition of shares in capital companies or their creation for the purposes of commercialization of the results of scientific research. In addition, pursuant to the Act, the Rector may entrust a special-purpose company with the management of industrial property rights (with the exclusion of other types of intellectual property rights, in this case copyright), which is done by their contribution in-kind to the company. The special-purpose company has full freedom to handle the received rights: it may locate them in a spin-off company as a contribution-in-kind, sell it, or license it (Makowiec, 2012, p. 111).

Based on the literature review involving studies concerned with the identification and classification of factors influencing the development of university spin-off/spin-out enterprises in Poland, the most important conditions for the creation of such entities include: supporting structures, networks (connections) and networking, geographical location, pro-innovation institutions, access to technology, the market and marketing (Kwiotkowska, 2012, p. 184-186).

Supporting structures can involve various forms of support, especially financial support (Korpysa, 2016), which is of particular importance in the initial stages of development. It may also engage commercial institutions, such as venture capital funds, business angels, banks and parabank institutions, as well as family and friends. The support of the state is also significant. The second category of factors is related to the creation of networking and making connections. Networks can be created with other spin-off companies or popular business forms, parent entities, clients, or suppliers. Another important factor influencing the development of university spin-offs/spin-outs is the geographical location, especially with reference to the proximity of a parent entity or a pro-innovation institution. Additionally, the proximity of incubators, technology parks and technology transfer offices is very important for universities and research institutions, given that it provides the advantage and the ability to monitor both areas – scientific and technological. Equally important is also the location near the industrial area or urban centers, agglomerations, which supports and accelerates the development of spin-off/spin-out companies. In addition, studies indicate that the following also deserve a separate mention: pro-innovation institutions, training and consulting institutions, technology transfer infrastructure centers, especially business incubators, and science and technology parks, which provide a variety of services and assistance mainly in the early stages of development. An important role can also be played by clusters of spin-off/spin-out companies or informal structures, similar to the industrial cluster. The goal of the

incubator is to effectively combine talent, technology, capital and know-how in order to speed up growth and forge the right bond of newly created companies with parent units for the optimal use of existing infrastructure. Spin-off/spin-out companies usually lack sufficient resources to grow, while incubators provide space, location, support, advice, finances and loans for new entrepreneurial initiatives. Moreover, not all resources needed for the further development of the company are known at the outset of business activity, and instead they emerge only as the venture moves forward. Incubators can therefore provide the necessary resources in line with the growing needs of companies, and also provide direct access, through formal and informal contacts and networks, to resources outside the incubator itself. Another separate category influencing the growth of competitiveness and supporting the development of spin-off/spin-out companies is access to technology. Technology is an important factor that affects major aspect of running a business such as: quality, price, delivery. In addition, broad access to technology enables cheaper production of higher-quality products. Noteworthy are also many factors related to the market, such as market shaping and research, market strategies, and marketing. Market segmentation, targeting and positioning are also significant, enabling to obtain information about types of clients/customers and to support the selection of those who are best suited to potentially receive a given product or service, as well as to optimize products/services for the introduced segmentation. The push and pull strategies support spin-off companies in promoting their market segment. It is also important to conduct market research and analyses, e.g. through marketing simulation. The discovery of the market niche often becomes the basis of the spin-off company's activity, favoring its creation and further development (Kwiotkowska, 2012, p. 184-186).

Last but not least, EU and regional programs are also conducive to the development of spin-off/spin-out enterprises in Poland. Since Poland's accession to the European Union, various pro-innovation institutions have been established to support and promote the creation of spin-off/spin-out enterprises.

4 Conclusion

Currently, spin-off/spin-out enterprises in Poland are developing in industries considered to be forward-looking and crucial from the point of view of a knowledge-based economy. These companies are founded, among others, as a result of projects carried out by researchers at the stage of applied research. Research team members decide to start a business based on the knowledge and technology developed during the implementation of the projects they are working on. Knowledge workers with high substantive skills (i.e. skills that require a long time to be acquired) play a particularly important role in these companies.

Analyzing the functioning of spin-off/spin-out enterprises in Poland, it can be observed that their success depends on: the availability of financial resources, a strong scientific foundation (institutional scientific base), technological and business knowledge resources, focusing on a specific application and niche market, and business experience. In the long-term perspective, spin-off/spin-out companies are the most profitable way of commercializing scientific thought. The advantages of these companies include: isolation of the market subject from the research structure, ease of doing business, transparency of structures and financial streams, university support (meaning less risk, further reduced by specific guarantees on the part of the experts in a given field), and therefore, greater stabilization.

Despite the obvious benefits, "spin-off/spin-out" entrepreneurship is still not very widespread, remaining a minor tool for commercialization of innovations among Polish academics. This is partly due to their ignorance and reluctance to simply take the risk. Another problem is the lack of incentives from senior management to support spin-off/spin-out development.

Therefore, all kinds of actions should be taken, including at government level, for the creation of spin-off/spin-out enterprises, given that they can help bridge the existing gap between the results of scientific research and its application in industry (Makowiec, 2012, p. 125).

To speed up the development of spin-off/spin-out enterprises in Poland, it is therefore necessary to (Lipczyński, 2013, p. 61; Makowiec, 2012, p. 114-116;Banerski, Gryzik, Matusiak, Mażewska, Stawasz and 2009, p. 143-148):

- increase budget spending for R&D projects, and improve access to a number of complementary sources of financing;
- improve and increase the stability, transparency, rationality and effectiveness of applicable law;
- enact formal provisions on the possibility of sharing project profits by involved parties;
- strengthen the position and develop effective organizational formulas for bridge institutions - technology transfer centers, incubators, and technology parks;
- put forward rules for access to the technical and laboratory infrastructure of the university;
- determine the possibilities of using scientific resources that are the intellectual property of the university as well as the concepts and results of research developed at the university by the spin-off/spin-out company, which should also be subject to its law as the property of the educational institution;
- support proper staff training not only in terms of education, but also attitudes, ambitions and understanding of investors and capital markets, as well as promote the encouragement of cooperation between research workers and R&D centers with entrepreneurs;
- conduct benchmarking of implemented innovations and their active promotion;
- steadily expand international cooperation in the field of knowledge and technology transfer to science and business.

The development perspectives for spin-off/spin-out enterprises can be perceived in further transformations of university and scientific-research institution operations, as well as their relationship with the economy. An opportunity for spin-off/spin-out companies is also the intensive promotion of this particular method of commercialization of intellectual property and the intensification of research and implementation activities in international cooperation networks.

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Strategic water management in enterprises

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Abstract

Strategic water management attracts attention of a large group of business stakeholders because of water-related problems in many entrepreneurial supply chains. However, the present knowledge about water resources management in enterprises is rather limited both at international and regional levels. The aim of this paper is to identify the actual business requirements and strategies for long-term water management in enterprises from case-study countries. The analyses presented in the paper are based on the data retrieved from field researches conducted in 2014 among 721 enterprises from selected countries around the world. The outcomes of the analyses give insights about research on risk, barriers and needs related to strategic management of water resources by business and water management systems in enterprises that are perceived as leaders in generating benefits in the system of a circular economy. The analytical information presented in this paper is a valuable contribution for businesses focusing on achieving a competitive advantage as well as for public policy in creating solutions to problems of industry development restricted by water scarcity.

Keywords: strategic management, environmental management systems, water management systems, supply chain, water auditing, public policy, circular economy

JEL Classification: L10, L19, L21, Q25

1 Introduction

The term *strategic water management* is used mainly in public policy. The domain of strategic water management entails long-term objectives related to water quality and quantity problems considered in the social, economic and environmental context of local, regional and national communities. Presently, the water issues are also a challenge for strategic management in enterprises around the world, especially the industry sectors dependent on this resource (Bissacot, Oliveira, Bissacot and Oliveira, 2017). Among the factors determining the interest in strategic water management in enterprises are: more stringent regulations of sustainable development and circular economy policy. The economic and administrative mechanisms embedded into these two kinds of policy include environmental policy instruments for governments oriented towards pollution reduction of air, soil and water, waste management, depletion of natural resources etc. (Liao, 2018). Both sustainable development and circular economy policy attribute to the private business the central role in the process of industry transformation or transition to more sustainable sociotechnical and economic systems (Geissdoerfer, Savaget, Bocken and Hultink, 2017). The changing business milieu and natural environment, new regulations (Wiengarten, Pagell and Fynes, 2013), innovations, customers expectations (Barrington, Prior and Ho, 2013) and investors' needs can be perceived as significant factors in the process of growing concern when striving for more efficient environmental management within supply chains, including environmental management

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systems and strategic water management. However, the current research problem is the limited knowledge of business on the integrated water resource management (IWRM) (Romer, 2014) – considered as integration of social, ecological, and infrastructural systems (Varady, Zuniga-Teran, Garfin, Martín and Vicuña, 2016) – as well as knowledge on actual business requirements and strategies regarding water management. There are many cases illustrating this problem. For example, it is water scarcity that has restricted the development of the coal chemical industry in China, because energy use, water inefficiency, and pollution have not been integrated to solve effectively (Xu, Hou, Xie, Lv and Yao, 2018). Another example is the petroleum refinery industry in Western Australia, which despite highly efficient water management, only after water auditing, has identified new opportunities and introduced company water policy (Barrington et al., 2013).

The research question in this paper is: What are the requirements and strategies in the water management of enterprises in selected countries around the world? The information on strategic requirements presented in this paper is important for business, when conducting the water auditing, identifying water risks and creating strategies on water management (which are currently absent in many leading companies) (see e.g. (Barrington et al., 2013). The contribution of this paper can be valuable for public policy design, when developing future circular economy regulations and incentives. Improved understanding of those issues is a basis for future effective planning, which can lead to (Kwieciński, 2008) new targets and goals in strategic management. Furthermore, the paper can also be helpful to investors and consumers concerned about water disclosure of the business sector in order to exert public pressure on a company (see: e.g. Maj, Hawrysz and Bebenek, 2018).

Thus, based on the research problem formulated above, the goal of this paper is to identify the actual business requirements and strategies in water management of enterprises from selected countries around the world. The analyses presented in the paper were based on the field research realized in 2014 among 721 enterprises in 49 countries. The research hypothesis of the paper assumes that the advancement in strategic water management among scrutinized enterprises is slow in many cases.

2 Drivers and recommendations for strategic water management in enterprises

Currently the idea of strategic water management in enterprises attracts growing attention because of the global water trends i.e.: increasing demand, insufficient supply and decreasing water quality (Barton, 2010). The probable business implications of these trends presented in the report of the Coalition for Environmentally Responsible Economies (CERES), are (Barton, 2010):

- Uncertain water availability in some regions,
- Higher costs for water,
- Regulatory restrictions on water use,
- Conflicts with communities and other stakeholders,
- Growing demand for water-efficient products,
- Decreased water availability for industry and agriculture,
- Operational disruptions and resulting financial loss,
- Disruptions to operations of suppliers and critical value chain partners,
- Impacts on future growth and license to operate,
- Higher pre-treatment costs for water,
- Higher costs for wastewater treatment to meet regulatory standards,

- New regulatory restrictions on some industrial activities and investments,
- Higher responsibility to implement community water infrastructure and watershed restoration projects,
- Workforce productivity impact linked to lack of drinking water and water-related illness.

Nowadays, in some supply chains the "strategic water management is no longer an option, but a prerequisite for stakeholders" (Salvá, Jones, Marshall and Bishop, 2013). For a long time however, this field of strategic management was underestimated in enterprises. According to the CERES report, the first comprehensive assessment and ranking of water disclosure practices of 100 publicly-traded companies (Barton, 2010), the majority of organisation scrutinized in 2008 had weak management and disclosures of water-related risks and opportunities (Lambooy, 2011). The activities recommended in the CERES report included the following strategic water management issues (Barton, 2010):

1. disclose management strategies and systems, reporting of water risks methodology integrated into governance and management systems from the boardroom to the facility-level;
2. develop actions and policies for assessing and managing water risks, including reduction targets in wastewater and water use;
3. disclose how the enterprises are collaborating with stakeholders and suppliers on water risks, including the methodology of setting performance goals for supply chains, responsible for indirect water use, which often account for the largest portion of the total water footprint;
4. create strategies for developing water-related products with strong market potential in a water-stressed world.

One can conclude, the strategic water management models should be highly recommended and effective tools for implementation of the presented requirements.

3 Models of strategic water management in enterprises

The dissemination of strategic water management models is differentiated worldwide by sector and by company as well as the by income distribution per country. These differences caused the industrial use of water to fall between 10% and 59% before 2003 among various countries (UNESCO, 2003). These data suggest some problems in effectiveness or performance of strategic water management in enterprises. The organisational weaknesses in this field can relate to many aspects, including also lacking knowledge on water management practices.

In practice, strategic water management models of enterprises prioritize water extraction, pollution and savings. As described in literature, the most effective approach for realization of the above mentioned strategies is the water minimisation hierarchy (WMH), which focuses on five levels (Barrington et al., 2013; Wan Alwi, Manan, Samingin and Misran, 2008): water source elimination (zero liquid discharge in closed loop systems), water source reduction (related to decrease in water needs), water reuse (without treatment), water regeneration/recycling (reuse after treatment, including desalination (Ziolkowska, 2015)), and fresh water use (in case of the lack of other alternative). These hierarchy should be embedded into every business management model. A prerequisite for any strategic model in water management is water auditing, a process of indicating water consumption and water quality (Barrington et al., 2013) by means of various water risk assessment tools. After a water audit is completed a water management strategy can be developed and thus the water audit is considered as a part of a water management system (Sturman, Ho and Mathew, 2004). The

conclusion is thus that systemic and strategic water management is similar in terms of the scale but, what is worth noticing, the strategy is not a prerequisite to implement systemic approach. Such systemic approach is based on informal (based mainly on tacit knowledge) or formal management system, as for example environmental management system (EMS). According to E. Deming (EN ISO 14001:2015, 2015), EMS consists of four structural elements as: planning, doing, checking and acting/adjusting (shortly PDCA model). When applying the logic of EMS, the key tools in the water management system could be for example: water policy, water management program (with water related targets and goals, responsibilities, resources, timeline), water performance evaluation/assessment, internal and external communication on water issues, water audit, top management review of the water management system. The presented tools can be elements in both informal and certified water management systems, what can vary among strategic water management models.

Strategic water management in enterprises can be realized by four models. First, within the framework of general company management system supported by principles of sustainability programs, among others products sustainability labeling programs e.g. LEED (Leadership in Energy and Environmental Design), Cradle to Cradle Certified Product Standard, Blue Angel. Second, water issues can be a part of a quality management system e.g. ISO 9001:2015 (Quality management systems), ISO 22000:2005 (Food safety management systems – Requirements for any organization in the food chain), HACCP (Hazard Analysis and Critical Control Points). Third, water problems can be embedded into sustainable management systems e.g. ISO 26000:2010 (Guidance on social responsibility), SA8000 (Social Accountability International), ISO 14001:2015 (Environmental management systems – Requirements with guidance for use), EMAS (Eco-Management and Audit Scheme). Finally, the strategic water management can be realized by means of a dedicated system such as e.g. ISO/DIS 24526 (Water efficiency management systems – Requirements with guidance for use).

4 Strategic approach in water management of enterprises

4.1 Research background

To identify actual business requirements and strategies in water management by enterprises around the world, the analysis of open data sets for companies was performed in this paper. The data were collected by a questionnaire within the water program of Carbon Disclosure Project (CDP) in 2014. The companies invited to participate in the research (numbered approximately 2300) were expected to deliver valuable knowledge on water risk in their supply chains. The response rate was about 31% in total (721 enterprises from 49 countries). The initiative was directed to large multinational companies that distributed the questionnaire to their suppliers. The careful investigation of the questionnaire structure proves that in its form it corresponds with the framework of international standard ISO 14001 (Environmental management systems – Requirements with guidance for use). The structure of the questionnaire encompasses such modules as: Introduction (Page: W0. Introduction), Current State (Page: W1. Context), Risk Assessment (Page: W2. Procedures and Requirements) Implications (Page: W3. Water Risks, Page: W4. Water Opportunities), Accounting (Page: W5. Water Accounting I and II), Response (Page: W6. Governance and Strategy, Page: W7. Compliance, Page: W8. Targets and Initiatives), Sign Off (Page: Sign Off). Table 1 presents selected items for which the results were available as open access source.

Table 1 Content of the questionnaire in the CDP's water program

No	Column name	Description and questions
1	Organization	Company name
2	ISIN	International Securities Identification Number
3	BBID	Bloomberg Identifier, defined by Bloomberg L.P.
4	Ticker	Stockticker assigned by the stock exchange in which the organization is listed. An organization can be listed on multiple exchanges and therefore might have multiple tickers. At CDP, we selected the stock ticker where the largest percentage of market capitalization was located.
5	Country HQ	Location of organization's headquarters
6	Importance of water quality and quantity: direct & indirect use	W1.1 Please rate the importance (current and future) of water quality and water quantity to the success of your organization
7	Importance of water quality and quantity: importance rating	W1.1 Please rate the importance (current and future) of water quality and water quantity to the success of your organization
8	Importance of water quality and quantity: explanation	W1.1 Please rate the importance (current and future) of water quality and water quantity to the success of your organization
9	Evaluated how water could affect growth strategy?	W1.2 Did you evaluate how water quality and water quantity affects / could affect the success (viability, constraints) of your organization's growth strategy?
10	Experienced detrimental impacts related to water this year?	W1.3 Did your organization experience any detrimental impacts related to water in the reporting period?
12	Procedures to assess water risk	W2.1 Please select the option that best describes your procedures with regard to assessing water risks
13	Geographic scale of assessments	Please state what geographic scale you undertake for water risk assessment
14	Methods used to assess water risks	Please select the methods used to assess water risks
15	Require key suppliers to report on water use, risks and management?	W2.5 Do you require your key suppliers to report on their water use, risks and management?
16	Exposed to water risk?	W3.1 Is your organization exposed to water risks, either current and/or future, that could generate a substantive change in your business, operations, revenue or expenditure?
17	Does water present opportunities?	W4.1 Does water present strategic, operational or market opportunities that substantively benefit/have the potential to benefit your organization?
18	Highest level of direct responsibility for water?	W6.1 Who has the highest level of direct responsibility for water within your organization and how frequently are they briefed?
19	Is water integrated into business strategy?	W6.2 Is water management integrated into your business strategy?
20	Does your organization have a water policy?	W6.3 Does your organization have a water policy that sets out clear goals and guidelines for action?
21	Subject to penalties and/or fines?	W7.1 Was your organization subject to any penalties and/or fines for breaches of abstraction licenses, discharge consents or other water and wastewater related regulations in the reporting period?
22	Target and/or goals?	W8.1 Do you have any company wide targets (quantitative) or goals (qualitative) related to water?

Source: (CDP, 2014)

The analysis performed in the paper aims at assessment of presented indicators and is supplemented by the analysis of the advancement in strategic water management. The analysis of the advancement was based on the following ordinal scale: lack of advancement (0% responses), advancement below average (<50% responses), average advancement (50% responses), advancement above average (>50% responses), full advancement (100% responses).

The next chapter presents selected results of the analysis including elements of strategic approach in water resource management of the analyzed enterprises.

4.2 Analysis of water management

To determine the real interest in strategic water management, the analysis of the question on water management integration into business strategy was performed. In 69% of enterprises water management issues are integrated into business strategy. This can suggest that their water plans and targets or goals should be in place. In order to prove this hypothesis enterprise targets (quantitative in nature) and goals (qualitative in nature) related to water were analyzed.

Among the analyzed companies, 31% declared having targets and goals in place, but at the same time other 33% of them did not have a mechanism to actively develop new targets and goals. Around 16% of companies focused their strategic water management only on qualitative indicators and 20% of enterprises were driven by only quantitative indicators. The formulation of targets (quantitative) in strategic management is a necessary requirement for a continual improvement in any management systems. This is because only quantitative management plans create conditions for measuring performance of business processes. The quantitative plans guarantee the highest possible benefits from improvement in effectiveness of strategic management.

The diagnosis of water policy implementation is a way to identify strategic water management but also the systemic approach, because water policy is the basic document in any water management system. The short review of on-line resources revealed that in some cases organisations which claimed to have developed water policy, in reality created just environmental policy embracing water issues. This can result from the limited knowledge about strategic water management among the surveyed enterprises as well as from some methodological deficits of the research questionnaire (e.g. lack of a distinct definition of the water policy and environmental policy). For this reason, it is not advisable to analyse the role of water policy and environmental policy both in case of enterprises that declared not having water policy in place and the remaining enterprises.

The advancement in the strategic water management can also be assessed when analyzing the number of enterprises which require their key suppliers to report their water use, risks and water management issues. Most of the surveyed companies (80%) declared lack of interest in strategic water management realized by their key suppliers which is a sign of rather a weak integration within the supply chains.

Important information on the strategic water management results from the analysis of direct responsibility for water within organizations. The best performance of environmental management systems can be achieved when all employees are responsible and engaged into designing and maintaining the system. In many organisations however, the direct responsibility is managed by committees or individuals. In 43% of examined companies the direct responsibility is transferred to management committees and in 49% of them to individual managers. There is however no literal information on the all employee engagement ("No individual or committee" can suggest either lack of delegating responsibility or all employee responsibility), thus it is difficult to assess the scale of direct responsibility about water management in companies.

The summary of the results on water management approaches by enterprises is presented in table 2.

Table 2 Selected results of strategic water management assessment in enterprises

Column name	Results of water management analysis	Advancement in strategic water management
Require key suppliers to report on water use, risks and management?	Yes: 20% (n=114) No: 80% (n=454)	below average
Highest level of direct responsibility for water?	Committee: 43% (n=239) No individual or committee: 9% (n=49) Individual manager: 49% (n=273)	below average
Is water integrated into business strategy?	Yes: 69% (n=389) No: 31% (n=178)	above average
Does your organization have a water policy?	Yes: 67% (n=376) No: 33% (n=183)	above average
Target and/or goals?	No: 33% (n=194) Yes, goals only: 16% (n=92) Yes, targets and goals: 31% (n=186) Yes, targets only: 20% (n=121)	below average

Source: Own calculations

The presented results show a real evidence supporting the research hypothesis of this paper. Thus, it was confirmed that the advancement in the strategic water management among the surveyed enterprises is low in many aspects e.g.: reporting on water use, risks and management in supply chains, the attribution of responsibility for water management, and formulation of water targets.

It is worth noticing that high advancement identified in the strategic water management is not always a true sign of excellence, as for example in the case of water policy that was misunderstood by many enterprises.

The surveyed enterprises should focus in their strategic water management especially on the issues identified above to resolve them and benefit from e.g. better legitimization among stakeholders after water disclosure (socially responsible image (O'Donovan, 2002), higher profits following the achievement of water targets (competitive advantage (Nikolaeva and Bicho, 2011), increased effectiveness and efficiency of the supply chains (enhancement in corporate reputation (Adams, 2002) or advanced skills in water management among the staff (what is a serious success factor of some enterprises, see: e.g. (Džupka and Šebová, 2018)).

Conclusion

The analyses of 721 enterprises surveyed in 2014 revealed that the hypothesis of the paper on low advancement in the strategic water management was correct. The performed assessment did not show any remarkable trends in strategic water management practices, however it delivered solid arguments for numerous suggestions regarding business requirements and strategies. The identification of the actual business requirements and strategies in water management of enterprises can be acknowledged as a success of the research goal defined in this paper.

According to the analysis, the number of companies without any targets and goals was below average ($< 50\%$). This can seem quite curious , but simultaneously should be assessed as a

main barrier in water management. The appropriate business requirement in this context is development of targets for the strategic water management.

As revealed in the analysis, different levels of knowledge about strategic water management in companies determine the advancement in understanding of a systemic and strategic approach. Because of significant differences between both water auditing and environmental auditing (Sturman et al., 2004), similarly both the water policy and environmental policy should be considered as two different strategic management tools with various impacts and roles in the water management system. Thus, it is recommended to initiate efforts aimed at improving knowledge about systemic management in enterprises including education programs on both environmental and water management systems. Another business requirement is the development and a wider implementation of water management systems as a dedicated management tool.

As revealed in the assessment of the direct responsibility for water within the surveyed organizations, the required in strategic management all employee involvement (Jankowska-Mihułowicz, 2010; Kapuścińska and Matejun, 2014) is not specified literally by companies. In order to increase the performance in the strategic water management the engagement of all employees is critical. The significantly low advancement (9% of companies) in delegating responsibility for the water management system to the all staff members or "not to individuals or committees" triggers the necessity to popularize the systemic approach in water management.

The results of the analysis can also be helpful for public policies because they introduce to the policy-making process both the possibly objective and certain information, which addresses expectations of policy makers (Brugnach, Tagg, Keil and de Lange, 2007). Thus, the formulated business requirements are diminishing the uncertainty of decision-makers who are responsible for creation of financial instruments supportive in strategic water management of small and medium-sized enterprises too.

The presented results provided an opportunity to indicate existing advantages and barriers in strategic water management among selected companies around the world. The resulting recommendations can be perceived as a tool for improving or developing water management systems in enterprises. It is also important to stress some limitations of the survey such as e.g.: restricted access to all outputs of the questionnaire (some data ware unavailable in open access) or differentiated knowledge of companies on water management systems.

The future research on the strategic water management could focus on performing similar analyses for the more recent years 2016-2018 among the same group of enterprises for comparison purposes.

Acknowledgments

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Young Scientists

Labor Market Dynamics as an Adjustment Mechanism in Europe: Theory and Evidence from the V4 Countries

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Abstract

Flexibility of labor markets is a required property in the OCA framework. Labor mobility should serve as an alternative adjustment mechanism in countries with no independence in conducting their own monetary policy. European labor markets in general tend to be more rigid, and particularly in Europe they differ significantly. Wide-ranging diversity within EU members causes the international mobility to remain low, despite the efforts to promote integration and open labor markets. The aim of this paper is to analyze the role of labor mobility in absorbing asymmetric shocks in the V4 countries and how its significance varies between countries following the ECB´s single monetary policy and countries with independent monetary policy. We discuss whether it is a sufficient mechanism, and if it is advisable for observed non-EA countries to adopt euro. In order to obtain the results VAR model and impulse-response functions are used. Similar methodology is used in several papers, however, this analysis contributes to the topic with the selection of a specific region in the EU instead of the commonly analyzed EU-15 area.

Keywords: Regional labor markets, Labor market adjustment, Asymmetric shock, Labor mobility, VAR, Impulse-response functions

JEL Classification: E24, F22, J61

1 Introduction

Desire to connect Europe through a common market has been one of the foundations in the forming European Union. Free movement of goods and capital has established fairly functioning markets. However, interregional mobility of persons remains very low even today.

Labor markets of member countries differentiate significantly in its most important features, i.e. unemployment rates and wages. Rigidity and inflexibility is a regular occurrence on the European labor markets. These imperfections represent a vigorous environment for asymmetric shocks (Bayoumi, Eichengreen, 1992), causing gaps between regions to deepen even more. The willingness to migrate because of better working opportunities is strongly influenced by several factors, such as language or cultural barriers (Nickell, 1997). To encourage further the mobility of labor force, Schengen Agreement has been implemented in mid-80s. Hitherto 27 countries within and out of the EU signed the agreement (Kang, Lim, 2016). With little to none geographic barriers, social-cultural integration in the EU is more likely to uphold side by side with encouragement of the European identity. Even though there are evident gains, in reality both mobility between and within countries of the EU is permanently low.

Mobility of labor is one of the very first "Mundellian" requirements for an optimally functioning currency area. The European monetary union (EMU) is an essential part of the EU.

Sacrificing their independent monetary policy, 19 countries entered the EMU to the present day. Even before the introduction of euro in 1999, the diversity of European markets has been emphasized repeatedly. Until financial crisis in 2007, the lack of homogeneity had not presented substantial difficulties to the European policy authorities. Yet, asymmetric shocks triggered by the crisis hit some countries harder than the others. Typically, these shocks shall be absorbed by flexibility of labor markets. The actual diversity and rigidity with low level of migration, however, did not permit a proper economic adjustment to happen.

The working hypothesis is that labor market dynamics are able to absorb an unexpected shock in the economy and the main research question is to what degree is labor mobility an effective adjustment mechanism. Following the methodology as presented in Blanchard and Katz (1992) and used by Arpaia et al. (2016) we investigate labor mobility in the V4 countries. This also represents the main contribution of this paper to the existing literature. It is a common practice to observe the European labor market as a whole, whereas we attempt to observe the effect in the Visegrad group specifically.

The remainder of this paper is structured as follows: Section 2 provides literature overview related to the labor market mobility as an adjustment mechanism with stylized facts about labor markets, Section 3 describes used data and methodology. Estimation of VAR and PVAR (vector autoregression and panel vector autoregression, respectively) and responses to specific asymmetric shocks are presented in Section 4. The Section 5 concludes results of the paper.

2 Labor markets determinants as adjustment mechanism

2.1 Literature overview

In 1960s works from Mundell (1961), McKinnon (1963) and Kenen (1969) changed the way of assessing currency unions. According to Mundell (1961) if a currency area was optimal, aftershocks would be carried out through the labor mobility rather than by adjusting prices of factors. Also, this leads to the fact that there is a trade-off between unemployment and inflation. The mobility of labor constitutes an adjustment mechanism in the medium to long run. On the other hand, price and wage flexibility is crucial for a currency union in the short run. This shall ensure that during the adjustment neither higher inflation in one country nor the higher unemployment in the other would sustain (Petreski, 2007). McKinnon (1963) and Kenen (1969) came to similar conclusions, only more precise. According to the former, the homogeneous production in a currency area is not an issue when higher level of labor mobility between regions is present. If this assumption does not hold, there is a risk of higher unemployment and price instability in the currency area. Kenen (1969) characterizes an optimum currency area (OCA) as a region with high interregional labor force mobility. Ultimately, when a country loses its independent monetary policy, setting interest and exchange rates is no longer an available tool to economic governance in critical times. Therefore, in order to maintain a sound economy even during any economic shock, migration in labor shall be sufficiently high to absorb the majority of such disturbance.

From the first stage of the EMU introduction in the early 90s has also derived the growing interest in European labor mobility. Decressin and Fatás (1995) find that more than three quarters of labor market dynamics is country specific. Based on this information they consider the region-specific shocks and their importance in economic adjustment processes. In the first three years following a demand shock majority of it is absorbed by increase in participation rate (or activity rate, used interchangeably). Whereas Europe does not react accordingly to Mundell's condition, for adjustment in the US mobility of workers is the most important factor. At the beginning of the millennium Puhani (2001) analyzed labor adjustment mechanism in

three European countries – Germany, France, and Italy. In all, labor mobility is not likely to perform as an adjustment mechanism in case of asymmetric shocks, as it takes several years for migration to absorb shock induced increase in unemployment. Nahuis and Parikh (2002) conclude that labor mobility is low, particularly if looking at unemployment differences. Nevertheless, labor mobility adjustment coefficient is not low if other explicit labor market adjustments entered the model. That migration is not an effective adjustment mechanism is main conclusion of Copaciu (2004) as well. Evidence from Fidrmuc (2004) shows that whereas high wages encourage overall mobility, high unemployment tends to discourage it. Instead of inducing a net migration from depressed regions to regions with better economic conditions, the former group of regions has largely immobile population. In comparison, more prosperous regions show higher in- and outflow of migrants. Cavelaars and Hessel (2007) also confirm that majority migration in Europe could be explained by factors other than economic differences. Moreover, regional mobility appears to be more of a source rather than a solution to asymmetries.

Economic crisis in 2007 has highlighted the importance of labor markets and their dynamics as an adjustment mechanism, and economists started investigating reaction of labor markets to asymmetric shocks more vigorously. Years of economic integration in Europe and two enlargements of the EU contributed considerably to strengthening labor mobility. Kahanec (2012) concludes that significant share of migrants from new member countries are young and skilled. Migration allows depressed countries to be relieved of higher unemployment and mismatch in their labor markets, while there are still partially profiting from remittances. It is important, however, to set policies supporting return migration. Similarly, in Jauer et al. (2014), the after crisis period in Europe is more prospective and dynamic than in the US. Increase in migration is mainly improved through third-countries population. Nevertheless, about a quarter of asymmetric shock would be absorbed by migration in a time span under a year. A study of 41 European regions over a period of 38 years by Beyer and Smets (2015) shows the importance of distinguishing between regional mobility and mobility between countries. European regional labor markets are more rigid, and the adjustment process takes longer time compared to the US market. The difference is visible when the diversity of Europe enters the picture. Language barriers, cultural and institutional differences impede the cross-country mobility of workers. Studying impulse-response functions, Arpaia et al. (2016) came to the same conclusions as Jauer et al. (2014) – migration would absorb about a quarter of an asymmetric shock within one year. What is more, since the introduction of single currency in Europe, movements in shocks response are almost twice as large. Jauer et al. (2018) currently published extended analysis achieving similar results.

This paper follows modified methodology of Blanchard and Katz (1992) which has been adjusted to European countries by Decressin and Fatás (1995) and used in Arpaia et al. (2016). These provide most of the analytical background in this paper, as it is a common practice in quantitatively evaluating the labor mobility as an adjustment mechanism. More of the methodology is described in Section 3.

2.2 Stylized facts about labor mobility in the V4 countries

Any country that enters the European Union is committed to eventually adopt euro as its official currency and follow single monetary policy of the European Central Bank. Europe itself is a rather heterogeneous environment where shocks to the economy affect countries differently. Losing exchange rate as a monetary tool and a possible adjustment channel requires other adjustment mechanism to take its place instead. One of the possibilities is adjustment through labor markets – flexible wages or labor mobility. In case of an asymmetric shock to the

economy growing differences in unemployment and participation rates are anticipated at first. These shall be absorbed initially by real wages and, if the shock persists, by interregional mobility that changes the labor force stocks in the affected countries. For the purpose of this paper the main focus is on the response of migration of working age population (Arpaia, 2016).

From the V4 countries only Slovakia is a member of the European monetary union. The Czech Republic, Hungary and Poland still have their own currencies. All countries entered the EU at the same time and have equal opportunities to move freely within the Schengen area. All face similar language and cultural barriers, and even though they are often pooled into one group, there is significant heterogeneity in the V4 region itself. Before the actual analysis this section presents some stylized facts about the labor mobility in these countries.

In general, these four Central European countries are not attractive for foreign labor force. Over the last decade (Figure 1) the share of foreigners in working age is relatively low. In the Czech Republic this number is steadily increasing and was almost 2.5% at the end of 2017. In comparison to 2008 it represents increase by approximately 1.5 percentage points. On the other hand, in the rest of the V4 countries, number of foreign born population never exceeded 1%. Slight drop is observed in Hungary; Poland and Slovakia follow similar pattern until 2016. Since then, share of foreign born population is increasing in Poland, while in Slovakia it is remaining at the same level with a decrease in the last quarter of 2017. Breaking down the composition of foreigners, on average in 2017, group of workers from other EU-28 countries is almost balanced with workers from third countries in the Czech Republic. Share of the former is higher in Hungary and Slovakia, and simultaneously only about 20% of foreign population in Poland is from other European Union countries (see Figure 2).
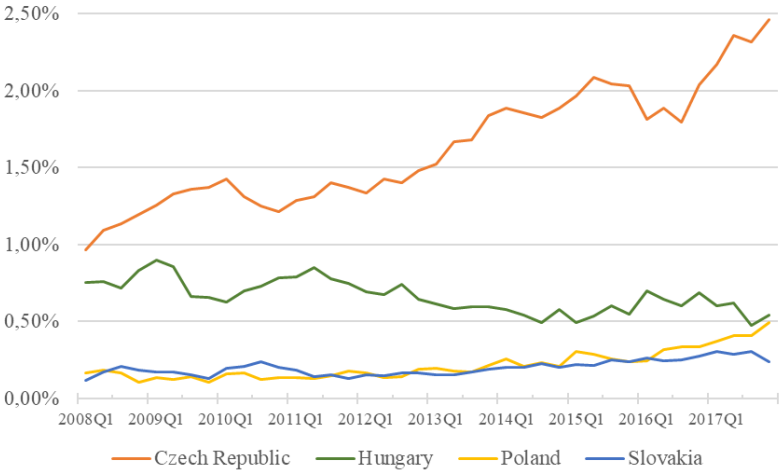
Figure 1 Share of foreign born population in the V4 countries over time
Source: own calculations, based on Eurostat (2018) data from the EU Labour Force Survey (LFS)
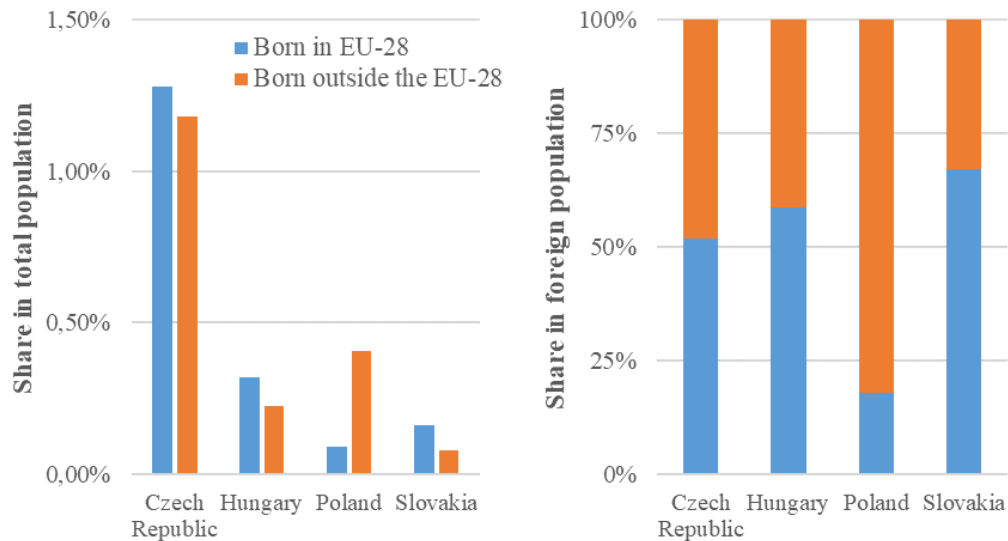
Figure 2 Share of foreign-born population in working age in the V4 countries, 2017
Source: own calculations, based on Eurostat (2018) data from the EU Labour Force Survey (LFS)

3 Data and Methodology

The aim of this section is to address labor mobility as a potential adjustment mechanism following an asymmetric shock in labor demand. In order to do so, adjusted methodology of Blanchard and Katz (1992) is used. Based on that, the main assumption is formulated – if any asymmetric shock in labor demand affects employment permanently but at the same time it has no effect on unemployment or participation rates, then the change in level employment ought to be absorbed by the dynamics in the working age population. It is also assumed that there are no significant changes in demography trends; therefore, the change in this particular population group should indicate the reaction of labor mobility.

3.1 Data

The purpose of this paper is to evaluate dynamics of labor markets and their reactions to asymmetric shocks in four countries – the Czech Republic, Hungary, Poland, and Slovakia. Analyzing countries instead of individual regions within one panel data series allows to observe the reaction of labor markets to any labor demand shock in the V4 region, focusing especially on labor mobility.

There are three target variables building the model – employment, unemployment rate, and participation rate. Employment is measured in levels (thousands of employed persons) and unemployment rate is expressed as the percentage of unemployed individuals. Participation rate represents the share of persons in the labor force in working-age population and is also measured in percentage. All the data used in the model are retrieved from the Eurostat database. Labor mobility in this analysis represents the residual change in employment that is not explained by changes in either unemployment or participation rates.

Quarterly data cover the period of 20 years starting in 1998Q1 and ending in 2017Q4. This is the longest observable time period with no missing observations. Altogether, 80 observations for each variable and country are used in VAR (vector autoregression) model described in the next section. Dynamics in selected countries are compared to the overall EU-28 situation. Thus, for the first part of the analysis, observed sample also consists of all 28 EU members.

First of all, all the data are transformed from original time series by taking natural logarithms. Specified VAR framework requires stationary time series of activity and employment rate and stationarity of employment in first differences. This is achieved by using cyclical components of each variable, which also deals with fixed country effects. Additionally, they are expressed relatively to the aggregate values for the EU. For the purpose of the analysis, unemployment rate is not one of the target variables, yet it is used in deriving the rate of employment (calculated as 1 - unemployment rate). This simplified calculation is in accordance with Arpaia et al. (2016).

Figure 3 shows quarter-on-quarter growth rates of all variables, relative to the EU average, through the observed period. Changes in labor mobility can be derived as a residual change of employment, not explained by changes in employment nor participation rates. All national variables are defined as deviations from the aggregate EU average.
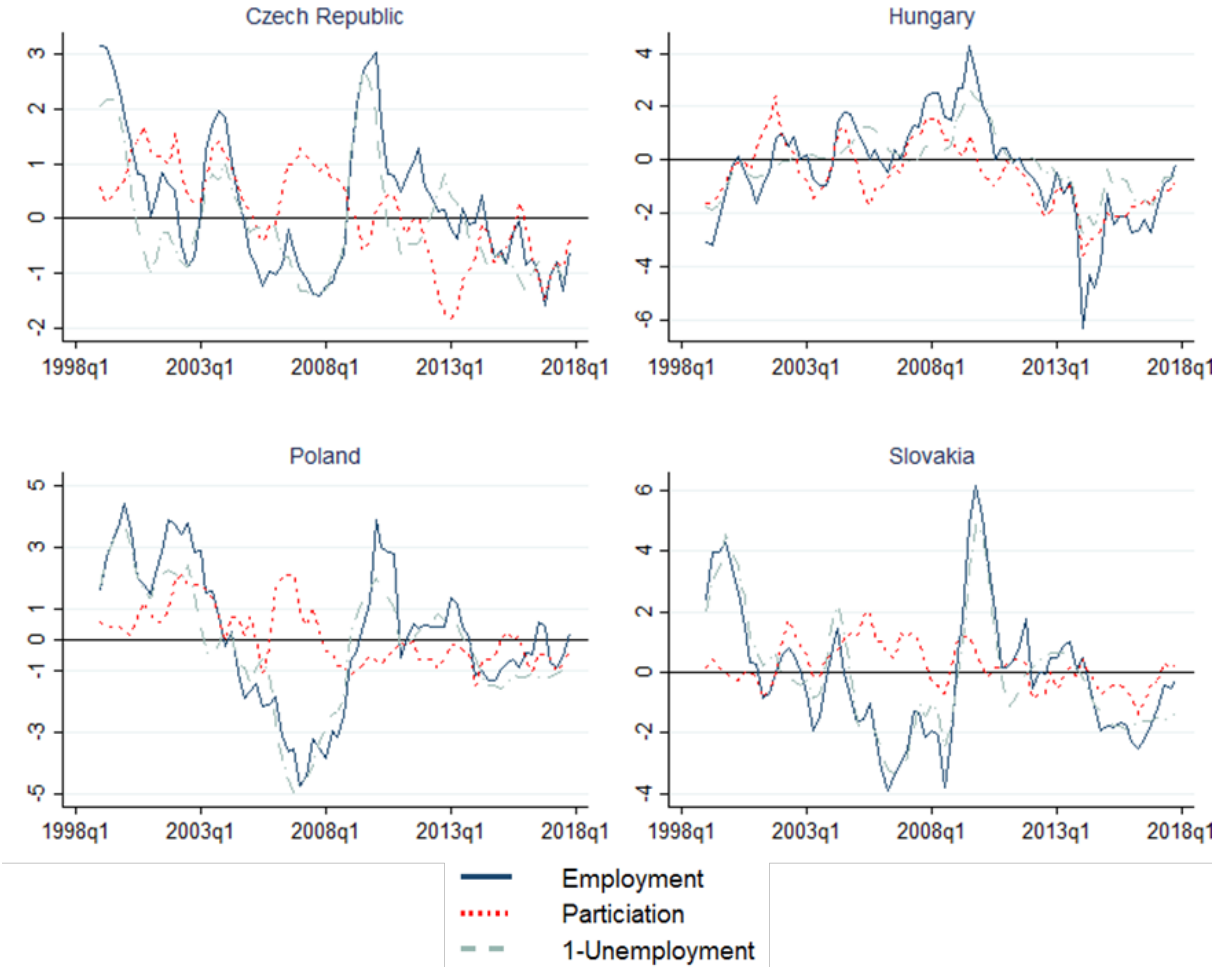
Figure 3 Labor market dynamics in the V4 countries relative to the EU average
Source: own calculations, based on Eurostat (2018) data

For all observed countries, relative employment growth and relative changes in participation and unemployment rates fluctuate around constant averages. The dynamics of labor mobility is quantified by subtracting changes in participation and activity growth rates from changes in relative employment growth (along the vertical axis), as shown in Figure 4. Labor mobility in Hungary has the lowest contribution to changes in employment from the V4 group, and with the exception at the beginning of the millennium, a tendency to weak inward mobility is visible. Secondly, mobility flows that affect the employment growth (positively) the strongest are in

Poland. On the other hand, after entering the EU, great outward mobility is detectable in Slovakia. A persistent increase of mobility is observed in the Czech Republic. There is stronger inclination towards inward mobility in all countries around 2010. Until then employment was affected by changes in mobility negatively, sans Hungary.
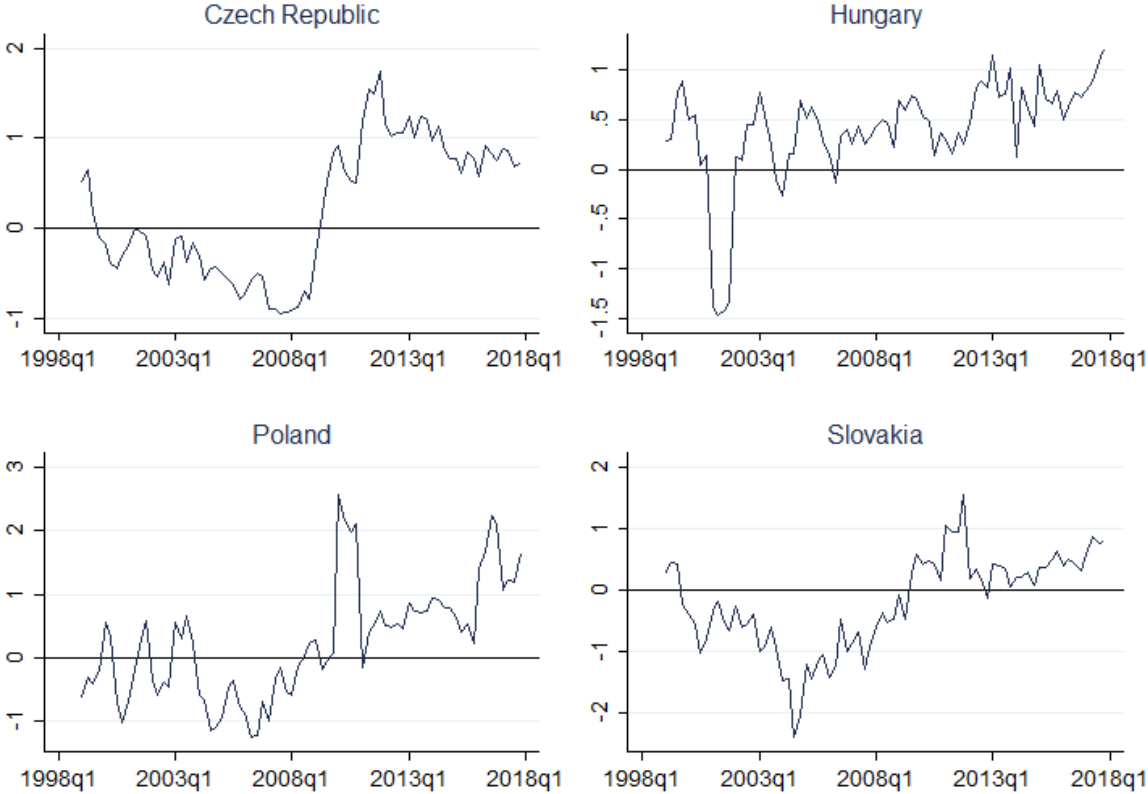
Figure 4 Tendencies towards mobility in the V4 countries
Source: own calculations, based on Eurostat (2018) data

A fundamental hypothesis as in Blanchard and Katz (1992) is that innovations to employment growth could be considered to be exogenous labor demand shocks. For this hypothesis to be reasonable, negative correlation between unemployment and employment growth has to be observed. In the panel regression of unemployment rate on employment growth the coefficient is -0.014 and is significant which means this assumption is valid also for the V4 area.

3.2 The Model

To observe responses of labor mobility and other labor market features VAR and PVAR (panel vector autoregression) models are estimated. The key assumption is that asymmetric shocks have permanent effect on unemployment but not on unemployment and activity rates. This results in the following – any change in employment is driven by change in labor mobility and, subsequently, relative employment in the VAR model is expressed in first differences while employment and activity rates are in levels.

In the first part of the analysis responses are estimated on a panel of EU-28 countries. In general, following PVAR can be estimated:

$$\vartheta_{i,t} = \alpha + \alpha_1(L)\vartheta_{i,t-1} + f_i + \varepsilon_t, \qquad (1)$$

where $\vartheta_{i,t}$ is the vector of labor market indices $[\Delta n_{i,t}, le_{i,t}, lp_{i,t}]$. $\Delta n_{i,t}$ represents the first difference of the logarithm of employment in country i minus the logarithm of aggregate

employment in the EU. $le_{i,t}$ is the logarithm of the employment rate (1 minus unemployment rate) in country i minus the logarithm of the EU employment rate. Finally, expression $lp_{i,t}$ is the logarithm of the activity rate in country i minus the logarithm of the participation rate in the EU. f_i accounts for country fixed effects, which are eliminated by detrending the variables with Hodrick-Prescott filter. Analysis proceeds with detrended variables.

For individual countries of the V4 area following VAR is suggested:
$$v_t = A + A_1(L)v_{t-1} + \varepsilon_t \qquad (2)$$

where v_t is the vector of variables corresponding to the model for the pooled panel data: employment, unemployment and activity rates. The difference is in how those are being expressed – while all variables are in logs and employment is in quarter-on-quarter growth rates, relative terms to respective European means are omitted.

As suggested in Arpaia et al. (2016) VAR models use 4 lags so that it is controlled for problems with autocorrelation and seasonality. Residuals of individual equations are most likely to be correlated which has to be dealt with using Cholesky decomposition. It is assumed that reaction to labor demand shock shows first in unemployment and participation rates contemporaneously, with lagged response of employment growth. This is also the logic behind the impulse-response functions used in this paper in order to see the dynamics of labor markets after asymmetric labor shock. Shocks are thus identified with Cholesky decomposition of residuals matrix with order: employment growth (first difference of employment in logarithms), employment rate, participation rate. Innovations to the employment growth represent labor demand shock.

4 Results

4.1 Adjustment to asymmetric labor demand shocks: Evidence for the EU

Results of the PVAR model are summarized by related impulse-response functions. Figure 5 shows responses of employment, unemployment rate and activity rate to a one-standard-deviation labor demand shock. Mobility is defined as the change in employment not explained by the changes in neither employment nor activity rates. Horizontal axis represents quarters following the shock. For the purpose of easier results presentation, confidence intervals are not shown.

The average size of a labor demand shock is approximately 0.8% over the period 1998-2017. Employment falls quickly and reaches level that is even lower than before the shock. Activity rate increases by about 0.4 percentage points above the EU average and the effect is slowly dying out until almost three years (11 quarters) after the shock. The peak of unemployment is observed after 4 quarters, after that the effect dissipates slowly over time. Within the first quarter activity rate absorbs about 60% of the initial shock, unemployment and labor mobility absorbs approximately 20% each.

Comparing these results with Arpaia et al. (2016), conclusions differ considerably. The enlargement of the EU and including Central and East European countries, where the tendency towards outward mobility is higher, might have caused significant differences.
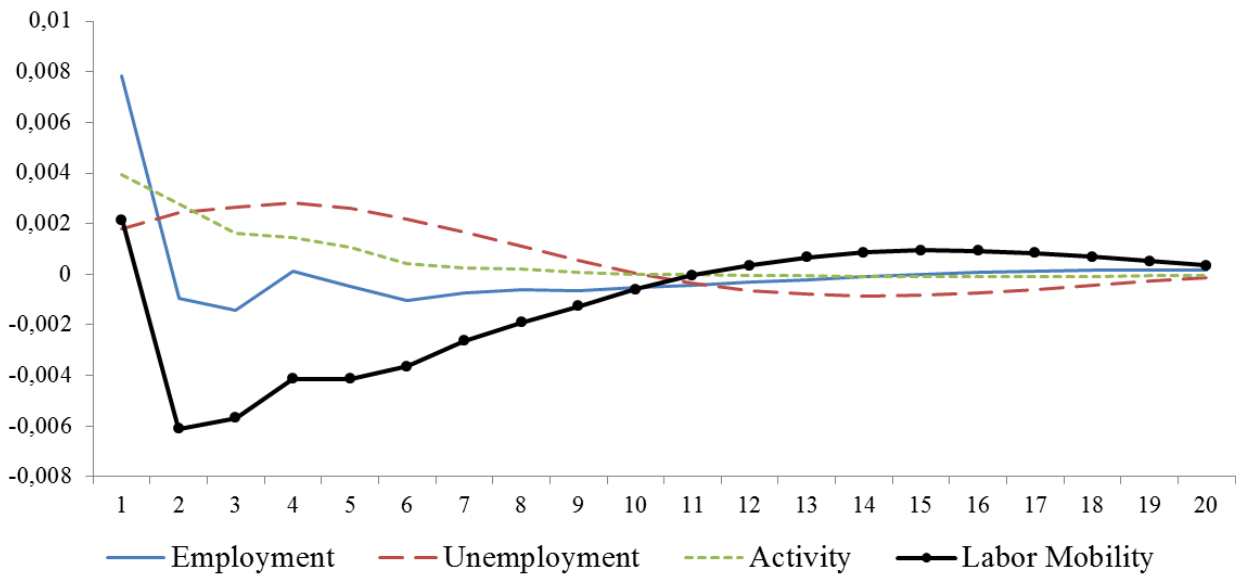
Figure 5 Responses to a country specific labor demand shock, EU-28, 1998-2017
Source: own calculations

4.2 Adjustment to asymmetric labor demand shocks: Evidence for individual countries

Results from section 4.1 present the average response to a country specific labor demand shock in the EU-28 area. In this section responses of labor markets are simulated specifically for the V4 countries individually and compared to estimations for the EU-28. The Czech Republic, Hungary and Poland are analyzed over the whole period 1998-2017 since they are not members of the euro area (Figure 6). On the other hand, Slovakia adopted euro in 2009 and depends on alternative adjustment mechanisms seeing that the country has lost its independent monetary policy and follows the policy of the ECB. For this reason, responses in Slovakia are analyzed both over the whole period and period after entering the EMU, 2009-2017 (Figure 7).
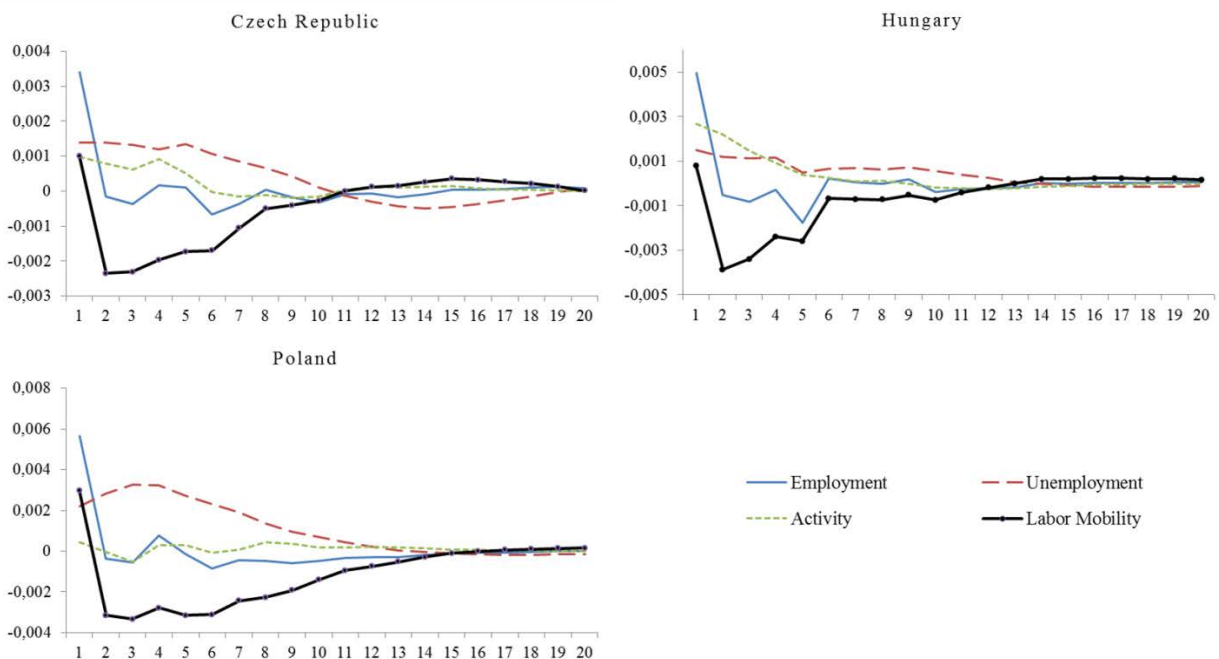
Figure 6 Responses to a country specific shock in the Czech Republic, Hungary and Poland, 1998-2017
Source: own calculations

Mobility is defined as the change in employment not explained by the changes in neither employment nor activity rates. Horizontal axis represents quarters following the shock.

Responses of labor market in the Czech Republic are qualitatively similar to those relevant for the whole EU-28 sample. Size of the labor demand shock is approximately 0.35% and all variables return roughly to their initial values. In case of the Czech Republic, unemployment responds more than activity rate and dissipates more smoothly over time.

Hungary in the simulation faces 0.5% shock. Majority of the shock is absorbed by the end of the second year (eighth quarter). After three years, shock is entirely absorbed. The adjustment through mobility of labor is finished in 6 quarters after the shock occurred.

The shock in Poland lasts the longest out of all observed countries. On average, it takes almost 4 more quarters for labor markets to return to their original levels. The size of the shock is almost 0.6 percentage points, which is also the highest in the V4 group. Results are qualitatively similar to those obtained from the PVAR model for the EU-28. Adjustment of unemployment and labor mobility is the most lasting, while the shock has almost no effect on activity rate.
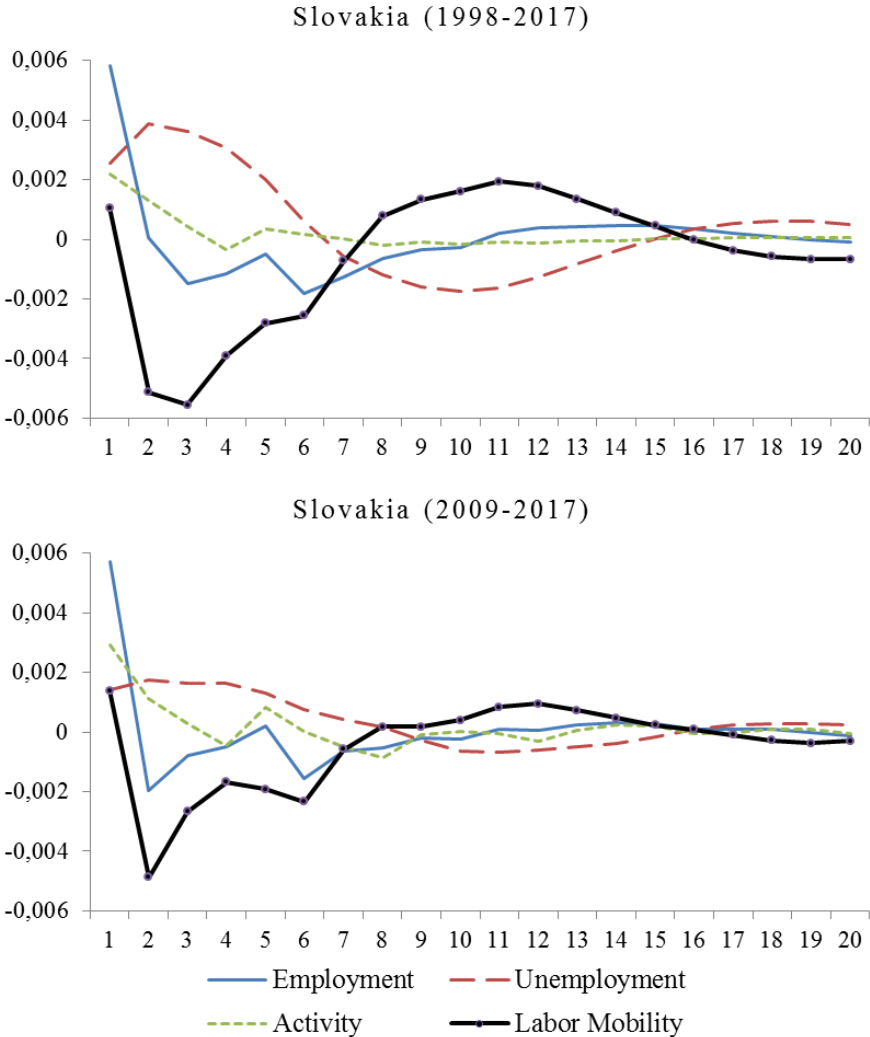
Figure 7 Responses to a country specific shock in Slovakia, whole sample and EMU period
Source: own calculations

From the V4 countries Slovakia is the only one that adopted euro as its currency. Therefore, labor mobility should be efficient as an alternative adjustment mechanism and should have significant role in shock absorption. Figure 7 shows responses to a labor demand shock in the model estimated for full period, and in the period after entering European Monetary Union in 2009. In both cases, the shock is nearly 0.6 percentage points. When the whole sample is analyzed, unemployment peaks after two quarters, and participation rate returns to its pre-shock level after an year. Labor migration achieves the maximum in the eleventh quarter. Even five years after shock, unemployment nor labor mobility are at its original levels. It is possible, that the change in unemployment (remember, that here it is employment rate calculated as 1-unemployment rate) might be driven by outward mobility. After joining European countries in the EMU, the response of mobility is more muted. Shock seems to be absorbed more quickly, and the response of unemployment is less prominent. During the fifth year post the shock, adjustment is nearly finished and the shock absorbed.

5 Conclusion

Mobility in Europe is still very low and does not achieve the requirements of the optimum currency area. This paper analyzes labor markets and their dynamics in four Central European countries, namely countries from the V4 group: the Czech Republic, Hungary, Poland, and Slovakia. All of them have different labor markets and conditions, Slovakia is the only one without independent monetary policy. While in general the European mobility is driven by labor migration from countries outside the EU, exactly the opposite holds for the V4 (with exception of Poland). Overall, the total share of foreigners is very low, the lowest in Slovakia (<0.5%) and highest in the Czech Republic (~2.5%).

For the analysis, PVAR has been used for the sample of all EU-28 countries. Results of this model were later compared to the results from VAR models for each V4 country individually. After that, responses of labor markets to one-standard-deviation labor demand shock were simulated through related impulse-response functions. The conclusion is that none of the simulated shocks is persistent. After 20 quarters almost all variables are back at their initial levels. The shock in the employment is short-lived and employment falls below the pre-shock values. What is more, responses are mostly not significant. This suggests that labor markets in the V4 countries are not very well prepared to lose interest and exchange rates channels of adjustment. For them it will require more flexible labor markets to be able to effectively contribute to Mundellian optimum currency area, as well as an increase in attractiveness of the country both for nationals to stay, and foreigners to come and work in the country. Further analysis should include real wages in VAR specification and some more control variables to accommodate all aspects of labor markets better. As for now, the rest three countries of the Visegrad group that still have their own currency might not be advisable to entry into the euro zone.

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The economic benefits of lifelong learning in terms of innovative model of economy: comparative analysis

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Abstract

The paper is devoted to the research of the economic benefits of lifelong learning in terms of innovative model of economy. The introduction outlines the importance of new knowledge and its rapid "aging", the role of lifelong learning in such conditions. The next stage was the research of scientific papers by the issue of lifelong learning, its benefits. The aim of the paper is to analyze the economic benefits of lifelong learning in terms of innovative model of economy and dependence of average wage from such factors as lifelong learning, higher education development, infrastructure and digital content and skills; relationship between these indicators. With regard to the aim, we have set the following hypothesis: we assume that there is a statistically significant correlation between total average wages, the Indicator of Lifelong learning, Higher Education development, Infrastructure and digital content and the Indicator of Skills. The analysis confirmed that the economic benefits, such as wage (personal) and gross domestic product (national general) have strong relationship with lifelong learning. Moreover, among the four factors of influencing on the average wages (the Indicator of Lifelong learning, Higher Education development, Infrastructure and digital content and the Indicator of Skills), the value of lifelong learning is rather significant, but less than infrastructure and digital content.

Key words: Lifelong Learning, Innovative Model of Economy, Competence of Employees, Wages, Adult Education, GDP

JEL Classification: A13; A23, E24

1 Introduction

The current stage of economic and social development is characterized by so high rates of scientific and technological progress, informatization, globalization and integration of economic processes. In such conditions, the requirements for the competence of employees are constantly increasing, and the prospects for their career growth, income growth, the ability for adaption to the changing environment are directly determined by the ability to master a new knowledge and skills, the willingness constantly of upgrading their skills or changing their profession. Now, as a result of scientific and technical progress over the course of a century, 6-9 generations of technology are being updated (and these rates are accelerating), and the "aging" of knowledge and skills are constantly taking place. Under such conditions, one can prepare for a lifetime of professional activity during one training cycle: according to

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the analysts' opinion, about 5% of theoretical and 20% of professional knowledge are updated annually. The unit of measurement of obsolescence of specialist knowledge, which was adopted in the USA - the half-life period of competence, that is 50% of decreasing in its competence due to the appearance of new information, shows that in many professions this period comes in less than 4-5 years. In this regard, lifelong learning is becoming more relevant day by day.

Firms can no longer rely solely on new graduates or new labor market entrants as the primary source of new skills and knowledge. Instead, they need workers who are willing and able to update their skills throughout their lifetimes. Countries need to respond to these needs by creating education and training systems that equip people with the appropriate skills (World Bank).

According to the Lisbon Strategy the eight key competences in the recommendation of the European Parliament and of the Council on key competences for lifelong learning are: communication in mother tongue; learning to learn; communication in foreign languages; social and civic competences; competences in maths, science, technology; sense of initiative and entrepreneurship; digital competences; cultural awareness and expression (Lisbon Strategy).

Some research (Cedefop, 2010) emphasizes the importance of lifelong learning as a way to sustain employment and personal development throughout life, not only during the career.

Economic factors such as income and employment play an important part in lifelong learning. They can provide people with reasons for joining learning programmes, as well as featuring in policy decisions on financing provision. The direct economic effects of lifelong learning potentially include impacts on earnings, on employability, and on the wider economy (Field, 2012).

Lifelong learning is becoming more and more important for the countries that want to be competitive in the global knowledge economy. So the era of the 21st century is not only a new landmark development but, above all, a transformational shift to the intellectualization as the process of the saturation of the information environment by the intellectual assets (Levchenko and al, 2017).

Analyzing the research Levchenko et al., 2017), we can observe a positive tendency of increasing the indicator of lifelong learning during the analyzed period. Under the influence of the 4th Industrial Revolution, the authors identified the interdependence between the global competitiveness index and lifelong learning, therefore, we are putting the next hypothesis about interrelation between the global innovation index, lifelong learning and the indicator of state cluster development in conditions of innovative-oriented economy.

Besides, the countries which pay more close attention and implement the effective models of lifelong learning have more intensive pace of innovation development of their economy. Furthermore, in such countries educational policy covers all types of education, learning and lifelong skills enhancement in the traditional education system, in adult and continuing education, in ongoing vocational training as part of working life, and in a variety of other contexts in which people learn and develop their knowledge, skills and competencies (Levchenko and Horpynchenko, 2017).

Lifelong learning has been linked to a variety of benefits, for the individual, the economy and wider society (Field, 2009). The researches show that participation in learning has a positive impact on life satisfaction (Feinstein et al., 2008a), optimism and subjective well-being (Moody, 2004; Hammond and Feinstein, 2006; Jenkins, 2009).

Adult learners also report increased confidence (Dench and Regan, 2000; Schuller et al., 2002, 2004; Preston and Hammond, 2003), mental stimulation (Feinstein et al., 2008b; Withnall, 2010) and an improved sense of self-efficacy (Hammond and Feinstein, 2006; Richeson et al., 2007; Formosa, 2013). Lifelong learning may also help people to develop the skills and knowledge to make informed choices about their lives, especially during periods of crisis and transition (Tuckett and McAuley, 2005).

Besides, the scientists defined, the lifelong learning has impact on men's wages (Dorsett, 2016). But as are known, the wage differentials - which provide an incentive to invest in skills - are widening in the knowledge economy. Narrowing the wage differentials among workers with different levels of education is expected to be very costly - perhaps as high as $1.66 trillion in the United States alone (Heckman, Roselius, and Smith 1994). Providing lifelong learning opportunities will require increased spending on education and training (by both the public and the private sector), but building in incentive schemes (capital accumulation) could reduce the investment needed (World Bank). It means that lifelong learning minimizes investment in self-development by optimizing them: the costs of self-education, different types of courses, training or workshop are lower than the costs of formal education (diplomas' degree).

Thus, the aim of our scientific research is analysis of economic benefits of lifelong learning in terms of innovative model of economy and dependence of average wage from such factors as lifelong learning, higher education development, infrastructure and digital content and skills; relationship between these indicators. For the solving of this aim we consider that it's necessary to analyze the next goals: analysis the Global Competitiveness Report, the Global Talent Competitiveness Index, the Global Information Technology Report and Indicator of earnings and wages (using OECD database). We put forward the following hypothesis that there is a statistically significant correlation between total average wages, the Indicator of Lifelong learning, Higher Education development, Infrastructure and digital content and the Indicator of Skills.

2 Methods

From standpoint of the methodology of our research in first phase of implementation, which are based on the research of foreign and Ukrainian literatures and the analysis of the results of one's own research. In our own research, we used the method of analysis and synthesis. The relationship between total average wages, the Indicator of Lifelong learning, Higher Education development, Infrastructure and digital content and the Indicator of Skills - representing the indicators were analyzed using Pearson correlation coefficient and linear regression. These indicators have been selected from OECD database for the year 2014, the Global Competitiveness Report 2016, the Global Talent Competitiveness Index, the Global Information Technology Report. The analysis has been carried out using Statistica Package.

3 Lifelong learning in innovative model of economy: benefits

To quantify the strength of the relationship between economic benefits (personal, in wage) and lifelong learning, we can conduct the correlation-regression analysis.

Table 1 The Pearson's correlation coefficients between the average total wages, the indicator of lifelong learning, higher education development, infrastructure and digital content and the indicator of skills

	Lifelong learning	HEd	Infrastructure and digital content	Skills
Average total wages	0,777418	0,600669	0,840623	0,739324

Source: Authors' own elaboration

As we can see from Table 1, the value of the pair correlation is more than 0.5, which is evidence of a linear correlation between variables, namely: the strongest relationship is observed between the total average wages and the infrastructure and digital content (0.841), total average wages and Lifelong learning[4] (r = 0.777); total average wages and Skills (r = 0.739); (r= 0.8158) and notable correlation between total average wages and HEd (r = 0.601). It should be noted that the correlation coefficient of the relationship between total average wages and HEd is lower than the correlation coefficient of the relationship between total average wages and Lifelong learning because of the process of complement and challenge to the traditional institutions, such as: private sector trainers, virtual universities, international providers, corporate universities, educational publishers, content brokers, and media companies.
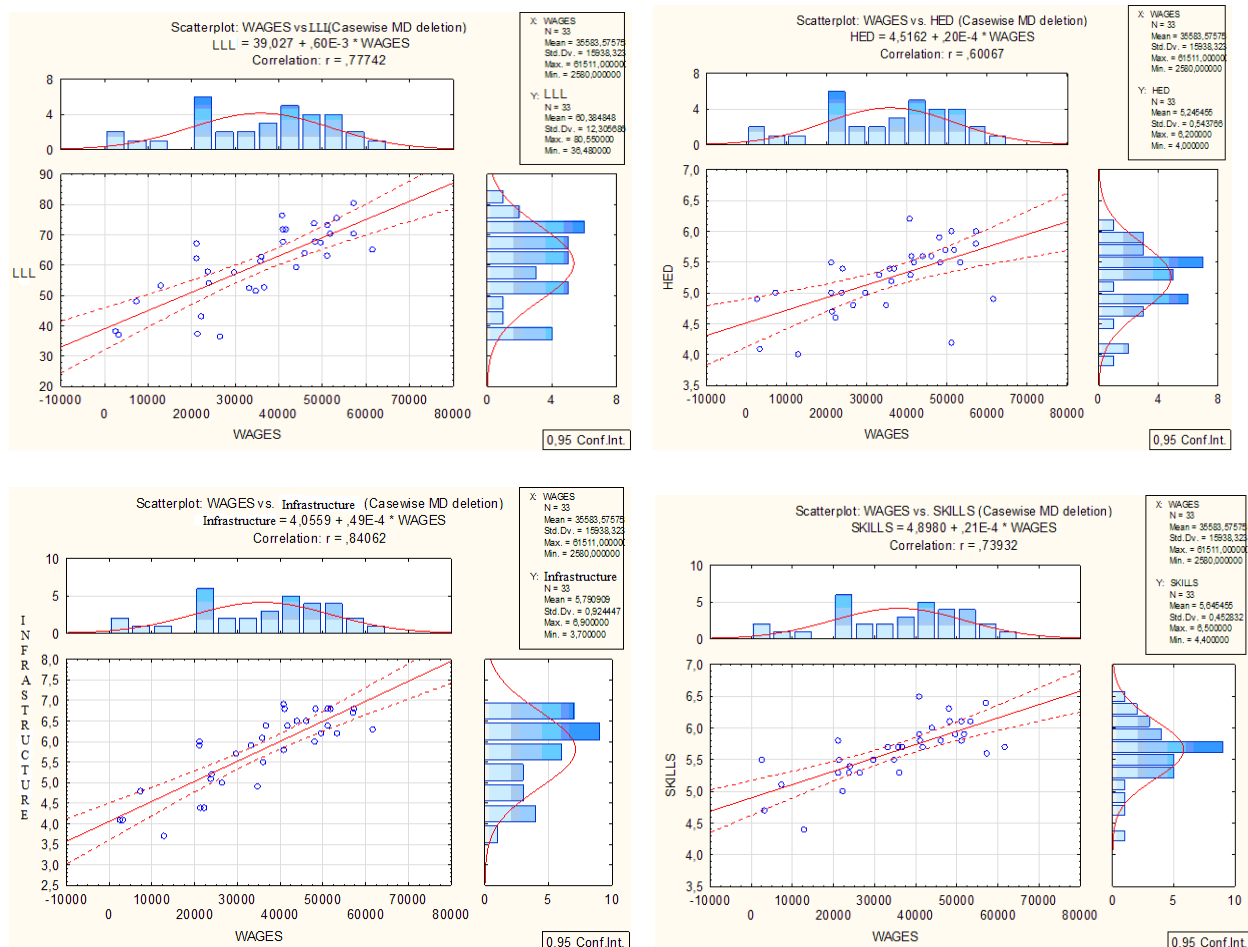
Figure 1 Linear regression model

Source: Authors' own elaboration [date of realese: The Global Talent Competitiveness Index 2014, The Global Competitiveness Report 2014, The Global Information Technology Report 2014, Worldbank 2016]

[4] Note: LLL- Lifelong learning, Skills- Readiness subindex (Skills), HEd - Global innovation index (subindex high education), Infrastructure - Readiness subindex (Infrastructure and digital content)

Taking into account the strength of correlation between the analyzed variables, the following conclusions can be made. First of all, the authors' hypothesis that strong positive correlations exist between total average wages and indicator of Lifelong learning can be accepted.

As we can observe the stated below scatter plots from the Figure 1, the relationship between all variables is linear, there is normal distribution.

So, from the Figure 1, we can see, that mean value of Lifelong learning is 60,30. The lowest value of Lifelong learning among the countries is 36,40 score (minimum), the highest is 80,55 score (maximum). The highest value is on 54,15 score higher than the lowest value (dimension). The standard deviation is 12,30 (12,30*2=24,6). Consequently, the variance, the square of the standard deviation, is (10.01) * 2 = 20.02. The asymmetry and the coefficient of variation are given with the corresponding standard errors.

The mean value of Readiness subindex (Skills) is 5,65. The lowest value of Readiness subindex (Skills) among the countries is 4,40 score (minimum), the highest is 6,50 score (maximum). The highest value is on 2,10 score higher than the lowest value (dimension). The standard deviation is 0,45.

The mean value of Global innovation index (subindex high education) is 5,25. The lowest value of Global innovation index (subindex high education) among the countries is 4,00 score (minimum), the highest is 6,20 score (maximum). The highest value is on 2,20 score higher than the lowest value (dimension). The standard deviation is 0,54.

And the mean value of Infrastructure - Readiness subindex (Infrastructure and digital content) is 5,79. The lowest value of Infrastructure - Readiness subindex (Infrastructure and digital content) among the countries is 3,70 score (minimum), the highest is 6,90 score (maximum). The highest value is on 3,20 score higher than the lowest value (dimension). The standard deviation is 0,92.

The Regression analysis was conducted with using the programme Statistica 12.0, the achieved results are shown in Table 2.

```
Multiple Regression Results

  Dependent: WAGES           Multiple R =  ,87089418    F = 21,98031
                                    R?= ,75845668    df =   4,28
  No. of cases: 33           adjusted R?=  ,72395049    p =  ,000000
             Standard error of estimate:8374,0613079
  Intercept: -60799,90700  Std.Error: 21216,69  t(   28) = -2,866  p =
,0078


         LLL b*=,320            HED b*=-,26      INFRASTRUCTURE
b*=,536
       SKILLS b*=,294


  (significant b* are highlighted in red)
```

Table 2 Regression Summary for Dependent Variable: WAGES

N=33	b*	Std.Err. of b*	b	Std.Err. of b	t(28)	p-value
Intercept			-60799,9	21216,69	-2,86566	0,007810
Lifelong learning	0,320314	0,170663	414,9	221,04	1,87688	0,070991
HEd	-0,263591	0,172443	-7726,1	5054,49	-1,52856	0,137592
Infrastructure and digital content	0,536240	0,188698	9245,3	3253,32	2,84180	0,008276
Skills	0,293503	0,189678	10330,4	6676,08	1,54738	0,133002

R= ,87089418 R?= ,75845668 Adjusted R?= ,72395049 F(4,28)=21,980 p<,00000 Std.Error of estimate: 8374,1

Source: Authors' own elaboration

Statistical significance of the model, verified with the help of the Fisher criterion (F): F (4,28) = 21,980 p <, 000001. Since p <000001, the null hypothesis that there is no relationship between the variables can be overridden, that is, the presence of a connection between the variables studied is statistically confirmed.

The coefficient of determination of the model R2 =, 758.

The values of the constant (b0) and the regression coefficient (b1) of the linear regression equation y = b1 * x + b2 * x + b3 * x + b4 * x + b0: b0 = -60799.9, b1 = 414.9, b2 = -7726.1, b3 = 9245.3, b4 = 10330.4.

The program also tests the null hypothesis about the zero value of the coefficient and constant using the Student's coefficient. In this case, the values of the Student's coefficient allow rejecting the null hypothesis both with respect to the constant and Regression coefficient for Infrastructure and digital content (p-value = 0.008276), for other coefficients - on the contrary, since the p-value value is above 0, 05.

Thus, among the four factors of influencing on the average wages (the Indicator of Lifelong learning[5], Higher Education development, Infrastructure and digital content and the Indicator of Skills), the value of lifelong learning is rather significant, but less than infrastructure and digital content. It could be explained through the process of comprehensive digitization of the all sphere of innovative economy and the inability to be engaged in lifelong learning without infrastructure and digital content.
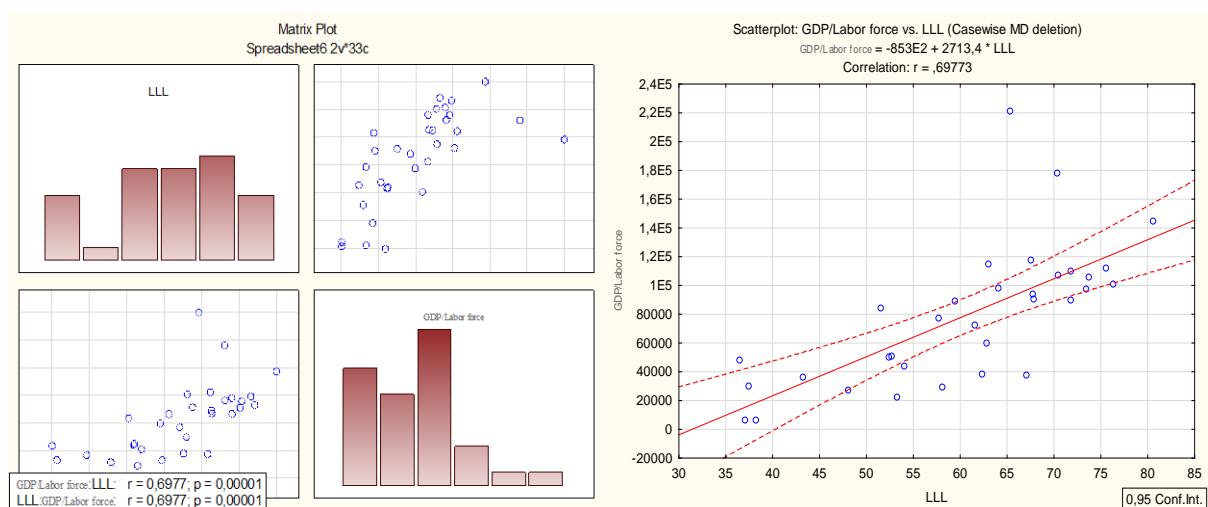
Figure 2 Linear regression model
Source: Authors' own elaboration [date of realese: Worldbank 2016, The Global Talent Competitiveness Index 2014]

[5] Note: LLL- Lifelong learning, GDP/Labor force - Gross domestic product / Labor force (ages 15 and older)

As we can see from Figure 2, the value of the pair correlation is more than 0.5, which is evidence of a linear correlation between variables, namely: the notable relationship is observed between the GDP/Labor force and the State of Lifelong learning (0.697), that is, in terms of innovative model of economy the state of development of lifelong learning influences on the level of GDP/labor force. It explains the fact that the developed countries are increasingly focusing on the development of lifelong learning through the dissemination and implementation the lifelong learning's policy.
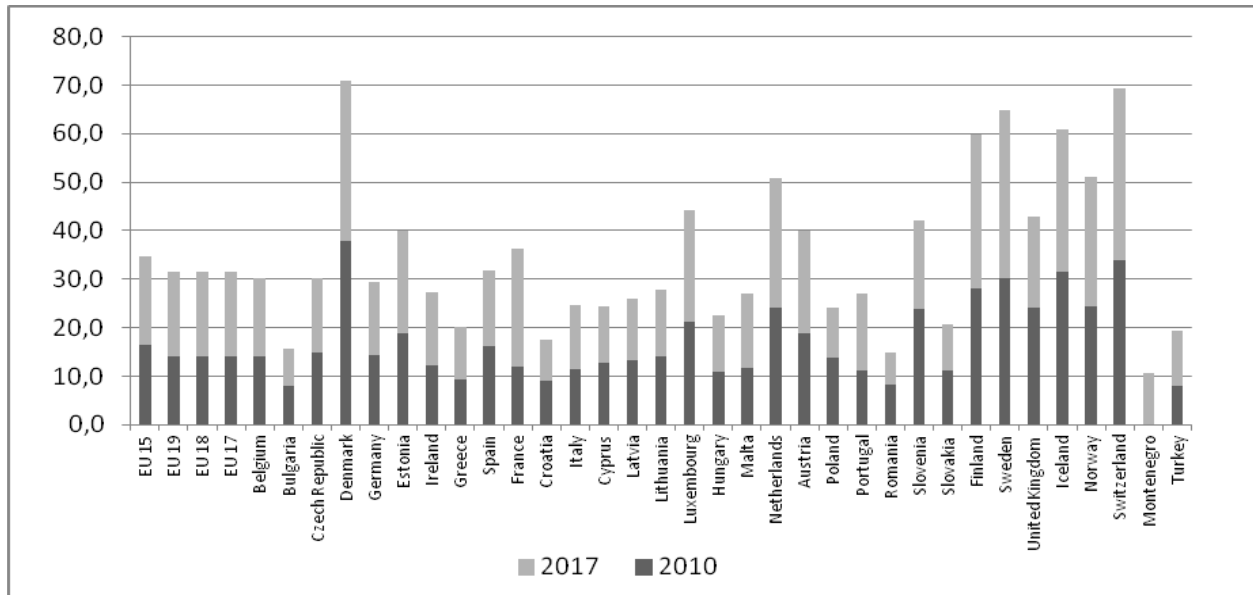
Figure 3 Adult participation in lifelong learning (% of population aged 25 to 64)
Source: Authors' own elaboration

As an example, Figure 3 shows the dynamics of adult participation in lifelong learning in the last 7 years in the EU's country. Most countries have increased their coverage of lifelong learning over the past few years: from 5% to 18.7 % (France), from 5.5 % to 9.8 % (Portugal), from 9.3% to 10.9 % (the EU-28 in whole) etc.

Unfortunately, we should note, that in "transition economies" lifelong learning is less popular. Most countries are only beginning to develop the mechanism of its provision and conditions for its development. In such countries is observed the adherence to the traditional education (the coverage of the population by higher education is the highest in the world). But as the above obtained results show, the HEd is less significant indicator in forming the average wages.

Conclusion

Thus, summarizing the above, we have to conclude about the following: the development of lifelong learning's policy is so important in terms of innovative model of economy, first of all, for "transition economies" because they will allow the growth in labor productivity due to the increasing of the average wages for individual and value of GDP per labor force for country in whole. The correlation-regression analysis showed strong positive correlations between total average wages and indicator of Lifelong learning, besides - a notable relationship between the GDP/Labor force and the State of Lifelong learning, which indicate on the impact of the state of development of lifelong learning influences on the level of GDP/labor force. Besides, we can admit, that there are positive correlations between Higher Education development, Infrastructure and digital content and the Indicator of Skills, in comparing with

Lifelong Learning. The process of developing a lifelong learning policy involves the permanent training and re-training of labor by upgrading and adapting the skills to the changes in global economy under conditions of innovative model, by taking account the aspects of rapid technological changes and increasing the share of the importance of knowledge (a new knowledge) in the production process. The concrete measures to support lifelong learning should include: better cooperation between universities and business sector, better adaptation of training and retraining to the existing labor market demand, improvement of educational programs and development of information services, consultancy, mediation and training in the National Employment Agency under the concept of lifelong training, organization of the training courses, involving the European funding for the development of training programs, conducting the training programs for employees, increasing cooperation between schools and universities, carrying out the training programs for employees, increasing access to education by increasing the number of colleges and universities due to the funded places, increasing the financial support for lifelong education programs etc. By implementing the lifelong learning's measures countries can recover the gaps in compared to the developed countries, and, as result, to improve work efficiency of labor force due to the personal economic effects for them and country in general.

Acknowledgements

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Impact of Managerial Education on Organisation Performance: A Study of Retirement Homes in Czechia

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Abstract

Efficiency and performance are the goals of all organisations. Therefore, these topics are current also for researchers and the influencing factors are being searched. This contribution aims to analyse if managerial education belongs to these factors in the specific field of social care. In view of the aging population, social care for the elderly will be more important in the future. Since social care is very labour intensive branch, human resource management has a great importance and influences employees' commitment, job satisfaction or intent to leave. The satisfied and motivated employees contribute to better organisation performance. Nevertheless, there is a question if educated management has also direct impact on performance. In order to answer this question, we have chosen Czech retirement homes as an analysed group. Information about managerial education was collected by own questionnaire. Performance indicators were obtained from public available sources. Primary and secondary data were connected and analysed by standard statistical methods. Findings show that 85% of social care managers underwent any managerial education and 83% suppose the further education as a benefit. There were identified the topics for future development which the managers are interested in. Regression analysis does not show any significant relation between managerial education and the selected performance indicators. Nevertheless, we do not want to generalize this result yet. For future research it is suggested to identified also others performance indicators and to tested stated relation again.

Keywords: Managerial Education, Further Education, Performance Measurement, Human Resource Development, Performance in Social Care, Andragogy.

JEL Classification: M53, J24, L32, L33

1 Introduction

In view of the socio-demographic trends, it is possible to suppose that social care for the elderly will grow in importance. As the population has been aging, the bigger portion of the unself-sufficient will be dependent on help of the others in the future. Although family members were historically the typical caregivers; society, family structure and individual's behaviour have changed (fertility rate, divorce rate, one-member households, job mobility, etc.) (McSweeney-Feld and Oetjen, 2012). Families could not be supposed to ensure care themselves anymore and thus, not only in the Czech Republic, there are provided a range of social care services.

The Czech social care services market is a mixed market. Services are provided by both public and private and both non-profit and for-profit organisations (Marková & Komárková, 2017). Nevertheless, although according to legal form, some organisations are ranked among for-profit organisations, profit generation does not have to be their main goal (Wong, 2008). Moreover,

research findings indicate that non-profit and for-profit organisations operating on the same market behave similarly (Rosenmayer, 2017).

The success of non-profit organisations, and potentially also for-profit organisations which are adapting on non-profit market, is assessed according to achieving goals and degree of their fulfilment (Molek, 2011). Even though goal of non-profit organisations is mainly not profit, which could indicate success and be an influencing factor of competitiveness on for-profit market, yet non-profit organisations should make efforts to efficient resources utilization. The most important and valuable resource of each organisation are human resources.

Since social care is very labour intensive branch, staff plays crucial role in goal achieving and appropriate human resource management should lead to higher quality of care and to achieving better outcome (Kabene et al., 2006). Thus, quality improvement of human resource management and social work management is one of the most important ways to efficient human resource utilization. This quality improvement is narrowly connected with regular transfer of the newest managerial knowledge and successful application into everyday practice (Molek, 2011).

Also other research findings support an important role of managers. Social care managers represent key factor influencing employees' organisational commitment and professional commitment (Giffords, 2009, McCray et al., 2014). They have impact on employees' job satisfaction and manifested interest in employees' issues could positively influence their intent to leave (Carpenter et al., 2012). Nevertheless, proper abilities, skills and competences are needed.

Rising requirements for managers increase the pressure on further education and development. Mumford and Gold (2004) called educational process and management development as a right way to managers' efficiency improvement. Deepening knowledge and full utilization of skills should be the basic philosophy of each organisation (Mumford and Gold, 2004). Each organisation could and should systematically offer development opportunities for their managers (Druckner, 2002). However, currently insufficient attention is paid to management development and leadership in social care (Van Zwanenberg, 2010).

The importance of developed and developing management is unquestionable. As state above, capable superiors affect subordinates' job satisfaction and motivation. Consequently, the satisfied and motivated employees could perform better. Therefore, it is possible to say that management indirectly influences organisation performance. However, is there any direct relation between managerial competences and performance and what is "performance" in social care when it is provided by non-profit organisations or quasi-for-profit organisations?

Performance is a multidimensional matter and has many definitions. Frequently, it is expressed as the relationship between input and output (Challis et al., 2006). One definition says that performance is "the amount made or done in relation to the resources used to make or produce or do it" (Harper, 1968, p.26 in Challis et al., 2006). The multidimensionality is illustrated for example in the British National Performance Framework (Department of Health, 1998). According this framework, performance should be assessed from multiple points of view (Table 1).

Table 1: Areas of Performance Measurement according National Performance Framework

Area	Aspects of performance
Health Improvement	The overall health and well-being of population
Fair Access	Fairness of service provision in relation to need
Effective delivery of appropriate healthcare (social care)	Effective in view of clinically effectiveness, appropriateness to need, timely, in accordance with standards…
Efficiency	Including: Cost per unit of care, labour productivity…
Patient/carer experience	Experience of response to needs, patient involvement, information and choice…
Health outcomes of NHS care	Reduction in levels of diseases, quality of life…

Source: Department of Health, 1998

Despite the generally acceptance of performance complexity, performance measurement is traditionally concentrated on financial measures (Saunila et al., 2012). So called rational-objective approach attempts to reduce performance measurement to quantitative especially financial metrics, for example overhead ratio (Ritchie and Kolodinsky, 2003). It correspondents with area Efficiency in the cited framework. Although many authors criticize this approach and we also consider it as a simplification, in this contribution we also focus on financial and other quantitative metrics for performance quantification. The individual selected metrics are introduced below.

In view of the above mentioned background, two main research questions were formulated:
- RQ1: Do managers in retirement homes have some managerial education?
- RQ2: Has managerial education any impact on financial performance of retirement homes?

2 Data and Methods

Legal framework of social care is stated by Social Service Act (Czechia, 2006) in the Czech Republic. This act defines 11 different social care services intend to the elderly. The most widespread services are home care and retirement homes. Since character of home care enables smaller and less organised providers, retirement homes represents better subject for investigation of management. In 2017 there were 525 organisations providing this social care service of different legal forms.

The research took place in April 2018, all retirement homes from the list of providers of 2017 were approached about research participation. For information about managerial education own electronic questionnaire was constructed as a data collection method and sent by email to the managers. The questionnaire consists of 13 questions. One of the questions investigated organisation's ID which could enable connection with publicly available data about organisation. Nevertheless, this question was not obligatory to preserving anonymity and thus not all of respondents fulfilled it. Secondary publicly available data were collected about retirement homes of which organisation's ID was stated. Sources of this data were the Social Services Providers Register (size, capacity, length of existence, region…) and the Business Register (financial statements for year 2016, newer data were not available).

The questionnaire was fulfilled by 174 retirement homes' top-managers and it represents the research sample for RQ1. Only 16 respondents did not state organisation's ID. However, 69 retirement homes with ID did not have the financial statements for year 2016 in the Business Register. Therefore, complete analysis for answer RQ2 was conducted at 89 organisations (51.1% of the origin sample).

Retirement homes participating on the research have had different legal forms. As seen on Figure 1, distribution of the individual sectors in the sample is similar to market distribution. Most of retirement homes have been public non-profit organisations (70.7%). The average length of existence has been 15.5 years and the average capacity has been 77.5 beds. The biggest portion of 35.1% involved retirement homes has got 50–99 employees.
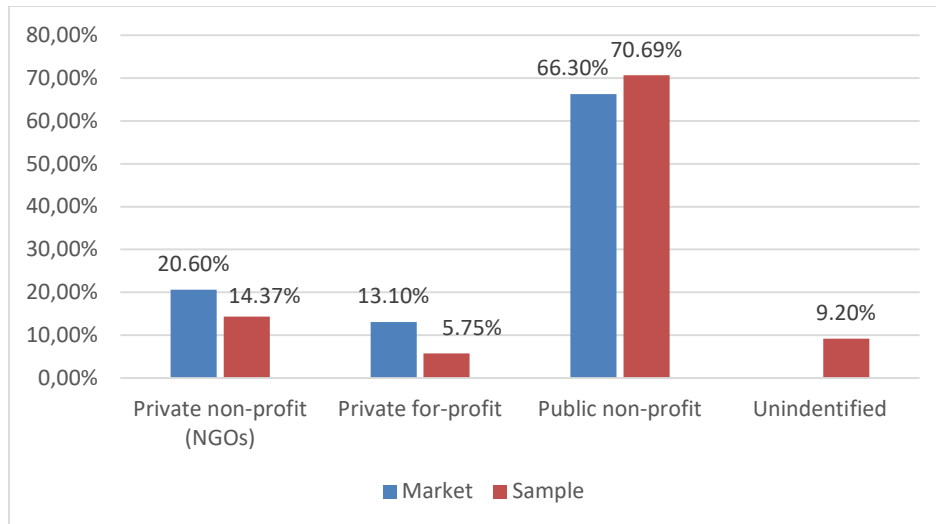
Figure 1: Comparison of the market and the sample by sectors
Source: MPSV, 2017

The sample consisted of 112 women and 62 men. The average age of retirement homes' top-managers was over 50 years and 93.1% have got university education and there was only a little difference between women and men. The summary of basic respondents' characteristics is in Table 2.

Table 2: Characteristics of respondents

	Women	Men	Total
Total	112 (64.4%)	62 (35.6%)	174 (100.0%)
Average age	49.3	51.7	50.1
Education (qualification)			
- Secondary school	7 (6.3%)	4 (6.5%)	11 (6.3%)
- Post-secondary school	0 (0.0%)	1 (1.6%)	1 (0.6%)
- University	105 (93.7%)	57 (91.9%)	162 (93.1%)

Source: own contribution

The second research question aims to identify a relation between managerial education and performance which is symbolized by the selected financial and others quantitative measures in this case. As mentioned, these data were collected about 89 organisations and further analysed. For this purpose, these performance indicators were selected:
- Revenues from sales of services
- Profit/loss
- Return on assets = Profit/Total assets
- Debet Ratio = Total liabilities/Total assets
- Work productivity = Revenues from sales/Average number of employees
- Total costs/Bed

The obtained and collected data were analysed by standard statistical methods. RQ1 was answered through descriptive statistics, chi-squared test, two-sample t-test and content analysis of open question. Secondly, linear regression models were constructed to answer RQ2. The technical support of analysis were MS Excel and SAS Enterprise Guide. Results are introduced in the next part.

3 Results and Discussion

Firstly, answers of 174 top-managers were explored. The questionnaire investigated if manager went through some managerial education before or during working on the top-managerial position. Furthermore, it investigated if they have an interest in some managerial education in the future. Results are summarized in Table 3. It was shown that 85.0% of retirement homes' top-managers have gone through some managerial training. 47.7% of them had this education before taking on the position. Contrary, 7.5% of them did not have any managerial training and at the same time they do not want any in the future. Additionally, 91.4 % of all respondents feel like and are able to call themselves as "manager" and 82.8% of respondents perceived managerial education as a benefit rather than an obligation.

Table 3: Absolved managerial education

Managerial education	Yes	No
- Before position holding	83 (47.7%)	91 (52.3%)
- During position holding	127 (73.0%)	47 (27.0%)
Total educated till now	**148 (85.0%)**	**26 (15.0%)**
- Interest in future education	104 (59.8%)	70 (40.2%)

Source: own contribution

Next question asked which kind of future education respondent want. Content analysis of the answers brings the topics which managers are mostly interested in. The biggest group (20 mentionings) were represented by answers like human resource management, personnel management, management, leadership or strategic management. 19 times, the general answer of managerial skills or competencies were appeared. Nevertheless, some respondents were more specific and they would welcome training in communication (14), economy and financial control (14), employee motivation (13), legislation (7), coping stress and time management (7) or employee evaluation (7).

Some respondents highlighted the important role of lector or mentor on effectiveness of training. Further, they would like to take part in some more practical courses, workshops or sharing good experiences with colleagues at the same position. 8 times it was mentioned that they would like to earn managerial knowledge especially in the context of social care. This information could contribute to creation of more suitable managerial courses specializing in social care management.

Subsequently, relations were testified between managerial education (before, during, in future) and gender, sector, qualification, age and relationship to education, and further, relation between last education and interest in future education. Chi-squared test and t-test were used. At 10% significance level, there were three relations significant. Firstly, the relation between undergone education before taking on position and interest in future education (p-value 0.09, who had gone through before they want again in the future). Secondly, the relation between undergone education during position holding and qualification (p-value 0.08, managers with secondary education underwent managerial training less than the others). Thirdly, the relation between undergone education during position holding and relationship to education (p-value 0.06, who perceives it as an obligation they underwent it).

Besides, both undergone managerial education during working on the position and interest in future education were related to age of managers, both at 5% significance level. The results of t-test showed that the older respondents went through education while managing (p-value 0.03). On the other hand, the older respondents do not want any managerial training in the future (p-value 0.01). Moreover, also the respondent who perceive education as a duty rather than a benefit do not want education in the future (p-value 0.04).

In the second step, linear regression analysis was executed. A new variable "some education" was created which states if managers underwent any managerial education, both before or during holding the position. There were tested the linear regression models with different dependent variable (profit/loss, individual ratios mentioned above) and independent (explanatory) variable some education. None of them show any statistical significance.

After that, more explanatory variables were added to the model according to the general linear regression equitation:

$$EY = ß_0 + ß_1X_1 + ß_2X_2 + \cdots + ß_nX_n \tag{1}$$

Where:
- Y - dependent variable - Revenues from sales of services, Profit/loss, Return on assets, Debet Ratio, Work productivity or Total costs/Bed
- $ß_1–ß_n$ - Parameter estimates
- $X_1–X_n$ – independent variables regarding managerial training and other manager's characteristics in combination with retirement home's characteristics, for example: manager's age, gender, education, capacity of retirement home, sector, average number of employees…

Unfortunately, it did not succeed in demonstrate a direct linkage between performance indicators and managerial education or managerial education in connection with others potential influencing factors. There appeared some significant relations, however, managerial education was statistically insignificant in all tested cases.

3.1 Discussion

The executed analysis showed that 85.0% of top-managers in retirement homes have got some training in managerial skills and competencies. 47.7% had gone through some training before they were promoted to the top-managerial position and 37.3% went through managerial education when they were managing retirement home. Contrary, the Swedish study of Shanks et al. (2014) stated that most of social care managers underwent in-service training after the promotion. At the same time, they say that managers mostly begin as social workers and there is a lack of post gradual managerial education at the Swedish schools of social work. Therefore, they do not have sufficient managerial knowledge.

Aim of this study was not to identified which type and quality of training managers went through. Nevertheless, over 91% of them have university education so some university managerial course could be supposed. 59.8% managers are open to further education. In previous part the topics, which managers are interested in, were identified. However, it is crucial to ensure quality of instructor or mentor, attractiveness and interactivity of training and tailored information for social care.

The statistical analysis found out several statistically significant relations (at 5% or 10% significant level). Specifically, it was shown that managers who had gone through the managerial training before promotion they want another training in the future. It could be

caused by the fact that there is a time delay and they want to update their knowledge. Furthermore, it seems that the higher education indicates the higher tendency and willingness to the further education. More educated people perceive the further education as a self-development. Additionally, data evinces the older managers the less motivation for future education.

One questions of questionnaire investigated how respondents perceive further education. Almost 83% labelled further education as a form of benefit rather than an obligation. The ensuing analysis showed that who perceive managerial training as a duty they underwent it during position holding, probably to fulfil and get over it. On the other hand, who perceive in as a benefit is more motivated for future courses. It raises the question for whom the training brings the bigger contribution.

In the second part of the analysis, relation was tested between the selected performance indicators and managerial education or managerial education in combination with other factors. The different linear regression models were tested. Nevertheless, none of them showed any significant impact of managerial education on organisation performance. In the introduction an indirect impact was deduced, however direct influence has not been proven. This result is in line with findings that managerial competencies increases individual performance, but there is a weaker relation with performance of the whole unit (Levenson et al., 2006). Moreover, social care managers themselves are more focused on care providing than development of key performance indicators (Ghenţa et al., 2015).

4 Conclusion

The demographic trends and relating social care provision raise many issues. In view of the fact that social care is very labour intensive branch (wage costs represent around 50% of total cost), effective and appropriate human resource management is crucial in its provision. Research findings show that management development and subsequently, developed management has an important impact on the different factors, f. e. employee job satisfaction, commitment and engagement or turnover rate. Therefore, it is possible supposed that organisation performance is (indirectly) positively influenced.

Aim of this contribution was to try to find out some direct relation between managerial education and organisation performance. Since social care is current theme, research took place in retirement homes. Firstly, attained managerial education and motivation for further education was investigated. Findings show that 85% of social care managers undergone some managerial training. Moreover, the topics of their interest for future education was found out.

In the second step, impact of managerial education on retirement home's performance was tested. However, the constructed linear regression models did not prove any (direct) significant relation. Although we were aware that performance is a multidimensional matter, we simplified it on the selected quantitative indicators because of public data availability. This fact could be considered as a limitation of our study and therefore we do not generalize these results yet. Further research in this topic is necessary and we suggest include also qualitative performance indicators.

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Effects of Quantitative Easing on Euro - Event Study Evidence

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Abstract

In this paper we examine effects of QE related statements made by ECB on major currency crosses with common Eurozone's currency. Considering announcements days as events, we adopt event-study approach to calculate excess changes on particular announcement day for main currency pairs with euro inside and outside the EU, admitting complexity of statements provided by ECB, and difficulty to isolate effects linked only to QE related information. Results indicate, that statements containing information about prolonging or excessing QE, or initial information about QE cause depreciation of euro, while information about tapering QE programmes initiate appreciation of euro. Our results seem to be in line with results of Sosvilla-Rivero & Fernández-Fernández (2016), while our results also could provide a contribution both from trading and policy making perspective.

Keywords: quantitative easing, ECB, foreign exchange rates, event study.

JEL Classification: E520, G140

1 Introduction

Quantitative easing (QE) is an unconventional monetary policy instrument, which took place popularly after crisis period in 2007 and 2008. Sticking to main theoretical background, QE should stimulate economy as a whole, while traditional monetary policy based on setting reference interest rates became ineffective, because of phenomenon called "zero lower bound". This basically describes situation where base interest rates are set to zero level or below, but as Bernanke (2004) states, cash positions bares no interest, therefore such a policy is ineffective. Axiom of such nonstandard monetary policy is, that monetary authority is supposed to buy selected type of assets – consequently providing liquidity further, mainly to banks, which should stimulate riskier investments. First evidence of QE comes from Japan, where Bank of Japan (BoJ) tried to fight deflation back in 2001 using this instrument. Quantitative easing was also used in the United Kingdom (from 2009) and the United States (QE1, QE2, QE3 – from 2008 till 2014), and since 2015 we face Expanded asset purchase programme (QE) managed by the ECB also in the EU. Taking into account complexity and widespread consequences of QE, its effectiveness remains open question among the authors. As crucial we consider understanding of so called transmission channels, throughout which QE affects economy. Across the literature, we find common ground, that there are three transmission channels (portfolio rebalancing channel, signalling channel and reassuring channel), through which QE impact interest rates, yields, and consequently on individuals' willingness to spend, bank´s willingness to lend etc. which turn into affecting inflation and economic growth (see e.g. Krishnamurthy & Vissing-Jorgensen, 2011; Joyce et al., 2011;

Gagnon et al., 2011; Wright, 2012; Bauer et al., 2014; Swanson, 2011; Joyce et al., 2010; Chung et al., 2012; Kapetanios et al., 2012; Meaning & Zhu, 2012)[3].

However, many studies deal with QE and its consequences, attempting to examine broader macroeconomic or partial effects. We can conclude that there is common ground among the authors, that QE lowered both corporate and government bonds´ yields across the yield curve significantly (Joyce et al., 2010; Joyce et al., 2011; Gagnon et al., 2011; Swanson, 2011; Wright, 2012; Bauer et al. 2014). Nevertheless, persistency of those effects caused by events is questionable. According to Thornton (2017), event-study approach where announcements are used as events will not provide statistically significant information about persistence and duration of those effects observed on bond yields. Therefore, using only event-study approach we cannot examine complex effectiveness of QE. Besides bond yields, Šafár (2017) apply event-study approach to examine effects caused by similar announcements on major stock indices in the EU. Also Sosvilla-Rivero & Fernández-Fernández (2016) adopt event-study, where authors focus on euro/dollar (EUR/USD) FX (foreign exchange) cross. Authors conclude that QE related statements from FED caused depreciation of dollar while QE related statements from ECB caused depreciation of euro. We believe that since this study was made, new announcements were made; also examining effects on broader sample of major euro FX crosses could provide solid and significant information about ECB´s unconventional policy effects on common currency. Besides mentioned event-study approach related studies, we find other methodologies among the literature dealing with QE. Gambetti & Musso (2017) describes transmission channels, and provide empirical evidence of the macroeconomic impact of the EAPP. Evidence from this study using VAR model, suggests, that APP had a significant upward effect on both real GDP and HICP inflation in euro area during first two years. Considering time frame, impact on real GDP appears to be stronger in the short term, while that on HICP inflation seems more marked in the medium term according to authors. From different perspective of view, Blattner & Joyce (2016) examines how shocks to the net supply of government bonds affect the euro area term structure of interest rates and the wider economy. Authors use BVAR model, while results provide evidence of significant lowering of euro area 10-year bond yields. Also results suggest that QE propped up both inflation and output gap throughout the euro area, while signalling channel was not considered.

As stated above, we find robust representation of event studies among the literature, but mainly oriented on bonds in general, thus we aimed to foreign exchange crosses in order to contribute as possible. Other reason is that FX market is very popular both for professional/institutional traders and retail/individual traders. Also currency strength is viewed as crucial even from monetary authority perspective of view. As far as we are concerned, QE programme will remain active for several months, and quitting the programme will take another significant portion of time, therefore knowing impact of information related to QE could bring profits or helps to hedge against loses.. On the other hand, realizing impact of such information to FX markets could be useful for policy makers.

2 Methodology and data

To examine effects of announcements on selected currency pairs representing reaction of common currency - euro, we adopted standard event study methodology to determine excess changes (see e.g. MacKinlay, 1997). Abnormal changes will be analysed in same time point

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[3] On the other hand, Berkmen (2012), Wallace (1981), Eggertsson & Woodford (2003), Curdia & Woodford (2011) suggests that effects of QE on economic activity and inflation are rather limited.

(day) as announcement is released[4] using average changes (Brown & Warner, 1985) calculated from previous sixty days:

$$A_{AD} = R_{AD} - \overline{R}_t \qquad (1)$$

$$\overline{R}_t = \frac{1}{60} \sum_{t=-60}^{-1} R_t \qquad (2)$$

Where A_{AD} represents excess change on announcement day (AD) of particular currency pair, R_{AD} is change of particular currency pair on announcement day calculated as difference between changes on announcement day and previous $\overline{R}_t$ day and is average change on particular currency pair considering sixty days before announcement[5]. For purposes of this study, we consider A_{AD} as a key indicator that helps us determine effect of QE related statements on euro as a common currency, while persistence of those effects cannot be examined via this methodology (see Thornton, 2017).

We used daily changes displayed as percentage of EUR/HUF, EUR/PLN, EUR/DKK, EUR/RON, EUR/BGN, EUR/CZK, EUR/HRK and EUR/SEK as for countries inside the EU, and EUR/USD, EUR/GBP, EUR/JPY, EUR/CNY, EUR/RUB, EUR/AUD for countries outside the EU. With this indicator we try to approximate how daily changes on currency pairs deviates on particular day after selected announcements from its average performance during previous sixty days. As stated before, in this study we use ECB announcements containing information about quantitative easing as events. We checked every single press release of ECB from January 2015 to March 2018 to compile Table 1, which contains only announcements with information about unconventional monetary policy[6].

Table 1: Announcement days

Date	Event	Description
08.03.2018	ECB press conference MPD-GC	EAPP 30B/m till 9/2018
25.01.2018	ECB press conference MPD-GC	EAPP 30B/m till 9/2019
14.12.2017	ECB press conference MPD-GC	EAPP 60B/m -> 30B/m from 1/2017
26.10.2017	ECB press conference MPD-GC	EAPP 60B/m -> 30B/m from 1/2018
07.09.2017	ECB press conference MPD-GC	EAPP 60B/m
20.07.2017	ECB press conference MPD-GC	EAPP 60B/m
08.06.2017	ECB press conference MPD-GC	EAPP 60B/m
27.04.2017	ECB press conference MPD-GC	EAPP 60B/m
09.03.2017	ECB press conference MPD-GC	EAPP 80B/m -> 60B/m from 4/2017
19.01.2017	ECB press conference MPD-GC	EAPP 80B/m -> 60B/m from 4/2017
08.12.2016	ECB press conference MPD-GC	EAPP 80B/m -> 60B/m from 4/2017
20.10.2016	ECB press conference MPD-GC	EAPP 80B/m
08.09.2016	ECB press conference MPD-GC	EAPP 80B/m

4 Announcements are released usually in the afternoon, while European markets closes several hours later, which gives us enough time to absorb information contained in particular announcement.

5 Changes on announcement days were removed from sample so average changes were calculated without contamination of excess changes on announcement days.

6 Expanded asset purchase programme, which is recognized as a quantitative easing, started on March 2016. Previous programmes are also identified as nonstandard or unconventional monetary policies, however considering scale of assets, volumes and durations, compared to QE they are less significant, hence we did not add them to our study.

Date	Event	Description
21.07.2016	ECB press conference MPD-GC	EAPP 80B/m
02.06.2016	ECB press conference MPD-GC	Corporate sector purchasing programme (CSPP)
21.04.2016	ECB press conference MPD-GC	EAPP 80B/m
10.03.2016	ECB press conference MPD-GC	EAPP 80B/m from 4/2016
21.01.2016	ECB press conference MPD-GC	EAPP 60B/m
03.12.2015	ECB press conference MPD-GC	EAPP 60B/m
09.11.2015	press release	Public sector purchasing programme (PSPP)
22.10.2015	ECB press conference MPD-GC	EAPP 60B/m
23.09.2015	press release	Asset backed purchase programme (ABSPP)
16.07.2015	ECB press conference MPD-GC	EAPP 60B/m
03.06.2015	ECB press conference MPD-GC	EAPP 60B/m
15.04.2015	ECB press conference MPD-GC	EAPP 60B/m
05.03.2015	ECB press conference MPD-GC	Revealing details about private sector purchases
22.01.2015	ECB press conference MPD-GC	Expanded asset purchase programme (EAPP) 60B/m

Note: ECB – European Central Bank; MPD-GC – Monetary Policy Department, Governing Council
Source: own elaboration using data from ECB

In Table 1 above we present what type of meeting or announcement on which particular day (first two columns) provided information linked to which particular non-standard monetary policy programme (third column).

3 Results and discussion

We calculated excess returns for 14 euro crosses using daily close prices on 27 announcement days. In Table 2 below we present calculated excess daily changes (in %) for currency pairs inside and outside EU on particular announcement days:

Calculated excess changes suggest, that currency pairs within the EU shows minimum and insignificant reaction, while outside the EU we can observe more volatile reactions, therefore we did not examine inside EU reactions further. Only EU currency where one percent movement occurred 5 times was Polsky Zloty. We consider this as a result of hard political stance of Poland towards the EU, therefore more nervous trading could occur on this particular cross. Taking into consideration only average excess returns on currency pairs outside the EU during observed period, we also get insignificant average reaction near zero.

Table 2: Excess returns on FX crosses

Date	Currency pair - Euro vs.:													
	Hungarian Forint	Polsky Zloty	Danish Krona	Romanian Leu	Bulgarian Lev	Czech Crown	Croatian Kuna	Sweden Krona	Austrlian Dollar	Chinese Yuan	Japanese Yen	Grt. Britain Pound	United States Dollar	Russian Ruble
08.03.2018	-0,04	-0,08	-0,03	0,76	0,02	-0,01	0,13	-0,43	-0,42	-0,58	-0,69	-0,21	-0,92	-
25.01.2018	-0,05	-0,18	-0,02	0,18	-0,01	-0,11	-0,07	-0,17	0,32	-0,88	0,00	0,63	-0,22	-0,41
14.12.2017	-0,08	0,20	0,03	-0,04	-0,02	0,20	-0,08	-0,19	-0,87	-0,55	-0,56	-0,50	-0,41	-0,04
26.10.2017	0,19	0,35	0,00	-0,04	0,03	0,36	0,01	0,18	-0,87	-1,29	-1,21	-0,58	-1,37	-1,02
07.09.2017	-0,24	-0,02	-0,01	0,05	-0,01	0,09	0,05	0,16	0,30	0,29	0,09	0,40	0,79	-0,14
20.07.2017	-0,22	0,07	-0,01	0,00	0,01	-0,08	-0,08	0,03	0,92	1,04	0,83	1,26	0,99	0,45
08.06.2017	-0,21	-0,21	0,00	-0,08	-0,03	0,00	0,24	-0,19	-0,44	-0,38	-0,24	-0,33	-0,47	-0,36
27.04.2017	-0,33	-0,03	-0,01	-0,08	-0,02	0,49	0,18	0,52	-0,18	-0,22	-0,06	-0,72	-0,30	-0,56
09.03.2017	0,22	0,43	0,03	0,12	0,00	0,01	0,05	0,28	0,64	0,33	0,90	0,32	0,34	1,20
19.01.2017	0,31	0,16	-0,01	0,11	-0,01	0,01	-0,15	0,30	-0,44	0,79	0,35	-0,33	0,32	0,72
08.12.2016	0,38	0,16	0,02	0,00	0,01	0,08	-0,03	-0,72	-0,91	-1,27	-1,15	-0,97	-1,21	-1,20
20.10.2016	0,15	0,32	-0,02	0,09	-0,01	0,05	-0,01	-0,01	0,91	-0,29	0,15	-0,22	-0,39	0,01
08.09.2016	0,04	0,19	-0,04	0,11	0,00	-0,01	0,02	0,14	0,61	0,17	0,95	0,39	0,20	-0,04
21.07.2016	-0,23	-0,31	0,02	-0,05	-0,02	-0,01	-0,03	-0,05	-0,14	0,05	-0,81	-0,20	0,12	1,20
02.06.2016	-0,36	-0,05	0,00	-0,05	0,01	-0,02	-0,14	0,08	-0,01	-0,22	-0,92	-0,39	-0,34	-0,41
21.04.2016	0,39	1,29	0,00	0,08	-0,01	0,01	-0,14	0,09	0,75	0,08	-0,36	-0,05	-0,12	2,59
10.03.2016	0,71	0,30	-0,02	0,06	0,01	0,00	0,03	0,81	2,70	1,46	1,47	1,06	1,60	2,36
21.01.2016	-0,12	-0,08	-0,04	-0,10	-0,03	0,00	0,01	-0,52	-1,47	-0,13	0,62	-0,46	-0,10	1,10
03.12.2015	0,97	1,17	0,00	0,02	-0,02	0,12	-0,11	0,79	2,76	3,27	2,55	1,76	3,77	3,27
09.11.2015	-0,37	-0,44	0,02	0,03	0,00	0,09	0,00	-0,29	0,08	0,26	0,17	-0,38	0,13	0,14
22.10.2015	-0,44	-1,00	-0,02	-0,13	-0,03	0,01	-0,01	-0,60	-2,05	-2,02	-1,44	-1,94	-2,11	-2,86
23.09.2015	0,33	0,55	0,08	0,03	0,04	0,34	-0,22	0,96	1,68	0,65	0,74	1,32	0,57	1,44
16.07.2015	-0,14	-0,46	0,01	-0,38	0,00	0,14	0,16	-0,17	-1,12	-0,69	-0,43	-0,48	-0,71	-0,81
03.06.2015	0,19	1,12	-0,07	-0,23	-0,06	0,00	-0,24	-0,67	0,83	1,43	1,05	1,83	1,72	3,98
15.04.2015	1,31	0,29	0,02	0,33	0,02	0,50	-0,03	-0,14	-0,43	0,27	0,20	-0,05	0,39	-1,48
05.03.2015	-0,20	-0,19	-0,05	-0,20	0,01	-0,71	-0,27	-0,28	0,07	-0,39	0,09	-0,15	-0,27	-1,46
22.01.2015	-0,93	-1,06	0,12	-0,26	0,01	-0,31	-0,11	-1,45	-1,28	-2,04	-1,55	-1,20	-1,97	-2,40

Note: Excess changes bigger than 1% in absolute value are shown in grey; Table is divided by line to currency pairs inside and outside the EU.

Source: own elaboration using daily changes data on currency pairs from investing.com

However, excluding three very specific announcements from our sample when we observed very positive gains on the euro brings different results. On June 3rd, 2015 besides stating that QE programme will continue without changes, some very positive macroeconomic data about Eurozone were presented, which dragged more attention from market participants. Then on

December 3rd, 2015, when forward guidance from head of ECB Mario Draghi took new and supportive narrative – "to do whatever it takes" – which again pushed euro higher again most of major peers. Also possibility of extending or expanding current programme was firstly mentioned as an option. After that, ECB´s rhetoric moved markets again after admitting option of expanding QE "in terms of size and duration" (March 10th, 2016), and signalized adding another 20bn euro in monthly purchases. On those two days (December 3rd, 2015 and March 10th, 2016), market participants reacted positively related to common currency mainly because of translating information as a support from ECB to Eurozone. After excluding those three particular announcements, we find negative average excess reaction among observed currency pairs: -0.18% on EUR/AUD, -0.29% on EUR/CNY, -0.18% on EUR/JPY, -0.20% on EUR/GBP, -0.29% on EUR/USD and -0.19% on EUR/RUB. To add on, we faced negative excess reaction in majority of observed announcements; 14 out of 24 on EUR/AUD and EUR/CNY, 13 out of 24 on EUR/JPY, 18 out of 24 on EUR/GBP, 15 out of 24 on EUR/USD and 14 out of 24 on EUR/RUB. Stated results bring us to conclusion, that we can expect depreciation of euro on announcement days mentioning ongoing QE programme without signalling changes in its pace or duration.

These negative reactions followed announcements containing information about QE referring to continuity or persistency of the programme or its expanding. Examining every press release and ECB statement further, we can conclude, that positive reactions came either because of better than expected (revised up) macroeconomic data for Eurozone, or when any form of tightening or tapering of accommodative monetary policy was mentioned. We can also observe decreasing trend in volatility of reactions over the time, which is in line with conclusions of other authors mentioning volatility with respect to QE (see e.g. Blattner & Joyce, 2016). This phenomenon could be caused by market participants adjusting to narrative provided by ECB and conditions in the markets in general, in other words accommodating to larger presence of monetary authority.

4 Conclusion

Results of Sosvilla-Rivero & Fernández-Fernández (2016) suggested, that QE linked information in general causes depreciation of domestic currency, and we can argue that our results are in line with those findings, yet more detailed and on various currency pairs. Our results also show that currency pairs inside the EU are mainly unaffected by ECB´s announcements. On currency pairs outside the EU, we observed negative reactions, in other words, depreciation of euro against other observed currencies following QE related statements in majority of occasions. However, persistency of those effects could not be proved by given methodology (Thornton, 2017), from short-term view we argue, that investors and market participants should hedge against depreciation of euro on announcements where QE is being declared. On the other hand, any information linked to tapering the programme could cause appreciation of euro. Considering fact, that tightening of still very accommodative monetary policy of ECB is still ahead, we suggest further research on particularly tapering linked announcement reactions, which could either help market participants to profit or to hedge against currency movements.

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The Problem of Using Ratio Data in DEA models

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Abstract

Data envelopment analysis (DEA) is one of the potential approaches to assessing the efficiency, performance and productivity of homogeneous production units. These units deal with the production of identical or equivalent outputs using identical or equivalent inputs. DEA allows an individual evaluation of the efficiency of each production unit relative to the whole set of units. In the literature are known examples, where inputs or outputs include data expressed as ratio data. Our paper points out how it is necessary to modify individual inputs or outputs in case of using indicators expressed as ratio with using DEA models. The acceptance of the ratios included in the DEA models is relative on the standardization of the input and output side that we present in our article. The ratios, which we use in our paper, are linked to the monitoring of health efficiency.

Keywords: Data Envelopment Analysis (DEA), Ratio Data, Efficiency

JEL Classification: C61, H51, I15

1   Introduction

Measuring efficiency in the service sector is currently the subject of various papers, which bring us different types of methods and implication. Data Envelopment Analysis is a non-parametric mathematical programming method that serves to measure the efficiency of production units - Decision Making Units (DMU). DEA's main starting point is the reduction of multiple inputs and multiple outputs on the one virtual input and one virtual output through the scales that result from the model. The ratio between virtual output and virtual input determines the efficiency score (Dlouhý and Jablonský, 2004). In general, the literature defines two types of efficiency – operational efficiency and overall efficiency. Operational efficiency was first mentioned by Farell (1957). Overall efficiency is divided into four main components: technical, allocation, scope efficiency and scale efficiency. The relative efficiency, introduced by Leibenstein (1966), includes technical and allocation efficiency. Technically inefficient is a unit if it uses too many inputs to produce given outputs. Allocative inefficient is a unit that uses incorrect set of inputs. Data Envelopment Analysis is one of the possibilities of a comprehensive evaluation of the relative efficiency in the service sector.

DEA analysis takes into account several factors that affect the efficiency of the entire unit. This means that the factors affect both the input side and the output side, and can be expressed in different units. Data Envelopment Analysis suggests that an important condition for increasing the performance of production units is to measure the effectiveness of DMUs and identify inefficiency

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units. DMU refers to a production unit with the character of a homogeneous unit producing the same or similar outputs, requiring certain inputs. Efficiency analysis offers the possibility of identifying efficient and inefficient units, but also identifying the source of inefficiency units. In many cases, the input or/and output variables are expressed as ratios. However, using the ratios brings several problems in standard DEA models. According to the aim, the paper is organized as follows: In the section 2 a preview of relevant literature is provided. Applied methodology is described in the section 3. In the section 4 we present the results and key findings. The aim of the paper is to focus on determining how to use DEA models in case of using data expressed as ratio.

2 Literature preview

One of the method for analyzing the efficiency of organizations or a particular service sector is Data Envelopment Analysis. DEA, specified by Charnes et al. (1978) and later developed by Banker et al. (1984), is a nonparametric method and based on mathematical programming. DEA includes two basic conceptual models: CCR model, developed by Charnes, Cooper and Rhodes (1978) and the BCC model, introduced by Banker, Charnes and Cooper (1984). The nature of the difference between these models results from the approach to returns to scale. The assumptions of the CCR model are constant returns to scale (CRS). The BCC model allows units to produce with variable returns to scale (VRS). The individual scales for each unit in the DEA analysis are searched to maximize the efficiency score of the units. For inefficient units, it is possible to determine the so-called hypothetical - virtual unit, which is characterized as the weighted average of certain actual values of effective units. The size of the inputs and outputs serves as a model for real inefficient units that produce fewer outputs or use more inputs than their virtual unit. In some cases, the sample DMU may be one of the effective actual units (Cooper et al. 2007). With variable returns to scale, the requirement that α multiple of the input must be balanced by an increase α multiple in output, is not valid. DMU can therefore be effective even though the relative increase in returns to scale will be lower or higher than the increase in inputs. Cooper et al. (2007) in their work point to the use basic conditions of DEA analysis. Petersen (1990) points to an alternative DEA approach and does not invoke the assumption of a convexity axiom. The first step of the analysis is devoted to the spanning of isoquants and the second is dealing with an assessment of the position an observed input-output combination compared to the isoquants. The convexity assumption is not consistent with an increase in returns to scale and not implied by constant or non-increasing returns to scale.

One of the main questions in DEA is what type of data to use in the analysis. In the case of using health indicators, it is clear that more data will be expressed as ratio variables. Ratio measures are often referred to contextual variables (income per capita, health expenditure per capita, health expenditure as % of GDP, doctor consultations per capita, infant mortality rate, tobacco consumption as % of adult population who are daily smokers, nurses' density per 1000 population, etc.). Ratio indicators in many analyzes represent the input and output attributes that are included in the analysis. Agrell et al. (2005), Podinovski (2005), Hollingsworth and Smith (2003) also focus on the use of ratio variables in DEA models, pointing to possibilities of using standard DEA models, but only under certain conditions. In the literature, we are confronted with the dilemma what type of the DEA model should be used, depending on the input and output variables. Olesen et al. (2009, 2015) state that, in line with the literature on health care applications of DEA, we can use the VRS or CRS models. It depends if the scale economies can not be ignored (and use VRS) or are negligible (and assuming CRS). In the case of input and output variables under health care provision, the following data are often presented: success rate for certain treatments; mortality rates

after specific surgical procedures; the average distance from the hospital to the patients; the proportion of the population in the catchment area with specific adverse health conditions such as diabetes or obesity. Olesen et al. (2015) points to an example as is shown in the Table 1. The authors present the hospitals A and B with their outputs. "Patients" is the number of patients who have received a certain treatment. "Successful treatments" are the number of treatments and the "success rate" is calculated as the ratio of the second to the first output. If C is the simple average of A and B hospitals, then we take into account the scales for both hospitals at 0.5. Hospital C has 750 patients and 300 of them were successfully treated. The success rate is 40. We can note that it is less than 50 %, which is the average of the success rates of 20 percent and 80 percent of both hospitals. This problem results from the fact that both denominators are different in both cases.

Table 1 Hospitals

Hospital	Patients	Successful treatments	Success rate
A	1000	200	20
B	500	400	80
C=0.5A+0.5B	750	300	50 (incorrect), 40 (correct)

Source: According to Olesen et al. (2015)

As can be seen, the use of ratio variables in standard DEA models (VRS and CRS models), mostly results in the incorrect results. Therefore, in this case, the authors recommend a simple step, which we can call a re-normalization of the input or output by the same denominator for all DMUs. For example, suppose that the annual production level is changed to the average monthly production level by dividing the former by 12. Because the denominator is the same for all production units, re-normalization does not affect the validity of the VRS and CRS production assumptions. For CRS models, it is still possible to make the re-normalization of all inputs and outputs of each DMU by a single unit specific denominator. For example, all inputs and outputs may be divided by its GDP or population. As we have already mentioned, using ratio measures brings some problems in traditional DEA models. However, there are some approaches that try to overcome these shortcomings, but these approaches have significant limitations. Thanassoulis et al. (1995, 2008) and Dyson (2001) report the use of volume measures instead of ratio variables. This approach is interesting but may not be practical. Using volume measures may not make sense in the context, and the data may not be available and ratio data can be seen sometimes too sensitive and confidential. That is the reason why is better to use ratio variables. Free Disposal Hull Model (FDH) introduced by Deprins et al. (2006) can be used in principle with both volume and ratio indicators. However, this model is used only for very small sample, because no convex combination of volumes of input and output variables is used. In literature, we still can find different studies that point to the adaptation of models using ratio indicators (Dyson et al., 2001, Ruggiero, 1996, Paradis et al., 2010, Olesen et al., 2015). Several authors have solved this question in their papers and their conclusions are that input and output variables, expressed as ratios, should not be used in standard DEA models (Bogetoft, 1996, Bogetoft et al., 2000, Cooper et al., 2007; Olesen et al., 2015, Emrouznejad and Amin, 2007). In our presented paper we want to point out the modification of the standard DEA models dealing with output variable expressed as a ratio indicator. In this paper, we focus on the area of health care. Health indicators are often expressed as ratio variables, which tell us about the country's health status situation. These indicators, in most cases, are contextual variables that represent healthcare quality, such as healthcare expenditure per capita, health expenditure as a percentage of GDP, discharges rates from hospital per 100,000 inhabitants, etc. (Olesen et al., 2015).

3 Research methodology

DEA models are based on the fact that for a given problem there is a set of production options that consists of the available input / output combinations (Thanassoulis et al. 2008). If we consider that each from n observed DMUs has m inputs to produces outputs, DMU$_j$ (for each $j = 1, \ldots, n$) is associated with the input vector of $\mathbf{x}_j = (x_{1j}, \ldots, x_{mj})$ and output vector of $\mathbf{y}_j = (y_{1j}, \ldots, y_{sj})$. The production possibility set is determined by an effective frontier $P = \{(\mathbf{x}, \mathbf{y}) \, | \, \mathbf{x} \text{ can produce } \mathbf{y}\}$. If the individual combinations of inputs and outputs within a particular unit lie at that frontier, we are talking about an efficient unit. The unit is efficient if it consumes a small amount of inputs for a large number of outputs. If the unit is not at the production frontier, it is necessary to adjust the size of inputs or outputs. Measurement of efficiency generally involves identifying relevant model variables and obtaining data, that will represent our chosen variables (Peacock et al., 2001). In general, it is clear that the small number of input and output variables in the model compared to the number of DMUs can reduce the explanatory power of DEA analysis. Golany and Roll (1989) report that the number of DMUs should be at least twice the number of inputs and outputs combined and Banker et al. (1984, 1989) state that the number of DMUs should be three times the number of inputs and outputs combined.

Without loss of generality assume we have n DMUs consuming a single input-ratio to produce an absolute single output, say $y_j = 1$. Emrouznejad and Amin (2007) assume the input-ratio of DMU$_j$ is denoted by

$$x_j = \frac{n_j}{d_j} \tag{1}$$

for each $j = 1, \ldots, n$.

Next we will see that using standard input oriented PPS defined in DEA is not correct.

$$PPS = \left\{ (x, y) : x \geq \sum_{j=1}^{n} \lambda_j x_j \, y \leq 1, \sum_{j=1}^{n} \lambda_j = 1, \lambda_j \geq 0, j = 1, \ldots, n \right\} \tag{2}$$

Now consider the actual convex combination of DMUs defined by

$$x^0 = \frac{\sum_{j=1}^{n} \lambda_j n_j}{\sum_{j=1}^{n} \lambda_j d_j}, \quad \sum_{j=1}^{n} \lambda_j = 1, \, \lambda_j \geq 0, \, j = 1, \ldots, n. \tag{3}$$

Let $\lambda_j = \frac{1}{n}, \forall j$ and note that $(x^0, 1)$ may not be in the PPS because

$$\frac{n_1 + \cdots + n_n}{d_1 + \cdots + d_n} \geq \frac{1}{n} \times \left(\frac{n_1}{d_1} + \cdots + \frac{n_n}{d_n} \right) \tag{4}$$

is not valid for any arbitrary given set of numbers n_j and d_j ($j = 1, \ldots, n.$). Hence we could conclude that the standard DEA models can not be used primary if at least one of the input or output variable is in the form of ratio (Emrouznejad and Amin, 2007).

Model 1. Standard input oriented DEA – CRS model

$$\min \quad h$$

$$s.t. \quad \sum_{j=1}^{n} x_{ij}\lambda_j - x_{ij_0}h \leq 0, \quad i = 1, \ldots, m,$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j \geq y_{rj_0}, \quad r = 1, \ldots, s, \tag{5}$$

$$\lambda_j \geq 0, \quad j = 1, \ldots, n,$$

where j_0 is the DMU to be assessed. Now assume that the kth-output is in the form of a ratio, where $1 \leq k \leq s$. Suppose that y_{kj} for unit j is calculated from the numerator and denominator of n_{kj} and d_{kj}, respectively, i.e. $y_{kj} = \dfrac{n_{kj}}{d_{kj}}, \quad (j = 1, \ldots, n)$.

We can conclude that DEA Model 1 can not be used since one of the outputs is in form of ratio. For that reason, we suggest next solution for this problem:

Solution 1: Both the numerator and denominators of any output-ratio variables place them accordingly as additional outputs and inputs into the model. This means Model 1 should be rewritten as follows:

Model 2. Input oriented DEA - CRS model (numerator and denominators of the output ratio variables as presented separated output and input variables)

$$\min \quad h$$

$$s.t. \quad \sum_{j=1}^{n} x_{ij}\lambda_j - x_{ij_0}h \leq 0 \quad i = 1, \ldots, m,$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j \geq y_{rj_o}, \quad r = 1, \ldots, s, r \neq k,$$

$$\sum_{j=1}^{n} n_{kj}\lambda_j \geq n_{kj_0}, \quad r = k, \tag{6}$$

$$\sum_{j=1}^{n} d_{kj}\lambda_j - d_{kj_0}h \leq 0,$$

$$\lambda_j \geq 0, \quad j = 1, \ldots, n.$$

In the next section of our paper we point to the results of our analysis. These results are explained in the tables 3, 4 and 5.

4 Research results

For the efficiency calculation we used the DEA Solver Pro 13 program. In addition to determining the ranking of countries in terms of efficiency, we can also determine how the input variables should be changed in case to reach the efficiency frontier. The aim of our paper is to point out the

differences in the results, that are affected by using the variables expressed as ratio, as reported by Emrouznejad and Amin (2009); Olesen and Petersen (2009); Cook et al. (2014); Olesen et al. (2015). In our analysis we use the ratio as output. The following table shows the variables what we use in the analysis. Table 6, in the Appendix, presents our dataset. We analyze the data, obtained from OECD database, for 26 OECD countries in 2015. In the case of missing data in 2015, we included the data that was closest to the given year, which, of course, can lead to a bias in the results.

Table 2 Definitions of variables

Variable	Definition
Inputs	
Physicians	Physicians per 1000 population
Beds	Beds per 1000 population
Output	
Infant survival rate (ISR)	Infant survival rate is calculated as difference between 1000 and infant mortality rate. Infant mortality rate (IMR) is the number of deaths of children under one year of age expressed per 1000 live births.

Source: prepared by authors

We must emphasize, that the impact on infant survival rate or infant mortality rate respectively, have not only mentioned inputs: physicians and beds per 1000 population, but also the other healthcare indicators. If we want to estimate the impact and efficiency, it is important to modify the model. In our model we use two inputs: physicians and beds and one output: infant survival rate. The definitions of inputs and output we present in the Table 2.

ISR is calculated as:

$$ISR = 1 - IMR = 1 - \frac{Infant\ deaths, total}{Births, total} = \frac{Births - Infant\ deaths}{Births} = \frac{Survivals}{Births} = \frac{Survivals\ per\ 1000\ population}{Births\ per\ 1000\ population} \quad (7)$$

According to Olesen and Petersen (2009) and Cook et al. (2014) we consider the size of the country and for that reason, all individual indicators were converted per 1000 population.

Table 3 presents the efficiency scores and calculations of the projections with using ratio as output in the traditional DEA model. Sweden and Turkey reached the highest level of efficiency from all 26 OECD countries. The average efficiency score is 0,6934. 18 countries reached the lower efficiency score than the average score. Interestingly, Germany and Austria were in the last places. The columns Diff. (%) represent the approximate value, how countries should reduce the inputs to reach the similar level of output.

Table 3 DEA CCR model with ratio as output and projections

DMU	Score	Rank	Beds	Proj.	Diff.(%)	Physicians	Proj.	Diff.(%)	ISR	Proj.
Austria	**0,358**	26	7,55	**2,702933**	*-64,2*	5,1	**1,825822**	*-64,2*	0,997061	0,997061
Belgium	**0,60422**	16	6,18	**2,701823**	*-56,281*	3,02	**1,824739**	*-39,578*	0,996639	0,996639
Czech Republic	**0,49495**	24	6,49	**2,704229**	*-58,332*	3,69	**1,826364**	*-50,505*	0,997526	0,997526
Denmark	**0,98837**	5	2,53	**2,500577**	*-1,163*	3,66	**3,617436**	*-1,163*	0,996358	0,996358
Estonia	**0,54438**	22	4,96	**2,700143**	*-45,562*	3,42	**1,861792**	*-45,562*	0,997483	0,997483
Finland	**0,61786**	15	4,35	**2,687691**	*-38,214*	3,21	**1,98333**	*-38,214*	0,997873	0,997873
France	**0,54649**	21	6,13	**2,702613**	*-55,912*	3,34	**1,825272**	*-45,351*	0,99693	0,99693
Germany	**0,44085**	25	8,13	**2,702364**	*-66,761*	4,14	**1,825104**	*-55,915*	0,996838	0,996838
Greece	**0,58633**	18	4,25	**2,49191**	*-41,367*	6,32	**3,705617**	*-41,367*	0,996766	0,996766
Hungary	**0,58801**	17	6,99	**2,69899**	*-61,388*	3,1	**1,822825**	*-41,199*	0,995593	0,995593
Iceland	**0,82375**	7	3,11	**2,561858**	*-17,625*	3,78	**3,11377**	*-17,625*	0,998062	0,998062
Ireland	**0,99455**	3	2,6	**2,585833**	*-0,545*	2,88	**2,864307**	*-0,545*	0,996719	0,996719
Italy	**0,80097**	8	3,2	**2,56309**	*-19,903*	3,84	**3,075708**	*-19,903*	0,997025	0,997025
Latvia	**0,56989**	20	5,69	**2,700205**	*-52,545*	3,2	**1,823646**	*-43,011*	0,996042	0,996042
Luxembourg	**0,62784**	14	4,82	**2,705172**	*-43,876*	2,91	**1,827001**	*-37,216*	0,997874	0,997874
Netherlands	**0,63608**	13	4,18	**2,65881**	*-36,392*	3,47	**2,207194**	*-36,392*	0,996552	0,996552
Norway	**0,68415**	11	3,76	**2,57239**	*-31,585*	4,4	**3,010243**	*-31,585*	0,997705	0,997705
Poland	**0,7825**	9	6,63	**2,699565**	*-59,283*	2,33	**1,823214**	*-21,75*	0,995806	0,995806
Portugal	**0,74253**	10	3,4	**2,524607**	*-25,747*	4,61	**3,42307**	*-25,747*	0,997146	0,997146
Slovak Republic	**0,52797**	23	5,75	**2,69704**	*-53,095*	3,45	**1,821508**	*-47,203*	0,994874	0,994874
Slovenia	**0,64567**	12	4,51	**2,705551**	*-40,01*	2,83	**1,827256**	*-35,433*	0,998014	0,998014
Spain	**0,85252**	6	2,98	**2,540498**	*-14,748*	3,85	**3,282187**	*-14,748*	0,997194	0,997194
Sweden	**1**	1	2,44	**2,44**	*0*	4,19	**4,19**	*0*	0,997536	0,997536
Switzerland	**0,57534**	19	4,58	**2,635063**	*-42,466*	4,2	**2,416433**	*-42,466*	0,99643	0,99643
Turkey	**1**	1	2,68	**2,68**	*0*	1,81	**1,81**	*0*	0,988589	0,988589
United Kingdom	**0,99402**	4	2,61	**2,594396**	*-0,598*	2,79	**2,77332**	*-0,598*	0,996167	0,996167
Average	**0,6934**	13,4615	4,6346	**2,633**	*-35,6768*	3,5977	**2,4387**	*-30,6645*	0,9966	0,9966

Source: prepared by authors

Emrouznejad and Amin (2009) point to the problems of using ratio variables as output. The Table 4 shows the efficiency scores and projections in modified DEA model, when the denominator of output-ratio is linked to the inputs. ISR is a ratio indicator. The numerator represents "Survivals", calculated as a difference between "Births" and "Infant deaths" (children deaths below 1 year) per year, and the denominator represents the "Births" in the country. Than we convert indicator per 1000 population. Consequently, we proceed to the calculation of the efficiency as shown in Model 2.

Table 4 Modified DEA CCR model and projections

DMU	Score	Rank	Beds	Proj.	Diff.(%)	Phys.	Proj.	Diff.(%)	Births	Proj.	Diff.(%)	Survivals
Austria	**0,999**	14	7,55	**2,432983**	*-67,775*	5,1	**2,957131**	*-42,017*	9,774047	**9,764239**	*-0,1*	9,745321
Belgium	**0,99867**	19	6,18	**2,525182**	*-59,139*	3,02	**3,015998**	*-0,133*	10,84547	**10,8311**	*-0,133*	10,80902
Czech Republic	**0,99946**	9	6,49	**2,615627**	*-59,698*	3,69	**3,179122**	*-13,845*	10,50288	**10,49724**	*-0,054*	10,4769
Denmark	**0,99832**	23	2,53	**2,525748**	*-0,168*	3,66	**3,125284**	*-14,61*	10,24108	**10,22387**	*-0,168*	10,20378
Estonia	**0,99942**	10	4,96	**2,632824**	*-46,919*	3,42	**3,200025**	*-6,432*	10,57239	**10,56626**	*-0,058*	10,54579
Finland	**0,99981**	7	4,35	**2,52202**	*-42,023*	3,21	**3,06535**	*-4,506*	10,12349	**10,12157**	*-0,019*	10,10196
France	**0,99897**	15	6,13	**2,793978**	*-54,421*	3,34	**3,336556**	*-0,103*	12,00273	**11,99036**	*-0,103*	11,96589
Germany	**0,99877**	17	8,13	**2,247103**	*-72,36*	4,14	**2,731206**	*-34,029*	9,029326	**9,01825**	*-0,123*	9,000777
Greece	**0,9987**	18	4,25	**2,112217**	*-50,301*	6,32	**2,567261**	*-59,379*	8,487939	**8,476917**	*-0,13*	8,460493
Hungary	**0,99753**	25	6,99	**2,326596**	*-66,715*	3,1	**2,827824**	*-8,78*	9,360433	**9,337276**	*-0,247*	9,319185
Iceland	**1**	1	3,11	**3,11**	*0*	3,78	**3,78**	*0*	12,4813	**12,4813**	*0*	12,45711
Ireland	**1**	1	2,6	**2,6**	*0*	2,88	**2,88**	*0*	14,10422	**14,10422**	*0*	14,05794
Italy	**0,99896**	16	3,2	**1,991046**	*-37,78*	3,84	**2,419986**	*-36,98*	7,998935	**7,990624**	*-0,104*	7,975142
Latvia	**0,99801**	24	5,69	**2,655014**	*-53,339*	3,2	**3,193638**	*-0,199*	11,11439	**11,09229**	*-0,199*	11,07039
Luxembourg	**1**	1	4,82	**2,450734**	*-49,155*	2,91	**2,91**	*0*	10,73553	**10,73553**	*0*	10,71271
Netherlands	**0,99849**	20	4,18	**2,50427**	*-40,089*	3,47	**3,043775**	*-12,283*	10,06557	**10,05033**	*-0,151*	10,03086
Norway	**0,99964**	8	3,76	**2,822576**	*-24,931*	4,4	**3,430656**	*-22,031*	11,33185	**11,32779**	*-0,036*	11,30584

DMU	Score	Rank	Beds	Proj.	Diff.(%)	Phys.	Proj.	Diff.(%)	Births	Proj.	Diff.(%)	Survivals
Poland	**0,99847**	21	6,63	**2,01568**	*-69,598*	2,33	**2,326435**	*-0,153*	9,722108	**9,707231**	*-0,153*	9,68133
Portugal	**0,99908**	12	3,4	**2,054891**	*-39,562*	4,61	**2,497585**	*-45,822*	8,254429	**8,246851**	*-0,092*	8,230872
Slovak Republic	**0,99681**	26	5,75	**2,546231**	*-55,718*	3,45	**3,094776**	*-10,296*	10,25148	**10,21874**	*-0,319*	10,19894
Slovenia	**1**	1	4,51	**2,361407**	*-47,641*	2,83	**2,83**	*0*	10,00276	**10,00276**	*0*	9,982889
Spain	**0,99913**	11	2,98	**2,242902**	*-24,735*	3,85	**2,726099**	*-29,192*	9,009226	**9,001389**	*-0,087*	8,983949
Sweden	**1**	1	2,44	**2,44**	*0*	4,19	**4,19**	*0*	11,7224	**11,7224**	*0*	11,69352
Switzerland	**0,99836**	22	4,58	**2,599837**	*-43,235*	4,2	**3,15993**	*-24,764*	10,45096	**10,43387**	*-0,164*	10,41365
Turkey	**1**	1	2,68	**2,68**	*0*	1,81	**1,81**	*0*	16,93827	**16,93827**	*0*	16,74498
United Kingdom	**0,99902**	13	2,61	**2,429237**	*-6,926*	2,79	**2,787276**	*-0,098*	11,92629	**11,91465**	*-0,098*	11,88059
Average	**0,999**	12,92	4,63	**2,4707**	*-38,9318*	3,5977	**2,9648**	*-14,064*	10,6558	**10,646**	*-0,0976*	10,6173

Source: prepared by authors

We included on the input side the denominator – "Births" from output-ratio in our modified DEA model. We can see from the results that the efficiency scores almost changed in all countries. The average efficiency score is 0,999. Except Sweden and Turkey, the efficiency countries are Iceland, Ireland, Luxembourg and Slovenia. As we have already mentioned, the results are relative because, on the one hand, the ISR can be affected by other variables and on the other hand also by increasing the number of inputs for the reason, that the denominator of output-ratio is linked to the inputs. More interesting than the efficiency score of modified DEA model is the rapid change in the ranking of several countries, which we present in the Table 5.

Table 5 Difference in Rank between countries

DMU	Ratio		No ratio		Difference in Rank
	Score	Rank	Score	Rank	
Austria	*0,358*	**26**	*0,999*	**14**	**12**
Belgium	*0,60422*	**16**	*0,99867*	**19**	**-3**
Czech Republic	*0,49495*	**24**	*0,99946*	**9**	**15**
Denmark	*0,98837*	**5**	*0,99832*	**23**	**-18**
Estonia	*0,54438*	**22**	*0,99942*	**10**	**12**
Finland	*0,61786*	**15**	*0,99981*	**7**	**8**
France	*0,54649*	**21**	*0,99897*	**15**	**6**
Germany	*0,44085*	**25**	*0,99877*	**17**	**8**
Greece	*0,58633*	**18**	*0,9987*	**18**	**0**
Hungary	*0,58801*	**17**	*0,99753*	**25**	**-8**
Iceland	*0,82375*	**7**	*1*	**1**	**6**
Ireland	*0,99455*	**3**	*1*	**1**	**2**
Italy	*0,80097*	**8**	*0,99896*	**16**	**-8**
Latvia	*0,56989*	**20**	*0,99801*	**24**	**-4**
Luxembourg	*0,62784*	**14**	*1*	**1**	**13**
Netherlands	*0,63608*	**13**	*0,99849*	**20**	**-7**
Norway	*0,68415*	**11**	*0,99964*	**8**	**3**
Poland	*0,7825*	**9**	*0,99847*	**21**	**-12**
Portugal	*0,74253*	**10**	*0,99908*	**12**	**-2**
Slovak Republic	*0,52797*	**23**	*0,99681*	**26**	**-3**
Slovenia	*0,64567*	**12**	*1*	**1**	**11**
Spain	*0,85252*	**6**	*0,99913*	**11**	**-5**
Sweden	*1*	**1**	*1*	**1**	**0**
Switzerland	*0,57534*	**19**	*0,99836*	**22**	**-3**
Turkey	*1*	**1**	*1*	**1**	**0**
United Kingdom	*0,99402*	**4**	*0,99902*	**13**	**-9**
Average	*0,6934*		*0,999*		

Source: prepared by authors

In the traditional DEA model were Germany and Austria in the last places. After applying Model 2, the position of these countries changed, Germany by 8 and Austria by 12 positions up. The most

significant change was in the Czech Republic, from the 24th place to the 9th place. Luxembourg was the 14th in the first case with efficiency score at 0,62784, and in the second case the efficiency score was 1. Thus, we can confirm that the use of output-ratios leads to biased results. Thus, it is better to split output-ratio and modify the model according to Emrouznejad and Amin (2009).

5 Conclusion

The aim of our paper was to analyze the efficiency cores using ratio variables in traditional DEA models. As we mentioned, in the literature we can find several authors who point to the problems of using ratio variables in traditional DEA models (Emrouznejad and Amin, 2009; Olesen and Petersen, 2009; Cook et al., 2014; Olesen et al., 2015). We use traditional DEA model with constant returns to scale. We analyze the efficiency scores in the healthcare sector between 26 OECD countries in 2015. We must emphasize, that the impact on infant survival rate or infant mortality rate respectively, have not only mentioned inputs: physicians and beds per 1000 population. There are several health indicators that we have not taken into account. Therefore, it can lead to biased results. However, the aim is to point to the differences in the results, using the ratio as output on the one hand, and the splitting of output-ratio on numerator and denominator on the other hand. The results show that the efficiency score by using modified DEA model has increased significantly. More interesting than the efficiency score of modified DEA model is the rapid change in the ranking of several countries. In the traditional DEA model were Germany and Austria in the last places. After applying Model 2, the position of these countries changed, Germany by 8 and Austria by 12 positions up. The results of modified DEA model are even closer to the fact that healthcare in these countries is socially considered at high level. Particularly in the healthcare sector there are many indicators expressed as a ratio; therefore, in the case of measuring the efficiency between countries, it is necessary to use new approaches that point to modify the input and output variables, expressed as a ratio.

Acknowledgements

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Appendix

Table 6 All variables

	Beds	Physicians	Population	Infant deaths	Births	IMR	ISR	Infant deaths	Births	Survivals
	per 1000 population	per 1000 population	Total number	Total number	Total number			per 1000 population	per 1000 population	per 1000 population
Austria	7,55	5,1	8633169	248	84381	0,003	0,997	0,029	9,774	9,745
Belgium	6,18	3,02	11274196	411	122274	0,003	0,997	0,036	10,845	10,809
Czech Republic	6,49	3,69	10546059	274	110764	0,002	0,998	0,026	10,503	10,477
Denmark	2,53	3,66	5683483	212	58205	0,004	0,996	0,037	10,241	10,204
Estonia	4,96	3,42	1315407	35	13907	0,003	0,997	0,027	10,572	10,546
Finland	4,35	3,21	5479531	118	55472	0,002	0,998	0,022	10,123	10,102
France	6,13	3,34	66624068	2455	799671	0,003	0,997	0,037	12,003	11,966
Germany	8,13	4,14	81686611	2332	737575	0,003	0,997	0,029	9,029	9,001
Greece	4,25	6,32	10820883	297	91847	0,003	0,997	0,027	8,488	8,460
Hungary	6,99	3,1	9843028	406	92135	0,004	0,996	0,041	9,360	9,319
Iceland	3,11	3,78	330815	8	4129	0,002	0,998	0,024	12,481	12,457
Ireland	2,6	2,88	4646554	215	65536	0,003	0,997	0,046	14,104	14,058
Italy	3,2	3,84	60730582	1445	485780	0,003	0,997	0,024	7,999	7,975
Latvia	5,69	3,2	1977527	87	21979	0,004	0,996	0,044	11,114	11,070
Luxembourg	4,82	2,91	569604	13	6115	0,002	0,998	0,023	10,736	10,713
Netherlands	4,18	3,47	16939923	588	170510	0,003	0,997	0,035	10,066	10,031
Norway	3,76	4,4	5190239	135	58815	0,002	0,998	0,026	11,332	11,306
Poland	6,63	2,33	37986412	1549	369308	0,004	0,996	0,041	9,722	9,681
Portugal	3,4	4,61	10358076	244	85500	0,003	0,997	0,024	8,254	8,231
Slovak Republic	5,75	3,45	5423801	285	55602	0,005	0,995	0,053	10,251	10,199
Slovenia	4,51	2,83	2063531	41	20641	0,002	0,998	0,020	10,003	9,983
Spain	2,98	3,85	46444832	1174	418432	0,003	0,997	0,025	9,009	8,984
Sweden	2,44	4,19	9799186	283	114870	0,002	0,998	0,029	11,722	11,694
Switzerland	4,58	4,2	8282396	309	86559	0,004	0,996	0,037	10,451	10,414
Turkey	2,68	1,81	78271472	15129	1325783	0,011	0,989	0,193	16,938	16,745
United Kingdom	2,61	2,79	65128861	2977	776746	0,004	0,996	0,046	11,926	11,881

Source: prepared by authors based on data from OECD database

Influence of capital market on the EU employment and GDP

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Abstract

In this article, we analyze the size of the European capital market and its attributes. The aim of the article is to analyze the impact of the capital market in the European Union and the Euro Area on macroeconomic variables such as employment and gross domestic product (GDP) growth. After the global crisis in 2008, the global economy was in a recession. National governments have taken measures to recover the national economy. The European Union, through its institutions as the European central bank, the European Commission and others, has come up with various measures such as interest rate cuts to support investment, consumption and ultimately, economic growth. Other measures include support programs for employment, euro-funds and the effort to support small and medium-sized enterprises in the market. In 2015, the European Commission decided to support the European Union's capital market, following the pattern of the United States, in order to trigger economic growth and increase employment, as this model works in the United States (US). It is doubtful whether a similar model will work in the European Union and therefore our study deals with the actual impact of the capital market on macroeconomic variables, namely GDP and employment. By examining the underlying factors, we can identify the weak and strong points of the capital market in the European Union and propose measures that could support the capital market to point out shortcomings and negative factors.

Keywords: European Union, European Monetary Union, Capital market, Stock markets, Employment, GDP.

JEL Classification: G15, O16, E44

1 Introduction

For proper functioning of the economy, healthy economic growth and development, it is important for the financial market and the financial system to work effectively. The capital market is part of the financial market and it significantly influences the size of the country's real economy. The capital market also has an important role in creating stable conditions in the economy, reducing uncertainty or contributing to a more transparent allocation of public finances. In this paper, we will focus on analyzing the European capital market in relation to macroeconomic indicators. In particular, we will analyze the impact on the size of economic growth and employment.

The European market differs in many distinct aspects from the American market. The portfolio of European investors and households is made up of investments in banking institutions, which is a difference in structure compared to the portfolio of US investors, which consists mainly of investments in shares, mutual funds or pension funds. In addition, the financial market within the European union (EU) member states is not uniform, it is made up of sub-national financial markets. Although, as reported by the European central bank (ECB) report (2017), for the past year 2016, the development of European financial market integration has shifted forward. The European Commission (EC) and the ECB, with the

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directives and measures adopted to regulate financial markets, are seeking to harmonize individual sub-markets and create a single, competitive market for the EU as a whole. Problems in financial market integration and the establishment of a common European market in 2017 caused the United Kingdom with exit from the EU, increasing uncertainty in EU countries and slowing integration processes.

This paper is divided into three parts: in the first part we have defined a brief introduction to the problem; the second part provides an overview of the literature and the methodological approach; the final part summarizes the main results. The main purpose of the contribution is to assess the impact of the capital market on core macroeconomic indicators within the EU and European monetary union (EMU) Member States on the basis of the data obtained from the World Bank.

2 Literature

The process of creating a single capital market began to emerge as soon as the Treaty of Rome was signed. However, the vision of a common Single Market has not yet been fulfilled. An important role was the creation of monetary and banking union, as the banking system ensures a stabilizing role in the integration process. The need to create a common financial system as well as to strengthen integration processes was strengthened, especially after the financial crisis in 2008, in order to ensure a higher level of financial stability within the EU. ECB (2017), Romero de Ávila, D. (2003)

The Banking Union and the creation of individual degrees of banking supervision have contributed significantly to the foundations of the single market, but in the integration process, it will be necessary to continue to create a fiscal union and a capital union. As the ECB report (2017) states, a stronger bank union is more resilient to external negative shocks and financial instability.

The theoretical dimension of capital market issues is geared to investigating the correlation between financial market indicators and macroeconomic indicators. The first ideas appeared in the early 20th century, when Schumpeter (1911) came up with the theory of investment and investment surpluses in the financial market that stimulate economic growth. At present, authors such as Zhou (2011); Coskun et al. (2017) focus on various analyzes of capital market impact on economic growth or performance. In general, we can meet five basic models in the literature to assess the relationship between the capital market and economic growth, namely the Keynes model, the neoclassical model, the McKinnon model, the IS-LM model, and the endogenous growth model. Pan & Mishra (2018), using the endogenous growth model and based on data from the Chinese financial market, notes that it is very difficult to identify factors that stimulate economic development only on the basis of one indicator such as the capital market. Studies have found strong positive dependence and the significant impact of the capital market on economic growth, Seven & Yetkiner (2016), Boubakari & Jin (2010) and Beck & Levine (2004). The aforementioned authors examined the impact of the capital market on the real economy in relation to other factors such as bank developments in the country, political factors, accumulation of capital, or market liquidity. Ologunwa & Sadibo (2016) addresses the diversification of risk and the development of integration processes in the financial markets.

On the other hand, in literature we may, although to a lesser extent, encounter negative opinions about correlating the effect of the capital market on the economy. The reasons for this skepticism lie largely in the lack of market information or the unwillingness of investors

to invest their capital in new shares. These economists argue that we do not know exactly where there is a direct link between the capital market and the real economy, as there are not many known facts, Pan & Mishra (2018).

Empirical exploration of capital markets typically uses causal relationships, regression models, impulse-response functions, or autoregressive VAR models. In these models, the authors analyze the relationship between monthly or quarterly data from developed countries (especially US market indicators) or examine developments in financial markets in emerging markets (such as the Chinese, Indian, Turkish and Latin American markets).

3 Methodology and data

To investigate the dependence of GDP growth and employment on the capital market we used data from the World Bank database. Data are available from year 1975 to 2016. As the European Union dates back to 1993, data before that year are applied to countries that were part of the European Community that later transformed into the European Union. All data available and related to the capital market in Europe are input into the model. In particular, it is Market capitalization (% of GDP), Stocks traded total value (% to GDP) and Stock traded turnover ratio (% to GDP). The World Bank and the European Statistical Office do not provide additional data that would be representative of the entire European Union or the Euro Area. We used a linear regression model that has the formula:

$$GDP_{it} = \alpha_i + X_{it}\beta + u_{it} \tag{1}$$

$$UNEM_{it} = \alpha_i + X_{it}\beta + u_{it} \tag{2}$$

For t=1,…T and i=1,…N, where GDP_{it} is a dependent variable, used as a representative figure for the economic growth. $UNEM_{it}$ is a dependent variable in our second model. X_{it} is the time variant matrix of explanatory variables – characteristics of capital market in our case, α_i is the unobserved time-invariant individual effect and u_{it} is the error term.

3.1 Models for European Union

In this article, we will address the dependency of GDP growth, respectively employment against the selected variables in the European Union and the Euro Area. For the purposes of the article, we choose these two groups to know the differences and, on the basis of the results, came up with recommendations. The following table below (Table 1) describes estimated coefficients for our GDP model and their value of significance.

Table 1 Estimated coefficients from EU GDP growth model

Coefficients	Estimate	p-value
Const	2,11383	0,0339**
Stocks traded total value	-0,00692482	0,8415
Stocks traded turnover ratio	-0,0122242	0,4834
Market capitalization	0,0209380	0,4236

Source: Own elaboration

As we can see (Figure 1), for the GDP growth model in the European Union, depending on the selected coefficients, the model is not statistically significant. After removing the statistically not significant variables, the model has not gained in significance and we can

confirm from the results that none of the coefficients has any impact on GDP growth in the European Union.
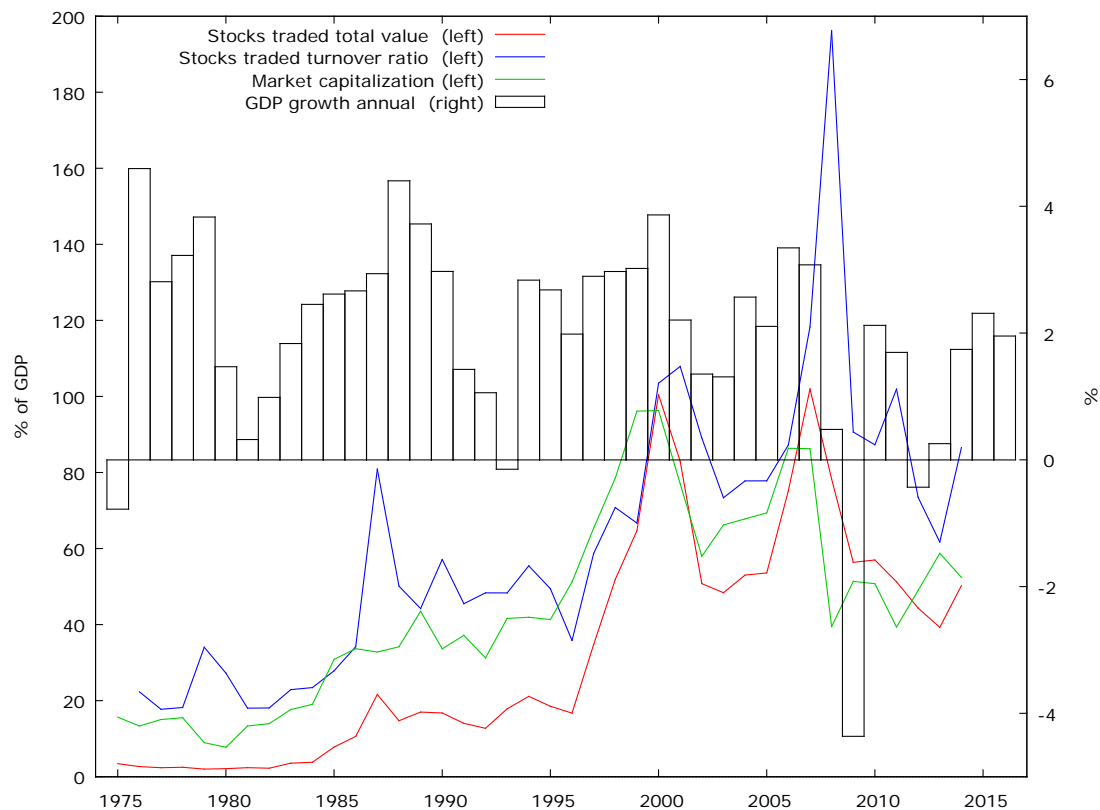
Figure 1 GDP model of European Union
Source: Own elaboration

The second part of our first model is the applied linear regression of equal variables on employment in the European Union, expressed as percentage of the total population employed. Employment data have only been available since 1985.

Table 2 Estimated coefficients from EU Employment model

Coefficients	Estimate	p-value
Const	50,8364	$1,15\ e^{-38}$ ***
Stocks traded total value	0,0426633	$1,75\ e^{-5}$ ***
Market capitalization	-0,0245780	0,0351 **

Note: ***, **, * denote significance levels on 1, 5 and 10 per cent respectively. R-Squared is 0.5782. According to Breusch-Pagan test, there is not heteroscedasticity presented in the model, LM = 3.54806. Residuals are normally distributed, Chi-square=3.2542.
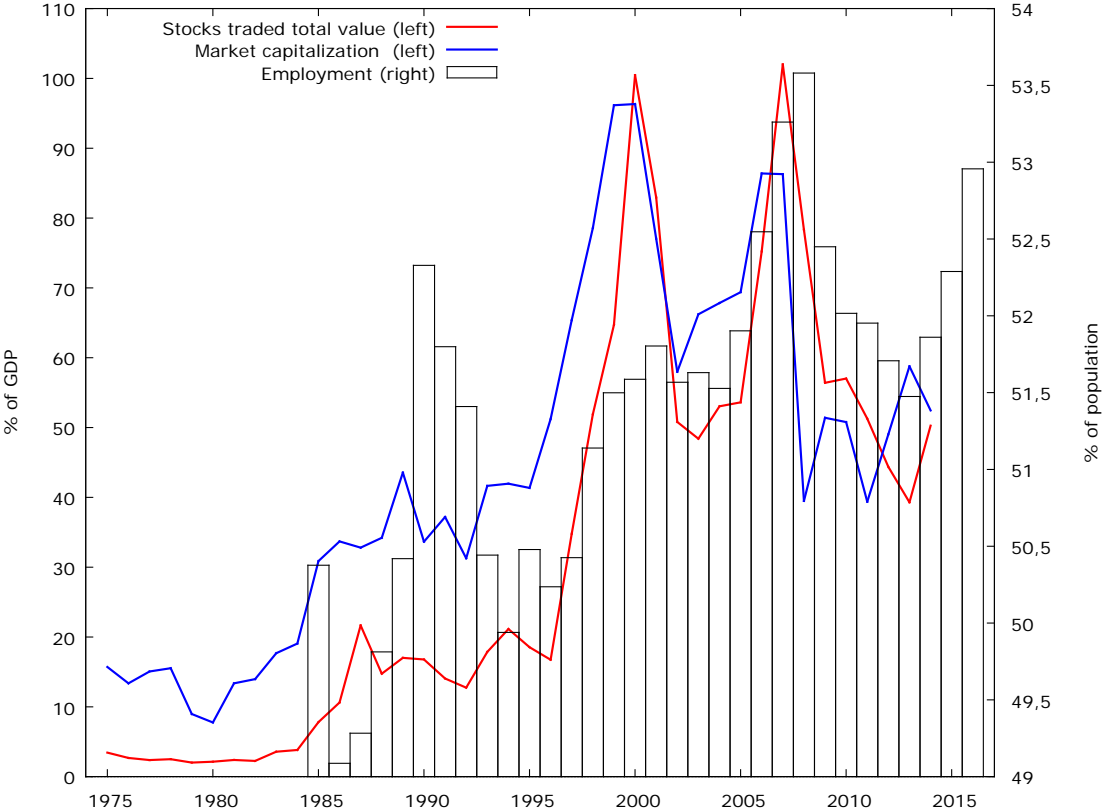
Source: Own elaboration

The resulting model is statistically significant after removing one variable. Based on the data from Table 2, we can say that stocks traded total value affect employment in the European Union in a positive way. On the other hand, market capitalization has a negative impact on employment. This result is in contradiction with our previous article about the US capital market where we have confirmed that these variables affect employment (also GDP), but in the opposite way. This means that market capitalization has a positive and stock traded total value a negative impact on US employment. Also, this conclusion proved some studies (such as Coskun et al. (2017), or Kaserer et al. (2014), Pan & Mishra (2018)), which concluded that

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the stronger capital market, the higher GDP in the economy and therefore the lower unemployment rate. The similar results are stated in study Choi & Lounani (2015) where authors analyzed unemployment rate and economic shocks. Also, our findings about an impact of employment on economic activity can be partly comparable to Belke & Fehn (2000) who dealt with structural unemployment and capital market imperfections in EU countries, and argue that highly developed capital markets should help to alleviate financial difficulties in the economy and support the labour market.

It is clear from our results that the parameters and current state of the capital market in the EU do not correspond to the US. On the one hand, this does not mean anything wrong and does not pose a problem in the EU economy. On the other hand, when looking at economic growth, employment and the recovery of the US economy after the crisis years, it is necessary to reflect on whether it is appropriate to change the market conditions in favor of increasing market capitalization, to encourage firms to gain access to the financial market.

Figure 2 shows a correlation between selected indicators in European Union. We can see a positive influence of stock traded total value and market capitalisation on the level of GDP.

Figure 2 Employment model of European Union
Source: Own elaboration

3.2 Models of Euro Area

When testing the significance of the Euro Area model, we used data from 1999 (despite the fact that database contains data from 1975), as the Euro Area was formed this year. The rationale for calculations and data processing was not substantiated before 1999, so we decided to ignore older data because of the relevance of the data.

Table 3 Estimated coefficients from EA GDP growth model

Coefficients	Estimate	p-value
Const	-4,57018	0,5084
Stocks traded total value	0,0710402	0,5941
Stocks traded turnover ratio	0,0150505	0,8901
Market capitalization	0,00696837	0,8933

Source: Own colaboration

From our second model that we applied on the Euro Area, we see the same results as the EU model. As it is clear from Table 3, no coefficient is statistically significant and the model as a whole is also statistically insignificant. However, after removing statistically not insignificant variables, the model remained insignificant. The gradual elimination of the variables left us in the resulting model that contains only market capitalization, which was statistically significant (Table 4). By performing statistical tests, we have found that residues do not come from normal distribution. The model also describes only minimal data variability. We can say that these variables do not have an impact on GDP growth in the Euro Area. As mentioned above, our US capital market research shows that market capitalization and capital market profitability have a positive impact on GDP growth. We do not see such a trend in the Euro Area, there is not even a direct relationship between the capital market and GDP growth.

Table 4 Estimated coefficients from EA GDP growth model

Coefficients	Estimate	p-value
Const	-3,52722	0,0680 *
Market capitalization	0,0812043	0,0133 **

Note: ***, **, * denote significance levels on 1, 5 and 10 per cent respectively. R-Squared is 0,3262. According to Breusch-Pagan test, there is not heteroscedasticity presented in the model, LM = 3,2662. Residuals are nor normally distributed.

Source: Own elaboration

To show our results graphically, we constructed Figure 3 that described a relationship between GDP growth and coefficients of market capitalisation. It can be seen that there is no significantly important trend between selected coefficients if we suppose the Euro Area.

Through the same approach as employment model of the European Union, we tested the employment model in the Euro Area. The results show the dependence between employment and market capitalization and stocks traded total value. Similarly to the above models, the opposite relationship regarding to US model also applies here (Table 5).

Table 5 Estimated coefficients from EA Employment model

| Coefficients	Estimate	p-value
Const	51,8326	$3,67\ e^{-17}$ ***
Market capitalization	-0,0480691	0,0195 **
Stocks traded total value	0,0332545	0,0173 **

Note: ***, **, * denote significance levels on 1, 5 and 10 per cent respectively. R-Squared is 0,40. According to Breusch-Pagan test, there is not heteroscedasticity presented in the model, LM = 9,5622. Residuals are normally distributed, Chi-square=0,4451.

Source: Own elaboration
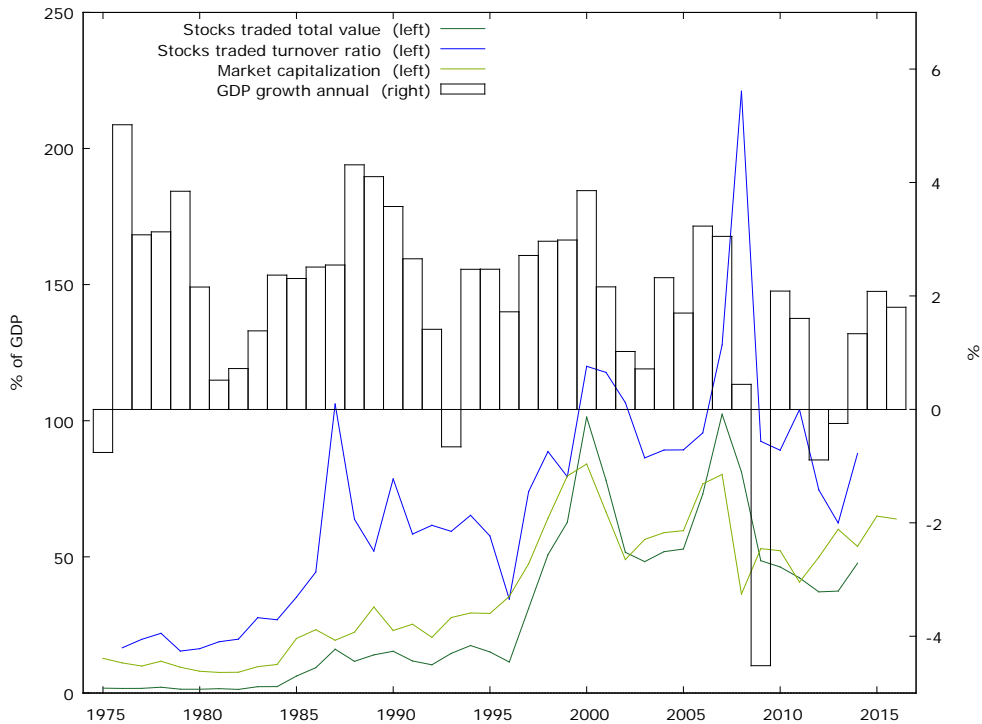
Figure 3 GDP model of Euro Area
Source: Own elaboration

The strength and development of capital market and its impact on employment is showed in Figure 4. We see that if the values of indicators of the capital market are higher, then there is a positive effect on employment, and on the opposite way, if capital market indicates lower values, then employment will decrease. This result can be seen especially in the period of 2005-2010.
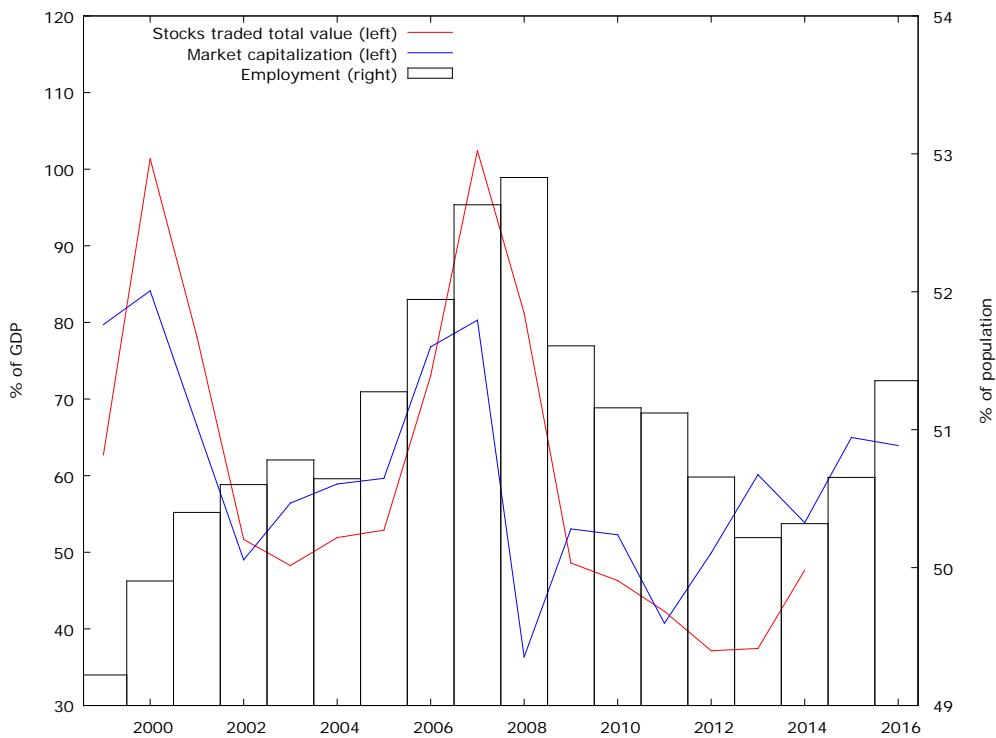
Figure 4 Employment model of Euro Area
Source: Own elaboration

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Conclusion

The article included a study on the capital market in the European Union or Euro Area. By regression analysis, we have selected capital market characteristics in relation to GDP growth and employment in the European Union and Euro Area. From the analysis results, we can come to a definite conclusion. With reference to our previous research, where we have proven the direct dependence of the capital market on GDP growth and unemployment (the bigger the capital market, the lower the unemployment) in the US, we are able to apply this article to real world. Based on the regression analysis, we found that selected characteristics of the European Union or Euro Area capital market have no direct impact on GDP growth and employment. Notwithstanding the European Commission's attempt to create a Capital Market Union, we cannot say with certainty whether the move will have a positive impact on the recovery and start-up of the economy. From the results, we can conclude that the capital market has no impact on GDP, which is not a good signal, as the capital market ultimately reflects the size of the economy as it is essentially real companies that form the values and make up a significant part of GDP. For this reason, it is necessary to continue to tackle the issue and find key elements that do not work in the European Union to try to strengthen the domestic capital market. On the other hand, taking into account employment, the factors influencing it are market capitalization and the total volume of trades on the capital market. It is for this reason that the market capitalization needs to be encouraged so that the volume of trades will be increased. The European Union's endeavor should be to facilitate the processes of capital market access for companies, to reduce the bureaucratic burden and to promote access to information about these possibilities. It is through these steps that the European Union can launch the capital market to achieve a competitive market with the US.

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European healthcare systems efficiency: DEA approach

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Abstract

The diversity of health systems affects total effectiveness of healthcare systems in countries across the world. The aim of this paper is to compare the efficiency of health systems in European countries and to analyze which countries should improve their performance. For the main purpose of this study, non-parametric DEA method was conducted. The dataset contains the indicators of 30 European countries during the period from 2011 to 2016. The results admit the differences in health efficiency over the Europe. The diversity between economic efficiency and health efficiency is known. Comparison of VRS efficiency and CRS efficiency shows diversity of efficiency and so the diversity in the case of benchmark analysis. Even the countries with the best economic reputation such as Germany, United Kingdom, Sweden are not known as the health efficient in all analyzed period. Majority of European countries are technically inefficient in healthcare.

Keywords: Efficiency, Health system, Data envelopment analysis, Healthy life expectancy, Infant mortality rate, Life expectancy

JEL Classification: H51, I10, I19, P36

1 Introduction

Health systems in European countries differ from each other. This difference is due to the diversity of the needs of the country's population as well as the historical development of the countries, different degrees of infrastructure development and development of social system, demographic structure, political organization of countries, economic specialization of the country, etc. Health systems differ in the form of funding and regulation, type of management and organization. Financial sustainability of healthcare is one of the major challenges of individual countries. Even though, healthcare spending should be one of the main factors influencing healthcare accessibility and quality of healthcare in individual countries, the assumption that higher spending should positively impact the health of the population is intuitive.

In general, efficiency is defined as the ability to maximize profit, minimize costs, that means the optimal use of available outputs for output. Inefficiency is defined using the minimum technically feasible total cost for each quantity and mix of total output and level of quality as a reference point (Zuckerman, Hadley, & Iezzoni, 1994). Estimation of the efficiency of health spending needs to take into account a wide range of relevant variables in the functioning of health systems to obtain unbiased and efficient estimates (Medeiros, Schwierz, European Commission, & Directorate-General for Economic and Financial Affairs, 2015). The measurement of the effectiveness of health systems is becoming a cardinal problem, especially due to its methodological difficulty, as well as problems related to variations related to its specificity. (Handler, Issel, & Turnock, 2001)

At present, the global aging process of inhabitants represents a serious social challenge that is related to those countries whose size or economic power is at low level. By gradually aging the population and decreasing the natural population growth, the overall population structure changes (Gavurova et al. 2017). Population grows, the proportion of the post-productive component increases, while the proportion of the pre-productive population is decreasing. Progress in medicine that allows to live longer and process of aging leads to a prolonged life expectancy. Significant demographic indicators of living conditions and mortality rates are life expectancy, mortality rates and birth rates. These are also the indicators of the social pillar of sustainable development. When estimating the efficiency of health systems economic, social and other indicator have to be taken in to account (Ashby, Guterman, & Greene, 2000; Mays et al., 2006).

Many methods are used to estimate the efficiency but not all of them offer the possibility to benchmark (Stefko et al. 2018). Data Envelopment Analysis (DEA) is a nonparametric method of measuring the efficiency of a decision-making unit (DMU) in both, public and private sector (Baek & Lee, 2009; Seiford & Thrall, 1990; P. Zhou, Ang, & Poh, 2008). This approach was implemented in accordance with the theoretical foundations of the authors (Asandului, Roman, & Fatulescu, 2014; Medeiros et al., 2015). The input–output combination selected by the country must fulfill the criterion of possibility to produce the output bundle selected from the associated input bundle. (Ray, 2004; Ray, Kumbhakar, & Dua, 2015). Comparing to single stage or two-stage DEA method, multi-stage DEA is recommended because it avoids the problems inherent in the two-stage method. (Peng Zhou, Poh, & Ang, 2016). While measuring technical efficiency, no random errors are assumed. DEA provides simultaneously both an efficiency score and benchmarking information. These two pieces of information are usually inseparable in DEA (Banker, Charnes, & Cooper, 1984; Charnes, Cooper, & Rhodes, 1978; López-Espín, Aparicio, Giménez, & Pastor, 2014). Benchmarking information gives DEA a distinct advantage over other efficiency methodologies (Baek & Lee, 2009).

2   Methodology and objective of study

There are three input variables and three output variables, number of countries analysed is 31 and so, the principal component analysis as the analysis for the aggregation of indicators isn´t needed. When correlation matrix composed, the correlation between life expectancy and healthy life expectancy was 0,88868 signifying strong correlation (Hudec, Sisáková, Tartaľová, & Želinský, 2007). To avoid the problem of correlation, two models were created:
- **Model 1** - involves two output variables, *life expectancy and infant mortality* and the input variables are *hospital beds, number of doctors* and *healthcare expenditure*.
- **Model 2** - contains output variables, *healthy life expectancy* and the *infant mortality*, the input variables are the same as in the previous model.

There are two types of frontier scale, that helps to estimate the efficiencies, CRS (constant returns to scale) and VRS (variable returns to scale). VRS includes both increasing and decreasing returns to scale and it is base on BCC model. Proportional change in CRS for input and output variables is presented, in VRS the proportional change is missing. Returns to scale in VRS could vary, in CRS it is constant and at the same time, it is commonly used and better in making interpretations (Benicio & Mello, 2015; Kao, Liu, Cheng, & Chou, 2012). Both, CRS and VRS are used to estimate the efficiency in this study. Since the objective of this study is to analyze the efficiency of healthcare systems over the Europe, DEA-method is applied, and comparison of CRS and VRS efficiency is calculated.

Data description

DMUs (decision making units) represent the 30 European countries for which a number of inputs and outputs are selected. For the purpose of study, analyzed countries are: Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Mata, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, United Kingdom, Iceland and Norway.

In modeling the technical efficiency of the healthcare system, we have chosen to analyze the output variables: life expectancy at birth, infant mortality rate and healthcare expenditure. The input variables are beds hospitals, number of doctors and the healthcare expenditure. The indicator hospital beds represents admitted patients to hospitals including the psychiatric hospitals per 100 000 inhabitants. Number of doctors stands for the doctors working in hospital including doctors working in psychiatric hospitals per 100 000 inhabitants. The last input used in the analysis represent the healthcare expenditure as a percentage of DP.

The descriptive statistics of dataset (Appendix:Table 3 Description statistics - indicators of all countries) show that for the differences in the characteristics (mean, median, maximum, minimum, standard deviation) in individual years, it is not possible to confirm or even to reverse the common increasing / decreasing trend. Whereas in the case of the average healthy life expectancy, which was 71.95 years old in 2011, and at the level of 73.67 years in the year of 2016, the average child mortality rate declined on the contrary - in 2011 it was at level 3.99% and in the year 2016 it was 3.57%. It can be said that these data also confirmed the prolongation of life with the associated aging of the population and at the same time the improvement of conditions in the health care and overall care that affects mortality in children. On the contrary, in the case of the number of hospital beds per 100,000 inhabitants, the total decrease from 942.93 (in 2011) to 933.8 (in 2016). At the same time, however, we are seeing the growing average number of doctors per 100,000 inhabitants from 11.85 to 14.07. Mean value of healthcare expenditure (% of GDP) also declined, while in 2011 it was at 6.4 in 2016 it was at 6.27.

3 Results

As shown in Table 1, in model 1, not all of the CRS efficiencies are equal to the VRS efficiencies. In 2011, eight countries, Estonia, France, Spain, Croatia, Cyprus, Portugal, Sweden, United Kingdom and Iceland were efficient in both, CRS and VRS, but as it can be seen, there are some soft differences between the CRS and VRS efficiency. The bigger difference of 11 % was in the case of Lithuania. In 2012, according to VRS, the highest efficiency was estimated in case of Bulgaria, Spain, Cyprus, Latvia, Luxembourg, Malta, Slovenia, Iceland, Sweden, Norway but only seven of these countries have the same efficiency following CRS. There were only four countries that were efficient in 2015 and 2016, Cyprus, Austria, Iceland, Norway.

There are some differences between estimated technical efficiencies of first model when comparing individual years. In 2011, the CRS efficiency of Belgium was 0,77, in 2012 the technical efficiency decreased to 0,61 but in 2013 the efficiency again increased. In 2016 the efficiency was close to the absolutely efficiency at 0,94 point. Contrary to Belgium, in Bulgaria the highest efficiency of HS was during period 2012 – 2014.

The progress between first and last analyzed year is positive in case of Belgium (21.32%), Denmark (98.41%), Germany (6.6%), Greece (20.34%), Lithuania (28.28%), Hungary (1.63%),

Malta (59.48%), Netherlands (11.56%), Austria (367.29%), Poland (1.20%) and Norway (15.47%). In VRS, the percentage increase between first and last year are similar: Belgium (16.94), Denmark (89.04%), Germany (4.44%), Ireland (49.93%), Greece (18.06%), Latvia (1.45%), Lithuania (20.20%), Malta (96.08%), Netherlands (38.59%), Austria (344.44%) and Norway (12.99%).

On contrary, the percentage decrease was noticed in case of Bulgaria (18.30%), Czech Republic (8.28%), Spain (23.9%), France (38.9%), Croatia (28.7), Italy (17.79%), Latvia (12.77), Luxembourg (21.9%), Romania (42.95%), Slovenia (13.8%), Finland (15.36%), Sweden (11.4%) and United Kingdom (40.9%). For the VRS, the percentage decrease was in case of Bulgaria (18.37%), Czech Republic (12.12%), Spain (24.2%), France (38.8%), Croatia (23.1%), Italy (19.53%), Luxembourg (21.07%), Hungary (0.47%), Poland (5.43%), Romania (43.06%), Slovenia (17.79%), Slovakia (6.99%), Finland (16.72%), United Kingdom (40.7%).
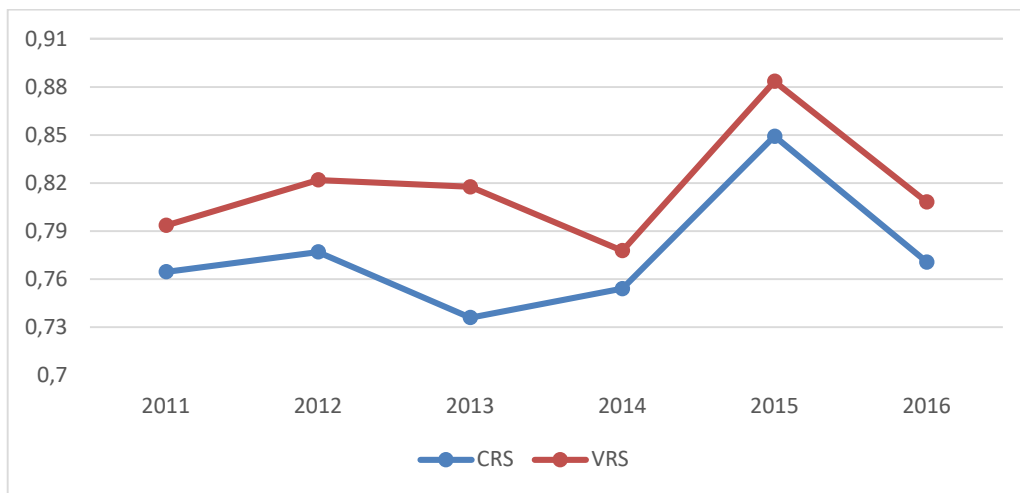
Figure 1 Model 1 - average DEA efficiency of 30 European healthcare systems during period 2011 – 2016
Source: Author

Average technical efficiency of health systems estimated in model 1, is shown in Figure 1. As it is seen, the average health efficiency is different for CRS comparing to VRS. CRS and VRS have the same line direction excluding the period from 2012 to 2014, where variance is the highest. In 2011, the average health technical efficiency (VRS) was 79,35%, in 2012 it grew up to 82,19%, but then it started to fall until 2014 to 77.8%. In 2015 has reached the peak, 88.34%, but in 2016 it has fallen down to 80.81%. CRS was 76.5% in 2011 and it raised until 2012 (77.7%), when it has started to fall down but in 2013 it has continued to raise. The peak point has been reached in 2015 – 84.9% but then it started to fall down and in 2016, the health technical efficiency was 77.1%.

Table 1 Model 1 - Healthcare system efficiency of European countries – comparing DEA CRS and DEA VRS

Country	Year: 2011		2012		2013		2014		2015		2016	
Scale of return:	CRS	VRS	CRS	VRS	CRS	VRS	CRS	VRS	CRS	VRS	CRS	VRS
Belgium	0.774	0.803	0.614	0.625	0.711	0.776	0.584	0.600	0.861	0.866	0.939	0.939
Bulgaria	0.705	0.784	1.000	1.000	0.986	1.000	1.000	1.000	1.000	1.000	0.576	0.640
Czech Republic	0.688	0.759	0.705	0.769	0.720	0.733	0.785	0.833	0.973	1.000	0.631	0.667
Denmark	0.504	0.529	0.650	0.660	0.591	0.716	0.735	0.778	0.860	1.000	1.000	1.000
Germany	0.727	0.744	0.951	0.958	0.719	0.914	0.732	0.736	0.802	0.803	0.775	0.777
Estonia	1.000	1.000	0.681	0.773	1.000	1.000	1.000	1.000	0.837	0.941	1.000	1.000
Ireland	0.626	0.667	0.700	0.900	0.631	0.980	0.638	0.730	0.897	1.000	1.000	1.000
Greece	0.831	0.847	0.890	0.909	0.847	1.000	1.000	1.000	0.670	0.671	1.000	1.000
Spain	0.996	1.000	1.000	1.000	0.677	0.792	0.952	0.953	0.933	1.000	0.758	0.758
France	1.000	1.000	0.687	0.694	0.558	0.658	0.580	0.582	0.716	0.719	0.611	0.612
Croatia	1.000	1.000	0.554	0.654	0.867	1.000	0.326	0.385	0.906	1.000	0.713	0.769
Italy	0.832	0.850	0.863	0.893	0.862	0.862	0.791	0.793	0.352	0.387	0.684	0.684
Cyprus	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Latvia	0.752	0.758	1.000	1.000	1.000	1.000	0.554	0.667	1.000	1.000	0.656	0.769
Lithuania	0.488	0.594	0.622	0.750	0.592	0.664	0.497	0.588	1.000	1.000	0.626	0.714
Luxembourg	0.831	0.845	1.000	1.000	0.628	0.643	0.772	0.789	1.000	1.000	0.649	0.667
Hungary	0.552	0.639	0.613	0.686	0.354	0.367	0.554	0.600	0.782	0.824	0.561	0.636
Malta	0.459	0.510	0.953	1.000	0.720	1.000	1.000	1.000	0.597	0.709	0.732	1.000
Netherlands	0.666	0.666	0.598	0.681	0.519	0.718	1.000	1.000	1.000	1.000	0.743	0.923
Austria	0.214	0.225	0.807	0.825	1.000	1.000	0.259	0.263	1.000	1.000	1.000	1.000
Poland	0.667	0.755	0.704	0.786	0.755	0.760	0.644	0.672	0.619	0.667	0.675	0.714
Portugal	1.000	1.000	0.708	0.786	0.534	0.579	0.832	0.855	0.659	0.714	1.000	1.000
Romania	0.447	0.483	0.575	0.600	0.690	0.750	0.448	0.500	0.597	0.601	0.255	0.275
Slovenia	0.855	0.905	0.939	1.000	0.565	0.579	1.000	1.000	1.000	1.000	0.737	0.744
Slovakia	0.590	0.672	0.505	0.569	0.628	0.641	0.641	0.655	0.905	1.000	0.590	0.625
Finland	0.866	0.885	0.708	0.714	0.987	1.000	0.933	0.937	1.000	1.000	0.733	0.737
Sweden	1.000	1.000	0.857	1.000	0.704	1.000	0.970	1.000	0.917	1.000	0.886	1.000
United Kingdom	1.000	1.000	0.424	0.425	0.524	0.563	0.542	0.542	0.594	0.600	0.591	0.593
Iceland	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Norway	0.866	0.885	1.000	1.000	0.710	0.833	0.852	0.875	1.000	1.000	1.000	1.000
Average efficiency	0.765	0.794	0.777	0.822	0.736	0.818	0.754	0.778	0.849	0.883	0.771	0.808

Source: Author

DEA provides not only information about efficiency but also the benchmark information. Table 2 is the presentation of benchmarking of countries in Model 1, as the output variables there are two variables: life expectancy. The peer countries to Belgium are Greece Norway and Austria according to CRS. The VRS column provides the information of benchmark while taking into account the VRS. In comparison to CRS, in case of Belgium, there is one additional country - Portugal. Peer countries to Bulgaria are Ireland, Iceland and Greece.

Table 2 Benchmark - peer countries – model 1

CRS				VRS				
Country	Peers			Country:	Peers:			
Belgium	Greece	Norway	Austria	Belgium	Greece	Norway	Austria	Portugal
Bulgaria	Ireland	Iceland	Greece	Bulgaria	Iceland	Greece	Ireland	
Czech Republic	Iceland	Cyprus	Norway	Czech Republic	Estonia	Cyprus	Iceland	
Denmark	Austria			Denmark	Austria			
Germany	Portugal	Estonia		Germany	Greece	Cyprus	Norway	Estonia
Estonia	Estonia			Estonia	Estonia			
Ireland	Ireland			Ireland	Ireland			
Greece	Greece			Greece	Greece			
Spain	Iceland	Cyprus	Norway	Spain	Norway	Cyprus	Iceland	Estonia
France	Iceland	Cyprus	Norway	France	Norway	Cyprus	Iceland	Estonia
Croatia	Portugal	Greece	Estonia	Croatia	Portugal	Greece	Estonia	
Italy	Iceland	Cyprus	Norway	Italy	Norway	Cyprus	Iceland	Estonia
Cyprus	Cyprus			Cyprus	Cyprus			
Latvia	Iceland	Cyprus	Norway	Latvia	Cyprus	Greece		
Lithuania	Greece	Cyprus	Estonia	Lithuania	Greece	Cyprus	Portugal	
Luxembourg	Estonia	Cyprus		Luxembourg	Estonia	Cyprus		
Hungary	Iceland	Cyprus	Norway	Hungary	Cyprus	Iceland	Estonia	
Malta	Greece	Iceland	Ireland	Malta	Malta			
Netherlands	Estonia	Cyprus		Netherlands	Malta	Norway	Sweden	
Austria	Austria			Austria	Austria			
Poland	Estonia	Greece	Cyprus	Poland	Greece	Portugal	Cyprus	Estonia
Portugal	Portugal			Portugal	Portugal			
Romania	Norway	Iceland	Cyprus	Romania	Estonia	Cyprus	Iceland	
Slovenia	Iceland	Cyprus	Norway	Slovenia	Cyprus	Iceland	Norway	Estonia
Slovakia	Estonia	Greece	Cyprus	Slovakia	Greece	Cyprus	Estonia	
Finland	Iceland	Cyprus	Norway	Finland	Cyprus	Iceland		
Sweden	Iceland	Cyprus	Norway	Sweden	Sweden			
United Kingdom	Iceland	Cyprus	Norway	United Kingdom	Norway	Cyprus	Iceland	Estonia
Iceland	Iceland			Iceland	Iceland			
Norway	Norway			Norway	Norway			

Source: Author

Table 3 presents the efficiencies of the countries (Model 2). As it can be seen, there are also diversity between the efficiency comparing CRS to VRS. In 2011 there were only six health efficient countries according to CRS (Spain, France, Cyprus, Poland, Sweden, Iceland). In case of VRS there were three more efficient countries (Estonia, Greece, Portugal). In the last year of analyzed period the efficient countries are Denmark, Estonia, Ireland, Greece, Cyprus, Austria, Portugal, Iceland and Norway, compared to VRS, where two additional efficient countries are Malta and Sweden.

The model with output variables – healthy life efficiency and infant mortality also shows progress between first and last analyzed year. Positive efficiency is in case of Belgium (8.04%), Bulgaria (16.06%), Czech Republic (213.27%), Denmark (67.22%), Germany (30.86%), Ireland (53.37%), Greece (1.83%), Croatia (20.72%), Latvia (10.76%), Lithuania (33.77%), Hungary (1.71%), Malta (24.83%), Netherlands (14.55%), Austria (66.94%), Portugal (2.04%), Finland (9.73%), United Kingdom (41.08%) and Norway (13.38%). In VRS, the percentage increase between first and last year are: Belgium (7.40%), Bulgaria (22.96%), Czech Republic (211.82%), Denmark (49.93%), Germany (30.55%), Ireland (49.93%), Croatia (18.13%), Italy (15.34%), Latvia (10.01%), Lithuania (48.08%), Luxembourg (0.47%), Malta (70.07%), Netherlands (14.48%), Austria (66.39%), United Kingdom (41.96%) and Norway (12.99%).

On contrary, the percentage decrease was noticed in case of Estonia (8.53%), Spain (23%), France (32.4%), Italy (17.36%), Luxembourg (16.97%), Poland (49.4%), Romania (32.32%), Slovenia (11.21%), Slovakia (4.82%) and Sweden (12.5%). The VRS show percentage decrease in case of Estonia (9.1%), France (14.3%), Luxembourg (9.53%), Poland (46.9%), Romania (31.58%), Slovenia (12.19%), Slovakia (6.99%) and Finland (12.5%).
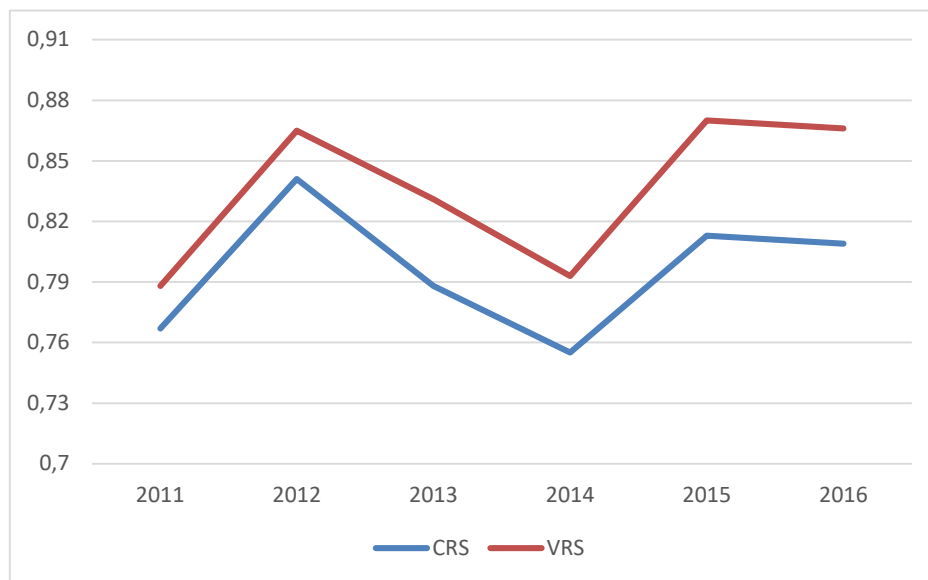
Figure 2 Model 2 - average DEA efficiency of 30 European health systems during period 2011 – 2016
Source: Author

Similarly as in the previous model, the health efficiency of countries in Model 2 is presented graphically in Figure 2. As it is seen, the average health efficiency has similar behavior in case of CRS and VRS. While VRS line in 2011 started at 78.8%, the CRS line started lower at 76.7%. The average health efficiency grew up in 2012, for CRS and VRS the efficiency respectively is 84.1% and 86.5%. Sharp felt down in period from 2012 to 2014 stopped at 75.5% and 79.3%. In 2016 the average health efficiency was 80.9% (CRS) and 86.6% (VRS).

Table 3 Model 2 - Healthcare system efficiency of European countries- comparing DEA CRS and DEA VRS

Country	Year:	2011		2012		2013		2014		2015		2016	
	Scale of return:	CRS	VRS	CRS	VRS	CRS	VRS	CRS	VRS	CRS	VRS	CRS	VRS
Belgium		0.846	0.851	0.632	0.637	0.713	0.713	0.594	0.600	0.807	0.834	0.914	0.914
Bulgaria		0.710	0.784	0.799	0.844	1.000	1.000	0.549	0.560	0.519	0.538	0.824	0.964
Czech Republic		0.211	0.220	0.796	0.823	0.718	0.733	1.000	1.000	0.810	0.835	0.661	0.686
Denmark		0.598	0.667	0.744	0.756	0.559	0.610	0.726	0.744	0.638	0.694	1.000	1.000
Germany		0.755	0.766	1.000	1.000	0.742	0.866	0.645	0.652	0.843	1.000	0.988	1.000
Estonia		0.950	1.000	0.883	0.901	1.000	1.000	0.816	0.852	0.628	0.657	0.869	0.909
Ireland		0.652	0.667	1.000	1.000	1.000	1.000	0.618	0.625	0.865	0.929	1.000	1.000
Greece		0.982	1.000	1.000	1.000	0.681	0.699	0.805	0.808	0.682	0.746	1.000	1.000
Spain		1.000	1.000	1.000	1.000	0.667	1.000	0.756	1.000	1.000	1.000	0.770	1.000
France		1.000	1.000	0.722	0.861	0.543	0.817	0.742	0.771	0.630	0.689	0.676	0.857
Croatia		0.613	0.651	0.664	0.699	1.000	1.000	0.818	1.000	0.984	1.000	0.740	0.769
Italy		0.841	0.867	0.783	1.000	0.973	1.000	0.696	1.000	0.695	1.000	0.695	1.000
Cyprus		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Latvia		0.855	0.909	1.000	1.000	1.000	1.000	0.915	0.933	1.000	1.000	0.947	1.000
Lithuania		0.616	0.651	0.685	0.750	0.622	0.664	0.894	0.909	0.794	0.824	0.824	0.964
Luxembourg		0.825	0.829	1.000	1.000	1.000	1.000	0.799	0.868	0.847	1.000	0.685	0.750
Hungary		0.585	0.639	0.643	0.684	0.535	0.560	0.368	0.389	0.806	0.824	0.595	0.642
Malta		0.572	0.588	1.000	1.000	0.886	1.000	0.376	0.387	0.456	0.680	0.714	1.000
Netherlands		0.646	0.649	0.644	0.654	0.489	0.523	0.740	0.741	0.765	0.854	0.740	0.743
Austria		0.599	0.601	0.887	0.895	1.000	1.000	0.625	0.630	1.000	1.000	1.000	1.000
Poland		1.000	1.000	1.000	1.000	0.764	0.766	1.000	1.000	0.649	0.667	0.506	0.531
Portugal		0.980	1.000	0.871	0.875	1.000	1.000	0.741	0.745	0.719	0.758	1.000	1.000
Romania		0.495	0.532	0.579	0.614	0.599	0.621	0.898	0.929	1.000	1.000	0.335	0.364
Slovenia		0.865	0.886	1.000	1.000	0.574	0.579	1.000	1.000	1.000	1.000	0.768	0.778
Slovakia		0.623	0.672	0.556	0.586	0.650	0.660	0.265	0.269	1.000	1.000	0.593	0.625
Finland		0.874	0.889	1.000	1.000	0.988	1.000	0.927	0.938	1.000	1.000	0.959	1.000
Sweden		1.000	1.000	1.000	1.000	0.425	0.607	0.939	0.967	0.891	1.000	0.875	0.875
United Kingdom		0.426	0.429	0.420	0.424	0.509	0.523	0.577	0.581	0.458	0.575	0.601	0.609
Iceland		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Norway		0.882	0.885	0.912	0.960	1.000	1.000	0.837	0.906	0.913	1.000	1.000	1.000
Average efficiency		0.767	0.788	0.841	0.865	0.788	0.831	0.756	0.793	0.813	0.870	0.809	0.866

Source: Author

Table 4 – Benchmark – peer countries – model 2

CRS						VRS				
Country	**Peers**					**Country**	**Peers**			
Belgium	Cyprus	Denmark	Portugal	Norway		Belgium	Denmark	Portugal	Norway	Cyprus
Bulgaria	Denmark	Ireland				Bulgaria	Latvia	Denmark		
Czech Republic	Norway	Iceland	Cyprus			Czech Republic	Norway	Iceland	Cyprus	
Denmark	Denmark					Denmark	Denmark			
Germany	Cyprus					Germany	Cyprus	Ireland		
Estonia	Greece	Cyprus				Estonia	Greece	Cyprus		
Ireland	Ireland					Ireland	Ireland			
Greece	Greece					Greece	Greece			
Spain	Iceland	Norway	Cyprus			Spain	Spain			
France	Denmark	Cyprus	Iceland			France	Cyprus			
Croatia	Cyprus	Greece	Portugal			Croatia	Cyprus	Greece	Portugal	
Italy	Norway	Iceland	Cyprus			Italy	Spain			
Cyprus	Cyprus					Cyprus	Cyprus			
Latvia	Denmark	Ireland	Cyprus			Latvia	Latvia			
Lithuania	Denmark	Ireland				Lithuania	Latvia	Denmark		
Luxembourg	Norway	Denmark	Cyprus	Iceland		Luxembourg	Cyprus			
Hungary	Norway	Iceland	Cyprus			Hungary	Norway	Iceland	Cyprus	
Malta	Greece	Ireland	Denmark			Malta	Cyprus	Norway		
Netherlands	Norway	Cyprus	Iceland	Denmark		Netherlands	Norway	Cyprus	Denmark	Iceland
Austria	Austria					Austria	Austria			
Poland	Cyprus	Portugal	Norway			Poland	Cyprus	Portugal	Norway	
Portugal	Portugal					Portugal	Portugal			
Romania	Norway	Austria				Romania	Norway	Austria		
Slovenia	Norway	Iceland	Cyprus			Slovenia	Norway	Iceland	Cyprus	
Slovakia	Cyprus	Greece	Portugal			Slovakia	Cyprus	Greece	Portugal	
Finland	Cyprus	Iceland				Finland	Finland			
Sweden	Norway	Iceland	Cyprus			Sweden	Norway	Iceland	Cyprus	
United Kingdom	Norway	Iceland	Cyprus			United Kingdom	Norway	Iceland	Cyprus	
Iceland	Iceland					Iceland	Iceland			
Norway	Norway					Norway	Norway			

Source: Author

4 Conclusion

This study builds on a previous study that analyzed the effectiveness of the health system of 30 European countries. While the previous analysis was conducted only for 2010, this study provides an overview of the effectiveness of European countries' health systems from 2011 to 2015. At the same time, it provides an extension in the form of comparison of results by implementing two types of DEA - CRS and VRS. The result of the study is that the rate of effectiveness in European countries varies from country to country. Study confirms the well-known conclusion that the level of health systems within different economies varies. The study

looked at effectiveness using the DEA method, comparing two models. In model 1, lifetime expectancy and infant mortality were the output variables, while in the second model the output variables were healthy life expectancy and infant mortality. The DEA method with respect to VRS and CRS was used. By comparing outputs based on VRS and CRS, the results shows the diversity mostly in the model 1.

During the analyzed period the health efficiency of countries varies. Even countries that were efficient in year 2011, were inefficient in other period such as Portugal, that became efficient again in 2016. It is obvious that average efficiency of healthcare systems varies greatly. The results have shown that some developed countries are efficient, while others are below the limit of efficiency. The results show that Cyprus has achieved the best efficiency in the monitored period, which was at the limit of efficiency in each monitored year. Even after economic crisis that hits the Greece, the health efficiency is visible. On the other hand, France and United Kingdom, as the economic leaders of Europe seems to be not efficient - in 2016 its health efficiency was 61% and 59.1% respectively.

To better demonstrate efficiency, "benchmark group" were created in Table 2 and Table 4. Countries that are within one group are similar at technical health efficiency. In 2016, the most effective countries are Denmark and Austria. Surprisingly, one of the groups was formed by Germany, Greece, Cyprus, Norway, Estonia- that signifies, that these countries are capable to use the inputs to produce outputs technically in the same way. However, these countries are at different economic level so the difference between economic efficiency and technical efficiency of health systems is proved. Country with the worst efficiency is Romania and its efficiency did not exceed 50%.

In the future, it is recommended to focus on a particular country closely and to analyze the country economically as well as the socioeconomic environment of the country. The analyze of the development of the individual variables is recommended too, to better understand the context of study. It is also advisable to expand models with other variables.

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Appendix

Table 5 Description statistics - indicators of all countries

MEAN	2011	2012	2013	2014	2015	2016
HALY	71.95	72.33	72.62	73	73.15	73.67
LE	79.33	79.41	79.75	80.06	79.92	80.23
HEX_GDP	6.4	6.42	6.38	6.39	6.33	6.27
DOCTORS_HOSPITAL	11.85	12.4	12.38	13.47	13.84	14.07
BEDS_HOSPITAL	587.92	587.17	578.51	575.29	569.93	561.06
INF_MORT	3.99	3.81	3.75	3.63	3.56	3.57
MINIMUM	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
HALY	62.6	62.8	63.9	64.7	65.5	65.8
LE	73.7	74.1	74.1	74.5	74.6	74.9
HEX_GDP	3.1	3	3.1	2.6	2.6	2.6
DOCTORS_HOSPITAL	6.73	7.16	7.3	7.98	8.67	8.66
BEDS_HOSPITAL	297.88	289.98	292.43	295.18	288.24	277.11
INF_MORT	0.9	1.1	1.6	1.8	1.6	0.7
MAXIMUM	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
HALY	78.55	78.6	79.15	79.35	79.5	79.65
LE	82.6	83	83.2	83.3	83	83.5
HEX_GDP	8.4	8.7	8.5	8.6	8.6	8.7
DOCTORS_HOSPITAL	21.16	18.58	20.31	26.21	25.24	24.44
BEDS_HOSPITAL	942.93	941.17	945.29	949.9	940.62	933.8
INF_MORT	9.4	9	8.9	8.2	7.6	7.4
MEDIAN	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
HALY	73.9	74.28	74.5	74.9	74.63	75.1
LE	80.7	80.7	80.95	81.35	81.1	81.4
HEX_GDP	6.8	6.85	6.8	6.7	6.55	6.6
DOCTORS_HOSPITAL	11.45	12.11	11.97	13.48	12.77	13.13
BEDS_HOSPITAL	609.91	603.99	578.24	589.19	582.26	542.53
INF_MORT	3.5	3.5	3.55	3.35	3.3	3.3
STANDARD DEVIATION	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
HALY	4.91	4.86	4.64	4.71	4.57	4.3
LE	2.88	2.82	2.8	2.87	2.78	2.78
HEX_GDP	1.41	1.51	1.48	1.55	1.49	1.54
DOCTORS_HOSPITAL	3.2	3.04	3.23	3.99	4.22	4.15
BEDS_HOSPITAL	183.51	184.8	187.73	190.8	191.03	190.98
INF_MORT	1.81	1.67	1.63	1.51	1.34	1.47

Source: Author

The Role of Universities and their Research Work in the Generation of Innovation

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Abstract

The paper deals with the issue of generation of innovation. We analyze and assess the linear relation between innovation development and independent variables such as competitiveness of higher education (Ranking Universitas21) and productivity of scientific research (H-index according to the SCImago Journal & Country Rank). The aim of this paper is to highlight the relationship between universities, which plays a key role in the economic development and innovation process of the collected countries. And also as well as the significance of the research work of the scientists of the universities of country in the increasing the competitiveness of the higher education system in the whole, and, as a result, the level of innovation development of the country's economy. For the purposes of this paper the analysis of these indicators of 49 countries of the world is conducted. With regard to the aim, we have set the following hypothesis: we assume that there is a statistically significant correlation between university ranking and innovation process of country, the research work of the scientists of the universities of country and university ranking and between the research work of the scientists of the universities and innovation development of country. The analysis confirmed that the innovation development has strong relationship with university ranking of country and less notable relationship with research work.

Keywords: university, research work, innovation development, h-index, productivity of scientific research.

JEL Classification: A20, I23, O30.

1 Introduction

One of the main world tendencies of the last decades in the development of innovative activity was the transition from the "linear model" of management of the innovative cycle in the "cooperative" model, which was called the "triple helix". This transformation radically changed the role, forms and methods of interaction between the institutes of science, education and business in the innovation process.

In the "linear" model, the various stages of the innovative cycle are performed successively by the individual institutions which function for the ensuring that the activity is carried out at each of these stages. In such management format, there is a problem of special provision of

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"technology transfer", that is, the transfer of the obtained results at each stage, further along the chain.

The main problem of this model is the situation when the performed and completed activities at one stage did not take into account the features of the following stages and therefore the development did not move further to the final result, in particularly, the process of commercialization, that is, turning it into the innovation.

When the innovative cycle was long enough, the technology transfer intermediaries softened the contradictions between the stages and more or less ensured the completion of the innovative cycle. Today, when the dynamism of all economic processes has increased significantly, and globalization has led to an unprecedented increase in international competition, the long linear innovative cycle hinders its successful completion in a relatively short time and in accordance with the actual specific demand, which has also been changing dynamically in recent decades. The search for optimization of these relations of participants in the innovative cycle led to the management concept of the "triple helix" of the innovative cycle, the institutional basis of which is the organic interaction of the three actors in the process of the creative innovation in the form of a metaphorical spiral: the authorities (both central and local), business structures, and also the universities. The latest in this model is the central role in the ensuring of effectiveness of the entire innovative cycle.

Universities in industrialized countries have transformed their traditional role of teaching and research into actively participating in regional economic development since 1980s (Mian, 1997).

Although universities are recognized as one of the three important players in regional innovation systems, namely 2 universities, governments and industries (Etzkowitz, 2003; Looy et al., 2003; Gunasekara, 2006), most studies didn't take into account the fact that the roles universities undertake in society can change and evolve over time, and the transformation of the university can influence regional economic development and innovation system (Youtie and al, 2008).

Any university intent in playing a strong role in economic development beyond simply the theoretical will have a sustained, positive impact on the regional economy only when its activities are guided by a reflective and on-going institution-wide and region-wide discourse" (Forrant, 2001).

To sum the researches, that were conducted in the recent years, the elements, which are in the focus of the most authors in the direction of changing of innovative cycle at the modern stage, can be determined (Edquist, 1997; Lundvall, 1992; Kumaresan & Miyazaki, 1999; Nelson, 1993; OECD, 1999). First of all, it is a set of institutions that are involved in the production, transmission and the using of knowledge, including government, enterprises, universities and research institutes. Secondly, these are all the other elements that impact on the innovative process: the context is created by the macroeconomic policies, the system of education and training, the system of financing innovations, communications and interaction with the international environment, the mechanism of innovation development, reflecting the system of relationships between these elements.

Almost all of the researches are devoted to the innovation system, focus on the fact that the flows of technology and information among persons, enterprises and institutions play a key

role in the innovation process (Etzkowitz &Leydesdorff, 1995; Etzkowitz & Leydesdorff, 1997).

Technological development is the result of a complex set of relationships between the system participants - companies, universities and public research institutions. Ongoing systemic transformation of the economy and society, transition to a post-industrial society, economy of knowledge, increase the value of the educational system to the society and economy (Etzkowitz, 2003; Mowery & Sampat, 2004).

University's opportunities for the region's development are considered in the following areas: universities are the main base for fundamental scientific research, creating conditions for regions' technological, socio-economic development in most countries. University studies are an important part of the scientific personnel's training, scientific and pedagogical potential of the region's accumulation. University often becomes a "pole of attraction" of knowledge-based industries' enterprises in its region (Armstrong & Taylor, 2000; Slaughter & Leslie, 1997).

Modern universities are expanding the goals and enriching features. Universities are not limited to the task of ensuring the highly qualified personnel to the economy, they are stepping up the activities in the field of research and development, ensuring the innovative development, becoming the regional centers of entrepreneurial activity (Armstrong & Taylor, 2000; Slaughter & Leslie, 1997; Clark, 1998).

System of higher education institutions is becoming not only a producer of educational services and a new knowledge to its customers (which has the own centers, powerful scientific centers and laboratories, where able to attract students of such universities), but also as their consumers through the creation the powerful research centers in such universities that are actively involved to the introduction of innovation in different spheres of economy and innovation activities (Levchenko and al, 2017).

The challenges of the economical present of a globalized economy, which are oriented on knowledge create the need to strengthen the aspects of innovation development, development of innovation infrastructure, the functioning of which would be aimed on the activating the innovation processes, which will be ensuring the high rates of economic growth. In these conditions the significant role in the development of research and innovation infrastructure is played by the system of higher education and the universities, in particular (Levchenko and al, 2017). Thus, a concept of the entrepreneurial university is being formed.

The aim of this paper is to highlight the relationship between universities, which play a key role in the economic development and innovation process of the collected countries. And also as well as the significance of the research work of the scientists of the universities of country in the increasing the competitiveness of the higher education system in the whole, and, as a result, the level of innovation development of the country's economy. For the purposes of this paper, the analysis of these indicators of 49 countries of the world. With regard to the aim, we have set the following hypothesis:
1. we assume that there is a statistically significant correlation between the effectiveness of universities activity in whole (system of higher education) and innovation process of country.

2. we assume that there is a statistically significant correlation between the research work of the scientists of the country's universities and the effectiveness of universities activity in whole (system of higher education).
3. we assume that there is a statistically significant correlation between the research work of the scientists of the universities and innovation development of country.

2 Methods

The research's methods comprise mainly descriptive statistic tools. The relationship between a Ranking Universitas21 (as indicator of the effectiveness of universities activity in whole (system of higher education) of analyzed country), the research work of the scientists of the universities of country and innovation development of country – representing the resources were analysed using Pearson correlation coefficient. The significance of correlations was tested with T- student's-test. Indicators have been selected from the Global Innovation Index 2017, the results of Ranking Univesitas21 and the SCImago Journal & Country Rank. The analysis has been carried out using Statistica Package and R.

3 Innovative development and the Research Work in University: statistical analysis

To quantify the strength of the relationship, we can calculate the correlation coefficient. In algebraic notation, if we have two variables x and y, and the data take the form of n pairs, then the correlation coefficient is given by the following equation:

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}} \quad (1)$$

where $\bar{x}$ is the mean of the x values, and $\bar{y}$ is the mean of the y values.

This is the product moment correlation coefficient (or Pearson correlation coefficient). The value of r always lies between -1 and +1. A value of the correlation coefficient close to +1 indicates a strong positive linear relationship (i.e. one variable increases with the other). Further, according to our hypothesis, calculate the degree of relationship between ranking Univarsitas21 and Global Innovation Index, than between the research work of the scientists of the universities and Univarsitas21 and between the research work and Global Innovation Index, taking into account the indicators of countries of the world according to the annual report, which is conducted by the Business School for the World (INSTEAD), the SCImago Journal & Country Rank Global, is conducted by the Scimago Lab and the Ranking of the system of higher education – Universitas21.

A correlation coefficient shows the degree of linear dependence of x and y. In other words, the coefficient shows how close two variables lie along a line. In our occasion, y (Innovation Development, which is measured by the Global Innovation Index) is dependent variable and x (Universitas 21, which evaluates the effectiveness of activities of the country's universities in whole and h-index as an indicator of scientific productivity of scientists) - independents variables.
From the Table 1, where are indicated the coefficients of correlation between all variables. So, looking at Table 1, there the following strong correlations, in particularly: Global Innovation Index and Universitas21 (r = 0.8970); Universitas21 and H-index' (r= 0.8158) and notable correlation between Global Innovation Index H-index (r= 0.7071).

Table 1 The matrix of correlations' ratio

Variable	GII	H-Index	U21
GII	1,0000	0,7071	0,8970
H-Index	0,7071	1,0000	0,8158
U21	0,8970	0,8158	1,0000

Source: Authors' own elaboration

Taking account the strength of correlation between the analyzed variables, the following conclusions can be made. First of all, the authors' hypothesis that strong positive correlations exists between effectiveness of universities activity in whole and innovation process of country, (which expressed through the Universitas21 and Global Innovation Index), the research work of the scientists of the universities of country and effectiveness of universities activity in whole (which expressed through the Universitas21 and H-index of the country according the SCImago Journal & Country Rank Global) and the research work of the scientists of the universities and innovation development of country can be accepted.

As we can observe the stated below scatter plots from the Figure 1, the relationship between all variables is linear, there is normal distribution.
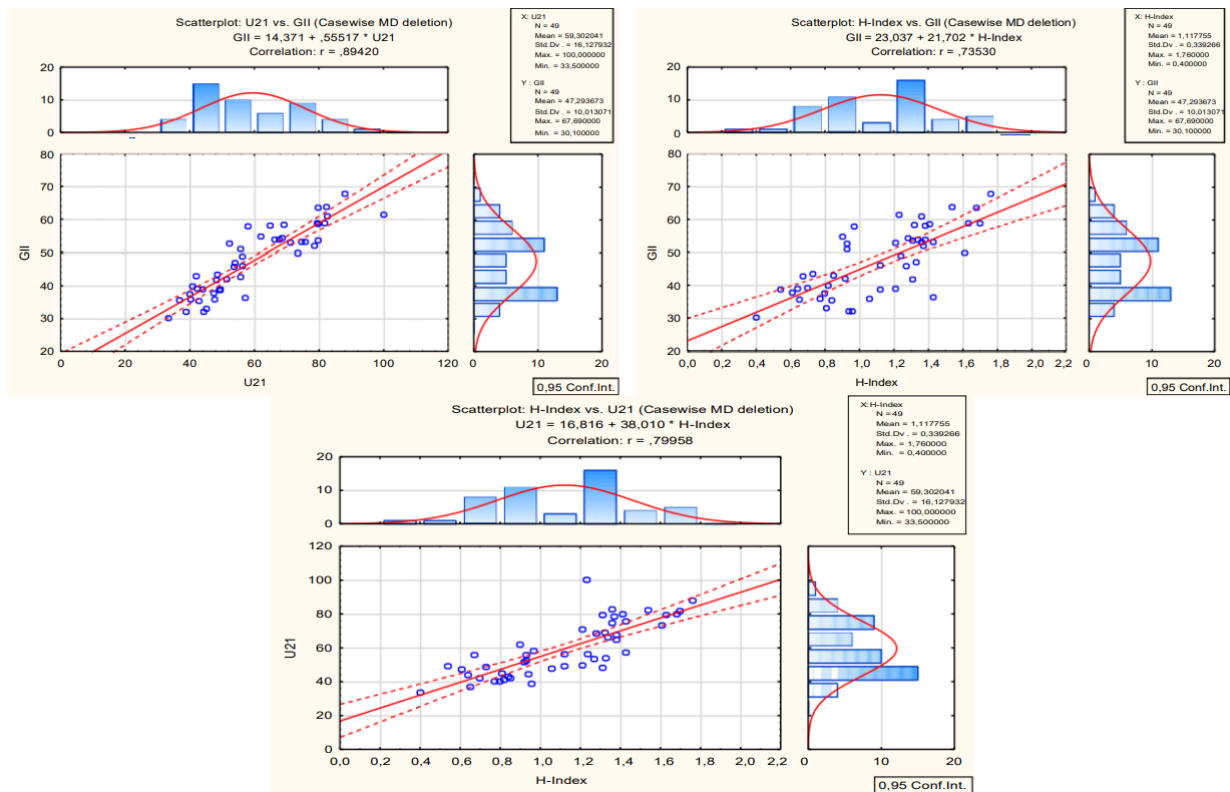
Figure 1 Linear regression model
Source: Authors' own elaboration

Besides, we consider, that the modeling of regression model can be useful in process of our analysis. The purpose of regression analysis is to analyze relationships among variables (in our analysis - Global Innovation Index, Universitas 21 and h-index), where the results serve the following two purposes: a) answer the question of how much y changes with changes in each of the x's (x1, x2,...,xk), and b) Forecast or predict the value of y based on the values of the X's.

Call:
lm(formula = form.log, data = data)

Residuals:

Min	1Q	Median	3Q	Max
-0.241666	-0.066031	0.006358	0.057505	0.211534

Coefficients:	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.913456	0.340758	2.681	0.0102	*
log(H)	-0.001151	0.068164	-0.017	0.9866	
log(U21)	0.721653	0.084936	8.496	5.54e-11	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.09649 on 46 degrees of
freedom Multiple R-squared: 0.8095,   Adjusted
R-squared: 0.8012 F-statistic: 97.73 on 2 and 46 DF,
p-value: < 2.2e-16

Statistical significance of the model:
H0: model is not statistically significant H1: model is statistically significant
p-value: 2.2e-16 < 0.05 we reject null hypothesis and we approve alternative hypothesis that model is significant

This model describes that 80 % of variability of dependent variable (Global Innovation Index), which is due to the differences in our independent variable – U21, while the rest 20% are other factors that were not taken into account in this case (H-index).

Statistical significance of the variables: H0: variable is not statistically significant H1: variable is statistically significant
p-values: 0.98 > 0.05 (H-Index), 5.54e-11 <0.05 (U21) we reject null hypothesis for variable – U21 and we approve alternative hypothesis that variable of U21 is significant. And also we reject 1 hypothesis for variable – H-index and we approve alternative hypothesis that variable of H- index is not significant.

Interpretation of the results:
Ceteris paribus: if the U21 rate will increase by one score GII (GII – dependent variable) will increase by 0.72 score.
Besides, we can see, that mean value of Global Innovation Index is 47.29. The lowest value of Global Innovation Index among the countries is 30.10 score (minimum), the highest is 67.69 score (maximum). The highest value is on 37.59 score higher than the lowest value (dimension). The standard deviation is 10.01. Consequently, the variance, the square of the standard deviation, is (10.01) * 2 = 20.02. The asymmetry and the coefficient of variation are given with the corresponding standard errors. The mean value of Universitas21 is 52.30. The lowest value of Universitas21 among the countries is 33.50 score (minimum), the highest is 100.00 score (maximum). The highest value is on 66.50 score higher than the lowest value (dimension). The standard deviation is 16.13. And the mean value of H-Index is 1.11. The lowest value of Universitas21 among the countries is 0.40 score (minimum), the highest is 1.76 score (maximum). The highest value is on 1.36 score higher than the lowest value (dimension). The standard deviation is 0.34.
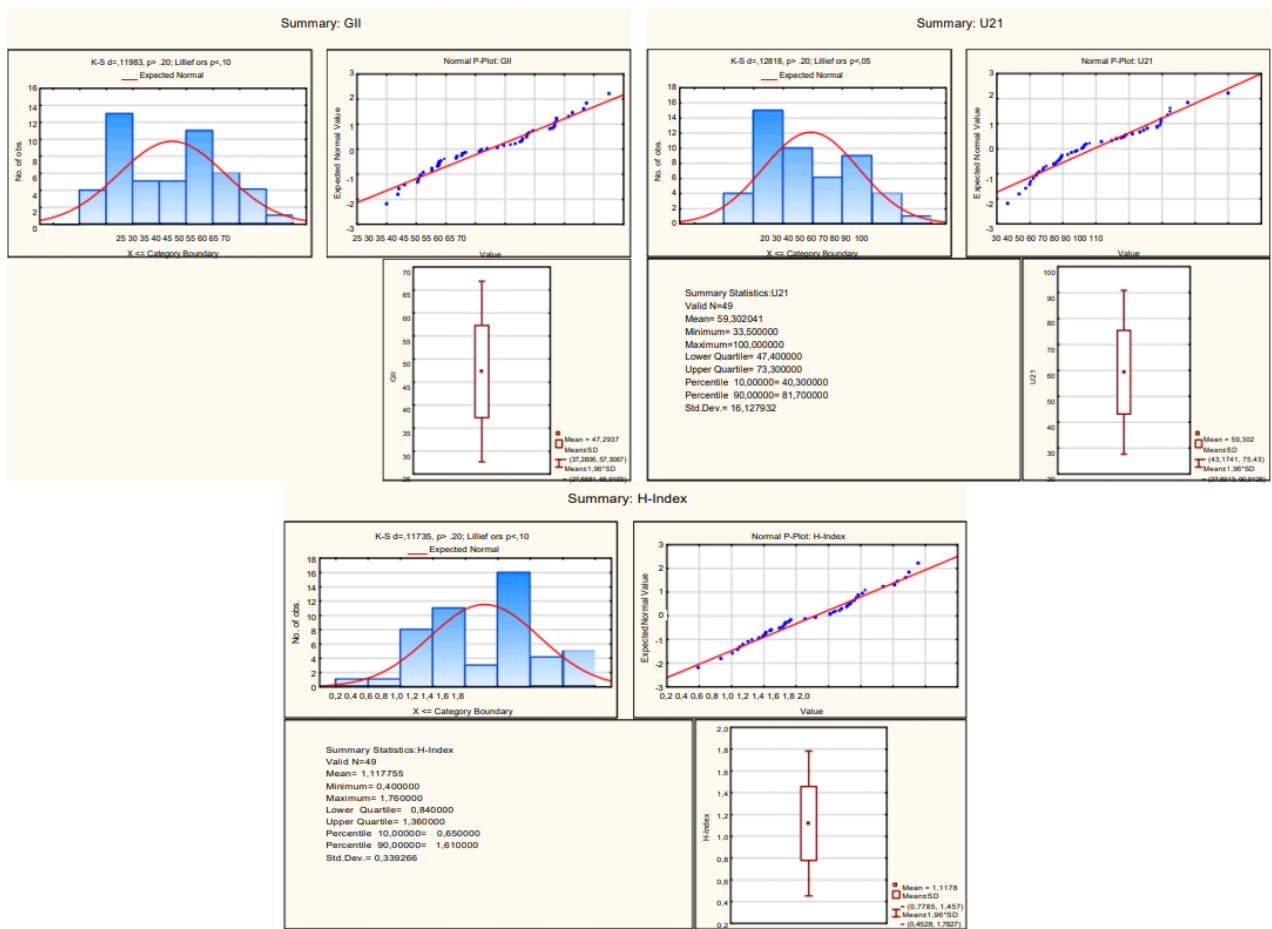
Figure 2 Descriptive statistics of such indicators as Global Innovation Index, Universitas21 and H-Index
Source: Authors' own elaboration

According to the Figure 2, we can see the highest of countries with level of Global Innovation Index level in the range of 35-40 score, the lowest is 65-70. Accordingly, the level of Universitas21: the highest of countries are in the range of 40-50 scores, the lowest are in 90-100. The level of H-Index: the highest of countries are in the range of 1.2-1.4 scores, the lowest are in 0.2-0.6.

Thus, the obtained calculated results of our research indicate about influence not only the universities in the generation of innovation but also their research work, and could be used by stakeholders as an instrument for the improving of innovation development. First of all, by governments of countries as one of the element of mechanism of ensuring the innovative process at the current stage of economy's reforming, because if the state will implement an effective policy for improving the competitiveness of higher education, to encourage scientists to the research work, in result - will increase Universitas21 (as an evidence of the effectiveness of the system of higher education), that as a whole will lead to activation of the generation of innovation (1 point of Universitas21 to 0,72 score of Global Innovation Index). Therefore, we think, that our results can be used by the state in elaboration a mechanism for the accelerating innovation to the economy. Furthermore, the received results strengthen the role of universities and their research work and the necessity of realization an effective state policy in the field of education. First of all, pay more attention to the last aspect because all innovations which are actively used now we have been born out of pure, strategic and applied research, it means without any research work - any innovation impossible.

4 Conclusion

The challenges of the economical present of a globalized economy, especially under the condition of the 4th Revolution, a new era of the knowledge, create the necessity in the generation of innovation for any country, which could be enhance the strengthening of the competitiveness of its economy, in a result - the level of social of prosperity of country's population. In these aspects the significant role in the generation of innovation is played by the system of higher education and the universities, in particular and their research work. The aims of increasing the effectiveness of socio-economic and scientific and technical policy through the the innovative process, based on the links of scientific institutions and operating enterprises in the network structure for the production of goods, services and innovations and become more significant in the context of the "triple helix". Thus, the correlation-regression analysis showed a strong relationship between innovation development and Universitas21, which indicate on the impact of higher education on the innovative process in the country, besides - a notable relationship between innovation development and h-index, which indicate on the impact of research work of scientists of the universalities on the level of innovation development of the country. Also, we can admit about a strong relationship between a level of the competitiveness of higher education and h-index of whole country (researchers of universities of this country). Nowadays the process of innovation's generation is an effective tool for ensuring the sustainable the country's development. In this regards, according to the idea of triple helix, the development of scientific ideas are becoming from the researchers' works in each universities, the results of the popularization of which are conducted through the publishing in the well-recognized journals, then – the modern universities make their approbation on the practice in the laboratories of universities or in collaboration with the enterprises, with the aim of commercialization in result. So, any country's innovation policy is not possible without the involving of such a powerful instrument in the conditions of the knowledge economy as the universities and their scientific potential (research work), are capable to the generation of new ideas and innovations.

Acknowledgements

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Specific topic for 2018: Taxes and Taxation

Description and analysis of current changes in research and development and their solution in accounting and tax context within Czech legislation and international accounting standards.

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Abstract

The paper focuses on the description of specialized terminology related to the research and development and the analysis of related issues in terms of valuation, bookkeeping and reporting results of research and development, as well as the comparison from the view of Czech accounting legislation and international financial reporting standards. Research and development can be considered as a very specific area, which is significantly monitored in the accounting; not only in terms of reporting accounting entity's results of the development and research, which is problematic in itself, but also in terms of the potential tax effect. The paper so focuses on the issues of tax effect and support, especially in terms of the recognized deduction of costs from research and development activities from the tax base. It also deals with the specific issue of possible double application of research and development costs, since in addition to claiming the costs in question within the tax base, the taxpayer can deduct these costs under the applicable income tax act also in the form of a deductible item from the tax base. In connection with claiming the tax deduction for research and development, there are a number of risks and uncertainties, which are often underestimated in practice and not given sufficient attention. The assessment of research and development in terms of Czech legislation and international accounting standards led to mutual convergence in the past, but there are still some differences between the two systems. The paper also provides information and analysis of current research and development changes as well as all related present and expected changes.

Keywords: Research; Development; Asset; Costs; Deductible item; Tax base; IAS/IFRS

JEL Classification: E62, H25, K34, M41, M48

1 Introduction

Science and research in the Czech Republic are supported and managed by the Government of the Czech Republic, which has prepared and approved a strategic document entitled "Národní politika výzkumu, vývoje a inovací na léta 2016-2020" (National Research, Development and Innovation Policy of the Czech Republic 2016-2020, hereafter National Policy). The government expects that in these years more emphasis will be placed on supporting applied research for the needs of the economy and the state administration. The approved document defines key areas and research themes to which the applied research should be focusing on and also proposes changes in the management and financing of science to support top scientific results and greater involvement of companies in research and development (hereafter only R&D). For the first time, the private sector participated in the preparation of

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the National Policy. Selected key areas include, for example, biotechnology and nanotechnology, digital economy, automotive and aviation industries and rail transportation, but also cultural and creative industry. However, the interest of science and research also include the traditional sectors such as electronics, engineering, casting and power industry. The National Policy further defines five areas in which Czech science lags behind and proposes solutions:

1. System for managing science and research – the management of science policy is planned to be unified under a single authority, the Ministry of Science. The Ministry should be in charge of funding research institutions, and it should also address the issue of international scientific collaboration and diplomacy.
2. The public sector – a new system of evaluating research organizations, which aims to support top scientific results, is to be introduced.
3. Collaboration of the private and public sector – researchers and companies are to be motivated to work together. Among other things, a database of equipment owned by research organizations which could also be used for corporate research is to be created.
4. Innovations in companies – this area includes mainly the introduction of new services and financial instruments that should primarily help small and middle-sized companies to engage in research (more details Mura and Machová, 2015).
5. Strategic targeting of support – new programmes are to be developed to address the specific and current needs of companies, taking into account the potential challenges or threats that society could face such as migration or drought (Národní politika výzkumu, vývoje a inovací na léta 2016-2020).

The intentions of the National Policy are gradually fulfilled, but the establishment of the new office for scientific policy management, i.e. the establishment of Ministry of Science, has encountered relatively broad criticism across academic, university and corporate research and has not been implemented so far. The financing of expenditure on research, experimental development and innovation of individual budget chapters will be determined by the government based on the proposal from the Research and Development Council, in accordance with Act No. 130/2002 Sb., on the Support of Research, Experimental Development and Innovation from Public Funds and on the Amendment to Some Related Acts. After discussing it with the government, the Ministry of Finance of the Czech Republic incorporates the amount of expenditures into the draft Act on the State Budget. For this year, it is the Act No. 474/2017 Sb. of 19 December 2017, on the State Budget of the Czech Republic for 2018. For 2018, the government approved the amount of R&D funds at the total amount of 36 billion CZK. Compared to 2017, when R&D funding was approved at the amount of 29 billion CZK, it is a relatively high increase. For the 2019, state budget expenditures for the science are proposed at the amount of 37.3 billion CZK and 38.5 billion CZK in 2020. For general overview of state budget expenditures on R&D in the Czech Republic see Figure 1. During 2007-2013, the largest number of people in R&D were employed in the business sector. The second most numerous sector in terms of registered number of employees is the higher education sector, see Figure 2.

The state supports science and research not only in the form of direct support, i.e. in the form of state budget expenditure, but also in the form of indirect public support and the option of deducting the R&D costs from the tax base for business entities, as stated in chapter 3. The accounting view of R&D in terms of both Czech and international legislation is presented in the chapter 2 below.
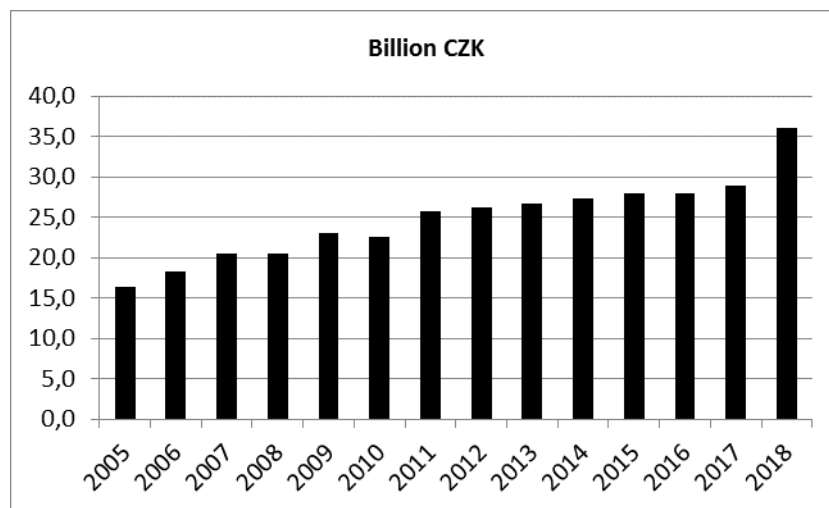
Figure 1 State budget expenditures on R&D in the Czech Republic in 2005–2018
Source: own processing (ČSÚ, 2018)
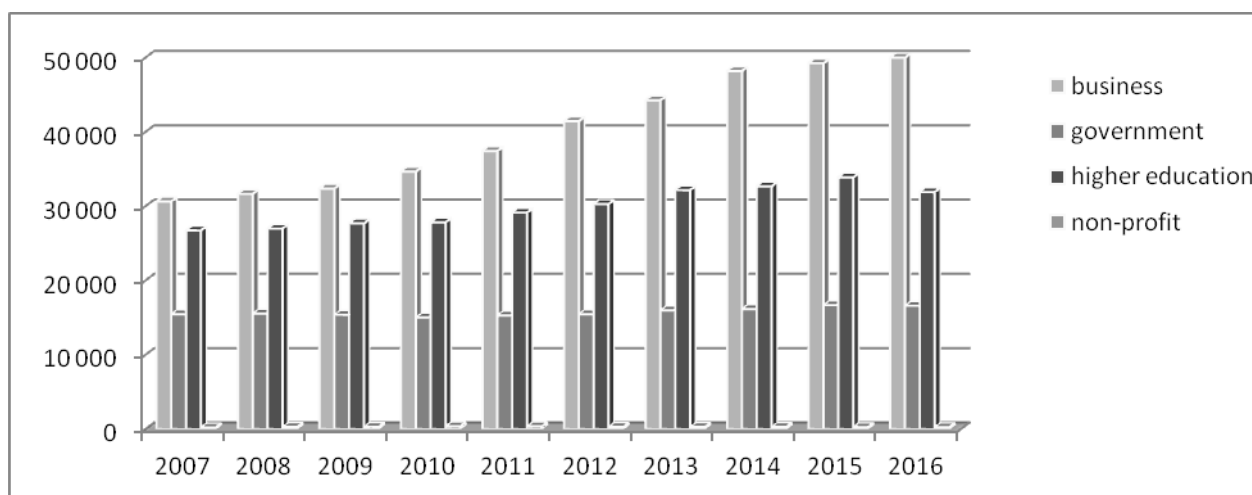
Figure 2 Total number of employees in R&D by sectors for 2007–2016
Source: own processing (ČSÚ, 2018)

2 Definition of Research and Development According to Czech Accounting Legislation

From 1 January 2018, there is a change in the accounting definition of the balance sheet item of Research and Development. In the accounting Decree No. 500/2002 Sb., there is a significant change when instead of "intangible results of research and development" only "intangible results of development" will be reported (intangible results of research do not meet the criteria for being recognised as intangible fixed assets).

In accordance with valid Czech accounting legislation, the intangible results of development are recognized as intangible assets of a company. Reporting of development activities is primarily regulated by the Czech Accounting Standard 013 – Intangible and Tangible Fixed Assets. Asset items that represent future economic benefit for the company are recognized as assets, and the benefit belongs only to this company. Expectations of the future benefit must be sufficiently reliable and demonstrable. The asset must also be reliably measurable. Entry prices are used for the valuation of intangible results of development in accounting; in accordance with the Act on Accounting, these may include: acquisition cost, replacement cost

or own costs. All intangible assets should also meet the following characteristics: they are without physical substance, are a result of past events, are identifiable, will bring future economic benefits and are controllable. Intangible results of development are results that were internally generated and are used for trading with them, or they were acquired from other entities. These are, for example, successfully completed projects or new technological procedures. If the accounting entity develops a new technological procedure and uses it only internally, it is not an intangible fixed asset but a cost.

The intangible results of the development are included into the accounting group 01 – Intangible Fixed Assets. The item B.I. Intangible Fixed Assets include, in particular, intangible results of development, software, valuable rights, other intangible fixed assets and goodwill with a useful life longer than one year, from the measurement value determined by the accounting entity, with the exception of goodwill and the fulfilment of statutory obligations, especially principle of materiality and faithful and fair representation of assets. The individual numbers of accounts are then within the competence of accounting entities. In the balance sheet, intangible results of development are among the fixed assets under the item of B.I.I. Intangible Results of Development. In its internal directive, the accounting entity sets a value threshold from which the acquisition of intangible assets will be classified as intangible fixed assets. In case of lower price of the acquired assets, the entity may record it directly to costs. Fixed limit for entry prices is not set by any accounting regulation. Act. No. 586/1992 Sb. on Income Tax (hereafter only Income Tax Act) defines a limit of 60,000 CZK for intangible fixed assets, and this limit is therefore usually used in accounting as well. The accounting entity amortises the intangible assets in its accounting; there is no fixed time limit set, so the development may be amortised in accordance with the amortisation plan for the selected period of time.

3 Definition of research and development in accordance with International Financial Reporting Standards (IAS/IFRS)

The definition of R&D in International Financial Reporting Standards (IFRS) is within the scope of IAS 38 – Intangible Assets. The Standard defines an intangible asset as an identifiable non-monetary asset that has no physical substance. Typical examples of intangible assets are computer software, patents, copyrights, customer or supplier relationships, customer lists, market share, or marketing rights. An intangible asset meets the identifiability criterion if it is separable or arises from contractual or other legal rights. For an asset to be recognized as an intangible asset, it must also continue to meet the criteria of control and future economic benefits.

The result of research and development as an intangible asset can be product recipe, product prototype, product design, processed production process. The result of research and development is therefore a certain knowledge that the accounting entity seeks to capitalize on in its other business activities, and the relevant regulation is so included in the intangible asset standard. As a result of all these activities, an intangible asset can be recognized and initial expenses classified as costs at the time when trading companies obtain revenue and associated cash flows from their development activities, for example, when they start selling cars or pharmaceuticals.

According to IAS 38, items are recognized as intangible asset if they meet the definition of intangible assets and the recognition criteria, i.e. it is probable that the future economic benefits that are attributable to the asset will flow to the accounting entity and the acquisition

cost of the asset can be measured reliably (Hakalová, Pšenková, Losová, 2014). As opposed to Czech regulations, the standard includes the definition of research and development.

Research is defined as original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding. Among research activities, IAS 38 mentions activities aimed at obtaining new knowledge, the search for, evaluation and final selection of applications of research findings, the search for alternative materials, devices, products, processes, systems or services, and the formulation, design, evaluation and final selection of possible production alternatives. Development is the next, ongoing phase of the research. It is the application of research findings or other knowledge to a plan or design for the production of new or substantially improved materials, devices, products, processes, systems or services before the start of commercial production or use. According to the IAS, the development activities may include the design, construction and testing of pre-production or pre-use prototypes and models, the design of new technology, the design, construction and operation of a pilot plant that is not of a scale economically feasible for commercial production. The development has more specific features and, under ideal conditions, should lead to the creation of a product or service with commercial use. The probability of future economic benefit and the cash flow from the development's results to the company is greater than in the research phase, and the recognition of an intangible asset is so expected.

In accordance with IFRS, intangible assets may arise from purchase, be internally generated, arise from acquisition by way of a government grant or acquisition as part of a business combination. The acquisition cost of an intangible asset is the expense incurred when an intangible asset has, for the first time, met the criteria for its recognition. As for the valuation of intangible assets, the standard allows accounting entities to choose from two models: the cost model or the revaluation model (i.e. fair value).

When amortising intangible assets, it must be determined whether the useful life of an intangible asset is finite or indefinite. If the useful life is finite, the its length or the number of outputs from the use of the asset is determined until the end of the asset's useful life. The asset is then amortised. The amortisation method used should reflect the pattern in which the asset's economic benefits are consumed. If this model cannot be reliably determined, the straight-line depreciation method is used (Kolektiv autorů, 2018).

4   Definition of research and development in terms of tax deduction

From a historical point of view, R&D deductions can be claimed as a tax-deductible item that lower the tax base from 2005 in the Czech Republic. At present, this issue is regulated by the Act No. 586/1992 Sb., on Income Tax, in Section 34a to 34e. This act regulates the amount of the deduction for the R&D support and also lists the expenditures that can be recognized as R&D expenses and can be so included in the deduction (Section 34 and Section 34b); in Section 34c the act further specifies the definition of a R&D project, including its essential requirements.

The project is, in fact, a document in which the activity under the Act on the Support of Research, Development and Innovation (basic research, applied research, experimental development) is defined prior to the start of the R&D project; the project must be approved before its start. The Income Tax Act in Section 34e also regulates the tax administrator's framework for the mandatory assessment of the expenditure on R&D included in the deduction.

According to the act, 100% of the expenditures spent on solving R&D projects can be deducted as well as 10% of the amount by which they exceed the expenditures incurred in the previous period. The tax deduction gives companies the opportunity to save at least 19% of the eligible R&D costs through a reduction in their tax liability.

Expenditures (costs) eligible for tax deduction are tax deductible costs that were spent on solving R&D projects as defined in the Income Tax Act and have been recorded separately from other costs. Eligible R&D costs are, as a matter of fact, used to reduce the tax base twice. In practice, companies often deal with the issue of what expenditures can be considered eligible; in case of uncertainty, they can be guided by the D-288 instruction of the Financial Administration, where amore detailed interpretation can be found. Eligible expenditure under the Income Tax Act include, for example:
- experimental or theoretical work,
- design and construction work,
- calculations,
- technology proposals,
- production of a functional sample or prototype of a product or its part related to the implementation of a R&D project,
- and other things.

The Income Tax Act also lists costs that cannot be recognized for the deduction, for example:
- costs for which public support has already been provided (e.g. through subsidy programmes or investment incentives);
- service costs (with the exception of services from a public university or research organization);
- fees for royalties and intangible results of research and development acquired from other persons (with the exception of results from public universities or research organizations);
- and other things.

As already mentioned, the state supports science and research not only in the form of direct support, i.e. in the form of state budget expenditure, but also through indirect public support. This represents state's support for science and research through the option of deducting R&D costs from the tax base for business entities. The number of companies that claimed deduction for R&D expenditure from corporate income tax in 2010-2016 is shown in Table 1. The total amount of tax deduction for R&D expenditure in 2010-2016 is listed in Table 2.

Table 1 The number of companies that claimed deduction for expenditure on research and development from corporate income tax

YEAR	2010	2011	2012	2013	2014	2015	2016
Number of companies	**718**	**863**	**1,025**	**1,124**	**1,268**	**1,311**	**1,254**
public companies	2	4	4	4	4	5	6
private domestic companies	514	606	716	796	902	938	889
private foreign companies	202	253	305	324	362	368	359

Source: own processing (ČSÚ, 2018)

Table 2 Claimed deductions for expenditures on the implementation of R&D projects from corporate income tax (billion CZK)

YEAR	2010	2011	2012	2013	2014	2015	2016
Billion CZK	**6,937**	**9,707**	**10,452**	**12,111**	**11,934**	**13,317**	**12,579**
public companies	6	42	17	21	22	29	29
private domestic companies	2,277	2,821	3,453	4,155	4,635	5,520	5,191
private foreign companies	4,654	6,844	6,982	7,935	7,277	7,768	7,359

Source: own processing (ČSÚ, 2018)

In practice, it is possible to encounter a number of issues in connection with the claim of R&D deduction, such as the following:

- the actual assessment of the activity of the company as R&D activities (the activity does not correspond with the R&D definition, it is not a novelty, etc.)
- eligibility of costs included in the deduction (expenditures not related to the project are included in the project);
- formal deficiencies in connection with the R&D project,
- the creation of a R&D project before the start of the project (the initiation of the project precedes the formal request);
- and other issues.

5 Conclusion

The basic objective of National Research, Development and Innovation Policy of the Czech Republic is to ensure the development of all R&D components in the Czech Republic, both for basic research and applied R&D, which should strengthen and contribute to the economic, cultural and social development of the country. Like other European states, the Czech Republic invests considerable funds in science and research. The state supports this area both in the form of direct expenditures from the state budget and in the form of indirect public support. For example, the number of companies that use the form of indirect public R&D support (i.e. tax deductions) has doubled since 2007. The amount of tax deductions is not limited to any maximum amount of support. Regardless of whether it is a micro, small, medium-sized or large accounting entity, taxpayers are only limited by the amount of their tax base.

Regarding the accounting view of R&D under Czech legislation and IFRS, it is clear that even after the amendment to the Czech Accounting Standard 013 - Intangible and tangible fixed assets, there have been still some differences in R&D since 2018. The reporting of intangible assets, in accordance with Czech accounting regulations and IAS/IFRS, still varies in many respects, particularly in the area of research and development, whether in terms of acquisition, valuation or amortisation methods (Krajňák, 2016).

The text of the paper shows that R&D deductions in the Czech Republic are generally used by an increasing number of taxpayers. Although the legal definition of a tax deduction is rather brief, its practical use faces some issues mentioned above, namely meeting the conditions for R&D definition, compliance with formal requirements of the R&D project and the eligibility of expenditures incurred and related to R&D.

R&D deduction is not specifically regulated only in the Czech Republic, as it is an option that is also often used in the European and even global context. Each country regulates the deduction differently according to its national legislation, taking into account different legal environment, the needs of taxpayers/state and other factors.

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Cluster Analysis of Corporate Tax Revenues in EU-28 Countries

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Abstract

In the development of corporate tax revenues, the EU-28 countries' efforts have been observed to increase those with ever-decreasing tax rates. A similar trend is supported by the adoption of similar tax elements for corporate tax base expansion. This trend is reinforced by the existence of the EMU, which has further expanded member states' integration in the internal market. Against the backdrop of these facts, the main objective of the contribution is to examine the categorization of EU-28 member countries on the basis of economically significant clusters, taking into account the selected segmentation criteria to formulate trends in corporate taxation and assess their convergence. The conclusions reached and the fact that a two-speed Europe divided into old and new EU-28 member countries is also observed in the tax area of corporate taxation is supported by empirical literature based on quantitative and qualitative indicators. This contribution brings economically clear and meaningful categorization of the EU-28 and at the same time analyses the level of convergence of member countries in the area of corporate taxation.

Keywords: Taxes, Corporate taxes, Corporate tax revenues, Fiscal policy, Cluster methods.

JEL Classification: H25

1 Introduction

The 1980s were linked to the introduction of simple corporate tax base rules and higher statutory tax rates (45.1 % in 1982 in OECD countries). A similar trend was observed in the EU in 1995-2005 (Piotrowska & Vanbooren, 2008). Nowadays, the development is the opposite, coupled with a larger number of tax bases that add up to the tax base and declining statutory tax rates (the lowest tax rate of 12.5 % in Cyprus or 10.0 % in Hungary). The change was also reflected in the level of corporate tax revenue as "*corporate-tax-revenue-paradox*" (EC, 2007; Piotrowska & Vanbooren, 2008). Despite the declining level of the statutory tax rate, corporate tax revenues grew from 2.3 % in 1995 to 3.3 % in 2007 and 2.6 % in 2016 in the EU-28 (Eurostat, 2018). The increase in the tax quota and the increasing volume of corporate tax revenues are positively perceived by the public, whether due to their role in budgetary policy, the promotion of economic, social and political goals of the country, or the achievement of macroeconomic stability (Stiglitz 2000; Stejskal 2008; OECD, 2014). Under the influence of the introduction of the internal market in the EU, there are also negative views on the existence of this tax, due to the ambiguity of its impact on the economy, the influence of behavior of companies and increasingly frequent aggressive tax planning (McClure, 1979; Auerbach, 2006; Devereux & Sørensen, 2006; Merrill, 2010). What is the next perspective in the development of this tax? The observed EC effort to shift the tax burden from direct to indirect taxes has been compounded by the impact of the crisis period to reduce the tax burden on the company. In the EU-28, it fell by 0.6 % during the period 2008-

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2016, but the average tax burden on direct taxes increased by 1.1 % (Eurostat, 2018). Corporate income tax is considered to be a stable source of income for European governments. The internal market affects the perspective of EU-based corporations, which are increasingly changing their position from the national zone to a coherent economic zone. Trends are reinforced by the introduction of the EMU, which has further expanded the integration achieved in the internal market.

Against the backdrop of mentioned cases, the motivation of the contribution is to create a categorization of the EU-28 member states and to formulate similar or, on the basis of economically significant groupings, different trends in company taxation and to assess their convergence. The amount of tax indicators that could potentially explain the snapshots created is broad. In order to meet the main objective of the contribution, the following section deals with a review of the most widely used tax indicators that promote economically clear and meaningful categorization of countries, taking into account selected segmentation criteria. These indicators also assess the level of convergence of EU-28 countries through the homogeneity of corporate taxation through the use of cluster analysis.

2 Overview of Empirical Literature of Tax Indicators of Corporate Income Tax

Last century studies focus on examining two factors, *statutory tax rates* and *effective average tax rates* that compare with the development of corporate tax revenue in relation to GDP or in proportion to total tax revenue, within a single country or a group of countries. One of the first studies, based on a number of literature reviews, is "*Why have corporate tax revenues declined?*" by Auerbach & Poterba (1987), investigating the sources of US corporate tax decline in 1965-1985. They consider accelerated depreciation and tax relief in the context of economic recovery as the largest tax rate accelerator. Similar conclusions come from Slemrod (1990), Douglas (1990), or Auerbach (2006). Spengel, Caron & Stevens & Baker & McKenzie (1999) state that individual companies are deciding on the level of the statutory tax rate and this indicator can explain some differences in corporate taxation between countries. Statutory tax rates are often considered the main determinant of the amount of corporate tax revenue, e.g. Clausing (2007), Kubátová & Říhová (2009). Lower tax rates determine the growth of corporate tax revenues proportionally, but at higher rate levels, their elasticity exceeds the value of one because of which corporate tax revenues decrease (Devereux, 2006; Clausing, 2007). The second significant rate is the effective average tax rate. It represents the share between the tax actually paid and the corporate tax base. It represents an indicator through which it is possible to capture differences in the tax base of those companies that have their headquarters in different countries but compete in the same market. Effective taxation affects the choice of place of business because multinationals are only faced with tax rates in their country of residence (EC, 2001).

Corporate tax revenues in relation to GDP in the 1990s recorded a stagnant development and in some countries a moderate growth despite the implementation of legislative adjustments for tax cuts. The phenomenon of "*corporate income tax rate-revenue paradox*"*, "corporate tax paradox*", "*race to the bottom*" has been coupled with the expansion of the tax base and lower tax rates. The moderate growth was explained by the fact that lower statutory tax rates prompted entrepreneurs to transfer their income to the corporate sector, thereby increasing corporate tax revenues slightly and expanding the corporate sector (Auerbach, 2006). Revenue effects are affected by the tax rate minimization strategy (Devereux, Griffith & Klemm, 2002). In most countries, corporate tax revenue declined for two reasons. The first resulted from legislative changes lowering statutory tax rates but increasing effective average

tax rates that negatively affected company profits and return on investment. The second reason was based on the criticism of the way analyses used to be processed. Since their comparison has so far been made in relation to GDP or total tax revenue, the implied trend was characterized by volatility for reasons other than the tax systems themselves. It depended on the relative size of corporate tax revenue in relation to GDP.

An important segmentation criterion is the *economic performance* of the country observed through GDP or GDP per capita, as the development and efforts to coordinate tax policies show. The higher tax burden on society negatively affects economic growth. Corporate taxation, where a 1 % change in the statutory tax rate affects economic growth in the range of 0.6 - 1.8 %. The growth of profitability and the growth of the corporate sector which have a direct effect on the corporate tax base have a positive impact on GDP growth (Clausing, 2007; Kubátová & Říhová, 2009; Bayer, 2011). Economic performance and economic developments in the country and the economic cycle are equally measurable macroeconomic indicators that affect the level of corporate tax revenue (Karagöz, 2013; Vasiliauskaite & Stankevicius, 2009).

3 Hierarchical and Non-Hierarchical Cluster Analysis of Corporate Taxation

The EU-28 Member States' classification is based on a combination of specifically presented tax indicators, such as the *statutory tax rate* in % (STR), the *effective tax rate* in % (EATR), the *tax quota* indicator determined as the sum of the tax revenue from the corporation, to the total tax revenue in % (CTR_TR), a tax quota indicator defined as the sum of tax revenue from the corporation, including capital taxes on GDP in % (CTR_GDP), and the *economic performance* of the country, expressed in terms of GDP per capita (GDP_PC). The choice of variables serves to assess the convergence trends in EU-28 corporate taxation. Individual impediments enter the 2007-2016 cluster analysis as median values. The database is obtained from the Eurostat database.

Due to the inconsistency of the input variables (expressed as a percentage or in the currency of EUR), they must be normalized at the interval <0;1> prior to entering the aggregation process using the standardization method. The Euclidean distance is used to determine the distance (similarity) between countries based on input variables, mainly due to the width of the use of this distance (the disadvantage is the significant influence of the input variables in their absolute height, but the lack is eliminated by normalization of data). The optimal number of clusters is based on the C-index, Duda and Hart index, TraceW index, Pseudo t^2 index (in hierarchical procedures), Beale index, Rubin index, Ball index and Gap index. The Ward method is used to determine the similarity of individual objects based on hierarchical clustering. In order to determine the similarity of objects on the basis of non-hierarchical clustering, *k*-clustering is used, based on the a priori knowledge of the number of clusters (centroids), whereby the objects are firmly divided into disjoint clusters (Schonlau, 2004). In the paper, the *k*-means method is used, because the individual objects are characterized exclusively by quantitative variables provided the Hartigan and Wong algorithm is used. The cluster analysis is implemented in the **R** program environment using packages *cluster, NbClust, nFactors, ggdendro* and *rgdal*.

4 Results

For the purpose of cluster analysis, the optimal number of clusters is determined. The output of the algorithms used, the method of determining their optimal number, the critical value level and the final recommended number of clusters are given in the table (Table 1). According to the selected algorithms, which are the C-index, the Duda and the Hart index, the Pseudo t^2 index, the Beale index, and the Gap index are determined on the basis of the critical values and the optimum number is considered to be two clusters.

Table 1 Determining the optimal number of clusters according to selected algorithms

Algorithm	The optimal number of clusters	Value_Index	Variant A
C-index	Minimum index value	0.1663	2
Duda a Hart index	The smallest number of clusters→ „criticalValue"	0.978	2
Pseudo t^2 index	The smallest number of clusters → „criticalValue"	0.2474	2
Beale index	The number of clusters is determined by the critical value → alpha	0.0645	2
Gap index	The smallest number of clusters as „criticalValue"→ = 0	-0.4896	2

Source: Author's own elaboration

The hierarchical agglomeration method, the Ward method, makes it possible to generate approximately equally sized clusters. Using the NBClust function, an optimal number of two clusters is confirmed for the five variables. The result of Ward's hierarchical clustering method are clusters of 15 and 13 EU-28 member countries. The output is visualized by dendrogram and clusplot (Figure 1). Economically meaningful clusters based on similarities in corporate taxation confirm that Ward's clustered method meets the requirement of common economic and tax characteristics (Table 2). The results of the cluster analysis reported a satisfactory conclusion, as none of the clusters was overlapping and had joint intersections.
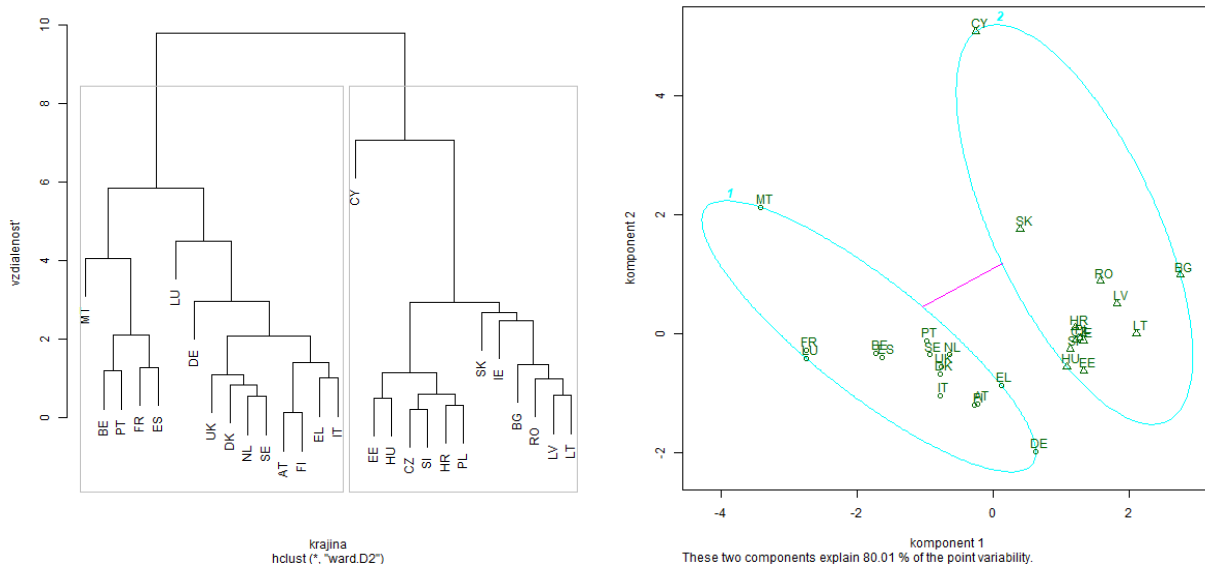
Figure 1 Categorization of EU-28 member countries based on the Ward method
Source: Author's own elaboration

Figure 2 Categorization of EU-28 member countries based on the Ward method

Classification	Cluster 1	Cluster 2
Quantity	15 countries	13 countries
Countries	**MT,** BE, PT, FR, ES, LU, DE, UK, DK, NL, SE, AT, FI, EL, IT	**CY, EE, HU, CZ, SI, HR, PL, SK, BG, RO, LV, LT,** IE
STR	27.76 %	16.62 %
EATR	26.29 %	15.22 %
CTR_TR	10.61 % TR	10.99 % TR
CTR_GDP	2.63 % GDP	2.26 % GDP
GDP_PC	EUR 33,555	EUR 14,004

Note: Bold refers to new EU-28 member states.

Source: Author's own elaboration

For non-hierarchical clustering in the form of *k*-means, the Hartigan and Wong iterative method is used to minimize the sum of squares within a known number of clusters. In this case, the previous findings of hierarchical aggregation and the same distribution of the surveyed countries are confirmed in two clusters. By comparing the two methods and facts mentioned above, it can be concluded that the Member States' dislocations are mainly made by their similarities, and the choice of clustering methods does not affect the results found. The same results show the suitability of the Member States' classifications. The purchases meet the requirements of a clear classification. The clutches do not overlap and the distance between them is sufficient.

From the point of view of the interpretation of the results, the relation of the variables with respect to corporate tax revenues, expressed in relation to GDP, is described. These are the central object of investigation. The average value of corporate tax revenue in relation to GDP in the EU-28 as a whole was 2.9 % of GDP in 2008, falling to 2.6 % of GDP in 2016. Developments did not show any significant fluctuations in values, but they varied in countries in the light of the different national tax structures. The increase of the indicator over the previous period was observed throughout the three member states (Belgium, Germany and the Netherlands) and Malta. *The cluster 1* was made up of 14 old EU-28 member states and Malta. The level of corporate tax revenue in relation to GDP reached 2.63 %. Malta, as a new EU-28 member country, confirms a development other than the other new EU-28 member countries. In addition, Luxembourg and Portugal (old Member States) were above the EU-28 average. *The cluster 2* was made up of 12 new member states and Ireland. The overall level of corporate tax revenue in relation to GDP was below the 2.26 %. An important determinant of the amount of corporate tax revenue that affects the PO decision on the placement of mobile capital is considered by STR. This indicator provides scope for cross-country comparison of tax burden (Spengel, Caron & Stevens & Baker & McKenzie, 1999). The average STR level in the EU-28 as a whole was 24.0 % in 2008 and declined to 23.0 % in 2016. In the case of *cluster 1*, the height of STR was 27.6 %, and the height of EATR was 26.2 %. In the case of *cluster 2*, the STR was 16.6 %, and in the case of EATR, it was 15.2 %. This cluster included countries with the lowest STRs (up to the 24 % average), almost exclusively in the EU-28 (except Malta) almost throughout the monitored period. During the whole period, there has been a decrease in STR in most Member States, both old and new. An exception, in the form of a tax rate increase, was made up of three Member States - Cyprus, Slovakia and Portugal, belonging to *cluster 2*. The lower STRs are important in the tax competitiveness process. Based on the analysis, Remeura's claim (2015) on the existence of tax competition between countries was confirmed. The cluster analysis results show differences in the taxation of legal entities in European countries. In *clustering countries 1*, the stronger economic performance

was observed (cluster average at EUR 33,555). For *cluster 2* it has been reported that at lower tax rates a lower level of corporate tax revenues in relation to GDP, and weaker performance of economies have been evaluated (average cluster at EUR 14,004).

When clustering countries on the basis of tax indicators with their link to corporate tax revenue, tax policy plays a huge role. Its developmental tendencies in individual clusters are very similar in terms of tax incentive policy. Country bumps have supported this fact, including the trend of falling tax rates and the increase in the number of measures taken with their link to tax base extensions. Summary qualitative approach to analyse the factors affecting corporate income tax is included in the following table (Table 3), which indicates the existence of the most common categories affecting the tax base. The table lists particular countries only if the occurrence of the category was, or was not present during 2008, 2012 and 2016.

Table 3 Qualitative approach to LP taxation

Category	Impact of implementation on LP	Advantageous LP conditions	Disadvantageous LP conditions	Expected impact on CTR
Anti-Avoidance Rules	-		**EE, LT, MT,** AT,DK, DE, IE, IT, PT, SE, UK	+
CFC Rules	-	**BG, HR, CY, CZ, LV, LU, MT, RO, SK, SI,** AT, BE, IE, NL	**HU, LT,** DK, FI, FR, DE, IT, PT, ES, SE, UK	+
Depreciations	+	**EE**	**MT,** UK	-
Holding Tax Climate	+	ES	**BG, HR, CY, CZ, EE, HU, LV, LT, MT, PL, RO, SK, SI,** AT, DK, FI, FR, DE, EL, IE, IT, NL, SE, UK	+
Loss Carry back	+	**EE,** FR, DE, IE, NL, UK	**BG, HR, CY, CZ, HU, LV, LT, MT, PL, RO, SK, SI,** AT, BE, DK, FI, EL, IT, LU, PT, ES, SE	-
Loss Carry forward	+	**EE, LT, MT, SI,** AT, BE, DK, FR, DE, IE, LU, SE, UK	**BG, HR, CZ, PL,** EL	-
R&D Tax Incentives	+	**LT**	**BG, CY, EE, SE,** FI, DE, LU	-
Taxation of Capital Gains	-	**CY, HU, LV, LU, MT, SE,** AT, BE, DK, FI, IE, NL, ES, UK	**BG, HR, PL, RO, SK,** EL	+
Taxation of Dividends Received	-	**BG, HR, CY, CZ, EE, HU, LV, LT, MT, PL, RO, SK,** AT, DK, FI, NL, PT, ES, SE	IE	+
Thin Capitalization Rules	+	**CY, EE, MT,** SE	**BG, HR, CZ, HU, LV, LT, PL, RO, SI,** BE, DK, FR, DE, IT, NL, PT, ES	-
Transfer Pricing Rules	-	**CY, MT**	**BG, HR, CZ, EE, HU, LV, LT, PL, , RO, SK, SL, SE,** AT, BE, DK, FI, FR, DE, EL, IT, NL, PT, ES, UK	+

Category	Impact of implementation on LP	Advantageous LP conditions	Disadvantageous LP conditions	Expected impact on CTR
Treaty Network	+	FR		+
Withholding Tax Rate Dividends	-	**CY, EE, HU, MT, SK,** UK		+
Withholding Tax Rate Interest	-	**CY, EE, HU, MT,** AT, DE, LU, NL, SE		+
Withholding Tax Rate Royalties	-	**HU, MT,** NL, LU,SE		+

Note: Bold refers to new EU-28 member states.

Source: Author's elaboration of the data available from Schanz, et al. (2017), EC (2018)

Higher volumes of corporate tax revenue were important during the period of the public finance crunch, when countries tried to stick to the established rules of budget deficits and ensure the economic recovery as soon as possible (Macek, 2015). Countries with a long-term excess of corporate tax revenue in relation to GDP include Belgium, the Czech Republic, Cyprus, Luxembourg and Malta over the whole period, and in terms of the corporate tax revenue indicator, in terms of total tax revenues, the Czech Republic, Cyprus and Malta (similar to previous case), followed by Ireland, Portugal, Romania, Slovakia and the United Kingdom. These countries, on the basis of the above-mentioned indicators, are considered to be those which, compared to the other EU-28 member states, focus more on the taxation of the LP and on the revenue accruing to the state budget from these taxes. Countries with a long-term above-average STR level include Belgium, Germany, Spain, France, Luxembourg, Malta, the Netherlands, Austria and Portugal, and from the EATR indicator are Belgium, Germany, Spain, France, Luxembourg, Malta, Austria, Portugal (as in the previous case), plus Greece, Italy and the United Kingdom. The long-term increase in the indicator of corporate tax revenue (in relation to GDP or TR) in conjunction with the increase in tax rates (STR or EATR) is observed in Belgium, Luxembourg, Malta, Portugal and the UK. Trends in the rates is their decline, which is linked within the EU-28 member states with the unchanging or moderately growing development of corporate tax revenues. It can be assumed that the fall in tax rates and the stability (or moderate increase) of corporate tax revenues are the result of widening tax bases in individual EU-28 countries. This is evidenced by the growing number of categories that affect the qualitative side of LP taxation. A qualitative approach has revealed the scope and complexity of EU-28 member states' tax systems. From the point of view of the categories favouring the business conditions in the form of a reduction of tax bases in the three-year cross-section period, countries favouring the taxation of LPs (at least 6 of the 15 factors observed) considered Cyprus, Malta, Estonia and the Netherlands. From the point of view of the factors adversely affecting the taxation of LPs in the three-year cross-section period, Latvia, Denmark, Germany, Italy, Great Britain, Belgium and Croatia are regarded as unfavourably affected countries. Countries with higher economic performance have higher corporate earnings. It is adequate to state that higher corporate tax revenues are exclusively in countries with higher tax rates. It can be said that corporate tax receipts are affected by tax variables, economic performance in the form of GDP, new variables examining the tax system and the structural elements of this LP.

The assessment of the results of the analysis in line with the main research objective formulated confirms that there is a certain level of convergence of corporate taxation, but only in two separate blocks (old and new EU member countries) based on quantitative indicators. The analysis confirmed that, despite continued EU integration and tax system harmonization, there are differences in country-by-country taxation. These differences are visible at the level of the analyzed qualitative and quantitative tax indicators. The analysis also shows the differences between the new and old EU member states. Efforts for convergence in the tax systems of these EU countries should continue. However, the process of policy harmonization is long-term. The problem area in the EU tax sector are national reforms, which are often inconsistent, and difficulties remain in the attitude towards the harmonization of corporate tax income.

5 Conclusion

Against the backdrop of other events of this century, the motivation of the paper is to examine the categorization of EU-28 member states and to formulate similar, or, on the basis of economically significant clusters, different trends in company taxation and to assess their convergence. The analysis provided a synthesis of knowledge and empirical evidence on tax indicators of corporate income tax. Empirical analysis results confirmed that the cluster analysis - a tool for data collection - is a suitable method for obtaining the required information in tax matters and methods to be used to assess the similarity of the tax on corporate income. The results of the analysis are confirmed by hierarchical and non-hierarchical clustering procedures. Research, in terms of its practical implications, has confirmed the economically efficient and transparent categorization of EU-28 countries. The creation of two clusters confirms the current breakdown of the EU-28 into a two-speed Europe, which was also reflected in the tax area. The analysis confirms that there are still differences in tax burden among countries, especially in the group of old and new EU member states, which are both quantitative and qualitative. The level of convergence of the two clusters in the tax system is not sufficient and there is still room for implementation of the harmonization measures.

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Review in analysis of tax revenues in the selected EU countries

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Abstract

In this article, we provide a review of tax accounting research and a brief literature review in tax field. We analyze and identify trends in total tax revenues in the selected European countries. Our main motivation is to find out the structure of tax revenues of the EU Member States, and according to tax revenues development and characteristic trends, to determine if a common tax base in the EU area is appropriate, or not. We use graphical method and some statistics for tax revenues analysis. This contribution should provide a highlight from tax area from accounting point of view, and should be use as a theoretical base for further research in tax accounting.

Keywords: Tax revenues. Optimal taxation. Tax accounting. Public finances. European Union.

JEL Classification: H20, H21, H71, E62.

1 Introduction

Taxes. Is it necessary to investigate them? Which basic aspects should they meet to be optimal? And is it appropriate to harmonize various individual tax systems within one integration area into a common fiscal union? These are only a few questions which authors solve in their research studies recently. Tax policy of the individual states should primary follow the aim of obtaining and securing the sufficient volume of total revenues to the state budget. However, well-adjusted and efficient tax system should not only create state revenues and secure the source of public finances. Tax system should also create economic welfare for each citizen who pays taxes and contributes to fiscal budget. In the recent times, there can be found studies that solve tax problems about the optimal tax system, deal with detail examination of tax accounting principles or describe different correlation analyses of tax revenues and macroeconomic variables. There is also some interesting studies that explain corporate income tax and personal income tax, or deal with tax burden and managing tax revenues from accounting point of view. Therefore, in this article we want to introduce to the general public relatively new term of tax accounting which explains how to record an income tax in the financial statements. The importance of tax accounting in the EU countries is closely related to common tax policy, tax revenues and tax harmonization process. As Graham, Raedy & Shackelford (2011) stated in their contribution, tax accounting belongs to the most complex area of financial accounting, and represents international tax law that is regulated by international financial reporting standards on accounting profit and taxable profit (concretely IAS 12). In the EU Member states, tax accounting is still discussed theme because of the integration process and creating the common fiscal union with common tax base for all Member States. However, firstly when analyzing tax accounting and income taxes, is crucial to differentiate between financial accounting and tax accounting. Meanwhile the financial accounting deals with financial

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statements and keeping records in fair and true view, tax accounting is focused on adopting international tax law (such as IAS/IFRS) into the national tax legislation and adjusting optimal tax system.

In our article, we will focus on tax revenues analysis in the selected European countries. Our leading motivation is to find out and better understand an influence of tax revenues on the economic growth, and to understand the development and structure of tax revenues in the EU. We use data from OECD database for total tax revenues, expressed in percentage of GDP. Our contribution is divided into three chapters: in the first part of the article, there was defined introduction into tax problematics briefly; the second chapter provides theoretical and empirical review of recent tax principles; and the third chapter brings results and discussion about tax revenues in the selected EU countries. In conclusion, we sum up the main findings. The main aim of our article is to bring short review to this interesting topic in economics, as well as to determine an impact of tax revenues in the EU Member States.

2 Literature

First of all, based on theoretical findings, the first authors dealing with tax accounting in a complex way were Graham, J.R., Raedy, J.S., Shackelford, D.A. (2014). They present and evaluate financial and tax research about tax information in the financial statements, and especially pay their attention to accounting for income taxes. From empirical point of view, the most used methodology is correlation analysis, descriptive statistics and statistical parametric or non-parametric tests. The empirical literature occupies also with the analysis of tax effect on various macroeconomic variables (externalities, economic shocks, competition and else) using regression analysis.

When we look at tax accounting more deeply, we can find studies and working papers analyzing the structure of total tax revenues in the literature. The majority of studies analyze correlation between tax rate and volume of total tax revenues. However, these studies use mainly American data. In the European countries, there is no common tax base or tax harmonization yet, so it is more difficult to collect data for tax research. When we are talking about tax harmonization and reporting corporate income taxes, then it should be mentioned international financial reporting standards IAS/IFRS. International accounting standards brings recommendations and legal regulation of tax planning and accounting for income profit. Also, some studies focus on taxation from IFRS view, such as Chan, K.H., Lin, K.Z., Mo, L.L. (2010) who state that financial reporting standards significantly influence company`s tax liability, and therefore have an impact on accounting profit and taxable profit. The crucial importance of IFRS for many advanced economies is that they are a better choice for reporting tax and accounting methods. On the other hand, some other researches (such as Ayers (2009), Hanlon (2005)), claim that IFRS have a negative impact on tax accounting, and they cause large differences between tradition government legal rules and international tax accounting rules. As Gielen, F., Hegarty, J. (2007) mentioned, the topic of tax accounting is also interesting because of a deeper integration process within the EU Member States. This area is still opened and discussed, and so it become a challenge for tax consultants and researchers to project common and optimal tax base for the whole European Union.

Another view at tax research provides studies, which assess a link between tax avoidance, corporate firms and government (e.g. Minnick, K., Noga, T. (2010) or Rego, S.O., Wilson, R.J. (2012)). Those studies usually investigate a link between government measurements and a level of tax avoidance, or they find out how risky behavior of corporate manager is when they it comes to tax avoidance and tax planning mechanism. After the global financial crisis, there are

many studies (for example Robinson, L.A., Slemrod, A.P. (2011)) dealing mainly with identifying an economic impact of tax harmonization in the EU area.

To conclude, we present Table 1 where we define a literature review of tax research problems in the current times. As stated above, the most discussed tax research is focusing on corporate income tax, or efficient and optimal tax system nowadays.

Table 1 Literature review of taxation in recent times

| Field of research in taxation	Authors
Optimal and efficient tax system and optimal labor taxation	Mankiw, N.G, Weinzeirl, M., Yagan, D. (2009); Piketty, T., Saez, E. (2013)
Correlation analysis of tax system and is impact on the economic growth	Reingewertz, Y. (2018)
Corporate income tax analysis based on the international accounting standards IAS/IFRS	Gielen, F., Hegarty, J (2007); Jirásková, S., Molín, J. (2015); De Simone, L. (2016)
Tax harmonization and the common tax base	Gielen, F., Hegarty, J (2007);
Analysis of the average and marginal tax rate, efficient tax rate and tax inequality	Fairfield, T., De louis, M.J. (2014), Saez, E., Zuckman, G. (2016)
Fiscal decentralization and an influence of tax total revenues on the public finances	OECD (2002)
Tax burden of households and corporates	Atrostic, B.K., Nunns, J.R. (1991), OECD (2000)
Tax avoidance and tax analysis based on macroeconomic indictors	Armstrong, Ch.S., Blouin, J.L., Jagolinzer, A.D., Larcker, D.F. (2015)

Source: Own processing

3 Discussion and results

In this chapter, there is presented methodological framework and our results of tax revenues research in the selected European countries.

3.1 Methodology

In our article, we used data primary from OECD database for EU countries on tax systems. To analyze and find out total tax revenues (in percentage of GDP) in the selected EU Member States, we use visual graphs and basic statistics methods. In the previous chapter, we used a study by Graham, J.R., Raedy, J.S., Shaeckelford, D.A. (2012) to define and describe tax research problems.

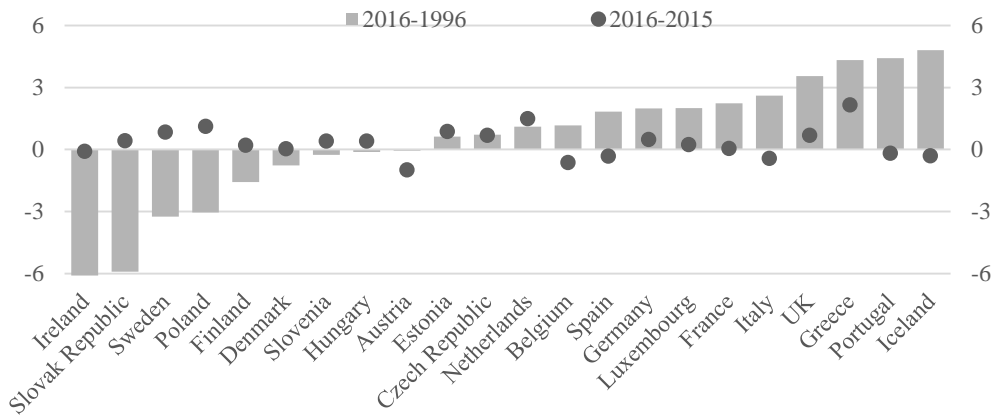## 3.2 The development of tax revenue in the EU countries

Proceed from OECD database, firstly we analyzed tax-to-GDP ratio. This indicator defines tax revenues collected from income taxes (personal and corporate), social security contributions, consumption taxes and property taxes. It indicates the share of country`s output that is collected by government. (OECD, 2017) We created some clusters for better projection of tax revenues in the EU Member States. As it is clear from Figure 1, tax-to-GDP ratio in period of 1995-2016 was slightly various. The highest tax-to-GDP ratio was recorded in Denmark (45.9% of GDP), Sweden (43.3%), Finland (44.1%) and Belgium (44.2%). On the opposite way, the lowest tax-to-GDP ratio was in the United Kingdom (33.2% of GDP), Ireland (23%) and Slovakia (32.7%). On average, tax-to-GDP ratio was at the level of 38% of GDP within the EU countries. It can be also noticed that in the Southern EU countries (mainly Spain, Portugal or Ireland, as well) was more considerable slump after occurring of the global financial crisis than in the EU core countries.
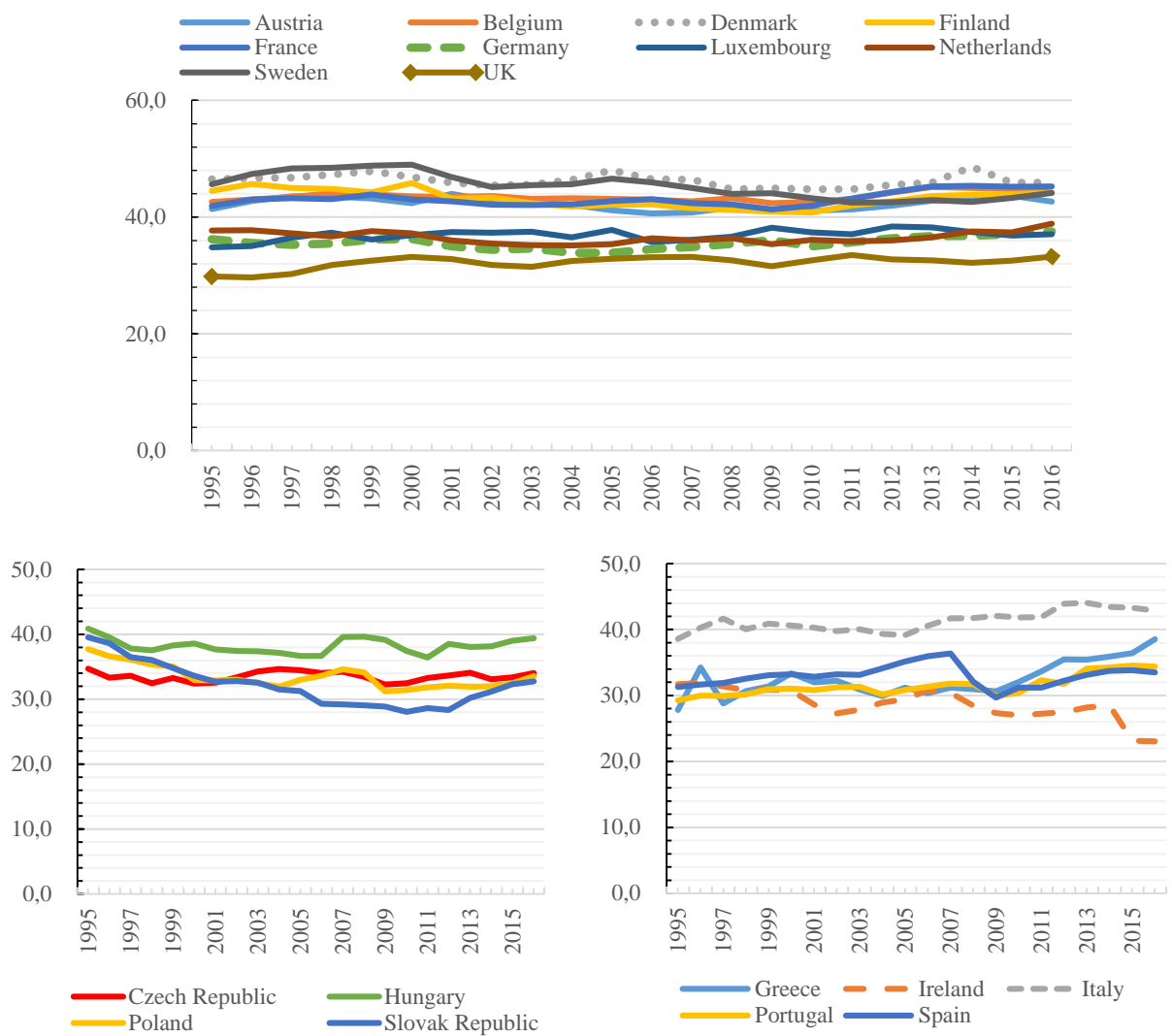
Figure 1 Total tax revenues in the selected EU countries (1995-2016, in % of GDP)
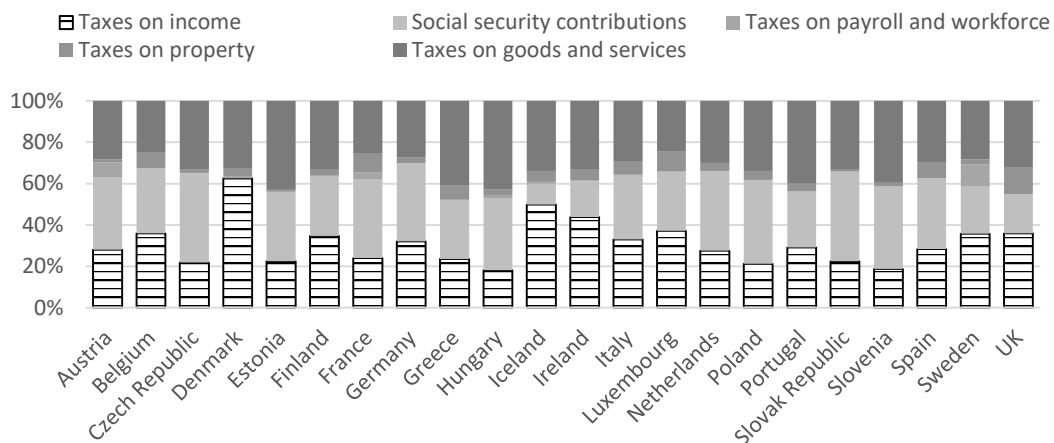Source: Own processing

Figure 2 shows changes in tax-to-GDP ratio in comparison to the previous year (2015) and to 1996. This change defines a growth rate of government tax revenues during the time. We can see that tax revenue growth in 2016-2015 period in majority of the EU countries had a slight increase (on average by 0.32% of GDP), except Greece where tax revenue growth arose by 2.1% of GDP. Meanwhile when we compare 2016-1996 period, there is a vary development of tax revenue growth: the largest negative change in tax-to-GDP ratio (that means a significant decrease in tax revenues during the period) was recorded in Ireland and Slovakia (-8.8%, resp. -5.9% of GDP), and the largest positive change in tax revenue growth was recorded in Greece, Portugal and Iceland (4.4% of GDP). So we can conclude that across the EU States ranged tax-to-GDP ratio from 33% to 42% of GDP, and so the contribution of tax revenues into particular state`s budget is different. To set a common tax base, we think that the differences between EU countries in tax revenues should be as low as possible because of securing stable common incomes.

Figure 2 Changes in tax-to-GDP ratio in selected EU countries (in 2016-2015 and 2016-1996, in %)
Source: Own processing

After understanding the development of total tax revenues, let us look more deeply at the tax structure. According to OECD (2017), the tax structure is measure by the share of major taxes as a percentage of total tax revenues. In 2016, based on OECD (2017) in the most developed world countries the tax structure very varied. As it can be seen from Figure 3, in the majority of the EU countries the largest part of tax structure represent income taxes, both corporate and personal, and the social security contribution. Generally, income taxes have more than 30% of share in tax revenues and so they are an important source of generating public budget. (OECD, 2017) Social security contributions (that means revenues paid by employer, employee and self-employer persons) have also substantial share of total revenues in EU area, almost 25% based on OECD data. A smaller, but still significant role, plays revenues from consumption taxes (that means value added tax, and taxes on goods or services), with almost 30% in some countries. The smallest share in tax structure has property and payroll taxes (less than 10%).

Figure 3 Tax structure in the EU countries (in 2016, % of GDP)
Source: Own processing

4 Conclusion

In this article, we presented an analysis of government total tax revenues in the selected EU countries based on OECD database. We chose this topic because tax revenues statistics are crucial to many political decision, such as in distributing public finance, or in applying international accounting principles for income taxes in national tax laws, or in decision-making in the corporate management. Especially in recent times, there is a necessity to know the development of tax revenues due to setting common tax principles and standards within the

European Member States. The article should be use as a theoretical basis in the next research in taxation.

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Optimization of Income Tax in Conditions of Slovak Republic

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Abstract

The optimization of the tax system is one of the studied topics of economists since the second half of the 20th century. One possible way to calculate the optimal income tax is agent-based modeling, where behaviour of small components determines outcome of the model. When maximizing the revenue of the government budget, behaviour of tax payers is guided by the goal of maximizing their utility composed of income and free time. On the other side government tries to maximize their income by tax policy. The model was created to compute uniform taxation under conditions of Slovak Republic. Subject of our work was middle class, where model recommends uniform tax rate of 24 %. Although the calculated tax rate is considered optimal, implementing progressive taxation could lead to more accurate results.

Keywords: agent-based modelling, income tax optimisation

JEL Classification: H21

1 Introduction

Agent-based modeling is one of the computational forms of scientific modeling that has been supported by the development of modern computing, especially since 1980. The principle of agent simulation lies in the use of agents, which are autonomous entities with relatively simple behaviors. That represent the real units of the monitored system where they operate and respond. During the simulation agents are monitored at discrete time, and each step the behavior of all agents is evaluated. The state of the environment depends on their initial parameters, as initial taxation, number of agents and learning speed of agents. Agents in our model are residents who pay income tax and the state that collects this tax. We could also consider state as agent, but the tax system of the Slovak Republic is created without progressive taxation. (Zoričák, 2016)

The aim of this paper is to analyse Slovak tax system under simplified conditions and to compute optimal uniform taxation. The data can be used to analyse behaviour of agents, because tax payers try to maximize their utility and also the government tries to maximize its revenues. Using results of the agent based-model it is possible to evaluate tax rates to maximize taxpayers and state benefits, as did James Mirrlees and Matti Tuomala. (Mirrlees, 1971; Tuomala, 1984)

2 Optimal tax theory

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Taxation can be interpreted as storing and charging taxes by government in order to acquire resources to finance government spending. Tax policy should ensure that low economic and social costs arise in this process. The state benefits from tax revenues for various needs, including the creation of a legal system and a free enterprise environment, macroeconomic regulation, ensuring microeconomic efficiency and redistribution. (Mikesell & Murphy, 1991)

Literature dealing with optimal taxation is quite extensive, especially since 1970, and many authors have sought to find criteria that should meet an optimal tax system. According to the OECD, the optimal tax system should be simple, fair, it should remove tax obstacles to growth and focus on more effective tax bases. (Zubaľová, 2008) Tax optimization includes a wide range of issues and areas that the government should take into account, when determining the requirements for an optimal tax system. According to Bierbrauer & Sahm (2010) higher taxation in the country can not increase social welfare.

Some researchers consider the best tax is the smallest tax. On the other side tax should be way of offsetting differences of social polarisation. The government effort should go to a balanced state budget, but not through too high tax burden. (Auerbach, 1985)

Optimization of taxation is closely linked to the psychology and motivation of tax subjects. If the government wants to convince a citizen to pay taxes, it should be convinced of meaningfulness and transparency that government can effectively, responsibly and correctly manage tax revenues. (Burák, 2016)

Tuomala (1984) points out, that marginal tax rates are not very low, and the shape of tax schedule is nonlinear. Substitution between income and leisure has very important function, because every citizen must choose between these two forms. Using average substitution of leisure equal to 0.5 we have tried to make comparable results.

3 Model

The basis of this analysis is the idea of optimizing the tax system of the Slovak Republic using utility maximization of taxpayers and the state. Government can adjust tax rate to maximize tax revenues, but also on the other side the tax rate affects the willingness to work of tax payers. This simple agent model was created in R. (R Core Team, 2018)

The agents have implemented learning tools that have served to help them with decisions. The goal of this paper was not to use real data, but based on input conditions, equations, and learning mechanisms create self-regulating system. We have assumed there are 48 working weeks in year and every citizen can adjust, how many weeks of year he will work, according to actual tax rate. Every citizen has its own working productivity that affects his income and work substitution that affects utility of his free time.

When calculating government income, gross annual income of citizen was used, defined as:

$$GI = WP * \frac{WW}{48} * AI, \qquad (1)$$

where
GI   Gross annual income,
WP   Normalized working productivity,
WW   Working weeks,
AI   Average annual income.

Government revenues were calculated by using the classic formula, where we multiplied the sum of gross income of citizens in country and the tax rate in percent (we have abstained from other taxation conditions – non-taxable amount of tax base, etc.).

Agents tax payers use standardized leisure time substitution effect as well as standard labor productivity, maximizing their benefits based on tax rate. Utility of tax payers is therefore the sum of the net direct revenues and the utility of its free time. Utility is calculated as:

$$TU = WP * \frac{WW}{48} * AI * (1 - TR) + \left(1 - \frac{WW}{48}\right)^{0,5} * WS * AI * (1 + TR), \qquad (2)$$

where
TU   Total utility of analyzed citizen,
AI   Average annual income,
TR   Tax rate,
WS   Value of work substitution.

The function of root over the parenthesis is to emphasize importance of free time. When people work only few weeks in a year, they have a lot of free time and therefore utility of free time will be lowered. On the other side when people do not have free time, root will lead to higher utility of free time. We have also added direct effect of tax rate on utility of free time to make model more sensitive on changes of tax rate.

Since the relationship of tax rate and tax revenue has the shape of the concave function, the behaviour of government depends on initial tax rate of model. If initial tax rate is below optimal tax rate, increasing a tax rate would lead to higher tax revenue. On the other side, when initial tax rate was established above optimal tax of a model, every tax increase would be reflected in decrease of tax revenues. Therefore, learning mechanism was created that implemented solution to this problem.

If: $\qquad (GR_t - GR_{t-1)} * (TR_t - TR_{t-1}) > 0$

Then: $\qquad TR_t = TR_{t-1} + \alpha * \left(\frac{|TR_{t-1} - TR_t|}{MGR}\right)^{0,5} \qquad (3)$

Else: $\qquad TR_t = TR_{t-1} - \alpha * \left(\frac{|TR_{t-1} - TR_t|}{MGR}\right)^{0,5},$

where
GR   Government revenues,
MGR   Maximal government revenue,
α Learning speed of government.
Maximal government revenue is a revenue, when every citizen works the whole year, but deducts the entire salary to government in form of tax. Maximal government revenue served to set up a speed of learning mechanism, where government optimize the tax rate in order to get maximum tax revenues.

Created system was immutable, therefore citizens were created in the initial phase of modelling. There were no changes in nature of citizens during the simulation. Tax payers were created using normal distribution of work productivity and work substitution, in relation to the current level of average wage in Slovakia. Using Formula *(1)* gross annual income was calculated and the resulting distribution is shown on Figure 1. The total number of tax payers has been set to

5000, because this number produced even distribution of income, shown on Figure 1 and it should be enough to create a representative sample of a citizens. This distribution was generated on the assumption of average income of circa 1000 EUR, which corresponds to actual average income in Slovak republic. Created model has been repeatedly run 200 times, and in the discussion part we present results of model close to the average of results.
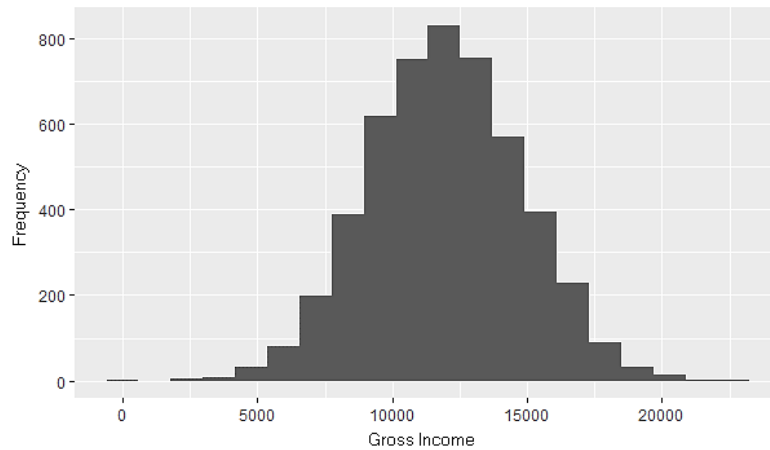

Figure 1 Distribution of annual gross income of tax payers
Source: Own processing

The substitution of free time depended on gross income, labor productivity and tax rates. Tax payers, whose value of substitution was higher, will work less, because of greater the importance of free time. Tax payers with a lower job substitution work more at the detriment of free time, because leisure is less important for their utility function.

4 Discussion

We have used normal distribution of tax payers, were low-income and high-income citizens do not play important role. On the other side, this distribution does not reflect the trend of social polarisation due to income inequality. Middle class should be the most important source of tax revenue. High-income citizens have also very high share of all government revenues from income taxes, but this people also should have other conditions of taxation. (Alm & Torgler, 2006)

Every tick represents approximately 1 period of the time, when in the beginning government announces tax rate for this period. After this information every citizen will decide about how many weeks a year he will be working to maximize his utility. The Figure 2 shows development of tax rate in the model. Because of higher learning speed set in the model, tax rate has reached optimum after 30 ticks. The duration has been set on 200 ticks, in order to show stability of system. The result of our model is the recommended tax rate on level 24%, where government should maximize its income tax revenues from middle class. The next development was driven by government effort of improvement of government revenue, but every attempt leads to lower revenue. Therefore, we can see fluctuations around the optimal tax rate of model.
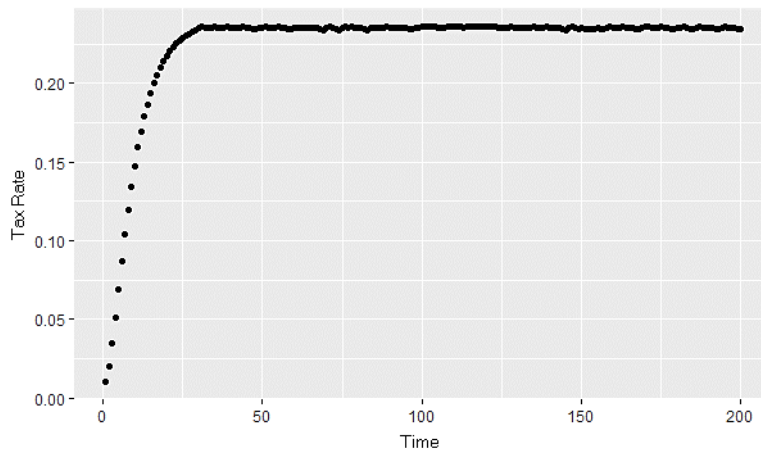
Figure 2 Development of tax rate in model
Source: Own processing

Agents tax payers have worked a certain number of weeks from 0 to 48 to maximize their utility. They have been deciding according to actual level of the tax rate. Their function of working weeks is decreasing with an increasing tax rate, because they replace work with free time. On the Figure 3 we can see the number of weeks worked by all agents and their gradual decrease with the increasing tax rate. This function has a concave shape, higher tax rates lead to higher decrease of a citizen working time.
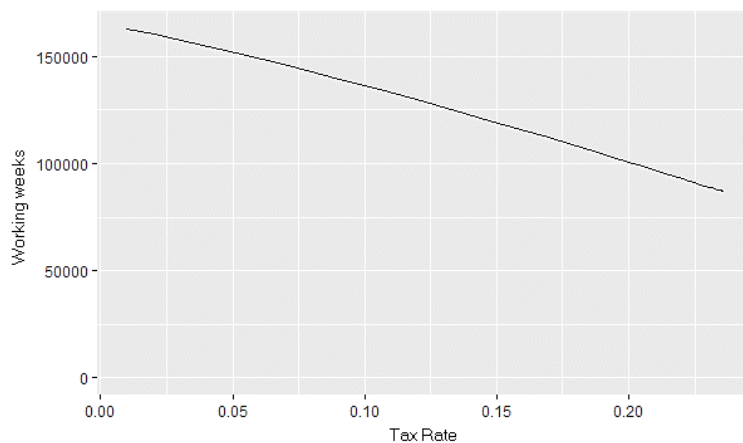
Figure 3 Relationship between tax rate and total weeks worked
Source: Own processing

According to theory of Laffer (2004) relationship between tax rate and government revenue has specific shape, that can change during the time. We tried to illustrate this relationship in our system. Income distribution of society can result in different forms of Laffer curve. The resulting Figure 4 has shown, that according to low average wage of middle class generated in our model, willingness to work starts to decline much earlier than in theory. This can be consequence of low amount of available money after taxation, and therefore people begin to rely on the support of the state. Higher average income incorporated to the model could be a sufficient reason to shift the curve to the right, which would correspond to the results of other studies.
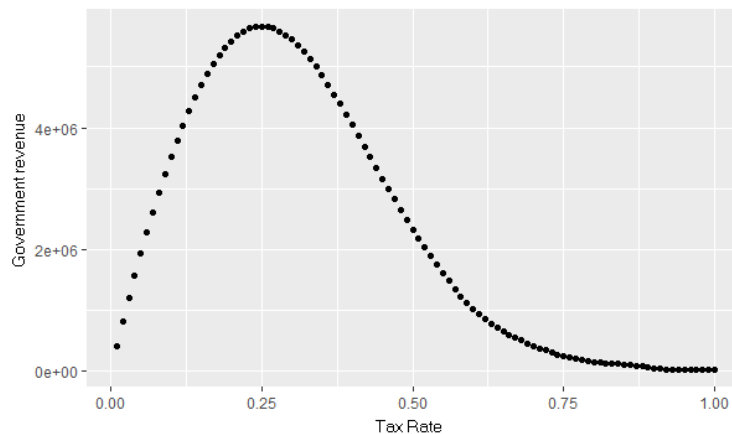
Figure 4 Relationship of tax rate and government revenues
Source: Own processing

5 Conclusion

The government of each state tries to fill the state budget as much as possible with tax revenues but also at the same time to encourage the population to work. Both, tax payers and government try to optimize their behaviour in a defined system, where they have different goals.

Under simplified terms, we have tried to find an optimal tax rate on personal income tax in this work to maximize tax revenue for the state. The optimal tax rate in our model was around 24 %. Currently, a progressive tax of 19% and 25% is applied in the Slovak Republic, thus, we can say that the optimal tax rate lies between the tax rates currently in use. Higher tax rate at the current average income could lead to preference for leisure time and so reducing the willingness to work or higher level of tax evasion.

Our results correspond to the optimal tax rate of middle class income, but only in conditions of the single tax. Therefore, expanding the model distribution of citizens by including low and high-income groups should be developed. This paper can be extended by other conditions that should lead to a more precise determination of the optimal tax rate, such as the non-taxable portion of the tax base and the adjustment of the income distribution.

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