VSB TECHNICAL UNIVERSITY OF OSTRAVA | FACULTY OF ECONOMICS | DEPARTMENT OF PUBLIC ECONOMICS

**VŠB – Technical University of Ostrava**
**Faculty of Economics**
**Department of Public Economics**

# DEVELOPMENT AND ADMINISTRATION OF BORDER AREAS OF THE CZECH REPUBLIC AND POLAND

## SUPPORT FOR SUSTAINABLE DEVELOPMENT


**2020**
**Ostrava, Czech Republic**

**VŠB – Technical University of Ostrava**
**Faculty of Economics**
**Department of Public Economics**

# DEVELOPMENT AND ADMINISTRATION OF BORDER AREAS OF THE CZECH REPUBLIC AND POLAND

## SUPPORT FOR SUSTAINABLE DEVELOPMENT

## Conference Proceedings of RASPO 2020


**Editor**

Eva Ardielli

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**DEVELOPMENT AND ADMINISTRATION OF BORDER AREAS OF THE CZECH REPUBLIC AND POLAND - SUPPORT FOR SUSTAINABLE DEVELOPMENT**

**Conference Proceedings of RASPO 2020**


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## Prologue

Dear readers,

this is the Proceedings of papers that were presented at the 3rd International Scientific conference “Development and Administration of Border Areas of the Czech Republic and Poland - Support for Sustainable Development” organized by the Department of Public Economics, Faculty of Economics of the VŠB - Technical University of Ostrava.

The 3rd International Scientific Conference **„Development and Administration of Border Areas of the Czech Republic and Poland - Support for Sustainable Development (RASPO)“** was organized on June 12, 2020. Due to the COVID-19 pandemic, this year's conference took place virtually.

The conference traditionally responds to common issues of the Czech-Polish border and the most discussed topics usually include Economic and social challenges of sustainable development, Economics and public services at the local level, Sustainable public administration and cross-border cooperation, Culture, ethnic minorities and migration, Public transport and reduction of air pollution, Ecology and efficient waste management.

Academics and students from Czech and Polish universities shared their professional experience and scientific research in real time. Many topics included the COVID-19 pandemic problem. The virtual conference showed that academics and students from Czech and Polish universities not only bring valuable scientific research results, but can also respond effectively to the new communication on-line tools.

This Proceedings of the RASPO 2020 conference include the peer-reviewed papers that have been successful in the review procedure and were approved by the Scientific Committee for publication.

Ostrava, June 2020

Iveta Vrabková
Head of the Department of Public Economics
Faculty of Economics
VŠB – TU Ostrava

## Content

# Comparison of the Financial Indicators of the ERASMUS+ Program in the Czech Republic and Poland

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## Abstract

School systems in the current European Union are very diverse. However, there are common trends and principles that are applied in all countries. The form and extent of individual implementation can vary. General trends and priorities include equality of access to education, multicultural education, emphasis on the development of key competences, emphasis on communication, the principle of employability and labor market links, emphasis on mobility, cooperation and lifelong learning, etc. The EU strongly supports the international mobility of higher education students. The Erasmus + program is an important tool in this area. The intention is to support students in their efforts to acquire skills that will contribute to their personal development and increase their employability. This paper is focused on the issue of student's mobility within the Erasmus+ programme in tertiary education in the Czech Republic and Poland and the comparison of main mobility and financial indicators. As a result, the EU countries are classified into groups on the basis of available grants per participant. Based on the performed cluster analysis, the Czech Republic and Poland belong to the countries with the lowest financial support per participant of the Erasmus + program in tertiary education.

***Keywords:*** *Comparison, Czech Republic, ERASMUS+, Poland, student mobility*

***JEL Classification:*** *F68, H11, Z10, Z19*

## 1 Introduction

The term mobility, or the ability to move, is becoming increasingly important. We can consider the mobility of citizens as basic mobility, which is automatic for us as members of the European Union. Freedom of movement for persons within the European Union is one of the fundamental rights of citizens of all Member States. Freedom of movement is of great importance for workers who can seek employment within the European labour market, where the supply of job opportunities is significantly wider and more diverse than in the conditions of individual national economies (European Commission, 2018). More and more often also students, participants in further education, teachers, masters of training or instructors are interested in mobility. This freedom of movement is called student mobility. Students leave the schools of their home countries for countries throughout Europe and beyond (European Union, 2017).

Cultural exchange has positive effects on all involved. For students, the greatest benefit of mobility and cultural exchange is undoubtedly gaining new experiences, improving in a foreign language, gaining new friends and contacts and gaining a general overview in the European context. In addition to the benefits that cultural exchange provides, there are also barriers and obstacles of various kinds. These barriers include, for example, social, cultural and linguistic barriers, including economic barriers (UNESCO, 2020a and Eijnden, J. et al., 2017).

Individual measures have been introduced to remove or at least reduce these barriers. General measures include, for example, the promotion of language learning, which would lead to the acquisition of at least two languages

spoken in the European Union. Improving access to scholarships and creating new financial instruments to support mobility (loans, grants, etc.), see Komise Evropských společenství (2009). Introduced measures in favor of students, should motivate students to complete part of their studies abroad, in recognition of parts of study time spent training abroad, using the European ECTS system and introduction of foreign language amendments to the diplomas (UNESCO, 2020b).

This paper is focused on the issue of student's mobility within the Erasmus+ programme in the Czech Republic and Poland. The aim is to compare the mobility and financial indicators of Erasmus+ programme in the tertiary education in the Czech Republic and Poland and to classify the EU countries in terms of the amount of grants per participant in higher education.

The topic of evaluating student exchange programs and cultural exchange is very important and current. The European Commission evaluates these projects every year, see European Union (2017). Specialized analyzes are also taking place in the academic sphere. For example, Marques, Zapp, and Powell (2020) examined three key patterns in the development of Erasmus Mundus Joint Degree Programme - the expansion of the program, the consolidation of pan-European networks, and the participation of and coordination by central universities in these Europeanization processes. Ardielli (2018) evaluated the language skills and participation on foreign culture in EU countries.

## 2 Mobility in Education at the European Union

Mobility in education, i.e. transnational mobility to acquire new skills, is one of the fundamental ways in which individuals, and in particular young people, can improve their future employability and enhance personal growth. Mobility in education increases the quality of human capital, as it gives students access to new knowledge and develops their language skills and intercultural competences. Thanks to mobility in education, education and training systems and institutions have become more open, more European and international, more accessible and more efficient (Bozoki, 2013). Mobility can also strengthen Europe's competitiveness by helping to build a knowledge-intensive society, thus contributing to the goals set out in the Lisbon Strategy for Growth and Jobs (European Commission, 2018; Capano and Piattoni, 2011).

Mobility in education has other positive features. For example, it can be beneficial in combating the risks of protectionism and xenophobia, which arise in times of economic crisis. It can support the deepening of young people's sense of European identity and citizenship. It also helps the movement of knowledge, which is very important for the future of a knowledge-based Europe, see Europa (2020) and Eijnden, J. et al. (2017). The potential of mobility in education and acquiring new knowledge can be also exploited as a means of creating jobs and combating unemployment and an important aspect of long-term sustainability, see Drastichová (2016b) and Slavata (2017) that points out the context of less mobility and the higher unemployment.

Related to mobility of students, there could be some factors — economic, social and psychological — which tend to lead to low mobility. For example, moving to a new location often appears to be costly due searching for housing. The European Union therefore supports learning mobility in the long term through various programs and initiatives, and in particular the Lifelong Learning Program, which covers a wide range of areas. Learning mobility is also supported by the Structural Funds. The mobility and exchange of higher education staff and students between European and non-European universities is supported by the Erasmus and Tempus programs, see Lifelong Learning Platform (2020).

The European Commission has helped to create a number of tools to facilitate mobility, such as Europass, the European Credit Transfer and Accumulation System (ECTS, higher education), the Diploma Supplement, the European Qualifications Framework for lifelong learning, the European Credit System for Vocational Education and Training (ECVET), the pass Youthpass 'youth passport, the EURAXESS portal, the visa directive for students and the visa package for researchers. Current mobility programs, tools and initiatives together reach different sections of the young European population (Komise Evropských společenství, 2009).

### 2.1 Educational Programmes

As part of its education policy, the European Union has set up EU education programs to support education. The first educational programs were created in the 1980s. At first, these were individual European programs. Gradually, however, most of them integrated into one program. In 1995, the Socrates program was established, focusing on education from kindergarten to school to university, adult education, improving the knowledge of European languages, promoting cooperation and mobility through education and, last but not least, the promotion of innovation in education and equal opportunities in all areas of education. This program was operational until 2006 (Socrates 1995-1999; Socrates II 2000-2006). All current EU member states, three European Trade Association countries (Iceland, Liechtenstein, Norway) and Turkey participated in the Socrates program (Euractiv, 2007).

The Socrates program was divided into eight sub-programs, which previously functioned as separate programs, namely Comenius (school education), Erasmus (higher education), Grundtvig (adult education and lifelong learning), Lingua (language education), Minerva (use of information and communication technologies, open and distance learning), Research and innovation (education policy issues), Joint actions (cooperation with other EU programs) and Complementary activities (support for activities not covered by individual programs), see Lifelong Learning Platform (2020).

Another educational program was the Leonardo da Vinci program, a European program aimed at supporting the development of vocational education and lifelong learning. It also supports internships and exchanges of high school and university students, graduates, young unemployed and young workers. Its aim is to improve young people's employability. It was created in 1995 by merging five separate programs, namely, Comett (higher education with a focus on economics), Eurotecnet (support for innovation and new technologies in vocational education), Force (support for vocational education), Petra (cooperation in education and training) and Lingua (language training) (Europa, 2020).

The Socrates / Erasmus program is followed by the Erasmus Mundus Scholarship Program. It is a five-year program that supports cooperation and mobility in higher education. It was launched in the academic year 2004/2005. In line with the goal of creating a knowledge-based society, the European Commission has consolidated all activities supporting lifelong learning under one program - the Lifelong Learning Program. The Lifelong Learning Program consists of four sectoral sub-programs, namely Comenius, Erasmus, Leonardo da Vinci and Grundtvig. These sub-programs are complemented by a cross-cutting program, which is further divided into four sub-programs - cooperation and innovation, languages, information and communication technologies, dissemination and exploitation of project results in practice. The last part of the new program is the Jean Monnet program, which aims to support teaching and research in the field of European integration in universities (Lifelong Learning Platform, 2020).

### 2.2 Mobility in Tertiary Education

According to the International Standard Classification of Education (ISCED), there are distinguished between the first stage of tertiary education (ISCED 5) and the second stage of tertiary education (ISCED 6), see UNESCO (2020a). Tertiary education is provided by universities and other types of colleges. The school systems in the EU countries are similar in basic trends in tertiary education, however, there are also considerable specifics of individual systems. At present, there is a particular trend to divide the first level of education (ISCED 5) into several relatively separate certified cycles. There is a strong emphasis on tertiary education in the EU, it is considered as a key factor in the development of economy, science, research, innovation and democracy in society, competitiveness and employability, etc. Several important declarations have already been issued in this area and mobility and internationalization in tertiary education in highly supported in the EU. In the case of the second stage of tertiary education (ISCED 6), the general trend is to increase the number of graduates of doctoral study programs, to support their mobility and participation in the European Research Area. The total number of students enrolled in tertiary education in the European Union ranged from 2013 to 2017, despite year-on-year fluctuations, at around 17,200,000 students.

Universities in the Czech Republic and Poland implement their international cooperation within programs such as Erasmus +, CEEPUS (focused on multilateral cooperation between Central and Eastern European countries), Aktion CR-Austria, PL-Austria, Visegrad Scholarship, DAAD and Campus France. Primarily the Erasmus + program is very widespread and best known in these countries.

### 2.3 Program Erasmus +

Erasmus was established in 1987 as an exchange program for university students. Since its first year of existence, with 3,200 students from 11 European countries (Belgium, Denmark, France, Ireland, Italy, Germany, the Netherlands, Portugal, Greece, Spain and the United Kingdom), the program has been constantly evolving. Over the years, the Erasmus program has expanded the range of trips originally intended primarily for university students to other groups of people. In 2014, the program was renamed Erasmus + and sends not only high school and university students to the world, but also teachers, apprentices, youth leaders and athletes. Recently, volunteering has also been popular, involving young people aged 17 to 30 (European Union, 2017).

All public universities and the vast majority of private ones apply to join the Erasmus program. About two-thirds of those interested will spend a semester at a university abroad. University students usually go to a foreign university for one semester. The rules for selecting students have different faculties. The hardest part is getting to universities in the UK. Students of secondary vocational schools and vocational schools and possibly also higher vocational schools most often go on practical internships directly to companies or firms in European countries.

Less often, they go on internships in vocational training organizations, where they combine theoretical teaching and practice (Aktuálně, 2020).

The Erasmus + program involves the Member States of the European Union, the Member States of the European Economic Area (Norway, Iceland, Liechtenstein) and, inter alia: and Turkey and the former Yugoslav Republic of Macedonia. In addition to these countries, partner countries can participate, but their participation is limited to a few events and often have to meet specific conditions (Naerasmusplus, 2020).

Erasmus + aims to contribute to the Europe 2020 strategy for growth, jobs, social justice and inclusion, as well as to the objectives of ET 2020, the EU's strategic framework for education and training. Erasmus + also aims to support the sustainable development of its higher education partners and to contribute to the objectives of the EU Youth Strategy.

Specific problems addressed by the program include reducing unemployment, especially among young people, and promoting adult learning, especially new skills and skills required in the labor market, encouraging young people to participate in European democracy, promoting innovation, cooperation and reform, reducing early school leaving and promoting cooperation and mobility with EU partner countries (Europa, 2020).

Erasmus + is divided into three key actions:

- KA 1 - Educational mobility of individuals,
- KA 2 - Cooperation on innovation and exchange of best practices,
- KA 3 – Support for education policy reforms.

### 2.4 Erasmus+ Funding

The Erasmus+ programme is managed by the European Commission (the EU's executive body), the Education, Audiovisual, and Culture Executive Agency (EACEA), a series of National Agencies in Programme countries, and a series of National Offices in some Partner countries.

The European Commission handles the overall management of the programme, including managing the budget, setting the priorities, identifying the programme's targets and criteria, monitoring and guiding the implementation and ollow-up and evaluation of the programme. In the EU countries, the Commission entrusts much of the management of Erasmus+ to National Agencies. Outside the EU, and specifically in the field of higher education, this role is filled by the National Erasmus+ Offices.

The Commission provides funding to the National Agencies, who use these funds to manage the programme's "decentralised" activities. This allows the Agencies to adapt the programme to suit their national education, training, and youth systems (Europa, 2020).

The program has a total indicative financial envelope of EUR 14.774 billion under heading 1 and 1.680 billion under heading 4 of the EU budget for a seven-year period (2014-2020). The Erasmus+ budget in years 2014 - 2018 is summarized in Table 1. It is evident from the table that finances are growing from year to year

**Table 1 –** Erasmus+ budget 2014 - 2018 (EUR, billion)

| **Year** | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|
| **Erasmus+ budget** (bil. EUR) | 2.07 | 2.08 | 2.27 | 2.6 | 2.8 | 3.01 |

Source: (Europa, 2020)

## 3 Material and Methods

The research is based on the comparison of mobility and financial indicators of Erasmus+ programme. The data were gained from annual European Commission Factsheets about Erasmus+ programme, see (Europa, 2020) and Culture Statistics, see (Eurostat, 2020). Obtained data were then evaluated using descriptive statistics and cluster analysis. Cluster analysis is a multivariate statistical method that is used to classify objects. It is used to sort units into groups (clusters) such that the units belonging to the same group are more similar than objects of the other groups. Cluster analysis can be carried out both on a set of objects, each of which must be described by the same set of characters that makes sense in the argument track and on a set of characters that are characterized through a specific set of objects, the holders of these characters. There are 5 classes of clustering methods: hierarchical clustering, partitioning methods (k-means, PAM, CLARA), density-based clustering, model-based clustering and fuzzy clustering. In the presented article was used hierarchical clustering (Kaufman and Rousseeuw, 1990). By hierarchical clustering a system of subsets is created, where an intersection of two subsets - clusters is either

empty set, or one of them. If there is at least once the second case, the system is hierarchical. The hierarchical clustering can be divided into two approaches -divisional approach and agglomerative approach. Hierarchical clustering offers several alternative solutions, the result of clustering is then possible to express as the dendrogram.

There are different approaches to clustering objects based on their distance or similarity. In the presented research was used the Ward´s method. Ward's method is based on an analysis of variance. Combines those clusters where is the minimal sum of squares. Generally, it can be said that this method is very effective, however, it tends to form relatively small clusters. Distances of objects are measured by Squared Euclidean distances. There are also several distance measurements for dichotomous variables (Dice, Jaccard, Russell / Rao, Matching), see Finch (2005). The results of these methods were not compared in this research.

A fundamental issue in partitioning clustering is determining the optimal number of clusters in a data set. There are more than thirty indices and methods for identifying the optimal number of clusters. The optimal number of clusters is somehow subjective and depends on the method used for measuring similarities and the parameters used for partitioning. A simple and popular solution consists of inspecting the dendrogram produced using hierarchical clustering to see if it suggests a particular number of clusters (Kaufman and Rousseeuw, 1990). Hierarchical clustering was performed using the Ward´s method in IBM SPSS software.The first part of the research is devoted to the comparison of eGovernment level in the Czech Republic and Poland. The second part of the analysis is aimed at evaluating the use of ten selected eGovernment services in the Czech Republic based on a questionnaire survey.

## 4 Results and Interpretations

In this part, a comparison of selected indicators of the Erasmus+ Programme in the Czech Republic and Poland is made. First, the mobility indicators in the Czech Republic and Poland are analyzed. Then a comparison of financial indicators of Erasmus+ Programme for the last five available years is made. Finally, the classification of EU countries according to the obtained financial support per participant is performed using cluster analysis.

### 4.1 Comparison of Educational Mobility Indicators in the Czech Republic and Poland

The number of mobile students from abroad in both countries is growing, see Table 2. The number of mobile students in the Czech Republic increased by 2651 students between 2013 and 2017, which is a growth of 7.67 percent. In Poland the increase was 30482 which means an increase of 140.55 percent.

**Table 2 -** Mobile students from abroad (EU) enrolled in tertiary education

| | **2013** | **2014** | **2015** | **2016** | **2017** |
|---|---|---|---|---|---|
| **Czechia** | 34 570 | 35 182 | 35 777 | 36 456 | 37 221 |
| **Poland** | 21 687 | 28 017 | 36 616 | 45 445 | 52 169 |

Source: Eurostat (2020)

From the Table 3 it can be seen that while the number of outgoing Erasmus + students is relatively balanced in both countries in the observed period (this is due to the amount of funding allocated to the program in a country), the number of incoming students is growing rapidly. The increase of foreign Erasmus+ students in the Czech Republic is 63.03 percent, in Poland 48.29 percent. This means that the interest of foreign students in coming to these destinations grows over time.

**Table 3 -** Erasmus+ mobile students and trainees

| | **2013/2014** | | **2014/2015** | | **2015/2016** | | **2016/2017** | | **2017/2018** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **out** | **in** | **out** | **in** | **out** | **in** | **out** | **in** | **out** | **in** |
| **Czechia** | 7510 | 6868 | 8228 | 8352 | 8104 | 9650 | 7891 | 10534 | 7365 | 11197 |
| **Poland** | 15521 | 11693 | 16796 | 13112 | 16690 | 15562 | 15453 | 16908 | 15266 | 17340 |

Source: Eurostat (2020)

### 4.2 Comparison of Financial Indicators of Erasmus+ Programme in the Czech Republic and Poland

In the Table 4, there are summarized the main financial indicators of Erasmus+ Programme in the Czech Republic in the years 2014 – 2018. It is evident, that the amount of allocated grants is growing in the monitored period. The amount of allocated grants in higher education is also growing. The number of participants is volatile in the monitored period. In 2018, however, it reaches a higher value than in 2014, both for the entire Erasmus+

programme and also in the field of higher education. In the table there are also calculates the values of the grants per participant and the values of the grants per participant in higher education in individual years.

**Table 4 -** Financial Indicators of Erasmus+ Programme in the Czech Republic

| | **2014** | **2015** | **2016** | **2017** | **2018** |
|---|---|---|---|---|---|
| Grants (mil. Euro) | 24.66 | 27.85 | 29.22 | 34.96 | 40.16 |
| Participants | 17916 | 15359 | 15275 | 19952 | 21658 |
| Grants - higher education (mil. Euro) | 13.80 | 16.71 | 17.89 | 20.78 | 24.10 |
| Participants - higher education | 10311 | 6560 | 7394 | 11592 | 12056 |
| Grant/Participant (Euro) | 1376.42 | 1813.27 | 1912.93 | 1752.21 | 1854.28 |
| Grants in higher education/Participants in higher education (Euro) | 1338.27 | 2546.59 | 2419.34 | 1792.66 | 1999.18 |

Source: Europa (2020), own calculations

In the Table 5, there are summarized the main financial indicators of Erasmus+ Programme in Poland. The amount of allocated grants is also growing in the monitored period. The amount of allocated grants in higher education is also growing in the period 2014 - 2018. The number of participants is also growing in the monitored period.

**Table 5 -** Financial Indicators of Erasmus+ Programme in Poland

| | **2014** | **2015** | **2016** | **2017** | **2018** |
|---|---|---|---|---|---|
| Grants (mil. Euro) | 78.26 | 85.96 | 85.55 | 92.11 | 100.67 |
| Participants | 46280 | 50877 | 51162 | 51161 | 57523 |
| Grants - higher education (mil. Euro) | 43.52 | 51.99 | 52.43 | 54.43 | 58.67 |
| Participants - higher education | 23151 | 27470 | 28200 | 27206 | 30025 |
| Grant/Participant (Euro) | 1691.01 | 1689.57 | 1672.14 | 1800.39 | 1750.08 |
| Grants in higher education/Participants in higher education (Euro) | 1879.72 | 1892.77 | 1859.26 | 2000.51 | 1954.17 |

Source: Europa (2020), own calculation

The values of the grants per participant in Poland are higher than in the Czech Republic in the year 2014 and 2017. In 2015, 2016 and 2018 these values are higher in the Czech Republic. The values of the grants per participant in higher education in individual years have the same trend.

### 4.3 Clustering of EU Countries

In Table 6, there are evaluated the EU member states according to the level of grants on participant in higher education based on the Cluster analysis, Ward´s method. The data point to reality in 2018. The countries are divided into 3 groups on Most subsidized countries, Medium subsidized countries and Least subsidized countries per Erasmus+ programme participant.

**Table 6 -** Evaluation of EU member countries by usage of Ward´s method (2018)

| Most subsidized countries per participant | Medium subsidized countries per participant | Least subsidized countries per participant |
|---|---|---|
| Cyprus, Malta, Estonia, Bulgaria, United Kingdom, Croatia, Greece, Sweden. | Latvia, Romania, Slovenia, Spain, Luxembourg, Hungary, Slovakia, Ireland, Lithuania, Germany. | Belgium, France, Finland, Italy, Portugal, Denmark, Austria, Poland, Czech Republic, Netherlands. |

Source: Own calculation

On average in EU countries, grants per participant are € 2198.80 in the year 2018. The lowest amount was found in the Netherlands (€ 1572.67). The highest amount was found in Cyprus (€ 3282.61). The Czech Republic and Poland are included in the group of countries with the lowest financial support per participant. In the Czech Republic the amount per participant is 1999.18 Euro, in Poland it is 1954.17 Euro.

## 5 Conclusion

This paper was focused on the issue of student's mobility within the Erasmus+ programme in tertiary education in the Czech Republic and Poland and the comparison of main mobility and financial indicators. The results of the research based on the examined indicators confirmed that the number of incoming students from abroad in the Czech Republic and Poland has been growing in recent years. The increase of foreign Erasmus+ students in the Czech Republic and Poland is also enormous. In the Czech Republic it is 63.03 % from 2013 to 2017, in Poland it is 48.29 % during the same period. When comparing the financial indicators in the monitored period, the amount of allocated grants is growing during 2014 – 2018 in both countries. The amount of allocated grants in higher education is also growing in the Czech Republic and Poland. The number of program participants in Czech Republic and Poland has also been growing over the monitored five years.

In this research the Cluster analysis and Ward's method with Squared Euclidean distance was used to perform the groups of EU countries according to the level of grants on participant in higher education in the year 2018. There were obtained 3 clusters of EU countries. While Cyprus, Malta, Estonia, Bulgaria, United Kingdom, Croatia, Greece, Sweden are among most subsidized countries per participant, Czech Republic and Poland, together with Belgium, France, Finland, Italy, Portugal, Denmark, Austria and Netherlands are among least subsidized countries per participant. Latvia, Romania, Slovenia, Spain, Luxembourg, Hungary, Slovakia, Ireland, Lithuania, Germany are ordered in the middle cluster.

The above research shows that EU countries do not have the same grants per participant; on the contrary, this amount varies from country to country and varies over the years. Unfortunately, the Czech Republic and Poland fall into the category of countries with the lowest grants per participant. At the same time, both countries show a large increase in the number of incoming students, which places increased demands on the ensuring of their stay. The number of outgoing Erasmus+ students from both countries remains quite the same and did not increase significantly during the period considered.

Students in each country should be encouraged on the home university to carry out at least one international mobility during their studies. This will contribute to improving professional competence and better employability in the future.

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# Information and Communication Technologies in Culture: Comparative Study in EU Member Countries

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## Abstract

The connection of culture with electronization and the involvement of Information and Communication Technologies to cultural sector currently brings many changes relating to the cultural participation of people and consumption of cultural products. By integrating ICT into the cultural sector, it is possible to improve and streamline the cultural process up to an innovative digital culture, thanks to which it is possible to actively enter into interaction with the viewer. Through the involvement of ICT in culture, not only online cultural products are created, but also opportunities for inspiration and creative activity of citizens are formulated. This paper is focused on the topic of electronic cultural participation of the citizens of European Union. The aim is to evaluate the actual usage of ICT by EU citizens for cultural purpose by the application of MCDM methods. As result, the EU Member Countries are ranked according to the participation of citizens in culture through ICT. On the best positions were placed Denmark, Sweden, Netherlands and United Kingdom while the worst state of electronic cultural participation was reported in Poland, Italy, Romania and Bulgaria.

***Keywords:*** *Culture, ICT, MCDM, participation, WSA*

***JEL Classification:*** *C38, O33, O57, Z18*

### 1 Introduction

Europe is characterized by significant richness and diversity of cultural heritage. Culture has the potential to play an important role in the EU integration process (UNESCO, 2009a). It brings together European citizens, provides a sense of identity and at the same time contributes to personal well-being, social cohesion and inclusion (UNESCO, 2009b). The cultural and creative industries are now increasingly seen as drivers of economic growth, especially as a source of job creation. These are the main reasons for the current importance of culture in EU policies (European Commission, 2013). In accordance with Article 167 of the Treaty of Lisbon, also the EU Member Countries may contribute to the flowering of cultures, while respecting their national and regional diversity, while bringing the common heritage to the fore (Compendium, 2017).

The cultural sector is distinguished from the creative sector, which includes all other sectors and activities that use art and culture as added value in the production of goods and services outside the field of art and culture itself, these are called creative industries (Cikánek, 2013).

The present time is characterized by a high involvement of Information and Communication Technologies (ICT) in all spheres of life. Culture is no exception, see Gardiner and Gere (2010). Currently, it is crucial that one of the effective factors is the ability to gather relevant and truthful information for decision-making and subsequent implementation. The use of information technology reduces costs and accelerates the development, production, distribution of products and services (Gere, 2008). ICT is also a tool for the emergence of virtual reality (Karaganis, 2007). ICT play an increasingly important role in creating value for the customers. From the real world, where interactions take place mainly through classic communication channels (telephone, business visit, meeting, etc.), in the digital world, the interactions are based on communication platforms (tools that allow many

people to communicate with each other), see UNESCO (2015). For example, the readers and contributors can access the platform from anywhere and at any time. Data are stored there permanently, so they can be discussed, searched and evaluated by users. Its goal is to enable a new type of communication and collaboration through digitally shared content (documents, audio recordings, videos, training, etc.) for all members of the community (Manovich, 2001; Praks, 2015).

Today's culture means everything that people do, say and think. Culture is a vast complex of phenomena that include the areas of knowledge, faith, language, morality, production, exchange, law, art, customs, education and action (Eurostat, 2019). Individual human perceptions are different. What one considers to be right or wrong, nice or ugly, tasty and disgusting, or true or untrue, applies only in the context of his culture. On the contrary, members of other cultures determine what is good, beautiful, and tasty or true differently, depending on their culture (UNESCO, 2009a). Therefore, the strengthening policies and strategies to promote the diversity of cultural expressions, cultural and creative industries, including more effective documentation, protection, transmission and accessibility is an important matter nowadays.

ICT has a direct impact on the way how cultural expressions are produced, disseminated and made accessible, and plays an increasingly important role in protecting and transmitting cultural heritage and promoting cultural diversity (UNESCO, 2009b). They allow better access to cultural goods and services, but in addition to access and distribution, they allow creators to interact with the audience, co-create and otherwise connect (Morrone, 2006).

Emphasis is placed on digitizing cultural content and heritage through a growing initiative that helps preserve this content for future generations (e.g. digital libraries and museums) and which also enables the involvement of marginalized groups, knowledge sharing (including traditional knowledge) and promoting social cohesion (UNESCO, 2016).

This paper is focused on the topic of electronic cultural participation of the citizens of European Union. The aim is to evaluate the actual usage of ICT by EU citizens for cultural purpose by the application of MCDM methods. Cultural participation is an essential dimension and driving force for the development of cultural sector of every country. It contributes to personal well-being and to the integration of individuals in society (Morrone, 2006; Brook, 2011). The cultural participation covers cultural activities as reading habits (books and newspapers), going to the cinema, attending live performances (plays, concerts, operas, ballet and dance) and visiting cultural sites (historical monuments, museums, art galleries or archaeological sites), etc. (Eurostat, 2019).

In the presented research, four areas of electronic cultural participation were included:

- households´ level of Internet access,
- use of Internet for cultural purposes,
- use of Internet for purchasing cultural goods and services,
- use of Internet space to store cultural content.

These four areas are represented by 14 cultural indicators. The data sources are the Cultural Statistics from 2019, see Eurostat (2019).

## 2 European Cultural Policy

The Treaty on the Functioning of the EU, and in particular Article 167 describes the EU's mission in the field of culture. The key task is to support and coordinate Member Countries' activities. In particular, preserving cultural heritage, promoting cooperation and international exchanges between cultural institutions in the Member Countries. The transition to digitalization and the promotion of innovation in the cultural sector are also key objectives (European Commission, 2013).

There are many different cultures in the European Union. This is a great opportunity to enrich the lives of European citizens through cultural diversity, but it is also a challenge that the community must face in the age of globalization. Culture lies at the heart of the European project, shaping European society and identity. It produces around 5.3 % of the EU's total GDP, or around € 509 billion, and employs around 7.5 % of its population, more than 12 million jobs (Eurostat, 2019).

The European “Strategy for Culture” was adopted in 2006. It set out the objectives of promoting intercultural dialogue and cultural diversity, fostering creativity through the cultural sector and promoting culture as a key component of the EU's international relations worldwide. The 2006 strategy is followed by the strategic framework for 2014 - 2020, called “Creative Europe”. The aim of this strategy is to support the cinema, cultural and creative industries (Beranová, 2016). It also includes the development of European cultural and linguistic

diversity, the promotion of the use of digital technologies, audience work, the development of interdisciplinary and international cooperation, and the collection of data on the cultural and creative sectors. It also plans to strengthen the capacity of the cultural and creative industries to work internationally and to improve their access to finance. The programs are open not only to EU Member Countries, but also to European Free Trade Area countries, candidate countries, potential candidates and countries involved in the European Neighborhood Policy (Euroskop, 2018).

The Creative Europe program also includes audiovisual media - film, television, video - and audio recordings, which, like goods and other services, are subject to rules that ensure their free circulation in the European single market. Coordination of this content is ensured by the "Audiovisual and Media Services Directive", which sets minimum standards. For example, in the field of promotion and advertising, child protection or the accessibility of audiovisual content to people with visual or hearing impairments (European Commission, 2013).

The budget for the Creative Europe program reached 1.46 billion euros, which is 9 % more than in the previous period. The program also includes previous EU programs - MEDIA (1991 - 2013), MEDIA Mundus (2011 - 2013) and Culture (2000 - 2013). 56 % of the budget is allocated to the MEDIA program, 31 % to the Culture sub-program and 13 % to the interdisciplinary part. From 2014 to 2016, the program provided € 544 million in funding and created around 3,000 jobs, making a significant contribution to the Europe 2020 employment target (Euroskop, 2018 and Eurostat, 2019).

One of the EU's most successful and well-known cultural initiatives is the "European Capitals of Culture". Cities are selected independently on the basis of a cultural program, which must have a strong European dimension and involve local people of all ages, thus contributing to the long-term development of the city. It is a unique renewal of cities, strengthening its creativity and improvement. So far, more than 40 cities have received EHMK status. The city selection process starts approximately six years in advance and takes place in two phases. The order of the Member Countries according to which the cities of those States are entitled to receive EHMK status is determined in advance (Compendium, 2017).

At the request of the Member Countries, the Commission proposed in 2010 a "European Heritage Label" to make it a formal EU initiative. The main aim is to deepen intercultural dialogue and the sense of belonging of European citizens to the Union. The selected places are responsible for symbolic values, important roles in the history and culture of Europe, the relationship to democratic principles and human rights. So far, 29 places have been selected by this designation (Euroskop, 2018).

The EU also protects national cultural treasures and integrates their protection with the principle of free movement of goods. It administers the physical return of cultural objects that have been illegally exported from the territory of the Member Countries. EU cultural policy awards cultural heritage, architecture, literature and music. In this way, it wants to highlight the excellent quality and success of European activities in these areas. The award raises the profile of artists, musicians, architects, writers and people working in the field of cultural heritage and their work. Thus, these awards highlight the rich cultural diversity of Europe and the importance of intercultural dialogue and cross-border cultural activities inside and outside Europe (Iskra, 2020).

## 3 Material and Methods

The evaluations of the selected sectors of national economies are often performed by usage of multi-criteria decision-making (MCDM) methods (Shaout and Yousif, 2014). MCDM methods are popular nowadays to solve problems in both public and private sectors. For example the MCDM methods - TOPSIS, WSA, VIKOR, AHP were used for evaluation of performance in health system (Karadayi and Karsak, 2014) or evaluation of public transportation services (Keyvan-Ekbatani and Cats, 2015). Ardielli (2019) used TOPSIS for evaluation of good governance in public administration. Vrabková, Ertingerová and Vavrek (2019) used the TOPSIS method for evaluation of social care in public sector of the Czech Republic. Vavrek, Adamišin and Kotulič (2017) used multi-criteria evaluation for municipalities in Slovakia. The MCDM method (WSA) was chosen also for the evaluation of the usage of ICT for cultural purpose in the EU countries presented in this paper.

### 3.1 MCDM model

Multi-criteria decision models show decision-making issues where the consequences of decisions are judged by multiple criteria. Multi-criteriality characterizes almost every decision-making situation. In these models of multi-criterial analysis of variants, a final set of variants $m$ is given, which is evaluated according to $n$ criteria. The purpose of the models is either to find the best variation on all considered considerations, to exclude ineffective variants or to arrange a set of variants (Šubrt et al., 2015).

The elements of the model of multi-criteria analysis of variants:

- variants of decisions $a_i$, $i$=1,…,$m$ (28 EU countries)

- criteria $f_j$, $j$=1,…,$n$ by which variants are evaluated (14 cultural sub-indicators)
- evaluation (preference) of variations according to individual criteria $y_{ij}$, $i$=1,…,$m$, $j$=1,…,$n$
- preference of criteria $v_j$, $j$=1,…,$n$, expressing their importance

In this paper all EU Member Countries (variants) were analysed according to 14 cultural indicators (criteria) by application of WSA method. WSA is a operations research method based on the principle of utility maximization. It arranges the alternatives in the order according to the total utility, which is taking into account all represented criteria (Fiala 2008).

### 3.2 Data

The research was based on the selected indicators from the dataset of Eurostat related to the "Culture statistics". Culture statistics present a selection of indicators on culture pertaining to the following topics: cultural employment, international trade in cultural goods, cultural enterprises, cultural participation, use of internet for cultural purposes and private cultural expenditure (Eurostat, 2019). From this dataset were selected 14 culture indicators connected with electronic cultural participation and selected the comparable data of the year 2019 or when not available of the year 2018. All criteria are maximizing nature. In calculations using WSA there are considered also the weights of individual criteria. The weights were determined by scoring method. These weighted values were used for the calculation. Selected indicators and their weights are described in Table 1.

**Table 1 -** Weights of criteria processed by scoring method

| **Area of electronic cultural participation** | **Indicator ($C_1$ – $C_{14}$)** | **Weights of indicators** |
|---|---|---|
| Internet access, 2019 (%) | Households – level of internet access – $C_1$ | 0.13333 |
| Use of internet for cultural purposes, 2018 or 2019 (%) | Playing or downloading games – $C_2$ | 0.53334 |
| | Listening to music (e.g. Radio wb, streaming music) – $C_3$ | |
| | Watching television or video broadcast via the Internet – $C_4$ | |
| | Reading online news servers/ newspapers/ news/ magazines – $C_5$ | |
| | Participation in social networks (creating user profile, posting messages or other posts on Facebook, Twitter, etc.) – $C_6$ | |
| | Creating websites or blogs – $C_7$ | |
| | Uploading content created on any website to share – $C_8$ | |
| | Consulting wikis (to gain knowledge of any subject) – $C_9$ | |
| Use of internet for purchasing cultural goods and services, 2019 (%) | Films/music – $C_{10}$ | 0.26667 |
| | Books/magazines/ newspapers – $C_{11}$ | |
| | Tickets for events – $C_{12}$ | |
| | Online shopping, downloaded or accessible from websites or applications: movies, music, e-books, e-magazines, e-newspapers or software – $C_{13}$ | |
| Use of Internet space 2019 (%) | Use of Internet space to store documents, pictures, music, videos, or other files – $C_{14}$ | 0.06666 |

Source: Eurostat (2019), own calculations

### 3.3 Methods

The WSA method (Weighted Sum Approach) is based on linear utility function. The method provides complete ranking of variants according to their total utilities. Application of WSA consists of the normalization of input data using following equation (1):

$$r_{ij} = \frac{y_{ij} - D_j}{H_j + D_j} \quad (1)$$

where $r_{ij}$ are the normalized values for $i$ variant and $j$ criterion, $y_{ij}$ is original value of variants according to the criterion $j$, $D_j$ are the values of the basal variant and $H_j$ are values of the ideal variant. Then was made the calculation of the total utility according to the following formula (2):

$$u(a_i) = \sum_{j=1}^{k} v_j r_{ij} \tag{2}$$

where $u(a_i)$ is the total utility of the variant $a_i$, $r_{ij}$ are normalized values from the previous step, $v_j$ is the weight of $j$-th criteria and $k$ is the number of criteria. Finally, the order of variants was set up according to the utilities.

## 4 Results and Discussion

In this part of the paper there are presented the application results of WSA method. Based on the results, it is possible to determine the order of the EU countries in terms of the state of electronic cultural participation from the best to the worst, as shown in Table 2.

**Table 2 -** Evaluation of electronic cultural participation in EU countries by WSA method

| Position | Country | Utility | Position | Country | Utility |
|---|---|---|---|---|---|
| 1 | Denmark | 0.91727 | 15 | Czech Republic | 0.43423 |
| 2 | Sweden | 0.84872 | 16 | Hungary | 0.42545 |
| 3 | Netherlands | 0.81153 | 17 | Lithuania | 0.37223 |
| 4 | United Kingdom | 0.80105 | 18 | France | 0.35555 |
| 5 | Finland | 0.75092 | 19 | Portugal | 0.33610 |
| 6 | Luxembourg | 0.67222 | 20 | Slovakia | 0.32352 |
| 7 | Germany | 0.64988 | 21 | Slovenia | 0.30179 |
| 8 | Estonia | 0.59656 | 22 | Croatia | 0.29882 |
| 9 | Ireland | 0.53247 | 23 | Latvia | 0.29799 |
| 10 | Spain | 0.52631 | 24 | Greece | 0.27815 |
| 11 | Malta | 0.52295 | 25 | Poland | 0.25985 |
| 12 | Belgium | 0.49250 | 26 | Italy | 0.21864 |
| 13 | Austria | 0.47632 | 27 | Romania | 0.13134 |
| 14 | Cyprus | 0.45848 | 28 | Bulgaria | 0.06448 |

Source: Author´s processing according to (Eurostat, 2019)

The ranking of EU countries according to WSA method presents that on the best place ranked Denmark and then Sweden and Netherlands. On the worst place ranked Bulgaria. Other countries with the worst state of electronic cultural participation were Romania, Italy and Poland. These results are similar to the results achieved in 2015 in Ardielli (2017a) where on the five best positions placed Luxembourg, Sweden, Finland, Denmark and Netherlands and on the worst five positions placed Bulgaria, Latvia, Croatia, Poland, Romania.

Cultural participation through ICT and modern technologies is largely dependent on technical parameters such as technical infrastructure, internet coverage and internet connection. Internet access is good in EU countries. 90 % of households have an internet connection (Eurostat, 2019). In the Netherlands, Great Britain and Sweden, the values are the highest (96 – 98 %). In contrast, there are countries where the Internet access in households is lower, as Bulgaria, Greece or Croatia, where the values are lower (75-81 %). The use of the Internet and ICT in the consumption of cultural products is not entirely common in all countries. The differences between countries are significant. While more developed countries commonly use the Internet for cultural purposes, this is less common in less developed countries. This may be related to how people are used to using modern technologies in everyday life, e.g. shopping through e-shops, the use of electronic eGovernment services, electronic banking. It can be expected that if citizens are used to using the Internet and ICT in these areas, their involvement in the electronic culture will be higher. This is confirmed by the results of countries that are at a high level in the implementation of eGovernment. According to United Nations (2016), the United Kingdom, Netherlands or Sweden has long been at the forefront in eGovernment, see Ardielli (2018). These countries are among the leaders in this study as well.

Furthermore, the level of electronic participation in culture also depends on the overall maturity of the cultural sector in a individual EU Member Country. UNESCO (2009), Chiaravalloti, (2014) and Ardielli (2017b) evaluates EU countries according to the performance of the cultural sector. Sweden, United Kingdom and Denmark place again in the leading positions in this area.

## 5 Conclusion

In the research there was investigated the importance of Information and communication technologies in European Union culture sector. The aim of the paper was to evaluate the actual usage of ICT for cultural purpose by the application of MCDM methods. For this purpose, there was selected the final list of variants (EU-28 countries) and criteria (14 cultural sub-indicators). The state of electronic cultural participation in the EU countries was evaluated by usage of WSA method. WSA method provides the complete ranking of the variants starting from the best towards the worst one. The results of the evaluation of EU countries acknowledged that the best ranking in this area obtained Denmark, Sweden, Netherlands and United Kingdom. The worst state of electronic cultural participation was reported in Poland, Italy, Romania and Bulgaria. It is possible to conclude, that the high involvement of individuals in electronic cultural participation is obvious in developed European Union countries; in less developed countries the electronic cultural participation is habitually lower.

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# SWOT Analysis of Creative Art in the Czech Republic and Poland by the Example of Publicly Established Theatres

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## Abstract

The paper summarizes conditions of functioning institutions producing mixed public goods in a creative art field at the level of the Czech Republic and Poland. Specifically, there are evaluated conditions of functioning publicly established theatres producing mixed public goods in cultural events field for inhabitants within the paper. There were applied analogue criteria of evaluated subjects within selected sample of evaluated institutions in territories of the Czech Republic and Poland. This includes overriding non-profit legal form of establishing, at least one professional theatre ensemble with permanent staff, regular operating of one theatre scene minimum, establishing of institution by public establisher, lower or higher territorial level (municipalities or regions) and a support of organization´s main activity through overriding sources from public budgets. The output of the paper is SWOT analysis of common characteristics of theatrical art by publicly established theatres in the Czech Republic and Poland, valid in 2020.

***Keywords:*** *culture, Czech Republic, Poland, public founder, public goods, SWOT, theatre*

***JEL Classification:*** *H44, H59, L33, R51, Z19*

## 1 Introduction

The importance of culture is undeniable in modern human society. The correct definition of culture and delineation of national nature is a matter of an infinite number of debates of renowned experts not only in culture field but also in e.g. frontal representatives of states. The concept of culture, according to Škarabelová (2007), occurred for the first time during the 17$^{th}$ century in France, when it was derived from Latin verb colo (colore, colou, cultum) that means grow and agriculturally occupy. Nowadays, it is not possible to choose one universally functioning definition that would be able to express comprehensiveness and width of culture concept. Neither the fact that humanity currently has the largest amount of available information, does not change anything about the fact, we are not able to define a concept of culture perfectly same as in antiquity or medieval. The United Nations for education, science and culture, known as UNESCO, has worked for definition of concept of culture when has stated: *UNESCO Universal declaration on cultural Diversity (s. l., 2001) state:* "Culture embrace in addition to art and literature also ways of life, ways of living together, value systems, traditions and convictions".

Perception of instilled cultural values helps society to form individuals into larger communities that create certain nation then with specific characteristics, common language and specific culture. The culture helps in retrospect to development of every individual of society, not only in emotional and intellectual field but in moral as well and thus fulfils its educational function. Common characteristics and ideas of individuals within culture connect individual states among themselves, while they vary them and characterize by their uniqueness.

From the view of economist the culture can be understood as specific life sphere of human society where arise and ongoing process that create, as a consequence, specific product. The main meaning of cultural sphere is production, creation, realization and brokering of cultural goods, which primary purpose is satisfaction cultural needs of individuals. A field of culture is a significant field in conditions of national economy of states,

especially if we focus on expenditure side when funding culture. The culture is fund from both private and public resources (usually different level of government) in developed countries of Europe. But culture is not only a recipient of private and public resources. In a field of culture, there is created a number of new markets, jobs, tax revenues into public budgets through realized activities. Culture, in a field of creative art, ranks among a filed of national economy producing especially public or mixed goods and services, and only exceptionally goods on a profit principle in the Czech Republic and Poland. The aim of the paper is to process common characteristics of theatrical creation of publicly established theatres in both states into organized SWOT analysis. SWOT analysis is processed on the base of operating of 92 public theatres which founder is lower or a higher unit of local authority (municipality or regions). Within found results, the emphasis will be placed on finding problems in field of management of public funds.

## 2 Public Goods, Culture and Review of Literature

The issue of goods was already mentioned in economy literature in the thesis of Paret and Schwier (1927) in a context of neo-classical theory of balance and Paret´s optimum. However, the first definition of public goods is attributed to P. A. Samuelson (1954), extended by Musgrave (1998) and discussed by Arrow (1963), Niskanen (1971), Pollit (1993), Buchanan (1998), Samuelson, Nordhaus (2010) or Stiplitz and Rosengard (2015).

Evaluation of cultural organization from different views is recently very popular, it is witnessed a number of expert thesis and publications focusing on not only art field but on evaluation of economic operation of the organizations. It can e mentioned e.g. a thesis of Frey (2003) or Kolb (2005), that focus on strategies for more attractive of classical music, museums or theatres for their visitors. Loach, Rowley and Griffiths (2017) deal with strategies for long-run sustainability of museum and libraries clients or Vrabková and Friedrich (2019) who state that an activity of cultural organizations is not only culture sustaining but it has na overlap to social, economical or environmental areas.

Economically focused works evaluating activity of cultural organizations usually comes from “Value for Money” (VFM), when e.g. according to Kalubanga and Kakwezi (2013) the base of VFM should be, by publicly established organizations, best use of public resources for achieving results, when management of organizations should be responsible for economy and effective organization management. This can be found, in a similar way, in thesis of Boyne (2002); Radnor and McGuire (2004);, Emery at al. (2008) or Antinoja et al. (2011). Principles of economy management and performance are recently applied by a number of organizations using benchmarking as well. The substance of the method is a pressure from public to organization management that is forced (from the reason of public funds support) to watch and improve provided services and increase performance to stood up to the competition of other organizations in the market (even on non-profit principle). The aim is to ensure long-term existential assurance both of users (visitors) and politicians and other subjects providing funds for operation of given organization.

If we look at creative art (theatre) within culture, we find most institutions in Europe originated in the past (usually during 18$^{th}$, 19$^{th}$ and 20$^{th}$ century) and primarily were not founded to create profit but to provide cultural services for aristocracy and high church dignitary (Černý 1982), they were provided for wide population later. It is very difficult to evaluate cultural organization providing services from economical view (Throsby, 2004) because profit aspect cannot be used, as it is usual by private organizations founded for that purpose. We meet with evaluation of users of services by cultural organization most often. Users satisfaction is very subjective thus the authors try to find objective measurable criteria through combination of economical and performance criteria. As examples of theatres evaluation can be noted works of Meineck (2010); Julien (2017); Ardielli (2018); Galecká and Smolny (2019) or Vavrek (2020). Nevertheless, the result of evaluation does not have to be objective because it depends on selection of economical and performance criteria and on used method of evaluation. The outputs are very different results of different authors when evaluating one specific field of publicly provided services.

Within this paper, the bellow stated institutions (theatres) of the Czech Republic and Poland will be evaluated neither from an economical view nor from a view of provided service quality but from a view of common reportable characteristics at a level of strengths and weaknesses and opportunities and threats. The aim of authors is, based on collected data and after studying economical and performance indicators by 25 publicly established theatres in the Czech Republic and 67 publicly established theatres in Poland, to work out SWOT analysis of common characteristics when operating theatrical art.

## 3 Material and Methods

It was based on a number of available materials of concept character to be used for SWOT analysis of common characteristics of theatre art in the Czech Republic and Poland. The materials are publicly available at the level of individual Ministry of Culture of the Czech Republic and Poland (e.g. cultural policy) or by evaluated

publicly establish theatres (annual reports) or from statistic of publicly available economical and performance indicators in creative art (theatres) within work out statistic by Statistical Office of both states (ČSÚ, GUS) or specialized organization of cultural field (NIPOS, theatre institute, etc.).

There were evaluated 25 publicly established theatres in a legal form of a contributory organization or a public service company equally placed in a territory of the Czech Republic producing drama, music (musical or operetta), opera, ballet or puppet performances within a file of Czech theatres. Their common characteristic is also a membership in Association of professional theatres in the Czech Republic, they establish, at least, one professional ensemble and operate one scene minimum. Twenty-two theatres from evaluated file are founded by municipalities with a number of inhabitants 30 thousands minimum (LAU 2), two theatres are established by regions (NUTS 3) and one theatre by combination of region and municipality according to percentage share of deposit of legal entity.

Evaluated public Polish theatres (dramatic, musical, puppet) are also established publicly by municipalities (LAU 2) but they have more than a hundred thousand inhabitants and voivodships (NUTS 3) according to territorial units for statistics (NUTS). The researched sample consists of 67 public theatres, out of 46 is founded by municipalities and 21 by voivodshis. A common characteristic is that they are founders of one professional ensemble minimum and one theatre scene.

A selected sample of theatres, a base for framing of SWOT analysis of common characteristics of theatrical art in the Czech Republic and Poland, is state in appendix to the paper and it is not full list of all publicly established theatres in given state. The theatre selection is evenly represented to a total number of publicly established theatres and their services geographically cover evenly whole territory of the Czech Republic and Poland.

Evaluation of theatres functioning is, to a certain extent, also influenced by a state of publishing information according to legal form of a theatre establishment in given state. As an example can be state differences in reporting of economical and performance information in annual reports of individual theatres, i.e. of contributory organizations, public service companies, business companies or limited liability companies.

## 4 Results and Discussion

In current Czech Republic and Poland, there are a number of publicly established theatres in a different legal entity (joint-stock companies, limited liability companies, etc.) that suggest, by their very nature and legal basis, establishment for profit, however, their founder is public. Legal entity was changed by a number of public established organizations providing cultural services sometimes at the turn of the millennium most often because of political convictions (without knowledge of relevant facts) of at that time elected representatives of local authorities, than from purely economical reasons with the aim to ensure regular profit of given institution. It is not possible to do realization of essential changes of economy when providing narrowly specific cultural services for wide sections population. According to Bernard at al. (2012), when funding culture, it should take into account the social interest in production of certain cultural goods. However, this is very problematic in all post-communist countries because inhabitants had been used, from the past times, to use certain kind of services without adequate finance participation from their own resources. It was out of the question for politicians to tell “harsh reality”, i.e. cultural services will no more be provided in under the same conditions. Economies of individual theatres got into state when price of costs increased and price of revenue (entrance fee turnover) stagnated. Increasing differences between costs and revenues (missing money) were, on the basis of politician decision of elected representatives of local authorities, rehabilitated from public resources. Such approach is from long-term view in the specified form and without setting of priorities for funding from public resources (education, health service, culture, sport, social affairs, traffic, building infrastructure, etc.) unsustainable.

It is work out bellow stated summary SWOT analysis (figure 1) from made analysis of available documents and information about functioning of individual theatres of the Czech Republic and Poland. The SWOT analysis descries common characteristics of theatrical art in both evaluated states.

**Tabel 1** – SWOT analysis of publicly established theatres in the Czech Republic and Poland

| Strengths | Weaknesses |
|---|---|
| • Rich history and tradition.<br>• Large number of established institutions.<br>• High level of professional artist and theatre employees.<br>• Employees work in institutions long term, usually for permanent employment.<br>• Wide spectrum of fields, it often occurs connection of theatre, music and art.<br>• Organizing of man cultural-social events (e.g. specific focused theatre festivals).<br>• Theatre competitiveness with other cultural institutions (within a country and internationally).<br>• Support development of tourism.<br>• A theatre is, in citizens´ awareness, very significant cultural organization of a territory.<br>• Large number of municipalities, as potential culture centre that are founder of theatres. | • Downward trend within funding from public resources to organizations of cultural field.<br>• Non-existing rules for funding of cultural field.<br>• Irregular funding of cultural organization of voluntary donors and sponsors.<br>• Unavailability of culture for some inhabitants (expansive entrance fee, traffic availability).<br>• Out of date, unsuitable material, room or technical background of theatre institutions.<br>• Low purchasing power of inhabitants.<br>• Inflexible legislation in cultural field.<br>• Different access to theatre finance according to a founder.<br>• Theatre management is dependent on a director of a theatre from economical view.<br>• Repertoire is dependent of finance possibilities of a budget. |
| **Opportunities** | **Threats** |
| • Growing trend of theatre attendance.<br>• Increasing number of realized titles and performances too.<br>• Increasing interest of public subjects in realization of performances, so called “on order”.<br>• Increasing role of donation and sponsoring.<br>• Cooperation and coordination of activities of individual cultural organization within one founder and in a branch (between themselves).<br>• Interest of inhabitants in new activities in cultural field.<br>• Including less common forms of performances within theatre repertoire (recitation, meet the author, latern magic, circus performance, etc.).<br>• Management orientation to use of available grant headings.<br>• Orientation to specific customers – children, teenagers, families, seniors, etc.<br>• Origin of new festivals and form of theatres.<br>• Cross-border cooperation between culture institutions in CZ and PL. | • Limited opportunities of public budgets and regular defence of organization functioning when change budget of founder<br>• Pressure of founder for increasing performance.<br>• Increasing price of wages and energies.<br>• Lower interest in traditional theatre repertoire.<br>• Lack of interest of some inhabitants groups in cultural activities – change to substituted activities of free time (internet, slot machines, drugs, criminality, shopping).<br>• Threat and possible extinction of cultural awareness of inhabitants living in defined territory, children and teenagers included.<br>• Decreasing willing of politicians to fund specific kinds of cultural institutions.<br>• Leaving abroad of quality artists.<br>• Threat of job opportunities in whole cultural field with a threat of economical crises.<br>• Increasing demands on material and technical equipments of theatres and their operation.<br>• Covid 19 and the change in the functioning of this type of institutions in the online sphere. |

Source: Own processing.

From the SWOT analysis results follow that publicly established institutions providing services in creative art field (theatres) do not differ in the Czech Republic and Poland significantly.

From the carried out analysis, it can further be state other different difficulties when providing theatre art within cultural field by some publicly established theatres in the Czech Republic and Poland. We can name e.g. increasing demands on number of realized cultural events from provided public funds, remaining unsatisfactory finance situation of most publicly established theatre, which is reflected in obsolescence of buildings and deterioration of technical parameters of evaluated theatres. Most public theatres of evaluated countries are dependent, to an important extent, on distributed funds from mostly public resources when produce art. And the

funds are redistributed according to inconsistent and often non-transparent criteria. Further, it can be note non-uniformity of observed indicators among institutions from level of individual founders and The Ministry of Culture too, significant role of government bureaucracy and general lack of resources from the view of economical ability of inhabitants when ensuring goods of cultural value (accepted entrance fee). Problem issue of quality ensure of production also is low number of permanent employees, as professional actors, or singers for permanent employment by some theatres.

Management of most professional theatres in current Czech Republic and Poland is placed in an unenviable situation for a longer time. On one hand, there is a try of founders to preserve operating of theatres in professional level, based on long-term declared art plans. And on the other, founder tries to restrict funds and subsidies from public resources. A theatre management is regularly controlled in a field of handling with allocated funds and minimum one of criteria for evaluation of organization operation is ability to keep balanced management. Funds necessary for operating of most theatres generally come from public resources of different government level (states, regions, municipalities) and reflect wiling of theatre founder and donator to keep and fund such cultural goods that are sought after by as many as possible visitors.

From the view of funding, it can be state by publicly established Czech and Polish theatres that amount of funds allocated for theatre operating is dependent on:

- Economical situation of founder and political will to fund certain kind of cultural goods for inhabitants;
- Own ability of management to gain finance resources from theatre creation dependent on selection of theatre repertoire and applied price policy (entrance fee revenue);
- Amount of funds that is possible to gain e.g. by selling or operating of other activities (e.g. refreshment), from temporally or permanent rent of unused rooms (e.g. halls, accommodation capacity);
- Resources possible gain by personal contacts and long-term cooperation with other business subjects, donators or patron of the arts (fundraising, crowfunding).

A higher level of finance self-sufficiency, about 50 %, show so called one-genre theatres in both evaluated states. They are most often focused on production of drama or puppet performance and they operate in large cities, i.e. Prague, Brno, and Ostrava in the Czech Republic, and Warsaw, Krakow, Wroclaw or Lodz in Poland. Self-sufficiency of multi-genre theatres is lower and it is about 20 %. These theatres offer more theatre genres (drama, opera, ballet, musical, etc) operated on one scene minimum but usually more scenes and more buildings in one municipality under the heading of one organization with legal personality.

## 5 Conclusion

Culture is an irreplaceable mean of information transport between generations. Culture, cultural environment development and its action is a long-term process. Results of this do not show immediately and thus it is important to offer quality cultural events to inhabitants, help them to identify with the territory and its traditions. Most processes in culture are economically inefficient by evaluated states and traditional cultural organizations (museums, theatres, libraries, etc.) are dependent on amount of funds from their founders. Finance of cultural institution is understood its sufficient finance security that covers total cost of operation.

From the view of economical theory, performance and quality is often discussed by organizations working on market principles, i.e. organizations established purely in private sector. Since, most institution in culture field (libraries, museums, theatres, etc.) are rather losses matter even in developed countries it is not possible to rely on invisible hand of the market because it often fails from different reasons. It is desirable to ensure providing of cultural goods for inhabitants for many reasons, but it does not mean we should not try to increase efficiency and performance of organizations operating their activities on non-profit principles and through prevailing public resources. If a management of any cultural institution ensure enough funds, it can fulfil their aims and it also has possibility to improve provided services.

From the SWOT analysis results follow that publicly established institutions providing services in creative art field (theatres) do not differ in the Czech Republic and Poland significantly. Their main role is to ensure available services for wide population in defined territory, where they often have no competition (except of large cities creating regional centre). Within operating activities, they contribute to feeling of belonging of an individual (citizen) to nations, regions, cities or towns and to their identification with community of people in both evaluated states. It can be state, from this view, that evaluated publicly established theatres positively influence individual´s perceptions and they can be one of motivation tools of young people to stay in an area or native region and they contribute to its development stability.

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## Appendix

A set of evaluated CZ and PL theatres

| Theater | | | | | |
|---|---|---|---|---|---|
| **CZ01** | CED Brno | **PL06** | Śląski teatr Lalki i aktora"Ateneum" | **PL37** | Teatr Rampa na Targówku |
| **CZ02** | Divadlo ALFA Plzeň | **PL07** | Teatr ludowy | **PL38** | Teatr Muzyczny Roma |
| **CZ03** | Divadlo F.X. Šaldy v Liberci | **PL08** | Teatr Bagatela im. Tadeusza | **PL39** | Teatr Rozmaitości |
| **CZ04** | Divadlo J.K. Tyla Plzeň | **PL09** | Teatr Lalki, Maski i Aktora "Groteska" | **PL40** | Teatr Scena Prezentacje |
| **CZ05** | Divadlo Na zábradlí Praha | **PL10** | Teatr Łaźnia Nowa | **PL41** | Teatr Studio im. S. I. Witkiewicza |
| **CZ06** | Divadlo Příbram (Antonína Dvořáka) | **PL11** | teatr im. H.ch. Andersena | **PL42** | Teatr Syrena |
| **CZ07** | Horácké divadlo Jihlava (R) | **PL12** | Teatr Nowy im.K.Dejmka | **PL43** | Teatr Współczesny w Warszawie |
| **CZ08** | Jihočeské divadlo České Budějovice | **PL13** | Teatr Powszechny | **PL44** | Teatr Żydowski im. E., R. i I. Kamińskich |
| **CZ09** | Loutkové divadlo Radost Brno | **PL14** | Teatr Lalek„Arlekin” | **PL45** | Opolski Teatr Lalki i Aktora im. A. Smolki |
| **CZ10** | Městská divadla pražská | **PL15** | Teatr Lalkii Aktora „Pinokio” | **PL46** | Teatr „Maska” w Rzeszowie |
| **CZ11** | Městské divadlo Brno | **PL16** | Teatr Muzyczny | **PL47** | Teatr Muzyczny im D. Baduszkowej w Gdyni (R) |
| **CZ12** | Městské divadlo Zlín | **PL17** | Olsztyski Teatr Lalek | **PL48** | Teatru Dramatycznego im. A. Węgierki w Białymstoku (R) |
| **CZ13** | Moravské divadlo Olomouc | **PL18** | Teatr Polski w Poznaniu | **PL49** | Teatr Wierszalin w Supraślu (R) |
| **CZ14** | Naivní divadlo Liberec | **PL19** | Teatr Animiacji w Poznaniu | **PL50** | Teatra Polski w Szczecinie (R) |
| **CZ15** | Národní divadlo Brno | **PL20** | Teatr Ósmego dnia | **PL51** | Teatr im. Stefana Jaracza w Olsztynie (R) |
| **CZ16** | Národní divadlo moravskoslezské Ostrava | **PL21** | Teatr lalek Pleciuga | **PL52** | Teatr im. A. Sewruka w Elblągu (R) |
| **CZ17** | Slezské divadlo Opava | **PL22** | Teatr Współczesny w Szczecinie | **PL53** | Teatr im. S. Żeromskiego w Kielcach (R) |
| **CZ18** | Slovácké divadlo Uherské Hradiště | **PL23** | Teatr Baj Pomorski | **PL54** | Teatr Dramatyczny im. J Szaniawskiego w Płocku (R) |
| **CZ19** | Těšínské divadlo Český Těšín (R) | **PL24** | Teatr Współczesny we Wrocławiu | **PL55** | Teatr im. Stefana Jaracza w Łodzi (R) |
| **CZ20** | Východočeské divadlo Pardubice | **PL25** | Teatr Lalek we Wrocławiu | **PL56** | Teatr Wielki w Łodzi (R) |
| **CZ21** | Západočeské divadlo Cheb | **PL26** | Capitol | **PL57** | Teatr Rozrywki w Chorzowie (R) |
| **CZ22** | Dejvické divadlo o.p.s. | **PL27** | Teatr Anateum im. S. Jaracza | **PL58** | Teatr im. J. Słowackiego w Krakowie (R) |
| **CZ23** | Divadlo Drak Hradec Králové | **PL28** | Teatr Baj | **PL59** | Teatr im. St.I. Witkiewicza w Zakopanem (R) |
| **CZ24** | Klicperovo divadlo Hradec Králové | **PL29** | Teatr Dramatyczny im. G. Holoubka | **PL60** | Teatr im. Jana Kochanowskiego (R) |
| **CZ25** | Severočeské divadlo opery a baletu (R) | **PL30** | Teatr Lalek Guliwer | **PL61** | Teatr im Wiliama Horzycy (R) |
| | | **PL31** | Północne Centrum Sztuki Teatr Komedia | **PL62** | Teatr Wielki im. S. Moniuszki w Poznaniu (R) |
| **PL01** | Teatr Polski | **PL32** | Teatr Kwadrat | **PL63** | Teatr Nowy im. Tadeusza Łomnickiego w Poznaniu (R) |
| **PL02** | Teatr Lalek Banialuka | **PL33** | Teatr Lalka | **PL64** | Teatr im A. Fredry w Gnieźnie (R) |
| **PL03** | Teatr Polski im. H. Konieczki | **PL34** | Teatr Nowy | **PL65** | Teatr im. W. Bogusławskiego w Kaliszu (R) |
| **PL04** | Teatr im A Mickiewicza | **PL35** | Teatr Ochoty | **PL66** | Teatr Im Jana Osterwy w Gorzowie Wlk (R) |
| **PL05** | Teatr Miejski im. W. Gombrowicza | **PL36** | Teatr Powszechny im. Z. Hübnera | **PL67** | Lubuski teatr im. L. Kruczkowskiego w Zielonej Górze (R) |

# The Impact of IP on Open and Closed Innovation Models for Sustainable Innovation

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## Abstract

One of the key elements of the company in sustainable development is the support of innovation. Based on the Global Responsibility and Sustainability Report (SDG), the Czech Republic lags behind other countries in supporting innovation and in a small number of patent applications. Working with industrial and legal protection databases enables businesses to avoid duplicate developments that have already been completed in the world, thus directly saving on development costs. An example of the trend of sharing research knowledge is the GreenXchange project, hrough which companies can collaborate and share their intellectual property, which can lead to the creation of new sustainable business models and further innovation. The aim of this article is to identify the aspects of IP on an open and closed innovation models, futher more identify other issues associated with open innovation, specifically IP acquisition, working with IP databases and IP licensing.

***Keywords:*** *innovation, intellectual property, patent, research, sustainable development*

***JEL Classification:*** *K11, L21, M20, M21*

### 1 Introduction

Intellectual property (IP) rights are designed as a tool for rewarding innovators and creators for their contributions to society, for legal time. They are designed to provide the necessary incentives to create and disseminate knowledge and support technology transfer. In general, the most important reason for securing any industrial-legal protection is to secure an exclusive market position in a given territory and hence to assert all rights that arise from legal protection. The effects of the patent are governed by the provisions of Section 11 of Act No. 527/1990 Coll., which states that the patent owner has the exclusive right to use the invention, to grant consent to the use of the invention to other persons or transfer the patent to them [1]. Patent protection makes it possible to offer products using the protected solution in an exclusive position, which leads to a financial bonus and a firm position in the market.

However, the concept of intellectual property covers a wide range of individual categories. As a follow-up to sustainable development, the most important are:

- Patents to protect and promote new, inventive and industrial uses of inventions;
- Useful patterns designed to protect technical innovations of inventions that usually do not meet the legal standards required for patents, the so-called inventive step;
- Unpublished information that protects commercial secrets (f.e. know-how, test results, etc.);
- Trademarks protecting the signs which distinguish the goods or services of one undertaking from the others;
- Geographical indications (GIs) identifying goods originating from a particular territory or having a specific geographical origin and where the production, processing and preparation of such goods takes place within a defined territory;
- Copyright to protect works of art such as music, literature, cinematography and other creations of creativity;

- Industrial designs that protect the appearance of the product, the ornamental or aesthetic aspect of the product. They may consist of the shape, pattern or colour of the product;
- Topographies of semiconductor products such as ICs, which are basic components of any digital device and which have been incorporated into a wide range of other industrial products.

## 2 Material

### 2.1 The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)

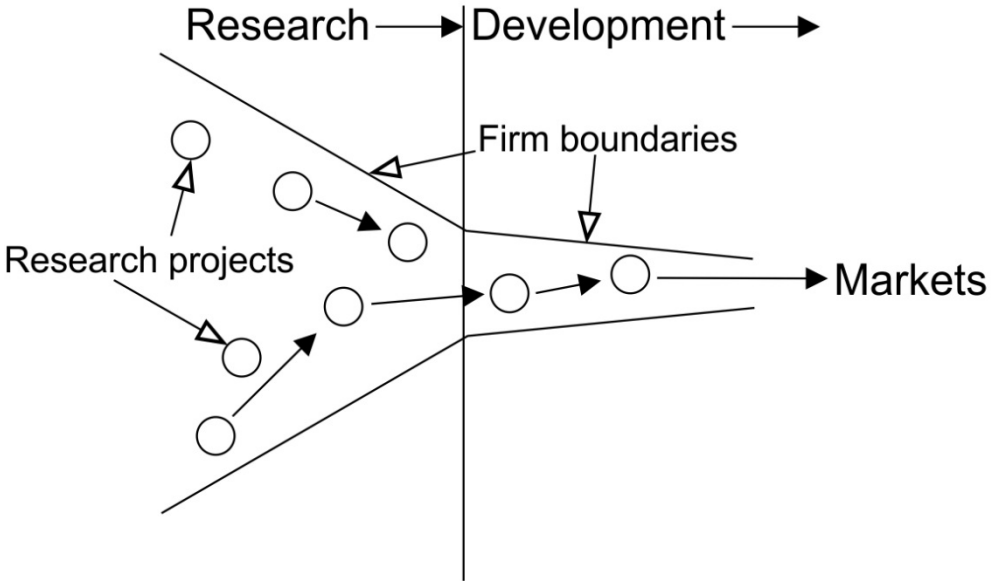
The TRIPS Agreement is the most comprehensive international agreement on intellectual property in general. Unlike other agreements, it regulates both industrial and copyright law. TRIPS defines, in its essence, the minimum standards of each category of intellectual property and the enforceability of these rights at international level.

The basic objectives of the TRIPS Agreement are to eliminate barriers to international trade and to ensure effective and proportionate protection of rights, and that this protection does not in itself constitute an obstacle to international trade [2]. It is anchored in the TRIPS Agreement that the States Parties give nationals of other countries the same treatment as that accorded to nationals of that State. One of the most important parts of the TRIPS Agreement is the protection of the principle of technological progress in the spirit of economically sustainable development. Within the scope of intellectual property, without distinction of copyright or industrial rights, the already created creations are protected on an international scale, no matter in which country they were created.

### 2.2 Closed innovation model

During the 20th Century, the company philosophy was clear: successful innovation requires control. It is thought that only by investing in internal development is it possible to achieve progress compared to competition in the market. Therefore, in this classical closed innovation model, it was crucial to hire the smartest developers and gain the greatest competitive edge in a given market segment through extensive investment in development and the subsequent protection of intellectual property. This approach was not bad. In history can be seen some successful results of closed model innovation, for example of Thomas A. Edison - the development of a phonograph, an electric bulb that led to General Electric, but the development itself was economically inefficient and time-consuming. The financial bonus resulting from an aggressive intellectual property strategy (patenting everything that a company develops) can then be invested back into internal development, but in the context of economic sustainability, this approach is undesirable. Other players on the market, whether in any segment, have to spend the money on their development, which is limited to the part that is not protected by intellectual property. Overall, this approach also has an impact on the environment. Historically the generations of closed innovation models as are: technology push, market pull, coupling, interactive model and network model [3]. All these models belong to the group of closed innovation models based on the way of working with IP. IP never enters in from external sources, either in the form of licenses or the purchase of IP.

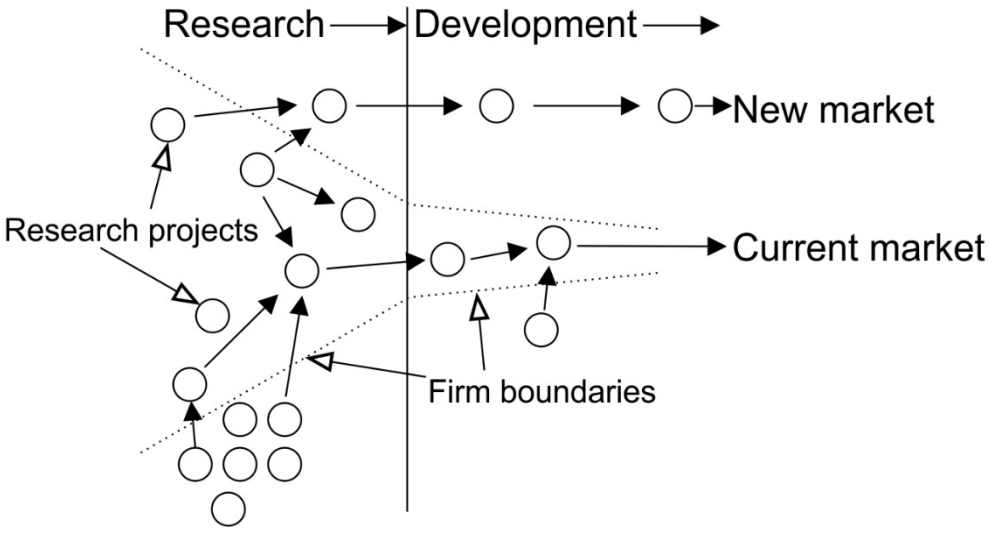
**Figure 1** – Closed innovation model. Source: Chesbrough, H., 2006 [4].




### 2.3 Open innovation model

In an open innovation model, the company is working not only with its internal research and development, but in the context of its development and its results, it also seeks to commercialize and evaluate the development stages in other market sectors. It is not just about "exporting" the outcomes of internal development out of company, but rather exploiting and sharing knowledge of the development with other companies and "importing" these outcomes of external development into the company back. The open innovation model works with the transfer of intellectual property between companies, whether in the form of joint startups (merger the result of development of two or more companies) or by sharing intellectual property (eg in the form of licenses). This model allows companies to get and share the results of other companies' development and thereby contribute to economically sustainable development. The open innovation model does not work with the company's borders and does not work with the country's borders. Its applicability is universal and a good example of such an overlap is SURPRISE DRINKS a.s., which, in the framework of its open model, innovates in intellectual property that is the result of the development of Polish partners and continuously commercialize them. The company itself does not have its own research and development, it only aggregates the results of their partners' development. It is also important to mention that it learns about the results of external developers through the search intellectual property databases they are continually working on.

**Figure 2** – Open innovation model. Source: Chesbrough, H., 2006 [4].



## 3 Results and Discussion

Patent protected innovations are more likely to influence the firm's decision to adopt closed innovation models. Generally, patents protect the idea as well as commercial application. Based on Trips agreement the patent owner is entitled to prevent anyone from making, using, selling the subject of patent. This means, that the patent owner excludes other competitors which results to closed innovation models which can lead to duplicate development. The so-called duplicate development, which is essentially a situation where a company develops a product or idea that is already developed and patent protected, is a common phenomenon in European countries. In 2012, the European Patent Office estimated that approximately EUR 20 billion had been spent since 2000 on the development of what has already been developed. And not only that the thing is developed, but it is also protected by intellectual property, so it is searchable in intellectual property databases. In the very life cycle of the innovation process, it is crucial to identify what is the state of the art (what already exists) and who is the owner. To find out whether to enter the innovation process, searches carried out on the subject of a potential innovation process serve. Research and surveys are used in scientific research activities, defining the innovation process in companies, and are instrumental in gaining insight into the state of the art and leading to a competitive advantage over other businesses in the industry.

Firms may not be able to produce IP, because creating IP usually requires strong investment in Research and Development (R&D). And also, the results of R&D may not gain IP law protection. For example, some firm may already start some form of innovation, but misses a certain technological components. In this situation, regarding the costs/time to develop this components, it is more efficient to search in IP databases for this missing components and to acquire IP through IP assignment, instead of producing IP itself. So the firms are sometimes forced to join for economic reasons. The processing of searches belongs to professional activities that involve work with both technical and legal information. If the company is interested in economically efficient management and adherence to sustainable development principles, it can by its search databases find out who is its competitor, who the solution the company intends to work with, and the owner of the intellectual property to get together and start working together. The difference between the closed innovation model and the open innovation model is shown below.

### 3.1 Comparison of closed and open innovation models regarding all aspects

In both models of innovative approaches, the main condition for the positive impact of research and development on the economy of the company is the ability to exclude "false positive" projects. This means identifying bad ideas that seem positive in the beginning. But only in the open innovation model, companies are working with "false negative" projects. These are projects that appear to be negative at the beginning, but can be an enormous benefit to the company. When identifying such a project or part of development, commercial potential begins to be sought through search databases. Who could have an interest in this result of development, who has already invested in similar project or invested in development of something similar. The aim is to find commercial usage. A negative example of an internal innovation model can be XEROX. Within this company, Ethernet and Graphics Interfaces (GUI) have been developed. As part of the internal innovation model, Xerox has appreciated that the benefits for their products (printers) will not benefit from these results, so development has been stopped. After a few years, the graphical interface (GUI) was used by Apple (Macintosh operating system) and Windows (Windows operating system). A positive example of the open innovation model is Cisco. Compared to its largest rival, Lucent, with its own research and development to develop state-of-the-art materials and systems for its future products and services, Cisco focused on an open model in which it purchased the results of the development of other companies from different industries, when Cisco needed something. Whether through licensing, partnership or start-up. This economically efficient model has helped Cisco become the market leader in communications equipment.

**Table 1 –** Comparison of innovative models.

| **Closed Innovation Principles** | **Open Innovation Principles** |
|---|---|
| The smart people in the field work for us. | Not all the smart people work for us, so owe must find and tap into the knowledge and expertise of bright individuals outside our company. |
| To profit from R&D, we must discover it, develop it, and ship it ourselves. | External R&D can create significant value: internal R&D is needed to claim some portion of that value. |
| If we discover it ourselves, we will get it to the market first. | We don't have to originate the research to profit from it. |
| The company that gets an innovation to the market first will win. | Building a better business model is better than getting to the market first. |
| If we create the most and the best ideas in the | If we make the best use of internal and external ideas, we will |

| | |
|---|---|
| industry, we will win. | win. |
| We should control our intellectual property (IP) so that our competitors don't profit from our ideas | We should profit from others' use of our IP, and we should buy others' IP whenever it advances our business model. |

Source: KEVIN R., DAVID K. (2000) [5].

## 4 Conclusion

Historically, intellectual property systems have been based on the notion that only government interventions to ensure protection and reward for innovators will lead to the motivation of other innovators to engage in research and development to build new ideas that will lead to further technological progress that will benefit the whole society. This idea later developed as a classical closed innovation model that has been practiced throughout the twentieth century. The closed innovation model is overcome today because of economic inefficiency and environmental impact. By working with industrial protection databases, the company can expand its portfolio of products or, on the contrary, find a partnership and thus commercially exploit the results of its current development. Only in this way can companies make investments more effective and contribute to sustainable development not only on the basis of financial savings but also on the environmental impact. As part of cross-border cooperation, partnerships in the context of development between Czech-Polish communities may result in the sharing of positions that will lead to the overall prosperity of both regions. The ideal goal of companies should be a clear application of the open innovation model, the search for strategic innovation partners not only within the Czech Republic, but also the search for partners in cross-border cooperation. Patent search databases will serve this well, with the help of which usable results of the development of other subjects can be found, which can then be contacted and these results can be used for their development. In Czech Republic, based on the SDG index [6], the Expenditure on research and development have risen since 2017, but according to another index, Triadic patent families filed have stayed the same. This mean, although in Czech Republic firms are spending more investments in R&D, they don't succeed in obtaining more patents. This could also mean slight weak work with IP databases and IP in general.

Innovation and IP have been linked since ancient times, and this relationship will certainly continue in times of open innovation model. In fact, a strong level of IP protection suppresses open innovation model, but without this protection firms may do not publish their results of innovation, but they would keep it in secret. This could possible lead to result of negative impact on the development of society, sustainable development and unnecessarily spent economic resources on duplicate development. The problem with open innovation model is the need for a clear and strategic IP management strategy. Nowadays, it is up to inventors (innovators) to choose a closed innovation model or move to open innovation model, which require clear and detailed IP management strategies. If companies want to pursue an open innovation model, whether by selling or buying licenses, it is essential they have a thorough knowledge of the IP legal environment in order to protect their IP or avoid breaching purchased IPs.

Essential for implementation of the open innovation model is the assessment of costs of management, operation and management of IP related to open innovation model. Another problem could be the aid intensity of nationals legal frameworks of IP-related laws related to licensing of patents. It should be noted that companies should maintain appropriate boundaries between their own R&D and innovation within their absorption capacity and should not rely too much on external partners.

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# Agriculture 4.0 – a New Stage of Modernization of Agricultural Holdings in Poland and the Czech Republic

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## Abstract

The aim of this study is to analyse the institutional conditions behind Agriculture 4.0, being a new stage of modernization of European agriculture, and to make an attempt at finding an answer to the following question: In what direction will systems of agricultural production develop within the framework of sustainable intensification? Particular attention was paid to the Farm Sustainability Tool for Nutrients (FaST) as an instrument of adapting digital technologies in agriculture and nutrition chains. The effectivity of institutional solutions of the Common Agricultural Policy 2020 (CAP 2020) will rely not only on the accepted model of organizing the institutional environment and co-management structures, but also on the modernization paths covered to date by agricultural holdings, as well as their involvement in ecological modernization of farming. The monographic research conducted with the use of the method of questionnaire-based survey in trade agricultural holdings in Opole Region allowed identifying the main gap in farmers' competences, which results from their insufficient knowledge relating to attributes of the local natural capital and services provided by it. Thus, the main conclusion that can be formulated on the basis of the conducted analysis concerns the need to create Decision Support System (DSS) in the sphere of making use of the primary productivity of the land and services of the ecosystems in raising agricultural holdings' productivity. Such a system ought to be of the transborder character, which is confirmed by institutional innovations successfully implemented in different countries as part of their transborder cooperation. They clearly show that differences in the agrarian structure of holdings do not pose barriers to the functioning of such systems.

***Keywords:*** *agriculture 4.0, Common Agricultural Policy, environmental regulations, modernization of agriculture, precision agriculture*

***JEL Classification:*** *Q16, Q18. Q56, O14*

### 1 Introduction. Agriculture 4.0.

The conception of ecological modernization gave rise to the present stage of modernization of agriculture. It is perceived as a process of separation of ecological rationality that co-decides about ways of managing agricultural holdings. In the 1990s, the institutions which formed the ecological rationality were agricultural-environmental programs and ecological farming. A successive stage in that process was opened by the Common Agricultural Policy (CAP) reform of 2003, connected with implementation of the principle of cross compliance (GAEC and SMR). In this very shape, ecological modernization required a reform of the system of agricultural advisory services, which, in turn, gave rise to adapting agriculture to economy based on knowledge (Bisaga et al., 2010). A significant institutional solution which favored ecological modernization of farms was the Directive issued by the European Commission, dealing with sustainable management of pesticides (OJ L 309/71 24.11.2009) , which basically transformed the model of farm management (Integrated Pest Management). The year 2013, saw the

beginnings of a new structural policy in European agriculture. The first pillar of the CAP was included into the ecological modernization. Consequently, 'Greening' was expected to contribute to protection of biodiversity and also to ensure conservation and development of "green infrastructure" in rural areas.

The new phase of modernization of agriculture can be referred to as 'reflective modernization', in which rationality directed at the goal (economic and ecological) is accompanied by communication rationality (Habermas, 1987). Reflective modernization assumes more knowledge, more experts and – first and foremost – building active trust towards the suggested solutions through managing networks of stakeholders. The quintessence of the new stage of modernization of agriculture can be the following: conception of responsible innovations (Rose, Chilvers, 2018) and model of formation of strategic plans introduced by the European Commission within the CAP 2020 (COM (2019) 392). The new phase of modernization of agriculture will accelerate the transition of European farming towards Agriculture 4.0, and will also invest these transformations with a clear social and environmental dimension.

Agriculture 4.0 is associated with the fourth agrarian revolution. The distinctive elements of technological revolutions in farming throughout the history were the following: taking advantage of the pulling power of animals (Agriculture 1.0), application of the combustion engine in machines and farming devices (Agriculture 2.0), using GPS signals in precision agriculture (Agriculture 3.0). The current farming activity is connected with cloud platforms (Agriculture 4.0). By contrast with the earlier agrarian revolutions – the latest one is going on almost parallel in industry and agriculture, which – without a doubt – is a consequence of simple industrialization of agriculture and its vertical integration within food chains (Zambon et al., 2019). Industry 4.0 combines machinery, labor and generally – systems – by means of intelligent networks established for the whole value chain. In this framework, Agriculture 4.0 denotes combined internal and external interactions of agricultural operations, offering digital information in all farming sectors and processes. In intelligent agriculture, the following technologies, among others, are used on a broad scale: Big Data, robotics, tele-detection, the Internet of Things. These tools can be addressed to individual farms, but can also create the developmental environment for the whole agricultural sector in the territorial framework. At present , such tools are offered by manufacturers of production means for agriculture, concerns producing intelligent machines, plant protection products and fertilizers. Thanks to these tools there are developed precision systems of plants and stockbreeding production.

Precision farming (Kušová et al., 2017; Samborski, 2018) is defined as running agricultural production in a way that secures carrying out relevant operations at suitable time, with the application of appropriate and possibly minimal number of production means (especially chemical ones), which facilitates an increase in economic effectiveness and technical productivity with the least burden to natural environment thanks to adjustment of the majority of elements of agrotechnology to changeable conditions of particular crops. Another distinctive element of precision farming is also the system of managing agricultural holdings, in which digital technologies are in use. Accordingly, the main components of precision farming are as follows:

- precise control of machines and devices working,
- identifying and analyzing factors which productivity of the soil and quality of products depend on,
- planning, monitoring and analyzing information.

The development of precision farming has become feasible thanks to the introduction of two technologies: geographic information system (GIS) and global positioning system (GPS). At the same time, different corporations offer machinery and devices to collect data (sensors, drones), as well as software to process information. Cloud platforms are established with the aim to process a series of information from different holdings. And this is the step that ought to be treated as one towards Agriculture 4.0. However, cloud platforms created by large corporations pose new risks (control of agricultural producers), as well as a number of controversies of the legal nature and related to data protection or intellectual rights. In the light of these controversies the European Commission's proposal seems relevant as it serves the development of precision farming within modernization of the CAP 2020 and the requirements of new conditionality which are included in this plan (COM (2018) 392). At the moment, on the basis of the nitrate directive (OJ L 375/1 31.12.1991), farmers are obliged to create Nitrogen Management Plans (NMP). This rule was then repeated within the framework of cross compliance principle accepted in 2003. In turn, in 2018, the European Commission proposed a new tool of sustainable management of managing nutrients – Farm Sustainability Tool for Nutrients (FaST). A farmer applying the FaST, apart from dosing nitrogen, must monitor usage of phosphorus. It is the farmer's duty, according to Art. 12, para 3 of the said directive, to activate the tool and introduce necessary information. The EU member states are obliged to provide farmers with such a device and the European Commission has its prototypes at their disposal. The FaST is meant as an application to go with a mobile device, able to display on the screen the boundaries of the farm and plots cultivated by the farmer, and also other information indispensable in nutrient management (Kowalczyk et al., 2018). The effect of the FaST ought to be an obligatory plan of

nutrient management in the form of colorful maps of plots and also other regular information updates concerning appropriate tasks pursued in the farm. The tool of FaST is of the module character, which means the possibility of passing more detailed data, for instance, from farm machinery if this is compliant with the interest of the farm in respect of management. The general architecture of information technologies supporting the functioning of this tool is to arrange for the following:

- optimizing the function of resources and costs,
- conducting scaling for a very large number of data,
- acting on the selected platform EU DIAS (cloud platform).

Information, data and services will be provided by Copernicus platform, supported by the Sentinel satellites by one of the companies chosen by way of bidding in 2019, which – in connection with information delivered through other technologies (e.g. tele-detection, data collected by sensors on the spot) can not only make optimization of managing an agricultural holding possible, but also are able to perfect the management of the environmental function and facilitate adjustment of instruments of the management to a farmer's individual needs. Moreover, data from the observation of the Earth, which come from the Copernicus system and are processed in the context of precision farming (Kowalczyk et al., 2018), can facilitate measuring agricultural holdings' environmental effectiveness, can prove useful to mark out buffer zones and broaden the knowledge on the influence of farming on: climatic changes, water resources, usage of energy and management of rainfall. The database built according to this strategy can be used while planning environmental and regional policies, as well as contribute to the development of transborder standards of measuring and monitoring practices of sustainable development in agriculture. Information collected via the FaST is also indispensable in the system of monitoring food chains and realization of consumers' rights to reliable information. All these possibilities were perceived in the strategy called "from farm to fork" (in other words: produce travelling from the field straight onto the table) accepted on 20 May 2020, whose aim is, among others, to diminish losses of nutrients by 50%. Undoubtedly, the FaST tool will be made use of to monitor the integrated action plan in the scope of managing nutrients, which the European Commission plans to prepare jointly with member states and which will be used in a network of data on sustainability of agricultural holdings (COM (2020) 381).

## 2 Material and Methods

The goal of the present study is to analyze the institutional conditions behind the new phase of modernization of European agriculture and to essay to answer the question: In what direction will systems of agricultural production aim within the framework of increased intensification?

This indeed was also one of the goals of monographic research conducted in trading agricultural holdings based in Opole region. The research was carried out in the years 2014 and 2018, with the use of a questionnaire-based interview in 100 farms with intensive and medium-intensive organization of production in communes representative of Opole Province. They were selected in compliance with the methodology of B. Kopeć, which is applied in monographic studies (Gołębiewska, 2010).

## 3 Results and Discussion

Upon Poland's integrating with the European Union, farmers operating in Opole Province expected improvement in profitability of production, strengthening of agricultural holdings as institutions, as well as broadening of the institutional environment that should favor modernization of farms (Bisaga et al., 2010). These expectations have materialized solely as far as the price of land is concerned (which undoubtedly had an influence on strengthening family-run farms as institutions) and access to new production technologies were concerned. In the countryside of Opole region there appeared a new phenomenon: a market and technological treadmill (Czyżewski, 2017), that is an obligation to implement innovations, augmented by a high technological culture already present in the countryside of Opole region and modernization paths which were taken in the earlier times. In the research of 2018, the farmers were asked about the motives which were lying at the foundation of implemented innovations (see Table 1).

**Table 1** – The motives behind implementation of innovations in the opinions of farmers based in Opole Province

| Specification | Indications in % in 2018 |
|---|---|
| Increasing production, sales | 62 |
| Lowering costs | 46 |
| Improving financial result | 45 |
| Bettering and modernizing the production process | 45 |
| High degree of wear of fixed assets | 14 |

| | |
|---|---|
| Rising quality and work efficiency | 26 |
| Possibility of obtaining funds from *PROW* (Rural Development Program) | 32 |

Source: Authors' own study based on the survey.

Among the variables explaining the causes of the market and technological treadmill the farmers enumerate the following: increasing of production (62% of the indications – the first place in the ranking), lowering of costs (46% - the second place), improving financial results as well as bettering and modernizing of production process (45% - the third place each) and the possibility of obtaining funds from PROW (Rural Development Program) (32% - ranking the fourth). The technological treadmill is a consequence of intensive connections of farms with the market, which raise a need for industrializing the production process and specialization of assets. The character of integration of agricultural holdings in value chains and market regulation structures lead to the occurrence of 'price scissors' phenomenon which in a significant way affects the profitability of agricultural holdings (see Table 2).

**Table 2** – Factors influencing the size of incomes of agricultural holdings according to the surveyed

| Specification | Place in the ranking | |
|---|---|---|
| | 2014 | 2018 |
| Prices of purchase | 1 | 1 |
| Prices of machines and devices | 3 | 4 |
| Prices of fertilizers and plants protection products | 2 | 2 |
| Prices of seeds and insemination material | 4 | 3 |
| Rise in the price of a product due to the possibility of its storage on the farm | 7 | 8 |
| Costs of credits | 7 | 6 |
| Height of taxes and fees | 6 | 7 |
| Height of direct payments | 5 | 5 |
| Bonuses from receivers on a high quality of produce | 9 | 9 |
| Premiums on participation in a group of agricultural producers | 10 | 10 |

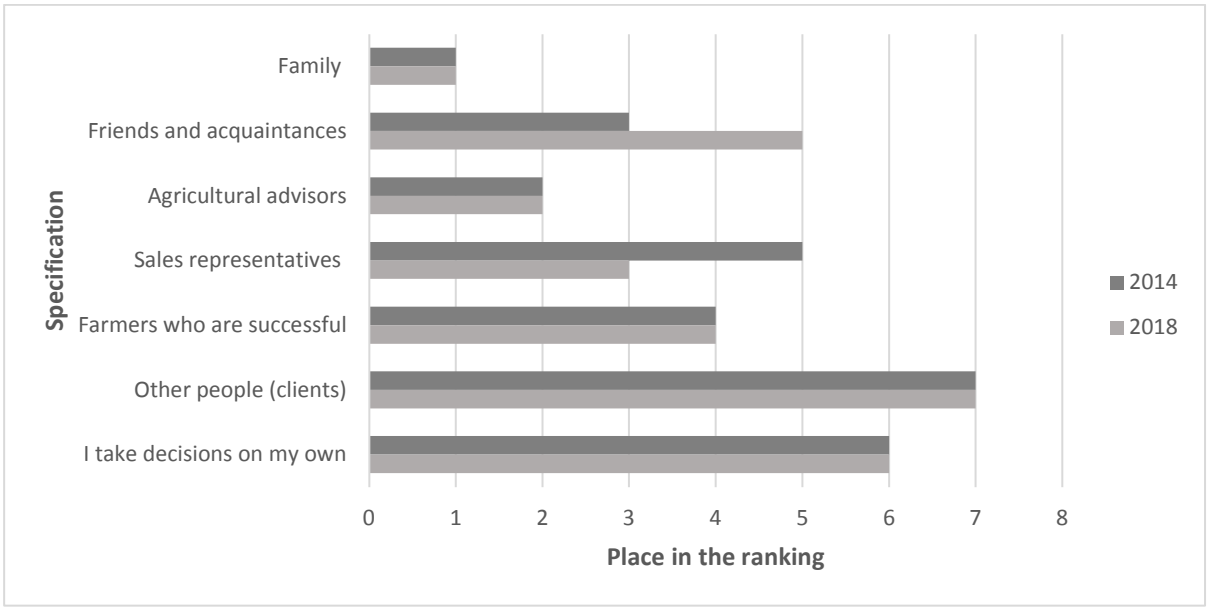
Source: Authors' own study based on the survey.

The phenomenon of 'price scissors' is broadly analyzed in the literature (Czyżewski, Mrówczyńska-Kamińska, 2010) since it exerts a strong influence on real processes, especially on assessment of changes in agricultural holdings' productivity. The point of reference is the price of farming produce; however, it is the volume of outlays (which is confirmed by the examined farmers) that decides about the division of productiveness surplus. As regards agriculture, periods of growth in prices of farming produce are short and do not compensate the volume of outlays on direct production means in long periods, when there ensues a decrease in the prices. At this time there intensifies the phenomenon of intercepting productivity surplus by other links of the food chain. It follows from Table 2 that new rents connected with storage of produce on the farm, their quality as well as those resulting from participation in producers' group only insignificantly influence incomes of agricultural holdings (the last place in the ranking). Also, direct payments do not compensate sufficiently the drain of economic rents resulting from a rise in productivity. It follows from B. Czyżewski's (2013) calculations relating to the mechanism of division of economic rents in food economy that the industry of production means only to a small degree takes part in draining farms' economic rents. Nevertheless, in the examined farmers' opinions, this makes the second position impacting their incomes. In this situation, the impossibility of realization of rents resulting from productivity surplus can pose a barrier to implementation of new models of management and organization of farms. On the other hand, in a given institutional environment, it can provide a strong stimulus to implement innovations.

The solidity of traditional agricultural holdings used to be secured by a constant mobilization, restructuring and differentiation of resources, which was the source of multi-functionality of the farms. A beam of these functions was of the individual nature (Ploeg, 2018), with the functions of farms being reflected by the holdings' autonomous targets as an individual set of relations between skills and resources, whose realization secured solidity to them. The autonomous targets, despite being based on hidden knowledge, made the main mechanism of family-run holdings' adaptation to the changing conditions of the environment. Modernization of agriculture has basically altered the mechanisms of specialization of assets and enforced a change of the decision-making model which links resources with skills in order to enter into market and institutional transactions. In agricultural holdings connected with the market, the autonomous goals have been subordinated to common ones (profit, size

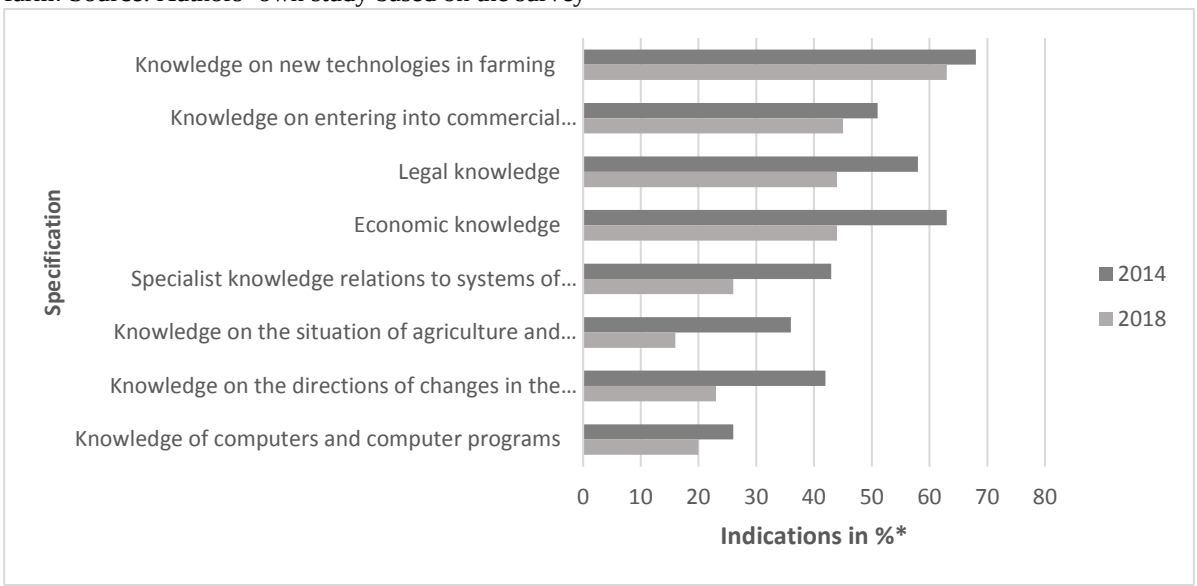
of production, economic force). The research dealing with the farming in Opole region permitted to identify stronger developmental processes which appeared after 1989. However, it was not before Poland's integration with the EU that the development and modernization of farms could become the main criteria of their solidity (Bisaga, Sokołowska, 2018b]. Acknowledging by farmers the developmental potential as an attribute of an agricultural holding's solidity was connected with a change in the way of taking decisions and – to a broader extent – with the model of managing farms (see Figure 1).

**Figure 1** – Subjects involved in creating the vision of development of an agricultural holding. Source: Authors' own study based on the survey




The model of management, in which agricultural advisors play the basic role in the process of decision-taking, formed within ten years of Poland's presence in the European Union and agricultural holdings' functioning within the institutional environment of the CAP. While presenting results of studies, it was underlined many times that the institutional environment of the CAP had initiated the process of adaptation of farms based in Opole Province to the economy based on knowledge (Bisaga, Sokołowska, 2018a). It needs stressing, though, that the new relations which must be entered into by farmers (both in the area of the market and the institutional one) enforce the processes of learning and gaining knowledge (see Figure 2).

**Figure 2 –** Knowledge indispensable to farmers in sustainable intensification of production and in managing a farm. Source: Authors' own study based on the survey




* It was possible to choose more than one option

In the case of this question, the respondents could give more than one answer. In comparison with the year 2014 the total number of indications has decreased. This demonstrates that farmers develop their skills of learning and are able to better identify their needs regarding the knowledge. Moreover, this change opens the process of learning onto expert's knowledge, information and innovations in agriculture.

The dominating role of knowledge of new production technologies results from the technological treadmill which was mentioned earlier. The power of its influence derives from the stimuli that serve the purpose of modernization of agriculture and is conditioned by both private and public institutional solutions which create conditions of competitiveness in agricultural markets. The aim of the new stage of modernizing agriculture is not as much to weaken the operation of the main mechanisms of modernization as to complement their actions with instruments of ecological and social rationality, ones that allow solving problems of food safety and climatic changes in connection with building economy of rural areas. In this new phase of modernizing agriculture it will still be necessary to improve knowledge on 'transaction technologies' and also economic knowledge, particularly in the area of risk management. A rise in the significance of legal knowledge was noted already in the research carried out in 2008. In legal sciences, it is even said about a renaissance of agrarian law. Following Poland's integration with the EU, the phenomenon of 'a surge of agrarian law' is pointed to have gained force, which results from the ecological modernization of agriculture legitimized within the CAP of 2003 (Rose, Chilvers, 2018). The introduced institutional change has proved significant to agriculture in these regions of Poland where there is intensive farming. In the work (Bisaga, Sokołowska, 2018a), the major instruments of ecological modernization of farming in Opole region were discussed and its main effects were pointed to. Technological optimization of production processes, as an autonomous target to secure solidity of family-run trading farms, was acknowledged to be the most important.

In the light of the findings, it needs asking the following question: In what way have the private and public institutions dealing in modernization of agriculture in Opole region managed to instill farming practices connected with the precision system of agricultural production? An answer to it is contained in Table 3 below.

**Table 3** – The influence of the institution of ecological modernization of the CAP on formation of the system of precision farming in Opole Province

| Instruments of precision farming | No. of indications in 2018 | Institutions supporting their implementation |
|---|---|---|
| Collecting data on spatial differentiation of crops within a field | 11 | GIS (Geographic Information System), services of suppliers of farm machines equipped with computers |
| Examination of the soil regarding its richness | 78 | GIS, farmers within the requirements of GAEC |
| Map of richness of the soils at the disposal | 17 | GIS, services of suppliers of farm machinery |
| Fertilizing balance | 36 | Plans of fertilizing – the Nitrates Directive, GAEC |
| Fertilizer spreaders, sprayers equipped with computers | 44 | Sales representatives, PROW (instrument – modernization of agriculture), credit lines for farmers in commercial banks |
| GPS | 17 | GPS |
| Information technologies (software) in the scope of agricultural production | 8 | The Internet, private software manufacturers |

Source: own elaboration on the basis of research, also see (Bisaga, Sokołowska, Szwiec, 2018)

As far as the present research is concerned, the examined farmers also pointed to the fact that the requirements of the GAEC and the SMR raised the largest number of changes in the applied agrotechnology (48% of the indications) and documentation of the performed work (39%). At the same time 70% of the respondents admitted that they used the documentation in managing their farms. It needs emphasizing that all of the examined holdings are equipped with computers, while 96% of them have access to the Internet. Farmers express their will to pass the data gathered in the production process on-line (39%) to the integrated management systems and to receive recommendations that facilitate decision taking in managing farms in the same way. On the basis of

these data it can be concluded that implementation of the FaST will run effectively in trading agricultural holdings based in Opole Province and will enjoy a great deal of interest on the part of farmers.

The accretion of knowledge on new technologies (compare Figure 2) causes farmers to get acquainted with hidden knowledge concerning the primary soil productivity. In the case of the question: "How does the quality of natural capital influence the quality and quantity of production in the holding?", asked in the survey conducted in 2018, 12% of the examined declared that they did not know. If the FaST is not extended with new modules and if there do not appear systems of supporting decisions which enable farmers to take advantage of and preserve the primary productivity of the soil, this phenomenon may intensify. In this case, the rising Agriculture 4.0 will not secure to farmers the leading role in managing nature, while fulfilling the indicative targets of the strategy 'from farm to fork' will definitely be hampered.

## 4 Conclusion

The conclusions following from the research, which concern the institutional conditions influencing the readiness of agricultural producers to implement the system of precision farming, may differ regarding the territorial framework, not only domestic, but also the regional one. However, they are indispensable in order to improve on the management system and its structures serving transformations of agriculture towards 4.0. It must be underlined that the 4.0 revolution in farming is possible both in large-area agricultural holdings that dominate in Czechia and are also present in Opole Province and in medium-sized and small family-run farms. Industry 4.0 was the first to perceive this, offering not only machinery, but also services of managing the primary soil productivity adjusted to different types of farms. It is only institutionalization of these solutions and subjecting them to social control that can secure sustainable intensification of agricultural production and its linking to transformation of food chains.

Cooperation in implementing the FaST can be not only of the key significance in building agriculture climatically resistant, one that conserves natural capital for future generations, but also in raising the quality and health values of food that is produced. A lot will depend on acceptance of the new strategy referred to as 'from farm to fork' accepted on 20 May 2020 and making one of the pillars of the European Green Deal, whose assumptions should be taken into account in national strategic plans of the CAP. This strategy has the transborder dimension, which can be the opening of institutional innovations which will decide about how the capacity of Industry 4.0 will impact Agriculture 4.0.

Innovations implemented in agriculture must be socially and environmentally responsible. Only the public manner of monitoring the effects of their implementation can secure an influence of various stakeholders on changes in the systems of agricultural production and restriction of risks connected with Agriculture 4.0, which we have not recognized yet.

It follows from the research carried out in Opole region that the modernization paths covered by agriculture are deciding to a significant degree about positive feedbacks between the normative solutions accepted within the CAP framework and farmers' readiness to introduce changes in the systems of agricultural production, as well as models of managing farms. It is the institutional capital (institutional balance) that has caused actions of the market and technological treadmill to serve ecological modernization of agricultural holdings, which meant that the process of implementing innovations was controlled by farmers. The consequence of this is a change of the model of decision-taking – the growing importance of agricultural advisors and sales representatives who render services of management substitution.

So far farmers have not had a tool at their disposal, one which would make building trust in expert's knowledge possible and allow rationalization of hidden knowledge about natural processes going on in cultivated land. The FaST, being gradually broadened with new modules, will make it possible to overcome information asymmetry in food chains and will strengthen the process of learning and acquiring knowledge about the quality of the natural capital in possession as well as services provided by its ecosystems.

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# Integrated Plant Protection – a Potential Area of Cooperation between the Czech Republic and Poland for the Sustained Intensification of Agricultural Production in Borderlands

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## Abstract

In the face of the climatic changes which are currently under way, the role of Integrated Pest Management (IPM), as a tool of sustained intensification of agricultural production, is growing considerably. Transformation of this model of plant protection management aimed to meet the challenges of food production security and the share of rural areas in the green economic growth in new conditions must take into account the territorial dimension, including also the transborder one. In the EU countries, searching and implementing the Climate-Smart Pest Management (CSPM) should be founded on the experience connected with implementation of the directive on sustainable use of pesticides. The empirical material analyzed in this study comes from the multi-stage survey-based research realized in trade agricultural holdings selected for the purpose from among subregions representative of the agriculture in Opole Province. In their work, the authors present results of the research devoted to economic effects and organizational changes resulting from these requirements in plant and animal production, as well as farmers' needs pertaining to knowledge and information that is indispensable in integrated plant protection. The economy plant protection on the level of an agricultural holding provides, first of all, a stimulus to have the production system changed. In their study, the authors underline that the CSPM needs to be considered in a broader context of transformation of European agriculture towards Agriculture 4.0 – farming that precisely makes use of digital technologies.

***Keywords:*** *agriculture 4.0, cross-border cooperation, environmental regulations, integrated pest management, sustainable intensification*

***JEL Classification:*** *Q16, R11, O13, Q01*

## 1 Introduction

The UN declared the year 2020 the International Year of Plant Health (IYPH), the purpose of the initiative being not only to demonstrate how protection of plants health can help to fight against famine and serve to diminish poverty, to protect environment and to develop economy, but also meaning to encourage institutions and

scientific environments to develop a broader debate on the paths of modernizing agriculture, which ensure its sustainable development and share in the green economic development in the conditions of climatic changes going on globally nowadays. In the European Union, issues connected with plants health are considered in a wide context of framework programs related to environmental protection (in particular in the Seventh Framework Program) and the strategy of preserving biodiversity, as well as providing steadiness of services of ecosystems (COM (2011) 244).

The 21st century has seen the establishment of institutional environment (GAEC, SMR, greening) within the Common Agricultural Policy (CAP), which supports framers' production choices and production technologies that are better adjusted to the habitat-related conditions of agricultural holdings, but also bring back the role of agricultural production in reproducing and restoring services of ecosystems. The key role in ensuring plants health is played by Directive 2009/128/EC concerning sustainable use of pesticides (Directive, 2009). This directive introduces an integrated protection of plants which "puts an emphasis on obtaining healthy crops at the minimal disturbance in the functioning of agricultural ecosystem and encourages use of natural ways of eliminating pests" (Art. 3 of the Directive). The Directive obliging European farmers has been in force since 1 January 2014 and has bound the member-states to prepare "domestic plans of action" serving the purpose of establishing their quantitative targets, means and schedules aiming to reduce threats resulting from application of pesticides and the influence of their use on people's health and natural environment, as well as supporting development and use of integrated plants protection. Until now, the European Commission, despite the requirements of the regulations, has not presented conclusions from the implementation of the said Doctrine by the member countries to date. This did not stop the European Parliament from voting a resolution concerning this question (European Parliament resolutions, 2019), where it acknowledged the accepted norms to be a valuable tool to guarantee that the environment, ecosystems, people's and animals' health are well protected. It is pointed in the Resolution that the efforts to implement the Directive by the member states are insufficient to achieve its main goals (Point 3 of the Resolution) and that they are not of the complex character (Point 8). As regards the member states, they lack in adequate engagement in practices of integrated plants protection, among which the priority is given to application of non-chemical solutions that are alternative to pesticides. In the opinion of the European Parliament, the above-mentioned Directive should serve to propagate integrated plants protection which strengthens the quality of the natural capital as well as lowers the costs borne by farmers within the frames of conventional protection of plants. The European Parliament expects also to have methodologies of integrated plants protection elaborated and prepared. In the report presented by the Ministry of Agriculture and Development of Rural Areas of the Polish Republic, concerning implementation of the Directive on sustainable use of pesticides, it was underlined that preparation of such methodologies and their popularization made the main aim of the "domestic plan of action" in Poland. Formulating such a goal results from a great output of state research institutes in preparing methodologies of integrated plant production (IPP) as a system of management of quality in primary production. As early as in 2003, the Act on plants protection (Ustawa, Dz,U. 2019, poz. 972) introduced premises which regulate the procedure of farmers' participation in such programs. In subsequent programs of development of rural areas financial means were guaranteed for farmers willing to participate in such programs and for adjustment of methodologies of IPP to the habitat-related conditions of agricultural holdings.

The present study undertake to discuss the problem of farmers' perception and evaluation of the requirements of integrated plants protection and the influence of institutional environment on farmers' choices and decisions concerning production. The analysis of research results is significant in view of the fact that due to the modernization paths taken earlier, the agriculture in Opole Province is distinguished by the highest level of using mineral fertilizers and plant protection products in Poland.

As regards the Czech-Polish debate, the problem of food safety makes one of the main themes and subjects of contention, which are transferred also onto the European forum. Hopefully, the world year for plants health should contribute to a broader cooperation in this sphere, especially in borderland areas where the existing threats are similar. This cooperation is particularly important as the ensuing climatic changes evoke new dangers to plants health. Accordingly, the European Commission published a list of ten most dangerous pests posing a new threat to plant production in the EU. The Czech-Polish cooperation should thus concern creating joint information portals to warn farmers against occurring dangers, promoting new technologies of plant protection research, as well as introducing new biocidal, seed multiplication and soil protection products into the market.

A broader context for the cooperation can be created by the European Green Deal, recently accepted by the European Commission (COM(2020) 381) and, specifically, by one of its leading strategies referred to as "from farm to fork" which takes into account issues of food safety and plants health in a complex way. This strategy assumes lowering the dependence on pesticides and antimicrobial agents, limiting excessive fertilization, strengthening ecological farming, improving the well-being of animals as well as reversing the process of loss of biological diversity. Moreover, there are new indexes accepted in the strategy, concerning integrated plants

protection: diminishing the use and risk resulting from chemical pesticides by 50% and the application of hazardous pesticides by 50% by the year 2030. The aims and assumptions behind this strategy must be included by member states in their individual "domestic strategic plans of the CAP" that make the cornerstone of the European agriculture modernization after 2020.

## 2 Material and Methods

The aim of this study is to evaluate the Integrated Pest Management (IPM) as a tool of sustainable intensification of agricultural production in Opole Province. Institutional conditions which are expected to incline farmers towards applying integrated protection of plants as well as economic and ecological effects of implementing this model of management are analyzed. The empirical material comes from monographic research dealing with changes in the organization and productivity of family-run agricultural farms in Opole Province. The source of primary research were survey-based studies carried out within the frameworks of the original research in 2014 and 2018. The survey-based interview was of the purposeful character and was conducted in 100 agricultural holdings of intensive and medium-intensive organization of agricultural production, located in communes which are representative of Opole Province. The farms were selected according to the methodology applied in monographic studies (Kopeć, cited in Gołębiewska (2010). The research methodology presented here allows interpreting data in a wide context of changes that are going on and also facilitates their holistic interpretation.

## 3 Results and Discussion

### 3.1 Economic and Ecological Aspects of Integrated Plants Protection

Implementation of the Directive on sustainable application of pesticides has two dimensions: economic and ecological, which are closely connected with each other. The economic aspect concerns, primarily, appraisal of ecosystems and assessment of the size of public goods provided by agriculture (Kulawik. 2014; Czyżewski et al., 2019) and offers now the major arena of dispute between environmental economics and its ecological counterpart. The econometric models proposed within these concepts allow assessing environmentally-oriented actions in agriculture and the environmental effectiveness of the CAP. As regards the food safety, the microeconomic dimension is significant, though – economics of plant protection exerts the basic impact on selection of a method of protecting plants, changes in the organization of farms, in technology of production and in investments in fixed assets, which are realized (Piwowar, 2018).

Farmers in Opole Province perceive the requirements of the integrated plants protection mainly in the economic aspect (see Table 1).

**Table 1** – Effects of the integrated plants protection policy binding in the UE in the opinions of farmers in Opole Province

| Effects / Consequences of the Directive | Indications in % * |
|---|---|
| - Production costs increase | 71 |
| - Quality of raw materials and produce improves | 25 |
| - The state of natural environment improves | 38 |
| - Production decreases | 18 |

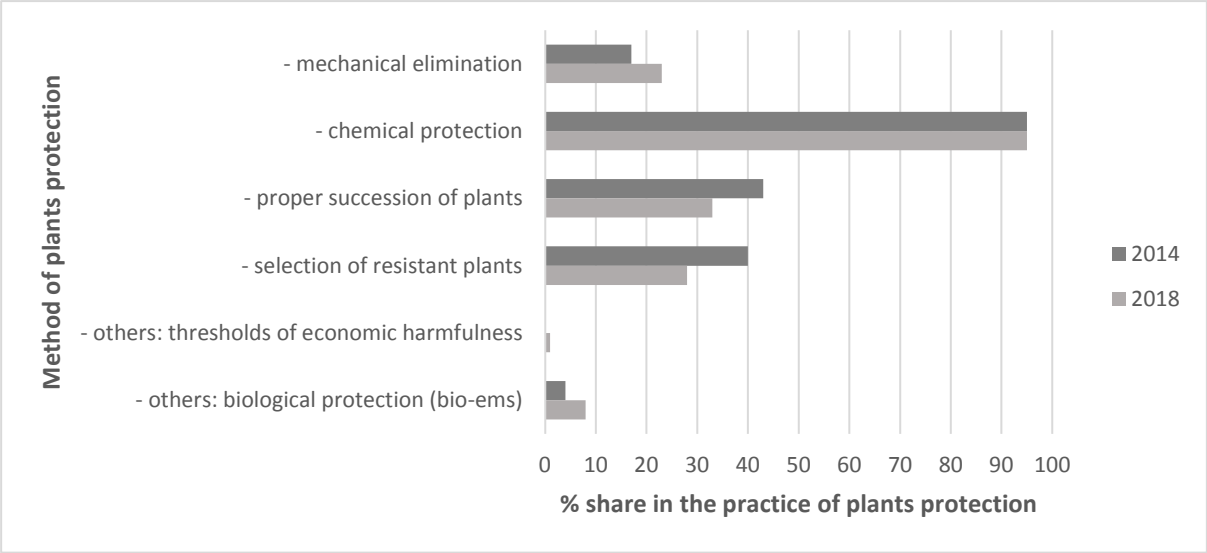
* - it was possible to indicate more than one answer
Source: authors' own research

A rise in the production costs, as a consequence of sustainable use of pesticides, was pointed to by 71% of the respondents, while 18% of the questioned indicated a decrease in the size of production. A fairly large group of the respondents appreciated the ecological effects of the accepted institutional solutions (38%) and perceived an improvement in the quality of materials and agricultural produce (25%). However, the finding that as many as 34% of the respondents saw a rise in costs as the only consequence of sustainable use of pesticides is indeed relevant. The majority of plants protection products used in Poland come from imports. It is only a few years ago that the domestic manufacture of innovative products of plants protection was restored. In the market of such products, in a different way from that typical of the market of mineral fertilizers, there does not occur cyclicality. However, new active substances, which do not develop plants resistance to their effects and have a shorter effect period, are more expensive than conventional pesticides. In Poland, there are few biological plants protection products registered, yet – as it follows from the already mentioned Resolution of the European Parliament and the Council – this phenomenon is characteristic of the whole European Union.

Methodologies of the integrated plants protection, apart from chemical one, include also such methods as: biological, mechanical and agrotechnical (crop rotation, selection of resistant plants, proper cultivation of soil).

All of the above-mentioned methodologies of plants protection are applied by farmers based in Opole Province (see Figure 1).

**Figure 1** – Ways of plants protection applied by farmers in Opole Province. Source: Authors' own study based on the survey




The use of mineral fertilizers and active substance in products of plant protection in Opole Province is the highest in the country, reaching the level of such products usage in the Czech Republic. Nevertheless, in opposition to the tendency in the rest of the country, which shows the growing application of pesticides, the process has slowed down in Opole Province thanks to their increasingly precise application. Still 13% of the respondents are afraid of having the soil and farm produce controlled to check the content of pesticides. The biological method is connected chiefly with the use of bio-ems. Although it generates a good amount of enthusiasm among farmers, its use is only slowly growing more and more popular. In Opole region, the post-variety seed production has had a long tradition, which explains why agricultural advisory services in this sphere are on a very high level. Nowadays, this type of services is taken advantage of by 31% of the respondents, while 28% apply these recommendations in practice. The regress in this area – in comparison with the year 2014 – has resulted from the fact that with the simplified crops structure in the region, the farmers use varieties which prove effective in the existing habitat-related conditions. While choosing plant varieties to sow, a greater and greater role falls to the interest in the given variety in the market, which was confirmed by 27% of the questioned (a rise by 12% in comparison with 2014). Agrotechnical methods of plant protection, which are connected, among others, with crop rotation are also losing their significance due to the simplified structure of plant production as well as common practices of application of catch crops in plant cultivation, in which structure-forming plants and nitrogen fixing plants are used.

The growing costs of integrated plants protection, which was pointed to by the respondents (compare Table 1), are the result of not only higher prices of products of plants protection. Chemical protection of plants should be considered in a broad context of ecological modernization of agricultural holdings as a mechanism of their sustainable development. This type of transformation is going on in the holdings in a number of dimensions: technical, technological, organizational and mental (affecting awareness). In each of the spheres, innovations (Bisaga, Sokołowska, 2016), which facilitate adaptation of farms to new production systems are of a particular importance (see Table 2).

**Table 2** – Types of innovations introduced in agricultural holdings in the last five years

| Type of innovation | Indications in % * |
|---|---|
| - purchase of high power tractors | 44 |
| - introducing new technological solutions in plant production | 45 |
| - introducing new technological solutions in animal production | 12 |
| - carrying out construction-related investments | 25 |
| - introducing integrated plant production | 11 |
| - improving on the aesthetics of the farm surroundings | 38 |

| | |
|---|---|
| - others | 7 |

* - it was possible to choose more than one answer
Source: authors' own research

The largest number of alterations were introduced into plant production (45%). At the same time, 43% of the questioned indicated the principle of cross-compliance as the main cause behind these changes.

Introduction of new systems of production requires usage of high power tractors which are indispensable in the case of modern cultivation aggregates as well as while applying bar sprayers of the shoulder reach of 6 and 12 meters in plant cultivation. They serve the purpose of chemical protection of plants in connection with leaf fertilization. Systems of plant production in Opole Province are evolving towards precision farming, with farmers commonly using such tools that are related to it as: examination of the soil regarding its richness (78% of the indications), fertilization balance (36%). Simultaneously, 44% of the respondents have sprayers equipped with computers at their disposal.

Since 2005 the integrated plants protection has been the accepted system of quality management in primary production in Poland. Support of the implementation and certification of it can be obtained within the Rural Development Program. As regards the examined population, this program was implemented in 11% of agricultural farms. When it comes to the national level, though, it is merely 2% of the holdings which have done so (Sprawozdanie, 2016). The necessity of a wider propagation of this system was drawn attention to by the Directorate-General for Agriculture of the European Commission in the evaluation and assessment of the realization of the domestic plan of action for sustainable use of pesticides in agriculture.

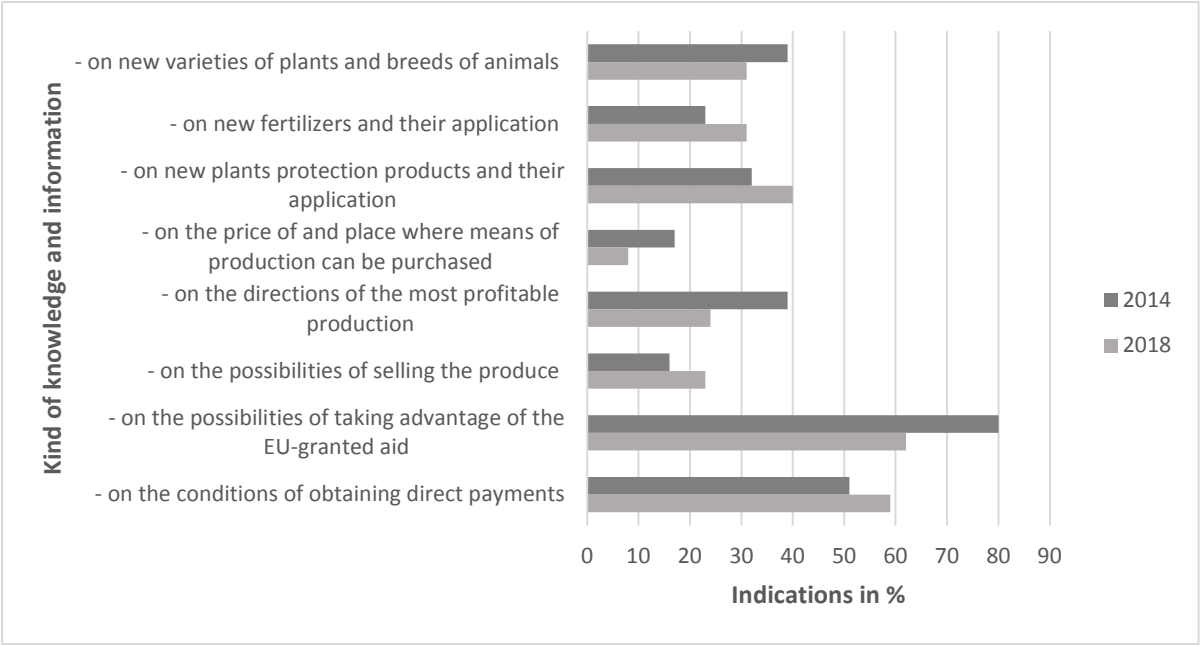
Within the sphere of infrastructural and facilities investments, farmers transform space available in farm buildings at their disposal for preparing and storing plants protection products.

The domestic strategic plan of the CAP, which takes into account the already-mentioned new EU strategy 'from the field onto the table' ought to provide a strong stimulus towards more effective implementation of the integrated plants protection both in the area of changes in systems of agricultural production and in mechanisms of dissemination of knowledge and innovations which ensure sustainable development of farming.

### 3.2 The Role of Knowledge and Information in the Integrated Management of Plants Protection

Ecological modernization of European agricultural holdings makes a vital factor in their adaptation to economy based on knowledge. In this process, a significant role is played by the system of agricultural advisory services, which was reformed in 2005 (see Figure 2).

**Figure 2** – Knowledge and information sought for by farmers with agricultural consultants. Source: Authors' own study based on the survey




The information that is still of the greatest relevance to the farmers based in Opole Province concerns the possibility of procuring the EU assistance funds and conditions of obtaining direct payments. It needs

underlining that without direct payments or investment support within the Rural Development Program schemes, ecological modernization of farms in the region would not be possible at all. Only a new stage of agricultural holdings modernization can cause the farmers' interest in new products of plant protection to grow (an increase by 8%). Managing the integrated plants protection requires employing many instruments such as: knowledge of thresholds of economic profitability of chemical plants protection, methodologies of plants protection for individual crops, ability to identify the pathogens which occur, safety requirements in application of pesticides, effects of using chemical plant protection agents on biodiversity and people's health, as well as knowledge of natural environment in which the farm is based and the processes which are going on in it. Accumulating competences and knowledge in the area of integrated management of plants protection cannot be restricted solely to the system of agricultural advisory services. In this process, it is necessary to integrate it with the whole system of dissemination of agricultural knowledge and information, as well as with assessment of different isles of knowledge that emerge in this process (Bisaga, 2019). Such an integration is feasible on different digital platforms, yet also thanks to digital devices which can process data on their own and which either support processes of taking decisions or individually regulate processes of chemical protection of plants. Such electronic tools are indispensable since the integrated management of plants protection must be adjusted to environmental conditions in which the given farm is based – the state of soils, climatic conditions, state of waters, existing biodiversity and specific services of agro-systems. In the opinions of farmers from Opole Province, the platform serving to modernize agricultural holdings should be multi-thematic (see Table 3).

**Table 3** – Thematic scope of regional digital platform aiding modernization of farms

| Thematic area | Indications in % |
|---|---|
| - varieties of plants and breeds of animals recommended in the region | 24 |
| - dosing fertilizing in connection with the existing climatic situation | 55 |
| - types of spraying in connection with the existing climatic situation | 58 |
| - threats posed to breeding | 20 |
| - economic situation in different farming markets | 25 |
| - trainings, demonstrations, contests that are held | 38 |
| - the latest results of scientific research | 27 |
| - climatic threats | 42 |

Source: authors' own elaboration

It was obvious to the creators of the integrated plants protection (Lefebvre et al., 2015) that implementation of the holistic approach towards production will demand creating a new model of managing a farm. They called the model "Integrated Pest Management" (IPM). It was supposed to support ecological modernization of agriculture with preserving the economic safety of agricultural holdings (Rose et al., 2019). Progress in implementing sustainable agriculture and institutional innovations serving its popularization, the network society being formed, and – first and foremost – climatic changes, have caused this model to require reconstructing (Dara, 2019). At the moment its significant elements are availability of knowledge, strategies of managing information, taking decisions at suitable time, as well as communication with other stakeholders. In Europe, this model is referred to as the Climate-Smart Pest Management (CSPM) (Hebb et al., 2019). To implement the strategy 'Farm to Fork' (2020) aiming at sustainable transformation of European farming will require popularizing the CSPM and creating institutional frameworks of integrated plants protection. Furthermore, it will be indispensable to make use to a broader extent of information technologies to process and share information concerning existing threats and optimization of decisions which are taken. This is confirmed by the data inserted in Table 3. The essence of this model is, moreover, its territorial rooting. The CSPM has also the transborder dimension, which was drawn attention to in the European Green Deal and was written into the "From the Field onto the Table" strategy. The proposal of cooperation within the CSPM was submitted by the Federal Republic of Germany to the interested parties. Such a cooperation will be necessary also in the Czech-Polish borderland, not only in the sphere of agriculture, but also throughout the public one. The beginnings of it can lie in the common platform of good practices of the CSPM. Such initiatives can count on support from the modernized CAP.

## 4 Conclusion

In the International Year of Plant Health, agriculture should be looked at through the prism of the fourth revolution which is going on in it. Intelligent farming and 'Agriculture 4.0' make its main driving force.

Accordingly, the integrated plants protection ought to be considered in such a broad context. Implementation of the CSPM can provide the beginnings of modernization of agriculture that makes a wide use of knowledge and instruments of digital technologies in borderland areas. Creation of a common CSPM platform makes but the beginning of transformation of agriculture. In the broader context, it is not only climatic changes that generate new risks, but also Agriculture 4.0 will reveal its threats and new types of risk which will ensue in farming and will cause losses in agricultural holdings. Creation of a common system of their identification can thus be a next step in building resilience agriculture in frontier areas.

On the basis of the research conducted in trading agricultural farms based in Opole Province, it is possible to formulate the following conclusions:

1. The CSPM offers an approach towards fighting pest in an economically-profitable manner, one that is controlled, socially acceptable and safe to environment, people's health and climate. This model of management provides security to the food system, which proves indispensable in crisis situations, such as the one evoked by COVID-19.
2. Each farmer develops their own strategy of plants production, minimizing losses, obtaining profits and communication in food chains. In this strategies there still dominates chemical protection of plants and information asymmetry.
3. Farmers based in Opole region are ready for updating methods of integrated plants protection, yet the lack of suitable tools does not allow them to assess whether the instruments and methodologies being implemented provide sustainable intensification of plants cultivation. Moreover, effective implementation of the integrated plants protection is restricted by the shortage of financial resources necessary to implement all the required investments, by the lack of specialist knowledge concerning methodologies of the integrated plants protection that are efficient in the existing climatic situation, as well as tools of such modelling of production decisions which could directly translate into economic benefits.
4. The CSPM will turn into an art, a model of entrepreneurship and a science, therefore it will be necessary to integrate the system of knowledge, information and agricultural innovations with the system of agricultural advisory services. A condition behind this integration is digitalization of farming and establishment of platforms to facilitate monitoring of crops and modeling decisions concerning available CSPM methodologies. This is one of the main goals of the National Strategy of Sustainable Development of Countryside, Agriculture and Fishing 2030. This strategy assumes also international cooperation in this field.
5. The CSPM must be integrated with other instruments of sustainable intensification of agricultural production, which facilitate usage and preservation of primary soil productivity.

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# The Level of Satisfying the Care and Health Needs of Elderly People (70+) in Opolskie Voivodship

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## Abstract

The progressive aging process of Polish society is becoming an increasing challenge for central, regional and local authorities. The increase in the number of elderly people influences the growing demand for health and care services. In order to show in which poviats of the Opolskie Voivodship the problem is most acute, the article attempts to assess the degree of satisfying the health and care needs of elderly people (70+) in particular poviats in the Opolskie Voivodship in 2018. Using the synthetic measure of development (SMR), a ranking of poviats in Opolskie voivodship has been created according to the degree of satisfying the care and health needs of elderly people (70+). The highest level of satisfying the care and health needs of elderly people in 2018 was characteristic for Opole city Poviat, followed by Głubczycki Poviat. The worst situation of the elderly in terms of satisfying health and caring needs was observed in Opolski and Krapkowicki Poviat. The study used generally available statistical data published by the Central Statistical Office and the regional authorities. The choice of data and the period from which they came was dependent on their availability.

***Keywords:*** *elderly people, health needs, long - term care*

***JEL Classification:*** *I15, J1*

## 1 Introduction

The aging of the Polish society is a basic demographic problem that affects directly the growing demand for health and care services. The state of human health deteriorates as people grow older. As indicated by M. Sygit, the percentage of people with disabilities in the population increases with age. While in the group of 50-70-year-olds there are about 20% of people with disabilities, among people aged over 70, disability affects almost every second person [8]. This is also confirmed by data from Germany. In older age groups, the proportion of people requiring care is higher. In case of people aged 80-85 this share does not exceed 20%, in the group of 85-90-year-olds it is 33%, and in the 90+ group it reaches almost 60% [7]. A similar situation supposedly occurs in other countries as well. The development of medicine and the improvement of the quality of life can contribute to reducing the percentage of people requiring care in a given age group, but age group of 70+ will become more numerous. This means that more and more elderly people are using and will continue to use health and care services. Ensuring access to this type of services is and will continue to be growing challenge for the health care system and social assistance.

### 1.1 Demographic Situation in the Opolskie Voivodship

The aging of the population observed in the developed countries, including Poland, is manifested in the increase of the share of elderly people in the population, which is due to the relatively low fertility rate and the gradual extension of life. In the years 2008-2018, an increase in the number of people aged 70+ was observed in all poviats in Opolskie Voivodship, except for the Prudnicki Poviat, in which there was a decrease of 5 people (see Table 1). The largest increase in the number of elderly people was observed in the city of Opole (an increase of 36.1%), in the Kędzierzyńsko-kozielski Poviat (an increase of 18.6%) and the Krapkowicki Poviat (an increase

of 17.6%). Relatively low growth (by less than 10%) took place in the following poviats: Opolski (1.3%), Strzelecki (5.5%), Głubczycki (6.1%), Oleski (8.2%), and Namysłowski (9.8%). In 2008, the average share of people aged 70+ in the total population of the Opolskie Voivodeship was 10.1%, while at the end of 2018 it had already reached the value of 11.9%. Poviats: Namysłowski (10.5%), Brzeski (11%) and Opolski (11%) were in the most favorable situation in 2018. The largest share of the number of elderly people concerned the two largest cities in the Opolskie Voivodeship: Opole (13.4%) and Kędzierzyn-Koźle (13.2%).

It is also worth emphasizing that in the analyzed period the number of inhabitants of the Opolskie Voivodeship decreased by 4.5%. This problem applies to virtually all poviats, but the worst situation is in Głubczycki poviat (a decrease of 7.5%). Only in the city of Opole an increase in the number of inhabitants was noted, but it resulted from the inclusion of several neighboring villages in 2017.

**Table 1 -** Population aged 70+ in Opolskie Voivodship in 2008 and 2018

| **Poviat** | **Population aged 70+** | | **Share of population aged 70+ in the total number of inhabitants (%)** | |
|---|---|---|---|---|
| | **2008** | **2018** | **2008** | **2018** |
| Brzeski | 8 812 | 9 889 | 9.6 | 11.0 |
| Głubczycki | 5 201 | 5 516 | 10.5 | 12.0 |
| Kędzierzyńsko-kozielski | 10 493 | 12 443 | 10.4 | 13.2 |
| Kluczborski | 6 683 | 7 599 | 9.7 | 11.5 |
| Krapkowicki | 6 260 | 7 359 | 9.4 | 11.5 |
| Namysłowski | 4 077 | 4 476 | 9.3 | 10.5 |
| Nyski | 14 437 | 15 980 | 10.0 | 11.7 |
| Oleski | 7 019 | 7 595 | 10.4 | 11.8 |
| Opolski | 13 448 | 13 629 | 10.0 | 11.0 |
| Prudnicki | 6 692 | 6 687 | 11.3 | 12.0 |
| Strzelecki | 8 222 | 8 676 | 10.4 | 11.6 |
| Opole city | 12 571 | 17 114 | 10.0 | 13.4 |
| **Average** | **-** | **-** | **10.1** | **11.9** |

Source: Own elaboration based on [1]

## 2 The Assessment of the Level of Satisfying the Heatlth and Care Needs of Elderly People (70+) in Particular Poviats of Opolskie Voivodship in 2018

### 2.1 Research Methodology

The aim of the study is to to build a ranking of the level of meeting the health and care needs of elderly people in poviats in Opolskie Voivodship. In connection with the progressing aging process, knowledge in this area can be helpful in creating social policy at the local level.

In order to determine the level of satisfying the health and care needs of elderly people in the Opolskie Voivodeship one of the taxonomic methods was used. Synthetic measure of development (SMR) is used to linearly order objects described by many diagnostic variables [4], which are replaced by one synthetic variable. To achieve this goal, the Hellwig development pattern method was used. This method assumes the existence of a reference object in which the input variables take optimal values. Determining the value of the development pattern is preceded by bringing diagnostic indicators to comparability and then excluding them from the set of negative values. The variables are normalized using classical standardization:

$$z_{ij} = \frac{x_{ij} - \bar{x}_j}{s_j}, \quad (1)$$

where:

$\bar{x}_j$- arithmetic average of the next characteristic

$S_j$- standard deviation of the next characteristic

$z_{ij}$- standardized value

The postulate of the positivity of standardized variables was provided by using transformation:

$$z_{ij} = z_{ij} + \varepsilon, \quad (2)$$

where:

$$\varepsilon = -min\{z_{ij}\} + \frac{1}{5}S(z), \quad (3)$$

and

$S(z)$- standard deviation of normalized input variables.

The Hellwig method prioritizes objects by comparing them to a designated development pattern. The coordinates of the reference object $(z_{0j})$. are the maximum values of standardized variables $(z_{ij})$.

$$z_{0j} = max\ z_{ij} \text{ (when the characteristic is a stimulant).} \quad (4)$$

Objects are hierarchized based on the distance from the pattern. Euclidean metric was used to calculate the distance of each object from the reference object:

$$d_{i0} = \sqrt{\sum_{j=1}^{m}(z_{ij} - z_{0j})^2}, \qquad \text{j=1,2, …,m; i=1, 2, …, n,} \quad (5)$$

where:

$z_{ij}$ - standardized values of diagnostic variables $x_{ij}$,

$z_{0j} = \max z_{ij}$ (for stimulants).

In the Hellwig method, objects are ordered based on the value of a synthetic measure (indicator) of development

$$s_i = 1 - \frac{d_{i0}}{d_0}, \quad (6)$$

where:

$$d_0 = \overline{d_0} + 2S_0, \quad (7)$$

whereby:

$$\overline{d_0} = n^{-1}\sum_{i=1}^{n} d_{i0}, \quad (8)$$

$$S_0 = \sqrt{n^{-1}\sum_{i=1}^{n}(d_{i0} - \bar{d})^2}, \quad (9)$$

The $S_i$ measure takes values in the range of [0; 1]. These values are higher if the object is less distant from the pattern. It is therefore worth ordering these values from the highest to the lowest. The last stage of calculations involves the division of objects into classes.

### 2.2 Preliminary Data Analysis - Selection of Diagnostic Variables

In the research on the standard of living, one of the areas describing the level of satisfaction of the basic needs of society is, in accordance with the approach proposed by J. Drewnowski - health, or with the approach proposed by A. Luszniewicz - health protection [2,9]. Data collected in this respect for the needs of national and international statistics include, above all: medical staff, medical equipment, the number of individual health care facilities and places in these facilities, the number of patients, the number of medical advice, the incidence of some diseases. Unfortunately, some data is not available at the poviat level, e.g. number of physiotherapists,

number of places in chronic medical care homes. The analysis mainly used data contained in the Local Data Bank of the Central Statistical Office and derived from registers published by voivodeship government institutions [5,6].

The level of satisfying the health and care needs of elderly people depends on many factors. It should be emphasized that the analysis was based only on quantitative variables. This means that an attempt was made to assess the degree of satisfaction of needs based on statistical data on: the number of beds / beds in facilities providing health and care services, the amount of medical staff. Therefore, the potential availability and not the quality of services provided was examined. The subjective assessment of the elderly regarding the degree of satisfaction of needs may differ from the results obtained.

The selection of diagnostic variables is of key importance for the correctness of the results obtained in the study. Determining the set of variables which describe the given phenomenon optimally is not an easy task. When choosing diagnostic features, follow the information criteria [3]:

- universality - the characteristics should have universally recognized weight and significance in the subject of analysis
- variability - the characteristics should not be similar to one another in the sense of information on the objects studied, but they should have a high ability to differentiate objects (high variability)
- validity - indicators for which tested objects hardly achieve high values (significant)
- correlation - selected indicators should be weakly correlated with one another, while strongly correlated with indicators excluded from analysis by reduction

Potential variables selected for analysis were divided into three categories (see Tab. 2). Most of the variables were in the category regarding access to facilities providing 24-hour medical and care services. It was assumed that in case of the elderly, the degree of satisfaction of needs depends primarily on the number of places in: social welfare homes, 24-hour facilities (including senior homes) and the number of beds in general hospitals. The set of potential variables included one variable regarding the number of facilities and describing access to a GP (number of outpatient clinics). Doctors and nurses were taken into account regarding access to medical staff. Unfortunately, no data are available for poviats regarding the number of laboratory diagnostics and physiotherapists.

**Table 2** - Potential diagnostic variables of the degree of satisfying the health and care needs of elderly people (70+) in particular poviats in the Opolskie Voivodship in 2018

| **Symbol** | **Description of the variable** |
|---|---|
| Access to medical staff | |
| X1 | Number of people 70+ per 1 doctor |
| X2 | Number of people 70+ per 1 nurse |
| Access to facilities providing round-the-clock medical and care services | |
| X3 | Number of people 70+ per 1 bed in general hospitals |
| X4 | Number of people 70+ per 1 bed in social welfare houses (excluding beds for children and young people) |
| X5 | Number of people 70+ per 1 bed in facilities providing round-the-clock care for the disabled, the chronically ill or the elderly |
| Access to out-patient healthcare | |
| X6 | Number of people 70+ per 1 out-patients department |

Source: own elaboration

In the first step of the initial verification of the variables, it was checked whether the variables were of sufficiently high variability. The coefficient of variation calculated on the basis of standard deviations for variables exceeding the threshold value (0.1) means that the variables are characterized by a sufficiently high variability. A value above 0.1 was obtained for all diagnostic variables. The exact values of the coefficient of variation for each variable are presented in Table 3.

**Table 3** - Numerical characteristics of potential diagnostic variables

| Variable | Average | Standard deviation | Coefficient of variation |
|---|---|---|---|
| X1 | 45.7 | 18.8 | 0.41 |
| X2 | 27.6 | 10.7 | 0.39 |
| X3 | 37.4 | 14.6 | 0.39 |
| X4 | 57.8 | 28.6 | 0.50 |
| X5 | 187.2 | 144.3 | 0.77 |
| X6 | 219.0 | 32.6 | 0.15 |

Source: own elaboration based on [1,5,6]

In the next step of the initial data analysis, the correlation of potential diagnostic variables (indicators) was assessed in order to reduce and select the final set of diagnostic indicators. The analysis of the correlation relationship included the construction of an array of correlation coefficients between variables. A high correlation was observed between the variables X1 and X2 (0.6359) and X2 and X3 (0.7785). For these correlation coefficients, p-value was less than 0.05 (see Table 4). It was decided to eliminate the variable concerning the number of nurses (X2). The correlation between the number of beds (X1) and the number of doctors (X3) was not statistically significant. Due to the substantive significance of variables X1 and X3, they were taken into account in further analysis.

**Table 4** - Pearson correlation coefficietns

| | X1 | X2 | X3 | X4 | X5 | X6 |
|---|---|---|---|---|---|---|
| **X1** | 1.0000<br>p= --- | 0.6359<br>p=0.019 | 0.4081<br>p=0.166 | -0.0872<br>p=0.777 | -0.3277<br>p=0.274 | 0.4464<br>p=0.126 |
| **X2** | 0.6359<br>p=0.019 | 1.0000<br>p= --- | 0.7785<br>p=0.002 | 0.2045<br>p=0.503 | -0.1960<br>p=0.521 | 0.2460<br>p=0.418 |
| **X3** | 0.4081<br>p=0.166 | 0.7785<br>p=0.002 | 1.0000<br>p= --- | -0.0853<br>p=0.782 | -0.2408<br>p=0.428 | 0.2613<br>p=0.388 |
| **X4** | -0.0872<br>p=0.777 | 0.2045<br>p=0.503 | -0.0853<br>p=0.782 | 1.0000<br>p= --- | 0.4669<br>p=0.108 | -0.2113<br>p=0.488 |
| **X5** | -0.3277<br>p=0.274 | -0.1960<br>p=0.521 | -0.2408<br>p=0.428 | 0.4669<br>p=0.108 | 1.0000<br>p= --- | -0.3185<br>p=0.289 |
| **X6** | 0.4464<br>p=0.126 | 0.2460<br>p=0.418 | 0.2613<br>p=0.388 | -0.2113<br>p=0.488 | -0.3185<br>p=0.289 | 1.0000<br>p= --- |

Source: own elaboration

## 3 Results

Five diagnostic indicators were adopted for the synthetic assessment of the degree of satisfying the health and care needs of the elderly (70+). The set of variables had a high informative value. The objects of the study were the 12 poviats of the Opolskie Voivodeship.

As a result of the study, the values of the synthetic measure of development were obtained (see Table 5 and Figure1), and thus the poviats of the Opolskie Voivodeship were ranked according to the degree of satisfying the health and care needs of the elderly (70+) in 2018. In the table, the level of satisfying the health and care needs of elderly people (70+) in poviats is ordered from the 'best' to 'worst'.

The difference between the minimum SMR value and the maximum value was divided into three brackets:

1) [min si, average – standard deviation), that is [0.21207, 0.23544),
2) [average – standard deviation, average + standard deviation), that is [0.23544, 0.49425),
3) [average + standard deviation, max si], that is [0.49425, 0.576613].

Three classes of poviats were distinguished – of low, medium and high level of satisfying the care and health needs (see Table 5 and Figure 1).

In 2018, the health and care needs of the elderly (70+) in Kluczborski Poviat, for which the value of the Hellwig measure was 0.576613, were best met. On the second place there was the city of Opole Poviat. It is worth emphasizing that in Opole, as the capital of the voivodship, the hospitals and clinics meet the health needs of not only residents of Opole, but also residents of other poviats. Therefore, this poviat recorded significantly lower than the voivodship's average values of the variables (X1, X3) describing access to medical staff and beds in hospitals. This means that there was a small number of people aged 70+ per 1 doctor or hospital bed. Another 8 poviats obtained the SMR qualifying them to class 2 (medium). It can be said that they were characterized by an average level of satisfying the health and care needs of the elderly. The care and health needs of the elderly (70+) in Kędzierzyńsko-kozielski Poviat (0.230571) and Prudnicki Poviat (0.212072) were least met. In the Kędzierzyńsko-kozielski Poviat the access to meeting care needs was very limited. This is evidenced by the high values of the variables X4 and X5. There was the worst access to doctors (X1) and to out-patients departments (X6) in Prudnicki Poviat.

**Table 5** - SMR values describing the degree of satisfaction of health and care needs of elderly people (70+) in particular poviats in Opolskie Voivodship in 2018

| | **Poviat** | **SMR value** | **Class** |
|---|---|---|---|
| 1. | Kluczborski | 0,576613 | high |
| 2. | Opole city | 0,539196 | high |
| 3. | Nyski | 0,47355 | medium |
| 4. | Strzelecki | 0,447928 | medium |
| 5. | Głubczycki | 0,439327 | high |
| 6. | Brzeski | 0,389522 | medium |
| 7. | Namysłowski | 0,326542 | medium |
| 8. | Oleski | 0,249068 | medium |
| 9. | Krapkowicki | 0,248619 | medium |
| 10. | Opolski | 0,245117 | medium |
| 11. | Kędzierzyńsko-kozielski | 0,230571 | low |
| 12. | Prudnicki | 0,212072 | low |

Source: own elaboration

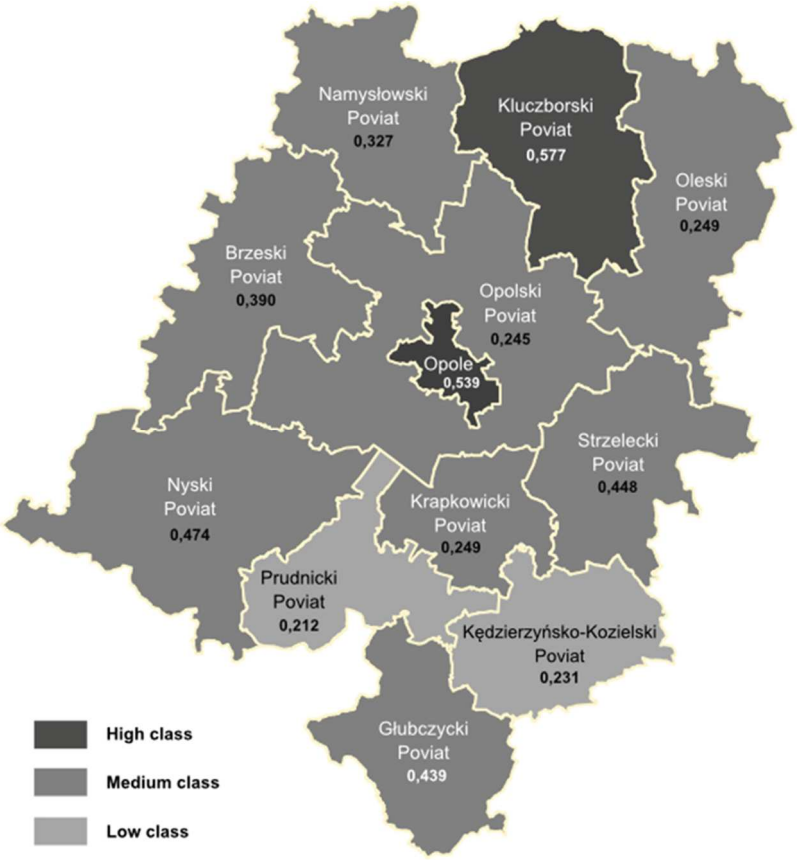
## 4 Conclusions

The level of satisfying the health and care needs of elderly people (70+) in the Opolskie Voivodeship in 2018 was assessed using the Hellwig synthetic development method. The study made it possible to build a ranking of the level of meeting the health and care needs of elderly people in poviats and to identify three homogeneous classes of the level of satisfying the health and care needs of elderly people. The values of the synthetic measure indicate a large diversity in meeting the health and care needs of elderly people in particular poviats of the Opolskie Voivodeship in 2018.

It should be remembered that each of the poviats performs better or worse in terms of a given aspect of satisfying the health and care needs of the elderly, but the value of the synthetic measure of development depends primarily on the values of all variables describing the studied phenomenon. In this analysis, the starting point of choosing potential diagnostic variables were indicators that described the availability of health care and care services as well as the human potential of these facilities. Therefore, the presented study took into account the variables available at this level of aggregation that characterize the level of satisfying the health and care needs of elderly people (70+) in the Opolskie Voivodeship in 2018.

In 2018, the highest level of satisfying the health and care needs of elderly people (70+) was implemented by the Kluczborski Poviat, followed by the city of Opole Poviat (see Figure 1). At the lowest level of satisfying the health and care needs of the elderly (70+) in the Opolskie Voivodeship were the poviats: Kędzierzyńsko-kozielski and Prudnicki. The results obtained may constitute the basis for conducting social policy at the local and voivodship level. Its goal should be to reduce this diversity while increasing the degree of satisfaction of the health and care needs of elderly people.

**Figure 1** – SMR values in particular poviats in Opolskie Voivodship in 2018. Source: own elaboration

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# Factors of Health and Wellbeing in the European Union

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## Abstract

In terms of the human development approach within the concept of sustainable development (SD), health is as an essential constituent of people's wellbeing. Health outcomes of countries are determined by the type of health system, the resources used within it, and additional factors. The relationships between healthcare resources and health status (outcome) indicators were analysed in the sample of 31 countries (the European Union (EU-27) plus Iceland, Norway, Switzerland and the United Kingdom (UK) by means of a cross-sectional regression analysis. The impacts of life expectancy at birth, healthy life years, and current health expenditure (resources) on the share of people with good or very good perceived health were evaluated. The first indicator reflects quantitative aspects and the second qualitative aspects of health status (health outcomes). The last one is a subjective indicator reflecting health status, and which also indicates wellbeing. Generally, a positive impact of both objective indicators on the subjective indicator reflecting health status was discovered. However, the impacts of the indicator reflecting healthcare resources, which is current healthcare expenditure as a percentage of GDP (CHE ratio) were not straightforward, or, in other words, they could have been indirect.

***Keywords:*** *current healthcare expenditure, healthy life years, life expectancy at birth, regression analysis, sustainable development*

***JEL Classification:*** *I10, I13, I15, I18, Q01*

## 1 Introduction

The rationale behind this work lies in a consideration of the concept of SD, which should be adopted as a basic philosophy (see also Drastichová, 2018a, b, c; Drastichová, 2019, 2020; Drastichová and Filzmoser, 2019, 2020). This results from the most frequently quoted (formal) definition of the World Commission on Environment and Development (WCED, 1987), according to which SD is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Although SD has become a popular catchphrase in contemporary development discourse (Mensah and Casadevall, 2019), it has also become a philosophy affecting activities in all economic sectors, and the lives of individuals and communities. Drastichová (2018c) and Mensah and Casadevall (2019) contributed to the discourse on SD. According to the second study, the entire issue of SD centres around inter- and intragenerational equity anchored essentially on three distinct but interconnected pillars, namely the environment, economy, and society. Decision-makers should be constantly mindful of the relationships, complementarities, and tension between these pillars and ensure responsible human behaviour and actions at the international, national, community, and individual levels to promote the tenets of SD in the interest of human development. The first study is informed by this knowledge. It also contains sophisticated and practical considerations regarding SD, and the human development approach. This approach emphasised the human dimension of SD. It focuses on advancing human wellbeing, namely the richness of human life, rather than simply the richness of the economy in which human beings live. In terms of that approach health is an essential constituent of people's wellbeing (see more in Drastichová (2018c)). SD is a vital concept, aimed at maintaining people's wellbeing for an unlimited period of time. All the

pillars of SD, including the institutional dimension of SD (see e.g. Ardielli (2016; 2019)), the spatial dimension (see e.g. Sucháček et al. (2018)), their particular topics, and their interconnections must be considered in the preparation of policies and strategies aimed at SD.

The EU is committed to implementing the 2030 Agenda for SD and the Sustainable Development Goals (SDGs) within the EU and in development cooperation with partner countries (European Commission, 2020). The 17 SDGs were adopted by all United Nations Member States in 2015, as part of the 2030 Agenda for SD, which is a recent policy framework worldwide for SD (United Nations, 2020). The progress towards the SDGs in an EU context is regularly monitored by means of the EU SDG indicator set. Relevant topics reflecting certain pillars of SD (often several of them) are included in specific SDGs. SDG 3 reflects the aspects of health and wellbeing analysed in this work. It aims to ensure health and well-being for all at all ages (see more on Eurostat (2020a)). The aim of this work is to discover relationships between the selected subjective and objective indicators reflecting health outcomes (health status) and healthcare resources in the sample of 31 countries, including the European Union (EU-27) plus Iceland, Norway, Switzerland and the United Kingdom (UK). More specifically, the impacts of objective indicators reflecting health status and those reflecting healthcare resources on subjective indicators of health status are investigated.

### 1.1 Theoretical Background and Literature Review

Health systems are defined as comprising all the organizations, institutions and resources that are devoted to producing actions principally aimed at improving, maintaining or restoring health (WHO, 2005). The health of the population is determined by both the type of health system and the resources used. The performance of the health system can be evaluated according to the relationship between resources and outcomes. However, the evidence for a causal link between healthcare expenditure and health outcomes remains elusive as problems emerge from the difficulty of isolating the contribution of the health service "input" as a determinant of health status "output" (Goldacre, 1996). According to Nixon and Ulmann (2006) establishing causal relationships between health expenditure and health outcomes is complex and difficult since healthcare expenditure is only one of many quantitative and qualitative factors that contribute to health outcomes, and measurement of health status is an imperfect process. The causal links between environmental change and human health are also complex and they are often indirect (Corvalan et al., 2005). Since it is necessary to move closer towards SD, both efficiency and sustainability of health systems are crucial.

Previous empirical studies on the relationship between healthcare expenditure and health outcomes provide conflicting views. Rana, et al. (2018), Anand and Ravallion (1993), Patricio et al. (2008) and Imoughele and Ismaila (2013) discovered positive relationships between public healthcare expenditure and health sector performance for 30 OECD countries, Sri Lanka, Russia and Nigeria, respectively. On the contrary, Filmer and Pritchett (1997), Musgrove (1996), and Kim and Moody (1992) found no relationship between these variables. Babazono and Hillman (1994) analysed 1988 data from OECD countries to determine how key healthcare indexes correlate with healthcare outcomes. Their results show that total healthcare spending per capita and outpatient and inpatient utilization are not related to health outcomes. It seems to be more important how the resources are allocated than how much money is actually spent. According to Rana, et al. (2018), the determinants of health outcomes include income, medical technology and education.

In the literature, different estimation methods, such as cross-sectional analysis, or panel, autoregressive distributed lag model, have been used to analyse the relationship between healthcare expenditure and health status outcomes (Rahman et al., 2018). Drastichová (2019) concluded that in the sample of 31 countries analysed the particular healthcare system model did not determine performance significantly. Therefore, types of expenditure reflecting particular healthcare system models are not used in this analysis. An approach based on an HCA applied to the data on healthcare inputs and outcomes was used in the previous author's works in this field (Drastichová, 2020; 2018a, b; Drastichová, 2019; Drastichová and Filzmoser, 2019). Drastichová (2020) used a combination of one objective quantitative indicator, one objective qualitative indicator and one subjective indicator reflecting health outcomes (health status), along with the indicator reflecting healthcare resources. Norway, Malta and Sweden, along with Iceland, Ireland, Italy and Cyprus were assessed as the best performing countries in the health status indicators applied. However, their CHE ratios were not among the highest. The same indicators are used in this study to investigate the impacts of objective indicators reflecting health outcomes and health resources on the subjective indicator in more detail by means of cross-sectional regression analysis. This approach provides a more detailed examination of these relationships in the sample. Although it is considered that the relationships between the indicator reflecting aspects of health are comprehensively, efforts were made to discover whether the objective indicators and healthcare resources affect the subjective indicators reflecting health status. Similarly, it is acknowledged that efficiency and sustainability related to these aspects are difficult to measure.

## 2 Material and Methods

The methodology applied and data used are introduced in this section.

### 2.1 Model and Data

*2.1.1 Data*

The indicators used are described in Table 1. Health status (outcomes) is represented by three indicators (the first three rows of Table 1). LE and PH indicators are included in the EU SDG indicator set for monitoring progress towards SDG 3 on good health and wellbeing (Eurostat, 2020a). LE primarily reflects quantitative aspects of health, while HLY and PH also reflect qualitative aspects. HLY focuses on the quality of life spent in a healthy state, rather than the quantity of life, as measured by LE. It is separately calculated for men and women. The PH indicator also reflects qualitative aspects, but it is constructed as a subjective indicator.

**Table 1** – The indicator applied in the analysis

| | |
|---|---|
| Life expectancy at birth (LE) | The mean number of years that a new-born child can expect to live if subjected throughout his life to the current mortality conditions (age specific probabilities of dying) |
| Healthy life years (HLY) | A composite indicator that combines mortality data with health status data: the number of remaining years that a person of specific age is expected to live without any severe or moderate health problems |
| The share of people with good or very good perceived health (PH) | The share of the population aged 16 or over perceiving itself to be in "good" or "very good" health |
| Current healthcare expenditure (CHE) | % Gross domestic product (GDP) |

Source: Eurostat (2020a, b); WHO (2020)

Healthcare resources are represented by the indicator displayed in the fourth row of Table 1 (available on WHO (2020)). The last available data from the previous years are used instead of the missing data of several indicators in several countries for some years.

*2.1.2 Model*

Cross-sectional regression analysis is the main method applied in this work. A cross-section model was created and a linear least-squares regression was applied to discover the relationships between the indicators used in the monitored sample of countries in 2010, 2014 and 2017. The applied formula to detect the relationship, which is relevant for SD, is as follows.

$$y = a + b_1 * x_1 + b_2 * x_2 + \mu_i. \quad (1)$$

In Eq. (1), y is an explained variable and $x_1$ and $x_2$ are two (statistically significant) explanatory variables. Symbols $a$ and $b$ represent coefficients. The assumptions of linear regression, in particular, (1) statistical independence of errors (absence of autocorrelation of regression residuals), (2) homoscedasticity (constant variance) of residuals, (3) normality of error (residual) distribution, and (4) no multicollinearity (see more in Pindyck and Rubinfeld (1991)), are verified by the relevant tests, i.e. by the Breusch-Godfrey test and the Durbin Watson test for the first assumption, the Breusch-Pagan test for the second one, and the Jarque-Bera test for the third one. Finally, variance inflation factor (VIF), which is a direct measure of how much the variance of the coefficient (i.e. its standard error) is being inflated due to multicollinearity, was used to verify the fourth assumption. Several models were tested and the best model (based on Eq. (1)) is presented in section 3. A Pearson correlation (r) is also used for the detailed explanation of the relationships between the indicator values.

## 3 Results and Discussion

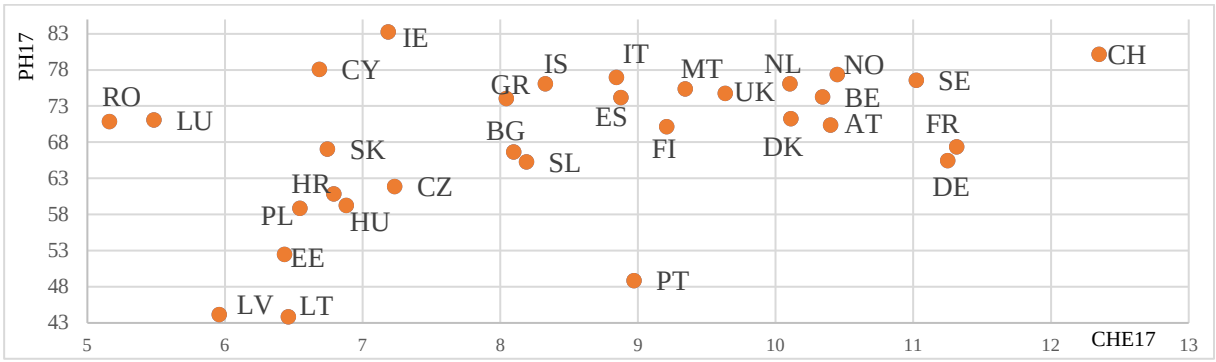
Firstly, the relationships among the variables are investigated (3.1) and secondly, a regression model is constructed and its results are presented (3.2). The results are discussed in more detail in the context of the previous works of the author (3.3).

### 3.1 Assessment of Relationships between Variables

In all three monitored years, the Pearson correlation coefficient was around 0.9 between the HLY indicators (0.918, 0.909 and 0.920 respectively). Although r is medium or relatively high between HLYm and LE (0.674, 0.586 and 0.602 respectively), HLYm and PH (0.742, 0.727, and 0.683), and PH and LE (0.675, 0.675 and 0.678 respectively), it is lower between HLYf and LE (0.441, 0.343 and 0.410 respectively). The coefficients between HLYf and PH are around 0.5 in each year (0.574, 0.547 and 0.526 respectively). As regards the CHE ratio, it is

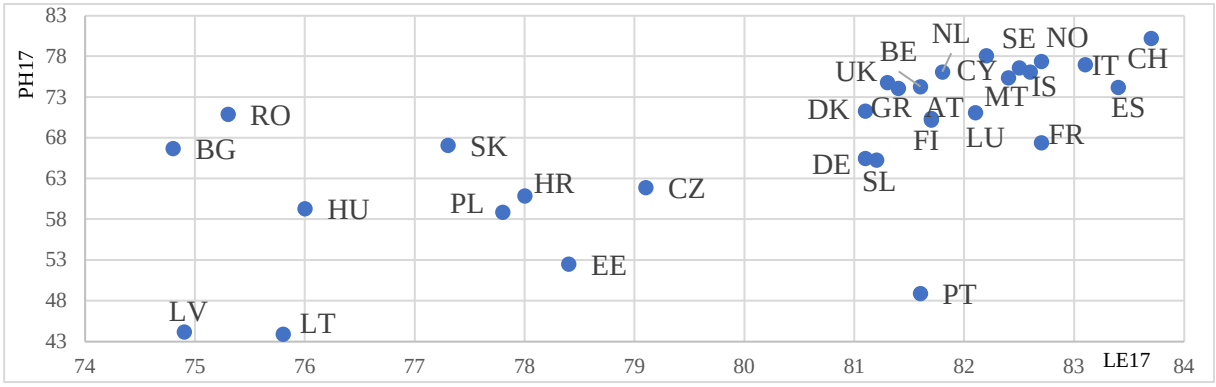
only correlated with LE and PH more significantly (for LE: 0.673, 0.671 and 0.653, and for PH: 0.425, 0.524 and 0.442 respectively), but it is not the case for HLY indicators (for HLYm: 0.304, 0.383 and 0.437, and for HLYf: 0.102, 0.210 and 0.310 respectively). Figure 1 displays the relationships between PH and the CHE ratio in 2017. Figure 2 displays the relationships between the PH and LE indicator in 2017. In both of them it is visible that the relationships are directly proportional, albeit not unequivocally. As it indicated above, the correlation coefficient between PH and the CHE ratio is 0.442 and between PH and LE is 0.678 (all in 2017). As regards the first relationship (Figure 1), a higher positive correlation would exist if several outliers were omitted. This is especially Romania, Luxembourg, Cyprus, Ireland and Portugal. The first four countries exhibited relatively high values of PH and relatively low CHE ratios and opposite is true for Portugal. After omitting these five countries the correlation coefficient would rise to 0.736. Moreover, the stronger relationship seems to exist in the group of eight new member countries, including Baltic countries, the Visegrad Group and Croatia (r = 0.758). It is weaker in the group of countries with higher CHE ratios, exceeding 8% of GDP. There are as countries with lower as countries with higher PH, but all PH values exceed 65% (with the lowest exhibited by Slovenia – 65.3%).

**Figure 1** Relationships between the PH and CHE indicators. Source: Eurostat (2020a, b); WHO (2020)




As regards the relationship indicated in Figure 2, this relationship seems to be less clear at first glance. After omitting some outliers (Bulgaria, Romania, Hungary, Slovakia and Portugal), the positive relationship between the variables would even be stronger that in the previous case (r = 0.924). On the other hand, in this group a stronger relationship seems to exist in the group of countries with higher LE values, in particular, older EU member countries (except Portugal), non-EU countries, and Cyprus, Malta and Slovenia. As regards the remaining new member countries, very low values of both indicators were exhibited by two Baltic countries (Latvia and Lithuania) and in the Visegrad group, along with Bulgaria, Romania, Estonia and Croatia, the negative relationships could also be identified (r = -0.614).

**Figure 2** Relationships between the PH and LE indicators. Source: Eurostat (2020a, b); WHO (2020)




This underlying analysis discovered some relationships; however, these relationships are not straightforward. HLY indicators are strongly correlated with one another and the average value of HLYf is higher than that of HLYm in each year. The average values of HLYf and CHE decreased, those of the remaining indicators increased. The strongest correlation was revealed to be between HLYm and PH. The correlation was medium between LE and PH, and HLYm and LE, but lower between HLYf and PH and LE. The CHE ratio is more significantly correlated only with LE. Next, the regression model described in Eq. (1) (subsection 2.1.2) is applied to investigate the relationships in more detail.

### 3.2 Results of Regression Analysis

As the PH indicator plays its important role as a subjective indicator in SDG 3 reflecting how people judge their health in general, its dependence on other objective indicators used is further investigated. Firstly, each explanatory variable, namely LE, the average value of HLYm and HLYf (further only HLY) and the CHE ratio were used separately. The results are displayed in Table 2. If LE alone was used as an explanatory variable, its coefficient ($b_1$, see Eq. (1)) would be higher (2.306, 2.397, and 2.513, in 2010, 2014, and 2017, respectively), but the adjusted $R^2$ of the model would be lower (0.436, 0.437, and 0.441, respectively) in comparison with the most appropriate model displayed in Table 3.

If the CHE ratio is added into the model as the second explanatory variable, it is insignificant and even negative in both 2010 and 2017, while the coefficient for LE is around 2 for each year (and significant at the 0 level in 2010 and 2017 and at the 0.001 level in 2014). The adjusted $R^2$ is around 0.42. If only HLY is used as an explanatory variable, the coefficients are lower than those for LE in separate models (around (above) 1). If only the CHE ratio is used as an explanatory variable, the models for all three years would be significant as well, so their coefficients (2.799, 2.811 and 2.356 respectively). However, the adjusted $R^2$ of these models is very low. Moreover, the homoscedasticity assumption for linear regression is violated in the model of 2017.

**Table 2** – The results of regression analysis for individual explanatory variables; 2010, 2014 and 2017

| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
|---|---|---|---|---|---|---|
| **Intercept** | -115.1608 | 37.0878 | -3.105 | 0.00422 ** | 0.4552 | 0.4364 |
| **LE10** | 2.3058 | 0.4685 | 4.922 | <0.0005*** | **F-s:** 24.23 | **p-v.:** <0.0005*** |
| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
| **Intercept** | -124.7856 | 38.9992 | -3.2 | 0.00332 ** | 0.456 | 0.4373 |
| **LE14** | 2.397 | 0.4861 | 4.931 | <0.0005*** | **F-s:** 24.31 | **p-v.:** <0.0005*** |
| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
| **Intercept** | -133.7438 | 40.6575 | -3.29 | 0.00264 ** | 0.4599 | 0.4413 |
| **LE17** | 2.5126 | 0.5056 | 4.97 | <0.0005*** | **F-s:** 24.7 | **p-v.:** <0.0005*** |
| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
| **Intercept** | -25.58 | 18.8839 | -1.355 | 0.186 | 0.4559 | 0.4372 |
| **HLY10** | 1.5 | 0.3043 | 4.93 | <0.0005*** | **F-s:** 24.3 | **p-v.:** <0.0005*** |
| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
| **Intercept** | -14.6495 | 17.6236 | -0.831 | 0.413 | 0.4292 | 0.4095 |
| **HLY14** | 1.3194 | 0.2825 | 4.67 | <0.0005*** | **F-s:** 21.81 | **p-v.:** <0.0005*** |
| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
| **Intercept** | -3.509 | 17.043 | -0.206 | 0.838339 | 0.3808 | 0.3594 |
| **HLY17** | 1.153 | 0.273 | 4.223 | 0.000218*** | **F-s:** 17.83 | **p-v.:** 0.0002178 |
| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
| **Intercept** | 43.458 | 9.457 | 4.595 | <0.0005*** | 0.1842 | 0.1561 |
| **CHE10** | 2.799 | 1.094 | 2.559 | 0.016 * | **F-s:** 6.548 | **p-v.:** 0.01598 |
| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
| **Intercept** | 43.3844 | 7.419 | 5.848 | <0.0005*** | 0.2745 | 0.2494 |
| **CHE14** | 2.8107 | 0.8486 | 3.312 | 0.00249 ** | **F-s:** 10.97 | **p-v.:** 0.002488 |
| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
| **Intercept** | 48.2565 | 7.6932 | 6.273 | <0.0005** | 0.1955 | 0.1678 |
| **CHE17** | 2.3557 | 0.8872 | 2.655 | 0.0127 * | **F-s:** 7.049 | **p-v.:** 0.01274 |

Source: author's calculations in R (2020)
Note 1: StE – standard error; adj$R^2$ – adjusted R-squared; mul$R^2$ − multiple R-squared; F-s − F-statistic; p-v. − p-value.
Note 2: Signif. codes: 0 '***;' 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1.

Next, all three explanatory variables are used in a common model. The CHE ratio representing resources is statistically insignificant when used as an explanatory variable along with the two objective indicators representing health outcomes. In 2010, LE is insignificant as well (significant at the 0.01 level in 2014 and at the 0.001 level in 2017). The coefficients for LE are the highest (1.187, 1.322 and 1.884 respectively). For the CHE ratio the coefficients are the lowest and even negative in 2017 (0.641, 0.759 and -0.156). The coefficients for HLY remain positive and significant for each year, but a decrease can be seen between these years (1.011, 0.872 and 0.683 respectively), while in the last year this coefficient is significant at the 0.01 level (at the 0.001 level in 2010 and 2014). The model displayed in Table 3 was chosen as the most appropriate model. However, a model based on two explanatory variables, namely the average value of HLY and the CHE ratio was also considered. The adjusted $R^2$ of these models is also relatively high in the first two years (0.509, 0.512 and 0.3901

respectively). All three models are statistically significant, but the intercept is only significant in 2010 at the 0.1 level. Both coefficients are around 1, higher for the CHE ratio in each year (1.359, 1.099 and 0.981 for HLY, and 1.953, 1.914 and 1.289 for the CHE ratio respectively; the coefficients for HLY are significant at the 0 level in 2010 and 2014, and at the 0.001 level in 2017; the coefficients for the CHE ratio are only significant in 2010 and 2014 at the 0.01 level). Since in 2014, the intercept, and in 2017, both the intercept and the CHE ratio are insignificant, the 2010 model, considered the most reliable, is displayed in Eq. (2):

$$y = -33.448 + 1.3588 * HLY_{10} + 1.9525 * CHE_{10} + \mu_i, \quad (2)$$

$$Pr(>|t|) = 0.0733\,^{\cdot}, 6.81e-05^{***}, 0.0300^{*};\ StE = 17.9743, 0.2909, 0.854;$$

$$F-statistic: 16.54\ on\ 2\ and\ 28\ DF, \qquad p-value: 1.813e-05;$$

$$Multiple\ R^2: 0.5415, \qquad Adjusted\ R^2: 0.5088,$$

where the first three values below Eq. (2) express the level of statistical significance of coefficients (respectively), standard errors are also related to these coefficients (respectively), and DF are degrees of freedom. HLY10 and CHE10 are the explanatory variables used in 2010. The weakening effect of both HLY and the CHE ratio can be seen in this model as well.

Finally, LE and HLY are used as explanatory variables in each year. The results of the regression model expressed by Eq. (1) are displayed in Table 3. All three models are statistically significant, so are their variables (the significance levels are also indicated in Table 3). In all three models, the higher effect of the LE variable was identified, while it was increasing. On the other hand, the effect of HLY is decreasing. The coefficients for HLY are higher when used in the common model with the CHE ratio (see also Eq. (2) and Table 3).

**Table 3** – The results of regression analysis for LE ad HLY as explanatory variables; 2010, 2014 and 2017

| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
|---|---|---|---|---|---|---|
| **Intercept** | -107.5748 | 33.2872 | -3.232 | 0.00314 ** | 0.5789 | 0.5488 |
| **LE10** | 1.4634 | 0.5118 | 2.860 | 0.00793 ** | **F-s** | **p-value** |
| **HLY10** | 0.9542 | 0.3326 | 2.869 | 0.00775 ** | 19.25 | <0.0005 |
| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
| **Intercept** | -119.8717 | 34.1414 | -3.511 | 0.00153 ** | 0.5983 | 0.5696 |
| **LE14** | 1.6641 | 0.4847 | 3.433 | 0.00187 ** | **F-s** | **p-value** |
| **HLY14** | 0.8661 | 0.275 | 3.149 | 0.00387 ** | 20.85 | <0.0005 |
| **Coefficient** | **Estimate** | **StE** | **t value** | **Pr(>\|t\|)** | **mulR²** | **adjR²** |
| **Intercept** | -120.0716 | 37.8778 | -3.170 | 0.00367 ** | 0.557 | 0.5254 |
| **LE17** | 1.8164 | 0.5442 | 3.338 | 0.00240 ** | **F-s** | **p-value** |
| **HLY17** | 0.6799 | 0.2745 | 2.477 | 0.01954 * | 17.6 | <0.0005 |

Source: author's calculations in R (2020)
Note 1: StE − standard error; adj$R^2$ − adjusted R-squared; mul$R^2$ − multiple R-squared; F-s − F-statistic
Note 2: Signif. codes: 0 '***;' 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1

It can be concluded that in the monitored sample of 31 countries, the share of people with good or very good perceived health (PH) is significantly determined by LE and HLY, but the effect of the CHE ratio is not that straightforward. The effects of the healthcare resources, expressed by the CHE ratio, can be indirect, depending on their influence of two objective indicators – LE and HLY. Nevertheless, after omitting some outliers (see Figure 1 for the situation in 2017), this relationship would be stronger. This relationship can also be stronger in some years (see Eq. (2))- It was also discovered that, between the monitored years, the effect of LE strengthened, while that of HLY and the CHE ratio weakened.

### 3.3 Discussion

Health status is determined by many factors, and it is difficult to identify the impact of individual influences. This study focused on the possible effects of two objective indicators reflecting health status, and another reflecting healthcare resources, on a subjective indicator reflecting health status, namely the share of people with good, or very good perceived health (PH). As regards a weaker effect of the CHE ratio, it is not only important to determine what the optimal percentage share of GDP for overall CHE should be, but also its allocation into particular components (in addition to the factors mentioned above). Drastichová and Filzmoser (2020) investigated the effects of the components of healthcare expenditure by the provider on the indicators representing healthcare outcomes (status) in the sample of 30 countries, including the EU-27, the UK, Norway and Iceland. Health outcome (status) indicators used were LE, HLYm, HLYf (similarly to this work) and death rate due to chronic diseases (DR). Compositional data analysis and regression analysis were applied to the data of the indicators in 2015. It was discovered that the higher the ratio of expenditure on retailers and other

providers of medical goods in relation to other types of expenditure in the composition, the higher the DR indicator and the lower the LE indicator. The ratio of expenditure on residential long-term care facilities in the composition had a positive effect on both HLYf and HLYm. The expenditure ratio on providers of healthcare system administration and financing had a negative impact on HLYm and a positive impact on LE. Negative effects were identified for expenditure ratios on providers of ambulatory healthcare on HLYf, and for providers of ancillary services on LE. Therefore, indirect effects on PH can exist as well.

Drastichová (2020) investigated relationships between the same indicators reflecting health outcomes (health status) and healthcare resources as in this study, and for the same sample of 31 countries. The performance of these countries was evaluated by means of hierarchical cluster analysis (HCA) in the sample for 2010, 2014, and 2017, and for all data for these three years. Four clusters were created in each analysis. This analysis can help understand the relationships among the variables also used in this study. Cluster 1 exhibiting the highest average values of the CHE ratio did not achieve the highest average values of the indicators reflecting health status. This cluster included Austria, Germany and Finland in each year and in the whole period, along with several, often developed, countries in individual analyses (such as France, Switzerland, Belgium or the Netherlands). In 2014, Slovenia and Portugal, having relatively low CHE ratios in comparison to the rest of this group, but relatively high in relation to their performance, were also included. It can also be good seen that these two countries exhibited relatively low PH values in relation to their CHE ratios (Figure 1) and also relatively low PH in relation to higher values of LE. Lithuania, exhibiting very low values of all indicators, was the worst performing country of the sample. This country also had very low CHE ratios. Norway, Malta, Sweden, Iceland, Ireland, Italy and Cyprus achieved the highest performance. The first three countries were in a common cluster in each year, however, they created a separate cluster only for the whole period. In 2014, they were grouped with Ireland and Iceland, and in the remaining years, with several countries, including, Cyprus, Spain, and Italy. These countries often exhibited high values of indicators reflecting health status (in some of them, such as Cyprus, Italy, Malta, or Sweden, significant increases occurred), while their CHE ratios were not the highest (see Figures 1 and 2). The relationships are diverse. Switzerland, with one of the highest PH and LE values, and the highest CHE ratio in the group, exhibited relatively low HLY values. It must be taken into account that the development of all the indicators included as well as macroeconomic indicators determining healthcare resources could significantly change from 2020 onwards reflecting the effects of new emerging health threats.

## 4 Conclusion

The aim of this study was to discover relationships between the selected subjective and objective indicators reflecting health outcomes (health status) and healthcare resources in the sample of 31 countries, including the EU-27, and Iceland, Norway, Switzerland and the UK by means of a cross-sectional regression analysis. The impacts of LE, HLY (objective indicators), and the CHE ratio (representing healthcare resources), on the share of people with good or very good perceived health (PH, representing a subjective indicator) were evaluated. LE reflects quantitative aspects and HLY qualitative aspects of health status (health outcomes). The indicators of health status also reflect wellbeing and play and important role in strategies for SD (especially in terms of the human development approach within the concept of SD, where health is an essential constituent of wellbeing). A positive impact of both objective indicators on the subjective indicator reflecting health status was discovered.

Several regression models were constructed for the sample for 2010, 2014 and 2017. The share of people with good or very good perceived health (PH) was used as an explanatory variable, and a combination of objective indicators reflecting health status (LE and HLY), along with the CHE ratio, reflecting healthcare resources, were used to explain PH. In the sample of 31 countries, the share of people with good or very good perceived health (PH) is significantly determined by LE and HLY. However, the effect of the CHE ratio is not that straightforward. It can be indirect, depending on their influence of two objective indicators – LE and HLY. On the other hand, after omitting some outliers, this effect would be stronger. The effect of CHE can also be stronger in some years. It was discovered that this effect could have been more significant in 2010 and 2014 than in 2017. The CHE ratio may have had a positive effect on PH, together with HLY, while that of the CHE ratio would have been stronger. Overall, the effect of LE is the strongest, as its coefficients (the slopes) were above 1 in all the models considered. For HLY, these coefficients were lower (around 1 or lower), which indicates a weaker effect. For the CHE ratio, the slope was low, or even negative, and often statistically insignificant, which indicates that the relationships between the indicators reflecting health status and those reflecting healthcare resources differ among countries. In certain countries in the group the values of indicators reflecting health status increased with simultaneous decreases in CHE ratios. Indirectly proportional relationships between PH and other variables applied could even be identified in some groups of countries. Between the monitored years, the effect of LE strengthened. Those of HLY and the CHE ratio weakened. It is also more likely that after achieving relatively high values of LE and CHE ratios, the effects on PH are weaker.

It must be considered that - based on the most recent developments - the values of indicators applied in this analysis can change significantly. A new challenge for the future is to analyse the capacity, efficiency, and sustainability of healthcare systems in response to the most recent situation, and the new health risks that have arisen, so as to avoid drawing even closer to the more unsustainable path of development. The challenge for the near future will be to focus on the social aspects of SD, in particular, health and wellbeing.

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# Staffing and Salary Situation in the Social Care Industry in the Czech Republic

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**Abstract**
The paper aim is to provide a perspective on the staffing and financial evaluation of persons employed in the social care industry in the Czech Republic, according to the structure of individual categories of workers and expenditure on salaries for the years 2007-2018. The research focuses on the social facilities of the regional offices, statutory cities, municipalities with extended powers and devices of the Ministry of Labour and Social Affairs of the Czech Republic. At the national level, the average monthly salaries per employee of the given industry are analysed in relation to the average salary by the section CZ-NACE (section Q). The monitored problematics will be solved primarily using the measure of time series dynamics. The results showed that the personnel and salary resources had a growing tendency in the defined period. However, it can be observed that the average salaries of workers in the social care industry are still very low and the number of workers is insufficient.

***Keywords:*** *analysis, average salary, Czech Republic, social care, staff*

***JEL Classification:*** *H75, J24, J30*

## 1 Introduction

The Statistical Classification of Economic Activities (CZ-NACE) defines areas of economic activity into individual branch sections (A-U), which are typical for the production of a particular product or provision of a specific service, using a combination of factors of production, labor, production processes and intermediate products. The group of defined sections also includes section Q which consists of the Health and Social care industry (level of classification of economic activities), which is focused on the provision of health and social care services. (Beránek, 2016) Health services are provided at the level of the Health Care section (86), ie with a focus on institutional health care, outpatient and dental health care and other activities related to health care. (CZSO, 2020)

Social care services are intended for persons with reduced physical and mental self-sufficiency, ie those who do not manage the basic tasks of caring for themselves. (MLSA, 2019) Social care services are provided in the form of residential[1], ie in health care facilities of institutional care, in facilities for people mentally ill or addicted to substances, in homes for the elderly and for people with disabilities or other groups of people (children, homeless people, etc.) and also in the form of outpatient or field[2]. In these forms, a number of activities of social care services are provided, but also health care services. In this area, medical care means primarily nursing and professional supervision of the state of health. (CZSO, 2020)

The issue of providing social care services is becoming more and more in the forefront of interest not only of experts, but also of the general public. From a socio-economic point of view, this is mainly due to objective

[1] Residential social care services section (87).
[2] Outpatient or field social services section (88).

trends in population development, the associated pressure on qualified human resources and, last but not least, conceptual issues of state policy and public budgets. (Ondrušová, Krahulcová, 2020)

The way in which social care services are provided, including the level of quality, significantly affects the overall perception of services by clients. (Petr, 2004) It is therefore desirable that the structure and number of employees, their level of education, professional skills and knowledge be in accordance with the defined needs of individual facilities that provide care and also to meet the needs of individual clients. Workers who provide social care need to be given increased attention, ie to ensure their professional development in continuing education, to enable them to consult regularly with independent qualified professionals in order to solve problems in the profession and, last but not least, to create suitable working conditions, including appropriate financial evaluation. (MLSA, 2007)

In the social care industry, increased demand for new jobs can be expected in the coming years. The projection of the demographic development of the population of the Czech Republic, but also of other European countries, assumes that in the following years there will be a significant increase in the number of people aged 65+. In the case of some Member States of the European Union, this phenomenon is already apparent, for example in Italy, Finland, Greece or Portugal. (Eurostat, 2019). The share of people of post-productive age in the total population will increase sharply, which will lead to greater pressure to provide the necessary social care of adequate quality and to a sufficient extent. Closely related to this is the need to ensure a sufficient number of professional staff in the social field in the coming decades, ie to ensure the necessary level of employment in this sector. (Spetz, Trupin, Bates, Coffman, 2015)

The paper provides a comprehensive view of the issue of employment and financial evaluation of workers in social care industry in the Czech Republic since 2007, ie when the Social Services Act No. 108/2006 Coll., entered into force. The findings can be valuable for policy makers, among other things, for their active involvement in addressing possible shortcomings in the monitored professional sphere, especially with regard to the expected growing demand for social care services in the coming years, see Průša (2015).

**The paper aim is to provide a perspective on the staffing and financial evaluation of persons employed in the social care industry in the Czech Republic, according to the structure of individual categories of workers and expenditure on salaries for the years 2007-2018.** Part of the paper is also a hypothetical estimate of the development of personnel security in the social care industry, selected social facilities in relation to the demographic aging of the population, ie the group of people over 65, until 2100.

The social care industry is examined from the perspective of the social facilities of the regional offices, statutory cities, municipalities with extended powers and devices of the Ministry of Labor and Social Affairs of the Czech Republic.

The evaluation of the development of the personnel and salary situation in the selected branch of social care for the period 2007-2018 is carried out through the peace of the dynamics of time series. The degree of dynamics of the monitored variables will be monitored using the average absolute increment, the average growth rate (average growth coefficient) and the average relative increment.

## 2 Methodology and data

### 2.1 Methodology

Time series mean the arrangement of numerical values of observed quantities or phenomena. In the economic concept, the time series can be characterized as a series that monitors the development of the values of a particular economic indicator. The purpose of time series analysis is to best estimate the behavior and development, in order to understand the series and predict their future development.

Measures of time series dynamics are intended to characterize the basic features of time series behavior and to formulate certain criteria for their subsequent modeling. The basic indicators of the rate of dynamics include absolute increment, average absolute increment, growth coefficient, average growth coefficient, relative increment and average relative increment. (Box-Steffensmeier et al., 2014; Rosenblatt, 2001)

The simplest indicator of the degree of dynamics is the absolute increment (first difference) which indicates the change in the value of the time series. It can be calculated by the difference of two consecutive values of series in time $y_n$ and in time $y_{n-1}$ in the form

$$\Delta y_n = y_n - y_{n-1}, \qquad n=2,\ldots,N. \tag{1}$$

The resulting value indicates the extent to which there has been a change in terms of the time series for the period under review.

Within the average difference of the absolute increment, it is possible to calculate the average absolute increment, which is suitable for monitoring the development of the entire time series. It is used mainly for longer time series. The result is an average change in the value of the time series over the entire period under review. In the mathematical expression, the calculation can be written as

$$\bar{d} = \frac{y_n - y_1}{n-1} \quad (2)$$

Another, no less important characteristic of the dynamics of dynamics is the growth rate, expressed by the growth coefficient. The growth rate indicates the extent to which the value of the measured characteristics has changed. The result is usually expressed as a percentage or decimal numbers. If the growth coefficients of a time series are relatively constant, the characteristics of the exponential trend can be deduced for a given time series.

The average growth rate or average growth factor is calculated as the geometric average of the individual growth factors in the form

$$\bar{k} = \sqrt[n-1]{\frac{y_n}{y_1}} \quad (3)$$

The resulting value expresses the average change in the time series over the observed time period. The growth coefficients can be used, among other things, as one of the criteria for finding a suitable trend function.

Another indicator of the degree of dynamics is the relative increase, resp. the increment coefficient, which indicates the increment of the value of the time series in the period $y_n$ versus the period $y_{n-1}$ in the share calculation. (Rosenblatt, 2001) The average coefficient is closely related to the growth coefficient, it is equal to its value reduced by 1, ie.

$$\bar{\delta} = \bar{k} - 1 \quad (4)$$

**2.2 Data**

The analysis in the Czech Republic focuses on selected branches of social care, specifically on social services facilities of regional authorities, statutory cities, municipalities with extended powers and centers of social services managed by the Ministry of Labor and Social Affairs of the Czech Republic.

The data were taken from the Ministry of Labor and Social Affairs of the Czech Republic (MLSA) - Statistical Yearbooks with a focus on the social care industry and from the Information System on Average Earnings (ISAE) - Salary Sphere of the Czech Republic - Region sections of economic activities CZ-NACE.

Selected data were monitored from 2007, ie from the year when there was a fundamental change in legislation in the social services sector (the Social Services Act No. 108/2006 Sb. entered into force), until 2018.

The professional structure of workers in social services facilities depends on the category of services provided, which include:

i. social services - direct service care, basic educational non-pedagogical activity, nursing activity, social workers, employees of professional social counseling centers,
ii. medical services - paramedics, masseurs, nurses, general and general nurses, doctors and therapists,
iii. pedagogical services - educators, teachers of vocational training, special pedagogues,
iv. others - economic, operational and manual employees.

The data of statistical yearbooks of the Ministry of Labor and Social Affairs of the Czech Republic for the period 2007-2018 show that employees in the category of social services make up more than half of all employees in the monitored social facilities. The second most numerous groups are workers providing technical and manual services (29 %) and workers in medical services (12 %).

The research will focus mainly on the first category of services, ie the structure of workers providing social services.

## 3 Results and Discussion

This section deals with 1) development of the number of workers providing social care in selected social facilities for the period 2007-2018, according to individual professions, 2) hypothetical prediction of the development of the number of social care workers in relation to the forecast of the population group 65+ until 2100, and 3) the development of salary evaluation of individual professional groups of social care for the period 2007-2018.

### 3.1 Results I.: Personnel Situation in Selected Social Facilities in the Social Care Industry

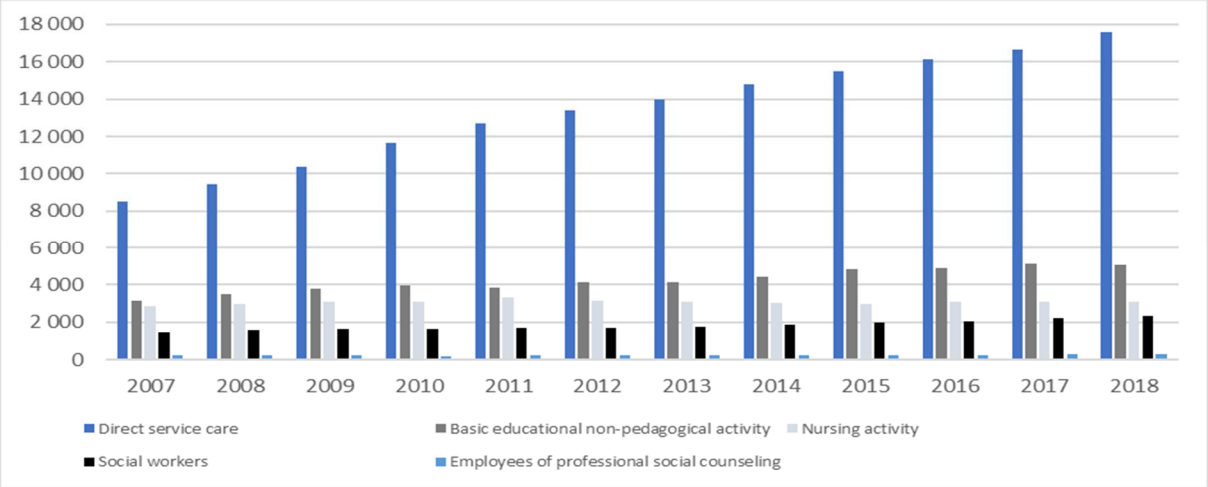
The health and social care industry falling under the CZ-NACE classification of economic activities has, since 2007, accounted for an average of around 7 % of the national economy of the Czech Republic in terms of the development of the number of human resources (physical condition of persons). (ESF, 2015)

Figure 1 shows the development of employment in the monitored social facilities since 2007, ie the development of individual professional groups. It is obvious that the largest group of workers in social services consists of workers in direct service care (over 53 %). These workers help people with reduced self-sufficiency in personal hygiene and clothing, and also participate in creating basic social and societal contacts. In the observed period, compared to other groups of workers, the number of workers in direct service increased significantly year-on-year. In 2018, more than twice as many people were employed in direct service care than in 2007. This is the highest increase in employment in the category of social services in 12 years, which is confirmed by the results of time series parameters: $\overline{d}$=824, $\overline{k}$=1,07, $\overline{\delta}$=0,07.

Workers providing basic educational non-pedagogical activities form the second largest group of workers in social services. Employment in this group increased year-on-year, so the values of the resulting parameters of the time series were also positive: $\overline{d}$ = 175, $\overline{k}$= 1.05, $\overline{\delta}$= 0.04. In the case of the group of social workers, the situation was similar, however, there was a relatively low increase. During the observed twelve-year period, the number of persons employed in this group increased by only less than a third ($\overline{d}$ = 77, $\overline{k}$= 1.04, $\overline{\delta}$= 0.04). This is a group of workers who, together with workers in direct service care, play a key role in ensuring the final form of the necessary and quality level of social care provided.

The number of persons providing care activities or working in professional social counseling centers did not increase significantly during the observed period; on the contrary, in some years they decreased. Year-on-year changes (increases, decreases) in the number of employees averaged around 5-10 %. Compared to 2007, in 2018 8 % more persons providing care activities were employed ($\overline{d}$=20,63, $\overline{k}$=1,007, $\overline{\delta}$=0,007) and 36 % more persons working in professional social counseling centers ($\overline{d}$=7,09, $\overline{k}$=1,03, $\overline{\delta}$=0,03).

**Figure 1** – Structure and development of employees in the category of social services in 2007-2018

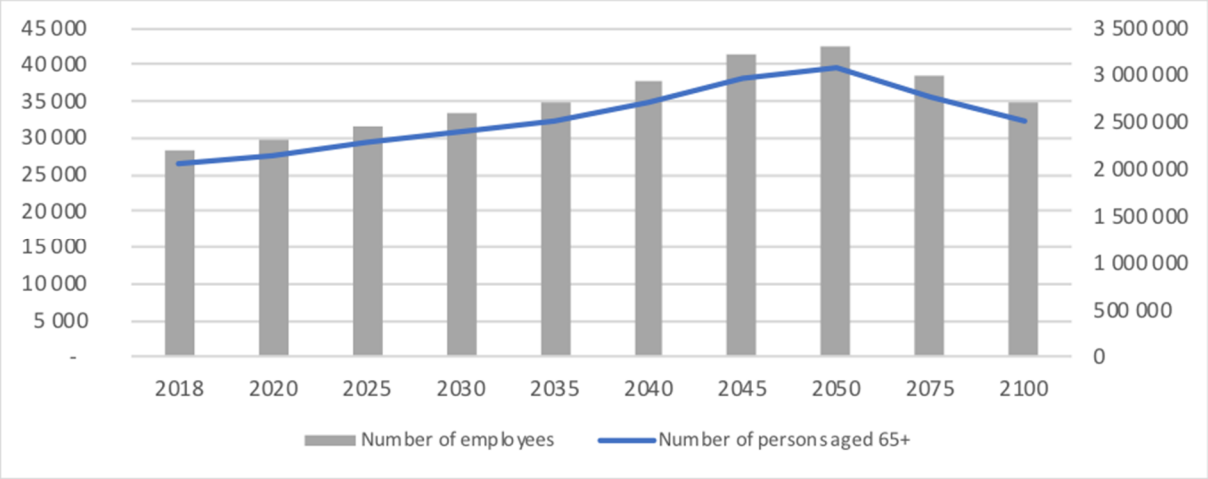



Source: Statistical yearbooks of the MLSA 2007-2018. Own processing.

Employment in the given professional groups should therefore be in accordance with the current situation on the market of social services and its demand for social care services. However, in most European countries this assumption is not fulfilled. Countries, on the other hand, face a significant base of skilled workers, including the Czech Republic. (Burton, Toscano, Zonouzi, 2012; Eurostat, 2019) For example, in Germany, Ireland or Norway, there is a strong dependence on workers from abroad, ie from Ukraine, Slovakia or Poland, due to the insufficient supply of workers born in their home country (Cangiano, 2014). Goździak (2016) sees low salaries and high living costs in large urban areas as the main reasons for Polish workers to work abroad, especially in Germany, Austria, Ireland or the United Kingdom. The country loses the most with the outflow of skilled workers. Also in Slovakia, the situation on the labor market in the social care industry is critical. Makčinová, Slovák, Keketiová and Eidenmüller (2015) point out the acute shortage of workers in social services - this has a negative impact on the quality of social care provided and threatens social services in Slovakia in the future. This problem is currently being solved very intensively in Slovakia. This includes, for example, a reduction in administrative matters in order to facilitate the recruitment of staff from abroad (eg from Ukraine or Serbia) or in the form of salary increases, considering the number of years worked in the organization.

As already mentioned in the Introduction, the demand for social care services is expected to increase in the coming decades due to the aging of the Czech population. The question thus arises as to what extent, respectively, by how much employment in the sector would have to be hypothetically increased if social care were provided only to persons over 65 years of age. Figure 2 shows the hypothetical development of the number of employees of the monitored social facilities, in relation to the forecasts of the demographic development of the selected group of persons (65+) until 2100 (medium variant of development). The starting year for the forecast was 2018 and the assumption that there are 72 people in the post-productive age per 1 employee.

**Figure 2** – Hypothetical development of employment in relation to the forecasts of the development of persons aged 65+ until 2100




Source: CZSO (2018). Own processing.

### 3.2 Results II.: Salary Situation in Selected Social Facilities in the Social Care Industry

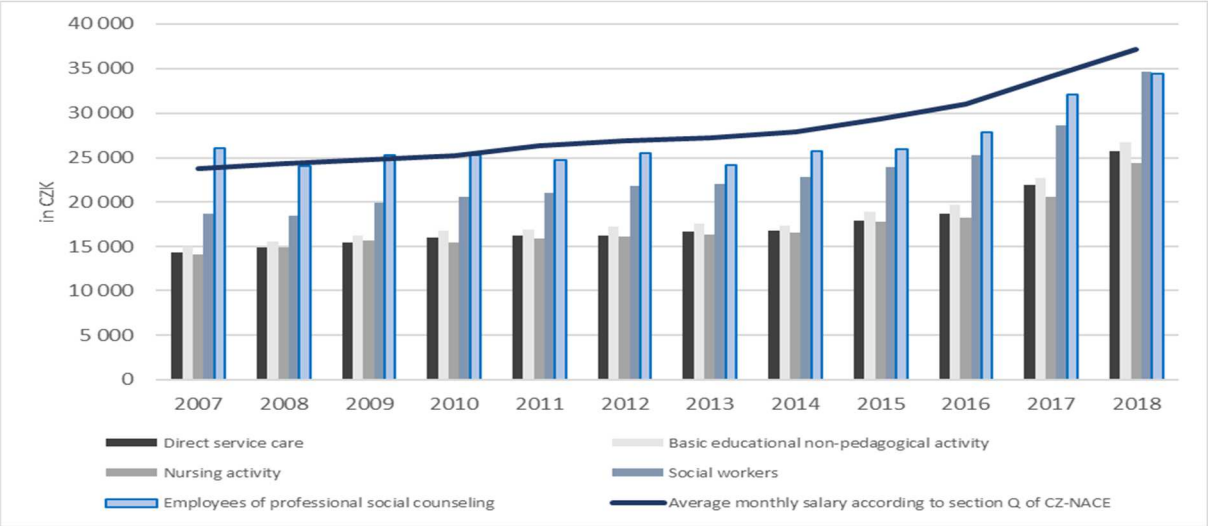
In the social care sector, about half of all employees receive a salary, the rest work for a wage. In the monitored social facilities, employees are evaluated by salary, the amount of which is influenced by the composition of the industry, expertise and specialization of individual professional groups.

Figure 3 shows the development of the average monthly salaries of the monitored occupational groups since 2007, including the development of the average monthly salary of section Q of the Health and Social care industry (CZ-NACE). The Figure shows relatively low year-on-year increases in the monitored groups, with the exception of the group of employees in professional social counseling centers; there was a fluctuating development of the average salary evaluation. Especially since 2015, it is clear that there has been an increase in funds for salaries. This trend was maintained in the following years - the average year-on-year increases were around 5-15 %. Thanks to this more significant increase in wages, it was possible to stop the outflow of workers from the monitored industry. However, their current value is still not adequate. (ASSP, 2019)

The rates of dynamics of time series between 2007 and 2018 were positive for all monitored professional groups.[3]

[3] Direct service care - $\overline{d}$=1 031, $\overline{k}$=1,05, $\overline{\delta}$=0,05; Basic educational non-pedagogical activity - $\overline{d}$=1 065, $\overline{k}$=1,05, $\overline{\delta}$=0,05; Nursing activity - $\overline{d}$=930, $\overline{k}$=1,05, $\overline{\delta}$=0,05; Social workers - $\overline{d}$=1 452, $\overline{k}$=1,05, $\overline{\delta}$=0,05 ; Employees of professional social counseling - $\overline{d}$=766, $\overline{k}$=1,03,$\overline{\delta}$=0,03.

**Figure 3** – Development of average monthly salaries of professional groups in 2007-2018




Source: Statistical yearbooks of the MLSA 2007-2018, ISAE 2007-2018. Own processing.

Although the average monthly salary per employee, with a few exceptions, has been rising steadily, no group of employees has reached the average monthly salary of the social care sector since 2011. Until 2010, only employees in professional social counseling centers reached this limit, and in the following years they were closest to this limit (in 2018 together with employees within nursing activities).

Such a low salary in the social care industry causes the departure of many qualified employees of individual groups. This is a physically and mentally very demanding job, which is, for example, in Austria or Germany much better financially evaluated. The importance of adequate financial evaluation for social care workers is confirmed by Morris (2009). The author states that a minimal increase in financial evaluation is insufficient to motivate employees to work better and higher quality. Employees who remain in the workplace are considering leaving due to high stress, excessive congestion and, above all, insufficient income. (Christensen, Pilling, 2017) The results of the Chou and Robert (2008) survey confirm that job satisfaction is negatively associated with work overload, which should be positively offset by financial support and suitable working conditions. Last but not least, according to Powers and Powers (2010) and Chou (2012), the amount of financial evaluation is a key factor influencing employee turnover (higher salary is associated with lower turnover). The decrease in the number of employees in social facilities, at its full capacity, leads to a significant reduction in the quality of services provided.

## 4 Conclusion

The paper focuses on the staffing and financial evaluation of workers in the social care industry in the Czech Republic for the period 2007-2018, according to the structure of individual categories of workers and expenditure on salaries. The monitored issue is focused on groups of workers providing social care within social services, ie direct service care, basic educational non-pedagogical activity, nursing activity, social workers and employees of professional social counseling centers.

Measures of time series dynamics, namely average absolute increment, average growth rate and average relative increment, were selected as basic indicators that allow to characterize the features of employment development and financial evaluation of workers in the social care industry between 2007 and 2018.

The analysis of employment in the social care industry was monitored in the social facilities of the regional offices, statutory cities, municipalities with extended powers and facilities of the Ministry of Labor and Social Affairs of the Czech Republic. The results showed that the most dynamic development of the number of employees was recorded in the group of direct service care, which is confirmed by selected indicators of the rate of dynamics, which were positively the most significant between 2007 and 2018. Although the increase in the number of employees in this occupational group was large (almost double the increase), an adequate level of employment was not reached to cover the total demand for social care. The lack of qualified social workers is also obvious, the number of which grew only very slowly year-on-year (2-7 %), although this is an important professional group that leads the entire process of social work. The absence of these two occupational groups threatens the entire system of care for the elderly and the disabled. A possible collapse of the system will lead to a reduction in the quality of care provided or bed capacity in some social facilities and also to an overload of

existing staff. In the case of other occupational groups, it can be stated that their positive increments were very low during the observed period.

The personnel crisis is critical mainly due to the financial and social underestimation of these professional groups. The development of average salaries of the monitored professional groups had a gradual increasing trend since 2007, with the exception of employees in professional social counseling centers, where there was a fluctuating development with declines in 2008, 2011 and 2013. Significant year-on-year increases in average salaries have been recorded since 2015 - average increases in all occupational groups ranged from 5-15 %. In terms of the growing development of average salaries between 2007 and 2018, it can be stated that the most significant increase was achieved in social workers - almost twice the financial value was detected, as well as in workers in direct care and basic educational non-pedagogical activity. It is clear that the almost twofold increase in the salaries of social workers cannot still be considered sufficient for the exercise of this profession, given their low number in recent years. A closer comparison of the average monthly salaries of workers in social services with the average monthly salary in the social care industry (section Q, CZ-NACE) showed that since 2011 no occupational group has reached the average monthly level in the monitored sector. This fact confirms that workers in social services are not sufficiently financially rewarded. The Czech Republic does not have any specific tools aimed at supporting workers in social care industry or motivating students to study in these fields.

The fact that the provision of quality care for the elderly or disabled in social facilities is extremely important is also evidenced by the current epidemic situation related to the occurrence of COVID-19 disease, which is caused by the coronavirus SARS-CoV-2. Given that the elderly and people with an associated illness belong to the most vulnerable group (highest mortality), the hitherto underappreciated work and personal approach of social care workers has proved to be key against the spread of the disease in individual facilities. The question remains whether the work commitment of workers during the coronavirus epidemic will help to improve their position in society, and thus change the system of financial remuneration in this industry. If not, it could happen that in the next crisis, fewer fighters will be the first to know, who will no longer be able to defend the walls of quality social care sufficiently.

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# Education in the Czech and Polish Context: The Impact of the Reform on the Funding for Regional Education in the Czech Republic

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## Abstract

The contribution focuses on the funding for education and the analysis of public expenditures with the focus on secondary education in the Czech and Polish context in years 2010-2018. Attention is given to the funding and the reform of the regional education in the Czech Republic since 2020, together with an evaluation of Ministry of Education, Youth and Sports assumptions about eliminating imperfections in the previous funding system. The aim is to evaluate expenditures on education in the Czech Republic and Poland and map the current reform phases of the education process in the Czech Republic with the focus on regional education, including impacts on chosen secondary schools (grammar schools) budgets. The main effort is to primarily evaluate the entities with radical changes within the new system of funding for education on the level of secondary education. The cluster analysis compares the increase in resources of the direct expenses at 14 Czech grammar schools (in 2019 and 2020). The results of the cluster analysis show the division of secondary schools (grammar schools) into two clusters based on internal similarity. Within the cluster, it is possible to see the similarity of the individual entities in their size and reliance on the increase of financial resources for salaries, including levies and other non-investment expenditures.

***Keywords:*** *Czech and Polish Context, education, expenditures, funding for regional education*

***JEL Classification:*** *H72, H75, I22*

### 1 Introduction

The education sector is worldwide under the growing pressure to improve the quality of education and increase its performance. With the spread of information and communication technology and global interconnectivity, many countries are modifying their education systems. Ongoing changes in the education system aim to establish competitively and efficiently operating education institutions (Bohm and Bohmova, 2016). The state defines the overall concept of education policy development. Subsequently, the level of education has a noticeable impact on the economic, cultural and social development of the society. The high-quality educational system bears considerable investments in it. The public expenditures on education are a significant part of public budgets in the international comparison, and one of the competitive ability indicators of the economy. Education is a fundamental investment in the development of the long-time economic potential of countries and an investment into changes related to technologies and demography (Kleňhová et al. 2010). The strategy Europe 2020 identified several key areas which concern the field of education and training: one of the five main headline targets concerns the improvement of education levels of European citizens (European Commission, 2019). Szczepaniak and Kovarova (2018) evaluate current state of citizens' quality of life by selected indicators in Poland and in the Czech Republic.

The implemented steps of the reform in the school administration of each state involve not only legislative changes, but also affect the financial field considerably. The size of the budget, mainly the correct and efficient

division of financial resources and their effective targeting, has without the discussion, impact on the overall level of the educational system. The long-term problem that has been solved in the sector of education is the way how to divide the budget, and which amount of the budget is the most effective considering educational outputs. Many authors deal with present questions about funding for education in Europe, the role of globalization, or efficiency of expenditures provided on education (Afonso and Aubyn, 2006; Conlin and Jalilevand, 2015; Kovernuk, 2016; Ozkok, 2017; Guziejewska and Majdzinska, 2018; Halaskova, 2019; Mihalcova et al., 2020). Afonso and Aubyn (2006) assess the efficiency of expenditures on education in the countries of OECD by the comparison of outputs (results PISA) with expended resources (teacher to student, the time spent at school). Other authors Mihalcová et al. (2020) analyze financial literacy based on PISA 2015 assessment in the chosen OECD countries and oversee the quality of professional education, including conditions in the Slovak Republic. Savas Yalcin and Akan (2018) attempt to reveal the obligations and responsibility of the public sector in securing funding for secondary education. Conlin and Jalilevand (2015) evaluate the increasing trend in expenditures on education and the financial system of education with special needs on the level of districts. The results show great misbalance in expenditures on students in special education and the composition of students that differ according to district wealth. The paper aims to evaluate the expenditures on education in the Czech Republic and Poland and map the current steps of the reform of education process in the Czech Republic with the focus on regional education including impacts on budgets of chosen secondary schools (grammar schools).

### 1.1 Funding for Education in the Czech and Polish Context

Education in Poland is funded primarily from public sources. It is estimated that public funds represent around 91% of funding in school education and around 79% in higher education. The share of public funding in early childhood education and care is bigger and represents around 82% (OECD, 2019). The main sources of public funding for education in Poland include the school education part of the general subsidy from the State budget provided to local government units (LGUs); State-budget grants for specific purposes (targeted grants) provided to LGUs; grants for specific purposes and institutions (targeted State-budget grants) and State-budget subsidies allocated to higher education institutions (for example, for the maintenance and development of the teaching and research capacities; financial benefits for students; co-funding for capital investment projects; tasks related to providing conditions for the full participation of disabled people in the learning process); LGUs' resources (for example, from charges and taxes); EU funds and other public funds (e.g. the Labour Fund; the National Fund for the Rehabilitation of Disabled People) (European Commission, 2019). Public funding is allocated not only to public educational institutions. Grants are also awarded to non-public institutions providing care to children, nursery schools, schools and higher education institutions if they fulfil requirements laid down in national legislation. The share of public funding shows the areas where the non-public sector plays an important role but also reflects varying levels of fees for services offered by public educational institutions (European Commission, 2019). The funding for education in Poland on the municipal level is the interest of, e.g. Guziejewska and Majdzinska (2018). The authors look into the indicators and factors that affect the number of expenditures on education in municipalities significantly. The results show a slightly positive correlation between the municipality's incomes per inhabitant and local share in funding for education per inhabitant. The educational challenges connected to the demographical situation are an added value.

Education in the Czech Republic (hereinafter referred to as the CZ) is funded through the public budget on the central level (the State budget) and territorial level (regional and municipality budgets). The largest amount of financial resources is directed to the sphere of regional education. The Ministry of Education, Youth and Sports (hereinafter referred to as the MEYS) provides the funding of individual educational departments the MEYS from the chapter of budget 333. Within this sector, the financial resources are provided on so-called direct expenses on education for schools and school facilities established by municipalities and voluntary union of municipalities and regions, non-investment donations to private and religious schools, and there is also fully ensured funding for directly controlled organizations (MEYS, 2020a). The development of the Czech educational system and its funding has been an interest of, e.g. Greger and Walterova (2007). The changes in funding system in the CZ since 2020 comes from the requirement when the funding system is not under the aim of The long-term intention of education and the development of education system of the CZ for period 2015-2020 (MEYS , 2015). According to Strategy 2030+ (MEYS, 2020b), the aim is to increase funding and guarantee its stability, that will reflect in the change of the content and the way of education, decreasing of imbalance, support of teachers and changes in management.

Until 2019, the system of normative funding was applied for education and school facilities from the State budget in the CZ. It was related to financial resources intending for direct expenditures of funding, that means salaries and levies from salaries of pedagogical and non-pedagogical employees and other non-investment expenses. Even though the normative system seemed to be fair in the time of its realization, it appeared that the high autonomy of regional offices in deciding process of funding led to differently stated normative for a certain unit of performance. The result was an uneven position of the individual, comparable recipients in the CZ, which

has been one of the reasons for the establishment of the reform of funding for regional education since 2020 (MEYS, 2020c). The funding of secondary education in the CZ has been the topic of, e.g. Maresova and Kuca (2019). They point out to school needs in the area of funding and introduce various financial resources and their practical use, including requirements for reform of funding for regional education in the CZ. Opletalova et al. (2019) analyze contemporary secondary school financial system in the CZ and form criteria for improvement of redistribution of means from public resources. As emerged from the results, there is a recommendation to watch some elements of contemporary funding system (watching the graduates in the evaluation of labour market, evaluation of schools and teachers).

## 2 Material and Methods

During the contribution processing, the data are used from Eurostat (Statistic database – general government expenditure by function COFOG) to compare the expenditures on education in the Czech Republic and Poland in years 2010 - 2018. The statistic data of the school budgets in the years 2019 and 2020 are used to analyse and evaluate secondary schools (grammar schools) in the CZ with the example of the Moravian-Silesian Region (hereinafter referred to as the MSR). Other sources are professional literature from the field of education funding, school documentation, annual reports, accounting statements etc. The chosen file comprises of 14 grammar schools established by the MSR (G1: Gymnázium Františka Živného, Bohumín Jana Palacha 794, p.o.; G2: Gymnázium Mikuláše Koperníka, Bílovec, p.o.; G3: Gymnázium a Střední průmyslová škola elektrotechniky a informatiky, Frenštát pod Radhoštěm, p.o.; G4:Gymnázium Havířov-Město, Komenského 2, p.o.; G5: Wichterlovo gymnázium, Ostrava - Poruba, p.o.; G6: Gymnázium, Nový Jičín, p. o.; G7: Gymnázium, Ostrava - Hrabůvka, p.o.; G8: Gymnázium, Frýdlant nad Ostravicí, nám. T. G. Masaryka 1260, p. o.; G9: Gymnázium, Krnov, p.o.; G10: Gymnázium, Karviná, p. o.; G11: Polské gymnázium-Polskie Gimnazjum im.Juliusza Słowackiego, Český Těšín, p. o.; G12: Gymnázium, Třinec, p. o.; G13: Gymnázium Petra Bezruče, Frýdek-Místek; G14: Gymnázium Havířov - Podlesí, příspěvková organizace).

The empirical part of contribution compares the chosen grammar schools in the CZ established by the MSR with the aid of the cluster analysis. The cluster analysis is a multidimensional statistical method used for the object classification. The cluster analysis aims to find the clusters of the schools among the analysed schools, that are similar given the set criteria. Due to the various extent (units vs thousands of CZK) and variability of the criteria, the data have to be standardised by Z- function before clustering. The associative matrix, which sets the similarity (distance) among the schools, is given by the basis of Euclidean distance. The agglomerative clustering was used to create the clusters. At the agglomerative clustering, the two subjects with the lowest distance are joined into the first cluster, and the new distance matrix is calculated. In this matrix, the subjects from the first cluster are omitted, and this cluster is classified as a subject. The whole process repeats as long as all subjects create one large cluster, or until there is only the number of clusters that was set beforehand (Garson, 2014). The diagram used for illustrating the single steps in cluster analysis (dendrogram) represents the final distances among the individual subjects (14 grammar schools) during the clustering phases. The horizontal axis of dendrogram represents the distance among the clusters. The vertical axis can illustrate the required degree of clustering. The Ward's method, whose principle is not the optimisation of the distances among the clusters but the minimisation of the clusters' heterogeneity, according to the criterion of the minimum increment of the inside-the-group sum of the subjects' square deviations from the cluster centres (Murtagh and Legendre, 2014), was used for the clustering. Then, the multiple box diagram is used for the visualisation of the comparison of the criteria for the found clusters. It is one of the ways of the graphical visualisation of the numeric data by their quartiles, which divides the statistical file into the quarters. The third quartile borders the central "box" part of the diagram from above, the first quartile from the bottom and between them, there is a line defining the median. The height of the box represents the range between the quartiles. The lowest, highest and distant figures can also be appraised (more in e.g. Mazzochi, 2008). Considering the assumptions of the criteria normality (the salary increase, employee limit, the difference of other non-investment expenditures) that were not fulfilled within the clusters, the Mann-Whitney test was performed for the appraisal of the statistical importance of the differences in the division of criteria in the clusters.

## 3 Results and Discussion

This part of the paper brings attention to comparison of education expenditures with emphasis on secondary education in the Czech Republic and Poland and the reform of funding for regional education in the CZ since 2020. The financial resources for covering direct expenditures of chosen secondary schools (of grammar schools) established by the MSR are assessed together with similarities and differences among the schools based on financial resources (the increase of direct expenses on salaries and changes of resources for other non-investment expenditures) in years 2019 and 2020.

### 3.1 Comparison of Public Expenditures on Education in the Czech Republic and Poland

Public expenditures on education in period 2010-2018 have an almost balanced trend in the Czech Republic and Poland, when they oscillate about 4.8% GDP in the CZ, that is 11.5 % of total general government expenditure, and around 5.2% GDP in Poland, which is 12.3% of total general government expenditure. The comparison of public expenditures on education and secondary education on the local level in the CZ and Poland is documented in years 2010 - 2018 as a % GDP and as a % of total local expenditures - see Table 1 and Table 2.

**Table 1 -** Local government expenditure on education and secondary education (Percentage of GDP)

| GEO/TIME | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| Czechia | 3.3 (1.9) | 3.3 (2.0) | 3.2 (1.8) | 3.2 (1.8) | 3.2 (1.9) | 3.1 (1.8) | 2.9 (1.7) | 3.0 (1.8) | 3.4 (2.0) |
| Poland | 3.9 (1.5) | 3.7 (1.4) | 3.7 (1.4) | 3.7 (1.4) | 3.7 (1.3) | 3.6 (1.4) | 3.6 (1.4) | 3.5 (1.3) | 3.6 (1.1) |

Source: Authors according to Eurostat (2020). Note: The figure in brackets is to secondary education.

**Table 2 -** Local government expenditure on education and secondary education (Percentage of total local government expenditure)

| GEO/TIME | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| Czechia | 25.9 (15.2) | 27.0 (16.2) | 28.0 (16.4) | 27.9 (15.9) | 27.7 (16.4) | 27.7 (16.4) | 28.4 (16.6) | 28.4 (16.6) | 28.9 (17.1) |
| Poland | 25.9 (10.0) | 26.5 (10.2) | 28.1 (10.7) | 28.2 (10.5) | 27.2 (9.8) | 27.9 (10.5) | 27.5 (10.5) | 26.3 (9.4) | 25.3 (7.5) |

Source: Authors according to Eurostat (2020) Note: The figure in brackets is to secondary education.

On the level of territorial self-governments in the CZ, the extent of expenditures on education in an average of years 2010-2018 comes up to 3.2% GDP, which is 27.8% of total local government expenditure. The extent of local expenditures on secondary education occupies 1.9% GDP, that is 16.3% of total local government expenditure. If we compare the expenditures of territorial self-government on education in Poland in period 2010 - 2018, it is possible to note the extent of these expenditures as 3.7% GDP, that is 27% of total local government expenditure. Local expenditures on secondary education in Poland are 1.4% GDP, that is approximately 10% of total local government expenditure, and they are 0.5% GDP lower than in the CZ. The comparison also shows that local expenditures on education in Poland, including secondary education, in the last observed years (2017 - 2018) monitor slightly decreasing trend. Contrarily in the CZ, there is a visible, slightly increasing trend of expenditures on education, including secondary one (see Table 1 and Table 2). This fact could be explained by the specific role of the local public sector in education in individual countries and different reforms and priorities in funding for education services. The size and structure of the local public sector are, however, influenced by the number of external factors, especially the economic, political and demographical ones.

### 3.2 Financial Reform of Regional Education Since 2020 in the Czech Republic

The financial system in the Czech Republic according to the number of students (performances) until 2019 brought big differences among regions considering the amount of financial support on education in the same type of schools. The equality for completely same branches of the study did not exist, and the school was financed on the base of performances (students). The real expenses for salaries were not distinguished. The new system bears in mind the financial advantage for schools that are in the zone with higher amount of students in a class, but it is not an assessment of direct of financial resources “per student”. The subject of the reform is also the change in the area of funding for non-pedagogical practice - the system until the year 2019 favoured schools with a higher filling of classes, without reason. At the same time, it is impossible to reduce the number of employees procuring economy, maintenance and similar activity of organization for a good functioning of school depending on units of performances (Schwarzová, 2018).

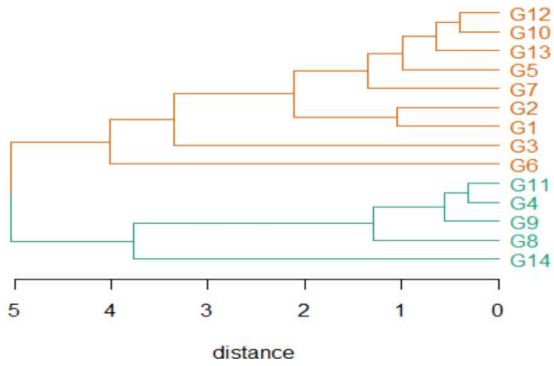
The 2020 reform in the CZ focuses on the area of funding for schools and school facilities established by regions, municipalities and voluntary unions of municipalities. Namely, it is the change in funding for pedagogical work of nursery schools, primary schools, secondary schools, art schools; with school facilities the change limits to after school care (MEYS, 2020c). On the contrary, the non-pedagogical work is funded only by normative on school (management), workplace, class (at secondary schools on class in a branch of study). The financial resources for them are normatively assigned to all schools regardless of how many employees the subject employ. Normative should comprise various professions demanded in various salary brackets.

According to the MEYS (2018), a moderate increase in the amount of non-pedagogical employees will happen at small, incomplete primary schools (so-called small schools with composite classes). At secondary schools, regardless of their size, the quantity of demanded non-pedagogical employees will stay unchanged. Other subjects (religious and private schools) will keep the normative funding per student. The new system in budgeting and funding for education in the CZ establishes normative changes and switches from the expense made a model of funding ”normative per student“ on the resource model “normative per educator”. The system based on the principle of so-called PH max (that is the maximal weekly amount of classes funded by State budget depending on the average number of students), provides to schools gaining of the sum of financial resources on salaries for teachers, in case of not exceeding it. The guarantee that the financial resources will be assigned to the extent of PH max does not ensure schools to have full coverage of direct expenses spent on the work of pedagogical employees. According to the valid school law, school gets some parts of salaries according to truly shown items (tariff parts of salary by teachers classification into salary brackets). The others are only assigned by normative in amount that is given for the calendar year in the Bulletin (MEYS, 2020d). The reform of funding for education in the CZ assumes that the division of money will consider: 1) different structures of schools in regions in their size and branches, financial demands of support education and 3) different salary brackets of teachers at individual schools.

### *3.2.1 Application of Cluster Analysis for the Evaluation of Direct Expenditures of the Secondary Education at Chosen Grammar Schools in the Moravian-Silesian Region*

The analysis aims to assess the developmental tendency of direct expenses for individual subjects in connection with the establishment of the reform of regional education in the CZ since 2020. The paper makes an effort to discover whether the reasons for change in the way of funding are fulfilled in practice and reflected in individual budgets of schools. To compare the funding changes in regional education by the cluster analysis, the three criteria, which are **K1**: an increase in salaries (the difference between resources on salaries for an employee in years 2020 and 2019 - CZK); **K2**: the limit of employees (defines the size of the school in 2020); **K3**: The difference ONIV (the difference between resources on other non-investment expenses in 2020 and 2019 - CZK have been chosen. The similarities of 14 grammar schools in the MSR are represented graphically in dendrogram by the chosen criteria (Figure 1).

**Figure 1** - Dendrogram of the Moravian-Silesian Region grammar schools according to the rise of direct expenses in 2020 and 2019. Source: Authors processed in programme R




The comparison by cluster analysis shows that the Moravian-Silesian Region grammar schools were divided into two clusters on the level of dissimilarity (distance) approximately 4.0 (Table 3). The similarity of individual subjects in the cluster could be seen in their size depending on the increase of financial resources. It is not possible to note that smaller subject, depending on the stages of the reform, reached a higher increase in the budget for unit. This does not unequivocally confirm the MEYS assumption about benefits for a smaller subject with the new financial system.

**Table 3** - The division of Moravian-Silesian Region grammar schools into clusters according to the similarities in the increase of direct expenses (for salaries including payments and other non-investment expenses) in 2020 and 2019

| **Cluster 1** | **Cluster 2** |
|---|---|
| G1, G2, G3, G5, G6, G7, G10, G12, G13 | G4, G8, G9, G11, G14 |

Source: Authors processed in programme R

Table 3 concludes that the first cluster shows the highest similarity at G1, G2, G3, G5, G6, G7, G10, G12 and G13. In the given cluster, there are distant quantities with two criteria (employees limit, ONCE difference). For the employees limit, it is G1 (minimum) and G3 (maximum). The reason for the distance at G3 given the higher mention criterion is that it is the only subject with the connection of grammar school and professional school, which brings higher demands on pedagogical and non-pedagogical employees. The ONCE difference shows only one distant figure at G6 (minimum). The second cluster brings together the grammar schools G4, G8, G9, G11 and G14 as the most similar. There is only one distant figure within the cluster at a salary increase at G14 (minimum). G4 and G11 are considered to be the most similar to the achieved results. The similarity can be in the size of the schools (smaller schools) and salary increase. Another very similar are G10 and G12. These are also schools with the same size (medium size) and roughly the same increase in salaries. The least similar, based on the results, seem to be G6 with the other schools in the first cluster. G6 is for the increase of financial resources for salaries placed among the subject with a higher increase, but concerning ONCE difference, it gains the highest negative figures without discussion. The box diagram (Figure 2) graphically represents the results of chosen secondary schools (grammar schools) in comparison to the increase in the direct expenses in 2020 and 2019. According to given criteria, the estimation of the median is illustrated, and the value of lower and upper quartile and distant figures are identified.

**Figure 2** - The assessment of the Moravian-Silesian Region grammar schools according to the increase in direct expenses (for salaries including levies and other non-investment expenses) in 2020 and 2019. Source: Authors processed in programme R

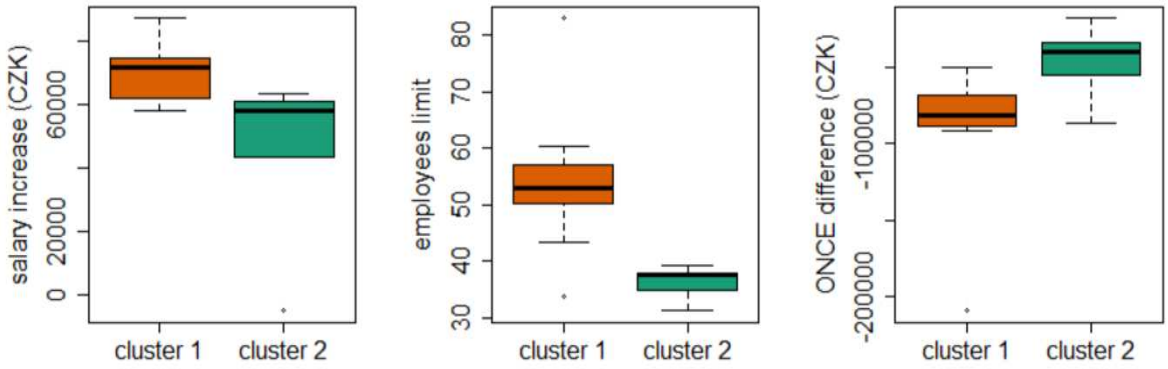



Figure 2 shows that the median is considerably higher with the first cluster in the criteria of salary increase employees limit. That could conclude that the schools with higher employees limit gains a higher salary increase connected to the new funding system. This would deny the MEYS assumption that rather small schools should benefit in their budgets from this reform. However, a higher salary increase can be caused by the age structure of the teaching staff. While the previous system disadvantaged "professionally senior" teaching staff from the view of financials, the new one seems to be fairer.

## 4 Conclusion

This paper aimed to assess the expenditures on education in the Czech Republic and Poland and map the current steps in the reform of the educational system in the Czech Republic with the focus on regional education including the impacts on the budgets of the chosen secondary schools (grammar schools). The sources of the State budget and budgets of regional self-governments could be put into primary sources of the public funding for education in Poland and also in the CZ. The amount of public expenditures for education is one of the indicators in the assessment of economic competitiveness. The expenditures on education reach 5% GDP in the CZ and Poland and oscillate around the European standard. From the analysis follows that extent of local expenditures on education reached 28% in the CZ and 27% in Poland from all local expenditures in a monitored period. The local expenditures on secondary education were 1.9% GDP in the CZ and 1.4% GDP in Poland in the period 2010-2018.

As it follows from the assessment of the funding for regional education in the CZ, the normative system "per student" was applied with schools and school facilities until 2019. This way, the finances from the State budget were divided into direct expenditures, salaries and levies from the salaries of pedagogical and non-pedagogical employees, and other non-investment expenditures. Within the given system, the high autonomy of regional offices in the process of funding led to a different normative set per unit of performance, and there were not distinguished real expenses for teacher salaries ("professionally senior" teaching staff had fewer finances for

rewards and personal bonuses as a result of higher demands for the tariff part of salary). The unequal position of individually comparable receivers was of the reason for the reform of regional education in the CZ since 2020.

The new system in budgeting and funding for education in the CZ establishes normative changes and switches from the expense made a model of funding ”normative per student“ on the resource model “normative per educator”. The system based on the principle of so-called PH max (that is the maximal weekly amount of classes funded by State budget depending on the average number of students), provides to schools gaining of the sum of financial resources on salaries for teachers. From the MEYS emerges that the reform of funding for education considers a different salary level of teachers at individual schools. By covering the tariff salary part, this assumption is fulfilled. To a certain extent, the schools are guaranteed to have a certain sum of financial resources for the above tariff salary components. Nevertheless, they are divided normatively on the unit of the direct pedagogical activity and assigned normatively only for the correspondent calendar year. The new system presumes considering the difference of the school size or branch structure and eliminating the disadvantage of smaller schools in the CZ regions during the distributing of money. However, this requirement has not been confirmed in our analyses with the use of results of cluster analyses. The influence also has other aspects (e.g. the classification of employees into higher salary degrees), that is why these issues also deserve studying from other specific points of view.

## Acknowledgements

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# Talent Management as a Method of Developing Competences on Polish Market

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## Abstract

Analysis of the literature on the subject indicates that talent management is becoming one of the most important trends in contemporary organization management. Rapid market changes, very high requirements of the labor market, globalization and growing competition mean that enterprises are developing various programs for talented employees. It is important to constantly improve the competences of employees, taking care of better quality of their work, flexibility, as well as a new approach to performed duties. Talent programs can help in this and make the company more competitive, and employees satisfied and adapted to the needs of the organization. In this way, the value of human capital increases, which when used properly as a result affects the effectiveness of the organization.
The main goal of the article is to present the idea of talent management and show examples of companies on the Polish market that have successfully introduced a talent program. The first part of the article presents the basic concepts of talent and talent management, and presents two models according to R. Silzer, B. E. Dowell and A. Grohmann, S. Kauffeld. The second part presents the general results of research carried out by Hewitt Associates, House of Skills and Polish scientists on the market in Poland. Examples of enterprise activities and effects of talent management implementation were indicated.

***Keywords:*** *talent, talent management, program of talent*

***JEL Classification:*** *M12, M59*

## 1 Introduction

Talent management is an approach based on the potential of highly talented employees. The development of this method occurred in the 90s and was associated with the dynamic development of the economy, when there was a surge in the demand for knowledge workers.

The concept of talent management appeared together with the phrase “war for talent” in the concept initiated in the United States in the 1980s [13]. Already then, human resources began to be regarded as important assets and a factor in the development of capital and potential of the enterprise. It has been noticed that investing in employee development, forming a specific employment structure and constellation of personnel characteristics allows creating competitive advantage over other business entities [9]; [6]. Talent management is interpreted as "actively shaping relationships with talented people, i.e. an innate predisposition to achieve success in a particular field" [13].

It is worth noting that the very concept of talent in modern understanding has developed mainly through management sciences. In the 1980s, an increasing number of researchers began to pay attention to the importance of talented individuals for the operation of enterprises. It turned out that it is human capital that is the basis for the effectiveness of companies and good financial results. Therefore, there was an increase in interest in this problem in the aspect of management. It was noticed that in this way one could rise the company's potential, increase employees' competences and skills.

In the literature on the subject there are many different ways of understanding the concept of talent. For example, T. Ingram defines talent as a person who is "characterized by potential, abilities, motivation and knowledge, who through his actions significantly affects the functioning of the organization, achieving above-average results, achieving the entrusted goals while caring for self-development" [1]. In turn, according to Ł. Brzezinski, “talent is considered to be above average abilities: general abilities (increased intellectual potential), specific abilities (related to specific areas); commitment to work: perseverance, diligence, internal discipline, fascination with tasks carried out, tendency to sacrifice; creativity: originality, fluidity and flexibility of thinking, undertaking new and unconventional problems, openness to ambiguity and uncertainty, risk taking, sensitivity and rich emotionality” [2]. This second definition is detailed because the multidimensionality of talent can be seen, because this concept can be applied to both personal characteristics and the level of general abilities.

The war for talents refers to such new phenomena as: increasing the competitiveness of companies in terms of offers addressed to employees, creating programs for talents, actions to improve the situation of subordinates, encouraging new candidates to work. Table 1 presents the "old" and "new" realities during the war for talents.

**Table 1** – Old and New Realities During the War for Talents.

| Old Reality | New Reality |
|---|---|
| People need companies | Companies need people |
| Machines, capital and location are competitive advantages | Talented people are competitive advantages |
| Having better talent stands out | Having better talent makes a huge difference |
| Job posts are rare | Talents are rare goods |
| The employees are loyal and job posts are secure. | People are mobile and their commitment is short-term |
| People accept the standard package that is offered to them. | People demand a lot more |

Source: [12, p. 6]

## 2 Material and Methods

The main goal of the article is to present the idea of talent management and show examples of companies on the Polish market that have successfully introduced a talent program.

The theoretical materials have been developed based on the Polish and international literature on the subject in the field of talent, talent management, method and program. The empirical part concerns the presentation of research conducted by Hewitt Associates, the House of Skills report from 2016 on the subject: “Talent management practices in Poland” and research conducted by J. Tabor-Błażewicz on the Polish labor market in 2008 and 2017. The author have also conducted her own research on two groups of recipients: HR Specialists (group A: 47 persons) and Managers (group B: 18 persons). As part of the survey, they were asked, among other questions whether they believe that the so-called fight for talents, and therefore competition for the best employees is noticeable in Poland. The study did not show unequivocal positions, therefore, only some talent programs for selected companies are described.

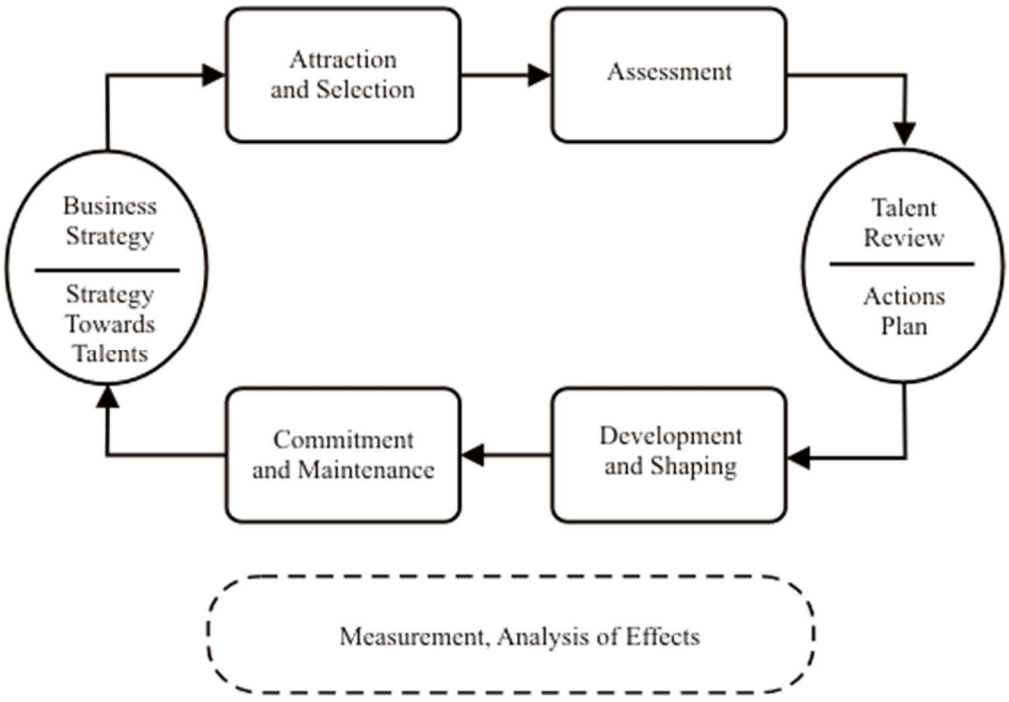
An example of a positive implementation of talent management at ING Bank and several other talent programs developed in large Polish companies were presented. The article adopts the method of desk research, which first concerned the analysis of literature on the subject, and then searching for examples of companies using talent management. Domestic and foreign scientific publications were used. Based on the collected information, the effects of the talent programs used were identified, negative aspects were also identified that are not included in these programs, and general conclusions have been formulated.

## 3 Models and Effects of Talent Management

Along with the concept of talent management the approach to employees has been changed. Human resources began to be treated as important assets and as a factor in the development of the company's capital and potential. It was noticed that investing in employee development, forming a specific employment structure and constellation of personnel characteristics allows creating competitive advantage over other business entities [9]. New models appeared that included elements such as: search, identification, recruitment, as well as retaining the

most talented employees. This means that subordinates who are recognized as talents, have special achievements, work efficiently and also have special skills, for example they know languages, have a high level of computer skills. Some models also take into account the employee improvement factor and raising their competences useful for the organization. Such a model is the diagram according to R. Silzer and B. E. Dowell presented in Figure 1.

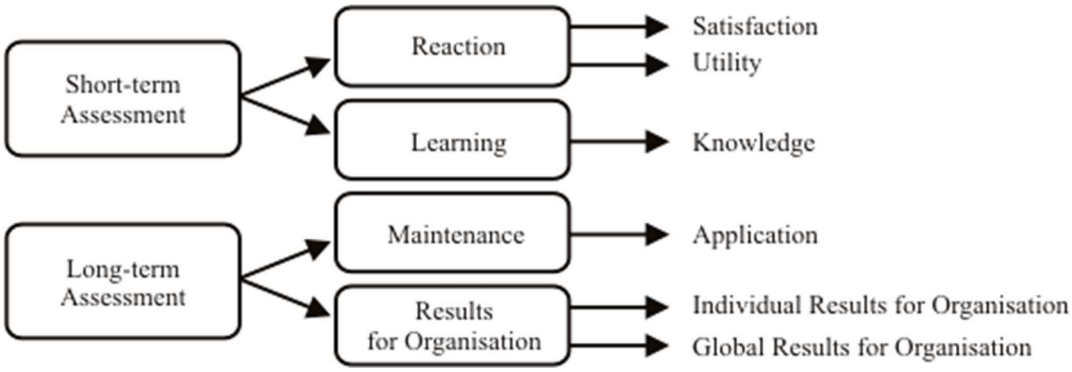
**Figure 1** – Model of R. Silzer i B. E. Dowell. Source: [14, p. 22].




R. Silzer and B. E. Dowell indicate that the main goal of talent management is to attract the most talented people to the company, and then act in such a way as to develop employees' skills, maintain commitment and do everything to keep employees in the company.

Another interesting model was proposed by A. Grohmann and S. Kauffeld, which can be treated not only as a talent management concept, but also as an Assessment Center (AC) model. It is also worth noting that AC is often one of the elements of the talent programs as well as the entire recruitment process. According to the model below, talents not only change themselves individually, because they have unique skills, but also affect the overall organization and the perception of the company by outsiders. This is crucial for all employer branding activities - i.e. building the employer's brand, training sessions, workshops, as well as creating the appropriate marketing strategy and PR. The model is presented in Figure 2.

**Figure 2** – Model of A. Grohmann and S. Kauffeld. Source: [10, p. 70].




In the A. Grohmann and S. Kauffeld model, it is not only important to create programs for talent but also to verify them according to short-term and long-term assessments. Caring for the best employees is of great importance, and then it is important to check what results are bring by specific actions and whether the assumed

goals have been achieved. Economic practice shows that not everything can be fulfilled during talent programs, but it can be recognized that every talent management program has some positive effects for the organization.

J. Kopeć distinguishes the following goals, which are assumed in models and programs for the most talented employees:

a.) permanent above-average results of the organization's talents,

b.) improving employees' competences and qualifications,

c.) shaping employee awareness that the organization supports the development of employee talents,

d.) preparing employees for changes and "fighting" with competition,

e.) achieving a competitive advantage,

f.) meeting employee expectations [8].

For employees, one of the most important effects of talent management is also increasing their salary, getting bonuses, and promotions. However, such effects are relatively rarely assumed by management, because according to them, talent programs are primarily to operate in a developmental way and increase internal motivation to achieve global results relevant from the organization's point of view.

Among the interesting examples of the best practice in the field of talent management, Google Company can be distinguished. It turns out that, according to the company's philosophy, too much control over employees is associated with the threat and therefore subordinates cannot develop and their skills remain at a too low level. Usually, employees at Google work in relatively small teams, which stimulates their creativity. In addition, there is the opportunity to develop talents in accordance with the 70/20/10 rule, which means that 10% of the time the employee spends on his own ideas, 20% on training, and 70% on performing daily duties, practice and gaining experience. In addition, in 2004 the Founders' Award was introduced, which is a special benefit for those teams that will create something innovative and unique, and thus contribute to Google's success [17].

## 4 Talent Management on the Market of Poland

Generally, in the world most often managers and senior employees take part in talent programs. "Findings that in all organizations that have put talent management into practice the initiator of the implementation and use of that approach was organization’s top management can be considered positive. Practical experience has confirmed that programs in the area of talents supported by the top management are usually more successful. By being an example and demonstrating support, the executives define what is important for their organization. This opinion was confirmed, for example, by the study “Have you got a sufficient number of talented workers? The key item on the program of leadership" worked out by the Deloitte company in 2008. There, the initiation and support of talent management utilization by the top management is considered as one of the key criteria in reaching talent management success [5]. However, more and more often it happens that entire companies are covered by trainings, in which talent is also sought among ordinary employees. In this way, you can get people with better skills in place of current managers. However, research conducted by Hewitt Associates [16] and House of Skills [3] indicates that it is best if the company focuses on all employees. As a result, their satisfaction increases and this improves the quality of their tasks, and can translate into increased enterprise productivity.

In Poland, you can also distinguish companies that operate in accordance with global trends and can be considered as examples of “best practice". ING Bank is such a company, but it defines talent in its own way: it is every ING employee who, in appropriate conditions (including training, coaching), shows ambitions and development ability, his other features are [7]:

a.) achieves excellent results,

b.) his competence profile is in line with the ING leader profile,

c.) adds significant value to ING's business operations,

d.) has high communication skills, is flexible and shows initiative,

e.) is a model for others,

f.) has significant experience and knowledge in the business area in which it operates.

As can be seen, the above definition shows that for ING Bank any employee can be a talent, and this approach makes subordinates willing to develop and care for their competences and continuous development. The ING talent management program consists of four stages:

a.) identifying talents by obtaining the opinion of superiors, the manager; each employee recognized as a talent receives a document called the "Individual Development Plan", and in it the subordinate saves their plans and additionally consults them with the supervisor;

b.) employee development, i.e. training, job rotation, learning different responsibilities, coaching, special workshops, as well as following the Individual Development Plan;

c.) succession plan;

d.) matching people from the talent group to senior positions [11].

In addition, "Talent Management" was introduced at ING Bank, based on managing people already recognized as talents. For the company, flexibility, entrepreneurship, as well as customer orientation are the most important [11]. It can be seen that the concept implementation scheme is consistent with the management model according to the model of R. Silzer and B. E. Dowell.

In business practice, however, more research can be distinguished, which was based on searching for interesting programs for talents and assessing their effects. For example, J. Tabor's research collected various activities for talents in Polish companies or with their branches in Poland. This list is presented in Table 2.

**Table 2** – Examples of companies on the market of poland which use talent management system or its elements.

| Company | Description of Talent Management Activities |
|---|---|
| Bank Millenium S.A. | Development programs for subordinates have been created, which are based on training, and in addition, a Development Forum is organized twice a year. |
| mBank | Individual Development Programs are established, and in addition subordinates recognized as talents receive special financial resources for training, and this budget can be used according to their own needs. |
| Carlsberg Polska | Special succession programs are created, and proper recruitment based on the search for the best employees is of great importance to the company. |
| GSK Pharma | The "Talent Management" program was implemented; career development assumes, among others taking positions ahead of time so there is no gap between the previous and next managers. |
| PKN Orlen S.A. | As part of the "Young Talents" program, employees are emerged and then trained, and in addition the PKN Business Academy for the best talents was created. |
| SAP Polska | Talent is defined as a unique unit, therefore only a few people qualify for annual talent programs. Such elite treatment of talents means that programs are seen as a success. |
| Unilever | As part of the Business Leaders Development Program, emerges on the basis of competence and past resultsand achievements, the best employees and for each person creates a development plan: training, Development Center. |

Source: [15, p. 55]

In the light of general research, the negative aspect of development programs conducted for a groups of talents is the fact that subordinates rarely receive salary increase or financial bonuses, which indicates that the material needs of employees are not met, and this particular part is particularly important in Poland. In addition, it turned out that in many enterprises the completion of the program itself does not change much and the employee receives neither promotion nor change of duties nor better remuneration. Such actions are inconsistent and can cause well-trained employees to leave the company because they will be discouraged, bored and lack of results. Talent management after the program or development process is also an important issue for many organizations. Often, participants' expectations of the organization increase. And not everyone can immediately promoted, expand their responsibilities or use the acquired skills in practice. Sometimes, the lack of immediate and visible benefits creates frustration and disappointment. Therefore, "taking care" and interest in talent after the program - monitoring its effectiveness and regular conversations become important [3].

Another conclusion resulting from the research is the fact that in financial institutions or banks programs for talents refer to the general development of employees and are standardized activities. However in other

companies, the best employees are qualified to talent programs and special career development plans are created for them. It can be stated that respective plans for selected employees are individualized and tailored to their competences and the needs of the organization itself. In general, all surveyed companies rely on the training of their employees, these are various internal and external trainings, during which the best employees are selected. Enterprises spend significant financial resources for training, but in recent times internal training has been more frequent in the face of the crisis. As part of various activities, talent programs in addition to training included coaching/mentoring, learning in practice, participation in strategic projects, training trips abroad and job rotation. In all surveyed companies, talent development and retention was mentioned as a key goal of talent management. The following goals were: building a succession policy, i.e. preparing employees to take over key positions in the company, and searching for talents among students and graduates of universities. However, in the face of the ongoing global crisis, many companies limit budgets related to talent management, although they realize that this is an important aspect of management in the economic world. Because the crisis enables taking advantage of the weakening of competitors by attracting talented employees from the market. The author's further research will concern changes in the labor market in Poland, the basic questions will concern issues: what expectations will have employers in the next years, what competences and qualifications will be necessary on the labor market. Because everyone is aware that there will be a radical transformation of this concept. It will be related to technological changes, which have already begun to come in very dynamic way and managers must take on new roles in human capital management processes. Talent management will be become the key to business success.

## 5 Conclusion

It can be concluded that talent programs are still developing in Poland. Generally, the programs cover groups of the most talented employees and this applies to about 15-20% of people in the organization. Usually such people are sought for top-level positions at the highest organizational structures [15]. This is not the right approach, there should be changes here. A similar opinion is expressed by P. Horvathova: "Talent management should not be aimed exclusively at workers with high potential - e.g. at managers holding top executive posts. It is necessary to introduce a broader approach that will identify talents and key segments of workers across the whole spectrum of the organization. Equally, talent management should not concentrate exclusively on talented individuals, but also on the optimal involvement of talented people in teams" [4].

In contrast, international corporations that have branches in Poland or operate on an outsourcing basis often create special programs for talents. This enables planing succession and increase employee satisfaction. Creating development paths and plans in Poland, as well as implementing talent management to a larger number of companies, is of considerable importance. Talent in the case of employed people should be recognized as an important feature thanks to which it is possible to generate greater profits for the organization, both in the financial sphere and in the area of new competences as well as in the area of R&D and marketing. Fast and unpredictable market changes, very high requirements, globalization and growing competition on the market make programs for talented employees more and more important. How important it is, it turned out nowadays, in the era of a general pandemic and threat of COVID-19 virus, when you had to demonstrate non-standard thinking, break well-established patterns and demonstrate a huge talent in mobilizing all employees to take on challenges in the era of global crisis. Talent programs can help in these situations and make the company able to find its key success factor and stay flexible in the environment of turbulent economic and market changes.

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# Comparison of Technical Efficiency of Competed Public Contracts to Ensure Transport Services in the Olomouc and Moravian-Silesian Regions

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## Abstract

The paper is focused on the comparison of technical efficiency of regional budgets, which are intended to ensure transport services. Specifically, the Olomouc and Moravian-Silesian regions are concerned. The obligation to provide transport services is given by the law – the Act No. 194/2010 Coll., On Public Services in Passenger Transport as amended. The territory of both regions is divided into individual areas, by which the carrier is selected in public contracts. To be specific, there are 24 areas; 10-year contracts concluded between the region and a specific carrier for the period 2018–2028 are taking into account. To estimate technical efficiency, an output-oriented DEA model was chosen with constant and variable returns to scale working with two input variables (competed price per 1 vehicle-kilometer and number of potential passengers) and two output variables (number of connections and number of vehicle-kilometers). In the selected output-oriented model with variable and constant returns to scale, the public contract (DMU 17) of the Vítkov region is the least efficient. Four DMUs are effective as in this model, Prostějov NW, Zábřeh, Nový Jičín East and Krnov regions.

***Keywords:*** *bus transport, compensation, Data Envelopment Analysis, efficiency, residents*

***JEL Classification:*** *C21, C67, R48*

### 1 Introduction

The obligation to provide transport services at the regional level is given by the Act No. 194/2010 Coll., On public services in passenger transport as amended. According to § 2 of this Act, transport services are defined "Transport services means the provision of transport over the entire week, in particular to schools and school facilities, public authorities, employment, health care facilities providing basic health care and to satisfy cultural, recreational and social needs, including return transport, contributing to sustainable development of the territorial district. "

To ensure transport services, the territory of the regions is divided into individual areas. For each given area, the contracting authority, in this case the region, announces public contracts for transport services, based on which a particular carrier is selected. Contracts are being concluded for the period of 10 years mainly because such the period brings a certain stability into the public transport as well as enables providers to invest more into vehicle fleet. (The plan of public transport in the area of MSR within 2017-2021; the plan of public transport in the area of Olomouc region).

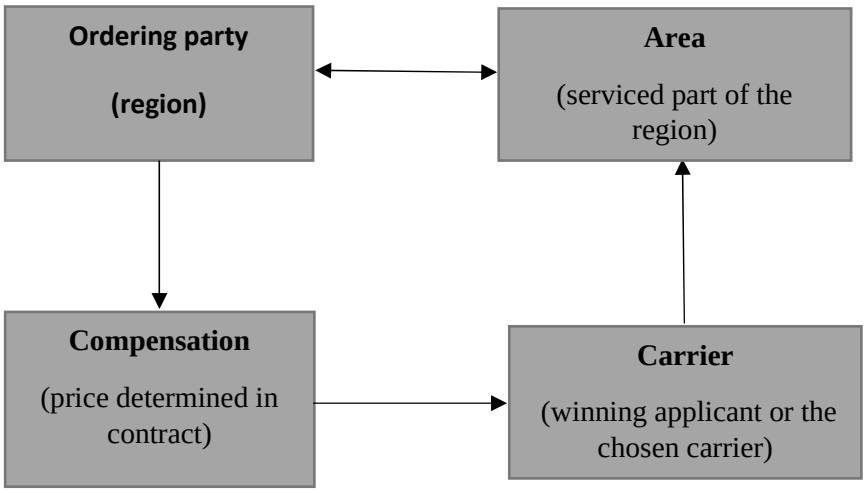
Based on their independent competence, the regions and municipalities have the right to determine the scope of this service, whether it concerns the required number of connections or the number of vehicle-kilometres travelled, or whether the service will be provided by public rail passenger transport or public line transport or their interconnection. Such process will fulfil the condition of the Act on Public Services in Passenger Transport. The aim of the paper is to evaluate the technical effectiveness of 10-year compensation of the suburban bus transport in 24 service areas in the Moravian-Silesian and Olomouc regions according to selected inputs and outputs. Two research questions (RQs) are verified for evaluation purposes:

RQ1: Is more than 50% of contracted compensation effective in selected regions?

RQ2: Do contracts in the Moravian-Silesian and Olomouc regions achieve comparable average efficiency values?

By the scheme presented in the Picture 1, mutual relations among contracting authority, compensation, carrier and specific area are shown. The region, contracting party, undertakes to specify price compensation in the contract thus the payment for public services made out of its budget to the provider. This payment is considered the cost. The price determined in the contract arises from a particular carrier bid in public contracts. The ordering party determines in advance the number of connections and number of vehicle-kilometers in invitation to tender. These items are specified for each area and an applicant offers the bid. The chosen applicant undertakes to fulfill the contract by the competed price. The carrier with the lowest price (but not with disproportionate price) becomes the winner of the public contract. The applicant with disproportionate price would be excluded from the public contract. The chosen carrier provides the public services by its technical equipment and with its employees. Based on the ordering party (in this case regional authority) request fulfilment thus requested number of connections and number of vehicle-kilometers travelled the given area will be serviced. By such contract, the regional guarantees a transport accessibility in the said area and thus fulfills the obligations given it by the law.

**Figure 1** - Scheme of mutual relation between ordering party and given area




Source: own elaboration

### 1.1 Synthesis of Literature: Effectiveness of Public Transport

The public transport becomes the subject of evaluation and research of many papers, to which a big attention is paid recently. The issue of transport mainly costs effectiveness and its utilization is being discussed in both European and non-European countries.

Compensation price is the public expenditure, in this case the expenditure out of regional budget. Hanauerová (2019) also deals with an evaluation of technical effectiveness in bus transport. In her study, she also uses DEA model. In their paper, the authors Beck and Walter (2013) discusses the factors influencing the bidding price in the public contract in Germany. The proportionate price compensation is also dealt with by Dementiev (2018). Rosell (2017) discusses the cost effectiveness using the example of municipalities of Barcelona province. His conclusion is the smaller the municipality ensuring the public transport is the less effective it is. The factors influencing the applicants for the public contract involving the public transport is being dealt with by Vigren (2018). In his study, he uses the Poisson model and concludes that in Sweden, technical equipment becomes the limiting factor thus buses. Mathisen (2016) issues the example of Norway and asks whether it is really necessary to choose the carriers in the public contracts bringing some uncertainty to them regarding the result and contract conclusion.

Also, the question arises, how long the public transport will be needed in such scope determined by the law. The increase of cars number means practically less usage of public transport and together with it, increasing pressure to its effectiveness. In their study, Zhang et al. (2019) use the example of 6 cities in China and research whether the policy limiting the purchase and the use of cars will influence the public transport development. The study of Migliore et al. (2013) points out the accessibility of public transport, which would increase its effectiveness and purposefulness.

## 2 Material and Methods

The estimation of technical efficiency of contracted compensations in bus suburban transport under the conditions of 12 MSR and OR areas was provided by the following process:

- determination of 2 inputs and 2 outputs for estimation of technical efficiency, statistical description of selected variables (see Table 1),
- calculation of output-oriented efficiency model by DEA model, which takes constant returns to scale (CCR) into account, by the formula (1),
- calculation of output-oriented efficiency model by DEA model, which takes variable returns to scale (BCC) into account, by the formula (2).

The core of DEA method is in division of investigated objects to effective and ineffective ones by the size of consumed sources and number of performed production or other type of output. By DEA models, empiric production function is determined. The DEA model compares units with the best units. The DEA models are based on premises that for given problem, there exist a production possibility set created by all possible combinations of inputs and outputs. A production frontier determines optimum relation between inputs and outputs aiming at a maximization of outputs under given input value (or more inputs). The production possibility set is determined by efficient frontier. To estimate what this efficient frontier and thus production possibility set would be, it is necessary to adopt an assumption on character of returns to scale for given problem.

Output-oriented models calculate the technical efficiency coefficient, which is determined by the ratio of the weighted sum of inputs to the weighted sum of outputs, but weights are sought so that the value of coefficient $g$ is greater than or equal to one. Thus, for the effective unit $Uq$ the coefficient $g = 1$ and for the inefficient unit $g > 1$.

Cooper et al. (2007) considers the CCR (Charnes, Cooper and Rhodes surname designation) a basic DEA model, which assumes constant returns to scale. Also the BCC model (designation according to the surnames of the authors of the model Banker, Charnes and Cooper), which assumes variable returns to scale. In case of constant returns to scale (CRS), the efficient frontier is possible to reach in the following ways:

- by increasing the value of output consumed while maintaining current input level – output- oriented models;
- by reducing the value of input used while maintaining the current output level – input-oriented models;
- by combination of both approaches - additive models, slack-based models. (Jablonský, Dlouhý, 2015; Vrábkova, Vaňková, 2015)

Output-oriented model CCR can be formulated as follows:

$$
\begin{aligned}
&\text{to minimize} && g = \textstyle\sum_j^m v_j x_{jq,} && && (1)\\
&\text{under conditions} && \textstyle\sum_i^r u_i y_{ik} \le \sum_j^m v_j x_{jk,} && k = 1, 2, \ldots, n,\\
& && \textstyle\sum_i^r u_i y_{iq} = 1, && \\
& && u_i \ge \varepsilon && i = 1, 2, \ldots, r,\\
& && v_j \ge \varepsilon, && j = 1, 2, \ldots, m.
\end{aligned}
$$

Output-oriented model BCC can be formulated as follows:

$$
\begin{aligned}
&\text{to minimize} && g = \textstyle\sum_i^m v_j x_{jq} + v, && && (2)\\
&\text{under conditions} && \textstyle\sum_i^r u_i y_{ik} \le \sum_j^m v_j x_{jk} + v, && k = 1, 2, \ldots, n,\\
& && \textstyle\sum_i^r u_i x_{iq} = 1, && \\
& && u_i \ge \varepsilon, && i = 1, 2, \ldots, r,\\
& && v_j \ge \varepsilon, && j = 1, 2, \ldots, m,\\
& && v - free. && &
\end{aligned}
$$

When evaluating effectiveness, the input is given by competed price (X1), number of potential passengers (X2), the output is given by two variables – the number of connections (Y1) and number of vehicle-kilometers (Y2).

**Inputs**

X1 – competed price (CZK/vkm). It means the price compensation for the carrier for 1 performed vkm. The data are accessible in the National Electronic Tools (NEN).

X2 – the number of potential passengers. this data is accessible on the Czech Statistical Office website. The number of inhabitants of particular municipalities have been summarized by the time schedules in each country.

**Outputs**

Y1 – number of connections being requested by MSR. Detailed specification of connections is determined in the Tender documentation, which is accessible in electronic form in the National Electronic Tool – Tender documentation (NEN).

Y2 – assumed number of driven vehicle-kilometers by the selected carrier in given locality within 10 years. This number is also mentioned in the Tender documentation related to concrete procedure, which is also accessible in the National Electronic Tool (NEN).

**Table 1 –** Statistic characteristic of input and outputs

| | **X1 – competitive price (CZK/vkm)** | **X2 – potencial passanger** | **Y1 – number of connections** | **Y2 – vkm/10 years** |
|---|---|---|---|---|
| **Min.** | 30.46 | 40 923 | 9 | 8 350 812 |
| **Max.** | 38.14 | 624 511 | 43 | 39 383 743 |
| **Mean** | 35.37 | 164 981 | 18.08 | 18 061 082 |
| **Median** | 35.55 | 251 671 | 16 | 15 851 699 |
| **SD** | 1.95 | 178 818.1 | 8 | 7 900 933.6 |

Source: own elaboration.

From Tab. 1, it is evident that the lowest competition price in the compared regions was CZK 30.46 / 1change for the Sternberg and Uničov regions of the Olomouc Region. On the other hand, the contract with the highest price (CZK 38.14 / 1vkm) was concluded in MSK for the Frydlant Region. The average value of the contested price from 24 regions in these regions is CZK 35.37 / vkm. The median or mean value of the input variable is 35.55 CZK / vkm The standard deviation of MSK input is 1.95.

The least number of potential passengers belongs to Krnov area, the highest number is in Opava area. The average number of passengers in chosen 24 areas is 164 981. The mid-value is 251 671. The standard deviation is 178 818,1.

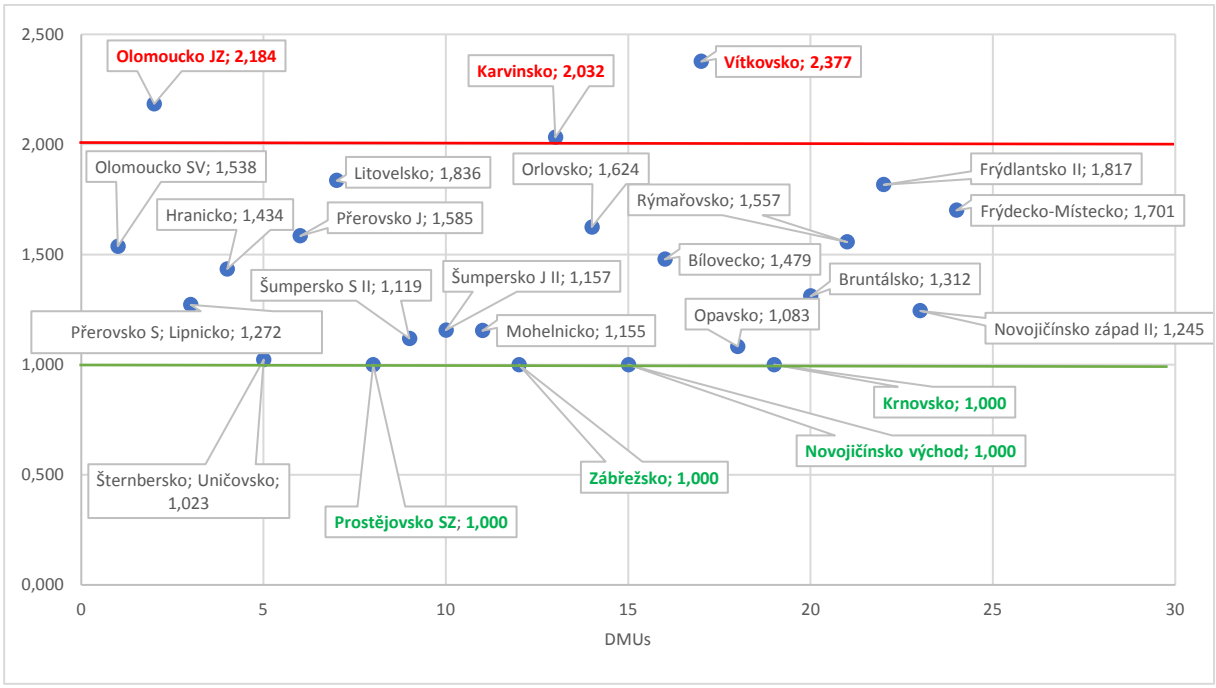
On the output side, two variables are selected, namely the number of connections and the estimated number of vehicle kilometers traveled within the time horizon of 10 years. From Tab. 1 shows that the lowest number of required connections is 9, this number is the same for both regions. In the Moravian-Silesian Region it is the Karviná region, in the Olomouc region it is the Přerov South region. The highest number of connections (43) is requested by the contracting authority for the Novojičínsko East in the Moravian-Silesian Region. The average number of connections is 18.08 connections per area. The median of this selected output is 16. The standard deviation of the output (Y1) is 8.

The second selected output is defined as the number of vehicle kilometers traveled by the client in the given location. The lowest number of vehicle kilometers is required for the Frydlant Region (8 350 thousand vehicle-kilometers / 10-years) in the Moravian-Silesian Region. The average mileage is 18 061 ths. Vkm/ 10 years for the site. The mean value for the number of driven kilometers is 15 851 ths. vkm/10years. The standard deviation of the second variable on the output side (Y2) is 7 900 thous. vkm/10years.

## 3 Results and Discussion

The results of effectiveness of output-oriented model with constant returns on scope show that out of 24 DMUs, only 4 are effective - Prostějov NW, Zábřeh, Nový Jičín East and Krnov areas. Only the value little above g=1 represents the effective public contract DMU 5 – Šternberk and Uničov area. The lowest price of all 24 chosen DMUs was competed by this area and the public transport is arranged for almost 400 000 potential passengers. Three DMUs are ineffective - Olomouc SW, Karviná and Vítkov (see Pic. 2). Ineffectiveness of DMUs, which represent individual areas of Olomouc and Moravian-Silesian regions is very interspersed among.

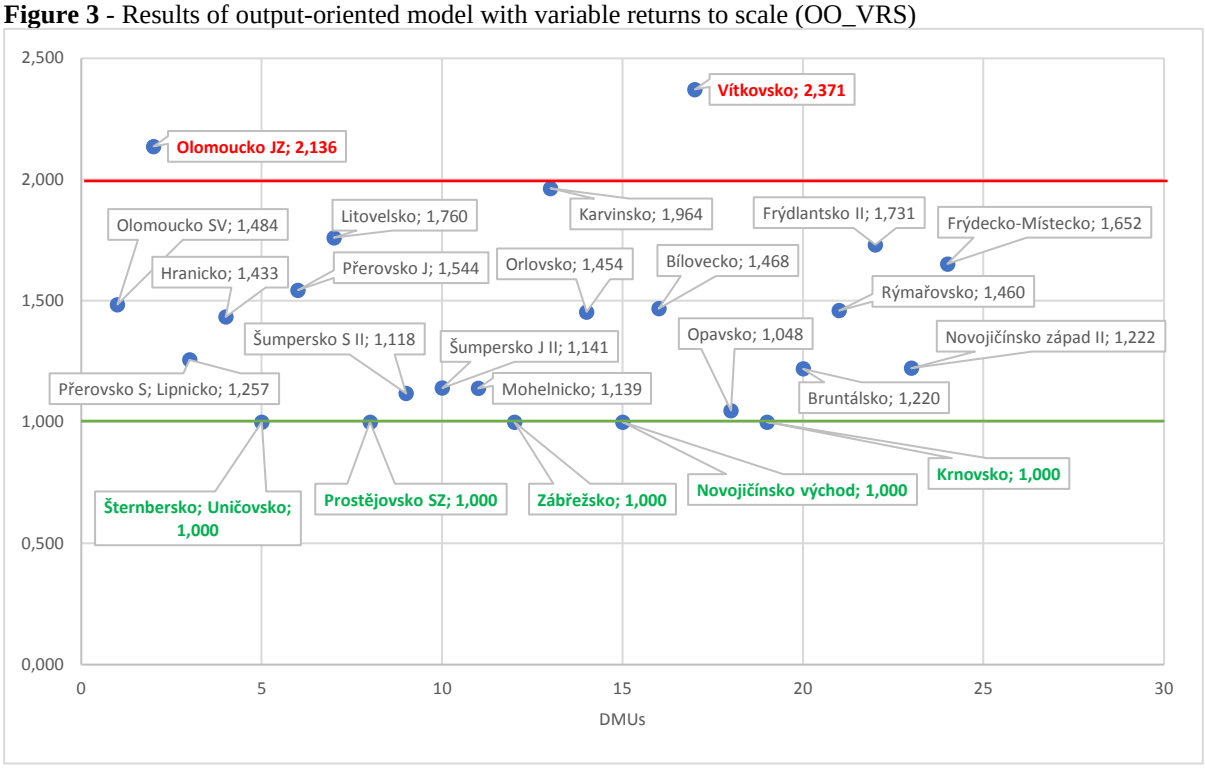
**Figure 2** - Results of output-oriented model with constant returns to scale (OO_CRS)




Source: own elaboration.

The results of output-oriented model with variable returns to scale (Pic. 3) show that compared to the model with constant returns to scale the competed price for Šternberk and Uničov area became very effective. Effective in this model (g=1), also the following DMUs are - DMU 8 – Prostějov NW, DMU 12 – Zábřeh, DMU 15 – Nový Jičín East and DMU 19 – Krnov. In this model, DMU 13 – Karviná gained the value 1,964 and got under value 2 at the scale g. As for totally ineffective DMUs, DMU 2 – Olomouc SW and DMU 17 – Vítkov again are.

**Figure 3** - Results of output-oriented model with variable returns to scale (OO_VRS)




Source: own elaboration.

In the chosen output-oriented model with variable and constant returns to scale, the least effective public contract for DMU 17 – Vítkov is. In this area, contract was concluded with the price 36,98 CZK/vkm, for 436 892 potential passengers, requested 16 connections and with 14 796 847 vkm/10yers.

The question arises, how long the public transport will be needed in such scope determined by the law. The increase of cars number means practically less usage of public transport and together with it, increasing pressure to its effectiveness. For people, cars are more comfortable and more effective. Within the inputs of the DEA model, it is appropriate to consider the area of individual area of the regions.

## 4 Conclusion

The public transport, being one of several types of transport, is justified to be used and being paid for in effective way. The fact that the number of cars and their usage is increasing cannot be omitted. Less interest in the public transport results out of it. It has to be kept in mind that all types of transport have their advantages and disadvantages.

The aim of this paper was to evaluate the effectiveness of compensation of suburb bus transport in the selected regions, namely in Moravian-Silesian and Olomouc regions using the DEA model. Effectiveness was estimated based on two inputs and two outputs.

As the region as the public ordering authority is obliged to ensure the basic transport accessibility by the Act No. 194/2010 Sb., On Public Services in Passenger Transport as amended, financial means invested to this service is not less important factor as these are considered the costs. The selection of the particular carrier is proceeded in accordance with the Act No. 134/2016 Coll, on public contracts, based on which the contract with the winner is concluded (who offered the most advantageous conditions in the ordering party views).

**Two research questions were chosen:**

RQ1: Is more than 50% of contracted compensation effective in selected regions?

RQ2: Do contracts in the Moravian-Silesian and Olomouc regions achieve comparable average efficiency values?

The Data Envelopment Analysis model was used to achieve the goal. In the verification of the research question RQ1: “Is more than 50% of contracted offsets effective in selected regions?” The efficiency calculation showed that in output oriented CRS and VRS models are more than 50 % of contracted offsets ineffective. For research question RQ2: “Do contracts in the Moravian-Silesian and Olomouc regions achieve comparable average efficiency values?” It can be said that the average estimated effectiveness is similar in given regions.

The model DEA works with 24 areas or units chosen based on competed public contracts announced by Moravian-Silesian and Olomouc regions. Within 2018–2019, the contracts were concluded with the chosen carrier for the period of 10 years. This paper is focused on 12 areas of MSR and OR - Karviná, Orlová, Frýdlant, Nový Jičín East, Nový Jičín West, Krnov, Bruntál, Rýmařov, Opava, Vítkov, Frýdek-Místek, Bílovec, Olomouc NE, Olomouc SW, Přerov North and Lipník, Hranice, Šternberk and Uničov, Přerov South, Litovel, Prostějov NW, Šumperk North, Šumperk South, Mohelnice, Zábřeh.

Units achieving g = 1 on the g scale are considered effective ones. Taking into account output-oriented model, units with g> 1 are considered ineffective.

When estimating the technical effectiveness in the chosen 24 homogeneous units (DMU) by output-oriented model DEA with constant returns to scale, the following contracts becomes totally ineffective - Olomouc SW, Karviná and Vítkov. Contrary to that, in the model with variable returns to scale the DMU Karviná “improved” and states under g = 2 level. As far as the model with constant and variable returns to scale are concerned, 4 units become totally effective - Prostějov NW, Zábřeh, Nový Jičín East and Krnov. As for technical effectiveness in output-oriented model with variable returns to scale, the DMU 5 – Štermberk and Uničov became effective.

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# Evaluation of the Use of Social Services for Homeless People in the Czech Republic

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## Abstract

Homelessness is considered a serious individual and social problem (highlighted in its negative consequences), and thus a challenge for the policymakers in developed countries. In European countries, wide range of special services are offered that are aimed at a reduction of the number of homeless people living in a public space. In the Czech Republic, services for homeless people are regarded as a part of social prevention services and are focused on basic human and housing needs of the individuals living in this extreme form of the social exclusion. Supply of these services and the number of their users differ, when the Czech territorial self-governing units (regions) are considered. The aim of the paper is to identify, describe and evaluate the extensity of the use of selected types of the social services for homeless people in 14 regions of the Czech Republic. Research is focused on three types of homeless services: low-threshold day centres, homeless shelters and asylum houses and covers period of years 2015–2018. Findings presented in the paper confirm general trends observed also in other European countries, namely higher share of men than women in homeless population, simultaneously connected with the increasing experience of women and children with homelessness.

***Keywords:*** *homelessness, homeless people, regions, social exclusion, social services*

***JEL Classification:*** *I31, I38, H44*

## 1 Introduction

Elimination of poverty and social exclusion belong to priorities of all developed countries. Both concepts (social exclusion and poverty) refer to material deprivation, but if the poverty is viewed as the absence, lack or denial of advantage (Dean, 2016), then social exclusion is understood as the multidimensional disadvantage. Social exclusion is understood to cover a remarkably wide range of social and economic problems (Sen, 2000), because individuals may be excluded from *a livelihood; secure, permanent employment; earning; property, credit or land; housing; the minimal or prevailing consumption level; education, skills and cultural capital; the benefits provided by participation in democratic process; public goods; the nation or the dominant race; the family and sociability; humane treatment, respect, personal fulfilment, understanding* (Silver 1995, p. 541). Silver's concept of social exclusion deals, inter alia, with the exclusion from housing, which refers to homelessness, when homelessness is usually considered to be the extreme form of social exclusion (Habanik 2018; MLSA, 2013; Hejhal, 2013a). Nowadays, with respect to the political priorities, number of homeless people is monitored regularly. Several studies and interest groups report the steady rise of homelessness in European countries, with the increased number of women, youth, families and migrants experiencing it (see e.g. Petit et al., 2019). Therefore, homelessness is not only an individual problem of those affected individuals, but also a serious social and public problem, and thus a challenge for the policymakers.

In general, wide range of services for homeless people exists in European countries (Pleace, Baptista, Benjaminsen, 2018). These services focus on individuals living in the conditions of homelessness, simply understood as living without a permanent shelter. Services for homeless people are provided by the subjects

coming from private, as well as public sector. They can provide support of various intensity connected with providing of basic services (e.g. hygiene, meal, health services) and temporary housing services (e.g. overnight shelters or homeless hostels). In many countries, these services are co-financed from public sources, and create thus a part of social welfare programmes aimed at reduction and elimination of social exclusion.

In the Czech Republic, services for homeless people create a significant part of the social prevention services, that are focused on socially excluded individuals living in an adverse social situation, in some cases connected also with a housing lost. Supply of these services and the number of their users differ, when the Czech territorial self-governing units (regions) are considered. Therefore, the aim of the paper is to identify, describe and evaluate the extensity of the use of selected types of the social services for homeless people in 14 regions of the Czech Republic. Research presented in next Chapters is focused on three types of homeless services: low-threshold day centres, homeless shelters and asylum houses and covers period of years 2015–2018.

## 2 Theoretical Background

Numerous of attributes of homelessness are emphasized when its fundamental nature is described. However, the most emphasized attribute of the homelessness is the absence of a home in terms of a shelter. Homelessness is usually considered a complex phenomenon, respectively a syndrome of complex social failure (Vágnerová et al., 2013), or a socio-pathological phenomenon connected with negative social circumstances (Štěchová et al., 2008). However, some authors (see e.g. Vágnerová et al., 2018) argue that homelessness must be understood rather as a process, than a state. As a process, homelessness is a result of several structural causes, like changes in mental health, substances/drugs abuse or lower housing availability (Boesveldt, 2019).

With respect to its causes, several categories of homelessness are recognized: (1) long-term homelessness (individuals born to the conditions of social exclusion are more likely to become homeless); (2) short-term (based on co-influences that can lead quite quickly to homelessness – unemployment, health problems, high mandatory costs of housing, family breakdown and exclusion of an individual from a common household); (3) health disabilities that unable individuals lead an usual way of life; (4) own choice of homeless individuals (MLSA, 2013). However, Dvořáčková et al. (2016) argue that homelessness usually does not have one single cause. It is a result of cumulation of various negative phenomena, and its causes are very individual, variable in time and hidden at the beginning.

Homelessness remains difficult to measure and thus compareble among different countries because of differing definitions applied there, and dependence of these definitions on political interest (Boesveldt, 2019). To bring any relevant statistics and academic research concerning homelessness, a consensus how to define *homelessness* is done. Therefore, most European countries apply for statistical purposes definition/concept of homelessness adopted by the *Federation of National Associations Working with Homeless* (known under acronyms FEANTSA or AISBL). Its homelessness concept, called as the *European Typology of Homelessness and Housing Exclusion* (*ETHOS*), and its simple version known as *ETHOS Light*, create a standard basis for the understanding of the homelessness.

*ETHOS Light* is considered a harmonised version of *the European Typology of Homelessness and Housing Exclusion* and is considered the simplified tool prepared for the data collection (FEANTSA, 2020b). This *Light* version deals with six operational categories of homelessness, which are accompanied with their definitions and description of the living situations covered by these categories (see Table 1). Categories 1, 2 can be assigned to the *roofless category*; categories 3, 4 to the *category homeless*, and the other ones to the categories *insecure* or *inadequate housing*, when the whole *ETHOS* typology is considered (FEANTSA, 2020a). First three operational categories include individuals whose emergency housing needs are usually met with various homeless services, especially in the form of *overnight shelters*, *homeless hostels*, or *temporary accommodation*.

**Table 1** - ETHOS Light: operational categories and accompanied living situations

| Category | Description of a living situation |
|---|---|
| 1 People living rough | 1 Public spaces / external spaces |
| 2 People in emergency accommodation | 2 Overnight shelters |
| 3 People living in accommodation for the homeless | 3 Homeless hostels<br>4 Temporary accommodation<br>5 Transitional supported accommodation<br>6 Women' shelters or refuge accommodation |
| 4 People living in institutions | 7 Health care institutions<br>8 Penal institutions |
| 5 People living in nonconventional dwellings | 9 Mobile homes |

| | |
|---|---|
| due to lack of housing | 10 Non-conventional buildings<br>11 Temporary structures |
| 6 Homeless people living temporarily in conventional housing with family and friends (due to lack of housing) | 12 Conventional housing, but not the person's usual place of residence |

Source: FEANTSA (2020b)

The FEANTSA's definition of homelessness does not differ significantly from the definition applied in the United States, which understands homeless persons as being individuals who lack a fixed, regular and adequate night-time residence and have a primary nigh-time residence provided as a homeless service, or live in a public space (Padgett et al., 2016). Definitions of homelessness, like the FEANTSA and American ones, are used also in other developed countries, in their national strategic social programmes' documents and legislation.

In the Czech Republic, homelessness is defined in the *Concept of prevention and tackling homelessness in the Czech Republic until the year 2020*, which was prepared by the Ministry of Labour and Social Affairs in 2013. This Concept understands homelessness as a complex, dynamic and differentiate process in which individuals and groups go through various entry and exit points (MLSA, 2013). However, the terms *homelessness* or *homeless person* is not used in Czech law. *Social Services Act* (108/2006 Coll.) speaks in this context about a person without a shelter or a person in an adverse situation connected with a housing lost.

Since the regime change in 1989, Czech society has been affected by increasing size of the homeless population, which is partly caused by the transformation of the hidden homelessness (typical for the socialist society) to the revealed one. Presence of homelessness is usually considered problematic and connected with negative consequences (Hejhal, 2013a). Recent public survey (Smidova, Vavra, 2016) shows that Czech people usually connect homelessness with long-term unemployment, indebtedness or they consider homelessness the chosen way of life. Baptista and Marlier (2019) identify, in inter-countries comparison done for European countries, especially rising housing costs and lack of affordable social housing to be the systematic causes of homelessness in the Czech Republic.

In the Czech Republic, services focused on needs of homeless individuals are considered, with respect to the *Social Services Act* (Nr. 108/2006 Coll.), the part of social prevention services. They are provided as the ambulatory, field or stay-in services. The homeless individuals' emergency housing needs are met with *asylum houses* (temporary accommodation for homeless people when special houses are offered for mothers with economically dependent children) and *homeless shelters* (overnight shelters), and their everyday basic human needs are met with services of the *low-threshold day centres* (non-residential or non-housing services). Most facilities are controlled by the Churches and other non-governmental non-profit organizations. However, critical is the role of territorial self-governing units (regions), which have the main responsibility for guaranteeing the supply of these services in their territory, and they provide public co-financing for these services.

In the European context, Czech social services for homeless people provided in homeless shelters are evaluated as a basic shared accommodation with low-intensity support, and services provided in asylum houses as the services of the medium-intensity with non-housing or some housing focused support. Weaknesses in the field of homeless services are identified in insufficient health services and lack of instruments enabling homeless people to return to standard housing (Baptista, Marlier, 2019).

## 3 Formulation of the Research Problem and Methodology

This paper presents analysis focused on regional differences in the use of social services provided to homeless people in the Czech Republic. Attention is paid to three types of services – low-threshold day centres providing everyday services in ambulatory form, and then to homeless shelters and asylum houses helping to meet emergency housing needs of homeless people through the stay-in services. *The aim of the paper is to identify, describe and evaluate the extensity of the use of selected types of the social services for homeless people in 14 regions of the Czech Republic.* Research covers period of years 2015–2018, which starts with the implementation of the new system of social services financing.

Attention is paid to: (1) total number of the users of the services for the homeless people; (2) structure of the users of homeless services with respect to their gender and age status (children/adults); (3) relation between the number of children affected by homelessness and the number of adult users of services for homeless people; (4) relation between the number of homeless services users and settlement structure of Czech regions. Users of social services of three selected services are simplified considered the homeless people because they were registered by the facilities provided their services only to individuals affected by homelessness.

Research is based on data taken from the public statistical yearbooks of the Ministry of Labour and Social Affairs (MLSA) and the register of the social services providers running under the control of the Ministry. Some data concerning the homelessness and the use of social prevention services are published annually also by the Czech Statistical Office, but they are not comparable with those provided by the MLSA, although the same categories are monitored. Therefore, it was necessary to work only with one data source. Data concerning the size of urban population are the only ones that were taken from the public database of the Czech Statistical Office. Data are processed with the use of standard methods of the explanatory statistics.

To meet the aim of the paper, three research hypotheses (RH) are stated. They will be confirmed or rejected with respect to data analysis.

- *RH1: Czech society faces with increasing number of homeless people, which will be reflected in increasing number of the users of social services for homeless people during the observed period of years (2015–2018).*

Increasing number of homeless people in European countries is reported by Baptista, Marlier (2019), Pleace, Baptisata, Benjaminsen (2018) and Petit et al. (2019). In the Czech Republic, a census focused on the number of homeless people has been done since 2011, because of increasing number of homeless people. The last one was done by the *Research Institute for Labour and Social Affair* in 2019 (further a reference Nešporová et al. is used). Authors of the census dealt not only with the number of social services users, but also with the number of people living in a public space. Their census worked with self-reported data and in some cases with expert estimates to cover selected operational categories of the *ETHOS Light* typology. However, this census brought information about the size of homeless population only for the moment when the census was done. Therefore, census does not enable to observe more general trends in homelessness in the Czech Republic.

At the same time, statistical yearbooks of the Ministry of Labour and Social Affairs report every year about the number of individuals who use specific social services, also services focusing on homeless people. Therefore, these numbers of the services users can be used to identify general trends when the size of homeless population is considered.

To assess the *RH1*, the number of users is observed for three types of social prevention services: *low-threshold day centres* (LTDC), *homeless shelters* (HOS) and *asylum houses* (ASH). However, in some cases, analysis deals only with residential homeless services because of the risk of double counting – services of LTDC and HOS are offered to the same category of homeless people. On the other hand, AHS are usually used as a permanent housing by their clients for the whole period of time they are allowed to stay there (usually one year), therefore they do not serve as a temporary accommodation in real terms. In this context, representants of the social services providers highlight that ASH play a role of social housing in some Czech regions. They speak in this context about the asylum tourism because asylum houses' users move from one asylum house to another one (also between regions) to avoid homelessness.

- *RH2: The share of women and children in total number of the users of homeless services will be lower than the share of men.*

Pleace (2019) states that women and children are less likely to be homeless because they do not leave common household so often when the family breaks down, they usually receive help from the relatives and friends, and they can use special social services provided to women with dependent children. In the Czech Republic, special social services are offered to homeless mothers with economically dependent children, too. These services are provided in the form of asylum houses, which serve in many cases as a permanent housing. If the special asylum houses are offered to women with children, it can be expected that the share of women using this type of temporary accommodation in total number of the asylum houses users will be higher, when this share will be compared with those shares calculated for other types of services for homeless people.

To assess the *RH2*, the total number of the homeless services users, and its decomposition into three main categories – men, women, and children, are monitored. Then, the relation between the number of men and women is analysed. To show, whether any relation between the number of homeless children and total number of homeless adults exists, the Spearman correlation coefficient is calculated for all analysed years.

- *RH3: The highest number of the users of homeless services will be registered in regions with higher share of population living in cities with more than 20,000 inhabitants.*

Nešporová et al. (2019) claim that homeless people are attracted especially by cities of above specified population size. It means that settlement structure matters when the number of homeless people in Czech regions is monitored. When the supply of social services is researched, then assumptions can be stated on findings of Víšek and Průša (2012). They explain that urban areas with approximately 25,000 inhabitants are large enough to cover all social groups and their social needs (including also their problematic segments), and these areas' size

enables to provide services at the economically acceptable level. At the same time, Víšek and Průša (2012) consider demand for social services (especially for those ones focusing on socially excluded individuals) to be the supply-induced one. Also, Hejhal (2013b) connects the study of homelessness with larger cities.

To assess the *RH3*, the number of homeless people with the population living in the cities with more than 20,000 inhabitants is compared for all Czech regions. Then, the relation between the number of homeless people and the size of urban population (population living in cities with more than 20,000) is examined more exactly with the use of Spearman correlation coefficient for all analysed years.

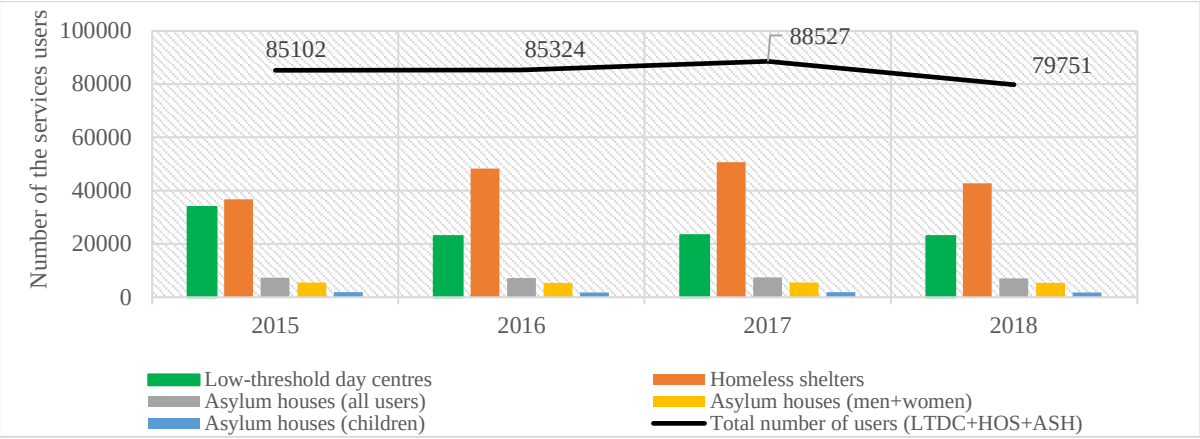
## 4 Interpretation and Evaluation of the Results

Czech policymakers regard homelessness as a serious social problem, which is reflected not only in the *Concept of prevention and tackling homelessness in the Czech Republic until the year 2020* and *Social Services Act*, but also in public financing of the services for homeless people, regardless their form and type. Then, number of the users of these services is monitored by the Czech Ministry of Labour and Social Affairs annually. However, the use of social services is not the same in all Czech regions and also homelessness does not affect Czech regions with the same intensity.

### 4.1 Number of the Users of the Social Services for Homeless People

Data of the Ministry of Labour and Social Affairs, presented in Figure 1, show that the number of the users of three selected types of social services is variable in time, when not changing significantly between years 2015 and 2016. In 2017, it increased to 88 527, and then declined by 10 % to 79 751 in 2018. Observed four years do not show any significant shift in the number of the services' users, even if the individual services are considered. However, one exception exists - the decreasing number of LTDC users between years 2015 and 2016, accompanied with the increasing number of the users of HOS.

**Figure 1** Users of the social services for homeless people: total number according to types of services




Source: Source: Ministry of Labour and Social Affairs (2015-2018), own data processing

In Figure 1, special attention is paid to the decomposition of the total number of the asylum houses users into two sub-groups: (a) men + women (adults) and (b) children. For the whole Czech Republic, number of children using the services of asylum houses was stable and accounted for 1,8 thousand in all analysed years.

Findings presented in Chapter 4.1 do not allow to confirm the *RH1* fully, because rising number of the homeless services users is reported only between years 2015 and 2017. Analysis of the longer data series are necessary to identify any general trend; however, such analysis is beyond the scope of this paper (focusing only on the period starting with the introduction of a new system of social services financing).

### 4.2 Share of Women and Children in the Total Number of Users of the Services for Homeless People

When the number of the services users decomposed to men and women is observed, then the general claim of Pleace (2019) seems to be true for the Czech Republic. On average, more men than women used selected social services during the observed period. However, the share of men declined and the share of women increased since the year 2016 in the case of LTDC, and in 2018 in the case of HOS, which is visible through the declining number of men per one woman using these two types of social services. However, for asylum houses, the number of men was nearly equal to the number of women. See the last row of Table 2, showing data for the whole Czech Republic.

When the regional perspective is applied, then significant differences can be identified: (1) In some regions, like Capital City of Prague, Karlovy Vary, Olomouc, Moravia-Silesia more men than women used all types of analysed services. However, in asylum houses, the number of men was nearly equal to the number of women. (2) In some regions, like Central Bohemia, Plzen, Usti, Hradec Kralove, more men than women used services of low-threshold day centres and homeless shelters, but more women than men used the services of asylum houses.

To make the differences more visible, green dots are used in Table 2 when the number of men per one woman is higher than or equal to 1, and yellow dots when the number of men per one woman is lower than 1.

**Table 2** - Users of the social services for homeless people: number of men per one woman

| Men versus women | 2015 | | | 2016 | | | 2017 | | | 2018 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of men per one woman | LTDC | HOS | ASH | LTDC | HOS | ASH | LTDC | HOS | ASH | LTDC | HOS | ASH |
| Capital City of Prague | 5,38 | 5,23 | 1,32 | 4,40 | 5,09 | 1,33 | 3,69 | 4,82 | 1,30 | 3,92 | 3,70 | 1,50 |
| Central Bohemian Region | 3,87 | 5,91 | 0,45 | 3,96 | 5,26 | 0,41 | 3,88 | 4,63 | 0,50 | 3,90 | 5,39 | 0,42 |
| South Bohemian Region | 6,20 | 0,38 | 0,77 | 4,92 | 0,60 | 0,75 | 6,56 | 14,05 | 0,72 | 6,70 | 362,00 | 0,80 |
| Plzen Region | 5,65 | 7,21 | 0,34 | 4,15 | 4,18 | 0,45 | 3,70 | 4,44 | 0,56 | 3,49 | 3,69 | 0,56 |
| Karlovy Vary Region | 3,94 | 5,35 | 1,37 | 4,29 | 4,95 | 1,70 | 4,16 | 2,96 | 1,26 | 3,67 | 4,07 | 2,08 |
| Usti Region | 4,60 | 10,06 | 1,03 | 3,58 | 10,61 | 0,94 | 3,41 | 7,18 | 0,86 | 4,72 | 6,88 | 0,95 |
| Liberec Region | 3,91 | 6,18 | 1,07 | 3,36 | 4,67 | 1,83 | 2,99 | 3,16 | 1,26 | 3,22 | 2,42 | 0,98 |
| Hradec Kralove Region | 3,50 | 4,15 | 0,72 | 3,59 | 4,39 | 0,73 | 3,95 | 4,84 | 0,78 | 3,37 | 4,01 | 0,69 |
| Pardubice Region | 2,86 | 2,58 | 0,67 | 1,58 | 1,51 | 0,69 | 1,64 | 1,97 | 0,74 | 0,40 | 0,38 | 0,63 |
| Region Vysocina | 0,00 | 0,00 | 1,54 | 0,00 | 0,00 | 1,09 | 0,00 | 0,00 | 0,91 | 0,00 | 0,00 | 1,01 |
| South Moravian Region | 3,80 | 4,52 | 1,10 | 3,30 | 3,29 | 1,26 | 3,48 | 3,44 | 1,02 | 4,09 | 4,00 | 0,90 |
| Olomouc Region | 3,65 | 6,18 | 1,11 | 3,43 | 5,22 | 1,16 | 3,88 | 5,87 | 1,23 | 3,89 | 5,16 | 1,43 |
| Zlin Region | 5,47 | 6,89 | 1,05 | 4,55 | 7,76 | 0,98 | 5,70 | 10,85 | 1,15 | 4,38 | 4,78 | 1,36 |
| Moravian-Silesian Region | 5,82 | 7,81 | 1,72 | 6,53 | 7,54 | 1,79 | 6,69 | 9,17 | 2,05 | 6,93 | 10,50 | 1,84 |
| **Czech Republic** | **4,96** | **4,87** | **1,09** | **3,06** | **4,02** | **1,12** | **2,97** | **4,52** | **1,13** | **1,95** | **2,76** | **1,16** |

Source: Ministry of Labour and Social Affairs (2015-2018), own data processing

Data for the whole Czech Republic and those for individual regions show clearly that more men than women used social services for homeless people, with one exception – services of asylum houses in some regions. It is caused by the existence of special asylum houses offering services only to mothers with dependent children. These houses usually cover the housing needs of those lonely mothers who cannot afford standard housing and solve thus the problem connected with the lack of a social housing in some regions of the Czech Republic.

As it can be seen form Figure 1 and Table 3, children created significant part of the users of asylum houses, but only the minor number of children used the services of low-threshold centres and homeless shelters. Table 3 also shows the number of children per one woman/man in asylum houses. To make the results more visible, the same symbols as in Table 2 are used.

**Table 3** - Users of the social services of the asylum houses: number of children per one woman/man

| Number of children per one woman/man | 2015 | | | 2016 | | | 2017 | | | 2018 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of kids | Kids versus women | Kids versus men | Number of kids | Kids versus women | Kids versus men | Number of kids | Kids versus women | Kids versus men | Number of kids | Kids versus women | Kids versus men |
| Capital City of Prague | 168 | 0,80 | 0,61 | 145 | 0,76 | 0,57 | 158 | 0,76 | 0,59 | 138 | 0,71 | 0,47 |
| Central Bohemian Region | 176 | 1,31 | 2,93 | 169 | 1,05 | 2,56 | 207 | 1,60 | 3,23 | 207 | 1,57 | 3,70 |
| South Bohemian Region | 152 | 1,73 | 2,24 | 137 | 1,78 | 2,36 | 159 | 1,87 | 2,61 | 110 | 1,55 | 1,93 |
| Plzen Region | 122 | 1,31 | 3,81 | 102 | 1,40 | 3,09 | 83 | 1,26 | 2,24 | 72 | 1,13 | 2,00 |
| Karlovy Vary Region | 31 | 0,76 | 0,55 | 27 | 1,00 | 0,59 | 26 | 0,74 | 0,59 | 9 | 0,36 | 0,17 |
| Usti Region | 220 | 1,16 | 1,13 | 190 | 0,95 | 1,01 | 195 | 1,04 | 1,20 | 215 | 1,07 | 1,13 |
| Liberec Region | 15 | 0,35 | 0,33 | 9 | 0,26 | 0,14 | 21 | 0,49 | 0,39 | 19 | 0,45 | 0,46 |
| Hradec Kralove Region | 89 | 1,93 | 2,70 | 94 | 1,84 | 2,54 | 102 | 2,04 | 2,62 | 92 | 1,92 | 2,79 |
| Pardubice Region | 88 | 1,69 | 2,51 | 90 | 1,73 | 2,50 | 88 | 1,63 | 2,20 | 102 | 1,57 | 2,49 |
| Region Vysocina | 45 | 1,22 | 0,79 | 39 | 0,67 | 0,62 | 34 | 0,53 | 0,59 | 40 | 0,59 | 0,58 |
| South Moravian Region | 213 | 1,04 | 0,95 | 225 | 1,19 | 0,94 | 240 | 1,17 | 1,14 | 235 | 1,26 | 1,40 |
| Olomouc Region | 192 | 0,95 | 0,85 | 213 | 1,08 | 0,93 | 200 | 1,04 | 0,84 | 181 | 1,01 | 0,70 |
| Zlin Region | 15 | 0,10 | 0,09 | 16 | 0,12 | 0,13 | 21 | 0,16 | 0,14 | 13 | 0,10 | 0,08 |
| Moravian-Silesian Region | 300 | 1,18 | 0,68 | 321 | 1,28 | 0,72 | 331 | 1,43 | 0,70 | 316 | 1,32 | 0,72 |
| **Czech Republic** | 1826 | 1,04 | 0,96 | 1777 | 1,05 | 0,94 | 1865 | 1,11 | 0,98 | 1749 | 1,07 | 0,92 |

Source: Ministry of Labour and Social Affairs (2015-2018), own data processing

Data presented in Table 3 reveal that in some regions (Capital City of Prague, Vysocina, Liberec) less kids than 1 accounted for one woman living in asylum houses, contrary to other regions, like Central Bohemia, South Bohemia, Plzen, Pardubice and Moravia-Silesia. Spearman correlation coefficient was calculated to show whether any relation between the number of adult users of residential social services for homeless people (HOS, ASH) and the number of children using these services exists. It means, correlation coefficient allows to identify whether the higher number of children using homeless services is monitored in regions where higher number of homeless adults using the same services is monitored. Values of Spearman correlation coefficient are presented in Table 4.

**Table 4** - Spearman correlation coefficient: children and adults using social services of HOS and ASH

| Year | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|
| Spearman correlation coefficient | 0,7198 | 0,7527 | 0,6604 | 0,6593 |

Source: Ministry of Labour and Social Affairs (2015-2018), own data processing

Values of Spearman correlation coefficient indicate positive relation between two observed variables (number of children and adults using homeless services), but the strongness of this relation declines in time. Values of Spearman coefficient express statistical dependence between the rankings of observed units (regions) with respect to two variables. Therefore, these values result from the differences between these two rankings. The most significant differences, that influenced the overall value of the coefficient, were observed for the Zlin Region and Hradec Karlove Region for all observed years. In Zlin Region, number of children using homeless services was the lowest one in comparison with other regions, which affects the difference between Zlin's rankings with respect to two followed variables. In Hradec Kralove Region, the number of homeless adults was low in comparison with other regions, but the number of homeless children was quite high in comparison with other regions, which affects difference between two region's rankings.

According to the latest census concerning the number of homeless people living in Czech regions (Nešporová et al., 2019), the highest number of children affected by homelessness lives in Moravian-Silesian Region (361), followed by South Moravian Region (318), Olomouc Region (271) and Usti Region (258), which corresponds to the number of children using selected types of social services focusing on homeless individuals. Number of children using asylum houses services was quite stable during the period of years 2015–2018, and their number was positively correlated with the number of adult users of these services, but the strongness of this relation declined in time. It means that the share of children in total homeless population must increase in some regions during the period of years 2015-2018.

Findings presented in the Chapter 4.2 show that women and children are less involved in the use of social services for homeless people, which confirms the *RH2*. However, in the case of services provided to people at rough, the number of men per one woman is much higher than in the case of services providing temporary accommodation. This finding relates to the existence of asylum houses focusing only on lonely mothers with economically dependent children. Important trend is also visible through increasing number of female users per one male user, which is caused by increasing number of women using selected social services accompanied simultaneously with declining number of men using the same services. It also indicates the increasing experience of women with homelessness.

### 4.3 Relation between the Number of Users of Services for Homeless People and Settlement Structure of Czech Regions

As it was interpreted in the theoretical part of the analysis, homeless people are attracted especially by cities with more than 20,000 inhabitants, and also larger urban areas create conditions for effective supply of social preventions services (including also services for homeless people). Following Table 5 presents numbers of users of two types of social services (users of the HOS, ASH, called further as the homeless people, HP) per 1,000 people of the population living in cities with more than 20,000 inhabitants (called as the urban population, UP) for all regions of the Czech Republic. Traffic light method is used to show the differences more visible (yellow colour = percentile 50).

At the first sight, strong positive relation between the number of homeless people and the size of urban population is revealed only for the Capital City of Prague, which is obvious (because of the opportunities existing in capital city, greater anonymity, etc.). One the other hand, in the Pardubice Region, strong negative relation has been indicated since the year 2016, because of quite small size of the urban population and very high number of the homeless people.

**Table 5** - Users of social services for homeless people (HOS and ASH): their relation to the size of urban population

| Homeless people (HP) versus size of the urban population (UP) | 2015 | | | 2016 | | | 2017 | | | 2018 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Homeless people | Urban Population | HP/UP | Homeless people | Urban Population | HP/UP | Homeless people | Urban Population | HP/UP | Homeless people | Urban Population | HP/UP |
| Capital City of Prague | 29 334 | 1 267 449 | 23,14 | 35 759 | 1 280 508 | 27,93 | 34 258 | 1 294 513 | 26,46 | 30 087 | 1 308 632 | 22,99 |
| Central Bohemian Region | 764 | 197 059 | 3,88 | 803 | 197 141 | 4,07 | 811 | 197 729 | 4,10 | 938 | 198 455 | 4,73 |
| South Bohemian Region | 1 101 | 202 445 | 5,44 | 1 289 | 202 394 | 6,37 | 621 | 202 797 | 3,06 | 601 | 203 020 | 2,96 |
| Plzen Region | 830 | 192 273 | 4,32 | 716 | 192 926 | 3,71 | 692 | 193 224 | 3,58 | 585 | 194 674 | 3,01 |
| Karlovy Vary Region | 236 | 105 359 | 2,24 | 362 | 104 986 | 3,45 | 422 | 104 385 | 4,04 | 461 | 103 730 | 4,44 |
| Usti Region | 1 202 | 357 249 | 3,36 | 1 297 | 356 185 | 3,64 | 1 273 | 355 327 | 3,58 | 1 323 | 354 127 | 3,74 |
| Liberec Region | 377 | 185 956 | 2,03 | 420 | 186 756 | 2,25 | 397 | 187 155 | 2,12 | 389 | 187 691 | 2,07 |
| Hradec Kralove Region | 477 | 143 970 | 3,31 | 516 | 143 758 | 3,59 | 559 | 143 626 | 3,89 | 534 | 123 114 | 4,34 |
| Pardubice Region | 599 | 131 924 | 4,54 | 5 550 | 113 146 | 49,05 | 6 059 | 113 468 | 53,40 | 5 850 | 113 839 | 51,39 |
| Region Vysocina | 139 | 23 234 | 5,98 | 160 | 131 194 | 1,22 | 156 | 130 869 | 1,19 | 177 | 130 639 | 1,35 |
| South Moravian Region | 2 293 | 502 466 | 4,56 | 1 795 | 503 169 | 3,57 | 1 711 | 504 375 | 3,39 | 1 650 | 505 302 | 3,27 |
| Olomouc Region | 1 417 | 214 603 | 6,60 | 1 503 | 214 449 | 7,01 | 1 578 | 214 008 | 7,37 | 1 524 | 213 346 | 7,14 |
| Zlin Region | 632 | 178 334 | 3,54 | 527 | 177 864 | 2,96 | 4 634 | 177 368 | 26,13 | 707 | 177 334 | 3,99 |
| Moravian-Silesian Region | 2 738 | 717 656 | 3,82 | 2 880 | 713 433 | 4,04 | 2 918 | 708 730 | 4,12 | 3 214 | 704 377 | 4,56 |
| **Czech Republic** | 42 139 | 4 509 442 | 9,34 | 53 577 | 4 517 909 | 11,86 | 56 089 | 4 527 574 | 12,39 | 48 040 | 4 518 280 | 10,63 |

Source: Ministry of Labour and Social Affairs (2015-2018), Czech Statistical Office (2020), own data processing

To measure the relation between two observed variables more exactly, Spearman correlation coefficient was calculated for all analysed years, see Table 6.

**Table 6** - Spearman correlation coefficient: users of the HOS and ASH services and size of urban population

| Year | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|
| Spearman correlation coefficient | 0,9604 | 0,6835 | 0,4945 | 0,6396 |

Source: Ministry of Labour and Social Affairs (2015-2018), Czech Statistical Office (2020), own data processing

Values of Spearman correlation coefficient indicate existing positive correlation between the number of users of social services for homeless people and the size of urban population (defined by the number of people living in cities with more than 20,000 inhabitants) in Czech regions. Variability of the coefficient values is caused by two regions, resp. by existing differences in their rankings with respect to followed variable - Zlin Region and Pardubice Region. The former one reports increasing number of the users of homeless shelters since the year 2017, which is reflected also by increased capacity of the current facilities and the opening of new facilities. The latter one reports increased number of users of selected services, too, but without any exact explanation. It opens space for discussion on tourism/migration of LTDC services users (argument used by the providers of social services of asylum houses), because at the same time, the Capital City Prague reports declining number of the users of these services.

Latest census focusing on the number of homeless people living in Czech regions (Nešporová et al., 2019) shows that the highest number of homeless people was observed in the Moravian-Silesian Region (3 541) that was followed by Capital City Prague (3 251) and South Moravian Region (2 453), which partly corresponds to the extensity of the use of social services provided to homeless people in Czech regions. On the other hand, increasing extensity of the use of homeless services in Pardubice Region remains a question for discussion because Nešporová et al. (2019) estimates the number of homeless people living there on 1 094.

Findings presented in Chapter 4.3, especially the values of Spearman correlation coefficient, allow to confirm the *RH3*, although the strongness of the relation between the number of the users of selected social services for homeless people and the size of specified urban population is not stable in time and was affected by situation in two regions – Zlin and Pardubice.

## 5 Conclusion

Homelessness expresses a serious social problem that is usually interpreted in negative consequences by Czech society. Therefore, reduction of the number of homeless people living in a public space belongs to the priorities of Czech policymakers. Social services programmes offer special services for homeless people to meet their basic human and housing needs. Many reports as well as stakeholders argue that the number of homeless people steady rise in Europe, but this argument cannot be fully acceptable for the Czech Republic, because of the absence of regular annual census concerning the number of homeless people. However, the Ministry of Labour and Social Affairs reports about the number of users of selected services focusing on homeless individuals, and

thus general trends in homelessness can be identified, but these trends relates rather to the extensity of the use of these services, than to real numbers of homeless people.

Findings relating to the extensity of the use of selected social services focusing on homeless people, which are presented above, show that when the period of years 2015–2018 is analysed, no general trend concerning the number of homeless people can be identified. On the other hand, data for four analysed years show that main general statements about the homelessness (regularly interpreted in the academic and statistical sources), such as the statement about the relation between the settlement structure and number of homeless people; or the statements about the increasing experience of women with homelessness, are acceptable for most regions of the Czech Republic, as well as for the whole Republic, when the number of homeless people is simplified replaced with the number of homeless services users.

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# Poland and the Czech Republic as Partners in Foreign Trade

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## Abstract

According to the contemporary theory of integration, the membership in the European Union promotes strengthening of international trade. The aim of this study is examining Poland and the Czech Republic as partners in foreign trade in the period of 2004-2019. For this purpose we analyzed the size and structure of foreign trade between the two states as well as a set of indicators that allowed us to determine the bilateral trade competitiveness of both economies (i.e. revealed comparative advantages indicator, intensity of intra-industry trade indicator, complementarity of exports and imports structure indicator).
The study proofed that Poland shows less economic dependence on the Czech Republic than vice versa. The trade between Poland and the Czech Republic is mainly based on intra-industry exchange. The most important Polish-Czech intra-industry trade applies to two of ten SITC sections i.e. namely „manufactured goods classified chiefly by material" and "machinery and transport equipment". These two sectors show high indicators, confirming revealed comparative advantages as well as high intensity of intra-industry trade indicators. Moreover, in years 2004-2019 systematically progressed adaptation of exports supply to the foreign partner's demand structure. It is also worth noting that over the entire examined period, Poland revealed weak comparative advantages in the inter-industry competitiveness with the Czech Republic.

***Keywords:*** *comparative advantage, economic integration, foreign trade, intra-industry trade*

***JEL Classification:*** *F14, F15, F41*

## 1 Introduction

Poland and the Czech Republic have a long history as partners in bilateral trade what results from the fact of neighborhood as well as from more than forty years of belonging to the bloc of socialist countries, formed after the II World War and strongly influenced by the Soviet Union. The transformation from a centrally planned to a market economy that started at the beginning of the 1990s and subsequently the membership of both countries in the European Union, opened a new chapter of economic cooperation between the two states. The most obvious form of international economic cooperation is foreign trade. In 2004, when both countries joined the European Union, the be-lateral trade between Poland and the Czech Republic did not exceed EUR 2.6 billion in Polish exports and EUR 2.7 billion in imports. For Poland it was the last year that closed with a negative balance in foreign trade with the Czech Republic (EUR -135,5 million). That economic integration with the highly developed countries of Western Europe, together with all its consequences in the sphere of socio-economic

changes supported by huge EU funds, gave rise to a leap in the civilization development of both countries. After 16 years the trade between Poland and the Czech Republic increased by 5,5 times in exports and more than 3 times in imports (2019: EUR 14.74 billion and EUR 9.3 billion, respectively). These figures clearly show that EU membership has resulted in enhanced trade between the two countries.

This reflects all the causal relationships of economic integration that have been describing in the theory of economics for more than 200 years.

The history of economic though on international trade theory have been written by many prominent classical economists as: A. Smith, D. Ricardo, J. St. Mill, K. Marks, F. Engels, further by the representatives of orthodox neoclassical theory like: E. Heckscher, B. Ohlin and P.A. Samuelson, A.P. Lerner, M.F.W. Stopler, T. Rybczyński, R.A. Mundell as well as by their critics: R. E. Caves, R.W. Jones, P. Neary, R.J. Marcusen, K.Y. Wong, and finally by modern heterodox economists like: V. Posner, R. Vernon, S. Hirsch, T. Scitovsky and their most modern followers like: W. Ethier, R. W. Jones and Ch. van Marrewijk. (Misala, 2012)

The economic goals of economic integration are closely linked to the goals of international division of labor. It is mainly about maximizing the benefits of international trade and other forms of cooperation within the integration group. (Machlup, 1986; Bożyk & Misala, 2003)

According to the contemporary theory of integration, even in the free trade area or customs unions, the so called static effects are revealed. They include, among others, the effect of creation and the effect of trade shift. The occurrence of the trade creation effect is synonymous with the parallel appearance of the production and consumption effect.

The production effect is associated with the discontinuation of the production (and thus export) of goods produced in a less efficient country (in other words in industries where the country has no comparative advantage). The consumption effect is closely related to the production effect and it relates to changes in the structure of consumption of goods. As resignation from production does not require resignation from consumption, then consumption needs are met by imports. (Meade, 1957)

Achieving measurable benefits from the effect of trade creation depends on: 1) Diversification of partners in terms of the production function of exchanged goods (due to different equipment in production factors and different intensity of their use). It leads to the development of inter- and intra-industry trade. 2) The diversity of partners in terms of the possibility of achieving economies of scale in the sphere of production and sales as well as the possibility of better satisfying the changing preferences of consumers. It is possible with very similar production functions of goods being exchanged and leads to the development of intra-industry trade.

The trade shift effect consists in shifting trade streams from non-member countries to member countries, which as well accompanied by production and consumption effects.

These effects occur in all forms of economic integration (customs union, common market or economic and monetary union). (Viner, 1950; Shibata, 1967)

The aim of this study is examining Poland and the Czech Republic as partners in foreign trade in the period of 2004-2019. For this purpose we analyzed the size and structure of foreign trade between the two states as well as a set of indicators that allowed us to determine the bilateral trade competitiveness of both economies.

## 2 Data and Method

In order to analyze the bilateral trade competitiveness of Poland and the Czech Republic we applied three indicators (Misala, 2007):

1) The revealed comparative advantages indicator (RCA) derived from Balassa (1965). The formula is as following:

$$RCA_i = \ln\left[\frac{x_{ij}^K}{m_{ij}^K} \div \frac{X_j^K}{M_j^K}\right] \tag{1}$$

where:

$x_{ij}^K$ - exports of commodity group *i* from country *K* to country or group of countries *j*,

$m_{ij}^K$ - imports of commodity group *i* to country *K* from country or group of countries *j*,

$X_j^K$ - total exports of country *K* to country or group of countries *j*,

$M_j^K$ - global imports of country *K* from country or group of countries *j*,

*i* - SITC section (Standard International Trade Classification),

*K* - in this study: Poland,

*J* - in this study: the Czech Republic.

If $RCA_i$ is greater than zero it points to revealed comparative advantages and to the intensity of this advantage. $RCA_i$ below zero denotes the absence of the revealed comparative advantage with either smaller or greater intensity. The logarithmical form of the formula makes it possible to maintain the symmetrically of the positive or negative $RCA_i$ indicators in a range hovering around zero.
The average value, especially weighted average, of $RCA_i$ indicators can be treated as composite indicator of international inter-industry competitiveness.

2) The intensity of intra-industry trade indicator developed by H. Grubel and P.J. Lloyd (1975). The formula is as following:

$$IIT_i = \frac{x_i + m_i - |x_i - m_i|}{x_i + m_i} \quad (2)$$

$x_i$ - exports of commodity group i from country K to country or group of countries j (here from Poland to the Czech Republic),

$m_i$ - imports of commodity group i to country K from country or group of countries j (here from the Czech Republic to Poland).

In contemporary international exchange, a significant and generally increasing role is played by intra-industry trade (also known as two-way trade), which is based on parallel imports and exports by a specific country or group of countries of finished products and/or their parts and components coming from the same sector in a given period, usually during a year.

The IITi index ranges from 0 to 1, the higher IITi index the more intensive intra-industry trade. If IIT = 0 it means 100% inter-industry exchange, if IIT = 1 than 100% of trade with a given country is intra-industry. The indicator expressed as a percentage shows the share of intra-industry trade in the total trade.

3) The complementarity of exports and imports structure indicator proposed by M. Michaely (1996). The formula is as following:

$$C_{jK} = 1 - \left(\sum |m_{iK} - x_{ij}|\right) \div 2 \quad (3)$$

where:
$m_{jK}$ - the share of imports of product (commodity group) *i* in the total imports of country (group of countries) *K*
$x_{ij}$ - the share of export of product (commodity group) *i* in the total exports of country (group of countries) *j*

The complementarity of exports and imports structures defined as adaptation of the export supply structure to the partners' demand structure can be observed and analyzed in reference to a specific period t as well as to a specific time bracket t1-tn.

The CjK index ranges from 0 to 1, where 0 means that product (commodity groups) i exported by country j (here: Poland) is not at all the subject of importation to country (group of countries) K (in our case the Czech Republic). In turn, index CjK has maximum value of 1 when the share of imports of products i,…,n of the analysed country (group of countries) K is exactly the same as the corresponding share in the exports of the analysed country j to other country (or group of countries). The higher CjK index the more adapted is the export supply of the analysed country to the import demand structure of its partner (or group of partners).

## 3 Results and Discussion

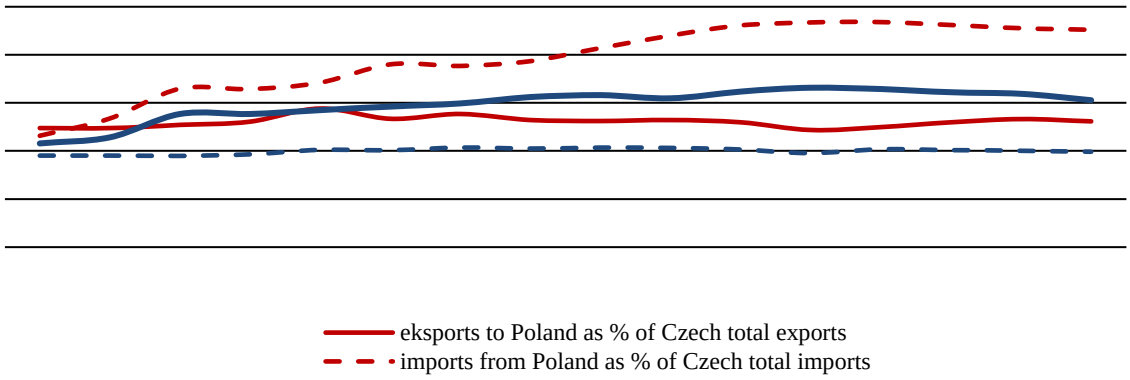
### 3.1 Size and Structure of Trade between Poland and the Czech Republic - Descriptive Statistics for 2004-2019

In 2004, the share of the Czech Republic in the total world exports amounted to 0.75%. For Poland it was 0.81%. After 16 years, these rates increased to 1.05% and 1.4%, respectively.

In 2004, the Czech Republic was the 6th partner in Poland's imports (after Germany, Italy, Russia, France and China) and the 5th one on the export side (after Germany, Italy, France, Great Britain). After 16 years, little has changed in imports (7th position), but in exports the Czech Republic advanced to the position of Poland's 2nd partner, ahead only by Germany.

For the Czech Republic, Poland was the 4th partner in exports (after Germany, Slovakia and Austria) and 5th in imports (after Germany, Slovakia, China and Italy). In 2019, Poland advanced to the 3rd place in both exports (after Germany and Slovakia) and imports (after Germany and China).

**Figure 1** Poland in the Czech Republic' foreign trade and the Czech Republic in Poland's foreign trade
Source: Own work on the basis of EUROSTAT on-line data.




Despite these high ranking positions, the importance of Polish - Czech foreign trade remains on rather low level. During 16 examined years imports from the Czech Republic remained stable at around 4% of the total amount of Polish imports. In turn, Poland's share in Czech imports almost doubled (from 4.6% in 2004 to 9% in 2019), but still it is not a lot. At the same time, a systematic increase of exports to the Czech Republic was observed (from approx. 4% to 6% of total value of Polish exports). The share of Czech exports do Poland fluctuated around 5% of the total Czech exports.

It can therefore be concluded that Poland shows less economic dependence on the Czech Republic than vice versa but still this dependence reflected in aggregated export-import numbers seems to be not crucial for both states. The further analysis will tell us more on this topic.

**Figure 2** Polish-Czech exports and imports as a percentage of GDP
Source: Own work on the basis of EUROSTAT on-line data.

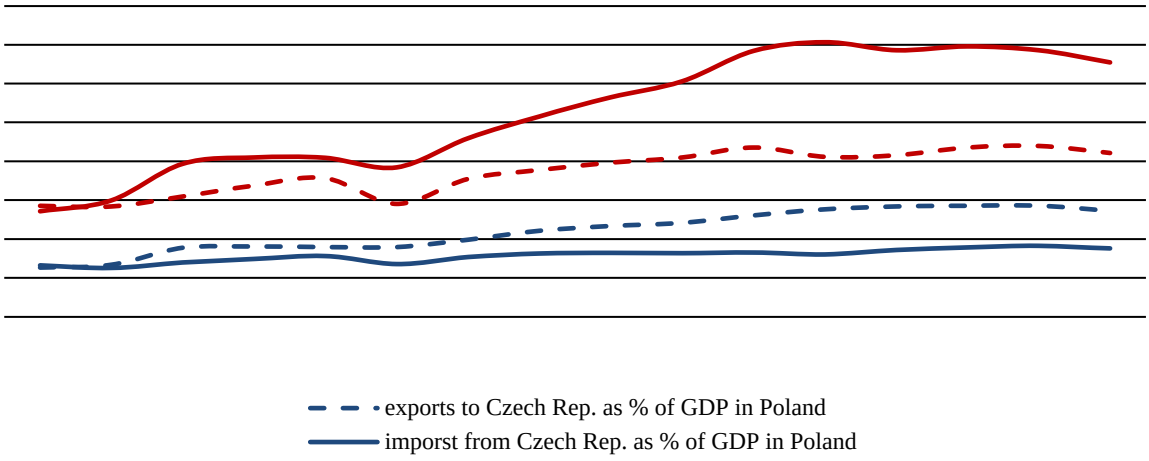



Figure 2 shows the share of foreign trade in GDP of both countries. Since 2004 exports to the Czech Republic accounted from 1.3% to 2.9% of Polish GDP while exports to Poland were almost twice higher and amounted in the range of 2.8% - 4.4% of Czech GDP. Data on imports further strengthen the thesis that the bilateral trade is less important for Polish economy than for the Czech one. Imports from Czechia did not exceed 1.8% of Polish GDP while the share of imports from Poland were systematically increasing in the Czech GDP, from 2.7% in 2004 up to 7.1% in 2015 (in 2019 it slightly dropped to 6,6%).

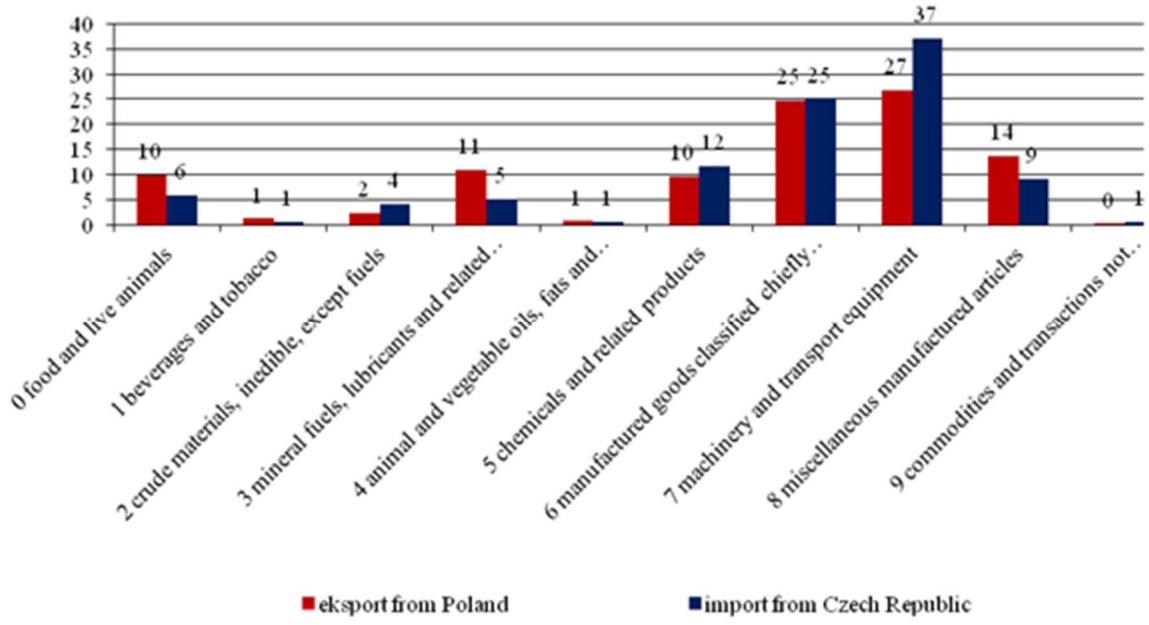
It is also worth emphasizing that both economies show a very strong correlation between the volume of foreign trade and GDP. The Pearson correlation coefficient between Polish GDP and total imports value as well as imports from the Czech Republic amounts to 0.99 and similarly for exports the Pearson coefficient amounts to 0.98. For Czechia these coefficients are slightly lower, but objectively, the relationship between Czech GDP and foreign trade is still very strong. The correlation coefficient for total Czech exports and GDP amounts to 0.95 while coefficient between GDP and trade to Poland amounts to 0.97. For imports these indicators are 0.96 and 0.93, respectively.

For more insightful assessment of partnership in foreign trade, it is important to analyze the industry structure of exports and imports. Figure 3 shows the structure of exports and imports between Poland and the Czech Republic by Standard International Trade Classification sections (SITC) which identifies 10 commodity groups.

In Poland's imports from the Czech Republic, section 7 i.e. “machinery and transport equipment” is of major importance. This group of commodities amounts to 37% of Polish imports from Czechia (mainly road vehicles, office machines and automatic data-processing machines, telecommunications and sound-recording and reproducing apparatus and equipment, general industrial machinery and equipment and machine parts). On the second place (with the share of 25%) we can see the commodities from SITC section 6, namely “manufactured goods classified chiefly by material” (iron and steel, non-ferrous metals, manufactures of metals). SITC section 5 took the third position with 12% share, these are “chemicals and related products” (essential oils and resinoids and perfume materials, chemical materials and products, n.e.s.) The mentioned three groups of commodities constitute almost 75% of Polish imports from the Czech Republic.

When we look at data on Polish exports, we immediately notice that trade relations with the Czech Republic are dominated by intra-industry exchange. SITC sections 7 and 6 cover, on average, about 52% of exports to Czechia. SITC sections 5 takes further 10%. However, other SITC sections like 8, 3 and 0 are also important: “miscellaneous manufactured articles (14%), “mineral fuels, lubricants and related materials” (11%), “food and live animals” (10%).

**Figure 3** Foreign trade between Poland and the Czech Republic – structure by SITC sections (average from 2004-2019). Source: Own work on the basis of EUROSTAT on-line data.




### 3.2 Results of Foreign Trade Indicators Analysis – RCA, IIT, C

The analysis of RCA indicators of 2004-2019 shows that Poland reveals comparative advantages in trade with the Czech Republic in the following SITC sections:

0 - food and live animals,

1 - beverages and tobacco,

3 - mineral fuels, lubricants and related materials,

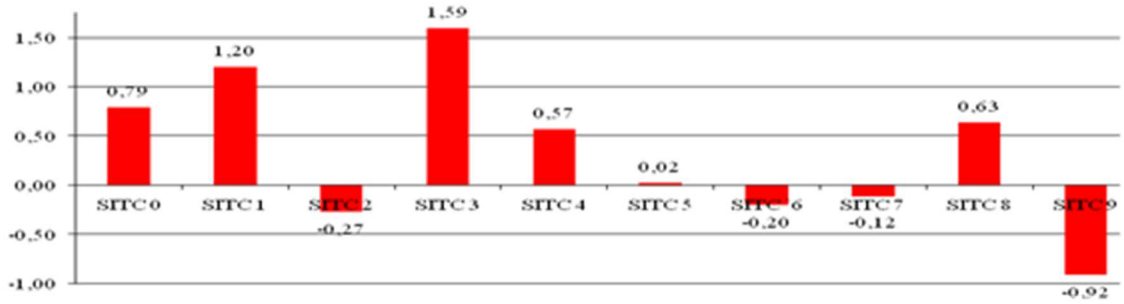
4 - animal and vegetable oils, fats and waxes,

8 - miscellaneous manufactured articles.

The average value of 2004-2019 RCA indicators for the above listed commodity groups ranged between 0.57 and 1.59. In each of these SITC sections, Poland achieved a positive trade balance (see Fig. 3 and Fig. 4). Poland reveals the greatest competitive advantage in trade of commodities from SITC 3 (mineral fuels, lubricants and related materials) but this group of goods takes only 11% of Polish exports to Czechia. Also seems surprising

that in the case of goods from groups 6 and 7 Poland does not reveal comparative advantages beside the fact that these two groups of commodities take more than 50% share in Polish exports to the Czech Republic.

**Figure 4** Revealed comparative advantage indicators (RCA) for Polish – Czech trade (average 2004-2019) Source: Own work on the basis of data from Table A1.




Looking at the RCA indicators from the Czech perspective, we can identify rather weak advantages in the following sections:

2 - crude materials, inedible, except fuels,

6 - manufactured goods classified chiefly by material,

7 - machinery and transport equipment,

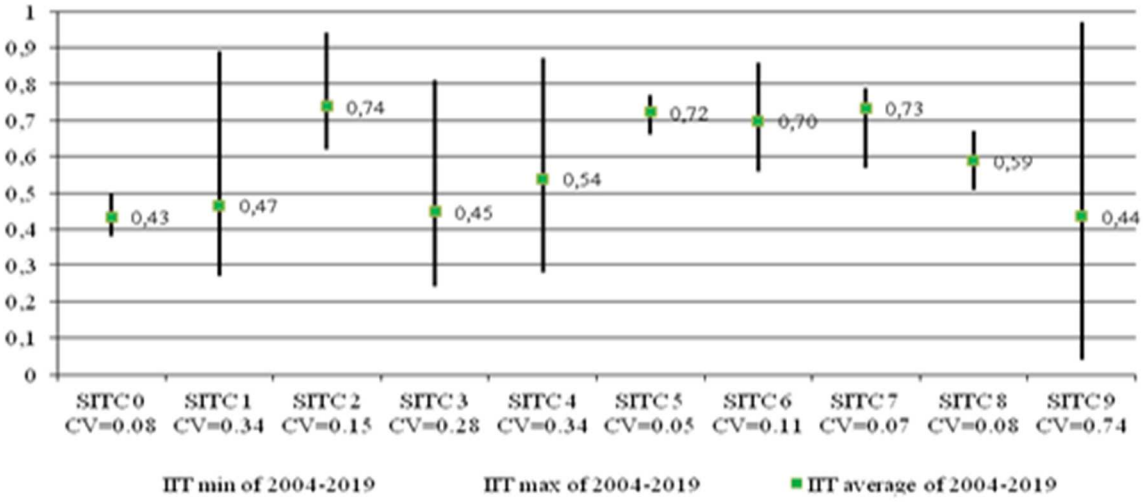
9 - commodities and transactions not classified.

The average value of 2004-2019 RCA indicator for the above listed commodity groups ranged between (-0.12) and (-0.92). In two of these SITC sections, the Czech Republic achieved a quite significant positive trade balance.

Over the entire examined period, the weighted average RCA indicators calculated for all SITC sections showed weak comparative advantages of the Polish economy (ranged between 0.31 and 0.74), what can be interpreted as Polands' advantages in the inter-industry competitiveness with the Czech Republic.

The analysis of the data illustrated in Figure 3 gave reasons to pre-assume that trade between Poland and the Czech Republic is mainly based on intra-industry exchange. To verify this assumption we used the IIT measure i.e. the intensity of intra-industry trade indicator. Figure 4 shows the range of IIT indicators, together with the average value, for each SITC section in the years 2004-2019.

**Figure 5** Intensity of intra-industry trade indicators (IIT) for Polish – Czech trade (minimum, maximum and average value in years 2004-2019). Source: Own work on the basis of data from Table A2.




As Figure 5 shows, in the case of 5 SITC sections even the minimum value of IIT index was not lower than 0.5 (SITC sections: 2, 5, 6, 7, 8). These SITC sections show also very low IIT coefficients of variation what means that in the examined period the value of IIT indicators showed little fluctuations (CV from 0.05 to 0.15). For these groups of commodities the 2004-2019 average value of ITT ranged between 0.59 and 0.74. This confirms a quite high intensity of intra-industry trade in the following industries: 1) crude materials, inedible, except fuels;

2) chemicals and related products; 3) manufactured goods classified chiefly by material; 4) machinery and transport equipment; 5) miscellaneous manufactured articles. Two of them represent the leading branches in Polish-Czech trade (SITC 6 and 7). In the period 2004-2019 about 58%-68% of trade between Poland and the Czech Republic was the intra-industry exchange (calculated as weighted averages of IIT indicators for all SITC sections).

The final step of our research is examining the complementarity of exports and imports structures in Polish – Czech trade. Table 1 shows indicators $\mathbf{C_{jK}}$ calculated according to the formula (3).

**Table 1 -** Indicators of complementarity of exports and imports structures in Polish – Czech trade ( 2004-2019)

| **$C_{jK}$ indicators for Polish – Czech trade** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** |
| 0,37 | 0,44 | 0,43 | 0,46 | 0,47 | 0,50 | 0,52 | 0,50 | 0,52 | 0,53 | 0,56 | 0,58 | 0,57 | 0,57 | 0,58 | 0,58 |

Source: Own calculations on the basis of EUROSTAT on-line data.

At the beginning of the analyzed period, the complementarity of exports and imports structures in Poland and the Czech Republic was at a relatively low level amounted to 0.37 in 2004. However, it was systematically increasing and reached 0.58 in 2019. It reflects positive adaptations of exports supply to the foreign partner's demand structure.

The calculation process of CjK indictors allowed to formulate the following complementary observations related to bilateral Polish-Czech trade in 2019:

Polish exports to the Czech Republic was excessively intense regarding to SITC sections 7, 5 and 3, namely: office machines and automatic data-processing machines, telecommunications and sound-recording and reproducing apparatus and equipment, medicinal and pharmaceutical products, petroleum, petroleum products and related materials.

In contrast, not intensive enough were exports of commodities from SITC sections 8, 7 and 6, i.e.: furniture and parts thereof, electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof, non-ferrous metals, iron and steel.

## 4 Conclusion

International trade is the most common and obvious form of cooperation between countries. Undoubtedly, integration processes, including integration within the EU, are conducive to the development of international trade. Bilateral trade between Poland and the Czech Republic is a good exemplification of, widely described in the literature, the phenomenon of strengthening international trade which is conducive to the structural transformation of domestic economies, on both the export and import sides. The study allowed forming some following conclusions. Poland shows less economic dependence on the Czech Republic than vice versa, but still this dependence reflected in aggregated export-import numbers seems to be not crucial for both economies (doesn't exceed 3% of GDP in Poland and 7% in the Czech Republic). Both economies show also a very strong correlation between foreign trade and GDP. The trade between Poland and the Czech Republic is mainly based on intra-industry exchange. The most important Polish-Czech intra-industry trade applies to two of ten sections of Standard International Trade Classification, namely „manufactured goods classified chiefly by material" and "machinery and transport equipment". These two sectors show high RCA indicators, confirming revealed comparative advantages as well as high intensity of intra-industry trade indicators (IIT). Moreover, in years 2004-2019 systematically progressed adaptation of exports supply to the foreign partner's demand structure, although in 2019 it was still possible to identify groups of commodities which were exported too much intensively as well those exported not enough. It is also worth noting that over the entire examined period, Poland revealed weak comparative advantages in the inter-industry competitiveness with the Czech Republic.

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## Appendix

**Table A2 Revealed comparative advantage indicators (RCA) for Polish – Czech trade (2004-2019)**

| SITC section | RCA indicators for Polish – Czech trade | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** |
| **0** | 0.62 | 0.90 | 0.65 | 0.64 | 0.74 | 0.91 | 0.91 | 0.97 | 0.84 | 0.94 | 0.79 | 0.55 | 0.57 | 0.79 | 0.89 | 0.92 |
| **1** | 0.91 | -0.16 | 0.44 | 0.85 | 1.35 | 2.00 | 2.00 | 0.79 | 0.80 | 1.29 | 1.05 | 1.84 | 1.30 | 1.67 | 1.80 | 1.34 |
| **2** | 0.35 | 0.16 | -0.09 | -0.27 | -0.32 | -0.68 | -0.38 | -0.22 | -0.18 | -0.01 | -0.12 | -0.31 | -0.53 | -0.58 | -0.67 | -0.44 |
| **3** | 1.32 | 1.15 | 2.85 | 2.85 | 1.98 | 2.01 | 1.27 | 2.13 | 2.04 | 1.01 | 1.07 | 1.76 | 1.33 | 0.97 | 0.88 | 0.85 |
| **4** | -1.01 | -0.16 | 1.11 | 2.30 | 1.27 | 0.97 | 0.49 | 0.61 | 0.33 | 0.24 | 0.65 | 1.17 | 1.28 | 0.13 | 0.00 | -0.34 |
| **5** | 0.10 | 0.04 | -0.12 | -0.02 | 0.01 | -0.20 | -0.16 | -0.08 | -0.10 | 0.00 | -0.07 | 0.03 | 0.23 | 0.20 | 0.23 | 0.28 |
| **6** | -0.24 | 0.08 | -0.57 | -0.38 | -0.14 | -0.42 | -0.35 | -0.23 | -0.36 | -0.19 | -0.18 | -0.32 | -0.16 | 0.14 | -0.03 | 0.11 |
| **7** | -0.89 | -0.40 | -0.16 | -0.07 | -0.05 | 0.02 | -0.03 | -0.19 | -0.10 | -0.03 | 0.09 | -0.04 | -0.04 | 0.06 | 0.03 | -0.09 |
| **8** | 1.14 | 0.78 | 0.67 | 0.62 | 0.67 | 0.79 | 0.78 | 0.82 | 0.71 | 0.41 | 0.28 | 0.22 | 0.45 | 0.53 | 0.59 | 0.69 |
| **9** | - | - | - | - | -0.48 | - | 1.09 | - | - | -3.62 | -4.46 | -0.12 | 3.06 | -0.40 | -1.88 | -1.43 |
| **Weighted average*** | **0.51** | **0.45** | **0.74** | **0.62** | **0.48** | **0.47** | **0.37** | **0.49** | **0.43** | **0.32** | **0.31** | **0.38** | **0.38** | **0.38** | **0.37** | **0.37** |

* As weights we used the shares of SITC groups of goods exported from Poland to Czechia (according to 2-digit SITC)
In grey - ($RCA_i$) >0 revealed comparative advantage for Polish foreign trade with Czech Republic

**Standard International Trade Classification sections (SITC)**

0 food and live animals
1 beverages and tobacco
2 crude materials. inedible. except fuels
3 mineral fuels. lubricants and related materials
4 animal and vegetable oils. fats and waxes
5 chemicals and related products
6 manufactured goods classified chiefly by material
7 machinery and transport equipment
8 miscellaneous manufactured articles
9 commodities and transactions not classified

Source: Own calculations on the basis of EUROSTAT on-line data.

**Table A3 Intensity of intra-industry trade indicators (IIT) for Polish – Czech trade (2004-2019)**

| SITC section | IIT indicators for Polish – Czech trade | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** |
| **0** | 0.50 | 0.45 | 0.40 | 0.48 | 0.44 | 0.38 | 0.40 | 0.40 | 0.46 | 0.45 | 0.44 | 0.39 | 0.42 | 0.47 | 0.43 | 0.44 |
| **1** | 0.53 | 0.89 | 0.67 | 0.53 | 0.53 | 0.33 | 0.42 | 0.56 | 0.53 | 0.41 | 0.44 | 0.35 | 0.35 | 0.30 | 0.27 | 0.36 |
| **2** | 0.82 | 0.82 | 0.87 | 0.94 | 0.89 | 0.70 | 0.62 | 0.62 | 0.63 | 0.69 | 0.66 | 0.67 | 0.63 | 0.67 | 0.71 | 0.87 |
| **3** | 0.81 | 0.49 | 0.34 | 0.41 | 0.53 | 0.40 | 0.58 | 0.45 | 0.40 | 0.46 | 0.41 | 0.24 | 0.30 | 0.44 | 0.43 | 0.49 |
| **4** | 0.69 | 0.61 | 0.43 | 0.39 | 0.43 | 0.46 | 0.73 | 0.65 | 0.72 | 0.69 | 0.49 | 0.31 | 0.28 | 0.87 | 0.38 | 0.49 |
| **5** | 0.71 | 0.72 | 0.72 | 0.70 | 0.70 | 0.77 | 0.76 | 0.77 | 0.76 | 0.74 | 0.73 | 0.75 | 0.67 | 0.66 | 0.70 | 0.69 |
| **6** | 0.68 | 0.59 | 0.56 | 0.65 | 0.78 | 0.86 | 0.80 | 0.72 | 0.70 | 0.70 | 0.73 | 0.70 | 0.70 | 0.66 | 0.69 | 0.66 |
| **7** | 0.57 | 0.73 | 0.75 | 0.79 | 0.78 | 0.76 | 0.75 | 0.78 | 0.77 | 0.73 | 0.70 | 0.73 | 0.72 | 0.72 | 0.74 | 0.73 |
| **8** | 0.52 | 0.61 | 0.59 | 0.62 | 0.62 | 0.57 | 0.58 | 0.56 | 0.57 | 0.63 | 0.67 | 0.66 | 0.59 | 0.57 | 0.55 | 0.51 |
| **9** | 0.35 | - | - | 0.83 | - | 0.41 | - | - | 0.08 | 0.04 | 0.79 | 0.06 | 0.97 | 0.38 | 0.54 | 0.35 |
| **Weighted average*** | **0.59** | **0.61** | **0.58** | **0.64** | **0.69** | **0.66** | **0.68** | **0.65** | **0.65** | **0.65** | **0.65** | **0.62** | **0.61** | **0.63** | **0.64** | **0.63** |

* As weights we used the shares of SITC groups of goods exported from Poland to Czechia (according to 2-digit SITC)
Source: Own calculations on the basis of EUROSTAT on-line data.

# Sources of Revenues and the Potential of NGOs Conducting Sports-Related Mission

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## Abstract

The conditions behind the functioning of non-governmental organisations translate into particular specifics of their resources. According to the Resource Dependence Theory, the ability to acquire and retain resources is the key to survival and development of organisations. However, the structure of the sources from which they are generated may influence the way of functioning and the choice of actions taken up by organisations. Therefore, it was assumed that the share of public funding in total revenues does differentiate NGOs. Thus, the aim of the study was to identify the structure of revenues of NGOs which undertake sports-related tasks as well as to recognise the differentiation of features relating to their financial and organisational potential and the scope of their activities, i.e. the scope, which measured by the number of addressees of actions run, was accepted as an effect of their sports-related activities. It was found that not only the engagement of public funding in financing the activities of social sports organisations, but also their share in the structure of revenues can be treated as a factor which generates differences in their organisational and financial potential. A greater share of grants in total revenues may indicate a considerable personnel potential and a wider range of activities of an individual public benefit organisation (PBO). Their smaller participation co-exists with a greater value of total revenues and with diversifying their sources. This can be perceived as a source of flexibility – a factor conducive to the ability to continue their activity.

***Keywords:*** *non-profit organisations, sources of revenues, sport*

***JEL Classification:*** *H72, L31, Z23*

## 1 Introduction

A considerable number of entities participating in carrying out sports activities in Poland are non-profit organizations. According to statistical data [10], the highest percentage of these entities (29.1%) determine sports, tourism, recreation and hobbies as the main domain of their activity, of which 71.8% are sports associations, including sports clubs. A good number of them function as entities holding the status of a public benefit organisation (PBO). The non-profit goals of their statutory activities, dedicated to satisfying social needs, translate into particular specifics of their resources. Inasmuch as they make a classical compilation of financial, material and human resources, they are additionally differentiated by the source of their origin, such as public and non-public, that is market-based and private.

Typically, NGOs' good financial standing is indicated as a condition of the effective fulfilment of their statutory goals [13]. At the same time, non-profit sports organisations have less financial means than other types of NGOs [7]. For this reason, they encounter problems connected with securing the remaining resources which are indispensable for their effective functioning. The difficulties in this respect are more significant as they are conditioned not only by the level of revenues, but also by the structure of the sources of their origin [5] and their changeability over time. It is the degree of diversification of the revenues sources that decides on their self-

sufficiency and their autonomy of accomplishing their public mission. Organizations which obtain their funding from a few sources only become highly dependent on them. According to the Resource Dependence Theory, this makes them particularly liable to negative effects of limiting the access to funding or lowering their capacity [2]. However, the European model of financing of non-profit sports organisations, which has been in existence for many years now, assumes that the basic source of financial outlays on the completion of their tasks is the public sector. The considerable share of public financing in the budgets of social entities is a derivative of increasing the role of contracting public services by public authorities as a way – in principle – that is expected to guarantee efficiency of expenditure. Furthermore, in case of the third sector organisations, good intentions – that generally accompany their activities – should not, at the same time, eliminate the debate on the rationality and effectiveness of their actions. Bearing this in mind, it was assumed in this paper that the share of public funding in total revenues can differentiate social sports organisations as regards their financial and organisational potentials as well as the scope of their activities.

Hence, in the first part of this paper, the institutional system of the organisation of sport as well as the principles of financing NGOs dealing with sports are shown as factors that stimulate the formation of dependence relations. The second part, which presents the research methodology, focuses on the differentiation of the share of public funding in the revenues of the analysed PBOs as well as on the features of their financial and organisational potential.

## 2 Dependence on the Resources of Sports-Related NGOs

The non-governmental sector and its socioeconomic potential are considered to be a significant group of entities which partake in the process of completion of public tasks in Poland, including the ones linked with sports. However, like other entities, these organisations are burdened with weaknesses and limitations, which include primarily the following: particularism, paternalism, gaps in the responsibility and insufficiency of resources [9]. These features impact both the character and the direction of their relations with the milieu in which they come to operate. The Resource Dependence Theory (put forward by Pfeffer and Salancik in 1978) makes references to the influence exerted by the resources deriving from the surroundings on the completion of activities taken up by organisations. Identifying the multiplicity of limitations that are imposed on organisations by the milieu, this theory explains that organisations poor in relevant resources, in order to acquire them, direct themselves towards relations with other entities [11]. If the deciding majority of resources are controlled by the surroundings, then they gain ‘power’ over the organisation [3]. In this context, both the institutional system of the organisation of sport and the principles of financing sports-related NGOs may be considered as invariant factors restricting the organisations and stimulating them to develop the relation of dependence.

Analysing the sources of these relations, one can apply the typology of European models of organising and supporting sport. The bureaucratic model is typical of Poland and dominates in the European Union [1]. Relations with the NGOs occur in the manner of delegating tasks and the public authority’s caring for the purposefulness and legality of expenditure of public funds they transfer. The hierarchical style of management (administration) reveals a strong engagement of the public authority in the controlling processes, which makes the model be susceptible to bureaucratic dysfunctions that give priority to processes over effects [4]. These features, resulting from legal bases and forms of organising actions that aim at popularising sports activities, which are practiced by the authorities, can thus be seen as an element of the institutional environment, where sports associations and clubs carry out their missions. The conditions of their functioning are therefore formed by a wide spectrum of public (mainly local-government-related) instruments of indirect and direct influence on the developmental processes in sports. The non-financial tools used in practice (information tools, organisational or advisory) and financial ones, as well as their impact result in forming relations of social dependences between sports entities and public authorities. One of the sensitive areas in which this dependence can be revealed in particular is the manner of financing sports-related tasks. The bureaucratic model assumes that the basic source of financial means necessary to complete them is just the public sector. From the point of view of sports-related NGOs, the main funding stream flows from public transfers (grants). This source of financing, both in Poland and in the majority of European countries, is perceived as one of the pillars of financing sport for all [12].

## 3 Material and Methods

The main aim of the research was to identify the share of public transfers in the revenues of organisations which carry out sports-related activities as well as to establish whether the scale of the funds obtained from such sources differentiates them due to the features of their financial and organisational potential.

The research included NGOs holding the PBO status, those which fulfil the commitments in scope of popularisation of physical culture. The status of the entities accepted for the study was purposefully defined. With reference to them, it was possible to collect data that were later the subject of the analysis. The sources of

the data were the annual financial and substantive reports found in the Base of PBOs Financial and Substantive Reports [8]. The PBOs based in the area of Opole Province were taken into consideration. Within the group of 339 PBOs that had satisfied the requirement, 25.96% were identified as sports-related (88 PBOs). As it was justified to conduct the analysis with reference to a definite time span, only the entities which had submitted their reports for particular years were taken into account. Thus the analysis was possible only for the period 2013–2017, in which 66 BPOs qualified for the needs of making further conclusions. They made 75% of the identified sports-related PBOs. The dominating part of the set (94%) was composed of sports clubs, associations or unions. Taking into account the main criteria of homogeneity, i.e. the convergent character of activity and undertaken tasks as well as an equal – regarding the principles – access to resources and functioning in a similar environment, it was assumed that the entities accepted for the study made a homogenous group.

In the research, the starting point was the analysis of differentiation of values and the structure of revenues in total. At the next stage, the median of share of public funds in revenues in total (49.83%) was applied as a variable grouping the set of examined entities. The group was divided into two subgroups, i.e. the ones for which the share of public funds was greater than the median (Group I) and those for which this share was formed on the lower level than the median (Group II). The further comparative analysis focused on the features of financial and organisational potential of systematised PBOs. The specificity of the financial resources was analysed through the prism of values of revenues and their structure. The following were accepted as organizational traits: the number of employees, volunteers, members and addressees of actions run by the PBOs. In order to carry out for the aim of the study, basic tools of descriptive statistics were applied.

### 3.1 Model and Data

The organisations' financial model was analysed on the basis of the parameters of descriptive analysis for total revenues. They are juxtaposed in Table 1. They indicate a very big financial differentiation. The scale of this phenomenon is exposed through substantial differences between the average and the median of obtained revenues. Between 2013 and 2017, the mean value of revenues was about twice as high as the median (for N=66).

**Table 1** – Descriptive statistics for revenues in total (in thousand PLN).

| Years | $\bar{X}$ | Me | SD | V | As | No. of PBOs | % of PBOs |
|---|---|---|---|---|---|---|---|
| 2013 | 156.43 | 90.66 | 237.28 | 151.68 | 5.13 | 44 | 66.67% |
| 2014 | 174.66 | 93.64 | 302.94 | 173.45 | 5.19 | 47 | 71.21% |
| 2015 | 186.34 | 85.72 | 318.22 | 170.78 | 4.35 | 49 | 74.24% |
| 2016 | 209.63 | 98.35 | 412.24 | 196.66 | 5.45 | 49 | 74.24% |
| 2017 | 238.60 | 108.63 | 614.53 | 257.55 | 7.20 | 50 | 75.76% |

Denotation of measures: $\bar{X}$ – arithmetic mean; Me – median; SD – standard deviation; V – coefficient of variation (in %); As – asymmetry
Source: Author's own elaboration

The value of revenues in the majority of PBOs remained at a lower level than the mean for the whole set. In subsequent years, such a situation occurred in the case of over 60% of the organisations (the last column in Table 1). In consequence, PBOs experienced a considerable instability of the level of accumulated revenues. This is confirmed by the structure of PBOs according to the class of total revenues, as presented in Table 2. An insignificant percentage of the organisations obtained revenues not exceeding PLN 10 thousand. The largest had revenues ranging from PLN 10 thousand to PLN 50 thousand, and about one fourth of the PBOs reached annual revenues exceeding PLN 100 thousand. Almost half of the entities maintained their annual revenues within one range over the whole five-year period.

**Table 2** – Structure of PBOs according to the class of total revenues.

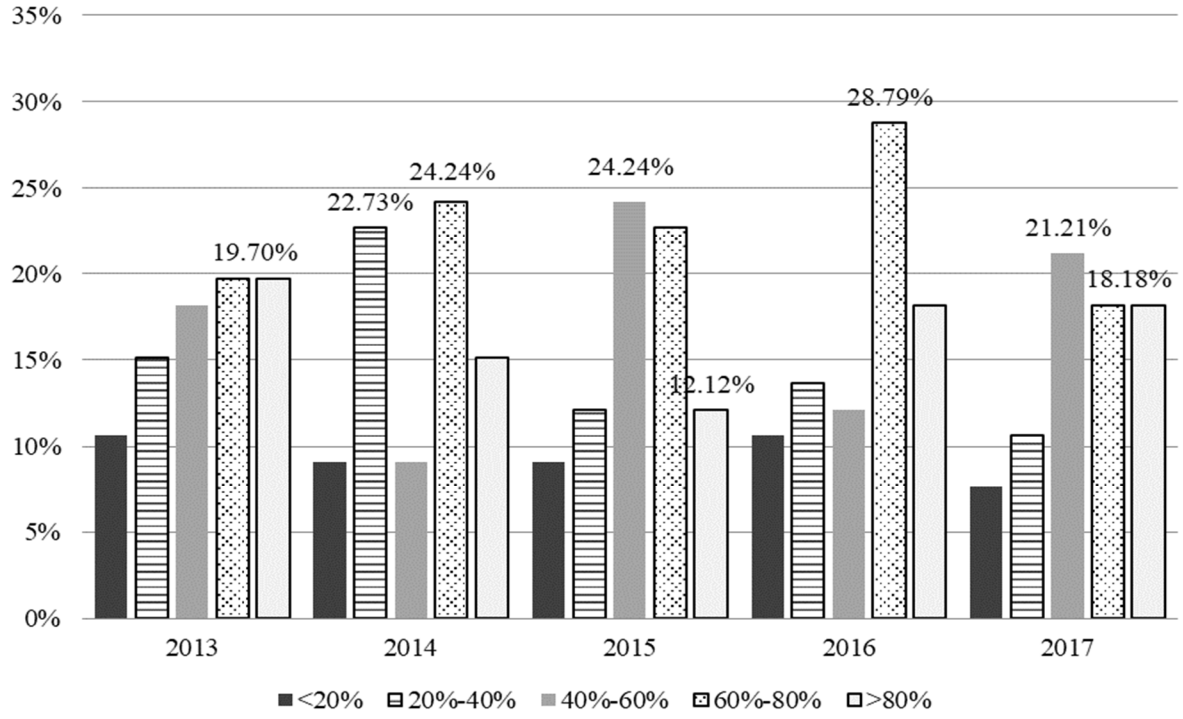
| Years | Dynamics of revenues in total | From 1K to 10K | Over 10K up to 50K | Over 50K up to 100K | Over 100K up to 200K | Over 200K |
|---|---|---|---|---|---|---|
| 2013 | | 3.03% | 28.79% | 22.73% | 24.24% | 21.21% |
| 2014 | 111.7% | 3.03% | 30.30% | 19.70% | 22.73% | 24.24% |
| 2015 | 106.7% | 6.06% | 30.30% | 16.67% | 22.73% | 24.24% |
| 2016 | 112.5% | 4.55% | 30.30% | 15.15% | 22.73% | 27.27% |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2017 | 113.8% | 4.55% | 21.21% | 22.73% | 22.73% | 28.79% |
| Annual mean | | 1.52% | 30.30% | 18.18% | 24.24% | 25.76% |
| No. of PBOs which maintained their class throughout the period | | 1 | 10 | 3 | 5 | 13 |

Source: Author's own elaboration.

Making reference to the assumption about the significance of the revenues structure, which was formulated in the Introduction, the following were distinguished within their sources: non-market (public, private), market (activity: paid, economic), payments of 1% of income tax from physical persons. It follows from the conducted analysis that the dominant sources of financing the activities of PBOs were non-market revenues. The determined revenues structure indicates also that throughout the period under analysis, about three fourths of external revenues came from public transfers (chiefly grants) which accounted for about 45% of the revenues in total. Figure 1 illustrates the fact that in subsequent years, the percentage of PBOs, in which the share of public funds in total revenues was lower than 20%, amounted to between 7.58% and 10.61%. In the case of 12.12–19.7% of the PBOs, that was the source corresponding to over 80% of the revenues in total.

**Figure 1** – Percentage of the PBOs according to the share of public funds in revenues in total. Source: Author's own elaboration




The analysis of the structure of public grants showed that the main source of these transfers were budgets of units of local government (ULG) (84.87–91.13%). In the case of 67.7% of the PBOs (N=62) that used public funds, their sources were only budgets of ULGs. Sporadic transfers came from the state budget (Ministry of Sport and Tourism, Ministry of Agriculture and Rural Development), designated grants from budgetary sources (e.g. Physical Culture Development Fund, Agency for Restructuring and Modernisation of Agriculture, State Fund for Rehabilitation of Disabled People). However, the use of European funds was scanty.

## 4 Results and Discussion

Due to the fact that the share of public grants in total revenues to a significant degree differentiates the examined organisations, in further analysis the median of share of public means in their revenues (49.83%) was applied as a variable grouping the set of the analysed entities. There were distinguished two groups: those for which the share of public funds was greater than the median (Group I) and those for which the share remained at the level

lower than the median (Group II). Further comparative analysis focused on the PBOs' systematised revenues. The values of the parameters of the descriptive statistics are presented in Table 3.

**Table 3** – Descriptive statistics for the features of PBOs' potential.

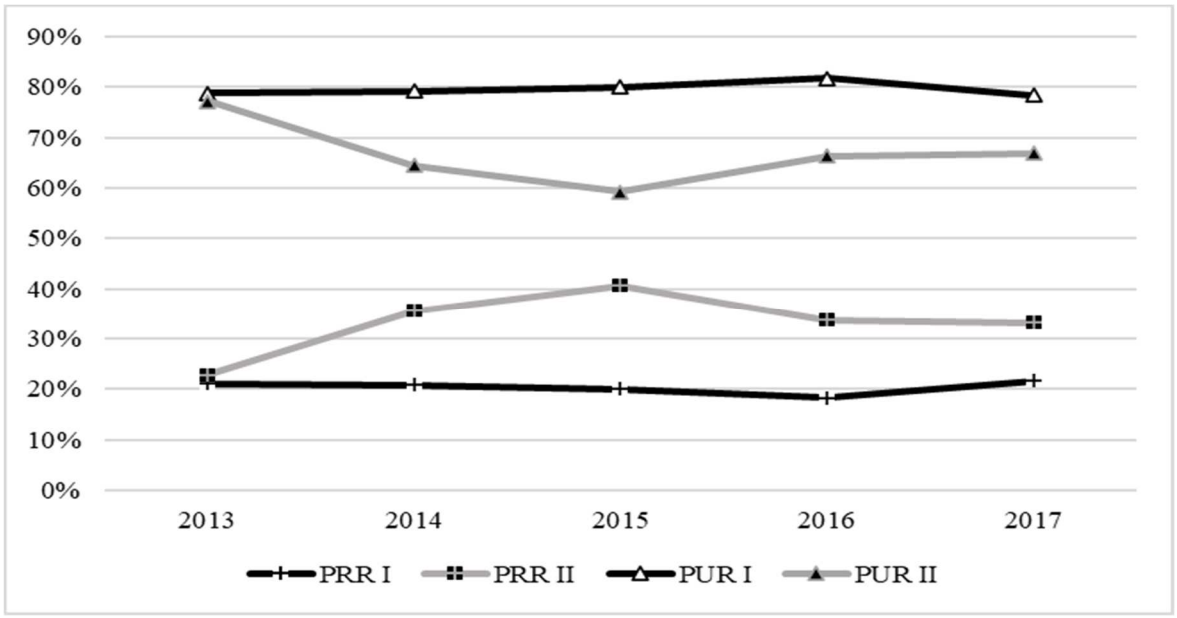
| Specification | Share of public means in revenues > Me Group I | | | | Share of public means in revenues < Me Group II | | | |
|---|---|---|---|---|---|---|---|---|
| | $\overline{X}$ | Me | V | As | $\overline{X}$ | Me | V | As |
| Total value of revenues | 170.42 | 97.65 | 105.90 | 2.42 | 215.85 | 103.15 | 228.26 | 4.96 |
| Indexes of the revenues structures | | | | | | | | |
| Share of non-market in total revenues | 0.82 | 0.85 | 15.35 | -0.50 | 0.43 | 0.45 | 57.58 | 0.04 |
| Share of market in total revenues | 0.04 | 0.0 | 311.46 | 3.6 | 0.2 | 0.0 | 135.43 | 0.95 |
| Share of public revenues in the non-market ones | 0.83 | 0.86 | 16.83 | -0.38 | 0.57 | 0.61 | 56.33 | -0.45 |
| Share of private revenues in the non-market ones | 0.17 | 0.14 | 79.68 | 0.38 | 0.43 | 0.39 | 75.68 | 0.45 |
| Share of private contributions | 0.27 | 0.16 | 114.6 | 1.05 | 0.37 | 0.2 | 107.51 | 0.6 |
| Share of donations in the private revenues | 0.67 | 0.79 | 53.16 | -0.79 | 0.49 | 0.48 | 79.54 | -0.06 |
| Share of 1% donation in the total | 0.03 | 0.02 | 118.25 | 2.24 | 0.04 | 0.02 | 128.19 | 1.81 |
| Organisational features | | | | | | | | |
| Number of full-time workers | 0.25 | 0.0 | 294.17 | 3.31 | 0.52 | 0.0 | 242.65 | 3.4 |
| Number of part-time workers | 6.52 | 3 | 207.42 | 4.35 | 5.03 | 2 | 147.8 | 1.89 |
| Number of volunteers | 12.36 | 6 | 165.31 | 3.86 | 14.81 | 6.8 | 186 | 3.9 |
| Number of members | 76.75 | 50 | 113.59 | 2.72 | 79.92 | 38 | 108.36 | 1.57 |
| Number of addressees of actions | 1 280.33 | 250 | 310.89 | 5.1 | 587.76 | 195.4 | 197.04 | 4.21 |

Denotations as in Table 1

Source: Author's own elaboration

The results indicate that the highest total revenues value was identified for the organisations of Group II. They are characterised by a higher degree of differentiation of the values than the entities belonging to Group I. It is worth underlining that the PBOs with a lower share of public transfers in the total revenues turned out to present a relevantly higher value of the share of the market revenues index in the total revenues. In the case of sports organisations operating chiefly on public funds (Group I), a higher percentage of entities passive in terms of acquisition of market revenues is a characteristic feature. Consequently, it is characterised by a much higher mean value of revenues coming from outside (non-market sources). Higher mean values of these revenues were recorded in both public and private categories [6]. It is worth drawing attention here to the structure of non-market revenues, which is shown in Figure 2. As far as Group I is concerned, it was dominated by public transfers of funds from local governments. In turn, regarding Group II, the share of private revenues was found to be at the level of about 2.5 times as high.

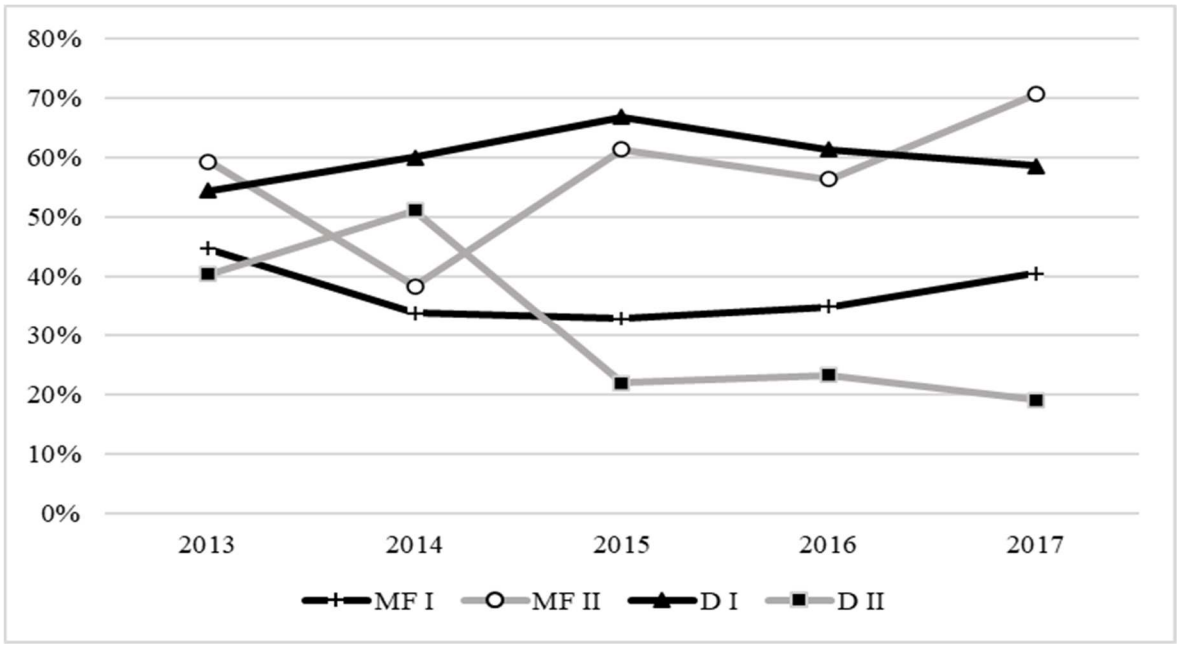
**Figure 2** – Structure of non-market revenues. Source: Author's own elaboration.




PRR I (II) – Private revenues in the non-market ones Group I (Group II); PUR I (II) – Public revenues in the non-market ones Group I (Group II)

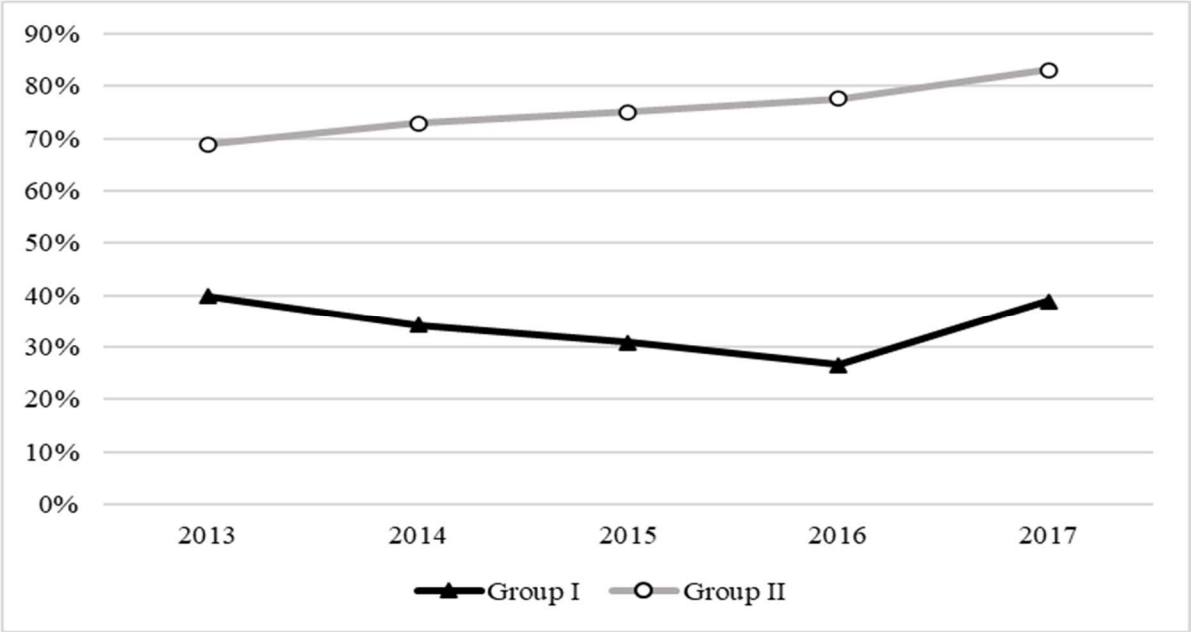
Typical sources of these revenues were members' fees and donations. The results of the analysis, which are juxtaposed in Figure 3, reveal that the share of membership fees in private revenues is characterised by a higher level in the PBOs belonging to Group II. In the case of donations, their higher share in private revenues was recorded for the PBOs in Group I.

**Figure 3** – Share of membership fees and donations in private revenues. Source: Author's own elaboration.




The last look at the revenues structure concerned establishing what part of the total is occupied by non-public revenues (a sum of market and non-market private ones). It was accepted that the financial resources obtained from these sources are significant to preserving self-sufficiency and retaining the ability to continue the activity. Figure 4 demonstrates the formation of this index. Inasmuch as in the case of PBOs of Group II, the value of the index is much greater and grows in successive years, in Group I, the attention should be paid to the 'habit' of having public funds at disposal, which consolidates over time.

**Figure 4** – Share of non-public revenues in total revenues. Source: Author's own elaboration.




The characteristics of financial resources that is determined by the share of public funds in total revenues also allowed to analyse the differences in the sizes of organisational resources and the scale of influence of PBOs. The number of people connected with the organisation's activity was accepted as one of the predictors of the organisational potential. Thus, it was decided to include, among others, the persons involved in organising and carrying out tasks in this group.

The revealed variety of forms of cooperation (employees, volunteers), forms of work (paid for and voluntary), dependent on the scope of cooperation (permanent, temporary), was used by PBOs in different configurations, whose specifics and percentages are shown in Table 4. In the case of slightly over 18% of the organisations (N=66), the works for their benefit were provided based on all forms of cooperation. However, in the case of nearly 47% of the PBOs (N=66), the tasks were executed by supernumeraries and volunteers (more often in the PBOs belonging to Group I). Moreover, in Group II, there was a higher percentage of organisations, in which full time employment coexisted with other forms of work.

**Table 4** – Configurations of forms of cooperation

| PBOs | 1,2,3 | 1 | 1,2 | 1,3 | 2 | 2,3 | 3 | 0 |
|---|---|---|---|---|---|---|---|---|
| Group I | 18.18% | 0 | 0 | 0 | 18.18% | 57.58% | 6.06% | 0 |
| Group II | 18.18% | 3.03% | 6.06% | 3.03% | 0 | 36.36% | 18.18% | 15.15% |
| Total | 18.18% | 1.52% | 3.03% | 1.52% | 9.09% | 46.97% | 12.12% | 7.58% |

1 – contract of employment; 2 – civil law contract; 3 – voluntary work; 0 – none
Source: Author's own elaboration

It is worth emphasising that also members of PBOs engage in their organisations' activities. According to the law, this is their voluntary non-payable work that the organisation's operation relies on. A slightly higher average number of them was found among the PBOs belonging to Group II. At the same time, they were the entities in which there was a noticeable – over twofold – difference between the mean and the median of the number of members (79.92 and 38, respectively). Similarly, a high average number of members characterised the organisations of Group I; nevertheless, half of them had more than 50 members. Taking into account the fact that part of the volunteers most frequently do not recruit from the circle of a PBO's members, in both of the distinguished groups, a lower variability of members and volunteers was found.

Both financial potential and human resources of an organisation may be understood as factors translating into the range of its influence. It does not mean its territorial aspect, but a whole host of people who are the addressees of activities undertaken by PBOs (their 'specific' clients). Also, as far as this characteristic is concerned, differences were exposed between the distinguished groups of PBOs. A higher average number of receivers was typically characteristic of the PBOs in Group I. In the case of this feature, the highest differentiation within the groups (310.89%) was definitely manifested However, the median of the number of receivers permits to acknowledge

the indication that the scale of influence of the PBOs of Group I extended over a slightly greater number of beneficiaries.

## 5 Conclusion

Commenting on the presented results, it may be concluded that the high degree of differentiation of financial and organisational entities concentrated on propagation of sport is a clearly typical property. This differentiation is related to their size, the number of sports disciplines offered, territorial location and the range of their impact. The presented results, however, justify the statement that in the group of examined organisations, public grants have gained the character of not as much complementary but rather dominant financing source. Additionally, the grouping parameter (the share of public funding in total revenues) approved in the research proved that it is not only the very fact of engaging (or not) public funds in financing sports activities of the organisations themselves, but also their share in the revenues structure, which can be treated as a factor generating differences in their financial and organisational potential. What is more important, the analysis carried out for a period longer than one year allows looking at the organisation's resources from the perspective of their significance in terms of independence and their ability to continue their activity. It enables us to make an initial assessment of the degree of the examined entities' dependence on external influences. The results indicate that the selected sports organisations that operate chiefly on the basis of public funds transfers have a lower mean value of total revenues. They are characterised by a higher percentage of entities passive with reference to acquisition of market revenues. Apart from this, due to the purposeful character of grants, they have a restricted freedom of deciding on the allocation of funds. Despite the fact that they are characterised by a greater scope of activity, they can be perceived as organisations with a weak bargaining position, strongly dependent on public authorities, burdened with a greater risk of pressure to change or resign from the accepted priorities exerted by them.

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# Is Financial Education in Poland Sustainable?

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## Abstract

Nowadays personal finance literacy appears necessary to function effectively on the market, and not only the financial one. Knowledge in this field can be conveyed in different ways and through different channels. School is one of the most important sources of knowledge, so personal finance should also be addressed through education. The essential experience in school education is the core curriculum. An analysis of its content and names of subjects shows that personal finance is absent in the form of a separate element of the teaching program. So the question arises whether personal finance is in any form present in the education cycle of children and adolescents? Is financial education conducted in a sustainable way? In this article, attention is devoted to financial education in the field of personal finance as a key one from the point of view of individuals.

***Keywords:*** *financial education, formal education, personal finance, sustainable education*

***JEL Classification:*** *I25, G41, Q01, G53*

### 1 Introduction

According to the English dictionary adjective "sustainable" means to be able to be supported as with the basic necessities [1]. Starting from such a definition education can be treated as a basic need that should be supported to be fulfilled by everyone.

On this ground, the concept of sustainable education was formulated, according to which it allows every human being to acquire knowledge, skills, attitudes and values necessary to shape a sustainable future. It is very wide and capacious definition, because it includes all aspects of a human life. One of them is obviously personal finance that is connected with everyday life functioning of individuals and households.

Personal finance education is a part of general financial education. It can be done in different ways and by different entities. On the grounds of the way in which education is provided, formal (structured) and informal (unstructured) education can be distinguished. Due to the category of the entity implementing the educational process, it is possible to distinguish institutionalized education (commercial vs. public and non-profit entities) and non-institutionalized education implemented by the environment (family, friends, mass media). Education can also be conscious and unconscious. In terms of a subject, financial education can be enforced by various entities, both these of a typically educational nature (schools, kindergartens), and those that perform activities of a different nature, as a part of additional activities. Financial institutions can be included in this second category.

This article focuses on formal and institutionalized education realized by kindergartens and schools in Poland. The aim of this paper is to answer the main question, if such financial education is conducted in a sustainable way. It is also aimed to answer some more detailed questions:

1. Are personal finances present in the formal education system of children and adolescents in Poland?
2. Is the scope of information regarding personal finance sufficient?
3. Is the moment of their introduction appropriate?

### 1.1 Sustainable Education – What's This?

As it was mentioned before sustainable education allows every human being to acquire knowledge, skills, attitudes and values necessary to shape the days to come in a sustainable way. It empowers people to change the way they think and work towards a sustainable future. It should lead to transformation of society by reorienting education and focus on the development of knowledge, skills, values and behaviours needed for a sustainable development. As it is described in United Nations' PRME initiative such education is for equipping students around the globe with a deeper understanding and better-developed skills to deliver "change tomorrow" [2]. This kind of education promotes competencies such as critical thinking, creating future scenarios and making decisions in a collaborative way.

Sustainable education can be also named as education for all. It derives from a wider concept named as Education for Sustainable Development (ESD) and according to Sustainable Development Goal 4 it is stated to "ensure inclusive and equitable quality education and promote life-long learning opportunities for all" [3] and includes a set of associated targets. The most important one in the analyzed context is 4.7 to "ensure that all learners acquire the knowledge and skills needed to promote sustainable development" and 12.8 from the SDG12 about Responsible consumption & production. It is to "ensure that people everywhere have the relevant information and awareness of sustainable development" [3]. The Brundtland Report has provided the first widely-used definition of sustainable development as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [4]. This significant role of education in achieving SDGs was also noted at the United Nations Conference on Environment and Development, held in Rio de Janeiro in 1992, through Chapter 36 of its outcome document [5].

Education in diverse forms and multiple contexts provides the means of protection of the future generations against failures of the current ones, and at the same time means to transmission of the culture, discoveries and successes. Without such attitude very little can be sustainable. Education is also important for spreading ideas, knowledge, skills and values within communities, nations and continents. Education is identified as a crucial element of sustainability-focused strategies in many contexts and levels. Agenda 21 in point 36.3 states that: "Education, including formal education, public awareness and training should be recognized as a process by which human beings and societies can reach their fullest potential. Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues. While basic education provides the underpinning for any environmental and development education, the latter needs to be incorporated as an essential part of learning. Both formal and non-formal education are indispensable to changing people's attitudes so that they have the capacity to assess and address their sustainable development concerns" [6]. A main challenge for this activity is to help scholarly communities to distinguish between educational approaches that seek sustainable solutions, methods of teaching, materials and tools, from those that are unsustainable [7].

### 1.2 Perception of Polish Financial Education

According to the "Diagnosis of economic knowledge and awareness of children and youth in Poland" carried out as part of a research project by the consortium of the "Stocznia" Foundation of Social Research and Innovation and the IQS Group at the request of the National Bank of Poland schoolchildren (at the level of elementary, junior high and high school) have constant contact with money. Most of them (60%, 70% and 76% at individual levels of education) declared that they had funds available for their own expenses. Unfortunately, only about 1/3 of them declared having savings (respectively 26%, 31% and 36%), which means that a significant part of the money obtained by young people is allocated to consumption. Declared savings students usually keep at home, but the older they are, the more often they store money in a different way. This is due to the fact that among the surveyed people, only a small percentage have their own bank account (2%, 7% and 23% respectively) [8].

According to another research conducted on the Polish market, and according to children's declarations, the most important source of knowledge for them are parents (19.1%), followed by: Internet and media (13.4%), other family members (5.4%), siblings (3.5%), friends (4.7%) and only at the very end - teachers (4.6%) [9]. This sounds as if formal education provided by school is not worth much.

## 2 Material and Method

To answer the question whether personal finance is in any form present in the cycle of education of children and adolescents an analysis of formal documents was led. Method used for that was purely descriptive, connected with exploration of regulations created by the Minister of National Education for different stages of formal education in Poland.

Starting from pre-school education personal finance in kindergarten is introduced on the basis of the Regulation of the Minister of National Education [10]. According to this legal act, the education of small children was

included as a part of the child's cognitive development. Point 17 indicates that thanks to the education at this level a child recognizes models of coins and banknotes of low denominations, organizes them, understands what money is used for in a household. This is actually the only financial element in the field of teaching.

According to the same act at the primary school level, it was stated that general education in school at this stage aims to develop competencies such as entrepreneurship. Within what subjects is this done? Further regulations indicate that Civics is an interdisciplinary subject making use of the achievements of social sciences, including economics. Within the teaching content entitled “The family” it is indicated that a student explains how the household works; lists the main sources of its income (from work, economic activity, social benefits); lists categories of household expenses; plans its budget. In turn, within mathematical education, the student performs monetary calculations; converts zlotys to groszys and vice versa, distinguishes denominations of coins and banknotes, indicates differences in their purchasing power. On the other hand, within Education for family life, a student knows what institutional assistance exists to help the family in poverty and unemployment situation [10]. This is not a wide scope of issues.

Financial education in secondary school is described by another Regulation of the Minister of National Education [11]. Threads regarding personal finance appear, among others, within the subject of the basics of entrepreneurship. They concern the development of skills and the application of knowledge in practice. In accordance with points 4-5, the program includes elements for learning [11]:

- responsible management of money, analyzing, assessing and knowing the use of financial services and investing capital with knowledge about the rights of financial services consumers;
- making independent, responsible financial decisions regarding own resources.

As a part of shaping attitudes, point 6 mentions schooling of how recognize the consequences of unethical financial-related activities, including tax obligations.

Analyzing the detailed requirements regarding the content of teaching, personal finance in secondary school includes issues related to the financial market such as money and its circulation, financial market institutions, forms of investment, central bank and monetary policy, commercial and cooperative banking, taxes, insurance, banking and insurance contracts, consumer protection of financial services, ethics in finance [11].

After the whole cycle of education, it is assumed that the student [11]:

- discusses the functions and forms of money and its circulation in the economy;
- characterizes financial market institutions in Poland (National Bank of Poland, Polish Financial Supervision Authority, Financial Ombudsman, Warsaw Stock Exchange, Bank Guarantee Fund, commercial and cooperative banks, cooperative savings and credit unions, investment funds, Insurance Guarantee Fund, insurance companies, entities providing payment services) and explains their importance in the functioning of the national economy, enterprises and human life;
- distinguishes between saving and investing forms, assesses them from the point of view of risk and expected profits, and carries out a simulated investment in the chosen form;
- characterizes the types of securities and explains the mechanism of investing on the stock exchange on the example of the Warsaw Stock Exchange;
- discusses the choice of investment fund type, taking into account potential profits and the risk of losses;
- recognizes the need to start systematically and early enough saving and investing funds for retirement;
- analyzes offers of commercial and cooperative banks as well as cooperative savings and credit unions in the field of personal accounts, payment cards, term deposits, credits and loans of non-bank loan institutions, taking into account the real interest rate, and also perceives threats and understands the principles of security when using electronic banking;
- identifies types of taxes according to various criteria and explains their impact on the country's economy, enterprises and households;
- explains the rules for submitting an annual declaration and calculating personal income tax;
- formulates arguments for and against the use of progressive and flat (linear) tax;
- characterizes types of insurance according to various criteria and compares the offers of insurance companies on the example of real estate or motor vehicle insurance, with a particular regard to the relation between coverage ranges and insurance sums and premiums;
- critically examines the sample loan or a loan agreement;
- analyzes the provisions of the general insurance conditions on the example of life insurance or accident insurance, identifying exclusions in the content of insurance contracts and presenting limitations on the liability of the insurance company;
- formulates a complaint to financial market institutions and writes a complaint to the Financial Ombudsman on the example of a selected financial product;

- is aware that a variety of reliable sources of information should be used before making financial decisions;
- assesses examples of ethical and unethical practices and behavior on the financial market.

## 3 Results and Discussion

One of the most important sources of knowledge is school, and therefore it seems that knowledge about personal finance should also be transmitted through it. In practice, however, the question arises whether personal finance is in any form present in the cycle of education of children and adolescents?

Considering the content of personal finance education programs it seems that this education starts quite late. In kindergartens and primary school this is very basic and perfunctory information. More detailed issues are taught in secondary school and there is quite a lot of them. It's noticeable that the content is more focused on description of several instruments, institutions and products, but less on the practical aspects – like preparing an own budget, cash flow or balance sheet. Such tools could be very useful while analyzing personal financial status. As a result, Polish students are not that often present at the financial market, because they do not feel confident enough to make financial choices.

## 4 Conclusion

The aim of this article was to answer the question, whether financial education is conducted in a sustainable way in Poland. Having all this information above it can be concluded that Polish formal financial education is not sustainable. Although the answer for the first detailed question if personal finance is present in the formal education system of children and youth in Poland, can be positive, the deeper analysis of the content shows that the scope of information regarding personal finance is insufficient. This is mainly a set of information about instruments, institutions and products, but not a guide how to use them practically. Moreover, this detailed information is introduced quite late and therefore it cannot be said that in appropriate time. It pushes children to informal financial education, mainly from parents and media.

As it was presented at the very beginning of the article, sustainable education should allow every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future. Analysis of Polish teaching programs reveals few deficiencies. First, they do not include proper elements to let students acquire skills. They are providing some knowledge, but without developing skills and thus they cannot shape adequate attitudes and values. Therefore, Polish students are not always able to make correct financial decisions in their current and future life. Therefore financial education in Poland cannot be perceived as sustainable.

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[10] Regulation of the Minister of National Education of February 14, 2017 on the core curriculum for pre-school education and the core curriculum for general education for primary school, including students with moderate or severe intellectual disability, general education for a vocational primary school, general education for a special school preparing for work, and general education for a post-secondary school/ Rozporządzenie Ministra Edukacji Narodowej z dnia 14 lutego 2017 r. w sprawie podstawy programowej wychowania przedszkolnego oraz podstawy programowej kształcenia ogólnego dla szkoły podstawowej, w tym dla uczniów z niepełnosprawnością intelektualną w stopniu umiarkowanym lub znacznym, kształcenia ogólnego dla branżowej szkoły I stopnia, kształcenia ogólnego dla szkoły specjalnej przysposabiającej do pracy oraz kształcenia ogólnego dla szkoły policealnej; Journal of Laws of 2017, item 356.

[11] Regulation of the Minister of National Education of 30 January 2018 regarding the core curriculum for general education for general high school, technical college, and the upper secondary vocational school/ Rozporządzenie Ministra Edukacji Narodowej z dnia 30 stycznia 2018 r. w sprawie podstawy programowej kształcenia ogólnego dla liceum ogólnokształcącego, technikum oraz branżowej szkoły II stopnia; Journal of Laws of 2018, item 467.

# The Profitability of Learning the Chinese Language in the Context of Increasing Opportunities in the Labor Market

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## Abstract

The article talks about the issues of potential factors motivating Europeans to take Chinese classes and the potential benefits that can be achieved due to that decision. The author also presented the results of research, conducted among teachers from Central and Eastern Europe specializing in teaching Chinese as a foreign language.
The study aimed to obtain information on the actual main motivations that encouraged respondents to start learning the language and to get an answer to the question of whether its mastery for the respondents turned out to be useful and is useful and profitable on the labor market. Among the main conclusions, it should be mentioned that the decision to make an effort related to learning a foreign language is assessed very positively. However, among the actual profits associated with mastering the Chinese language, non-financial elements are mainly mentioned.

***Keywords:*** *Chinese language, job satisfaction, labor market, profits from learning foreign languages, management culture, skills*

***JEL Classification:*** *J24, J28, Z13*

## 1 Introduction

In Europe, there is a growing interest in learning Chinese. This is evidenced not only by an increasing number of private schools, which offer Chinese classes, and faculties related to Chinese (among others, sinology, specializations concerning translation from/to Chinese and even Far Eastern studies), but also foreigners' growing interest in taking state Chinese knowledge exams HSK (*Hanyu Shuiping Kaoshi*) and increasing its passing rate and popularity of scholarships offered by the People's Republic of China (PRC) (Mazur-Kajta, Paterska-Kownacka 2016, 225, 236-237). Its popularity is also evidenced by increasingly newer programs and applications for learning Chinese as well as the possibility of learning through online social networks - communication channels or communication platforms increasingly popular among the younger generation. Online social networks are becoming increasingly useful in conveniently learning foreign culture and language (Akbar, Naderi, Simons, Pilot 2016). Young Europeans (including Czechs and Poles), planning their professional future and focusing on the development of their competencies for improving of future employability in the labor market, are increasingly choosing a field of study dedicated to the language and culture of China, they also decide to participate in language courses. Some of them will find employment in the area of public sector services. Chinese language is considered to be one of the thirteen most important languages in the world[4]. Knowledge of the Chinese language, in addition to its application in business and tourism, is also used in education. Significance of this language is also increasing due to the One Belt One Road Initiative which was started in 2013 by the chairman Xi Jinping [OBOR/Belt and Road Initiative/BRI]. Within the past 7 years, not

[4] This group includes Chinese, English, Spanish, Arabic, Russian, French, Portuguese, German, Malay, Japanese, Turkish, Italian and Dutch (Ginsburgh, Melitz, Toubal).

only has the initiative involved 138 countries and 30 international organizations[5] (*已同中国签订共建“一带一路”合作文件的国家一览*), included 6 economic areas, one of which - New Eurasia Land Bridge[6] - goes through Poland, but also it relates to *people-to-people bonds* at its foundations, therefore it's connected to cultural, educational and tourist exchange[7]. In terms of BRI, knowledge of Chinese might facilitate multilateral commercial and cultural exchange and improve management on an international level. Language competence can not only influence mutual understanding of negotiating parties, but also it might contribute to creating mutual economic growth. Trade exchange in terms of BRI is to promote cultural integration. On the other hand, through actions based on cooperation and mutual learning of countries involved in the initiative - the aim is to head towards civilization progress (Fei Xu, 61-62, 64-65; Khan, Sandano, Ptratt, Farid 2018).

According to Europeans, knowledge of foreign languages is very useful and it will continue to be so, for both the respondents and, in the future, for their children. In terms of usefulness, the most valued language is English. Chinese occupies the 5th position, right after: German, French and Spanish (Kutyłowska 2013). However, the main benefits of learning foreign languages in Europe include: opportunity to work abroad, using at professional work, use during holiday travels, applying for a better job, opportunity to study abroad, possibility to understand people who represent different cultures, personal satisfaction from meeting people from other countries, using the Internet and feeling more European (*Special Eurobarometer 386. Europeans and their languages*, 62).
Investing in language abilities pays off in benefits for both the employee and the employer. Learning Chinese might be treated as investing in human capital and its knowledge can stand out on the labor market. The European Parliament includes communication in foreign languages among basic key competences in the process of life-long learning (Pietrzak 2015, 433 after: Zalecenia Parlamentu Europejskiego i Rady nr 2006/962/WE z dnia 18 grudnia 2006 r.), whereas the European Commission highlights that knowledge of foreign languages plays the key role in economic growth, creating new jobs and competitiveness. Knowledge of every other language increases human's possibilities and the learner's language success depends on assumed measurable benefits appearing as a result of mastering a language (only when revenues in financial and non-financial terms are higher than incurred expenses) (Kutyłowska 2013, 28-29.) The results of PIMLICO project carried out on the European Commission's commission in 2011 show, among others, that the lack of competence in using a foreign language might bring about financial losses for an enterprise, and "language" investments may have an impact on the increase of the enterprise's incomes from export (Pietrzak 2015, 430 after: Elan 2006). On the other hand, the lack of a common language among people who conduct business talks might affect trade (just like a 7% tax), and the ability of direct communication in business matters is three times more effective than that of using an interpreter (Kutyłowska 2013, 35 after: Melitz 2008).

Due to foreigners' growing interest in Chinese[8], research concerning opinions about the actual profitability of learning Chinese, considered from the point of view of an employee, was carried out. The aim of this venture was to obtain information regarding motivations that encourage to start learning this language and answering the question whether mastering it turned out to be useful, and whether it is truly profitable, i.e. if it has brought any profits to the learner (in financial and non-financial terms) - whether it has proven beneficial in terms of the labor market. It was an attempt made to answer the question of whether the skills acquired during the studies, the time devoted to learning Chinese, had an unequivocally positive impact on the labor market situation.

## 2 Material and Methods

The main reasons for taking up learning Chinese, among others, include: curiosity, an opportunity for self-development, willingness to exercise one's mind, willingness to travel more consciously, more cheaply and more comfortably, encouragement of close ones, wider access to information, possibility to get to know a new culture and new people, scholarship offers, the labor market prospects, employer's requirements and hobby.

### 2.1 Curiosity

Chinese is still perceived among Europeans as an exotic and difficult language to learn, and through discovering meanings of Chinese characters (compared to Egyptian hieroglyphs by some) is often treated, especially at the first stage of learning, as a sort of adventure. Due to the fact that the Chinese writing is an extremely important part of the Chinese culture, its characters appear not only in the media (as a printed/online word) and on road signs (information and prohibition etc.), but also as numerous decorative and good fortune elements, e.g. in the form of Chinese calligraphy, wishes of prosperity, etc.

[5] Data at the beginning of the year 2020.
[6] Others include: China-Mongolia-Russia, China-Central Asia-West Asia, China-Pakistan, Bangladesh-China-India-Myanmar and China Indochina Peninsula.
[7] Others include: policy coordination, unimpeded trade, facilities connectivity and financial integration.
[8] In the article under the Chinese language it is understand the Chinese official language *putonghua*.

### 2.2 The Possibility of Self-Development

Acquiring a foreign language can be compared to working on your own personality. Its full mastery (bilingualism) might double it in a sense. When learning a foreign language, one develops one's own mental plasticity, which is necessary in effective adapting to changing conditions, as well as regularity and discipline, which are facilitated by regular exercises related to revising vocabulary and writing Chinese characters (Kliś, 2016, 126-128). Thanks to learning a foreign language, one gets to know himself better, which was observed by Johan Wolfgang von Goethe, and which is now expressed in a saying: "he, who doesn't know foreign languages, knows nothing about himself[9]". Moreover, language skills are acquired, so, in terms of quality, it improves potential communication efficiency.

### 2.3 Willingness to Train Your Mind

For a European, Chinese language is considered in the first place from the point of view of two different languages - spoken and written. When training spoken language, already acquired patterns (e.g. when learning the native language or another European language) are used. This is favored by phonetic transcription *hanyu pinyin* (or others), but it hinders its tonicity. However, when learning how to write it, you get to know or come up with new learning methods, which also stimulates the mind. Due to the fact that in Chinese language an ideographic writing is used - Chinese characters (simplified or not simplified writing), its learning develops the skill of symbolic thinking. In addition, movement coordination is trained by writing characters (working on "muscle memory") and perception is improved (recognizing subtle differences between characters and their particular elements both in written form and pronunciation in different tones). While learning the third language has a positive impact on working memory (Huang, Loerts, Steinkrauss 2020, 13).
Learning new language can also improve memory, postpone process of mental aging (senile dementia) and occurrence of the nervous system diseases (e.g. Alzheimer's disease) (Kliś 2016, 126-128).

### 2.4 Willingness of More Conscious, Cheaper and More Comfortable Travelling

Knowing Chinese language makes it easier to travel around:

- 9 597 000 km² of People's Republic of China;
- countries which once belonged to the Chinese state or which used Chinese characters to record their own language. For example, in Japan, not simplified Chinese characters are still used today - kanji writing, which allows meaningful understanding of written language in a considerable way;
- countries which are inhabited by ethnic groups with Chinese origin - e.g. Singapore, Malaysia, Indonesia, where on the streets people communicating in Chinese can be found;
- countries which adapt their service markets to Chinese tourists and consumers - e.g. South Korea, where staff of shops, restaurants, museums etc. more often speaks Chinese than English.

Not having communication problems, it is possible to get more useful information, e.g. on alternative (often cheaper) ways of moving around, accommodation and gastronomy offer, as well as places worth visiting, which might not be included in brand guides or travel agency ads. Besides, knowing Chinese enables bargaining on one's own and bypassing costly "brokers" institutions.

### 2.5 Encouragement of Close Ones

Members of family, friends who share their reflections or good practices, or teachers, who have the most up-to-date information on effective learning methods, teaching materials, scholarship offers, etc. People who are important to learners of a language have an influence on their beliefs, it is especially true among the representatives of the same culture, who use the same mother tongue, who represent the same level of education and the same gender (Alhamami 2020).

### 2.6 Wider Access to Information

Acquiring information which is unavailable in other languages, e.g.:

- results of unpublished in English scientific research,
- ancient philosophical texts, whose translations significantly differ from each other,
- Chinese medicine records, which has not yet been fully explored by Western science,

[9] „Wer fremde Sprachen nicht kennt, weiß nichts von seiner eigenen."

- etc.

### 2.7 Opportunity to Learn About a New Culture

Learning to tolerate different views, habits, attitudes, symbolism, norms, tradition, beliefs and values, which aids easier social contacts and appreciation of diversity, as well as expanding boundaries of our own understanding of the world.

### 2.8 Opportunity to Meeting New People

Belonging to a group of people who learn Chinese or to community, who has already mastered it. Both in terms of a group of foreigners, who explore secrets of Chinese language, and the Chinese, who open up much more quickly to foreigners (i.e. to people from outside of China/ outside their culture) who speak their language. As well as making friends and creating a network of contacts - *guanxi*.

### 2.9 Scholarship Offers

In 2016 over 49 thousands of foreigners went to China within scholarship programs. According to the *Plan of studies in China* (issued by the Ministry of Education of the People's Republic of China in 2010), the number of foreign students will have reached 500 thousands in 2020. In 2016 the number of foreign students in China was 440 thousands and currently, among Asian countries, China attracts the largest number of students from abroad. Nearly half of this group (47,4%) are people who learn in English or in Chinese in order to obtain a Bachelor's degree (安延 2017, 9). At the beginning of 2020 in China, there were 2100 Polish people, among which, 250 studied on scholarship programs (*Epidemia koronawirusa. Polskie uczelnie odwołują wyjazdy studentów i pracowników do Chin*). This shows, among others, that China, as a destination country for getting education, is no longer associated with the place to go to only in order to study the language, but also, in order to obtain a university degree in a field other than Chinese, as a foreign language.

### 2.10 Prospects on a Labor Market - Employers' Requirements

Both, prospects on a labor market in the country of origin and abroad (mobility aspect), as well as employers' requirements as to the ability of using Chinese language, are related to China's still growing importance from both the economic (as a strong trading partner - country which in 2018 was responsible for 11,6% of global import and 0,9% of global export (*Rocznik Statystyczny Handlu Zagranicznego 2019*, 100); and a competitor in many branches of industry), and political point of view - an increasingly stronger player on the international scene. In addition, the One Belt One Road Initiative might, in the long term, have an impact on the development of economies which are situated in transport areas, thanks to which, there is a possibility of increasing trade, foreign investments and improving inhabitants' living conditions in countries involved. For example, in 2017, 40 % of the global export of goods, took place within countries involved in the initiative. However, a condition is to introduce by China a number of reforms which would influence risk limits, and, among others, increase transaction transparency, decrease social stratification, mitigate results of excessive exploitation of natural environment, preventing corruption, etc. (*Belt And Road Economics. Opportunities And Risks Of Transport Corridors* 2019, 4, 13) Chinese is the first language for the largest number of people in the world (*12 najważniejszych języków świata*) (it is recognized as the official language for 1 390 080 000 (*China Statistical Yearbook 2018*) (in practice for about 800m people (Godlewski) and people speaking Chinese as their native language in Hongkong, Macao, in Taiwan, Singapore and Malaysia)). Besides, it is spoken by around 60 m people of the Chinese origin, who live outside PRC (Godlewski), mainly originating from Chinese south-eastern provinces (*Leksykon wiedzy o Chinach współczesnych* 2009, 49). According to some predictions, Chinese will become the second (after the native) language used in the future. It will also acquire the status of an international language. Once, this status belonged to Latin, then to French and English. This is already the case in most Asian countries, where Chinese is taught mainly as a second language. Similar trends are also present in South America and Africa, where investments from China are becoming more and more frequent. In Europe, Chinese is not yet the leading language, it is only classified as the fifth most useful foreign language. It is worth noting, however, that the language is treated by Europeans as more useful to the future generation of respondents, rather than for themselves. In the Eurobarometer survey in 2012, 6% of respondents said that this language is useful for themselves and more than twice as many people - i.e. 14% thought it would be useful in the future - for their children. Details are shown in table 1. (Kutyłowska 2013, 23 after: *Special Eurobarometer 386. Europeans and their languages*).

**Table 1** - The most useful foreign languages.

| **Foreign language** | **Usefulness for the respondent [%]** a | **Suitability for the child of the respondent [%]** b | **Difference** c = b - a | **Index** c as % of a |
|---|---|---|---|---|
| English | 67 | 79 | 12 | 18 |
| German | 17 | 20 | 3 | 18 |
| French | 16 | 20 | 4 | 25 |
| Spanish | 14 | 16 | 2 | 14 |
| Chinese | **6** | **14** | **8** | **133** |
| Italian | 5 | 2 | -3 | -60 |
| Russian | 4 | 4 | 0 | 0 |

Source: own elaboration based on *Special Eurobarometer 386. Europeans and their languages.* [online]. [cit. 27.12.2017]. Komisja Europejska. Available: http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_386_en.pdf , p. 69, 75.

According to the data presented by the portal wynagrodzenie.pl based on National Salary Survey by Sedlak&Sedlak company, the ability to use less popular languages translated into higher earnings. This is particularly true of fields, such as energy technology and industry. Average salary received in Poland in 2013 by employees who spoke Chinese was over 5 thousands PLN, whereas the best paid ones received about 10 thousands PLN monthly (Ile zarobisz znając czeski, chiński czy szwedzki? Angielski to wymóg, mniej popularny język to atut). This amount in 2019 was more than four times, and in 2020 nearly four times the value of the Polish minimum wage.

On the other hand, there are arguments that regardless of the country in which one plans to take up employment, the basic requirement remains knowledge of English and that ability more often guarantees higher earnings (Barnato).

### 2.11 Hobby

Interests, such as: martial arts, Chinese literature, Chinese calligraphy, Chinese ritual of making tea, Chinese medicine, etc.

The above motivational factors to start learning Chinese can also be attributed to potential benefits that can be achieved. Both of the groups have been presented in the table 2.

**Table 2** - Main potential incentives and benefits of learning Chinese.

| **Potential incentives** | **Potential benefits** |
|---|---|
| - Curiosity<br>- Hobby | - Satisfying curiosity<br>- Exploring the issue<br>- Fun |
| - Self-development opportunity<br>- Willingness to train mind | - Mastering a foreign language<br>- Expanding cognitive horizons<br>- Development of interpersonal skills, thinking: logical, creative, abstract<br>- Delaying of mental aging process and diseases of the nervous system<br>- Developing confidence (温晓虹, 81) |
| - Wider access to information | - Obtaining information that is unavailable in other languages |
| - Desire to more conscious, cheaper and more comfortable travelling | - Greater cultural awareness<br>- Travelling to less popular places (i.e. not necessarily mentioned in guidebooks)<br>- Taking advantage of cheaper or more convenient travel options, through wider access to information |
| - Employers' requirements<br>- Prospects on the labor market | - Getting a good job (in the country of origin or abroad)<br>- Professional promotion |

| | |
|---|---|
| | - Increasing salary |
| - Opportunity to get to know new culture and new lifestyle | - Greater cultural awareness<br>- Meeting interesting people<br>- Acquiring contacts (*guanxi*)<br>- Contact with live language |
| - Opportunity to meet new people | |
| - Encouragement of close ones (family members, friends, teachers, etc.) | - Admiration<br>- Pride of loved ones |
| - Scholarship offers | - Obtaining a scholarship abroad<br>- Foreign trip<br>- Opportunity to train live language<br>- "Enriching " resume |

Source: own study.

### 2.12 Research Survey Among Chinese Language Teachers

Due to foreigners' growing interest in Chinese[10], a survey related to opinions on the actual profitability of learning Chinese from the employee's point of view has been carried out. An attempt has been made to find answers to questions about actual motivations encouraging to start learning the language as well as whether mastering it is really profitable, i.e. if it allows to improve employee's situation on the labor market.

The carried out survey was a primary, one-time and qualitative one. It included 30 structured interviews. The questions asked were focused on the profitability of learning Chinese, both in financial and non-financial terms. Due to the great difficulties in reaching a group of people, who once were learning Chinese, and who use it at work, a survey was conducted among participants of symposium/ training, which was addressed to Chinese language teachers. Symposium took place between 02-06.11.2017 and it was organized by the Institute of East Asian Studies at Eötvös Loránd University in Budapest. Teachers from both the People's Republic of China and Central Europe took part in it. The survey only included answers given by teachers of universities and schools specializing exclusively in teaching foreign languages located in: Poland, the Czech Republic, Hungary, Russia, Serbia, Slovenia, Romania, Lithuania, Latvia and Croatia. Most of the interviews were obtained in this way, the remaining ones were collected through contact with teachers, who attended previous editions of symposium.

Half of the surveyed group were women. Respondents were in the age range between 25 and 34 (25-34 years old - 40% of the respondents, 35-44 years old - 53%, 45-54 years old - 7%). The majority of the respondents (80%) completed fields of study related to Chinese language (Chinese language/ Chinese linguistics: 43% of indications, sinology: 20%, Chinese literature - 17%, international relations - 10%, Far Eastern studies - 7%, and English philology - 1%). The largest group consisted of people with master's degree (60% of people), then doctoral degree (23%) and bachelor's degree (17%).

The respondents devoted from 1 to 17 months to learn Chinese (during regular classes). However, in China they spent one year to 10 years all together - detailed answers are presented in figures 1 and 2. The declared level of proficiency in Chinese was described most often by the respondents as intermediate (80%) or advanced (13%).
At the time of the survey, all the respondents used Chinese in their current work, 87% of them used Chinese at work on a daily basis, whereas the remaining 13% did so only occasionally.

[10] In the article under the Chinese language it is understand the Chinese official language *putonghua*.

**Figure 1** - Years devoted to learning Chinese [%]. Source: own study.

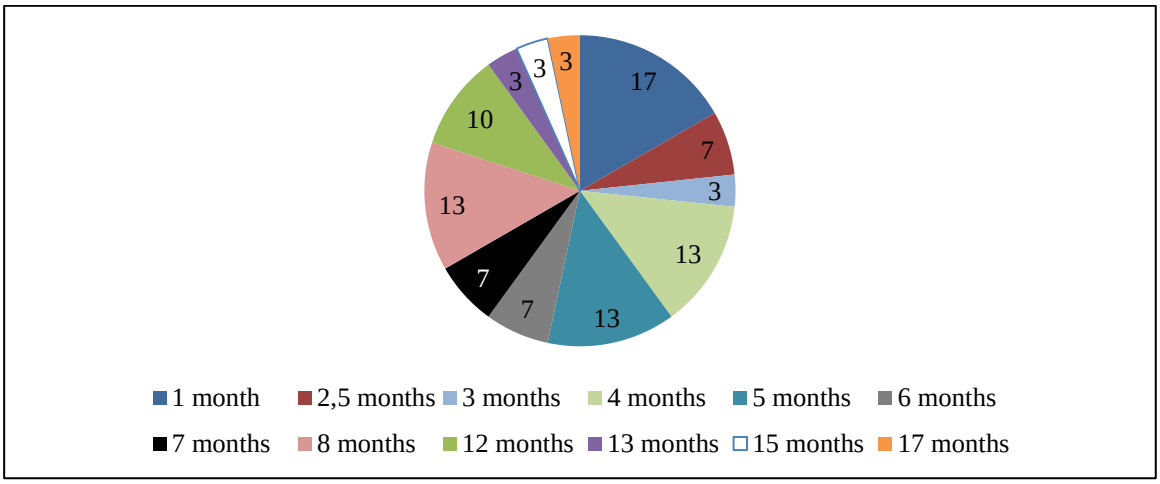
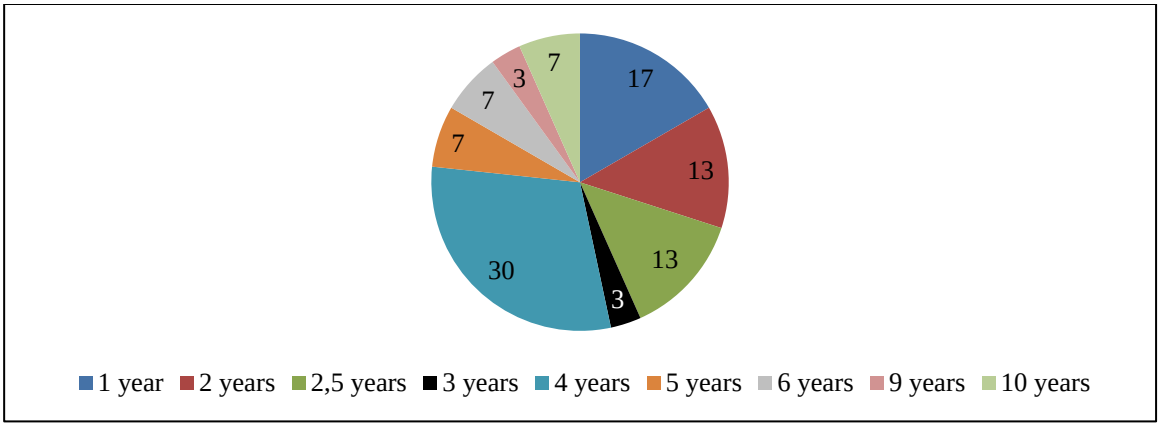



**Figure 2** - Years spent in the People's Republic of China [%]. Source: own study.




## 3 Results and Discussion

The survey on the opinion of teachers from Central and Eastern Europe began by asking a question about the most important reason for learning Chinese language. The main motivating elements were: *curiosity* (30% of responses), *self-development possibility* (20%; twice more often indicated by male respondents), *prospects on the labor market* (17%; twice more often indicated by female respondents) and *scholarship offers* (13%) – figure 3. The main expectations that teachers had when they began learning Chinese were: *finding a good job in the country of origin* (53% of responses) and possibility of *professional promotion* (20% twice more often indicated by the male respondents) - figure 4[11].

[11] The other category contained individual answers, including: *Chinese literature*, *relationship structure*, *high salary* and *Chinese music*.

**Figure 3** - Main motivational elements to start learning Chinese [%]. Source: own study.

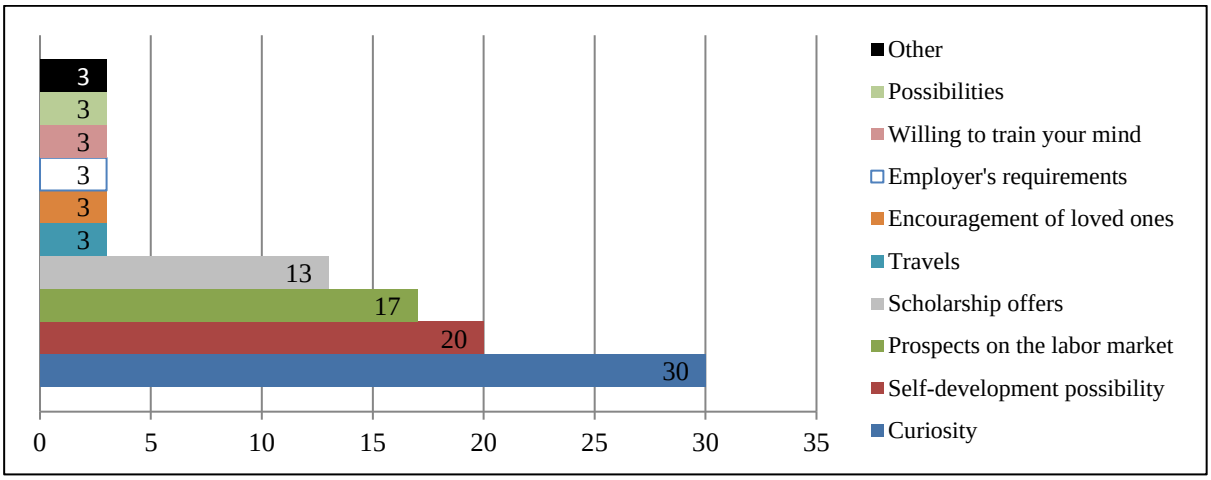
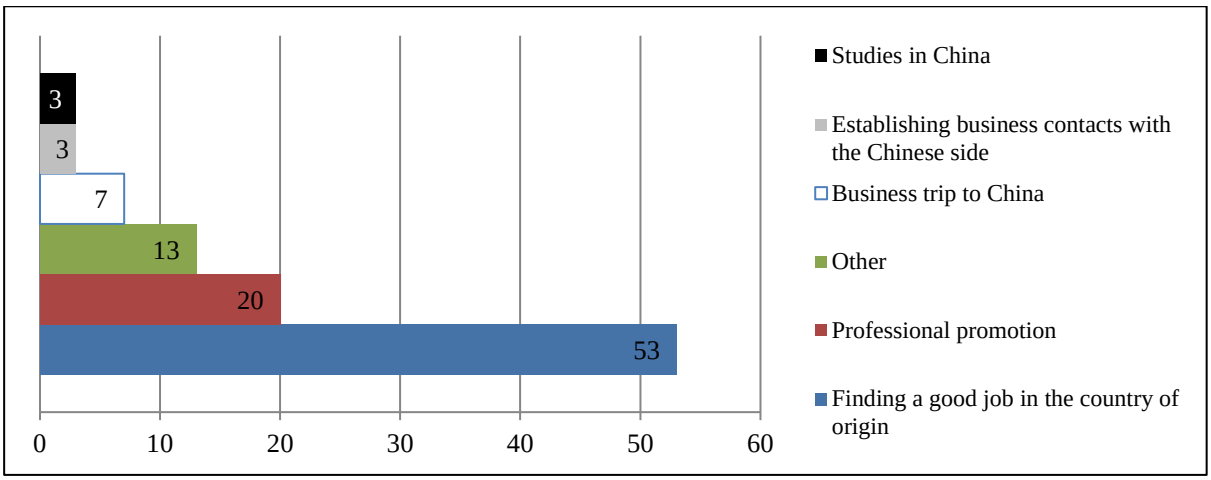



**Figure 4** - Main expectations related to profits resulting from learning Chinese [%]. Source: own study.




The respondents were mostly satisfied with the choice they made, i.e. they began learning Chinese (94% of indications, of which 87% said *definitely yes*) - figure 5.

Among the profits that the teachers achieved when they took up learning Chinese (not including good mastering of the language), the respondents mentioned mainly: *getting a foreign grant* (30% of responses), *meeting interesting people* (30%) and *getting a good job in the native country* (27%) - figure 6. The positive responses were accompanied by comments like:

- *I feel personal satisfaction. I decided to learn Chinese language and I achieved this goal.*
- *Recognition in the eyes of the Chinese is also a success. Speaking Chinese allows you to enter the inner circle, as if you became more socially acceptable.*
- *The profits also include the fact that a Chinese speaking person is perceived much more positively by the Chinese from the very beginning. Chinese guarantees making a good first impression. The Chinese look at foreigners who speak Chinese with some kind of respect, perceive them as well-educated and exceptionally talented.*
- *My parents, who used to be quite skeptical when I practiced Chinese, now brag to their friends all the time about how much I was able to negotiate thanks to my knowledge of this language. They're proud, not only because I managed to master the language, but also because I can actually use the knowledge I have acquired.*
- *Learning Chinese is just half a battle. While learning the language, one gets to know more about culture and develops other private interests, whose in-depth knowledge wouldn't be possible without*

*Chinese. Thanks to Chinese, I've become interested in Chinese tea, others took interest in calligraphy and yet others have become fascinated by acupuncture.*

**Figure 5** - Satisfaction from making the decision about starting learning Chinese [%]. Source: own study.

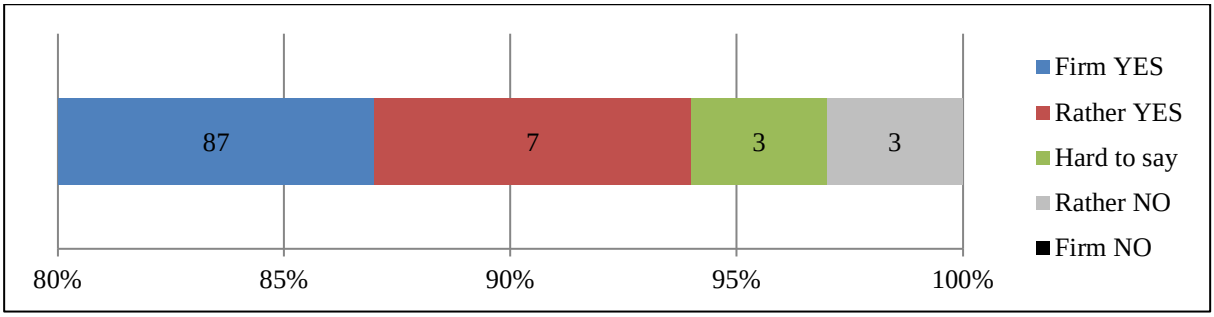
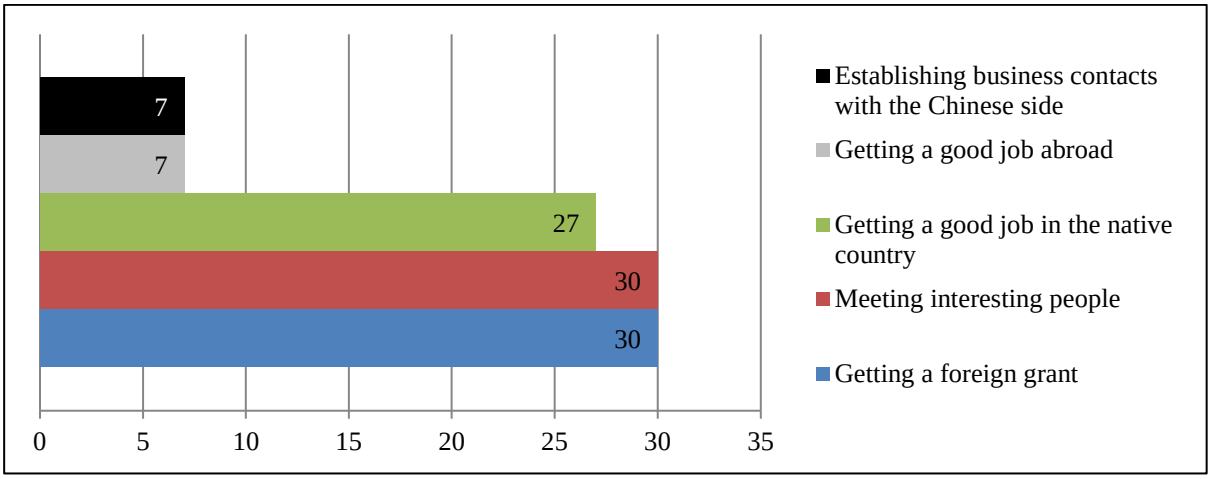



**Figure 6** - Profits resulting from taking up learning Chinese [%]. Source: own study.




Most respondents declared that they were satisfied with net monthly incomes generated from their current work, in which they use Chinese (63% of responses). Nevertheless, every tenth respondent could not state the opinion on that matter (10%; answers given exclusively by female respondents), and the rest (27%) could not classify their salaries as satisfactory. Details are presented in figure 7.

The respondents were also asked what wage for 45 minutes of Chinese class in the country where they work should look like. Dominant answers were: 25€ (37% of indications) and 15€ (17%). As many as 1/5 of respondents was unable to determine the amount (20%). Details are shown in figure 8.

Due to the fact that teachers were from different countries of Central and Eastern Europe, the question was extended about a part concerning the situation on their labor markets. They were asked if in their countries wages for 45 minutes of Chinese classes were lower/comparable/higher than wages offered for 45 minutes of English classes. Half of the teachers thought that Chinese classes were more valued in their countries than English classes. 1/5 of the respondents thought that the wages are the same. A similar number of respondents abstained from giving their opinions and 1/10 did not give an answer at all. Details are presented in figure 9.

**Figure 7** - Satisfaction with the monthly net incomes generated from the current work (in which Chinese is used) [%]. Source: own study.

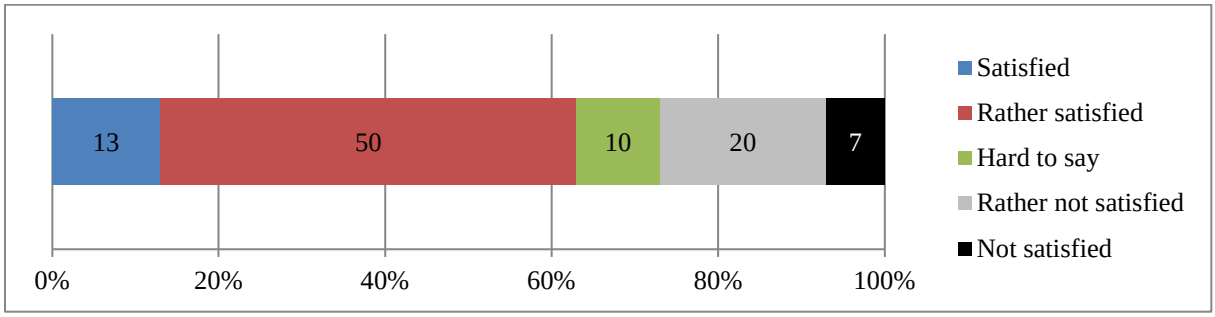


**Figure 8** - The expected wage for 45 minutes of a Chinese class [%]. Source: own study.

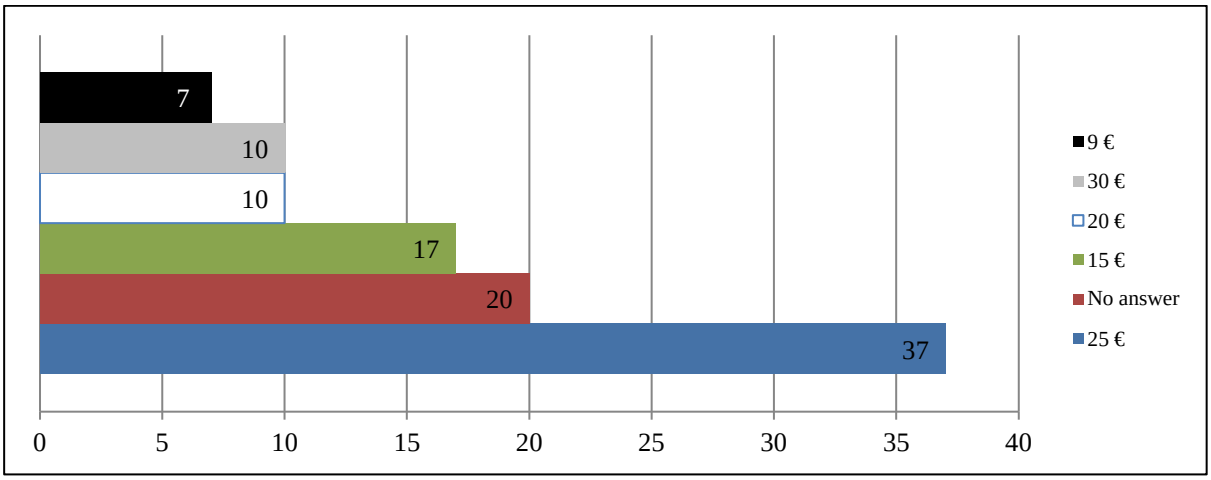
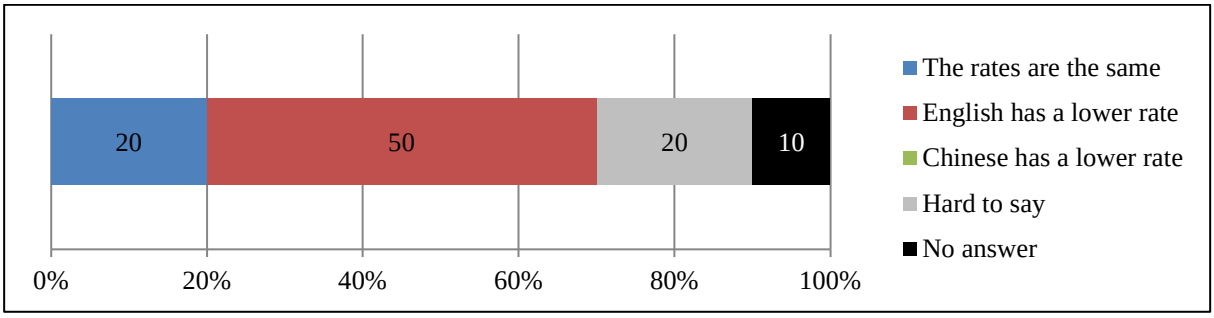


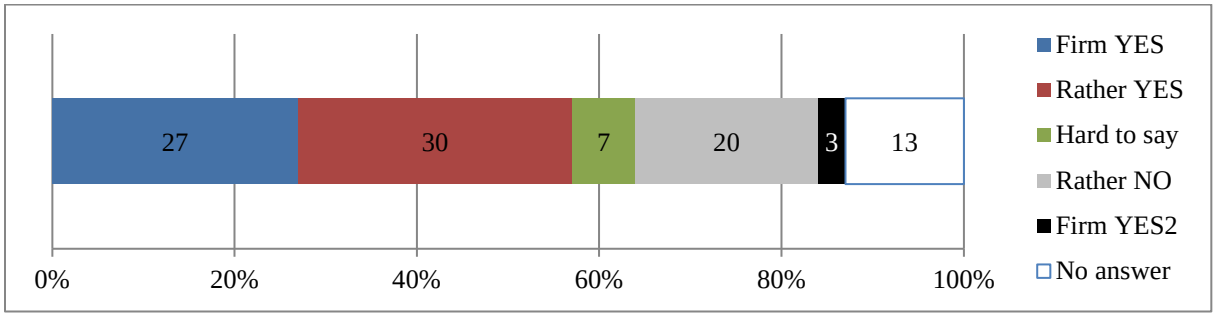

**Figure 9** - Comparison between 45 minutes of English and Chinese classes in the country of employment [%]. Source: own study.




More than a half of the teachers (57% of indications) had an opinion that their earlier expectation as to learning Chinese were correct. The answer *rather yes* was chosen twice as often by male respondents. Over 1/5 of the respondents had an opposite opinion (23%; of which *rather no* answers were chosen twice as often by female respondents), and another 1/5 did not give an answer (responses given exclusively by women) or could not determine an opinion on that matter (20%) - figure 10. Among the negative answers there were additional comments made by respondents, such as:

- *I'm not quite satisfied with the current situation, but I'm working on it.*
- *Even though I'm one of very few people who speak Chinese in my country, it's not very appreciated, especially in the work of a university teacher.*
- *I'm constantly expanding the range of my language competences, but it does not translate into increase in earnings, nor into employer's recognition.*
- *When I share the information that I speak Chinese quite fluently, most people from my country spontaneously react by showing admiration. They expect that since I've mastered such a difficult language, I must certainly be on the gravy train. In this aspect, I have achieved success - there is a kind of respect coming together with mastering Chinese language. The financial issue, however, is a different kettle of fish.*

**Figure 10** - The actual realization of earlier expectations related to learning Chinese language [%]. Source: own study.




## 4 Conclusion

The conducted survey allows to draw the following conclusions:

- The main factors motivating the surveyed teachers to begin learning Chinese, first of all, include: *curiosity, self-development opportunity, prospects on the labor market* and *scholarship offer*;
- The main expectations related to mastering Chinese language include: *finding a good job in the native country* and *opportunity for professional promotion*;
- Three out of four above-mentioned main motivating factors belong to the non-financial group. On the other hand, the purely financial aspect (the last of the mentioned factors) was chosen twice as often by female rather than male respondents. In turn, men, in comparison with women, chose hopes for future professional promotion, among their expectations, twice as often as ladies;
- Comparing the motivational factors and expectations of the respondents, it can be seen that the main purpose of starting learning the language is related to workplace - expectations regarding chances for improving one's situation on the labor market;
- **Decision about making effort to learn a foreign language is assessed very positively by the respondents;**
- The main benefits resulting from the decision to learn Chinese include: *obtaining a scholarship abroad, meeting interesting people* and *getting a good job in the native country*;
- Additional comments, made by the respondents, regarding profits resulting from learning Chinese mostly concern non-financial factors, such as: personal success - related to mastering a foreign language, respect and acceptance by the Chinese side, and pride of the close ones, as well as development of personal interests, which would not be possible on the same level without learning the language;
- 6 out of 10 respondents were satisfied with the salary for work they do, whereas 3 out of 10 had an opposite opinion;
- The wage for 45 minutes of Chinese class was assessed by half of the respondents as higher than for English class and 2 out of 10 did not see the difference between the wages. It shows, among others, that the ability to use Chinese language is not less valued than abilities to speak another foreign language;
- Nearly 6 out of 10 of the respondents thought that their expectations related to profits coming from mastering Chinese were correct. These answers were chosen twice as often by men than women. 2 out of 10 expressed an opposite opinion (chosen twice as often by women than men);
- Additional comments regarding dissatisfaction indicate: desire to change the current unfavorable situation on the labor market - supported by active action; indicate that realities on the labor market do not always point to employers' policy, appreciating employees who improve their qualifications, and the prevailing misconception that everyone who mastered a difficult and unpopular language receives high income.

It is important to highlight that conducted surveys were qualitative and refer, most of all, to the examined group of teachers. Nevertheless, they allow to make some general observations that may form the basis for further, more detailed research:

- It is worth spending time on learning Chinese, not only due to the change in the balance of power on the international market - economic force of PRC and expectations towards the OBOR Initiative, but also because of possessing unique skills - knowledge of a rare language and non-financial profits;
- The respondents expressed their satisfaction with the fact of taking up the effort of learning the language, nevertheless, the male respondents felt greater benefits than female respondents;
- **The respondents' expectations related to Chinese were mainly of professional nature,** whereas, **among profits concerning mastering of Chinese there were mostly non-financial elements;**
- The expectations of the respondents - those who had finished the learning/mastering stage of Chinese - related to job possibilities on the labor market did not find confirmation in the factual situation that they had pictured. Although the respondents did not declare their comments as to the amount of salary they received. Nevertheless, they did not specify their positions/work as dreamed, i.e. described by the adverb "good".

One of the advantages that the respondents had at the time of applying for their current job was the knowledge of the Chinese language, acquired mainly during their studies. However, its unequivocally positive impact on improving their situation on the labor market (private and public sectors) has not been noted.

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# Historical Context of Cross-Border Cooperation of Těšín/Cieszyn Silesia

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## Abstract

The current cross-border cooperation of Těšín/Cieszyn Silesia also needs to be examined from a historical perspective in order to understand the essence of its development. In the vicinity of the Odra, Ostravice and Olza rivers for centuries history has shaped the development of this part of Central Europe. Těšín/Cieszyn Silesia is an example of significant historical events with different interpretations to the present day. This paper focuses mainly on the region around Český Těšín and polish Cieszyn. From the historical context, the importance of the accession of the Czech Republic and Poland to the EU for Těšín/Cieszyn Silesia and its development is derived especially in the first decades of the 21st century. The author relies mainly on the results of his research work, but also practical and personal experience (based on the processing of the family tree up to 1530). The research was based on historical and comparative analysis and fieldwork.

***Keywords:*** *cross-border cooperation, development, history, migration, Silesia Těšín/Cieszyn Silesia*

***JEL Classification:*** *N90, O57, P52, R23, Z13*

## 1 Introduction

We should also examine the cross-border cooperation of Těšín Silesia from a historical point of view in order to understand the essence of its development. To the east of the Ostravice River lies Těšín Silesia with the border towns of Bohumín, Ostrava and Frýdek-Místek. This article focuses mainly on the region around Český Těšín and Cieszyn, Poland. The importance of the accession of the Czech Republic and Poland to the EU for Těšín Silesia and its development, especially in the first decades of the 21st century, is derived from the historical context.

***The aim of the paper*** is to present the results of research on the development and impact of political, cultural, linguistic, religious, economic and infrastructural changes on the migration of the population and the development of Cieszyn Silesia from its beginning to the present.

## 2 Material and Methods

The author relies mainly on the results of his research work, but also practical and personal experience (based on the processing of the family tree up to 1530). The research was based on historical and comparative analysis and fieldwork (Kurowska-Pysz, 2014).

Information and data were obtained by secondary research (analysis and comparison of literary sources from the Czech Republic and Poland) and field experimental research. Two genealogies examining the lines of ancestors in both parts of the Těšín region (in Czech and Polish) were developed until 1530.

The results of analyzes and surveys were evaluated using the **V5π** model. We define the model by the mathematical relation (1) **V5π = π.a.b.c.d.e.** Where **a** is the line between **T** the center of gravity of the brace (for symmetrical formations in the center **S**) and the point **A** = *economic power*, **b** is the line from **T** to **B** = *political power*, **c** is the line from **T** to **C** = *violent power*. Similarly, **d** is a line from **T** to **D** = *nature* and **e** is a line from **T** to **E** = *identity*. The **V5 π** model describing the evolving world has five spatial dimensions, which can be

arranged into six triangles by interactions of the basic elements of the model of the investigated formation (marked points **A ... E**) with the unstable center of gravity of the formation (**T**) and its parts (i.e. triangles interconnected elements), which causes the rotation of the space of the investigated formation, i.e. dimensions and elements of the researched world (shown in its model).

The main elements of society are *economic*, *political* and *violent power*. Their development is not always symmetrical. Thus, the center of gravity of the relations between the elements shifts historically and oscillates around an imaginary ("ideal") center. This dynamic of social relations is reflected in other dimensions of the world and, of course, the other world also affects society. (This model is described in more detail in the e-book Mikoláš, 2016, chapter: *Contemporary dilemmas of market society paradigms ... dilemmas of power).*

## 3 Results and Discussion

### 3.1 The Beginnings of the Principality of Cieszyn

The Principality of Cieszyn or the Duchy of Teschen (Latin *Ducatus Tessinensis*, German *Herzogtum Teschen*, Polish *Księstwo Cieszyńskie*) was a Silesian principality, which was established in 1281, when the duke of Opole-Racibórz, Vladislav I, died. His sons divided the territory he controlled. Těšín, Auschwitz and Racibórz gained Měšek and Přemysl into a joint government, but already in 1290, they divided the territory and Měšek became the first duke of Těšín, while Přemysl received Racibórz. Měšek chose the castle in Těšín as his seat and began to lean towards the Czech Kingdom, which was also reflected in the marriage of his daughter Viola Těšínská, which deepened relations with the Czech King Wenceslas III. With the division of the original Silesia, historical turbulence and complications in the development of Těšín Silesia began.

After Měšek's death, Kazimír (1314–1358) took over the government of Těšín. In 1327, Kazimir became a feudatory of the Czech King Jan of Luxembourg. During the reigns of Měšek and Kazimír, the medieval colonization of the Těšín region reached its peak. The towns of Bilsko and Frýdek were founded and a number of villages were established. Cieszyn remained apart from the conflicts, especially during the Hussite wars, due to its geographical location. During the reign of Princess Euphemia (1431–1442), it temporarily divided. Kazimir II, after 1477, he reunited the principality. In 1460, Duke Přemysl (1442–1477) sided with Mytáš Korvín, to whom Kazimir II Těšínský was also obedient (1477–1528). In the years 1563-1571, the principality was again divided into the Těšín and Fryštát parts. Duke of Fridrich ruled in Fryštát and his father, Prince of Václav III Adam, ruled in Těšín. At that time, Duke of Frederick was still the sole heir of the entire principality. With his sudden death in 1571, the Fryštát part definitively separated from the Těšín part by passing it into the hands of the Czech king and Emperor Maximilian II Habsburg, who, however, sold this territory in 1573 to the Silesian aristocracy. This historical stage of the development of the Těšín region is characterized by its political oscillation towards its southern neighbors (alternating inclination towards the Czech or Hungarian king).

### 3.2 Historical Turbulence in the Period 1528–1653

This period is characterized by religious tensions and wars. Kazimir´s grandson Wenceslas III. Adam (1528–1579) drew up a Czech land code written for the Těšín region, which, however, was enforced due to the resistance of the local nobility only after his death. In the archives and in the presbyteries, we find more documents written in Czech, which is still reluctant to many Polish archivists and priests. The duke also introduced Protestantism in the country. Therefore, even today, other Catholic areas of Poland view the southern part of Cieszyn Silesia with some distrust. The indebtedness of the principality led to the sale of part of the princely chamber estates as minor status, thus creating the Frýdek, Fryštát and Bílsko estates. These sales even affected the occupation of Czech territory by the Polish army from October 4, 1938, when the troops stopped on the river Lucina in Vojkovice, and not on the river Ostravice separating Frýdek (Silesia) from Místek (Moravia). Therefore, the historical boundary of the Frýdek estate was accepted.

During Wenceslas' reign, Wallachians, Lašas and other ethnic groups from the south of Europe began to come into the southern mountainous parts of the Těšín region from Hungary, feeding on pastoralism, and the migration wave intensified even more after the Ottoman expansion in Hungary. This fact was also reflected in the formation of the local language. The incoming population received a number of benefits, but also obligations. They had to protect the border with Hungary (therefore many municipalities bear derived names from the borders such as Hrádek, Hradiště, etc.), they also had to speak the local language (which was a form of the original Old Slavonic from Great Moravia) and acquired land in mountainous areas, which they had to fertilize (remove forests, i.e. "grub up") and repay the manor within a specified period (therefore many municipalities bear the names Lhotka, Ligotka, Vyšní or Nižní Lhoty, etc.).

It follows from the above that Cieszyn has become a multinational and multilingual region. For example, the adjectives "upper" and "lower" are not used in the current Czech language, but in Slovak, and they are of Old

Slavonic origin. Or the word "kunčina" meaning clover in the Eastern Laško dialect. Another example is the "dash", which in the Moravian and Slovak space means a hyphen, not a divider (see Frýdek-Místek). The name of the Beskydy Mountains originates in Old Albanian ("lysá hora"). Words containing the letters š, č (bača, salaš, ščuči, possibly ščudlek, which is a clover in the Western Laško dialect) and the short pronunciation of the local language come from Romanian. The name of the village and the river Morávka is of Celtic origin. It is not generally known that the Laško language was considered in Czechoslovakia until 1960 (i.e. until the introduction of the rules of the Czech language) as an equal language with Czech and Slovak.

Another peculiarity is that Wallachia is now referred to only as the areas of Zlín, Vsetín and others. But the Wallachians, resp. Walachovie, they also live in the Těšín region (further to eastern Slovakia). The borders between Lašsko and parts of Wallachia are approximately the town of Frenštát and in the east the villages of Dobratice, Tošanovice, etc. Until now, there is a clear difference in the colloquial speech of citizens in individual border municipalities, such as Vojkovice and Tošanovice, Horní Bludovice and Žermanice, etc. It is no coincidence that two Euroregions are now created: Cieszyn (including the north-eastern part of the original principality) and Beskydy/Beskid (including the de facto former Frýdek estate). The consequences of these events centuries ago are evident to these days.

Bedřich Vilém died in 1625 without leaving a male heir. The Czech King Ferdinand II claimed the Principality of Těšín as a dead fief, but he allowed Bedřich Vilém's sister Alžběta Lukrécia to administer Těšín for the rest of her life. After the extinction of the Těšín Piast family, the Principality of Těšín fell as a death to the Czech king of the Habsburg dynasty. The Habsburgs were then princes of Těšín until 1918, when Austria-Hungary disintegrated.

### 3.3 Changes in the Position of the Těšín Region (1653-1918)

After the death of Elizabeth Lukrecia, the Principality of Cieszyn came under the rule of the Habsburgs, which was forged by the Royal Chamber in Wroclaw. Cieszyn ceased to be the seat of the Teschen princes and within the Habsburg monarchy the principality became a periphery. Cieszyn opposed Prussia in the wars for Austrian inheritance. In the end, Cieszyn, unlike most of Silesia, remained part of Austrian Silesia. The connection of Galicia (Eastern Europe) also brought a change in the position of the Těšín region in 1772, which was also reflected in the construction of the imperial road from Olomouc to Lviv, which led through Frýdek, Těšín and Bílsko.

The reign of Joseph II. brought in 1781 not only the abolition of slavery, but also religious tolerance for the Evangelicals in Těšín. The following year, an administrative reform was carried out, during which Austrian Silesia was connected with Moravia to the Moravian-Silesian Land, which was divided into regions. The territory of the Principality of Těšín and the eastern part of the Duchy of Opava fell under the administration of the Governor's Office of the Těšín Region. Until 1918, however, the Principality of Cieszyn retained the status of a crown country. These were the regions that the Habsburg ruling dynasty had acquired for the Austrian crown over the centuries and ruled in the form of a personal union.[12] The turn of the 18th and 19th centuries was marked by the passage of troops participating in the Napoleonic Wars. The French invasion even required the temporary relocation of the Viennese court to Cieszyn in 1805. After the end of the Napoleonic Wars, there was rapid economic development in the Těšín region. The richness of mountain forests and shallow ore enabled the rise of metallurgy, and textile[13] and distillery production also developed. In 1849, the Silesian Land was established, whose self-government was taken care of by the Silesian Land Exchange, which replaced, among other things, the Estates Assembly in Těšín. Cieszyn itself was divided into four political districts (Bílský, Těšín, Bohumín and Fryštát).

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A national movement also developed with the economy. Czechs and Poles were often forced to work together against Germanization efforts. It is paradoxical that the original Slavic population, which referred to themselves as the Silesians, gradually began to speak German (and was not considered German in principle) in order to

[12] The personal union refers to two or more formally separate states – monarchies united by the person of the monarch.
[13] The village of Raškovice on the Morávka River (which historians neglect) played an important role in the development of metallurgical and textile production in the region.

distinguish them from the Poles who immigrated to the area. In particular, hard coal mining, metallurgy and the metalworking industry expanded. Several railway lines were also put into operation, the most important of which was the Northern Railway of Emperor Ferninand, which connected Vienna, Bohumín, Krakow and Lviv. The inhabitants moved to the rapidly developing areas not only from the mountainous part of the Těšín region, but also from Galicia (Eastern Europe), so in 1860 the Těšín region was one of the most densely populated areas in the Czech lands. This regional migration caused the area of Těšín Silesia to change with regard to the population structure. The influx of Poles from Živec, Cracow and the Galicia area caused that the villages with a predominance of Moravian (or Czech) and Silesian population or mixed ethnicities (e.g. many Jews lived in Těšín) to change into nationally Polish ones. This fact is also evident from genealogy and DNA analyzes, especially in descends in the female line.[14] State institutions were in the hands of the original population (i.e., belonging to Austrian or Czech origin), but the Polish national movement was more active and gained more followers. From the beginning of the 20th century, tensions between Czech and Polish nationalists escalated.

### 3.4 Dramatic Events after the Establishment of Czechoslovakia and Poland (1918 - 1938)

With the disintegration of Austria-Hungary in 1918, the Principality of Těšín also disappeared. The dispute over whether Cieszyn would join Poland or Czechoslovakia eventually culminated in 1919 with the Seven-Day War, which resulted in the division of historic Cieszyn between the two states. At the embassy conference on July 28, 1920, the European powers decided on the Czechoslovak-Polish border, including the Těšín region. The Czechoslovak party signed the decision with reservations on the same day and the Polish on 31 July 1920. Poland fell to the Bílsko political district and part of the Těšín and Fryštát districts (a total of 1,012 km$^2$ with a total population of 139,630, of which 61.1% speak Polish, 1.4% Czech-speaking and 31.1% German-speaking). Czechoslovakia belonged to the Frýdek political district and most of the districts of Těšín and Fryštát (a total of 1270 km$^2$ with a total of 295,191 inhabitants, of which 48.6% speak Polish, 39.9% Czech and 11.3% German). Czechoslovakia thus accounted for approximately 56% of the territory and 68% of the population of the Těšín region. The delimitation of the Czechoslovak-Polish border was completed in February 1924 and recorded in the protocol (legislatively) on April 29, 1924. The eastern part of Czechoslovak Těšín with a strong Polish minority began to be called by the Poles Zaolzie (Záolší - area behind the river Olše/Olza, seen from Poland.

### 3.5 New Dimensions of the Development of Těšín Silesia in the Period from 1938 to 1989

The events of 1938, at the end of World War II and in the following years, greatly deepened the differences between Czechoslovakia and Poland over Cieszyn. Already in the autumn of 1937, the Ministry of Foreign Affairs of Poland decided to resume diversionary activities in the Czech part of the Těšín region. On September 20, 1938, A. Hitler gave Poland a free hand in the question of Cieszyn, with the condition that the action begin only after the occupation of the Sudetenland by the German army. Polish actions began to develop on the night of September 22-23 with the attack on Sibice (part of Český Těšín). The territory of the Těšín region was to be evacuated by the Czech side by 10 October up to the Ostravice River, which flows, for example, through Frýdek-Místek and Ostrava. Weakened Czechoslovakia had to accept Polish ultimatums. The Polish occupation stopped on the river Lucina (which flows through the villages of Vojkovice, Horní Bludovice, etc.).

After the occupation[15], about 30,000 Czechs and 5,000 Germans had to emigrate from the Těšín region. Witnesses from the Czechs, Moravians and Silesians (including my parents) said that the Poles treated them much worse and crueler than the Germans in September 1939 (even my relative emigrated to Britain to fight as a pilot against Poland, then against Germany). On October 2, 1938, representatives of about 50,000 Germans and 100,000 Silesians from the Czech part of the Těšín region sent a telegram to Berlin to annex the area to Germany because Polish repression was unbearable. The situation changed fundamentally on October 1, 1939 after the German attack on Poland, Cieszyn Silesia was annexed to the empire. The Silesians were again victims of a new situation. They were classified as Category 4 of Germans and had to join the German army (e.g. my mother's eldest brother was deported to Norway and my younger brother emigrated to the Protectorate to escape his occupation in the German army, and he spent the whole war in the cellar of a shop in Nižní Lhoty on Frýdek).

During World War II, attempts were made to reconcile the interests of Czechoslovakia and Poland, even by considering the creation of a Czechoslovak-Polish confederation. This concept of settlement of relations between Poland and Czechoslovakia collapsed as early as 1943. Military and political tensions between Czechoslovakia and Poland were renewed after the liberation of Těšín in the period from 1 to 5 May 1945 by the Red Army with

[14] The men who immigrated to work in the Těšín region mostly returned to their original villages after the time they had earned money. The women in the Těšín region remained (they were not mostly heirs in their birthplace) and married in their new homeland. Therefore, the current population from the districts of Karviná and Frýdek-Místek has distant relatives in Poland near the borders of the Czech Republic or Slovakia. Similar trends are known in the form of economic migration so far.

[15] Polish literature speaks of protecting the Polish population from the German threat. (Roszkowski, 2017)

the participation of the 1st Czechoslovak Independent Tank Brigade in the USSR. Unexpected struggles and unrealistic demands for territorial gains after World War II, both in Czechoslovakia and in Poland, began. The situation escalated so much that Stalin had to enter the conflict twice in person, which more or less led to a return to the borders of Czechoslovakia before the occupation by the Polish army in 1938 and the loss of Transcarpathian Russia. The pressure of the USSR on both states did not take effect until *March 10, 1947, when the Treaty of Friendship and Mutual Assistance was signed in Warsaw between the Republic of Poland and the Czechoslovak Republic.* However, the border dispute was not resolved *until June 13, 1958 in Warsaw, where the Treaty on the Final Demarcation of State Borders was signed between the Czechoslovak Republic and the Republic of Poland* (partial border adjustments were made reciprocally in subsequent years in the interests of both countries).

It is paradoxical that this treaty ended 3 military conflicts between Czechoslovakia and Poland during the 40 years of the 20th century (i.e. in the period 1918 - 1958). The armies of both countries came into conflict in 1919, 1938 and 1945. It is also remarkable that contemporary professional literature in Czechoslovakia (or the Czech Republic) and in Poland interprets historical events in the Těšín region often completely differently. It is also negative that politics re-entered the development of the Těšín region soon after World War II. First, "people's democratic regimes" were established in both countries, dependent on Soviet policy, which led to the creation of the CMEA - Council for Mutual Economic Assistance (founded on January 5, 1949), the Warsaw Pact (May 4, 1955), etc. Formal cooperation received two significant rifts during this period. Firstly, with the entry of Warsaw Pact troops (incl. Poland, but without Romania) into Czechoslovakia in 1968, and then with the Czechoslovak army's readiness to ensure "peace" in Poland in 1980. The life of divided Cieszyn after decades was ended by fundamental political changes in both countries after 1990.

### 3.6 Development after 1990

A significant investment in this period was the construction and opening of a 760 m long road bridge (in 1991), bridging the Olše/Olza valley together with the *Cieszyn-Boguszowice - Cottbus* border crossing (Czech Republic). The S52 expressway leads across the bridge, and the D48 motorway continues on the Czech side. Then followed the process of opening other roads and railway crossings, but also the opening of the so-called green border, which caused a real reunification of the historic Těšín region. The integration of the Těšín region with transport infrastructure, which began in the time of Austria-Hungary, will be completed by the reconstruction of road No. 11 leading from the Slovak border to Třanovice (Frýdek-Místek district), where it will connect to the D48. The focus of the transport infrastructure of the Těšín region is shifting to Český Těšín, Frýdek-Místek, Bohumín and Ostrava. The importance of the railway junction in Český Těšín, which lies at the intersection of the Bohumín - Žilina, Frýdek-Místek - Cieszyn (resp. Bilsko-Biala) railways, is growing.

A typical example of the integration of the Těšín region is the merging of the towns of Český Těšín - Cieszyn and the creation of the Euroregion Těšínské Slezsko. The accession of the Czech Republic and Poland to the European Union (1 May 2004) is important for restoring the original significance and integrity of the Těšín region. An illustrative example is the personality of European significance *Jerzy Karol Buzek*, who was born on July 3, 1940 in Smilovice in the Těšín region (Frýdek-Místek district). Karol Buzek was the *Polish Prime Minister from 1997 to 2001. From 2009 to 2012, he was President of the European Parliament.* The second example is the important Polish family company *MOKATE* from Ustron (a Polish town near Třinec). The beginning of the business of the Mokryš family (1900) is in the village of Dobrá near Frýdku, later the family did business in Skočov (a Polish town near Cieszyn). The company MOKATE (the name is derived from the names Mokryš / Mokrysz, Kazimierz, Teresa) still cooperates with the municipality of Dobrá (e.g. it helped with the repair of the fire station).

Many people from abroad work in towns and villages near the borders with Poland and Slovakia (especially in Karviná, Český Těšín, Třinec), all above Poles on the Czech side of the Těšín region. Polish companies serve services and products to the population on the border of the Czech Republic (e.g. supplies of coal, wood, furniture, etc., construction work, etc.). The location of the towns of Cieszyn - Český Těšín - Třinec has not yet been appreciated. It is not only a local agglomeration. Within a radius of these cities, around 500 kilometers, there is a substantial part of significant European industrial production, which gives this region extraordinary productive potential. An informal and emotional example of the rebirth of Těšín Silesia is a recent event (www.seznam.cz, March 21, 2020, Filip Harzer). Český Těšín and Polish Těšín / Cieszyn have actually been one city for about 15 years. However, the coronavirus crisis (Covid19) and the closure of state borders again divided it into two separate parts. The local population is dealing with it in its own way. They send messages across the Olša/Olza river. *"I long for you Czech. I miss you, Czech Republic."* The text of a double-sided banner that appeared on March 20, 2020 by a river on the Polish side of a divided city. People from Český Těšín immediately returned the message to the Polish part of Těšín. There can be no better example of the benefits of the accession of the Czech Republic and Poland to the EU for Cieszyn Silesia.

## 4 Conclusion

Cieszyn Silesia and the Beskydy/Beskid Euroregion are examples of regional integration due to EU accession. They are examples of a return to the historical roots of the development of regions overcoming biased state interests, often enforced aggressively. Cieszyn Silesia and its vicinity has a very high potential for future economic, social, cultural and ecological development. An example is the development of the Frýdek-Místek district over the last decade (in more detail Kurowska-Pysz, 2014).

We should take note of the historical experience of the Těšín region:

- The potential (especially economic or power, it can also be a strategic location) of a certain region often leads to conflicts between states
- economic development causes migratory flows, changes in the ethnic structure of the local population, changes in culture, religion, language and its overall identity
- if the integrity of the region is maintained (e.g. as a Euroregion) there is a healthy development of its potential and positive effects in the participating countries (e.g. Poland and the Czech Republic.

The core of the Těšín region (approximately 20 km around the Český Těšín/Cieszyn double city) has an extraordinary potential for the future of the Czech Republic and Poland, namely that this area is:

- traffic crossway (road and rail)
- immigration gravitational pole with a strong cultural mix
- space with ecological, sports, tourist, educational, industrial potential, etc.
- concentration of entrepreneurs and business people with different national roots (Czechs, Slovaks, Poles, Vietnamese, Armenians, Koreans, etc.), such as Walmark, Hyundai, Moravia Steel, Marlenka, Mokate, etc.
- a place where culture and sports activities are shared (singer Eva Farna, HC Třinec, ski center in Wisła, Gorol festivities, etc.)
- place of transport integration, e.g. direct train connection between Frýdek-Místek and Cieszyn, Poland, connection of the D48 motorway with the Polish S52 expressway
- an example of cooperation between institutions, such as chambers of commerce, etc.
- -typically filter the activities of companies from the Czech Republic to the Polish side (e.g. Hyundai's investments in Poland) and, conversely, to Polish companies in Czech Silesia.

In particular, the districts of Frýdek-Místek, Karviná and Cieszyn should be given more attention not only by historians, but also by the professional public focused on economics, business, culture, ecology, etc. Cieszyn Silesia is a living laboratory of European integration.

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# Economical Aspect in Comparison of Parameters and Performance Evaluation between a Vacuum Pump from Chinese Manufacturer and from an Established Producer

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## Abstract

The article deals with possibilities of using and application of cheaper alternatives of devices for transportation and evacuation of air mass and gases in real operation in energetics and in other associated industries. This article deals with the measurement of the important parameters of a water ring vacuum pump. Then the parameters that are declared by the Chinese producer are compared with real and actually measured values obtained by the laboratory testing. Operational tests were performed after validation measurements and there were created operational characteristics of the vacuum pump. The result of the measurement is the evaluation and comparison of the advantage of installing a vacuum pump from a cheap Chinese manufacturer compared to established suppliers who offer guaranteed quality, but at a higher purchase price. Measured values and tests proves clearly that the values from a device label, guaranteed by the manufacturer, cannot be trusted, and when purchasing these devices from foreign or even unknown manufacturers, it should be taken into account that there may be other risks - such as the quality of the materials used, reliability, etc. The customer should consider if they wants to save money at the expense of quality and reliability.

***Keywords:*** *Operating Parameters, Price Performance Ratio Comparison, Vacuum Pump, Water Ring Vacuum Pump*

***JEL Classification:*** *Q310, Q410, L640*

## 1 Introduction

With the development of telecommunication technologies, manufacturing processes and availability of information, new options for the purchase of a wide variety of goods are opening up worldwide. Thanks to the availability of the Internet and the offer on the sales portals, it is now quite a standard to buy items of everyday use, electronics, clothing and more goods from abroad. Recently, new opportunities have also opened up for the purchase of specialized machinery and machine parts. Previously, these goods were mainly in the offer of specialized companies, but with the advancing time it is possible to order almost anything in so-called "aftermarket". It is worth considering - what the quality of these products is, especially from the Asian and other third country markets. Specifically the goods crafted in China. It is good to consider whether goods that are sometimes suspiciously cheap can also be of adequate quality. Most of the components and various parts are produced in China and used in devices worldwide. It is a question of what materials are used for each component, what the quality control of the product is and what technology for production is used. Another issue represent different standards and demands for overall quality of work. This article will try to reveal the pitfalls of purchasing cheap technology from Asian producers in the area of energetics.

### 1.1 Vacuum Pumps

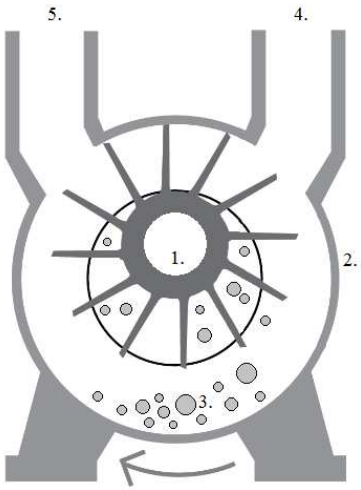
Generally, Vacuum pump is a machine, which is used mainly for evacuation - pumping gas or air out from a specific space or place (from containers, pipes, reservoirs, production line, sterile area, …). In principle, we can

say that it is an air pump or a gas pump. By evacuating of this air or gas from a particular space, we create a low pressure conditions in this space. We can say that there was created a partial vacuum. In general, a vacuum pump maintains a pressure below atmospheric pressure in a certain space. So the vacuum pump can be used both to evacuate certain space of redundant air or gas (for example, it can be used to solve the problem of aeration of pipelines in conventional water pumps, aspirate hazardous gas from the controlled area, etc.), or to transport this air or gas to another space, so it replace the function of air pump. Types of vacuum pumps are divided by construction, function and use. Depending on the function and arrangement, they can be divided into mechanical vacuum pumps, jet pumps, lamellar, oil, piston, water ring types and sorption vacuum pumps. There are other special designs, but these work on a different principle of evacuating gas from the monitored area.Basic construction types can be for example divided to: „Positive displacement vacuum pumps“ which are using the principle of expanding and cavitation in its working chamber. These vacuum pumps are good for performing low vacuum conditions. „Liquid ring vacuum pumps“ are most common used in industry and are working on the principle of change of the working space (These type of vacuum pumps are most common). „Momentum transfer vacuum pumps“ are high-speed machines working with dense fluid and transfer of molecules of gases, these are suitable to perform high level vacuum. Special types of vacuum pumps are based on sorption principle. As special an installation is for example „Entrapment vacuum pump“ which works with low temperatures and produce the best levels of vacuum, these vacuum pumps are used in special applications as cryogenics etc. The development in the field of evacuation devices is still ongoing. [1, 2].

Our type of vacuum pump chosen for testing is Water ring type vacuum pump. This type of construction can provide evacuation of gas approximately in quantity range from 2 to 1000 m3.h-1, with pressure drop starting from 102 Pa up to 102 kPa.

It is a vacuum pump whose rotor is equipped with curved blades. These blades are located eccentrically against the stator. During operation there is cooling water fed into the pump working area. This water is carried by the blades and forms a "ring" around the inner circumference. This will create tiny chambers which are bounded by individual blades and the water ring. In the suction area, the volume of the chambers first increases and the suction of the gas occur. Thereafter, the volume of the chambers is reduced by the rotation of the eccentric rotor and gas is dragged to discharge pipe from the working space of vacuum pump. Part of the liquid is also drained with the exhausted gas out of the discharge pipe so. This water is need to be separated from the evacuated gas if needed and also new water need to be refilled into the vacuum pump. The vacuum reached depends on the temperature of the cooling water and on the barometric pressure. For the purpose of our testing, the Chinese manufacturer Shandong CHINCO Pumps Co., Ltd. has been selected. The offer of this producer is quite extensive and there is no problem with delivery to our country. Price of devices offered by this company is also very interesting and the company also presents itself as established in the industry with its pleasant presentation. The purpose was to compare the operating parameters declared by the manufacturer and to assess the advantage of a cheaper pump compared to conventional products, which are, however, more expensive.

**Figure 1** – Water ring vacuum pump in cut. Source: Author.




Legend: 1. Eccentric rotor with curved blades. 2. Stator with working area inside. 3. Water pumped into the working area to perform action and to cool the device itself. 4. Inlet of gas – suction. 5. Outlet of evacuated gas.

## 2 Material and Methods

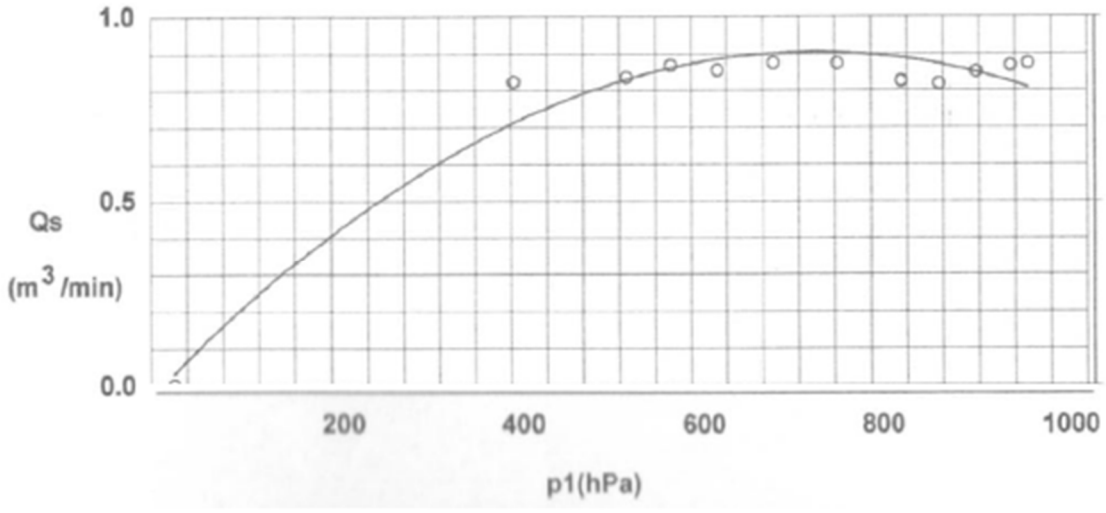
For testing purposes, the vacuum pump was selected according to the parameters and amount of the gas withdrawn from the process. The individual parameters declared by the manufacturer and the operating characteristics are shown in the table below.

**Table 1** – Declared parameters of tested vacuum pump.

| | |
|---|---|
| Type: | 2BV2-061 |
| Manufacturer: | CHINCO Pumps Co., Ltd. |
| Year of production: | 2016 |
| Serial No.: | C1611132 |
| Maximal suction power: | 52 $m3.h^{-1}$ |
| Water consumption: | 2,5 $l.min^{-1}$ |
| Power input: | 1,45 kW |
| Type of engine: | YX3-90S-2T2 |
| Voltage: | 380 V |
| Weight | 22 kg |

Source: Values from the label of the tested vacuum pump.

**Figure 2** - Power Characteristic of Vacuum Pump provided by Manufacturer. Source: Characteristic from the prospectus from the manufacturer CHINCO Pumps Co., Ltd.




The vacuum pump tested was connected to the testing bench built just for this purpose and subjected to a series of repeated tests. The pump was evacuating the process gas from the reactor for biomass energy treatment by torrefaction. To carry out a series of different tests of each part of the vacuum pump, an extra measuring stand was created, on which various devices could be connected and all data measured can be collected to computer. The pump was tested under various operating modes and loads - one of the load where the most realistic and relevant data can be obtained - was the full load. At full load it is possible to monitor and record individual parameters for comparison with declared values. All data was recorded online using the Almemo data logger from Ahlborn. The following tests and procedures have been carried out during all experiments to describe the individual pump parameters:

1. Measurement of temperature and relative humidity in all of the operationally important points.

2. Measurement of static and differential pressures.

3. Gas flow rate measurement on eccentric orifice plate.

4. Measurement of water flow to the vacuum pump.

5. Measurement of the electrical power of the vacuum pump using the Yokogawa WT230 electronic wattmeter.

6. Measurement of winding by impact generator SPS Electronic type SPS 215A.

7. Symmetry measurement of electric motor winding by Agilent 34401A.

8. Measurement of insulation resistance by megaohmeter Chauvin Arnoux 6545.

9. Loss factor measurement using Hameg LCR meter.

10. Measurement of impedance, inductance and active resistance using Hewlett Packard ACP / A and Yokogawa WT210.

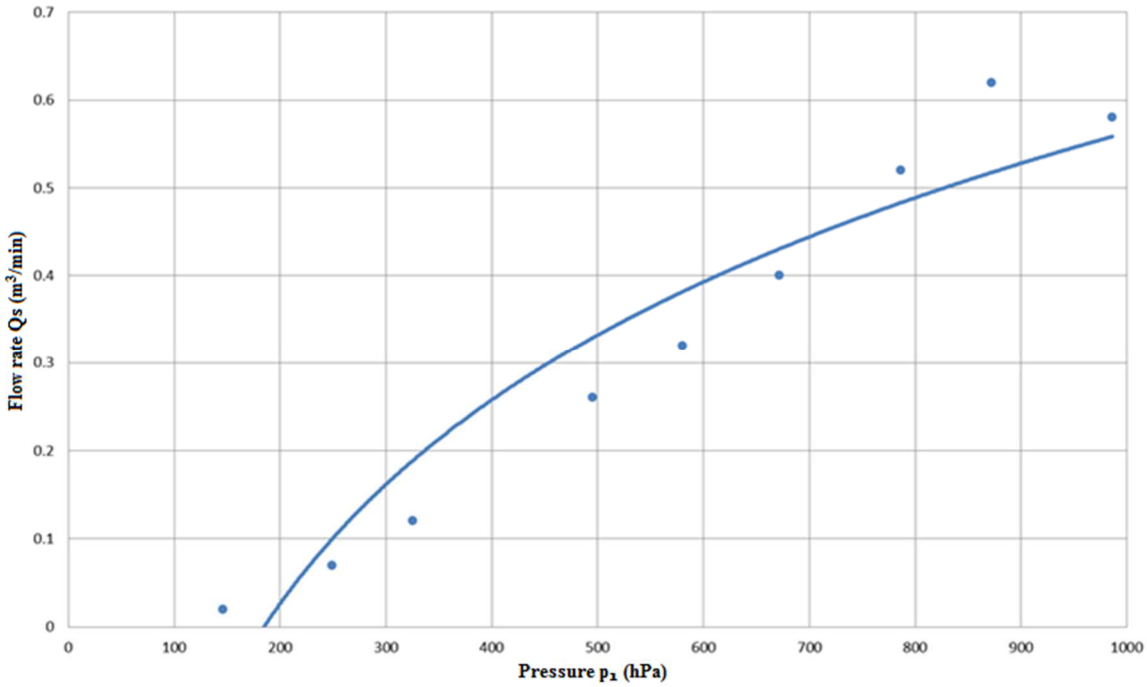
11. Thermal imaging of individual parts of the vacuum pump using the FLIR SC 610 thermal imager.

All measurements were made in repeated series and according to ČSN EN ISO standards. Measured values were recorded and verified during repeated tests. The instruments have been properly calibrated [3, 4, 5].

## 3 Results and Discussion

Operating and performance characteristics were determined from the measured data of the tested vacuum pump 2BV2-061. All monitored parameters that could affect the overall efficiency of the pump and the parameters declared by the manufacturer were assessed. On the next figure there is real characteristic of the tested vacuum pump obtained by series of tests on our measurement stand. This is the characteristic, where the biggest difference between our measured parameters and parameters declared by the manufacturer can be seen.

**Figure 3** – Power characteristic of tested vacuum pump. Source: Author.




As for other measurement that can influence declared parameters by the manufacturer results are listed below:

1. Temperature and humidity have remained in normal values for the whole time of testing.

2. The pressures at the time of testing were stable.

3. The gas flow rate was lower than the official value declared by manufacturer.

4. The water flow was constant.

5. Power input was higher than officially declared by manufacturer.

6. No significant deviations were measured, the difference of the measured values is <5%, which is satisfactory.

7. Maximum winding unbalance is 0.63%, which is satisfactory.

8. The measured maximum resistance of 2.009 Ohms is satisfactory.

9. The maximum loss factor was 0.003, which is satisfactory.

10. The active resistance does not change too much during the measurement, the maximum range was 0.15 Ohm, which is satisfactory.

11. Scanning of individual parts with a thermal imager did not reveal any places that would indicate overheating.

Moreover, when testing the device, the sealing elements - the gas seals rings - were damaged and had to be replaced. This incident meant a partial disassembly of the vacuum pump and thus an unplanned shutdown.

## 4 Conclusion

Based on our evaluation of the tested device in terms of real-time usage, we can state the following:

A positive factor is purchase price from the Chinese producer's. The approximate price that can be obtained from retailers is between $ 480 and $ 560. This price may be increased due to the shipping costs. If we look at manufacturers and sellers of water ring vacuum pumps our and European markets - for example, Vacuum Bohemia offer a VBV2 061 pump with almost identical parameters, but at a price 4 times higher. Other manufacturers such as IN-ECO, s.r.o, Danish Atlas Copco, or the traditional SIGMA Pumpy Hranice, s.r.o. offer vacuum pumps of similar parameter at 3-6x higher prices than Chinese companies. It should be noted that the overall processing and materials used by the Chinese manufacturer are much lower quality than those of our traditional manufacturers. Our producers have to apply European normative control and quality testing. When choosing a Chinese producer - there is a risk of damage to the pump or its components. Such a situation means stopping the operation and repairing or replacing it with a new piece. If Chinese vacuum pumps are less reliable and of lower quality, it is risky to use them for example in pharmacy or healthcare. In industrial production, such shutdown failures mean the entire associated process and which brings considerable financial loss.

However, the biggest problem is that the manufacturer specifies vacuum pump parameters different from reality. Higher power consumption and lower gas output are alarming. Measured power input at our testing stand was 1.937 kW, whereas the manufacturer declares consumption only 1.45 kW. The difference is 0,487 kW. If we imagine a friendly option variant of use of such a vacuum pump in a standard one-shift operation (8 working hours, from Monday till Friday excluding weekend) and considering the vacuum pump works on average 7 hours a day, we count few hours for the maintenance per year (total 1 day a year), and approximately 251 working days, the year difference of consumption of electricity for 250 working days is:

$$250 \cdot 7 \cdot 0{,}487 = 852{,}25 \text{ kWh} \quad (1)$$

With an average price of electricity in the year 2019 in the Czech Republic - on average 4,58 CZK per kWh, the year difference in consumption of the vacuum pump compared to reality is:

$$852{,}25 \cdot 4{,}58 = 3903{,}305 \text{ CZK} \quad (2)$$

If we consider, that the vacuum pump will be installed in a three-shift operation (3x8 working hours, whole week, each day a year) the vacuum pump will be working 21 hours a day. There will probably be more days per year for maintenance, consider 7 day a year from total 365 working days. The year difference in consumption of electricity will be:

$$358 \cdot 21 \cdot 0{,}487 = 3661{,}266 \text{ kWh} \quad (3)$$

Again with the average price of 4,58 CZK per kWh, the year difference in consumption of the vacuum pump is:

$$3661{,}266 \cdot 4{,}58 = 16768{,}598 \text{ CZK} \quad (4)$$

In terms of proper maintenance, the service life of a water ring vacuum pump is in tens of years (with proper check and maintenance of seals, bearings and other stressed components). If we look at the case of use of a cheap Chinese vacuum pump at the price of approximately 11 000 CZK, working in one-shift operation, the hidden power loss will be the same as the price of the cheapest quality vacuum pump from a domestic manufacturer. Approximately 40 000 CZK after 7,43 years of work of this Chinese vacuum pump. If we look at the case of three-shift operation use, the hidden loss will cost the same money as the quality vacuum pump, and this will be in less than 1,73 years. When using the cheap Chinese pump longer time, the hidden financial loss will be growing due to higher consumption of electricity. Also with the time there is a bigger chance of minor or fatal damage of such a pump due to lesser quality of manufacturing and material used. The use of Chinese vacuum pump can be recommended to use in special installations, where it will be running less working hours and or in experimental use, where no risk of health and property damage is likely to occur. Other problem is that gas output and total evacuated quantity is lower than declared. This can be also dangerous if the operation needs to be precise and fully covered. This is to be considered by the user at their own risk and judgement. If we look

at other parameters tested and measured, we can state that there are no more anomalies at the device and all the values are within normal limits [6, 7].

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# Employment Related Contex of Silver Economy in Poland

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## Abstract

The systematic increase in the share of older people in the population has a significant impact on the functioning of the labour market and the entire economy. From a perspective of the labour market, aging society is both a threat resulting from a decrease of people in working age and a chance for e.g. an improvement of rates of professional activity of older persons. What is more, the predicted demographic situation can be a catalyst for the development of new branches and a demand for employees representing professions that are closely related on satisfying needs of senior part of the society. The literature mentions the concept of silver economy, which can be a response to above mentioned transformations. The aim of the article is to indicate the scale of loss of labor resources in Poland and the possibility of using the professional potential of the elderly in the silver economy model. The article uses the desk research method. Research was based on an analysis of the literature of the subject and source documents, as well as statistical data obtained from databases of the Polish Central Statistical Office.

***Keywords:*** *labour market, economic activity of the elderly, elderly people, silver economy*

***JEL Classification:*** *J11, J14, J21, J23*

### 1 Introduction

The issue of the direction, dynamics and consequences of demographic changes has been one of key elements of a wide public debate in Poland for over two decades. The necessity of searching for solutions in the field of social and economic policy, considering demographic conditions of economic development, resulted in a growth of interest in the concept of silver economy. It is a confirmation of a change of approach towards consequences of ageing of modern societies. While several years ago, this phenomenon was perceived only in terms of a burden for the state and society, a threat to the stability of pension systems, nowadays, the attention is more often paid to the fact that a growing share of older people in the population is a great capital for social and economic development.

In the field of labour market, the need of more efficient use of the professional potential of this social group is seen not only in the context of demographic projections but is already felt on Polish labour market due to already observed deficiency of labour force. The aim of the article is to indicate the scale of loss of labor resources in Poland and the possibility of using the professional potential of the elderly in the silver economy model.

Real demographic data and their projections into next decades unequivocally indicate the necessity to intensify activities in favour of using the professional potential of older people. It seems that awareness of this fact in Poland is just only shaping. The article presents the dynamics of changes of labour resources in the perspective by 2050. It focuses on the role and importance of the professional activity of older people for the continuity of economic growth, as well as barriers limiting it. What is more, it also discusses the demand character of undergoing changes in the field of employment in the context of the development of silver economy. This paper fits in the current discussion on silver economy and provides an introduction to in-depth research in this field.

## 2 Material and Methods

Based on the assumption that the systematic increase in the share of older people in the population has a significant impact on the functioning of the labor market and the entire economy, the article attempts to approximate the concept of the silver economy, recognized as a response to modern demographic changes.

The considerations began with the presentation of the dynamics of changes in labour resources in Poland in the perspective to 2050 based on statistical data obtained from the databases of the Central Statistical Office. Attention was paid to both the problem of the loss of labour resources and the change in their age structure.

Based on the literature on the subject and on the desk research, the determinants of professional activity of the elderly were discussed, indicating its main barriers. The main part of the article contains considerations regarding the silver economy as a model of the economy creating opportunities to use the professional potential of the elderly. At the same time, reference was made to Polish experience in creating regional solutions referring to the silver economy.

## 3 The Essence of the Concept of the Silver Economy

An analysis of the economic literature on contemporary economics systems indicates, the growing interest of theorists, researchers and decision makers in the concept of the silver economy. Although more and more is being written and discussed on the subject, the precise definition of its essence raises some problems. It should be emphasized that the concept of "silver economy" is sometimes used interchangeably with the phrase "silver market", which appeared in the early 1970s in Japan.

Although being a new idea, it already has various ways of interpretation. The above results from the fact that some see in it mainly possibilities of a greater activation and longer professional activity of older employees, while others focus rather on creating new jobs, necessary for service of older people and new possibilities of economic development, resulting from ongoing demographic changes. However, these two perspectives can be combined into one and the concept can be regarded in a wide way.

In the 2020 Strategy of Human Capital Development, silver economy sector is defined as: *"economy considering the age structure of the population, in which a significant role is played by people in mature or older age", or: „a model of economy responding to needs of older people and allowing use of the potential of people in advanced age* (Strategy of Human Capital Development 2020, p. 84).

B. Urbaniak postulates a broad perspective of the silver economy. As Urbaniak indicates: *"it refers to the entire socio-economic system at the national, regional or local level, when decision-makers are guided not only by the pursuit of the needs of aging societies, but they are trying to make demographic change an impulse to create new development opportunities. All generations will be their beneficiaries".... Silver economy creates highly qualified jobs in manufacturing and services, has an influence on a growth of human capital, and gives a chance for work for younger and older persons"* (Urbaniak 2016, pp. 284-285).

Such complex approach towards understanding the concept of silver economy creates chances for noticing even greater potential advantages resulting from implementing its assumptions.

The concept of the silver economy is part of the scientific and research trend called gerontechnology, covering many interdisciplinary issues regarding technology and the aging process, and its overarching goal is to improve the daily lives of older people [Graafmans, Taipale, Charness 1998, p. 3]. In addition, it can also be assumed that the silver economy is part of a broader sustainable development strategy, assuming the even use of resources, including human resources.

The decline in the absolute size of the population in working age is one of the main threats to the continuity of the economic growth process and the possibility of improving the standard of living of the population. In the subject literature, there is a common opinion that a slower pace of growth of labour force resources can be a burden for economic development, what in future perspective can result in a reduced standard of living (Nyce, Schieber, 2011, pp.163-164).

1) In order to prevent the aging of the population to become a barrier to economic growth and not to inhibit the process of improving the standard of living, two strategies are implemented:

2) Increasing the size of labour supply by professional activation of people who remained professionally inactive or persons from groups of a low professional activity,

3) Increasing competences of employees, increasing the number of implemented technical innovations.

Both strategies create chances for maintenance of the continuity of economic growth. Assuming that a growth of labour resources at any level of productiveness means a greater production, regulations and state's policy

focused on professional activity of people will be of a key importance. This issue has a special meaning if we take a look at the dynamics of changes of quantity and age structure of labour resources in Poland (Tab. 1).

**Table 1** - Projected population of Poland in accordance to economic age groups considering old pension age (thousands)

| Specification | 2013 | 2020 | 2035 | 2050 | 2050 |
|---|---|---|---|---|---|
| | | | | | 2013=100 |
| **Pre-working age 0-17** | 6 995 | 6 773 | 5 568 | 4 963 | 71,0 |
| **Mobile working age 18-44** | 15 338 | 14 219 | 10 725 | 9 331 | 60,8 |
| **Non-mobile working age 45-59/64** | 9 084 | 8 568 | 9 990 | 7 252 | 79,8 |
| **Post-working age 60 +/65 +** | 7 078 | 8 617 | 10 193 | 12 404 | 175,3 |

Source: *Prognoza ludności na lata 2014 -2050*, GUS, Warszawa 2014, p.148.

An analysis of projected data indicates maintenance of current trends in future, i.e. outflow of population and significant changes in age structure, what results from known mechanisms concerning relationships between the number of births and deaths and the state of population. The perspective by 2050 predicts a gradual drop of persons in their pre-working age (about 2 million in total) as well as persons aged 18-44 (by 6 million). It is estimated that the greatest scale of the drop will take place in the years 2020-2035. The number of people in immobile age will be increasing in next decades, until 2035-2040. What is more, in the course of predicted quantitative changes in particular age groups, there will occur changes of a share of each of these groups in the total population. To compare, in 2013, people in their pre-working age as well as those in post-working age, constituted over 18% of population each, while remaining 63% were person in their working age. However, in the last year of the prognosis, the potential labour resources shall constitute 56% of the population, while a significant difference will be noticed between populations in non-working age – the share of older of them (post-working age) will twice larger than the younger one (pre-working age) (The Polish Central Statistical Office 2014, p. 149).

In demographers' view, Poland has found itself in such situation of demographic development, that even an increase in the fertility rate to a level guaranteeing simple replacement of generations in a short period, will not reverse these processes and will not stop the decline in the population of the country. At such significant distortion of the population's age structure, the process of demographic rebuilding is a slow process, requiring consequent long-term activities. Realisation of a new pro-family policy, e.g. related with 500 plus programme brings some dose of optimism. However, according to initial estimations, even in the course of realisation of this programme, one can not expect a complete inhibition of the drop of population but only a significant slowdown of this process. It should be also mentioned that effects of demographic trends are additionally aggravated by emigration.

A change of age structure is equally essential as an outflow of potential labour resources. A growth of share of older people in the population also means ageing of labour resources. In this context, a special importance is of the issue of using the potential of the mature part of labour resources and encouraging persons who have pension rights to longer professional activity. In the concept of silver economy, professional potential of older people is regarded as a significant capital for development. Hence, the need to create proper conditions for complete and effective participation in economic life by professional work is natural.

At the same time, attention is drawn to the need to increase their productivity. The literature of the subject describes so called productive aging[16], i.e. aging that enables older people continuing active participation in the social life and earn their own living. Grassroots of the concept of productive aging include the belief that older people are active actors, capable of producing and co-creating valuable, wide-understood products and services in the social, economic, politic or cultural sphere (Hinterlong, Morrow-Howell, Sherraden, 2001, pp. 3-18, Barabasch, Dehmel, Loo, 2012, pp. 9-34).

In the context of labour market, productive aging consists in providing a safe and healthy work environment to all people by complex strategies that enable optimal functioning at any age, including older persons.

[16] The term *productive aging* was introduced by R. Butler, who, being anxious by perception and wrong presentation of older people as less fit to fully participate in the social life and generating high costs for a state, decided to present a more balanced image of capabilities and potential of older people. Butler, R. N., and Gleason, H. P. *Productive Aging: Enhancing Vitality in Later Life.* New York: Springer, 1985, s. XII.

## 4 Conditions of Professional Activity of Older People

Assuming that professional activity of older persons is one of key factors deciding about the dynamics of economic growth in conditions of silver economy, states try to increase the level and extend the time of professional activity of this group by proper legal regulations. This strategy varies much from previous strategies implemented in the 1990s. At that time, not only in Poland but also in other European countries, there were introduced pension privileges, encouraging older people to finish their professional activity earlier. Such solutions were to be a cure for unemployment of young people. However, as stated by OECD experts, that policy was based on two false prerequisites. First, the number of jobs in economy is not strictly specified. Secondly, after entering the labour market, young employees do not automatically replace older ones at the same posts (OECD 2014, pp. 21-22).

It should be mentioned that the final result expressed in the form of rates of professional activity is an effect of a complex process, determined by factors related to individual capabilities of an individual, as well as by external factors (dynamics of economic growth, labour market policy, etc.).

One can risk and propose a thesis that the awareness of the fact that human capital of older people is an essential ground for development of silver economy is slowly shaping in Poland. As far as directions and rules of the policy of employing older people are concerned, there is a full coherence of Polish documents with global and European acts in this field. In order to increase the level of professional engagement of older people, it is necessary to provide the labour market to them, including various forms of support in finding and maintaining employment, as well as to respect the ban of discrimination due to age. Current instrument of the policy of employment of older people in Poland concerned mainly mature persons still in their working age. However, in the context of data presented in Table 1, it is indispensable to develop solutions that will encourage also seniors to be professionally active, especially because the share of this age group in the society shall be increasing in the fastest rate during incoming years.

Basing on experiences of Polish labour market, the employment rate of people from older groups of working age has been increasing during last few years, while it remains at the level of several percent among persons at pension age.

A review of the literature of the subject and available results of studies on the professional activity of older people allows one to indicate barriers limiting an access to the labour market to older people, including:

- stronger competition on the market and high costs of running an economic activity, making entrepreneurs searching for the cheapest and the most efficient employees, what is a potential threat for older people, who, for example due to more years of service, generate higher costs than young people;
- dynamic development of new technologies imposing the necessity of knowing them, what can be a problem in case of older people;
- common stereotypes concerning older employees, perceived as less flexible, more often being ill, etc.;
- Special protection against termination of employment contract for employees who have less than four years to gain pension rights;
- relatively low qualifications of older people, the need of acquiring new skills and qualifications at a lack of proper training (Szostakowska, Ogrodzka-Klepacz 2013).

The above limitations result in the fact that skills, experience, and knowledge of older people are not fully used, what constricts their significant role in the development of silver economy in Poland.

## 5 Demand for Labour in Conditions of Silver Economy

Demographic transformations have their consequences also in respect to the size and structure of the demand for labour. On the one hand, the process of gradual increase in the percentage of older people in the entire population is treated as a real threat to the economy - in particular, for public finances - but on the other hand it can creatively influence the economy by creating new opportunities for its development. These new possibilities can concern development of previously not used potential of older people, as well as chances for a development of the activity of entities providing goods and services to older persons, or, finally, arise of new segments of market/branches, which can offer a pioneer offer of goods and services.

Comprehensive approach towards understanding the concept of silver economy creates chances for noticing even greater potential advantages resulting from implementing its assumptions.

Introduction of assumptions of silver economy can have an influence on developing new possibilities in the field of a growth of demand for labour in branches and professions which are strictly related with satisfying needs of

older people. This can also relate to the medical and nursing branch, including a growth of demand for work of geriatricians or carers, what previously was not of a great interest of representatives of labour supply. The above mentioned lack of interest may result from an existing gap in declaring needs in this scope, as well as still not high, when compared to other countries, incomes of older people. This branch can develop also in the area of providing new technical and technological solutions, used in the process of rehabilitation or monitoring the health condition of older people. That, in turn, results in a necessity of development of scientific and implementary studies in this field, as well as emergence of new entities interested in production and delivering goods and services of this type. As far as the labour market is concerned, this creates new possibilities in creating new jobs.

In a similar way, it is possible to analyse challenges of other sectors of the economy, which can have its share in transformations of labour market resulting from demographic changes. The literature of the subject formulates propositions of sectors of market that run activities in fields specified as "age sensitive". In an expert publication New Waves of Growth, there are specified areas that constitute fields of observation as far as possibilities of development of silver economy are concerned. These include: education in older age, goods and services of holiday and entertainment branch, health service, wellness, services related with health branch, financial products and services adjusted to age, and consumer products considering age (*New Waves of Growth* 2011, pp. 8-9).

A more precise approach to this issue is represented by P. Enste, G. Naegele, V. Leve, who perceive development potential in fields like below:

- IT technologies in medicine;
- adaptation of apartments and services making life easier;
- promotion of independent life basing on IT technologies;
- gerontology branches essential for economy of health;
- continuing education and culture;
- robotics of services in the area of improving independent life;
- mobility and promotion of its elements, e.g. traffic safety;
- leisure, travelling, culture, communication, entertainment;
- fitness and wellness;
- services facilitating everyday life;
- financial services, especially in areas of capital protection, wealth maintenance, counteracting losses of savings (Enste, Naegele, Leve, 2008, pp. 330-331).

Development of branches related to senior economy seems to be a necessity, but also a chance that is worth to be used. One of key advantages predicted in the Strategy of Human Capital Development 2020 resulting from development of this branch of the economy is a growth of new jobs, especially an increase of a group called “silver jobs”, i.e. jobs producing goods and services related to needs of seniors (Sochańska-Kawiecka, Kołakowska-Seroczyńska, Ziewiec, 2016, p.16).

One effect of ongoing demographic transformations, especially ageing of the society, is creation of so called white jobs, i.e. generating the demand for labour by the sector of caring and health services, rendered mainly for older people. The importance of this sector increases proportionally to an increasing number of older people in the population. Presence of “white” professions in the group of professions that will be searched for in the future is a very probable direction of development. An increasing number of older people shall increase the demand for new jobs in care and support field for this age group (Regional Development Observatory, 2016, p. 8).

Assumptions concerning the necessity of adjusting the situation on the labour market to ongoing demographic transformation are more clearly expressed also in strategic documents. For example, the Regional Operational Programme for Świętokrzyskie Voivodeship for 2014-2020 includes activities related to promotion and increasing competences and professional qualifications, e.g. among people aged 50+ and with low qualifications. These activities also mention the possibility of developing jobs in “white sector” and in “silver and green economy”. It is supported by e.g. the necessity of creating new jobs for people aged 50+ in order they could increase professional competences and qualifications (*Regional Operational Programme for Świętokrzyskie Voivodeship for 2014-2020*).

In the report titled *Potential of labour market of Łódź voivodeship in the field of silver economy*, authors pay attention to numerous barriers and threats related with adjusting labour market to changing reality. As the most serious and difficult ones, they regard financial barriers related to low expenditures on caring and medical services. According to them, finances are the main reason of shortages in human resources at care centres and social care institutions. In their work, weak sides making development of silver economy difficult include also e.g. spatial differentiation of an access to care, deficiencies in the field of qualifications and competences of "silver collars" within the scope of services for seniors, deficiencies of some professions related to care and medicine, insufficient number of institutions supporting activity of seniors, poor cooperation between entities supporting older people (Ciepucha, Koniewski, 2015, p. 204).

Short staff being one of barriers for development of silver economy requires actions, which in the era of so called "ordered specialties" at higher education schools, could have an influence on a growth of education in indispensable fields. However, the situation is more complex. According to a report by the Supreme Chamber of Control, e.g. in the area of education of staff, in the nearest future, the number of medicine doctors, dentists, and nurses in Poland will not be high enough in order to secure medical care for all people who need it (Sochańska-Kawiecka, Kołakowska-Seroczyńska, Ziewiec, 2016, p.16). One of causes of such state is economic migration of medicine graduates. This makes us think that in such situation, a probable deficiency of labour supply will result in a necessity of eliminating it by accepting labour resources from other countries. Another possible and desirable variant is re-emigration, however it requires either significant improvement of salaries level or arising of new factors (e.g. Brexit in United Kingdom or European migration crisis), which will additional incentives for people to return to the country.

## 6 Conclusions

Inevitability of ongoing demographic changes implies a greater necessity to search for ways and possibilities of counteracting their negative results or at least an attempt of attenuating them. The concept of silver economy assumes a use of the potential of older people but also directing the development of the economy towards achieving maximal advantages from these transformations. Polish labour market struggles with structural problems, a lack of match between demand and supply in the qualifications and professional context. What is more, demographic projections depicting changes in the age structure of the population indicate that the problem of a loss and ageing of labour resources will escalate. Thus, there increases an interest in the concept of silver economy creating chances for maintaining economic growth in conditions of ageing society. In order to achieve this, it is necessary e.g. to notice the professional potential of older people on the labour market as well as on the market of goods and services. Promoting education in specialties that are already today characterised by a less number of representatives (medical professions or those related to care over older people) can bring greater potential advantages at the moment when needs in this area emerge. However, the above requires earlier activities and building a belief that such direction is indispensable. Not using chances for labour market and a whole economy can mean a pessimistic scenario for older people as well as for the rest of the professionally active society. It is therefore necessary to create favorable working conditions for the elderly and / or to create jobs dedicated to seniors, as well as to offer goods and services that meet the changing needs of older people.

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# Innovation Management and Innovation Process in Selected Enterprises in the Czech Republic and Poland

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## Abstract

The ability to recognize opportunities and create new ways to exploit them is the foundation of business. Sometimes these are completely new possibilities, taking the form of a radical breakthrough in technology or in the product itself. Another way is that innovation take the form of newly acquired outlets or new ways of providing services in the existing market. What distinguishes real innovators from other companies is the ability to effectively manage innovation and the innovation process. Innovation management is linked to the financing and organization of innovation-making people. On the other hand, the management of the innovation process is based on the management of individual steps from invention to the launch of innovation to the market. Despite the fact that business management is aware of the importance of innovation, it does not always approach innovation management and innovation process effectively. It is therefore important to identify the problems that arise in managing innovation and innovation process and help companies to fix these problems. The contribution of the paper is to evaluate the management of innovation and innovation process in selected enterprises in the Moravian-Silesian Region in the Czech Republic and in the Silesian Voivodeship in Poland. The evaluation will be based on primary data, which will be obtained through a questionnaire survey. The research sample will be 60 Czech and 60 Polish innovative enterprises, i.e. companies carrying out intensive product, process, marketing and organizational innovations. The evaluation of innovation management will be based on an approach to innovation management based on four management models - the opportunist, the advocate, the enabler and the producer according to the authors Wolcott and Lippitz (2007). These two authors emphasize the way in which innovation is financed in innovation management and the way of organizing the implementation of innovations. The cluster analysis will identify differences in the management of the innovation process for selected Czech and Polish enterprises. The results obtained will be shown using dendrogram.

***Keywords:*** *cluster analysis, innovation activities, innovation process, innovation management*

***JEL Classification:*** *O3, L2, M1*

## 1 Introduction

What distinguishes true innovators from other companies is the ability to create a enterprise management system that supports the implementation of innovation. Innovation management is part of the strategic management of a company and can be implemented through the BSC method based on a system of selected indicators - project management or the approach of authors Wolcott and Lipittz (2007), who emphasize the way of financing and way of organizing the implementation of innovations in the management of innovation. The aim of innovation management is to strategically direct the company's innovation activities and their financing. When implementing innovation activities, the company can focus on product innovation or business process innovation

(Oslo Manual 2018). Product innovations are the launch of a new or substantially improved product or service. Business process innovations are internal process innovations that involve the introduction of a new or substantially improved method of production, the introduction of a new IT system or information processing in a company. Further substantial improvement or introduction of business support activities such as administration, maintenance, purchasing or accounting. Part of the innovation of internal processes are marketing innovations representing the introduction of a new way of promotion. Organizational innovations related to the introduction of a new way of organizing the management of supplier-customer relationships.

On the other hand, the management of the innovation process represents the management of the process steps of the implementation of a specific innovation, from the development of a new product, from the obtaining an invention to the launch of a product. Kassay (2013) claims that the innovation process is developed on knowledge and creativity and is based on the creation of invention, innovation and diffusion of innovation. Herzog (2011) defines the innovation process as a time sequence of events that occur when people develop and implement their innovative ideas together in an institutional context. The innovation process begins with the generation of ideas and ends with their commercial use. The innovation process consists of preparing of the innovation, implementing the ideas and developing and launching the innovation. The defined steps of the innovation process are similar for most authors (Košturiak and Chal´, 2008; Herzog, 2011; Kassay, 2013, Peterková 2018). This is usually the phase of generating invention, creating innovation and launching the innovation. However, the authors Tidd and Bessant (2013) claims as part of the innovation process is also the learning phase which serves to gather knowledge from finished projects and allows its use in the next generation of products.

Problems arise in the management of innovation activities and the innovation process. These problems are important to identify and subsequently eliminate them.

The contribution of the paper is to evaluate the management of innovation and innovation process in selected enterprises in the Moravian-Silesian Region in the Czech Republic and in the Silesian Voivodeship in Poland including the identification of problems that arise in the management of innovation activities and innovation process. The evaluation will be based on primary data which will be obtained through a questionnaire survey and verification of four models of management of innovation activities - the opportunist, the advocate, the enabler and the producer according to the authors Wolcott and Lippitz (2009). The research sample will be 120 Czech and Polish companies. Two border regions were selected for comparison of companies, namely the Moravian-Silesian Region (CZ) and the Silesian Voivodeship (PL) with regard to similar economic and cultural development and conditions for implementation and evaluation of innovation activities. The cluster analysis will identify differences in the management of the innovation process for selected Czech and Polish enterprises. The obtained results will be represented by using a dendrogram.

## 2 Theoretical and Methodical Approaches

The current state of knowledge is based on contemporary knowledge presented in domestic and foreign professional literature related to innovation management in the company and the results of own research focused on the management of innovation concepts in industrial enterprises within the project OP VK CZ 1.07/2.3.00/20.0296 Research team for modelling economic and financial processes at VŠB-TU Ostrava (co-researcher) and from own research focused on the analysis of innovation activities in SGS project SP2019/47 "Evaluation of innovation activities and identification of problems in management of the innovation process in selected companies in the Czech Republic and Poland".

Authors Veber et al. (2016), Tidd and Besant (2013), Krasnicka, Glod and Wronka-Pospiech (2016), Birkinshaw, Hamel and Mol (2008) point out that the established innovation management system plays an important role in the creation and implementation of innovations in the company. According to Veber et al. (2016) innovation management represents a complex of activities associated with the initiation of innovation, up to their application. At the same time, Košturiak and Chal´ (2008), Krasnicka, Glod and Wronka-Pospiech (2016), Hitt (2006) emphasize that innovation management should be accompanied by building an organization that has the ability to learn and innovate itself. Authors Wolcott and Lippitz (2007) show how to initiate an internal business that generates new use of market opportunities. It is a new type of internal business approach by which the company's management and its owners create conditions for the creative environment for their employees. The authors created a matrix of four main models of internal innovative business with regard to organizational responsibility and resource authority. The access to finance is considered to be the resource authority. It can be either ex post or ex ante. The ex post approach to the provision of funding is established on the provision of funding only after an evaluation of the profitability of the projects. On the other hand, the ex-ante approach is based on the systematic provision of funding before the implementation of innovation activities. Organizational responsibility means organizing employees implementing innovative projects, which has a concentrated form, i.e.. they create research teams or scattered form, i.e. employees are without research

facilities. With regard to these facts companies apply a model of innovation management either opportunistic, advocate, enabling or producing. Verification of this model in practice will make it possible to determine the systematic nature of the implementation of innovation activities with regard to the allocation of funds and with regard to the created conditions for the implementation of innovations.

The evaluation of innovation activities is carried out in the Czech Republic and Poland by statistical offices in individual countries through a statistical sample survey in two-year cycles. The results of the last innovation survey are for the period 2016 – 2018. The basis for collecting data on innovation activities of enterprises is the harmonized Eurostat model questionnaire for the unified EU survey on innovation CIS 2016 (Community Innovation Survey 2016). A closer understanding of the problems related to the management of the innovation process requires its own questionnaire survey based on a questionnaire.

Cluster analysis can be applied to the analysis of multidimensional data in order to classify a set of objects into several relatively homogeneous subsets, referred to as clusters (Řezanková et al., 2009). Objects inside clusters should be as similar as possible and objects belonging to different clusters as different as possible. The basic criteria for creating object clusters is the similarity between objects. Common clustering methods include: nearest-neighbour method - a pair for clustering is selected according to shortest distances; furthest-neighbour method - the pair for clustering is selected according to the greatest distance; average linkage method - based on the average distance of all objects in the cluster 1 to all objects in the cluster 2 and Ward's method - in each step the increment of the sum of squares of deviations, created by merging them, is calculated for all pairs of deviations, and then the clusters are combined, which corresponds to the minimum value of this increment. Clustering by this method can be represented using a binary tree, a dendrogram.

## 3 Results

The obtained results are based on the implemented survey and on the implementation of cluster analysis to the data from the survey. The structured survey was divided into three areas: A. Identification questions, B. Innovative activities of the company, C. Problems in the implementation of innovative activities of the company. The survey was created online in Google form contained 26 questions and was held in Czech and Polish language. The survey consisted of closed questions with a list of possible answers and opened questions to express the respondents ‘opinions. The research was conducted from June 2019 to September 2019 by phone and e-mail. The respondents were companies ‘directors, research and development directors or technical directors.

### 3.1 Survey Results

The evaluation of the management of innovation activities and the innovation process was carried out on a selected sample of companies in the Moravian-Silesian Region (60 - database of innovative companies of the Association of Innovative Entrepreneurship in the Czech Republic) and in Silesian Voivodeship (60 - database of innovative companies GARP-Górnośląska Agencija Przedsiębiorczośca i Rozwoja in Poland) through own research. Selected results of the survey are evaluated using the statistical program IBM SPSS Statistics 21.

The survey showed that the matrix of the four main models of internal innovation business by Wolcott and Lippitz (2007) which was described in the survey and the respondents from the companies chose the appropriate innovation management model that best describes the approach to innovation management in their company. It was found that in the Moravian-Silesian Region dominated the advocate model (18.2 %), followed by the opportunist model (15.9 %) and the producer model (15.9 %). Last in line was the enabler model (6.8 %). On the other hand, the opportunist model (47.5 %) predominates among innovative companies in the Silesian Voivodeship, followed by the enabler model (5 %), the advocate model (5 %) and the producer model (5 %) at the same level. Most of the innovative companies in the Moravian-Silesian Region and in the Silesian Voivodeship manage the implementation of innovation activities (56.8 % in the Moravian-Silesian Region, 62.5 % in the Silesian Voivodeship).

Based on the results of the survey it was found which of the obstacles most influence the implementation of the innovation process, see Table 1.

**Table 1 -** Obstacles to the implementation of the innovation process.

| Obstacles | Companies CZ | Companies PL |
|---|---|---|
| Lack of staff | 38 | 15 |
| Lack of funding | 26 | 43 |
| Low return of investment | 17 | 10 |
| Problem with public support | 15 | 9 |

| | | |
|---|---|---|
| Low awareness | 6 | 6 |
| Insufficient ability to make decisions | 3 | 2 |

Source: own elaboration

It was found that the biggest obstacles in the implementation of the innovation process in Czech companies include a lack of staff, lack of funding and subsequently a low return on investment. The order of obstacles is different for Polish companies - the biggest obstacle is a lack of funding, followed by a lack of staff and then a low return on investment.

Differences in the approach to the implementation of the innovation process and to the nature of the process were found in innovative companies. In the case of innovative companies in the Moravian-Silesian Region, the implementation of innovation activities is in most cases followed (66.1%) on the basis of set steps resulting from experience from past innovation cases. This results in a formalized innovation process that has precisely defined implementation steps. On the other hand, innovating companies in the Silesian Voivodeship carry out innovation activities intuitively, the implementation steps from past innovation cases are not taken into account and this results in the innovation process not being formalized. According to the average implementation time of one innovation process from the origin of the idea to its implementation, it can be concluded that innovative companies in the Moravian-Silesian Region implement long-term innovation activities (average length of the innovation process is from 2 to 5 years) than innovative companies in Silesian Voivodeship (the average length of the innovation process is around 8-11 months).

The structure of the innovation process can be generalized on the basis of the identified steps of the innovation process for innovative companies in both regions mentioned. We can identify the research phase in the innovation process during which the signals from the internal and external environment are monitored. The selection phase - decision which signal to respond to and the phase of implementation of ideas and their launch to the market. The last phase of learning from the implemented innovation process can be identified only for innovative companies in Moravian – Silesian Region. Only three companies apply the learning phase in innovative companies in the Silesian Voivodeship.

Problems related to the management of the innovation process were also identified from the results of the survey. The biggest problems are the lack of innovation forecasting and poor market research in the market research phase, see Table 2.

**Table 2** – Problems in the market research phase.

| Stages of the innovation process | Problems | Frequency of occurrence in the questionnaire |
|---|---|---|
| Market research - signal monitoring (ideas) from internal and external environment | Missing knowledge from basic and applied research | 23 (8 SV, 15 MSK) |
| | Missing knowledge from marketing analyses | 40 (14 SV, 26 MSK) |
| | Bad market research | 57 (38 SV, 19 MSK) |
| | Lack of innovation forecasting | 61 (46 SV, 15 MSK) |
| | Unavailability of data to map environment | 30 (15 SV, 15 MSK) |
| | Missing search from patent documentation | 5 (1 SV, 4 MSK) |
| | Missing searches from professional articles and magazines | 3 (1 SV, 2 MSK) |

Source: own elaboration

The lack of financial resources for the implementation of the selected idea and insufficient potential customer demand identified on the basis of market research those are the biggest problems in the phase of choosing the decision on which signal to respond to, see Table 3.

**Table 3** – Problems in the phase of choosing the decision.

| Stages of the innovation process | Problems | Frequency of occurrence in the questionnaire |
|---|---|---|
| Choosing a decision on which signal (idea) | Missing knowledge for the implementation of the selected idea | 24 (10 SV, 14 MSK) |

| | | |
|---|---|---|
| will be responded to | Missing funds for the implementation of the selected idea | 60 (39 SV, 21 MSK) |
| | Inadequate technical background for the implementation of the selected idea | 33 (13 SV, 20 MSK) |
| | Insufficient potential customer demand identified from the survey | 68 (41 SV, 27 MSK) |
| | Insufficient qualified workforce for the implementation of the selected idea | 35 (12 SV, 23 MSK) |
| | Intense competitive environment in offering a selected idea on the market | 15 (2 SV, 13 MSK) |

Source: own elaboration

In the phase of implementation of ideas and their launch on the market are the biggest problems the low profitability of the innovated product and the long-term nature of the implementation process, see Table 4.

**Table 4** – Problems in the phase of implementation of idea.

| Stages of the innovation process | Problems | Frequency of occurrence in the questionnaire |
|---|---|---|
| Implementation of ideas and their launching on the market | Lack of experience of employees with implementation | 35 (10 SV, 25 MSK) |
| | The innovated product has worse parameters than the prototype | 16 (9SV, 7 MSK) |
| | Long-term nature of the implementation process | 40 (13 SV, 27 MSK) |
| | The profitability of the innovated product is low | 69 (48 SV, 21 MSK) |
| | Lack of customer interest in the innovated product | 44 (30 SV, 14 MSK) |
| | Bad marketing tools for launching a new product | 14 (2 SV, 12 MSK) |
| | Bad marketing tools to keep a new product on the market | 8 (5 SV, 3 MSK) |

Source: own elaboration

In the learning phase of the implemented innovation process is the biggest problem the lack of evaluation of implemented innovation projects and non-existent routines in the implementation of the innovation process, see Table 5.

**Table 5** – Problems in the learning phase

| Stages of the innovation process | Problems | Frequency of occurrence in the questionnaire |
|---|---|---|
| Learning from the implemented innovation process | Missing formalized steps of the innovation process | 15 (2 SV, 13 MSK) |
| | Lack of evaluation of the implementation of individual steps of the innovation process | 24 (8 SV, 16 MSK) |
| | Lack of evaluation of implemented innovation projects | 56 (40 SV, 16 MSK) |
| | Non-existent routines in the implementation of the innovation process | 45 (37 SV, 8 MSK) |
| | Non-existent knowledge base | 34 (27 SV, 7 MSK) |
| | Reluctance to share knowledge between employees | 18 (7SV, 11 MSK) |
| | Know-how only for a closed group of employees | 17 (3 SV, 14 MSK) |

Source: own elaboration

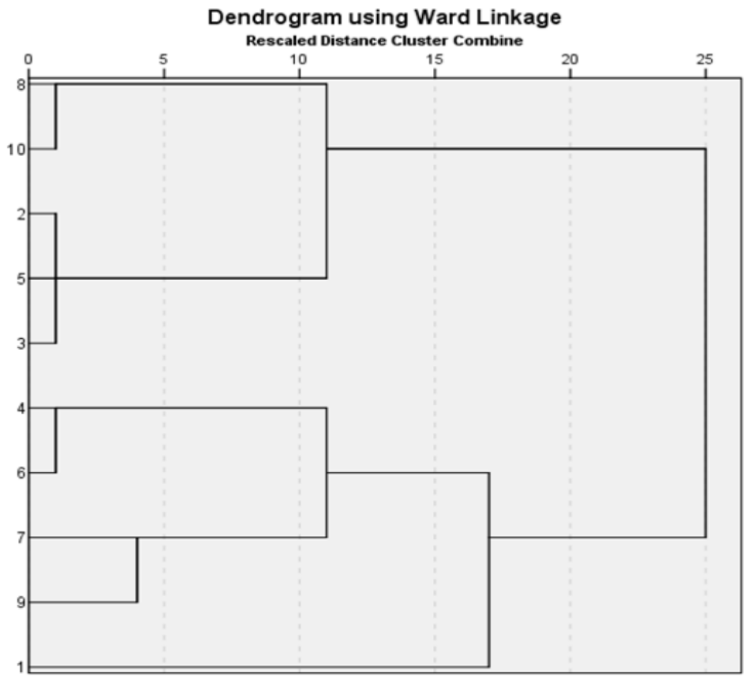
### 3.2 Cluster Analysis Results

Cluster analysis and Ward's method with Euclidean distance was used to identify differences in the management of the innovation process in selected companies in the Czech Republic and Poland. Cluster analysis was performed using SPSS software. Clustering by this method is shown using a binary tree, dendrogram (Figure 1). Cluster analysis classifies sets of objects into 7 relatively homogeneous subsets marked as clusters. The

following 4 criteria were used for clustering: model, obstacles, process formalization, problems in individual stages. The clustering made it possible to specify the differences and common features of innovative companies in the Moravian-Silesian Region and the Silesian Voivodeship.

In the cluster 1 a connection between the type of innovation management model and the method of research implementation appeared in Czech and Polish companies. It turned out that if companies apply the producer model they have their own research and development. In the cluster 2 which consisted only of Polish companies it turned out that companies that apply the opportunistic model are most affected by the lack of funds in the implementation of innovations. Also the cluster 3 consisted of Polish companies and the opportunistic model was applied and at the same time these companies do not have an innovative philosophy. Insufficient demand which is accompanied by a lack of funds those were the common features in the cluster 4 which contained Czech and Polish companies. In the cluster 5 which consisted of companies from both countries, the common features include a lack of staff and insufficient marketing research. The cluster 6 was created only of Czech companies - it was found that there is a lack of experience in evaluating the implementation of innovation and steps. Cluster 7 involved only Polish companies. These companies applied the opportunistic model but there was no forecasting of innovation.

**Figure 1** – Dendrogram Source: own elaboration




## 4 Conclusion

Innovations play a crucial role in the corporate philosophy and mainly technical and product innovations are implemented in both border regions. Despite the fact that both regions are economically and culturally similar, there are differences in the obstacles to the implementation of the innovation process. Specially in the way they develop innovative products and in the applied models of innovation management. There is also a different approach to the implementation of the process steps of the innovation process. The innovation process is formalized in the case of Czech companies. While in Polish companies the process steps of the innovation process are implemented intuitively.

Problems related to the management of the innovation process were identified based on the survey on a sample of 60 Polish and 60 Czech companies and a stack of type problems was created. Those problems are included in the individual phases of the innovation process.

Cluster analysis and Ward's method with Euclidean distance was used to identify differences in the management of the innovation process in selected companies in the Czech Republic and Poland. The clustering made it possible to specify the differences and common features of innovative companies in the Moravian-Silesian Region and the Silesian Voivodeship.

Despite the existing differences in the management of innovation activities and the innovation process, innovation is proving to play an important role in entrepreneurship in both regions.

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# The Concept of the State-Supported Insurance in the Czech Republic and Poland

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## Abstract

Territorial and political risks can have enormous effects on business operations, can generate significant profits, but also incur huge financial losses or total cancellation of ongoing operations. Political and commercial risks are becoming a key issue that various entrepreneurs must be concern for. The solution is export insurance, which is able to cover territorial risks and long-term commercial risks, thereby help to cope with unexpected situations. Insurance for these situations is available on commercial basis and with state support. Therefore, the state supports export through specialized insurance institutions and thus helps exporters to trade in countries with political, macroeconomic and financially lower stability. The aim of the paper is to compare the current pro-export policy in the Czech Republic and Poland on the approach to insurance with state support. The authors are aware that the conditions for pro-export policy are comparable in developed countries. Because export support, although it is a national competence, must be set in accordance with international rules established at the level of the WTO, the OECD and the EU. Nevertheless, there are obvious differences in the concept, methods and rules of the pro-export policy setting of individual states, which the authors explain in the approaches to state-supported insurance in the CR and Poland.

***Keywords:*** *export support, foreign policy, political risks, state-supported insurance, territorial risks*

***JEL Classification:*** *F13, F36, F53, K33*

## 1 Introduction

Export is an important economic variable, but it is difficult for the exporter to succeed in foreign markets. Therefore, export promotion plays an important role. Pro-export policy is part of foreign trade policy and each state decides on its own export support. However, there are rules at international level that must be followed. It is a set of principles and means by which trade relations are organized with other countries. Through the government, individual countries try to provide information on all opportunities, risks in other countries and offer financial subsidies to penetrate foreign markets. (Beneš, 2004). The rules are set in accordance with international rules established at the level of the World Trade Organization, the Organization for Economic Co-operation and Development and the European Union.

In general, the rules for the use of state aid for financing and insuring export credits from public sources are regulated by the OECD Consensus, or the Arrangement on Officially Supported Export Credits. The OECD Consensus first came into existence in 1978 and conditions have been gradually developed and updated to current needs. (OECD, 2020) The Consensus sets down the conditions that must be met by transactions applying for financing or insurance with state support. It contains conditions concerning the loan period, the share of advance payment and payments upon delivery, the frequency and size of instalments, minimum interest and insurance rates, shares of local costs, etc. Insurance companies have set the most advantageous conditions under which they can offer insurance. (Machková, Černohlávková, Sato, 2014)

Adherence to the OECD Consensus is only mandatory, it is a so-called gentleman's agreement, which its participants have decided to observe. (OECD, 2020) For EU member states, observance of the OECD Consensus is legally binding. Compliance is established in Council Directive 98/29/EC of May 1998 on the harmonisation of the main provisions concerning export credit insurance for transactions with medium and long-term cover. According to Machková, Černohlávková, Sato (2014), the European Union wanted to ensure that there is no distortion of competitiveness between member states in the field of financing, insurance and loan guarantees. In addition to the rules set by the Consensus and the EU, the states follow the principles established by the Berne Union. It is the International Union of Credit and Investment Insurers. The Union was founded in 1934. The mission of the Berne Union is to actively facilitate foreign trade by supporting the international acceptance of sound principles in the field of export credit and foreign investment. (Berne Union, 2020)

The rules and principles are set at the international level. Nevertheless, there are obvious differences in the concept, methods and rules of setting the pro-export policy of individual states. Methods of export support have common features, so that companies can export to markets to which they would not penetrate only with their own financing. According to Beneš (2004), the correct setting of rules for the provision of support and subsidies by the state is crucial. If the state set the rules incorrectly, companies that do not need it could get access to funding, and the benefits would only come for companies that achieve the subsidy. State support for export has become a standard tool.

Insurance of credit risks becomes a specialized area where professionalism is required, so there are not many insurers. In addition to private insurance companies, state agencies and state-owned enterprises also operate on the market. The largest credit insurers are offering their services on a commercial basis and also with state support. Authors Alsem, K. J. et al. (2003) study the key determinants of export credit risk insurability by the private market. However, according to Böhm (2004), so-called territorial risks and long-term commercial risks cannot be insured by ordinary commercial insurance companies. Basically, export insurance with state support, which is currently able to cover territorial risks and long-term commercial risks, fills a gap in the market. It thus helps to conduct trade in countries with less political, macroeconomic and financial stability, which is confirmed by a number of studies. Baltensperger and Herger (2009) analyze public export insurance in OECD countries and conclude that though such schemes appear to have promoted trade towards middle and high-income countries, they failed to facilitate trade with low-income, and thus rather unstable, countries. At the same time, Baltensperger and Herger (2009) point out that as with any insurance scheme, issuing trade credits with a state-guarantee may furthermore give rise to adverse incentives, e.g. when exporting firms engage in excessive risk taking. In their study, Janda, Michalikova and Skuhrovec (2013), on the other hand, demonstrate the importance of export support on the example of the Czech Republic. Janda, Michalikova and Skuhrovec (2013) show that the support of export credits had a significant positive effect on the growth of the Czech Republic's export and at the same time better control of political risk and trade costs. Also Auboin and Engemann (2014) strongly emphasize the positive impact of the insurance of the trade credit, with the interesting result that the positive impact does not change between crisis and non-crisis periods.

The aim of the paper is to compare the current pro-export policy in the Czech Republic and Poland on access to insurance with state support. Also, in the Czech Republic and Poland, export support from the state is provided through specialized financial institutions. In the Czech Republic, state-supported insurance is offered by the Export Guarantee and Insurance Corporation, known as EGAP, and in Poland by the Export Credit Insurance Corporation, or KUKE.

## 2 Pro-export Policy and Access to Insurance with State Support in the Czech Republic and Poland

Both countries have similar cultural values and social roots. Both the Czech Republic and Poland were part of the USSR, now they are members of the Visegrád Four and the European Union. Both countries joined the EU on 1 May 2004, but this did not fundamentally change the area of support. Even before joining the EU, both countries followed the international rules of the OECD and the Berne Union. The only obligation arising from this step is compliance with the EU's Common Commercial Policy.

Pro-export policy is implemented by the state itself through institutions that are set up for this purpose. An Export Guarantee and Insurance Corporation was established in the Czech Republic to support export, in Poland it is the Export Credit Insurance Corporation. At present, they are the only state-supported insurers in these countries. As we know, the conditions for insuring loans with state support are set internationally, which is why the products offered by individual insurance companies are comparable in the most developed countries.

Pro-export policy in the Czech Republic is regulated by the government-approved document Export Strategy of the Czech Republic for the period 2012-2020. The purpose of the document is to define visions, main goals and key projects of the state pro-export policy, with the aim to restructure and streamline export support (an

overview and development of export support is presented by Janda, Michalikova and Skuhrovec (2013)). The Strategy identifies three pillars - reporting for export, export development and promotion of business opportunities. The principle of the strategy is to define priority and interest markets on the basis of growth potential, absorption capacity and compatibility in relation to the Czech economy. Prioritized countries include Brazil, the PRC, India, Iraq, Kazakhstan, Mexico, the Russian Federation, Serbia, Turkey, Ukraine, USA, Vietnam. Countries of interest include Angola, Argentina, Australia, Azerbaijan, Belarus, Egypt, Ethiopia, Chile, Ghana, Croatia, Israel, Japan, Republic of South Africa, Canada, Colombia, Morocco, Moldova, Nigeria, Norway, Peru, Senegal, Singapore, the UAE, Switzerland and Thailand. The export strategy aims to maintain the current position and develop positions in the SME segment enterprises. The main goal for the Czech Republic is to become one of the 20 most competitive countries in the world by 2020. (MPO, 2016)

In the Czech Republic, the state strives to create favorable conditions for exporters and removes obstacles through local government bodies and various organizations established for this purpose. (Beneš, 2004) Financing and insurance for export are currently offered in the Czech Republic by two state-controlled institutions. The first of these is the Czech Export Bank (CEB), which provides export credits and other related services. The second is the Export Guarantee and Insurance Corporation (EGAP), which insures export credits. In addition to state-controlled institutions, there are also private institutions in this area, namely commercial banks and specialized commercial insurance companies. Another institution to support export is the Czech Trade Promotion Agency CzechTrade. This institution focuses primarily on consulting services, namely providing information. Export support also comes from European Union funds. Compliance with the rules for the origin of goods is a basic precondition for the provision of insurance with state support. The rule tells us that the share of Czech goods and services in the total value of export must reach at least 50%. (EGAP, 2020b)

In Poland, we can find a comprehensive concept for export promotion in a document called Strategie na rzecz odpowiedzialnego rozwoju do roku 2020 (with a view to 2030). This document was adopted by the Polish government in 2017 and is a medium-term development strategy for Poland. If we compare export support with the Czech Republic, there are fewer export-supporting institutions in Poland. Polish export is supported mainly by European Union funds. Pro-export policy is also dealt with the Ministry of Finance and the Embassy, specifically the Trade and Investment Promotion Department. Institutions that deal with export promotion in Poland are mainly Bank gospodarstwa krajowego (Bank of National Economy, BGK), Krajowa Izba Gospodarcza (National Chamber of Commerce), Korporacja ubezpieczén kredytów eksportowych spolka akcyjna (Export Credit Insurance Corporation, KUKE) and others. Polska Agencja Inwestycji i Handlu (Polish Investment and Trade Agency, PAIH) is also responsible for Polish export support, providing export support for Polish products in nine areas - furniture, Polish fashion, yachts and boats, cosmetics, medical supplies, biotechnology and pharmaceuticals, construction and finalization of buildings, machines and tools, automotive and aircraft parts. The other three areas of export - food, IT, health services - are supported by three other institutions - Krajowy Ośrodek Wsparcia Rolnictwa (KOWR), Polska Agencja Rozwoju Przedsiębiorczości (PARP) and Polska Organizacja Turystyczna (POT). In addition, Polish entrepreneurs can benefit from export support under the government's support program in promising markets (Rządowy Program Promocji na rynkach perspektywistycznych) and the government's "GO" programs (Rządowe Programy "GO"). (Tereszczuk, 2018)

In terms of pro-export policy concepts in individual countries, it is possible to see not only differences, but also similarities. Both countries are trying to support a long-term pro-export policy, as they are aware of the major impacts of this area on their economies. Of course, each country mainly supports areas in which it excels, or which are important for this country. However, we cannot ignore the geopolitical features of individual countries, where Poland is several times larger than the Czech Republic, the Czech Republic is located in the middle of Europe. Therefore, the Czech Republic's focus on export and its support also plays a much larger role in the Czech Republic. However, this does not reduce Poland's activities in this area. Both countries significantly support export in the form of state aid insurance. In the Czech Republic, state-supported insurance is offered by the Export Guarantee and Insurance Corporation, known as EGAP, and in Poland by the Export Credit Insurance Corporation, or KUKE.

### 2.1 Export Guarantee and Insurance Corporation (EGAP) - Czech Republic

The Export Guarantee and Insurance Corporation (EGAP) is a state credit insurance company, which was founded in June 1992 as a reaction to the transformation of the Czechoslovak economy, where an integral part was the creation of institutions to support export. It is a joint-stock company, which is 100% owned by the state and shareholder rights are exercised through the Ministry of Finance of the Czech Republic. (EGAP, 2020a) From the very beginning, EGAP focuses on uninsurable political and commercial risks associated with export financing, especially to countries where there is a greater degree of uncertainty or risk of default due to the political, economic and legal environment. The insurance covers the financing of export of large energy, machinery and technological systems, investment projects, transport constructions and investments.

EGAP mainly insures the bank loans due in over 2 years. Thanks to the fact that it provides credit insurance with state support, it helps Czech exporters to insure themselves against risks against which they could not insure themselves on the commercial insurance market. (EGAP, 2020a) The products offered by the insurance company are divided according to individual risks. Against *the risk of non-payment directly for exporters* is offered by the Insurance of a Short-Term Export Supplier Credit against the Risk of Non-Payment and the Insurance of a Medium and Long-Term Export Supplier Credit against the Risk of Non-Payment. EGAP can be insured against *the risk of non-payment for the financing bank* within the Insurance of a Short Term Export Supplier Credit Financed by a Bank against the Risk of Non Payment, Insurance of a Medium and Long Term Export Supplier Credit Financed by a Bank against the Risk of Non Payment, Insurance of an Export Buyer Credit against the risk of Non-Payment, Insurance of Confirmed Letter of Credit, Insurance of a Credit for Pre-Export Financing of Production for Export and Insurance of Credit for the Financing of Investment in Foreign Countries. Against *the risk of devaluation of the investment* can be arranged Insurance of Investment in Foreign Countries and Insurance of Credit for the Financing of Investment in Foreign Countries. *The risk of cancellation of the contract by the importer* is insurable thanks to the Insurance Against the Risk of Inability to Fulfil an Export Contract. In addition to the above, EGAP offers *insurance of bank guarantees*. Within this product, it is possible to arrange Insurance of a Bank Guarantee Issued in Relation to Fulfilment of Conditions for Winning or Performing. For small and medium-sized enterprises, the offer is tailor-made, so they also have the option of export insurance in the same way as large corporations. (EGAP, 2020c)

### 2.2 Export Credit Insurance Corporation (KUKE) – Poland

In Poland, this type of insurance with state support is offered by the Export Credit Insurance Corporation (KUKE - Korporacja Ubezpieczeń Kredytów Eksportowych Spółka Akcyjna, KUKE S. A.). It was founded in 1991 as a joint stock company. Shareholder rights are divided between the state represented by the Ministry of Finance (87.85%) and the National Economic Bank (12.15%). It insures the business transactions of its clients both in the territory of this state and abroad. In its activities, it focuses primarily on insuring trade receivables arising from sales of goods and services with deferred payment, as well as on the provision of insurance guarantees. It is the only one company in Poland, which is authorized to provide export insurance backed by the State Treasury and thus offering insurance cover on markets exposed to higher political risk. (KUKE, 2020a,b)

Together with Bankiem gospodarstwa krajowego (Bank of National Economy, BGK), KUKE implements a government export financial support program. The aim of this program is to support Polish export by facilitating Polish entrepreneurs' access to loans to finance the export of Polish goods and services. The funds are paid directly to Polish exporters, and foreign customers, upon receipt of the goods or services, subsequently repay the loan directly to the bank. The advantage is that the transaction is insured with the Export Credit Insurance Corporation (KUKE), which thus provides protection to entrepreneurs against political and commercial risk. (Ostrowska, Skuriat, 2013)

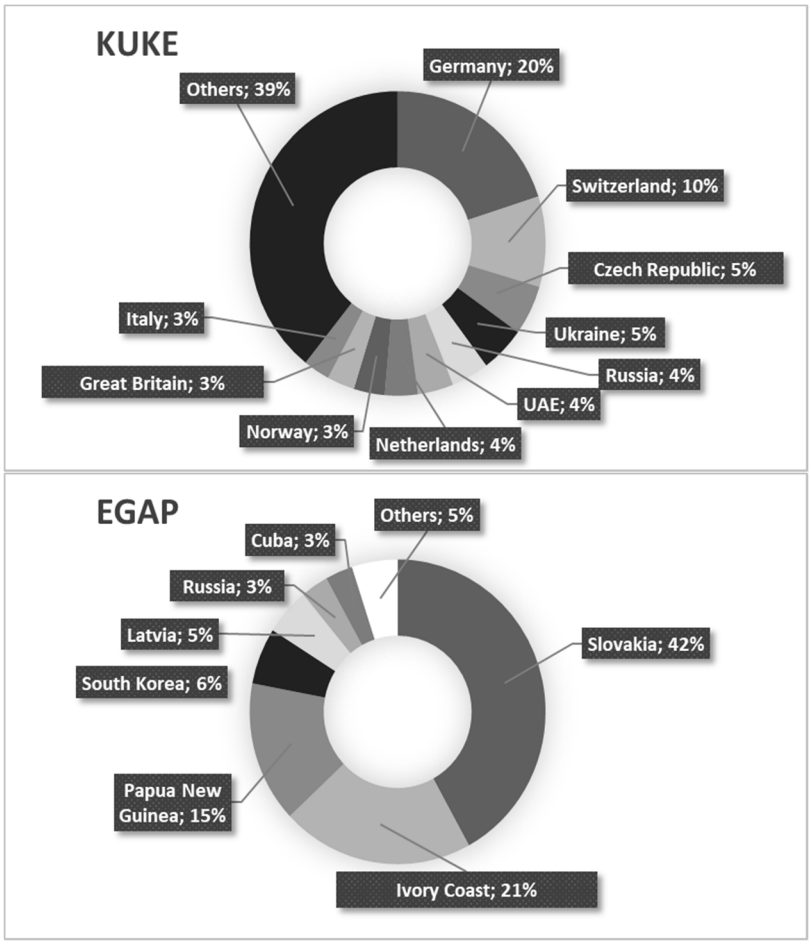
KUKE provides its services to Polish entrepreneurs to facilitate secure trade. They insure export and domestic transactions and trade receivables arising from sales of goods and services with deferred payment. KUKE, like EGAP, provides credit insurance guaranteed by the State Treasury, and therefore they can also insure bank loans due in over 2 years. Thanks to this, it also offers insurance coverage even in markets exposed to higher political risk. (KUKE, 2020a)

The products are offered according to the type of customers - for enterprises and for banks or financial institutions. The *offer for enterprises* consists of Policy for the East, Insurance of a Single Export Contract, Insurance of Direct Investments Abroad, Contract Bond Insurance and Insurance of Bonds Concerning Short-term Loans Financing Export Contracts. *Banks* can choose from products such as Buyer’s Credit Insurance, Insurance of Forfaiting, Insurance of Financial Leasing and Bonds concerning Letters of Credit. (KUKE, 2020b)

## 3 Comparison of Selected Indicators

The offer, tools and results of insurance companies with state support we compare according to various determinants, territories, products, economies. For the article, we select a comparison of the volume of export that were insured or guaranteed by insurance, according to individual countries (Figure 1).

**Figure 1** – Percentage share of countries in the total volume of export credits in 2018 of KUKE and EGAP.




Source: own elaboration by *Annual report KUKE (2019)* and *Annual report EGAP (2019)*

The pie chart (Figure 1) shows the countries to which EGAP and KUKE provided export credits in 2018. KUKE provided the most loans in 2018 to countries such as Germany, Switzerland, the Czech Republic and Ukraine. Among the most significant supported projects in 2018 were loans to Feerum company, which signed contracts with a Ukrainian company for the sale of grain silo complexes. (KUKE, 2019) In the case of EGAP dominates Slovakia, followed by Ivory Coast, Papua New Guinea and South Korea. One of the most significant projects supported by EGAP this year was the export of 450 Iveco buses to Ivory Coast. The total value of the project reached almost 2.4 billion CZK. Other significant projects implemented with EGAP insurance in 2018 include the modernization and reconstruction of the hospital in Papua New Guinea. (EGAP, 2019). What is interesting about the data in this chart is that KUKE protects the trade transactions with partners from countries of higher risk (i.e. Russia, Ukraine, Belarus, Kazakhstan etc.), but still, the largest share in exports is to Germany, Switzerland, the Czech Republic and Italy. It can be seen from the data in chart that EGAP reported more projects with countries of higher risks than KUKE. But in the territorial structure of insured commitment, i.e. all currently insured export credit risks, closely reflects the structure of interest and target countries of Czech or Polish exporters. The next part, therefore, moves on to discuss the financial results.

Table 1 provides an overview of selected financial results: net income and insured export volume. As can be seen from the table the results are favorable for both companies. Table reveals that there has been a steady number of insured export volume of EGAP and KUKE. Premium new transactions, entrance into new markets and a struggle with problematic older business transactions, it is some transactions that are behind the negative economic result. But EGAP and KUKE do not have the primary goal of creating a surplus, rather supporting the competitiveness of Czech and Polish exporters. Its activities, however, should balance off over the long term, which is illustrated by the data in the table.

**Table 1** – Selected results of KUKE and EGAP

| KUKE | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| **Net income (thousand Eur)** | 2,491.2 | 4,108.9 | -1,820.8 | 887.7 | 1,210.8 | 516.0 | 1,366.9 | 119.5 | 457.0 |
| **Insured export volume (mil. Eur)** | 6,304.2 | 6,945.2 | 6,583.1 | 6,334.4 | 6,851.9 | 6,737.3 | 7,141.2 | 8,935.5 | 10,716.4 |

| EGAP | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| **Net income (thousand Eur)** | 13,694.1 | -38,140.2 | -7,446.4 | -36,033.4 | -217,653.4 | -197,856.8 | -45,296.0 | -86,560.1 | 7,628.0 |
| **Insured export volume (mil. Eur)** | 2,440.9 | 1,925.1 | 2,618.9 | 2,302.9 | 1,714.5 | 1,471.1 | 1,158.7 | 1,554.7 | 1,300.8 |

Source: own elaboration by *Annual report KUKE (2010-2018)* and *Annual report EGAP (2010-2018)*

We describe the last numbers in more detail. In 2018, EGAP's financial results improved significantly. Corporation was able to make a profit from the loss in a year. This is due to an increase in the number of concluded contracts and a reduction in the cost of insurance benefits. The interest of Czech exporters in insurance in EGAP grew last year. In 2019, the EGAP insurance company supported 63 exporters, which is two more year-on-year. The total volume of insured export decreased, from 1.5 billion EUR to 1.3 billion EUR. (EGAP, 2019) In 2018, all selected results at KUKE also increased compared to the previous year, so we can say that the company is increasingly succeeding in supporting export in the country. The only negative is that, together with other variables, the cost of insurance activity also increased. In 2018, KUKE insured business transactions in a total of 10,716.45 million EUR, i. e. 19.9% more than in the previous year. In fact, all values in 2018 grew by more than 10% compared to 2017.

We can also compare the current approach of corporations to the coronavirus crisis, which has become a global risk and which will significantly affect international trade. We can expect some deglobalization in international trade and elements of protectionism to prevail. The insurance segment also had to face the new risk and introduce specialized tools in the shortest possible time. EGAP offers assistance to Czech exporters who are threatened by the economic consequences of a viral pandemic, such as reduced fees, shorter waiting times and priority processing of current applications. Insurance companies are coming up with new products that are aimed at companies with the effects of a pandemic. EGAP, for example, offers a guarantee program for large companies, COVID Plus. KUKE offers new tools for times of crisis called KUKE GAP EX and KUKE GAP EX + with a guarantee of State Treasury.

The European Commission also responded to the situation by easing the conditions for the provision of financial and reinsurance services to specialized state institutions. The so-called ECA (Export Credit Agencies), which includes EGAP and KUKE, can also offer their products in the countries of the European Union and in other developed markets, such as the United States.

## 4 Conclusion

By providing state-supported insurance, states increase domestic economic activity, employment, gross domestic product and trade relations with other countries. The benefits of state-supported insurance are also beneficial not only for exporters but also for their subcontractors. The benefits include the possibility of increasing jobs and developing employment, maintaining a certain type of production, sustaining highly qualified workers and know-how. A great benefit is the opportunity to find business opportunities and new business contracts not only in the European Union, but also in developing markets in Asia, Africa or Central and South America. (EGAP, 2020b)

Pro-export measures have long been supported in both studied countries – in the Czech Republic and Poland. Both countries use similar tools to support export, out of consideration for their historical development. One of the key tools is the provision of state guarantees through insurance instruments. From a comparison of pro-export policy in the Czech Republic and Poland, we can say that in both countries, a certain ministry always deals with export support. In the Czech Republic, this issue is being addressed by the Ministry of Industry and Trade together with the Ministry of Foreign Affairs. There were established institutions such as the Czech Export Bank, the Export Guarantee and Insurance Corporation or the CzechTrade Agency. In Poland, the Ministry of Finance is in charge. There were also established institutions such as the Bank of the National Economy, the National Chamber of Commerce and the Export Credit Insurance Corporation were also established here.

Differences can be seen in particular in the areas that are priority for individual countries and in the instruments through which these priority areas are supported. For this reason, in individual countries have been developed tools that focus specifically on these areas. However, in the territorial structure of insured commitment, i.e. all currently insured export credit risks, closely reflects the structure of interest and target countries of Czech or Polish exporters, too.

The results of this research support the idea that the state-supported insurance fills a gap in the market and complements the offer of commercial credit insurers. In cases where private (commercial) credit insurance companies cannot secure a specific business, for example due to high risk, it is necessary to use insurance with state support. It was confirmed that EGAP and KUKE do not have the primary goal of creating a surplus but its activities, however, should balance off over the long term. Taken together, these results suggest that the state-supported insurance has primarily supporting the competitiveness of Czech and Polish exporters mostly with its insurance rates and providing other advantageous conditions.

A new challenge in this area is caused by the unprecedented SARS-COVID-19 pandemic in the world. At the moment its consequences are unpredictable, because it is an unprecedented situation in which, with a few exceptions, the whole world has stopped and state borders have been closed. This situation logically had to be reflected in the pro-export policy of individual states, and it is already clear that these states are trying to react flexibly to the new situation. Both EGAP and KUKE are introducing new insurance instruments with the support of the European Commission. The stability of individual states in terms of public finances will also play an important role here. Here we dare to say, that the Czech Republic is better than Poland because it has a much lower public debt. But in the context of other states, even Poland has nothing to be ashamed of. Further research might explore consequences of SARS-COVID-19 pandemic to pro-export policy of individual states.

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# Entrepreneurship in Rural Areas and Sustainable Development - to What Extent Self-Government Activities Support them. A Case Study of Opole Voivodeship

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## Abstract

Entrepreneurship acts as a catalyst for resolving many economic and social issues. It is often seen as the key factor in driving employment rates in rural areas, particularly among young people. It significantly impacts the overall development of the region, including the quality of life. More job opportunities help create employment for a number of people within their own social system. More specifically, it encourages young and well-educated people to stay in village areas which otherwise become increasingly depopulated. This brings us to a problem; to overcome the existing challenges, rural areas must not only drive the development but also ensure its sustainability.

Sustainable rural development should provide alternative sources of income and shape agricultural production in accordance with the environmental standards to preserve the landscape. Therefore, it is expected to concurrently shape the conditions for diverse economic activities and support the development of social and cultural functions to ensure good living standards.

The purpose of this paper is to present the factors promoting entrepreneurship and sustainable rural development based on activities undertaken by self-government and residents of rural areas. The findings of this paper were obtained through desk research, surveys, and interviews with leaders of Local Action Groups of Opole Voivodeship. The research results indicate a high level of satisfaction with the business environment, especially in terms of infrastructure, transport accessibility and cooperation with the local environment and public administration.

***Keywords:*** *epreneurship, Opole Voivodeship, rural areas, Rural Renewal Program, sustainable development*

***JEL Classification:*** *Q01, Q56, J24*

## 1 Introduction

Rural entrepreneurship is an interesting phenomenon, which draws attention of numerous researchers, mainly in Europe and developing countries [4]. It has a vital role as a change factor in rural areas and this itself makes it worth being explored. To foster rural development many national and international institutions support the creation of businesses as part of programs stimulating endogenous sources of local growth i.e. LEADER, monitoring at the same time their results and disseminating lessons learned. With their centralized frameworks, even if statistically relevant, such programs should be verified on a systematic basis among the direct beneficiary, to understand their utility, adaptation needs and real impact on the original problem. The results of such verification are reported in this paper, which aims to present the factors promoting entrepreneurship and sustainable rural development based on activities undertaken by local administration and residents of rural areas. The data were collected through surveys and interviews with leaders of Local Action Groups of Opole Voivodship to figure out local echoing of the program framework and its performance. In parallel, the first

surveys and interviews concepts were confronted in current paper with later theory development on rural entrepreneurship to enrich future research directions.

### 1.1. Rural Entrepreneurship Notion

With more than two decades of research, the term "rural entrepreneurship" has already many different approaches elaborated[13].Gaddefors and Anderson provide insightful reflections on risks engendered by some emotional appeal hiding in the rurality notion, which can bias/influence the research conception and process and “impose embellished assumptions of the rural”[4]. Some reflections on that risk seem to also have impact on the programs addressed to the rural areas mainly focused on preserving natural and cultural landscapes (with quality of life improvements for rural population) through plethora of actions such as infrastructure, agriculture, tourism, small and medium businesses and community development and the jobs creation, as well as the protection of environment and education [5].

Gaddefors and Anderson point out two concepts of rural entrepreneurship that can be found in the literature with distinctive epistemological roots, approaches, methods and research questions. The first is loaded with some attribution error (when the simple qualifier “rural” is taken as a genre distinction) - namely “rural entrepreneurship” and the second one refers to the spatial aspect: “entrepreneurship in the rural” being just a form of entrepreneurship existing in the rural areas [4]. Such entrepreneurship adds value in rural context of resources used, people employed, rural jobs generated and local government budgets supported [7].That perspective was formerly adopted in this research framework and allows us to make use of general issues on entrepreneurship.

The stimulation of entrepreneurship needs entrepreneurial communities and change in the culture of the rural area and people [5].The concept of entrepreneurship culture can be defined by a set of beliefs, norms, decision making capacities and behavioral patterns shared by the members of the company or the territory. The important fact is that the entrepreneurship refers not only to the scope of economic activities of one entity or manifests itself just in the form of economic undertakings, but also as activities resulting from the ability to adapt to changing conditions, and to perceive opportunities and use them.[3]. According to Gaddefors and Anderson rural entrepreneurship covers “those activities where entrepreneurship interacts and engages with contexts” understood as a pool of attributes (social, cultural, spatial and institutional) used by the entrepreneurial activities and otherwise shaping them[4].

Interesting feature of rural entrepreneurship is that some of businesses in rural area are led by in-migrants, which appear as more growth-oriented in comparison to locally issued firms [1]. It can be explained partially by the “local embeddedness” which motivates local entrepreneurs to use in-place resources and to go for them to their network (family and friends)[12][10]. Contrary to that, non-local connections are developed to overtake structural holes (opportunity source for entrepreneurs) mostly by in-migrant entrepreneurs but also by local ones to find markets, partners and resources lacking in the original place [12].

Urban and rural areas differ in economic, social and environmental terms. Due to the diverging dynamics in urban and rural areas, the social and economic distance between them might increase in the future even more. Rural entrepreneurs with linkages to urban areas are able to bridge the rural–urban divide by accessing some of the urban features, such as knowledge and markets, while at the same time profiting from the advantages of their peripheral location.” [9]. Such impulse can prompt other inhabitants to take a chance and establish their own businesses, it can also form a plethora of locally successful business models and raise the awareness of the local government towards the needs of rural entrepreneurs.

### 1.2 Rural Entrepreneurship and Local Government Impact

Among basic factors impacting rural entrepreneurship are an opportunity and desire to become an entrepreneur - first and foremost with a set of internal entrepreneurial abilities, investment, market and macro-economic conditions, but also covering more complex reality with individual and environmental factors[6]. This can be completed by a larger model of rural entrepreneurial ecosystem development [11]. In both proposals the institutional dimension is mentioned, as a part of framework consisting of natural capital, culture, demand, and infrastructure along with institutions and governance. Local authorities are furnishing needed funds with external (mostly) support, to develop necessary infrastructures – technical and social as well. Territorial governments play crucial role in the rising of the competitiveness of local markets attracting new businesses or sustaining existing ones, through policies shaping property rights, access to information and infrastructures, (co)funding the promotion of local products and outcomes, impacting the performance of obligatory education (primary and secondary with vocational education level) to outline local labor market. Proportionately to the competences executed on the local government level, by its doings it can encourage entrepreneurship or impede such activity[13]. Besides weak governance, also sociocultural barriers and lack of successful entrepreneurial

examples form the vicious triangle of institutional barriers to obstruct rural entrepreneurship [11]. The important question is how they are used- since even smallest community has considerable tools to impact local achievement - is that beneficial for inhabitants and businesses or produce some obscure effects representing the "dark side" of rural remoteness[15]. Actively lobbying for locally scarce resources the rural government can bring into play its community political capital increasing chance to acquire them[13] and at the same time building the self-confidence of its members and sometimes giving them access to the first entrepreneurial experiences. Establishing the vision of rural area development and coordinating its realization, the local government can also inspire the sustainable transformation of the place and its entrepreneurial tissue.

### 1.3 Sustainable Dimension of Rural Entrepreneurship

When it comes to interest in development, researches are often based on examples of high-tech activities, oriented by technology and by a market-focused corporate culture. As a consequence, the field of innovation is narrowed to the most technological dimensions. This way minor innovations and even many territories are ignored. The example of such territory can be rural areas where high-tech solutions might not be used, but other sorts of innovation activities (social, organizational, institutional, etc.) are present. Moreover, the existence of local products and skills: either part of industrial manufacturing as well as the modernization of traditional crafts, not necessarily involving high-tech activities, appear to be keys to the improved competitiveness of rural areas[8]. E. Harpa reports similar observations that the majority of rural entrepreneurs are non-innovators [5]. However, there is a growing interest in promoting social economic and environmental sustainability at the local level. Even if many say that it's not enough, that actions should be intensified, especially on larger scale, local actions have proved their efficiency. While the Declaration of the United Nations Conference on the Human Environment (Stockholm, 1972) outlined sustainable development in the ecological, economic and social context, it was only unveiled in Rio Declaration that participation of a conscious society (entrepreneurial attitude) is required. That is because one of the superior principles of creating conditions for effective achievement of goals is constant and consistent raising of public awareness (awareness, entrepreneurial attitude as well as commitment to social issues), as well as an increase in the public access to information and its participation in the decision-making process.

The aim of supporting the sustainable development of rural areas is to provide alternative sources of income and to shape agricultural production in accordance with the environmental requirements and in a manner that ensures the preservation of the landscape assets. Such a support is also important as far as the improvement of the social and the technical infrastructure is concerned. All the actions taken are designed to reduce unemployment, including structural unemployment. The sustainable development of rural areas is connected with the concept of their multifunctionality, with the shaping of the conditions for diverse economic activities carried out with respect for environmental aspects, with the development of social and cultural functions, and with the attention to ensuring good living conditions for the inhabitants.

## 2 Material and Method

The research survey (of pilot character) was carried out on the territory of Opole Voivodeship among the leaders of local action groups operating under the Rural Renewal Program. The research sample covered 72 of more than 600 rural administrative units (601 units in 2015) participating in the Program, that is over 10% of their entire number. The employed research method was an electronic questionnaire consisting of 30 closed questions with a possibility to complement the given answer in an open question "Other (specify)"– which, however, was very rarely used by the respondents.The results obtained in July and August 2017 represented more than 10% of the rural administrative units participating in the Program.

As regards the entrepreneurship, and in line with literature findings – presented in the introductory part, the role of local government was surveyed, which represents the institutional factor raising or impeding the localization's potential. In particular the following issues were verified: the set of activities undertaken by the local government and its reception among local leaders. That group is particularly important for the overall depiction of area potential, as its members stand for the active part of the population, responsive to the local problems and acting to solve them. In their actions, local leaders must be attentive to the legal framework, outlining the border of acceptable solutions and by this way they deploy their creativity and entrepreneurial abilities. They develop the understanding of challenges from both sides of decisional process, being spokesmen for their communities in the discussions with local authorities and in that manner becoming aware of the limits for governmental action. All that motivated the choice of that group as reliable respondents in the research.

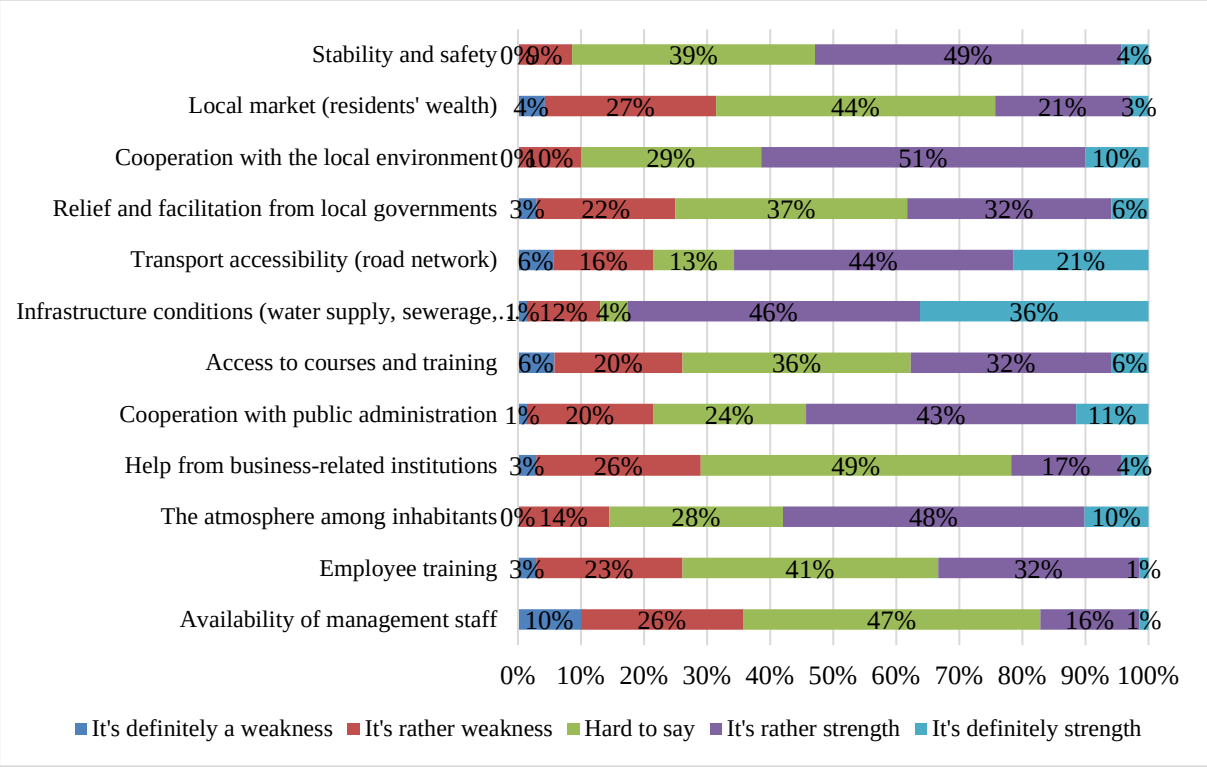
The question referring to the entrepreneurship factors impacted by the local authorities decisions embraced the set of instruments permitted to employ in their areas of governance, which creates the conditions for business (and overall entrepreneurship culture) development. Those conditions were assessed by the respondents. Second and third questions refer to the perception of the instruments available for the local authorities and used to

stimulate business creation and development and the needs in that field. They were ranked by the respondents accordingly to their usefulness as supporting tools for entrepreneurs and their businesses.

## 3 Research Results

Since a large part of entrepreneurial ecosystem factors depends on the activities of local governments, that topic was cautiously pursued. The business favorable conditions are crucial for entrepreneurship potential fulfillment (cf. fig. 1). The research results indicate a high level of satisfaction with the business environment, especially in terms of infrastructure (82% of indications), transport accessibility (65%), cooperation with the local environment (61%) and public administration (54%). Also, the atmosphere among inhabitants has been assessed as a definite strength or a moderate strength by 58% of respondents.

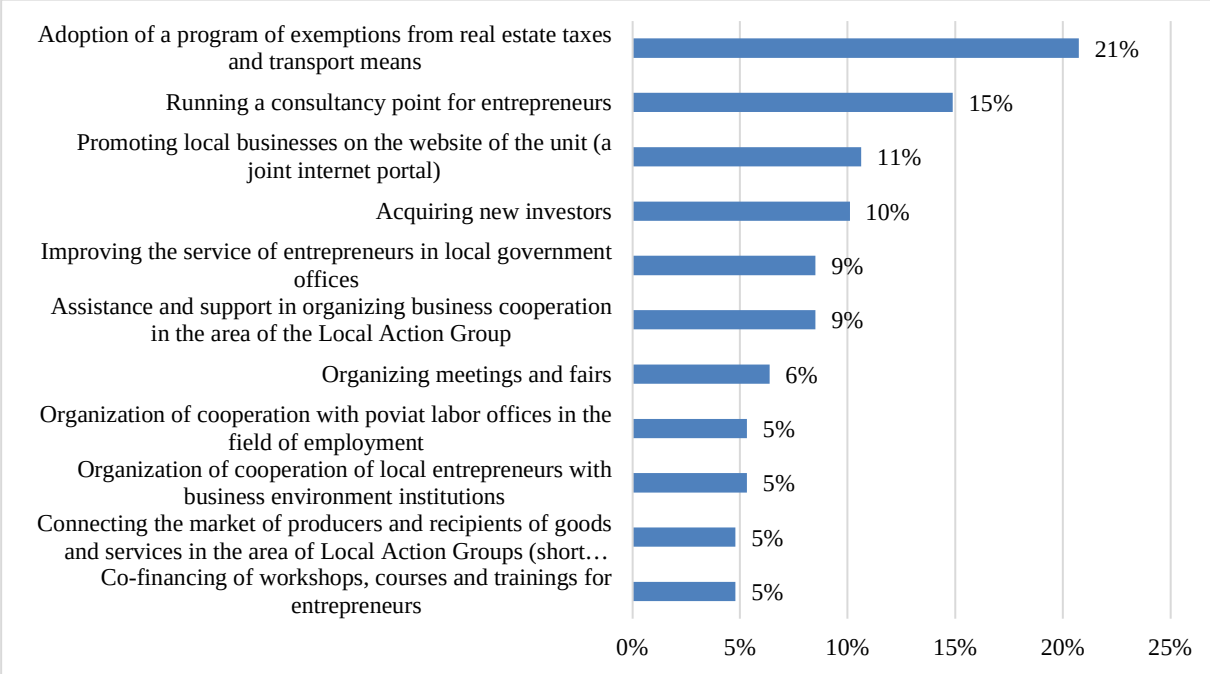
**Figure 1** - Conditions for conducting business activity in the area of the village council (% indications). Source: Own study based on empirical research




The infrastructure was proved to be the factor affecting the sustainability of development, even though the impact on all four areas is not the same. It is also important to be aware that the infrastructure may have a negative effect on sustainable development in the environmental domain. Research conducted by J. Salamon and M. Łukasiewicz (2010 and 2016) indicate that technical infrastructure is one of the factors that affect the level of sustainable development. The authors stated that infrastructure elements related to water and gas supply as well as sewage disposal primarily affect social and economic order. Although no statistically significant impact of infrastructure on natural, political and institutional order was found, some regularity was observed in the environmental impact of the infrastructure. The correlation between the quality of infrastructure and the quality of natural order was negative. It has not been shown whether the low quality of the environment is due to the lack of appropriate infrastructure or whether the development of infrastructure has contributed to the deterioration of the quality of the natural environment. It is more likely that irrationally developed infrastructure, in a way that does not consider the need for sustainable development of its individual elements, can cause environmental damage[14].

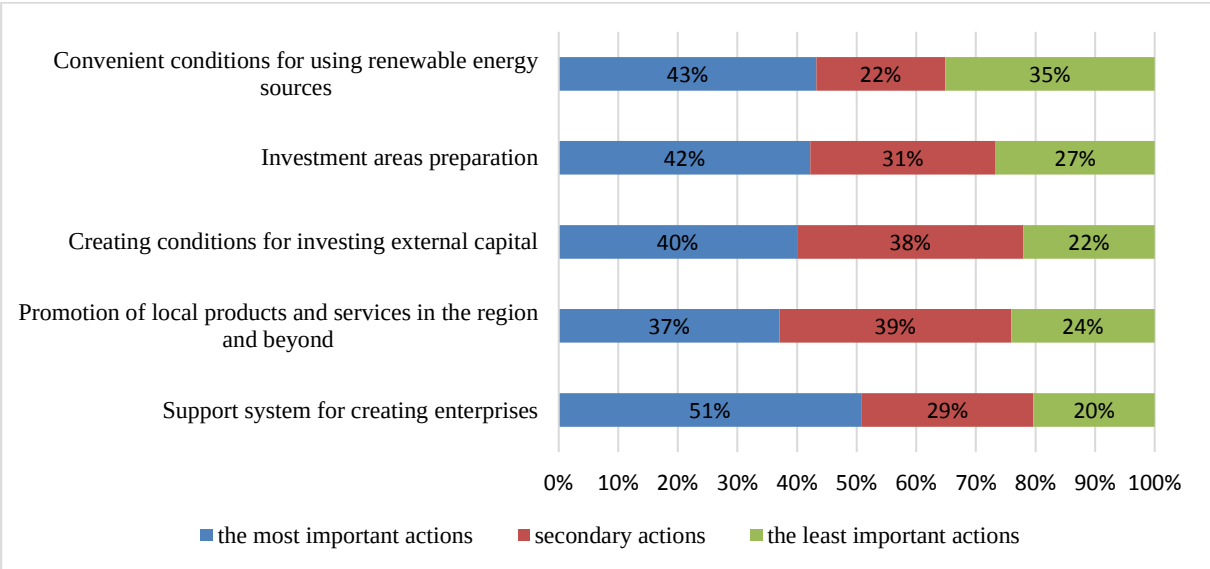
As for supporting business instruments employed by the local authorities and assessed by the respondents, for the most favorable forms are tax exemptions, advisory centers for entrepreneurs, promotion of local businesses on the internet, improvement of business services for entrepreneurs in offices and acquisitions (cf. fig. 2.). Among the key problem areas, respondents reported the possibility of finding a good job, collective transport and access to health care services.

**Figure 2** - The most favorable - according to respondents - forms of supporting entrepreneurship in the area of village council (% indications). Source: Own study based on empirical research.




The answers given by the respondents provide a relatively high level of trust towards non-governmental organizations and concern for the weaker members of the community. The main obstacles contrarily are the attitude of the residents (lack of commitment) and bureaucracy involved in raising funds for the realization of goals of the local community.

**Figure 3 -** Measures to strengthen entrepreneurship that should be taken (% indications). Source: Own study based on empirical research.




And finally, the respondents placed the support for business creation (51%) and using renewable sources (43%) among the important factors in strengthening of the entrepreneurship. Also, other research results (research conducted among agritourist service providers using and not using renewable energy sources by J. Cichowska) show that although the use of renewable energy sources is not yet common, renewable energy sources play a very important role. Although obvious benefits for users (significant reduction in electrical energy costs in respondents farms, encouraging them to reduce the prices for the tourist), more accessible counseling services are required. This shows the constant need to balance development factors with a greater emphasis on environmental issues[2].

## 4 Conclusions

Rural areas form a specific context for entrepreneurship development in its spatial, cultural, social and institutional dimensions. At the same time that rural context offers to the businesses a possibility to employ "romanticized" and "embellished" image of rurality, with all real resources accessible there. That prompts entrepreneurs (local and attracted in-migrants) to explore existing niches and at the same time urge the local authorities to foster the development by supporting businesses with all tools they have access to. One of the directions promising real impact on the rural areas growth and appealing for entrepreneurship is sustainable development, well matched with the rural resources structure and seen as an opportunity by the respondents in the survey presented in the current study. Besides the satisfaction expressed by most respondents as for economic business conditions created by local authorities, there is always room to improve the situation in consultation with the entrepreneurship milieu, fairly aware of own needs for support and the best performing methods of it. That could be only beneficial for all local stakeholders.

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# A Comprehensive Tool for Allocating Public Funding

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## Abstract

The aim of the article is to present the first phase of project of the design of an application tool to increase the efficiency and accuracy of measuring the social need for investments financed from public resources in the defined area, in terms of their impact on improving the quality of life of inhabitants and other social needs. Use of the application tool should lead to:
a) optimising processes in the phase of evaluating public investments;
b) enabling the engagement of a new comprehensive tool for evaluating projects and public investments, which allows for transparent and responsible decision-making from the perspective of the EU provider,
c) achieving positive and socially just contributions from economic, social and environmental investments.
It follows from the evaluation of phase 1 of the survey that it is no longer appropriate to assess the contribution of the social return on investment using only one value, but there is a need to divide the overall benefit into the 4 specified factors - economic, environmental, social and society-wide factors. The results of the evaluation of stakeholders suggested that among the individual "investors", it is necessary to differentiate the weight of the benefits of their investments within the defined factors.

***Keywords:*** *public funding, public investment, social responsibility, social value, social return on Investment*

***JEL Classification:*** *M14, M21, H20*

## 1 Introduction

The return on investments in the social sector is a highly discussed topic at present. The state, non-profit organisations and corporations are increasingly concerned about ensuring that the funds spent on investments have the greatest possible impact, whereas it no longer suffices to evaluate only the financial impacts (profit), but the aim is also to fulfil social and environmental objectives.

When assessing investments (individual projects), the economic profitability of the investment is no longer the only assessed factor. The non-financial "added" value of the investment is also taken into account. Hence, when evaluating an investment, it is necessary to assess it globally with respect to its impact and benefits for the company, region and population. This means that it is essential to evaluate how the specific investment can improve the economic, social and environmental situation in the given locality. The method currently used to evaluate the social return on investment, as a measurable value expressed in CZK, is the Social Return on Investment (SROI) analysis. The social benefit is an assessment indicator of the impacts of investments that can arise for a company; this benefit need not be expressed as a direct profit for the investment, but from an overall social perspective the implementation of such investments is desirable.

The SROI (Social Return on Investment) analysis enables the evaluation of the impacts of socio-economic and environmental investments and activities through the changes which occur among the relevant stakeholder groups as a consequence of implementing these activities. Compared to other methods used to assess a return on

investment, the SROI analysis takes into account the social benefits of the project concerning all the stakeholders, in addition to the direct financial impacts on the investor.

### 1.1 SROI

Social economics are focussed on solving the issues of employment, social cohesion and local development. It is founded and evolves on the concept of a triple benefit - economic, social and environmental. A definition of social economics is offered by a range of authors (Borzaga, Defourny, 2004), (Johanisová, 2008) and organisations, such as the CIRIEC global scientific organisation, Social Economy Europe, or the EMES research society.

The differences between corporate and social economic analyses are due primarily to different inputs. (Arvidson, 2010) states that the corporate analysis, e.g. using the Return on Investment (ROI) method, works primarily with financial values, while the social economic analysis also includes values which are difficult to quantify, which is why these non-financial impacts need to be expressed in monetary units, so as to allow the evaluation of the total effectiveness of the investment.

The SROI analysis translates the identified non-financial, often intangible benefits into money. The result is the SROI indicator expressed as the ratio between the overall benefits and costs of the project. In addition to expressing the overall benefit and value generated by the implemented activity for the area, the SROI analysis also contributes to strengthening the organisation's reputation, justifies the meaningfulness of the implemented activities and informs the public about them.

The study "Social Return on Investment (SROI) Analysis of the Greenlink, a partnership project managed by the Central Scotland Forest Trust (CSFT)" from the year 2009 provides the following definition: "SROI is a story of change, on which decisions can be based and which includes case studies, qualitative, quantitative and financial information." (The SROI Network by Matter&Co., 2012).

The academic sphere devotes considerable attention to the SROI method, as demonstrated by a whole range of specialised publications analysing existing research concerning the SROI method (Maier, Schober, Simsa, Millner, 2015), (Nicholls, 2017), (Solórzano-García, Navío-Marco, Ruiz-Gómez, 2019), (Urwohedi, Gurd, 2019). However, the SROI method is also widely discussed in professional practice, e.g. the ARCO (Action Research for Co-development) centre (Action Research for Co-development, 2020), the Thematic Network for Social Economic Development (TESSSEA, 2019).

### 1.2 Evaluation of Social Economic Projects in CZ

The support of socioeconomic projects can improve the quality of life in society without the need to increase taxes or strengthen the economic situation of the given locality. Because state administrative authorities are the key contracting authorities for public contracts, they can contribute substantially to the development of this sector while supporting sustainable development (EUROPEAN COMMISSION, 2011).

In the Czech Republic, the Technical Network for Social Economic Development (TESSEA ČR, z.s.) was established to support social economics and social business. It is an opinion platform whose aim is to promote the concept of social economics and social business in the Czech Republic. At present, there is another platform in the Czech Republic to support social business, 3P – People, Planet, Profit, o.p.s., which organises awareness campaigns and manages the Czech Social Business domain. There are other organisations which also engage in this issue.

Social economics do not currently have a legislative definition in the Czech Republic. Among the basic documents available in the Czech Republic is the "Methodical Handbook" issued by the Ministry of Regional Development in 2015, which is based on the Guide to Social Return on Investment (SROI) Analysis, drafted on the basis of the only internationally recognised SROI analysis method (A Guide to Social Return on Investment) and adapted to the Czech environment (Ministerstvo pro místní rozvoj, 2015). This Methodical Handbook states that a discount rate of 5% is usually used in the Czech Republic when analysing costs and benefits which are a part of applications for subsidies from EU funds. Based on existing practice in the Czech Republic and specialised publications focussed on calculating the social discount rate, it is recommended to use a 5% discount rate in SROI analyses, based on the European Commission's method of financial evaluation for processing CBA. A financial discount rate of 5% and a social discount rate of 5.5% is stipulated for environmental projects in the Czech Republic. According to France, the most advantageous method for its determination for the Czech Republic is based on the social rate of preference (STPR) approach, which indicates a social discount rate of 5.06% when used (Franc, 2012).

In the SROI analysis, various entities (ministries, regions, municipalities and other public sector entities) obtain a tool for comparing the impacts of various activities, which can be used as a reference for transparent and responsible decision-making about investments from public resources. However, it must be emphasised that the obtained SROI ratio only indicates a part of the effects of the total investment, which is why the individual projects/activities must be assessed in a broader context.

It could be said that measuring the social return on investment is an entirely new approach in the Czech Republic, which is why there is not yet enough verified data to determine the financial indicators, and most figures entered into the analysis must be estimated. According to Krátký (2012), the main problem when applying the SROI method in the Czech Republic is the lack of experience in quantifying non-financial values and collecting data. The option of using foreign platforms (e.g. English) to share financial indicators is limited in this case, because all the indicators are based on the concrete situation in the specific country (Krátky, 2012). The use of the SROI analysis, and most likely other methods for evaluating the social impacts of an organisation, is largely problematic in the Czech Republic. However, experts from the practical and academic field agree that despite the obstacles of the SROI analysis, it is an interesting method that is worth attempting to adapt to the Czech environment and subsequently making use of Šťastná, head of the working group of the Thematic Network for Development of Social Economics in the Czech Republic on the topic of the "SRIO Pilot Testing Process", states that the SROI analysis is laborious for social enterprises, and will be difficult to promote without systemic support from the state." (Kulatý stůl na téma metoda SROI, 2011).

This system is not widely used yet in the Czech Republic, but in some professional publications it is possible to find proposals for the possible use of the SROI method under Czech conditions, e.g. in the work of Bernášková (2014), who uses the positive aspects of the SROI analysis as a tool to describe the changes brought about by the given organisation. Furthermore, the said proposal eliminates the need for financial evaluation, the possibility of which is still very limited in the Czech Republic due to the lack of determined financial indicators and insufficient data collection, i.e. the method does not allow the calculation of the social return on investment indicator (Bernášková, 2014).

## 2 Material and Methods

A team of experts from the VŠB-TUO is conducting an extensive survey concerning the evaluation of socioeconomic projects under conditions in the Moravian-Silesian Region. The survey involves a dynamic multi-disciplinary solution, because the project is based on the active cooperation of several fields - political science, sociology, economics, statistics and public sector entities, never previously applied in the conditions of the Moravian-Silesian Region.

The research is divided into two basic phases:

1. Phase 1 - identification of factors which must be included in the analysis of benefits within the SROI analysis
2. Phase 2 - quantification of the real value of benefits within the SROI analysis

In terms of time, costs and operations, it is impossible to address all the stakeholders, which is why a selected sample was stipulated to represent the basic set. The selected sample comprised 1000 stakeholders chosen so as to evenly cover the representation of the individual stakeholder groups. Emphasis was placed on ensuring that stakeholder groups from the Moravian-Silesian Region in particular were represented. The overall conclusion was estimated based on the results of evaluating the selected sample. When defining the selected set, a range of data return was defined at which the data would objectively copy the conclusions from the basic set. This limit was stipulated at 40% and higher.

The method of a questionnaire survey was chosen to obtain primary information. A structured questionnaire in the Czech language was compiled to obtain the necessary information. Multiple choice questions and questions with the option of choosing on a scale were used in the questionnaire. The classic scaling model was used when creating the available answers. These questions were supplemented with open questions, which gave the respondents the opportunity to express themselves and specify their answers to the previous questions. Statistical methods were used for the analysis and evaluation of the questionnaire survey.

The aim of the research is to present the design of an application tool to increase the efficiency and accuracy of measuring the social need for investments financed from public resources in the defined area, in terms of their impact on improving the quality of life of inhabitants and other social needs. Use of the application tool should lead to optimising processes in the phase of evaluating public investments and achieving positive and socially just contributions from economic, social and environmental investments.

## 3 Practical Part: Possibility of Applying SROI Analysis under Conditions in CZ

The implemented project focuses on the issue of the effective and expedient allocation of funds from public resources. The state, non-profit organisations and corporations are increasingly concerned about ensuring that the investments from public resources have the highest possible positive impact (on profit, cash flow), while also fulfilling current social and environmental objectives. Given that social and environmental objectives are unchanging, the project will propose a methodical application tool which will allow the real-time (dynamic) determination of the weight (importance, necessity) of these areas.

The Moravian-Silesian Region is classified among the structurally-impaired regions, those being regions in the Czech Republic with a high share of mining and heavy industry and a high level of urbanisation, whose industrial base is undergoing massive restructuring associated with above-average unemployment, with a concentration of the negative impacts of structural changes and the closing down of major enterprises or entire sectors. In this sectors exist a specific problems of financing industrial and mainly metallurgical firms from public sources (Kušnierz, Baránková, Kozel, Vilamová (2011). The region's classification among structurally impaired regions was a breakthrough decision of the Czech government because, thanks to the document "Strategy for the Economic Restructuring of the Ústí, Moravian-Silesian and Karlovy Vary Regions" based on Government Resolution No. 826 of 19 October 2015 and to the specific proposed sets of measures, it should lead to the strengthening of education, the growth of average wages and the halting of depopulation in the region, among other things.

Social (non-commercial) benefits within the SROI analysis concern the stakeholders, who can be divided into three basic groups, namely the population, public administration and enterprises.

The basic stakeholders in the population group include:

- Employees
- Entrepreneurs
- Unemployed persons
- Seniors
- Disabled persons
- Mothers caring for children up to the age of 3
- Handicapped persons
- Persons involved in tourism
- Inhabitants of specific regions, e.g. within municipalities and regions

The basic stakeholders in public administration include:
- Public budgets (municipal, regional)
- Social security administration
- Ministries
- Society as a whole

The stakeholders among manufacturing and non-manufacturing enterprises include:
- Owners
- Investors
- Employees
- Trade unionists
- Suppliers
- Customers
- Competition (regional, national, foreign)

The research results achieved to date indicate that social benefits within the SROI analysis can be divided into nationwide and regional benefits in terms of the scope of their impact.

The basic nationwide social benefits include:
- Improved economic level of the Czech Republic
- Contributions to the state budget
- Benefits within social security and health insurance
- Social and health security for inhabitants
- Ensuring the security of inhabitants and their property
- Ensuring employment
- Increasing the competitiveness of the national economy
- Ensuring national economic structures which are more resilient to crisis (better able to withstand fluctuations in the economic cycle).
- Ensuring food self-sufficiency

- Ensuring a high-quality transport infrastructure
- Protecting and securing water resources
- Landscape protection
- Improving education in a structure that corresponds to the needs of the national economy

The basic regional social benefits include:
- Contributions to the regional budgets
- Social and health security for inhabitants
- Ensuring the security of inhabitants and their property
- Ensuring employment
- Protecting and securing water resources
- Landscape protection

In phase 1 of the performed analysis, 4 key factors were identified which need to be included in analysing the benefits within the SROI analysis:
- Economic factors
- Environmental factors
- Social factors
- Society-wide factors

The results of evaluation of the stakeholder groups showed that the indicators presented below are included in the listed factors.

**Economic factors**
- Higher employment
- Higher tax and levy collection
- Reduced allowance payment
- Higher rating
- Higher added value
- Performance, efficiency

**Environmental factors**
- Improved air quality
- Recycling
- Reduced pollution of natural resources
- Reduced energy demand
- Use of renewable resources
- Use of brownfields

**Social factors**
- Social integration
- Improved infrastructure
- Manual skills
- Improved quality of life
- Use of leisure time

**Society-wide factors**
- Reduced criminality
- Improved education rate
- Improved safety
- Development of the region

It follows from the evaluation of phase 1 of the extensive survey that the aforementioned factors must be included in analysing the benefits within the SROI analysis. The performed analysis thus indicated that it is no longer appropriate to assess the contribution of the social return on investment using only one value, but there is a need to divide the overall benefit into the 4 specified factors - economic, environmental, social and society-wide factors.

**Overall benefit within the SROI analysis =** $x_{economic} + x_{environmental} + x_{social} + x_{society\text{-}wide}$ (1)

Where: *X… benefit within the SROI analysis*

Within phase 2 of the survey, five specific "investors" were defined, who are assumed to evaluate not only the financial impacts (profit) when evaluating the return on investment, but who also strive to achieve social and environmental objectives.

- Municipality
- School
- Non-profit organisation
- Hospital
- Industrial enterprise

The results of the evaluation of stakeholders suggested that among the individual "investors", it is necessary to differentiate the weight of the benefits of their investments within the defined factors - economic, environmental, social and society-wide factors (see Table 1).

**Table 1** – The weight of the benefits of their investments within the defined factors

| Investor / weights | Economic factor | Environmental factor | Social factor | Society factor |
|---|---|---|---|---|
| Municipality | 0.1 | 0.1 | 0.1 | 0.7 |
| School | 0.1 | 0.2 | 0.3 | 0.4 |
| Non-profit organisation | 0.1 | 0.3 | 0.3 | 0.3 |
| Hospital | 0.4 | 0.1 | 0.3 | 0.2 |
| Industrial enterprise | 0.6 | 0.2 | 0.1 | 0.1 |

In the next phase of the research, the coefficients will be quantified to express how the value of the benefit presented within the SROI analysis must be reduced among the individual "investors" so as to reflect the real value of the contribution - economic, environmental, social and society-wide with respect to the given type of "investor".

## 4 Discussion

The current method used in the Czech Republic evaluates the social need for public investments by assessing their contributions in economic, environmental and social terms, while respecting the equal importance of these areas.

After the evaluation, the results of the comprehensive sociological survey will be transformed into a dynamic, exact model that can specify the terms which are difficult to grasp sociologically into specific quantities, which we can mutually compare and evaluate. The comprehensive sociological survey is focussed on the target groups of participants in public contract award procedures, either on the side of the contracting authority or bidder, with the aim of pinpointing the most important areas of impact of socioeconomic and environmental investments and activities, and proposing the key parameters for applying the method. The outputs from phase 1 are presented in this article.

The proposed method newly anticipates that it will take into account the varying social importance and need for the impacts of investments into economic, environmental and social areas, using weights (coefficients) of this importance and need within the affected areas. The proposed method will thus allow a flexible reaction to the changing needs of public administration in the social, environmental and economic sectors.

Another novelty in the proposed research solution will be the division of the individual areas (environmental, social and financial) into sub-categories to ensure the more precise definition of importance and need coefficients of the evaluated investment benefits. These sub-categories can be amended and supplemented based on the changing needs of public administration.

## 5 Conclusion

As mentioned previously, the quantification of the social return on investment is still problematic in the Czech Republic, primarily due to the non-existence of enough open data to determine the financial indicators, which is why most of the quantified data (contributions) within the analysis are stipulated based on estimates. A number of factors are entirely dependent on the subjective opinions and experiences of the evaluator stipulating the value of expected returns - benefits of the investment. Hence, the identity of the processor calculating these values and their experience plays a crucial role.

The option of using foreign platforms to share financial indicators is limited, because all of the indicators are based on the concrete situation in the given country.

The presented results of the extensive survey, performed to evaluate socioeconomic projects under the conditions in the North Moravian Region and primarily to identify the key factors and quantify their impact on the resulting value of the benefits of projects in the economic, environmental, social and society-wide areas with respect to the type of "investor", may become an important tool for the assessing entities, e.g. ministries, regions, municipalities and other public sector entities, in order to compare the impacts of various investments, which they can use as a reference for transparent and responsible decision-making about investments from public resources.

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# The Comparison of Housing Investment Opportunities of Czech and Polish Regions

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## Abstract

The Czech Republic is a country with one of the highest growth of real estate's prices in Europe. The paper is focused on the analysis of housing investment opportunities of Czech and Polish regions. The aim is to create some simple indicator for decision making of investors and as second to calculate its value for separate Czech and Polish region. The investors often have to choose the most appropriate option to secure their profit. There will be constructed investment index for particular Czech and Polish region. The index will be calculated from three basic decision elements that are necessary for decision making of investors. The main parameters to construct the investment index will be the share of flats for sale of housing market, the price of flats, the rent and the average salary. All the parameters will be given for particular Czech and Polish region. The parameters will be calculated to get three most investment important indicators. They are: I/P ratio indicates the real price of flats, P/R ratio indicates the profitability and flats for sale to supply of housing indicates what is the share of flats for sale. The aim of the paper is to find out (with the help of mentioned ratios), if there are better or worse investment opportunities between Czech and Polish regions. The results show the Czech regions are in average the regions with low level of investment opportunities in comparison to the Polish regions.

***Keywords:*** *housing, ownership, price/income ratio, price/rent ratio, real estate market, vsb invest index*

***JEL Classification:*** *P50, R30*

### 1 Introduction

The paper focuses on analyse of housing investment opportunities in Czech and Polish regions. Many countries in the world have been experiencing boom in house prices for a couple of years, and the European countries are no exception. The house price is one of the highly monitored indicator. To analyse housing prices and housing bubbles is very common topic in literature. The house price analysis has become very common in connection with crisis in 2008. From the time up to now the economists make many of researches to explore potential risk of house price increase. Now in 2020 again many of papers are analysing the potential risk due to coronacrisis. Under condition of rising prices of homes and rising amount of mortgages there are some worries of Czech National Bank, that is afraid of too high prices of flats in Czech Republic. It forecasts the flat prices are more than 25% overestimated in Czech Republic. In these unclear conditions it is very difficult to make the right decision for many of real estate investors.

This paper is related to the increasing literature, which focuses on the empirical investigation in housing market. The main goal of this paper is to make an analysis of investment opportunities in the housing market of Czech and Poland. Using the main housing ratios I will transform them to the common investment indicator. The housing ratios are often used as indicators not only for investment decisions. The housing ratios are used as an

indicators of real estate bubble, which can affect both investors, landlords and tenants. The topic of real estate bubble is very common in literature.

There are many of different view and factors how to identify the real estate bubble. Under the condition of Czech Republic there are several authors who analyse the situation of house prices in Czech Republic. J Cadil (2009) tries to analyse the real estate bubble in Czech Republic using the R/I ratio and regression analysis. He states the price bubble is the expectation of price acceleration of particular asset, which results in higher demand and such increase in demand is pushing prices up. The self – reinforcing mechanism is working until bubble bursts.

There are some other authors who try to analyse the Czech real estate market from the point of real estate bubble. Hlavacek, Komarek (2010) define real estate bubble as residual of housing price growth that cannot be explained by the aforementioned "standard" factors. The main factors for increase of real estate prices in national economy they define as:

1. a process of catching-up with the usual level in developed economies combined with macroeconomic convergence,

2. a correction in relative prices,

3. the development of the Czech housing market and

4. the constantly expanding mortgage market in the Czech Republic.

They analyse the property prices using three alternative approaches – an approach based on simple indicators of housing price sustainability (price-to-income and rental returns) and two simple econometric models (a time series model and panel regression).

Zemcik and Mikhed (2009) in their paper investigate the situation of decreasing of U.S. real estate market after the beginning of the financial crisis. Thea use the regression analysis to explain the main fluctuations.

Many of sources use for identification of price real estate bubble the simple housing market indicators. There are mainly compared the historical levels of indicators with the current level of indicators. The most typical indicator using by accredited institutions (national and international financial institutions such as Goldman Sachs, Czech National Bank etc.) is P/I ratio. The comparison of P/I can indicate potential real estate bubble.

The main simple real estate indicators can be divided into the four separate groups:

1. housing affordability measures
2. housing debt measures
3. housing ownership and rent indicators
4. housing price indexes

The similar topic of flat price analysis in Czech – Polish border regions you can find in Ardielli and Ardielli (2018). The authors analyse each segments of real estate market and present the main differences.

## 2 Material and Methods

As the main source of data the internet analytical portal www.trzniceny.cz for recording of data describing Czech real estate market was used. To record the data describing Polish real estate market the portal www.otodom.pl was used. There were recorded the information of flat prices, rent prices and share of flats for sale. The other needed data were recorded from official national statistical offices www.czso.cz and www.stat.gov.pl. Especially the information describing the level of salaries in Czech and Polish regions. To analyse the Czech and Polish real estate market the data from the July 2020 were from online renewed web pages collected and recorded.

The construction of VSB invest index is based on the assumption of rational considerations of investor. It tries to combine the three most important parameters of investor decision on real estate market. All the investors who want to reach profit should take into the account return of investment, amount of flat supply and price of flat. It is understandable, the return of investment should be the shorter the better, amount of flat supply should be the bigger the better and the price should be the lower the better. All these assumptions will be involved in new created VSB invest index. As the first step for construction it is necessary to state the basic indicators describing return of investment, share of supply and real flat price. The construction of VSB invest index was inspired by Polednikova (2014) and Halaskova (2015).

The indicators are:

1. IP ratio
2. RP ratio
3. FSR ratio

The income to price ratio (see the formula 2.1) is the basic affordability measure for housing in a given area. It is generally the ratio of average dispose incomes to average house prices, expressed as a percentage or as area of the flat in $m^2$, which is available to the investor per average income. As bigger area per average salary the investor can buy as better.

IP ratio = I/P (2.1)

where

P…… Average price of flat

I…… Average personal income

The rent to price ratio express the value of capitalization. It shows what is the profit from investing in an flat. As higher the R/P ratio is as better investment.

RP ratio = R/P (2.2)

where

P…… Average price of flat

R…… Average gross year rent

The FSR ratio shows the share of flat for sale in real estate market. As higher the share as better position for investor. If there is lower amount of flat for rent on the market the situation seems to be convenient for the landlord, because there is low competition on rent market. In such situation the investor can choose the most credible tenant to rent him his flat. On the other hand if there is high share of flat for sale, the investor can choose the best one. In such situation the market of flat for sale is competitive and the investor is in better situation than seller.

FSR = FS / (FS+FR) (2.3)

where

FS……flat for sale on the market

FR……flats for rent on the market

To construct VSB invest index we will use the previous three indicators. To construct the VSB invest index we will assume the higher value the indicator the better position for the potential investor. The best situation would be if the values of all indicators were on its maximum value. Using of VSB index we will search for the best regions with the highest levels of the three indicators, which are transformed to the VSB index. To calculate VSB we will use the Pythagorean theorem. The larger the diaphragm, the length of which is bounded by points (values of indicators) on the perpendiculars, the better. The VSB invest is defined by the length of diaphragm. The mathematical formula:

$$VSB\ invest = \sqrt{VSBp^2 + FSR^2} \quad (2.4)$$

where

$$VSBp = \sqrt{RP^2 + IP^2} \quad (2.5)$$

To calculate the VSB invest index, it is necessary to inspect the basic parameters of Czech and Polish real estate markets such as prices of flats of separate regions, rents of flats of separate regions, wages of separate regions and share of flats for sale of separate regions. Specificly, because of inter comparison the data were modified. They were transformed to their average values - flat price per $m^2$ , year payed rent per $m^2$ and year gross salaries.

## 3 Results and Discussion

The basic data describing Czech real estate market are in Table 1 presented. Praha region seems to be highly exceptional within the Czech regions. It is typical with the highest level of flat price, rent price and gross year salary. Even in Praha there is offered the most flats for sale and for rent in comparison to other Czech regions. On the other hand the most cheapest region is Ústecký region, with the price 18 thousands Kč/$m^2$ of flat. Ustecky region seems to be the cheapest from the point of rent. Its price is 150,-CZK/$m^2$/month. The lowest salary is indicated in Zlinsky region (365 100,-CZK/year).

**Table 1**- Czech market basic data June 2020

| Region | Price per $m^2$ in ths. CZK | Flats for sale | Month Rent per $m^2$ in CZK | Flats for Rent | Gross Year Salary in CZK |
|---|---|---|---|---|---|
| Praha | 104,4 | 4806 | 317 | 8806 | 510636 |
| Jihomoravský | 56,4 | 1210 | 226 | 1388 | 394752 |
| Karlovarský | 37,7 | 984 | 160 | 254 | 359544 |
| Středočeský | 48,5 | 1468 | 208 | 765 | 418800 |
| Plzeňský | 36,4 | 664 | 172 | 628 | 397848 |
| Liberecký | 34,6 | 435 | 180 | 272 | 380436 |
| Jihočeský | 37,8 | 572 | 164 | 379 | 371820 |
| Vysočina | 36,2 | 268 | 163 | 212 | 373764 |
| Královéhradecký | 42,5 | 498 | 180 | 262 | 383100 |
| Pardubický | 33,4 | 340 | 184 | 232 | 367908 |
| Zlínský | 38,4 | 418 | 177 | 311 | 365100 |
| Olomoucký | 35,6 | 926 | 179 | 559 | 369408 |
| Moravskoslezský | 26 | 924 | 151 | 1067 | 369720 |
| Ústecký | 18 | 1025 | 150 | 713 | 377160 |

Source: Own calculations, www.trzniceny.cz, www.czso.cz

The basic data describing Polish real estate market are in Table 2 presented. Mazowiecki region seems to be highly exceptional within the Polish regions. It is typical with the highest level of flat price, rent price and gross year salary. Even in Mazowiecki region there is offered the most flats for sale and for rent in comparison to other Polish regions. On the other hand the most cheapest region is Lubuski region, with the price 26,7 thousands CZK/m2 of flat. The cheapest region from the point of rent seems to be Opolski region. Its price is 180,-CZK/m2/month. The lowest salary is indicated in Warminsko Mazurski region (330 586,-CZK/year).

**Table 2** - Polish market basic data June 2020

| Region | Price per $m^2$ in CZK | Flats for sale | Month Rent per $m^2$ in CZK | Flats for Rent | Gross Year Salary in CZK |
|---|---|---|---|---|---|
| Małopolskie | 52545 | 6024 | 244,11 | 5390 | 395475 |
| Mazowieckie | 64655 | 14936 | 399,59 | 10216 | 461963 |
| Pomorskie | 59030 | 6944 | 244,3 | 3198 | 394460 |
| Podlaskie | 38087 | 1283 | 208,91 | 277 | 353132 |
| Wielkopolskie | 44909 | 3490 | 234,23 | 2320 | 360649 |
| Świętokrzyskie | 33479 | 891 | 192,31 | 183 | 345487 |
| Zachodniopomorskie | 40120 | 3875 | 216,21 | 931 | 365196 |
| Lubelskie | 39805 | 1684 | 209,26 | 514 | 346991 |
| Kujawsko-pomorskie | 35873 | 5294 | 201,2 | 1316 | 346262 |
| Podkarpackie | 39495 | 1077 | 184,12 | 519 | 333718 |
| Warmińsko-mazurskie | 34324 | 1046 | 208,93 | 159 | 330586 |
| Dolnośląskie | 45425 | 9343 | 240,38 | 4077 | 409756 |

| | | | | | |
|---|---|---|---|---|---|
| Opolskie | 27684 | 921 | 179,76 | 189 | 357268 |
| Lubuskie | 26794 | 1486 | 190,45 | 335 | 348717 |
| Łódzkie | 39043 | 2529 | 207,04 | 1081 | 374928 |
| Śląskie | 27892 | 6362 | 206,23 | 2594 | 402849 |

Source: Own calculations, www.otodom.pl, www.stat.gov.pl, exchange rate 6,022CZK/PLN

The table 3 the value levels of main indicators shows. The most exceptional region in Czech Republic seems to be Praha. All the shown indicators show exceptional position of Praha region. IP value indicates the real prices of flats in Praha are the highest in comparison to other Czech regions (4,89 $m^2$ per annual gross salary). RP the same shows very low profitability. The gross profit stays on the level of 3,64. That level is the lowest in comparison of other Czech regions. The FSR indicator presents the share of flat for sale. The lowest level you can find again in Praha.

On the other hand the most lowest real prices of flats in comparison to the average salary are indicated in Ustecky region (20,95 $m^2$ per annual gross salary). The same RP indicates the highest profitability (10%) in Ustecky region. The highest level of FSR you can find in Karlovarsky region. The share of flat for sale is 79,48%.

**Table 3 -** Czech Republic, values of indicators

| Region | FSR | RP | IP |
|---|---|---|---|
| Praha | 35,31 | 3,64 | 4,89 |
| Jihomoravský | 46,57 | 4,81 | 7,00 |
| Středočeský | 65,74 | 5,15 | 8,64 |
| Královéhradecký | 65,53 | 5,08 | 9,01 |
| Zlínský | 57,34 | 5,53 | 9,51 |
| Karlovarský | 79,48 | 5,09 | 9,54 |
| Jihočeský | 60,15 | 5,21 | 9,84 |
| Vysočina | 55,83 | 5,40 | 10,32 |
| Olomoucký | 62,36 | 6,03 | 10,38 |
| Plzeňský | 51,39 | 5,67 | 10,93 |
| Liberecký | 61,53 | 6,24 | 11,00 |
| Pardubický | 59,44 | 6,61 | 11,02 |
| Moravskoslezský | 46,41 | 6,97 | 14,22 |
| Ústecký | 58,98 | 10,00 | 20,95 |

Source: Own calculations, www.trzniceny.cz, www.czso.cz

The table 4 the value levels of main indicators in Poland shows. IP value indicates the real prices of flats in Pomorski region is the highest in comparison to other Polish regions (6,68 m2 per annual gross salary). RP the same shows very low profitability for Pomorski region. The gross profit stays on the level of 4,97. That level is the lowest in comparison of other Polish regions. The FSR indicator presents the share of flat for sale. The lowest level you can find again in Malopolski region (52,78%).

On the other hand the most lowest real prices of flats in comparison to the average salary are indicated in Slaski region (14,44 m2 per annual gross salary). The same RP indicates the highest profitability (8,87%) in Slaski region. The highest level of FSR you can find in Warminsko Mazurski region. The share of flat for sale is 86,80%.

**Table 4 -** Poland, Values of indicators

| Region | FSR | RP | IP |
|---|---|---|---|
| Pomorski | 68,47 | 4,97 | 6,68 |
| Mazowiecki | 59,38 | 7,42 | 7,15 |
| Małopolski | 52,78 | 5,57 | 7,53 |
| Wielkopolski | 60,07 | 6,26 | 8,03 |
| Podkarpacki | 67,48 | 5,59 | 8,45 |

| | | | |
|---|---|---|---|
| Lubelski | 76,62 | 6,31 | 8,72 |
| Dolnośląski | 69,62 | 6,35 | 9,02 |
| Zachodniopomorski | 80,63 | 6,47 | 9,10 |
| Podlaski | 82,24 | 6,58 | 9,27 |
| Łódzki | 70,06 | 6,36 | 9,60 |
| Warmińsko-mazurski | 86,80 | 7,30 | 9,63 |
| Kujawsko-pomorski | 80,09 | 6,73 | 9,65 |
| Świętokrzyski | 82,96 | 6,89 | 10,32 |
| Opolski | 82,97 | 7,79 | 12,91 |
| Lubuski | 81,60 | 8,53 | 13,01 |
| Śląski | 71,04 | 8,87 | 14,44 |

Source: Own calculations, www.otodom.pl, www.stat.gov.pl

The table 5 presents the result of the research. The regions Czech and Polish are presented due to the value of VSB invest index. The lowest values on the top, the highest values down the table. The lowest values present the worse investment position, the highest values present the best for potential investment.

The top of the table 5 is occupied by Praha region with the lowest value of VSB invest index (35,83). By other words it says the worst flat investment environment in region Praha exists. Its value is even 46,6% below its average value (67,11). The most interesting region for flat investment within the Czech regions you can find in Karlovarsky region (80,21).

The fifth position of the table 5 belongs to the Polish region Malopolski. It presents the worst value within the Polish regions (53,60). On the other hand the highest level of flat investment opportunities in Poland you can find in Warminsko-Mazurski region with the value of VSB invest index on the level 87,64. Warminsko Mazurski region represents even the highest level of flat investment opportunities within all the 30 searched regions.

**Table 5 -** VSB invest index

| **Region** | **VSB invest** |
|---|---|
| Praha | 35,83 |
| Jihomoravský | 47,34 |
| Moravskoslezský | 49,04 |
| Plzeňský | 52,85 |
| Małopolski | 53,60 |
| Vysočina | 57,04 |
| Zlínský | 58,38 |
| Mazowiecki | 60,27 |
| Pardubický | 60,81 |
| Wielkopolski | 60,93 |
| Jihočeský | 61,17 |
| Liberecký | 62,81 |
| Ústecký | 63,38 |
| Olomoucký | 63,50 |
| Královéhradecký | 66,34 |
| Středočeský | 66,51 |
| Podkarpacki | 68,24 |
| Pomorski | 68,97 |
| Dolnośląski | 70,49 |
| Łódzki | 71,00 |

| | |
|---|---|
| Śląski | 73,03 |
| Lubelski | 77,37 |
| Karlovarský | 80,21 |
| Kujawsko-pomorski | 80,95 |
| Zachodniopomorski | 81,40 |
| Podlaski | 83,03 |
| Lubuski | 83,07 |
| Świętokrzyski | 83,88 |
| Opolski | 84,33 |
| Warmińsko-mazurski | 87,64 |

Own calculations, www.otodom.pl, www.stat.gov.pl, www.trzniceny.cz, www.czso.cz

In average the flat investment opportunities of Czech regions is worse than Polish ones. Below the average level you can find 13 Czech regions and only the 3 Polish regions (the law level of flat investment opportunities). Up to the average level there are 13 Polish regions and only the one Czech region (the high level of flat investment opportunities).

## 4 Conclusion

The results made by indicators and by VSB invest index show the low level of flat investment opportunities in Czech regions in comparison to Polish regions. The Czech region with the highest level of flat investment opportunities looks to be Karlovarsky region as the VSB invest index shows. The region is highly depended on the touristic industry, which is temporary risky segment because of Covid disease and possible reason for the high level of flat investment opportunities. On the other hand the lowest level of flat investment opportunities seems to be still in Praha region despite of Covid disease.

The VSB invest index show the higher level of flat investment opportunities in Polish regions with comparison to the Czech regions. The Polish region with the highest level of flat investment opportunities looks to be Warminsko – Mazurski region. The region is depended on touristic industry and from that point of view it is similar to the Czech Karlovarsky region. The lowest level of flat investment opportunities in Poland you can find in Malopolski region.

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# The State of Municipal Economy in Local Government Units in Poland in the Years 2010-2018

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## Abstract

Currently, the domain of all residential areas is striving to ensure sustainable socio-economic development. It depends on the location, natural environment and the population living in this area. Despite the actions taken, every activity of society has an impact on the natural environment, including by occupying and transforming surfaces, as well as waste generation. They are one of the biggest problems of today's economy due to the constantly growing population and, what is associated with it, the growing production of waste. In Poland and other countries, the predominant way of managing waste is to export it to landfills. However, this is not a good solution for environmental protection. First of all, landfills occupy large areas. Secondly, due to the biochemical transformations that the stored waste undergo, they negatively affect individual elements of the environment. Municipal services are very important for environmental protection. The purpose of the article is to present the current state of municipal economy in local government units. The work uses statistical data showing how in the analyzed years 2010-2018 the length of the active water distribution network was shaped, municipal waste collected or collected per capita, treatment of municipal waste, the number of active landfills and illegal municipal landfills.

***Keywords:*** *environmental protection, local government units, municipal services*

***JEL Classification:*** *H72, Q54*

## 1 Introduction

Waste is a material which can be processed many times and the closed circuit economy can use its potential. There are very large possibilities to effectively use the resources in Poland. It is worth to notice that in the recent years awareness of the advantages coming from protection of the environment which is a base to change the model of the waste management increased significantly. The purpose of the article is to present and analyze the impact of municipal services provided in local government units on environmental protection.

The article uses the so-called existing data, and therefore statistical information possible to obtain directly related to the topic taken. Statistical data were taken from information contained in Statistical Yearbooks published by the Central Statistical Office and the Local Data Bank.

## 2 Theoretical Aspects of Municipal Economy

From a historical point of view, the emergence of a municipal economy was associated with the need to meet basic human needs. Flats, heating, lighting, transport and sanitary and hygienic needs are eligible. The social division of labor created conditions for the development of various forms of settlement and for meeting some of

the needs through exchange [1]. The creation of cities was important in this process. The constant expansion of the resulting settlement units and urban complexes resulted in the need to meet these needs on a social scale. It can therefore be assumed that the municipal economy appeared with the creation of cities and the first state structures [2].

Municipal economy is defined as a branch of the national economy managed by local government. Its purpose is to meet the material and living needs of the population in cities by providing both tangible and intangible services [3]. According to the currently binding legal regulations, municipal economy includes public utility tasks. Their purpose is current and continuous satisfaction of the collective needs of the population by providing publicly available services [4].

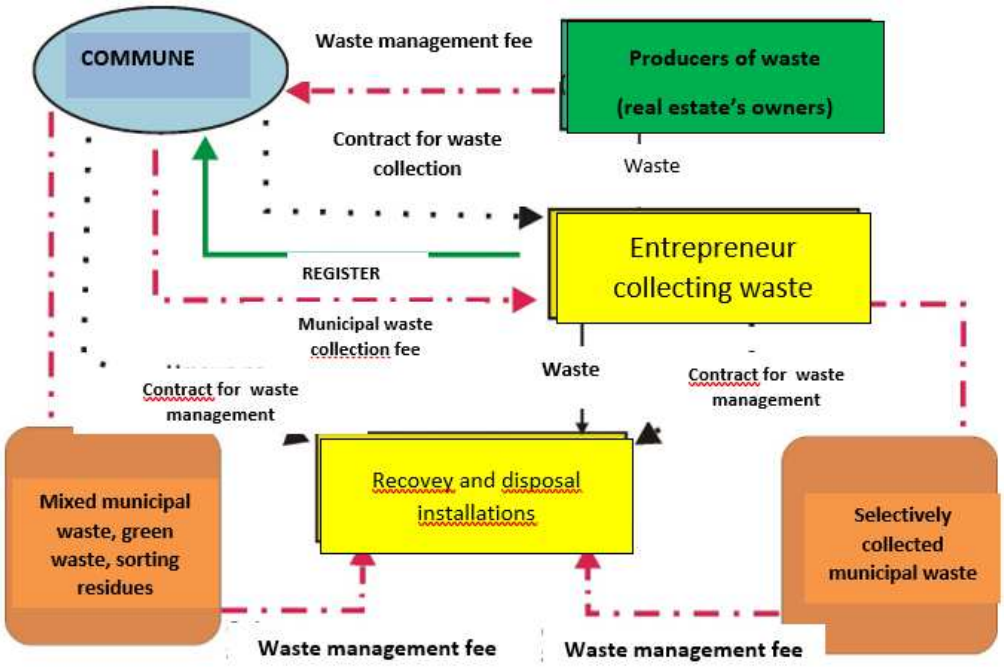
To implement public benefit tasks, local government units run municipal activities in the form [5]:

a) local government budgetary establishments - their expenses are covered from their own revenues, however, they may receive from the budget of the local government unit subject subsidies, targeted subsidies and entity subsidies;
b) commercial law companies that can be created by one entity (these are so-called one-man companies of a local government unit) or by several entities. These companies have legal personality as well as their own assets. In the municipal sector, however, capital companies are the most important. Local government units, which are the owners of all shares or all shares of the company, can direct the activities of the established companies by adopting resolutions through a local government resolution body;
c) associations where municipalities can form associations, including with poviats and voivodships, solely to support the idea of self-government and defend common interests.

In the Polish local government system, part of the tasks in the field of municipal economy were entrusted to municipalities. Municipalities and voivodships may conduct activities outside the public utility zone only in the form of a commercial company. Municipalities may then establish companies for this purpose, provided, however, in accordance with art. 10 paragraph 1 of the Act on municipal economy, on the local market there are unmet needs of the local government community and at the same time there is unemployment in the commune, which has a significant negative impact on the standard of living of the local government community, and one cannot influence the activation of economic life as a result of other activities [4].

In the area of municipal economy, municipal infrastructure is particularly important, in particular technical infrastructure. A local government unit can carry out its public tasks using these resources. Municipal infrastructure is a set of devices and institutions necessary for the proper functioning of the economy, as well as the organization of life of the population in a given area. It is an essential factor determining the conditions of cities functioning, deciding about the location of new investments and the possibilities of economic development [6].

**Figure 1 –** The municipal waste management system in Poland



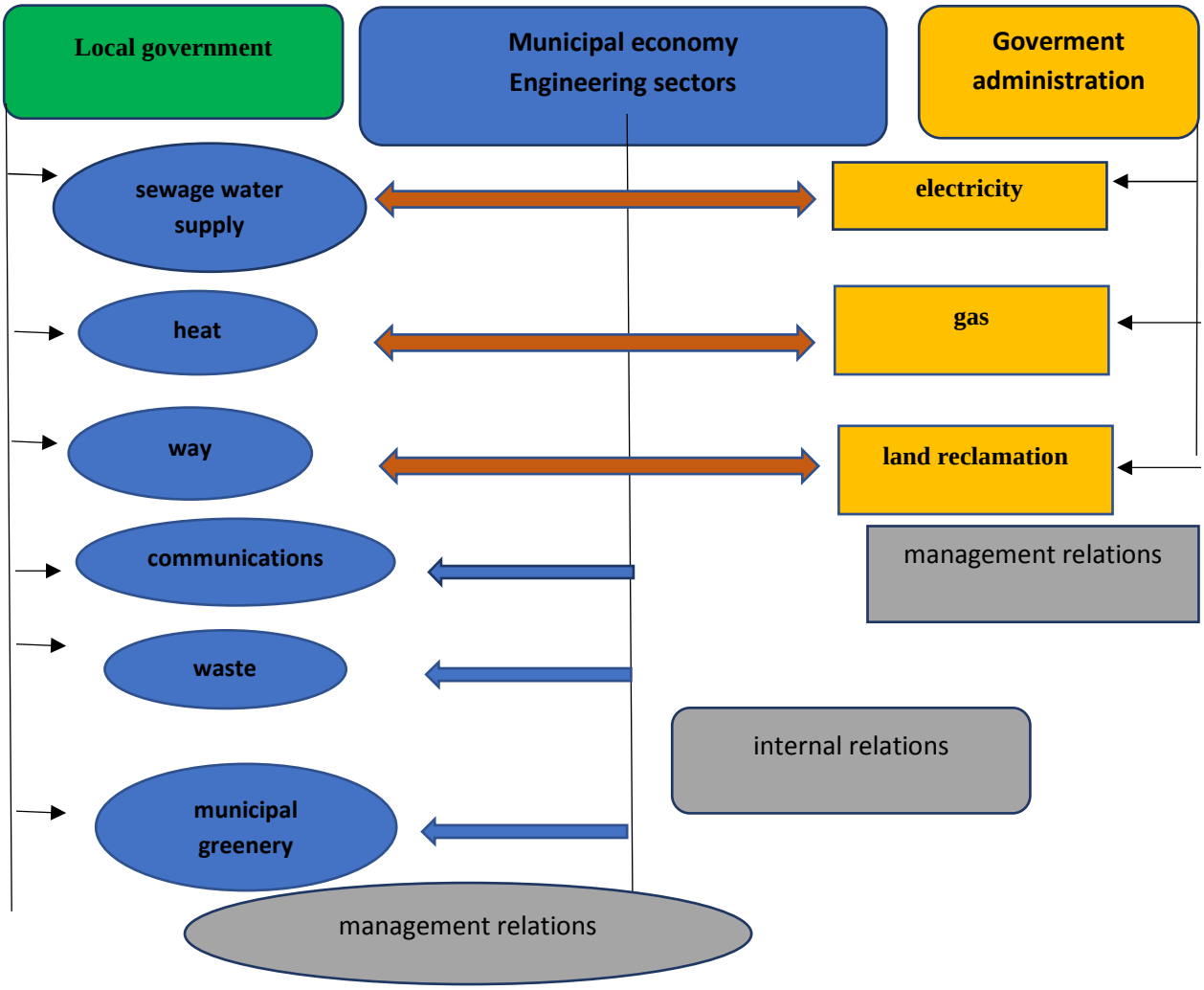
The commune plays primary role in the whole waste management system and it is obliged to create conditions to build a modern, comprehensive system based on the selective waste collection ensuring achievement of the recycling levels and waste storage reduction required by the law [7]. The system which is recommended in the national and provincial waste management plans is based on a network of regional waste processing installations functioning within designated regions and it was presented in the figure 2. [8]

Engineering sectors of municipal economy infrastructure include [3]:

a) underground municipal infrastructure (water supply, sewage, energy, heating, gas, telecommunications and underground networks, municipal roads and drainage);
b) ground communal infrastructure (ground roads, bridges, communication, tram tracks, railroad tracks, urban greenery, urban drainage);
c) aboveground municipal infrastructure (roads, viaducts, overhead power networks, overhead trams, telephone networks).

These industries have a different technical infrastructure. In the water supply and sewage industry, the water supply infrastructure itself is a set of technical devices that, working together, ensure the supply of water to recipients in the required quantity, with the right quality, at the right pressure, over a certain area of operation, over a certain period of time. Technical infrastructure is characterized by high capital intensity, longevity, durability of buildings and technical indivisibility. Management of engineering sectors is assigned to local government units and government administration.

**Figure 2 -** Management of municipal infrastructure sectors




It should be noted that individual industries are characterized by different technical infrastructure. In the water supply and sewerage industry, the water supply infrastructure ensures the supply of water to recipients in the required quantity, with the right quality, at the right pressure, over a certain area of operation, over a certain period of time. In turn, the sewage infrastructure is a complex of devices used for sewage disposal and treatment. On the other hand, municipal waste management infrastructure includes, among others, landfills, utilization

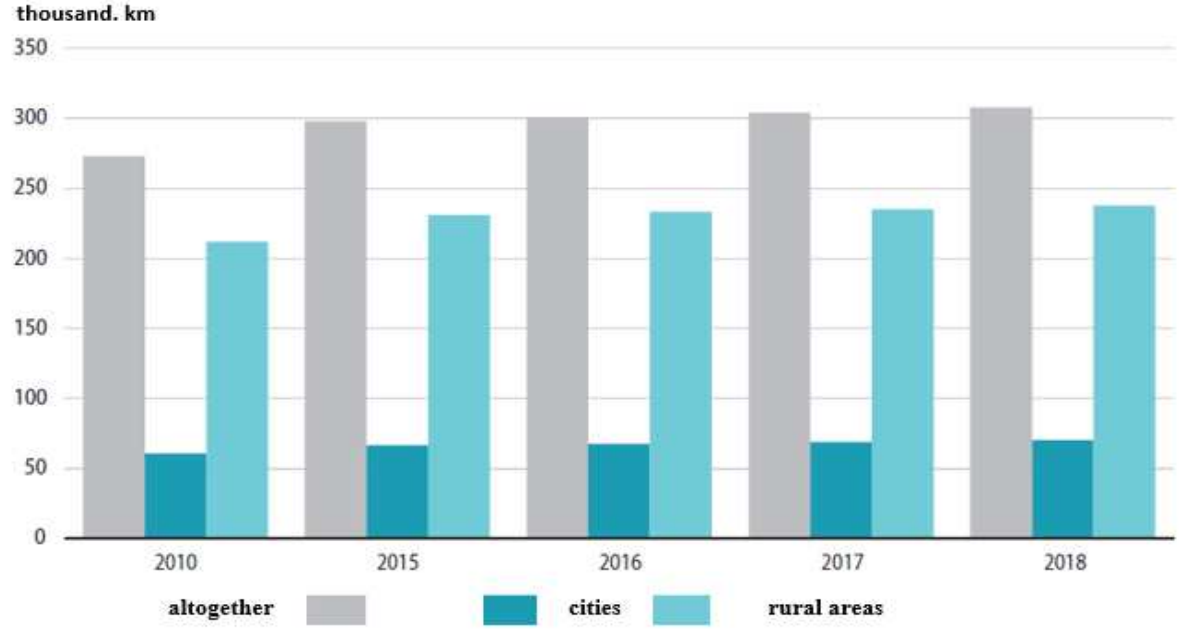
plants, including composting and incineration plants, waste collection containers, specialized equipment for exporting this waste, as well as all other devices related to the process of waste recycling and obtaining secondary raw materials [9].

## 3 Changes in Communal Services in 2010-2018

Municipal services and environmental protection are an important area of activity of local government units, in particular at the local level. The scope of municipal services includes, among others, collective water supply, sewage disposal and treatment, cleaning of public areas, collection and collection of municipal waste, municipal waste management, as well as running municipal cemeteries. In addition, in larger cities, these services also include the production and distribution of heat and the organization of public transport. In the field of environmental protection, these issues are related to the protection of water, soil and air. The publication selected the two most important ones that play a leading role in municipal management, namely water and wastewater management as well as municipal waste management.

Water and sewage management is an important area of the state's functioning. The methods of conducting it determine the condition of the aquatic environment, as well as the entire natural environment. The length of the active water distribution network is shown in Figure 3.

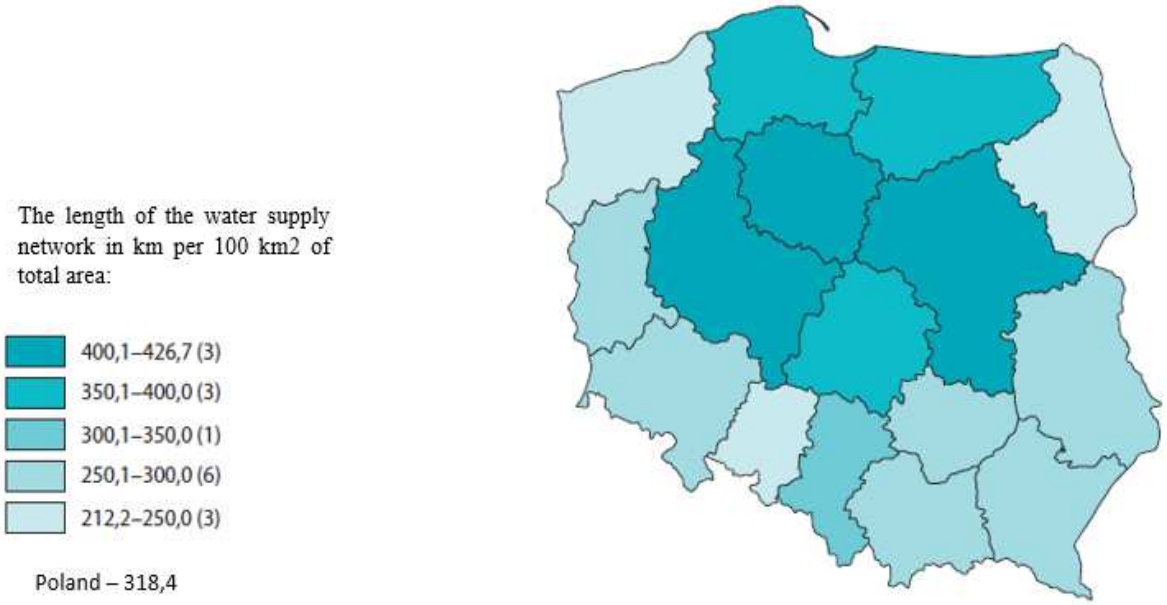
**Figure 3 -** Length of the active water distribution network




Source: own study based on GUS

Based on the above data, it should be noted that compared to 2010, the length of the water supply network increased by 12.8% (i.e. from 272.9 thousand km in 2010 to 307.7 thousand in 2018, including in rural areas from 211.9 thousand km to 237.6 thousand km of network, i.e. by 12.1%. The number of connections in turn increased by nearly 735,000 units, i.e. by 14.9%, in about 478 thousand in rural areas, i.e. by 15.7%.

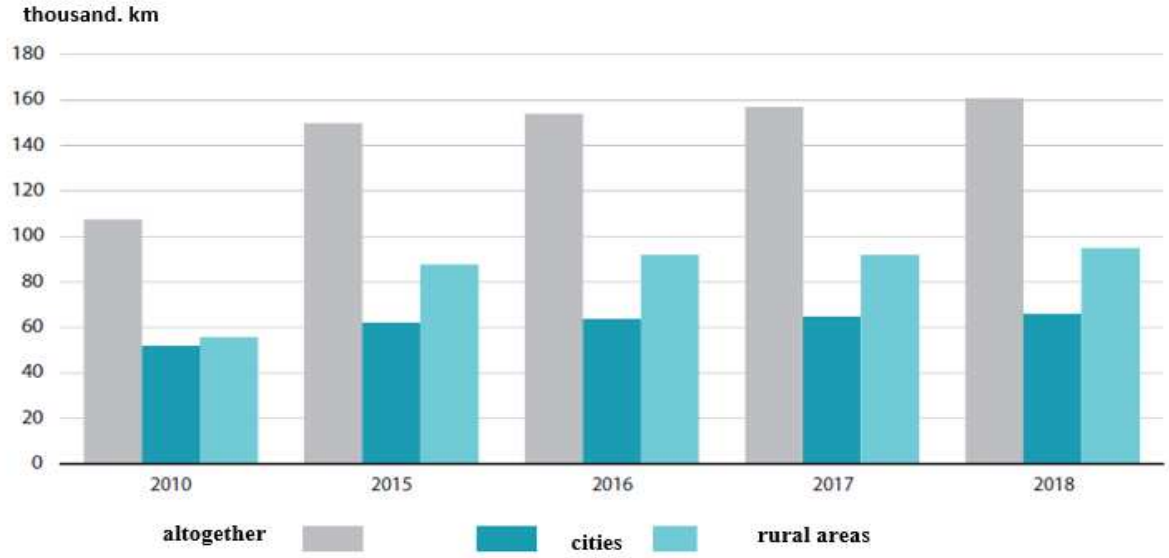
**Figure 4 -** The density of the water supply network in cities in 2018




Source: own study based on GUS

In 2018, the highest values of the water supply network density indicator were observed in the Śląskie Voivodeship - 175.7 km per 100 km2 and Małopolskie - 137.4 km per 100 km2. Whereas the lowest in the West Pomeranian Voivodeship - 49.9 km per 100 km2.

**Figure 5 -** Length of active sewage network in Poland in the years 2010 - 2018 (in thousand km)




Source: own study based on GUS

In the analyzed years, the length of the sewage network increased by 53.2 thous. km (by 49.4%). In 2018, it reached the length of 160.7 thousand. km. In the case of rural areas, the increase in the length of the network was higher by 39.3 thousand. km (by 70.6%) than in cities where there was an increase of almost 14 thousand. km (by 49.4%).

**Table 1 -** Population using the water supply network and water consumption in households per capita in Poland in the years 2010 – 2018

| Specification | 2010 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| Users of the water supply network to the general population (%) | 87,4 | 91,8 | 91,9 | 92,0 | 92,1 |
| | 95,3 | 96,5 | 96,5 | 96,6 | 96,6 |
| Water consumption per capita (m3) including in cities | 31,1 | 32,2 | 32,2 | 31,8 | 33,3 |
| | 35,0 | 34,3 | 34,2 | 34,1 | 35,2 |

Source: own study based on GUS

The average water consumption of households in 2018 was 33.3 m3 per capita. It should be noted that in cities it was 35.2 m3, while in rural areas 30.6 m3. The percentage of people using the sewerage network in the period 2010–2018 increased from 62% to 70.8% (an increase of 8.8 percentage points).

**Table 2 -** Population using the sewage network and the amount of sewage discharged from households in Poland in the years 2010 – 2018

| Specification | 2010 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| Using the sewage network to the general population(%) | 62,0 | 69,7 | 70,2 | 70,5 | 70,8 |
| including in cities | 86,1 | 89,8 | 90,0 | 90,2 | 90,2 |
| Waste water discharged from the sewage network from households during the year (hm3) | 901,6 | 926,1 | 938,1 | 954,4 | 969,5 |

Source: own study based on GUS
Based on the data contained in Table 2 in the analyzed years it should be noted that the amount of wastewater discharged from households is systematically increasing. In 2018 it amounted to 969.5 hm3 (in cities 845.5 hm3, in rural areas 124 hm3).

The problem of development of water and sewage infrastructure does not affect cities to a small extent, which is confirmed by statistical data. Therefore, the problem covers rural areas. It is therefore necessary to increase the equipment of rural areas with water and sewage infrastructure, as well as to improve access of non-urban areas residents to basic services (such as water supply, sewage disposal and treatment). The main effect of the actions taken will then be to improve the living conditions of the inhabitants and to improve the status of water bodies, as well as to preserve and develop the potential of the environment.

**Table 3 -** Municipal waste collected or collected per capita in Poland in the years 2010 – 2018

| Specification | 2010 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| | kg na 1 mieszkańca | | | | |
| Total municipal waste | 261 | 283 | 303 | 312 | 325 |
| Mixed municipal waste collected in total | 238 | 217 | 227 | 227 | 231 |
| Municipal waste collected selectively | 22 | 66 | 77 | 84 | 94 |

Source: own study based on GUS

In the analyzed period, a systematic increase of collected or received municipal waste in Poland is visible. In 2018, 12,485.4 thousand were generated in Poland. tons of municipal waste, which was an increase of 4.3% compared to the previous year. On average, 325 kg of municipal waste collected per inhabitant of Poland. In urban areas it was 382 kg, and in rural areas - 239 kg.

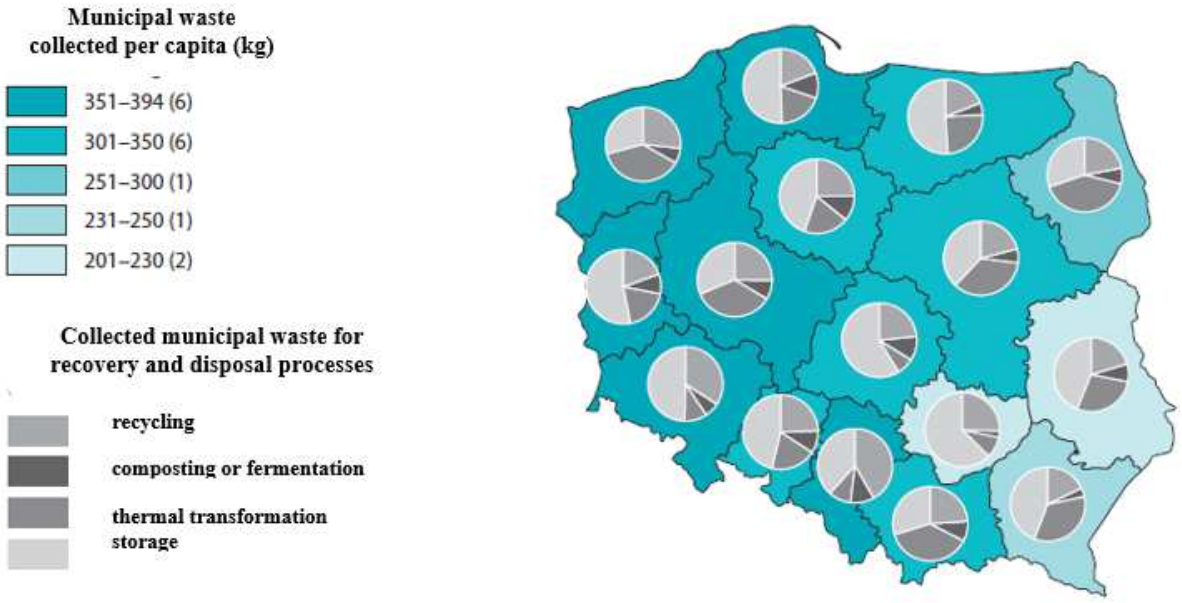
**Table 4 -** Processing of municipal waste in Poland in 2010-2018

| Specification | 2010 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| **Municipal waste directed to recovery processes (thousand t) from this to:** | 1 965 | 4 845 | 6 172 | 6 771 | 7 103 |
| • material recycling | 1 783 | 2 867 | 3 243 | 3 199 | 3 269 |
| • organic recycling | 181 | 661 | 814 | 848 | 1 012 |
| • thermal processing with energy recovery | – | 1 318 | 2 114 | 2 724 | 2 822 |
| **Municipal waste directed to disposal processes (thousand t) from this to:** | 8 076 | 6 018 | 5 483 | 5 198 | 5 382 |
| • Storage | 8 037 | 5 897 | 5 331 | 5 000 | 5 191 |
| • thermal processing without energy recovery | 39 | 121 | 152 | 198 | 191 |

Source: own study based on GUS

Municipal waste processing in Poland in the researched years has been systematically increasing. The major problem in achieving high recycling results for Polish municipal waste is its mixing at source. The reasons for the high proportion of mixed waste in the overall stream are different. Not only faulty regulations are important here, but also the lack of economic incentives, low ecological awareness of the population, or even more generally - socio-cultural conditions. Compared to 2010, this situation is changing, which is beneficial for the natural environment.

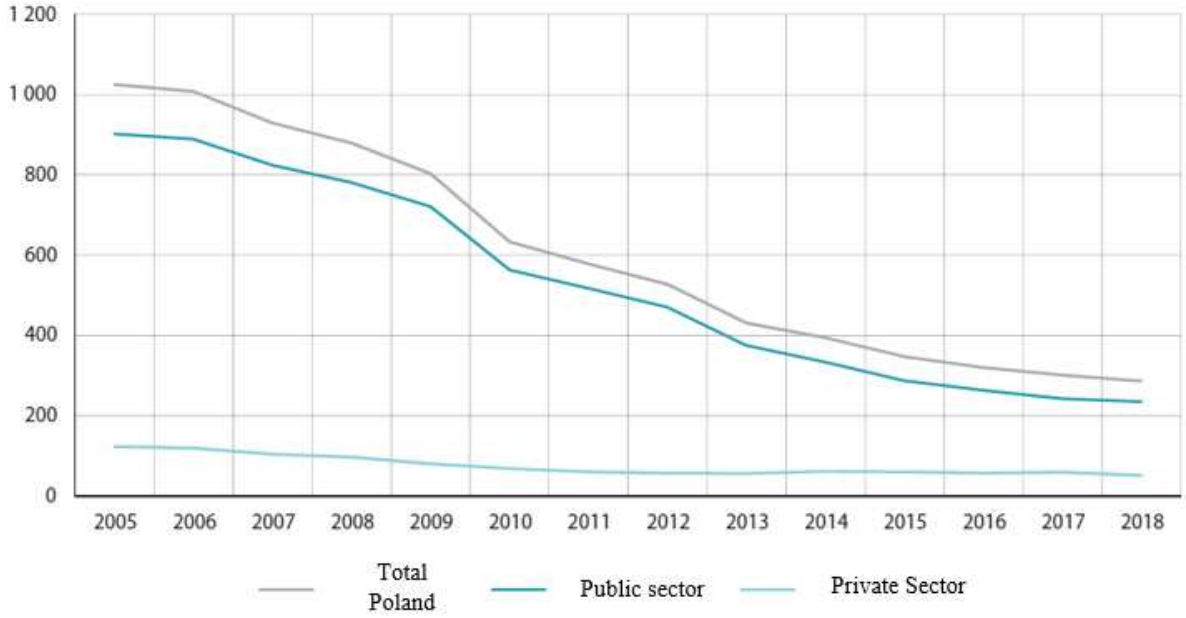
**Figure 6 -** Municipal waste management in 2018




Source: own study based on GUS

As part of municipal services, 56.9% of municipal waste generated in 2018 was intended for recovery (7 103.1 thousand tonnes), of which nearly 3 269.1 thousand. tons of municipal waste was designated for recycling (26.2% of the amount of municipal waste generated). These were both municipal waste collected or collected selectively, and raw material waste sorted from mixed municipal waste.

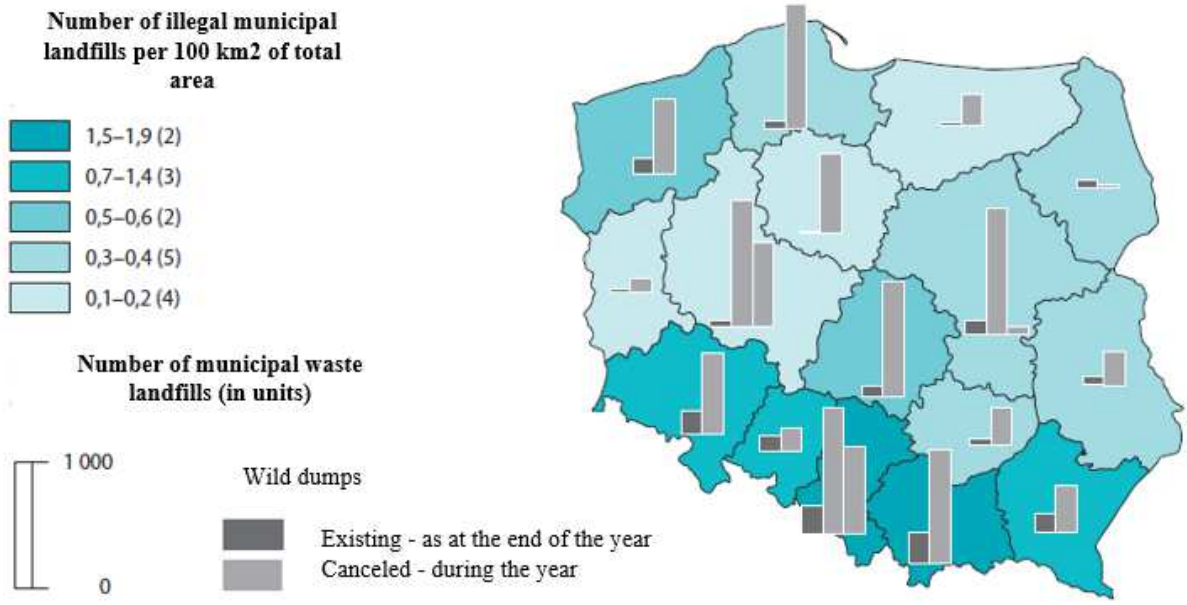
**Figure 7 -** Active landfills in Poland in 2005-2018




Source: own study based on GUS

In Poland, due to the need to adapt municipal waste landfills to technical and organizational requirements resulting from legal provisions, the number of active landfills has been systematically falling for several years. The solutions adopted are designed to protect the environment.

**Figure 8 -** Wild municipal landfills in 2018




Source: own study based on GUS

In the interests of the environment, it was important to eliminate illegal dumps. At the end of 2018, there were 1,607 illegal dumps in Poland. (i.e. 3.3% less than in 2017). In 2018, 10.5 thousand were liquidated. illegal dumps, of which 80.6% in cities.

## 4 Sumary

The natural environment is a nationwide good. It is therefore necessary to provide him with both protection and rational formation so that society can equally enjoy its values. Actions aimed at limiting environmental damage caused by the municipal infrastructure system include, above all, normalization and standardization in relation to

currently applicable European norms and standards, the use of modern materials and technologies. Unfortunately, the development of municipal services is not even across individual local government units. Communes, especially rural communes, are facing the problem of implementing the latest solutions in the field of municipal economy. Poviat cities are in a better position. In order to eliminate these differences, municipalities should receive additional funds for the development of municipal economy. It is also extremely important to conduct scientific research in relation to technologies used in municipal economy and to systematically improve processes of municipal infrastructure systems operation. In Poland, there are visible changes in municipal economy that have a positive impact on the state of the natural environment.

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# A Bicycle as an Alternative Mean of Car Transport

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## Abstract

The article analyses influence of using a bicycle as an alternative means of transport to reduce air pollution. There was analysed the territory of Poland with special attention on the Czech-Polish borderland because the border for the neighbours is not insignificant the same as the fact that the incoming air from the both sides should be of a good quality. In this respect expectations are two-sided considering that the border between Poland and the Czech Republic is covered with beautiful mountain ranges on which territory there are numerous spas. Therefore, the purpose of this article will be to demonstrate that cycling is more ecological that driving a car.

***Keywords:*** *air pollution, bicycle transport, car transport, smog*

***JEL Classification:*** *O18, Q01*

### 1 Introduction

The below mentioned examples can be used to present how important role fulfils the bicycle in a social life. In the time after the Second Ward War there was popular a bicycle event called the Peace Race which was organized annually in May with its route going through three existing then countries, i.e. East Germany, Czechoslovakia and Poland. Athletes, cyclist from different countries took part in it. A bicycle was a basis of films, e.g. 'Bicycles Thieves' produced in Poland in 1948 and directed by Viktora De Siky. It is a very beautiful story about ordinary people who lived in Italy in post-war period, which leitmotif was just a bike. The film won numerous awards on the global film market. In turn, '9 million bicycles' is a title of a song composed by Katie Melua. Inspiration to create the song was journey of the star to China during which the guide informed the tourists that in Beijing around 9 million bicycles ride its streets every day. And who of the readers browsing an old album with photographs did not see people photographed with a bicycle in the background. Decades ago a photo with a bicycle was a manifestation of prestige and wealth of the photographed person.

Coming back to the present days it should be stated that the bicycle is perceived as an alternative mean of transport in comparison to car traffic and public transport. It is used first of all by young people moving in cities. For this purpose it is needed a secure infrastructure which is being created in the last years more and more. Financial sources for this purpose are getting from the UE and own municipalities shared in the form of civil budgets (Sońta, 2013). Citizens' participation is an important factor supporting the process.

What may an individual mean comparing with large-scale coal power plans and idle politicians? Changes should be started form ourselves and our environment. For example, one can get on a bike and leave a car in a garage. Sum of such individual behaviours of the citizens will have a positive impact on the environmental protection. On the other hand,I suppose most of us are 'hostage of a car'. Therefore appears a question: is it really needed a ton of iron, electronics and oil to move within a city? This article will give answers on this and other questions related with the issues. Writing the article it was used analysis and synthesis of the materials developed by the institutions dealing with the studied issue published in scientific journals, conference materials, reports, internet information and legal regulations.

## 2 Material and Methods

This article will give answers on this and other questions related with the issues. Writing the article it was used analysis and synthesis of the materials developed by the institutions dealing with the studied issue published in scientific journals, conference materials, reports, internet information and legal regulations.

### 2.1. Influence of a Bicycle on the Environmental Protection

Analysing participation of the commune in the environmental protection there were separated organizational, directly executive, obligingly-replicating and supervisory control tasks. The organizational tasks rely on taking actions affecting the environment's condition as a whole or on its individual elements. The most important role in the group of the tasks is attributed to planning instruments ensuring organization of activities in the commune in the field of the environmental protection. The commune should provide conditions for the local community to the appropriate existence. The basic condition is health which among others quality of the air we breathe has significant influence. The air pollution in Poland is the topic which every year is being discussed more and more in the mass media and public discussions. All this is caused by increasing public awareness about the threats caused by the increase gas concentrations. The example can be organized on 29$^{th}$ January 2019 by the Supreme Chamber of Control the scientific conference 'Urban agglomerations – impact of the transport on the air quality', which was an introduction to work on the newest report concerning the air pollution in Poland (SCC Conference 2019). The latest SCC report on the air quality topic comes from 2014 and there can be found data from 2009-2012 (SCC Report 2018). The information in the reports present that vast majority 93% of the dust pollution in the period came from the so-called low-emission. It comes from domestic heating furnaces and local coal-fired boiler rooms. According to the same data, traffic pollution is between 5 and 7 %. Based on a cursory analysis of the data it would seem that emission coming from cars is on a low level. However, the data concern an average for the whole country. The proportions are completely different in case of large cities (https://oko.press/).

In 2011 cars were responsible for 63% of smog in the Warsaw agglomeration. Meanwhile, number of the cars in Warsaw and other large cities in Poland is growing. The number of the cars between 2012 and 2017 in Warsaw according to the Central Statistical Office (CSO) has increased by 27%. The smog problem concerns mainly municipalities due to heavy car traffic and high-rise architecture which limits air flow. The society realizes importance of the environmental protection only when people cannot breathe clean air. In the recent years, a lot of attention was paid to promote ecological solutions in life of each person what causes growing of social awareness and sense of responsibility for the common good which is the air.

Due to the fact, riding a bike is becoming more and more fashionable. Moving in a city without exhausts, noise and traffic jams are not a utopian dream but everyday life of two wheels' lovers. Thanks to new paths appearing in many cities riding a bike in urban conditions is becoming safer. Winters with moderate temperature allow two-wheeled journeys throughout a year. Although it is difficult to see decreasing number of cars on the roads a careful observer surely will notice more and more bicycle users. There are many reasons for such situation. Crowded and traffic jammed streets prevent fast movements from place to place. Meanwhile, small one-wheelers easily travel even long distances without delays related to heavy traffic. More Polish cities decide to develop a network of bicycle paths. There are created new public bicycles rentals with an extensive network of points in which bicycles can be picked up and returned (Paterka, Wieczorek, Gołaszewski, 2000).

It is impossible not to notice that the bicycle is a great alternative for own car or even the public transport. It is cheap in operation, easy to park, independent on a timetable and above all ecological. There are five main reasons for which cycling has a positive effect on the environmental protection:

1. A bicycle does not need a fuel. It is powered by renewable energy from our legs.

There is a double benefit of this. First of all, cycling we do not create any poisonous exhausts containing harmful substances that cause diseases and air pollution. Secondly, fossil fuels which extraction, processing and transport have nothing good in ecology are not needed to powers bicycles. Taking into account production as well as operation of various means of transport it turns out that cycling per person generates ten times less emission of carbon dioxide than driving a car and five times less than bus riding what will be described later in the article.

2. Production of a bicycle needs fewer amounts of limited natural resources. Everyone

who has tried to repair a car on one's own knows perfectly how many components are needed to function the whole efficiently and safely. There are used metal alloys, various plastics, liquids, greases, rubbers and glass. An average car weighs over a ton and its complexity sometimes make it impossible to exchange a bulb. However, production, repair and maintenance of a bicycle look completely different. Most of basic faults can be repaired by one's own using simple tools. A bicycle produced 30 years ago is as ecological to use as the one which recently left a production line. Exchange of a few components makes possible to enjoy riding a retro bicycle during next many years what cannot be said about cars or buses.

3. A bicycle does not create any noise. Pollution of noise is a plague in most modern

cities. Their inhabitants live in continuous hum. It is difficult to have silence even at night, starting from the earliest morning hours their ears are attacked by rambling of trams, braking of buses, hors, sirens and drone. Noise fatigue can be a reason of worse mood, migraine attacks and weakened immunity. The most discrete means of transport is a bicycle which riding almost does not create any noises. Replacing cars with bicycles would create silence in cities.

4. Cycling is good for health. It is worth to know that one hour of riding a bike is from

300 to 600 burnt calories. Systematic use of the two wheels favours improvement of physical condition. It is especially valuable for people working in front of computers in offices. Way to work allows taking at least a minimum amount of activity having such type of the work. Even slight physical activity on a fresh air performed systematically contributes to better oxygenation of a body, strengthen immunity and improve mood. It will be also a perfect excuse to commune with nature if less frequented paths will be used.

5. Cycling one pays more attention on the natural environment. Peoples see then garbage

lying on a side of a road, feel the smog, the noise and exhausts around more painfully. Proximity of the threats builds environmental awareness. It is not possible to see everything from a car's steering wheel.

### 2.2. The Bicycle Boom

Rentals of public bicycles operate not only in large agglomerations but more often also in small cities. The groups of the people convinced that on two wheels one can reach his or her destination faster than driving a car on crowded streets is growing. Authorities of the cities meet the process.

The bicycle boom continues through the country. The two-wheel vehicles are available in all regions of the country starting from Warsaw, Cracow, through Lodz, Bydgoszcz, Bialystok, Katowice, Lublin, Wroclaw, Poznan, Radom and many other cities and towns. Public bicycles were launched in Duszniki Zdroj, Boleslawiec, Lubon what are small cities with tourists in mind.

In 2011 came into force in Poland a concept (City for Bicycles 2018). It is a nationwide network of organisations and people working for rights of the cyclists and their popularization as an environmental friendly mean of transport in a city which has its headquarter in Wroclaw. Representatives of the organization cooperate among others with the Ministry of Infrastructure, Parliamentary Group on Communication Development and Bicycle Tourism, National Headquarters for National Roads and Motorways. The main mission of the concept is business of the whole society including: increase of bicycle traffic causing improvement of the environment condition and reduction of the transport costs. Facilities for the cyclists favouring overall improvement of safety of the road traffic as well as forming pro-bicycle awareness are also important aspect. It as a result is popularization of the sustainable transport, creating of universal awareness of benefits coming from development of the bicycle traffic and safety of traffic behaviours among drivers and cyclists. It is also worth to notice the fact that it is a public presentation of the cyclists' interests by supporting grassroots initiatives of the pro-bicycle campaigns, active public dialogue with the local government authorities and the state institutions.

Surveys conducted by students showed that having question would you agree to pay an extra 5 zloty municipal fee, i.e. equivalent 30 CZK monthly, the respondents replied that building of bicycles roads was on 5$^{th}$ position with result of 55% of 13 given propositions to be chosen. Below there are the survey's results in the cities:

Czestochowa 68%, Radom 68%, Bydgoszcz 67%, cities above 450 thousand of residents 58%, cities below 450 thousand of residents 63 %.

The presented data shows that the smaller is a city the greater is the willingness to allocate the funds for building of the paths and that the local communities want to live in modern cities and the bicycles' paths are permanent elements of the road infrastructure of a modern European city (City for Bicycles 2018).

It seems that definition of the smog's concept brings closer the analysed problem. It was created over the years because the pollutions were being noticed already in the 17$^{th}$ century. The name 'smog' known for everybody comes from two English words: 'smoke' and 'fog'. Such combination perfectly defines essence of the smog's problem but not completely. In other words the smog is a combination of three factors: pollution produced by people, fog as an atmospheric phenomenon and also 'atmospheric silence'. The last phenomenon means total lack of winds. In such a way is created a fog of pollution suspended on the atmosphere level where live people.

If Poland would adopt the European information standards about the air pollution then in 2017 a smog alert would be announced in: Cracow 41 times, Katowice 37 times, Opole 22 times, Wroclaw 17 times. As an example there are alert levels in the Visegrad Group countries for average daily dust concentration of PM10. Data in micrograms per cubic meter are Czech Republic 100, Hungary 100, Slovakia 150, Poland 300 what is a

high threshold (Smog Alert Report 2018). From the above mentioned data results that in Poland the alert level is accepted at twice or even three times higher level comparing with norms of the southern neighbours. Lower levels are among others in Belgium 70, Italy 75, and France 80. The data shows that Poland in terms of the emitted smog is not the best neighbour. Therefore, from 11th October 2019 there are applied new norms for smog information and warnings. Although they have been reduced by half they are still too high comparing with other countries. The smog alert according to the new regulations will be announced at daily PM10 concentration exceeding 150 mcg and level of information is 100 mcg (Regulation of the Environment Ministry 2019).

In the ranking of the 50 most polluted European cities, as many as 36 cities are Polish (WHO report from 2018) and among them there are listed cities located the closest to Polish-Czech border: Zywiec, Pszczyna, Rybnik, Wodzisław Slaski and Katowice. Action of the two countries from the central level to the local governments' work is a very important element of the cooperation in the integrating Europe.

## 3 Result and Discussion

### 3.1 A Bicycle or a Car – Pros and Cons

Two-wheeled vehicles have been very popular in the recent years; every year more than one million bikes are sold in Poland. Whereas, electric bikes are equipped with a battery which allows traveling even 100 km and which can be charged like a normal mobile phone. In any case, an electrically powered bicycle allows traveling much faster and much further than a regular bike. A traditional bicycle or a one powered electrically is surely better alternative than a car.

From ecological point of view riding a standard or an electric bike is about thirteen times less harmful for the natural environment than driving a passenger car (European Cyclists Foundation 2013). For the bicycles emission of the carbon dioxide ($CO_2$) is calculated per one person as 21 grams per each ridden kilometre. The whole 'life cycle' of the equipment is taken into account. The $CO_2$ production in such circumstances results not so much from riding but it is related to manufacturing of a bicycle as well its maintenance. In case of the e-bicycles, the indicator is slightly higher and its average value is 22 grams.

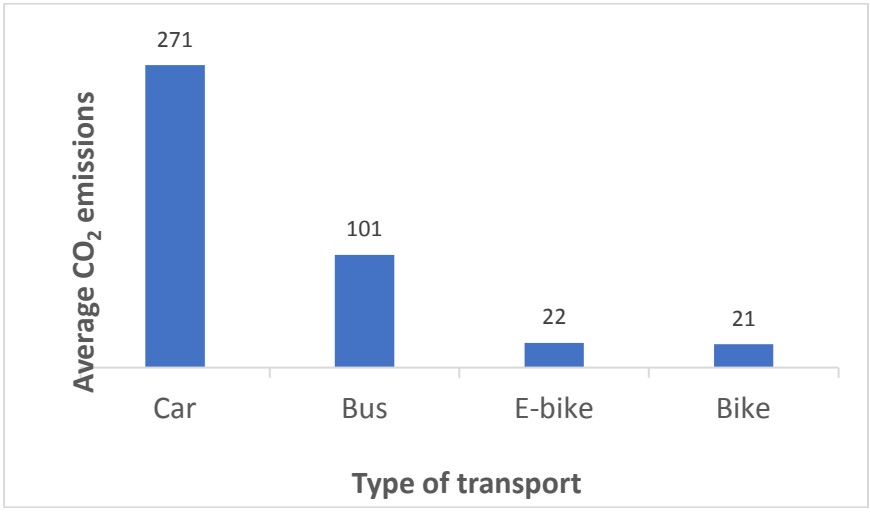
For a long time, constantly the car transport is recognized as the fastest growing source of the carbon dioxide's emission. The European Cyclists Federation estimated that in case of a passenger car, the $CO_2$ emission is in total 271 grams average for each driven kilometre per one passenger. Travelling by cars or buses is definitely more harmful for the environment than using bicycles. The bus transport looks slightly better in this respect and it is 101 grams. The environmental pollution is the first onerousness and the noise is the second. We can significantly influence on the noise reduction in our environment changing means of transport for a bike. A single vehicle emits 65 dB noise while a very old one even up to 95 dB. At the same time bicycles, even the ones with electrical support almost do not emit any noise.

Summarizing the point, it can be claimed that the bicycles contribute not only to better health of their users but also they have a large influence on the s surrounding environment. The more bikes in a city the fewer cars what effects on cleaner air. In turn, less exhausts and dust protect green areas and historic buildings against the harmful effects of the pollution.

The ecological two wheels can be practically and even often faster than the four wheels. The rule works mainly in cities. The reasons are traffic jams and parking places. In very large cities at rush hours street are almost impassable (fig 2). One has to stay very long to move while using a bike other can slip through thicket of internal combustion cars. Each parking place for a vehicle means a lot of concrete and a bike rack can fits everywhere. It follows that it is easier to park a bike.

Choosing a bicycle instead of a car or public transport we can save even up to several dozen zlotych monthly. Purchase of a bike is a one-time expense and if we choose a good bicycle it will serve us for many years. A high quality urban model of a bike can be bought for 2,000 Polish zloty while a recreational one which can be used to ride a trip for 3,000 zlotych. In turn for a car's bill it must be necessarily added refuelling, obligate insurance fee and technical inspection. Each mean of transport has advantages and disadvantages but riding a bike combines especially many values (table 1).

**Figure 1** - Average $CO_2$ emission calculated on every travelled kilometre*




* The estimations include among others the emission related to production of a mean of transport
Source: (The European Cyclists Federation – ECF)

### 3.2 A Bicycle at the Southern Neighbours

The Polish-Czech border has a length of 761.8 km constituting approximately 22.7% of the total length of Poland's borders. A characteristic feature of the Czech-Polish border area is a diversification of the landscape where areas located above are less polluted than the ones located in cirques where air movement is limited. On the Polish side the border with the Czech Republic passes the area of three voivodships: Lower Silesia, Opolskie and Silesia and at the Czech Republic side: Liberacký kraj, Králové – hradecký kraj, Pardubický kraj, Olomuniecký kraj and Moravskoslezký kraj.

The southern Polish border almost along its all length passes mountain areas. The Polish-Czech borderland is one of the best developed touristic areas. There are also developed ski, cycling and spa tourism on the area additionally to the nature and mountain tourism. There is here the largest number of areas legally protected nature (especially national parks). The main tourist areas on the Polish-Czech border are: Izerskie Mountains, Karkonosze Mountains, Stolowe Mountains, Klodzko Land and Silesian Beskid.

In 2013, when a group of urban cycling enthusiasts joined their forces and created concept which will become the largest successful public bicycles' project in the Czech Republic, which is used by both the residents and tourists. An interesting fact is that there has been followed personalisation of the bicycles because all of them have names instead of boring codes. At the beginning the group operated as a non-profit organization. Then the crowdfunding[17] was used which turned out to be a very successful idea and helped the company to get better financially. It is noteworthy, that the city does not manage the project nor support it in any way. The currently available industrialized public bicycle's programs are low profitable hence unworkable in case of smaller cities and despite this a good example is the Kyselky Canter. It is located in Nové Mésto close to Smrkem city, directly at the foot of Izerski Mountains. One can get there from Poland travelling from Szklarska Poreba towards Swieradowa Zdroj and Czerniawa / Nové Mésto pod Smrkem border crossing. The bicycle's paths are about 80 kilometres long and they are a unique project in the Central Europe. The project was co-financed by the surrounding municipalities and from the European Union's funds. The paths many times were awarded by various tourist groups. It is the highest located starting base placed in the very centre of the bike's paths network. TREK American brand testing centre offers high quality bicycles (rental, wash, accommodation, parking for 60 places for cars). Motto of the Centre is: 'Enjoy your ride and leave worries to us'.

Attractions for the cyclists on the Czech side are:

- trip along the Bata canal with the path's length 56 km;
- excursion to Germany along the Ohře river what is 99 km;
- picturesque Greenway route 470 km from Prague to Vienna
- extreme experiences on the 21 km Rychlewski Routes.

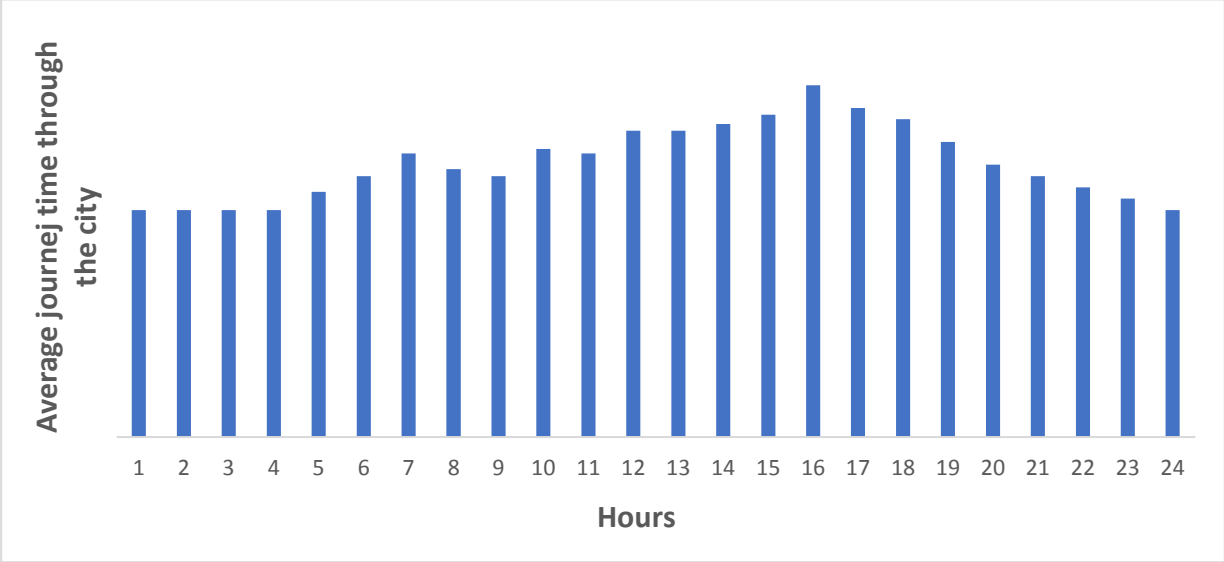
[17] Crowdfunding – form of a project financing by a community, which is or will be organized around the project.

Our southern neighbours can take care of the cyclists. They prepare various conveniences thinking about them. One of them are cyclobuses it means buses for transporting bicycles which are used by the cyclists who are riding on the bicycle's roads in Beskidy, Karkonosze or the Bohemian Paradise.

From the beginning of 21st century even before Poland and the Czech Republic joined the European Union there were realized works on providing an organizational framework of the Intelligent Transport Systems (ITS) building in Europe-wide, cross-border, regional and local scale. The last one despite the lowest territorial range has a large meaning for daily lives of million citizens of each of the European Union Countries. The intelligent public transport systems help to improve the transportation process of people and commodities in urban agglomeration terrain operating basically in the areas of: passengers' service, traffic management, transport logistics' system (Vrabková, Vaňková, Ivan, 2016).

A smart city cannot exist without transportation system which can quickly and efficiently react on changing conditions and needs of the residents. The adaptability is important both in the context of long-term changes, e.g. a city development as well as in the contest of reaction on everyday events, e.g., a communication peak.

**Figure 2** - The communication peak in Warsaw in 15th October 2018




Source: Traffic data in 2018, www.ce-traffic.pl

Average passing time through a city at 4 p.m. is almost two times longer than driving in free traffic conditions. Therefore, a question arises: is it worth to go by a car? The main criteria during choosing a mean of transport are time and cost of a travel. Most studies of the issue neglects to respect the environment.

## 4 Conclusion

The article presents the more important aspects related to the bicycle transportation's impact on the air pollution's reduction. Summarizing the previously presented considerations for using a bicycle as an alternative mean of the road transport, they are listed in the table 1.

**Table 1** - Advantages and disadvantages of a city bicycle.

| Advantages | Disadvantages |
|---|---|
| 1. Increasing number of people riding a bicycle.<br>2. Possibility of using a bicycle by the residents, visitors, students and tourists.<br>3. Reduction of crowd in the public means of transport.<br>4. Improvement of the air quality.<br>5. Improvement of health condition (physical as well as mental).<br>6. Offering the residents an alternative to the city transport.<br>7. Low project's realization costs.<br>8. Improvement of the bicycle infrastructure. | 1. Addiction to weather conditions.<br>2. Lack of comfort for greater distances.<br>3. Fatigue caused by heavy physical effort.<br>4. Low safety due to lack of bike's paths.<br>5. Long travelling time.<br>6. High exposure to road accidents.<br>7. Cyclists are not liked by pedestrians and drivers.<br>8. Signalization sensors during changing traffic lights do not react on the cyclists.<br>9. Mandates for the cyclists riding on pedestrian walkways. |

| | |
|---|---|
| 9. Lack of theft's risk, storage problems and problems related to purchase and maintenance.<br>10. No waiting on bus stops. | |

Source: own study based on the information contained in this article.

Summing up, a properly configured system of the public bicycle provides the residents an affordable access to a bicycle as an alternative to the public and car transport. It is also an advertisement for the city and for tourists it gives opportunity to explore it. Of course, some of the proposed advantages and disadvantages in the table are debatable, for example the physical effort and the long travelling time included in the disadvantages which may be reduced by using an e-bicycle, etc.

From the above mentioned follows that a bicycle is an interesting alternative for cars, buses and even trams. It is comfortable, cheap and practical. Most of us have learnt to ride a bicycle already in childhood. Do not hesitate to use the skill for own convince, health and care for common good because riding a bike we protect the natural environment (Dębowska-Mróz, Lis, Pawłowski 2019).

The issues presented in the article do not cover all aspects related to it. Therefore, there is a pressure of the public opinion as well the global institutions and the European Union that the changes and legal conditions in the area of the environmental protection follow in the right direction. It is evidenced even by the cited earlier regulation about tightening reduction of the measurements' level of harmful substances in the air. The legal regulations are followed by the deeds. Kozienice Power Plant in Poland can be used as an example which had produced electricity based only on carbon unit now. Currently, there are works related to rebuild of its power units which fuel will be gas. These few examples do not evidence that the situation in terms of improving the air quality will not get better from day to day because it will require a longer time perspective and huge financial outlays.

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# Migration Behaviour at the Level of Municipalities of the TRITIA Region

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## Abstract

The main aim of this paper is to compare differences of the migration behaviour at the level of municipalities (LAU 1) of the four European regions: the Moravian-Silesian Region, the Opole Voivodeship, the Silesian Voivodeship and Žilina Region. Migration behaviour will be evaluated on the basis of official statistics on the numbers of immigrants and emigrants. The main indicator for the analysis will be the net migration and the crude rate of net migration of the municipalities of the TRITIA region. Due to the different settlement policy at the level of municipalities, especially in Poland, we will perform a basic analysis using a selected size category of municipalities. Migration behaviour will be evaluated for a ten-year period between 2007 and 2016. The result will be presented not only in text and tabular form, but also represented by map output in the ArcView geographical software.

***Keywords:*** *Moravian-Silesian Region, natural increase, net migration, Opole Voivodeship, Silesian Voivodeship, Žilina Self-governing region*

***JEL Classification:*** *J11, J13, R23*

### 1 Introduction

The European Grouping for Territorial Cooperation (EGTC) is a European Union level form of transnational cooperation between countries and local authorities with legal personality (Zapletal, 2010). EU Council Regulation 1082/2006 of 5 July 2006 forms its legal basis. Today we have in the European Union 69 EGTC. One of them is TRITIA (Foldynová, Hrušková, Šotkovský, Kubáň, 2018), the first grouping of its kind at the area of Poland, Slovakia and the Czechia with regional governments as its members. Territory where EGTC TRITIA works includes Moravian-Silesian Region from Czech Republic, Silesian Voivodeship from Poland and Žilina Self-governing Region from Slovak Republic (**Chyba! Nenalezen zdroj odkazů.Chyba! Chybný odkaz na záložku.**).

But the established members of the EGTC TRITIA were the four regions. On 1.1.2018 the member Opole Voivodeship left the Grouping. EGTC TRITIA was established on February 25, 2013 to facilitate and support cooperation between the PL-SK-CZ members. But the decision to establish the group was made by the leaders of the four regional governments in 2009. It aims to support social and economic cohesion within the border region mainly though intelligent implementation of programs and projects of territorial cooperation. The leaders' decision was based on the positive experience of the regions in their mutual cross-border cooperation as well as the impacts of this cooperation on the improvement of wellbeing of the people in cross-border area (EGTC TRITIA, 2020).

**Figure 1** – Basic map of the Tritia region.


Source: Author

We will analyse the migration behaviour of the municipalities of all four founding members of EGTC Tritia between years 2007 and 2016. From the point of view of the Nomenclature of Territorial Units for Statistics (NUTS), we will work with the LAU2 level as a spatial unit. These so called "Local Administrative Units" are not subject of the NUTS Regulation. In the 1970s, Poland went through a stage of integration that responded to the general development trend related to rural depopulation and the growth of service demands. At present, most rural municipalities (Czech Statistical Office, 2019) have a population of 2,000 to 9,000 and are composed of more than 20 villages and with a system of so-called care (sołectwo), self-government at the level of settlements. In Poland, the principle applies that the municipality must have at least 1,000 inhabitants. In the Opole (OV) and Silesian (SV) Voivodeships, there are no municipalities with less than 2,000 inhabitants.

**Table 1** – Territorial division of the Tritira Region and its size characteristics.

| Code (NUTS) | NUTS2 and NUTS3 | | | | | Population (mil.) | | Density | LAU2 |
|---|---|---|---|---|---|---|---|---|---|
| | Name origin | Name English | | Country | Area (km$^2$) | 2007 | 2016 | 2016 | number |
| **CZ 08** | Moravskoslezský kraj | Moravian-Silesian Region | MSR | Czechia | 5.427 | 1.250 | 1.210 | 223 | 300 |
| **PL 22** | Województwo Śląskie | Silesian Voivodeship | SV | Poland | 12.333 | 4.654 | 4.559 | 370 | 167 |
| **PL 52** | Województwo Opolskie | Opole Voivodeship | OV | Poland | 9.412 | 1.037 | 0.993 | 106 | 71 |
| **SK031** | Žilinský samosprávný kraj | Žilina Self-governing Region | ŽSR | Slovakia | 6.809 | 0.696 | 0.691 | 101 | 315 |
| | | Tritia Region | TR | Total | 33.981 | 7.637 | 7.453 | 219 | 853 |

Source: author, EUROSTAT data (Eurostat, 2020)

Our evaluation of migration behaviour focuses on 853 municipalities in the Tritia region. During the monitored decade, the total population of the region decreased by approximately 180,000 in the area of 33,981 km$^2$ (TABLE). Polish statistics show a larger error in the dynamics of changes in population size. But despite the errors of the current population register in the regions, the result of the analysis can be summarized as follows:

- All four regions are population-loss, but the loss itself is not large and reaches values from 0.7% (Žilina Self-governing Region) to 4.2% (Opole Voivodeship) with an average of about 2%.
- The migration balance with a weight of 60% contributes significantly to the decline in the population.
- The population in the Silesian Voivodeship decreased the most in absolute terms. Given its population size of over 4.5 million, this is understandable. Its share in the total population decline of the region was 50%, but its weight in the population of the region is more than 60%.

- All regions were migratory losses throughout the period under review.

As migration behaviour (Bosswick, Husband, 2005) is a crucial component of the change in the population weight of all regions, we decided to analyse this behaviour at the level of municipalities in the Tritia region. Due to the differences in the settlement hierarchy, especially between Poland and the other two states, it will be more appropriate to focus the research on selected size categories of the set of municipalities.

## 2 Methodology of Analysis of Migration Behaviour and Settlement Hierarchy

The difference between the numbers moving in (immigrant, ***I***) and moving out (emigrant, ***E***) is net migration (***NM***) (1). Net migration is the difference between immigration to and emigration from a given area during the year (net migration is positive when there are more immigrants than emigrants and negative when there are more emigrants than immigrants). Since many countries either do not have accurate figures on immigration and emigration, or have no figures at all, net migration has to be estimated. It is usually estimated as the difference between the total population change and the natural increase during the year. Net migration gives no indication of the relative scale of the separate immigration (***I***) and emigration (***E***) flows to and from a country; a country may report low net migration but experience high immigration and emigration flows.

$$NM = I - E \tag{1}$$

Crude rate of net migration (***CRNM***) is simply the ratio of net migration (often including statistical adjustment) in a year divided by the total population at mid-year and multiplied by 1,000 (2).
The value is expressed per 1 000 inhabitants. At the international level, the nomenclature methodology is not unified. Therefore, different names appear for this indicator, e.g. the net migration rate (Poston, Bouvier, 2017). That is:

$$CRNM = \frac{NM}{P} \cdot 1{,}000 = \frac{I - E}{P} \cdot 1{,}000 . \tag{2}$$

In migration statistics, data are compiled by the age, gender, marital status, native language, country of birth, and region of arrival and departure of migrants. The population change (the total population increase) over time can be quantified as the number aggregate of the natural increase (***NI***) and net migration (***NM***).

For references territory diversity values of the net migration we will use data come from the statistical office of the European Union (EUROSTAT) and national statistical offices of all three states.

**Table 2** – Size groups of municipalities by regions.

| Tritia region | Population size categories (December, 2016) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | less than 5,000 | | 5,000 - 19,999 | | 20,000 - 49,999 | | 50,000 - 99,999 | | 100,000 and more | |
| | LAU2 | Population | LAU2 | Population | LAU2 | Population | LAU2 | Population | LAU2 | Population |
| Moravian-Silesian Region | 266 | 325,608 | 22 | 170,838 | 7 | 180,006 | 4 | 241,793 | 1 | 291,634 |
| Opole Voivodeship | 10 | 40,16 | 50 | 487,822 | 8 | 226,603 | 2 | 119,729 | 1 | 118,722 |
| Silesian Voivodeship | 15 | 58,405 | 111 | 1137,239 | 17 | 525,988 | 12 | 770,133 | 12 | 2,067,399 |
| Žilina Region | 294 | 337,588 | 16 | 133,848 | 3 | 82,969 | 2 | 136,373 | 0 | 0 |
| Tritia region | 585 | 761,761 | 199 | 1,929,747 | 35 | 1,015,566 | 20 | 1,268,028 | 14 | 2,477,755 |

Source: author (EUROSTAT data and national statistical offices)

Migration is an important part of changes in population size (Zlotnik, 1998), especially at the lowest spatial level, i.e. at the level of municipalities. When evaluating a large set of municipalities, it is purposefully more appropriate to use a spatially structural approach. This leaves the possibility to work with the size structure of municipalities, which remain the basic territorial self-governing unit (Loughlin, Hendriks, Lidström, 2011). Due to the different potential in relation to the settlement structure, it is not possible to more accurately analyse the migration behaviour of small municipalities with a population of up to 5,000 (TABLE). Poland's policy of centralizing the administration of small municipalities prevents us from doing so. Out of the total number of 853 surveyed municipalities, the structure selected by us according to size categories is burdened by a disproportionately large number of municipalities in the smallest group of municipalities with less than 5,000 inhabitants. There is a total of 585 of them, which means almost 69% of the total number of municipalities. However, only a tenth of the population of the Tritia region lives in this group, which is the least of all five size categories of municipalities. To other differences we can add the following:

- Most people live in the largest cities with more than a hundred thousand inhabitants, a total of one third.
- The second most populous size category consists of settlements with 5 to 20 thousand inhabitants, a total of one quarter.

- The third most populous size category consists of settlements with 50 to 100 thousand inhabitants with a weight of 17%.

## 3 The Analysis of the Migration Behaviour on the Tritia Region

In the ten years between 2007 and 2016, the area of the Tritia region has lost more than 120,000 inhabitants, based on statistical data on the natural increase and migration balance. The migration loss accounted for almost 60 percent of this decrease (TABLE). In the area of the Tritia region, the population was lost by migration in excess of 70,000 in the monitored decade. This value represents less than one percent of the total population of the Tritia region, where today less than 7.5 million people live permanently. The remaining 40 percent of the loss was in natural decrease. Although the measurement of net migration is less accurate than the measurement of natural increase, it is clear that migration has a greater impact on the decline of the population of the Tritia region.

**Table 3** – Net migration by population size categories of municipalities in the Tritia region.

| Population size categories | Net migration (2007 - 2016) | | | | | | | | | | Municipalities | | Population | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MSR | % | OV | % | SV | % | ŽR | % | TR | % | 2016 | % | 2016 | % |
| less than 5,000 | 17,951 | 64.4 | -813 | -12.2 | 879 | 2.6 | 12,670 | 649.4 | 30,687 | 43,4 | 585 | 68,6 | 761,761 | 10,2 |
| 5,000 - 19,999 | 1,144 | 4.1 | 2,609 | 39.0 | 37,131 | 108.6 | -3,867 | -198.2 | 37,017 | 52,4 | 199 | 23,3 | 1,929,747 | 25,9 |
| 20,000 - 49,999 | -10,280 | -36.9 | -4,109 | -61.4 | 2,993 | 8.8 | -4,655 | -238.6 | -16,051 | -22,7 | 35 | 4,1 | 1,015,566 | 13,6 |
| 50,000 - 99,999 | -18,654 | -66.9 | -2,656 | -39.7 | -14,727 | -43.1 | -6,099 | -312.6 | -42,136 | -59,6 | 20 | 2,3 | 1,268,028 | 17,0 |
| 100,000 and more | -18,030 | -64.7 | -1,722 | -25.7 | -60,468 | -176.8 | 0 | 0.0 | -80,220 | -113,5 | 14 | 1,6 | 2,477,755 | 33,3 |
| Total | **-27,869** | 100.0 | **-6,691** | 100.0 | **-34,192** | 100.0 | **-1,951** | 100.0 | **-70,703** | 100.0 | 853 | 100 | 7,452,857 | 100,0 |

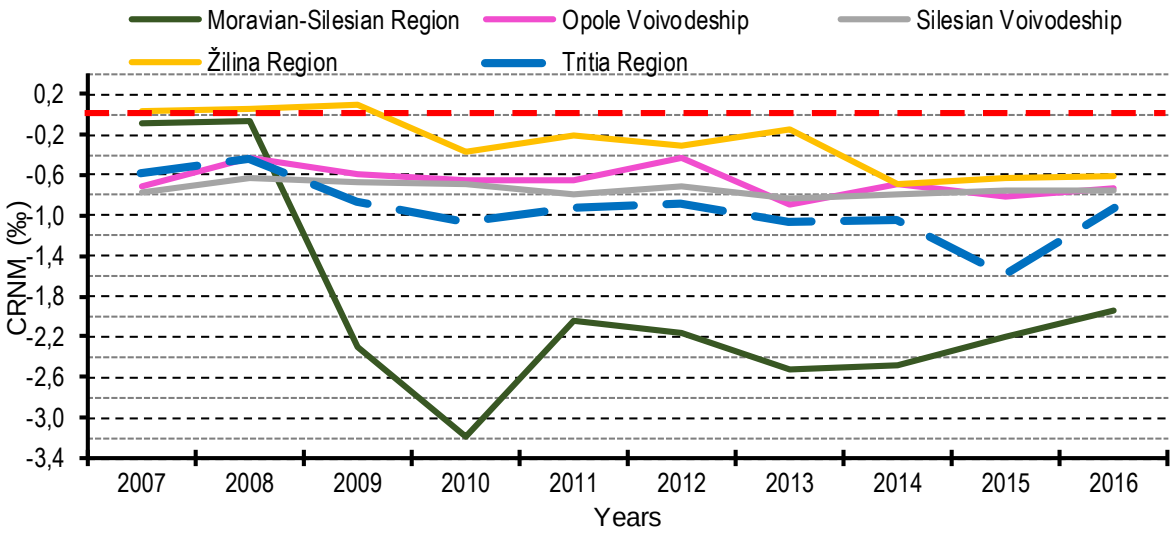
Source: author (EUROSTAT data and national statistical offices)

We can see two different groups of regions:

- The largest migration losses are in the Silesian Voivodeship and the Moravian-Silesian Region, with a total migration loss for the observed decade exceeding 62,000. A slightly higher absolute loss fell on the Silesian Voivodeship (-34 thousand), followed by the Moravian-Silesian Region (-28 thousand).
- The second group consists of the regions of the Žilina self-governing region and the Opole Voivodeship, where migration losses were recorded at the level of thousands of units. In total, it was a migration loss of 8.5 thousand inhabitants.

In general, the overall migration loss in the Tritia region is not large and its social and economic impact cannot be considered a threat. Due to the fact that these are regions with a substantially peripheral location with respect to the position of their states, their depopulation development (Šotkovský, 2016b) is not alarming. From the point of view of natural increase, this is a phenomenon quite general in the sense that all more developed regions have losses in natural increase to a very similar extent. It is a manifestation of behaviour when the total fertility is below 2.0 in the long run. Due to the way of life and the value system of more developed areas, no major changes in the development of the natural increase can be expected in the longer term.

**Figure 2** – Migration behaviour of the Tritia region and its main areas in the years 2007 to 2016.




Source: author (EUROSTAT data and national statistical offices)

Among the four monitored areas of the Tritia region, when assessing their migration behaviour, we can highlight the following moments on the basis of the CRNM indicator (FIGURE ):

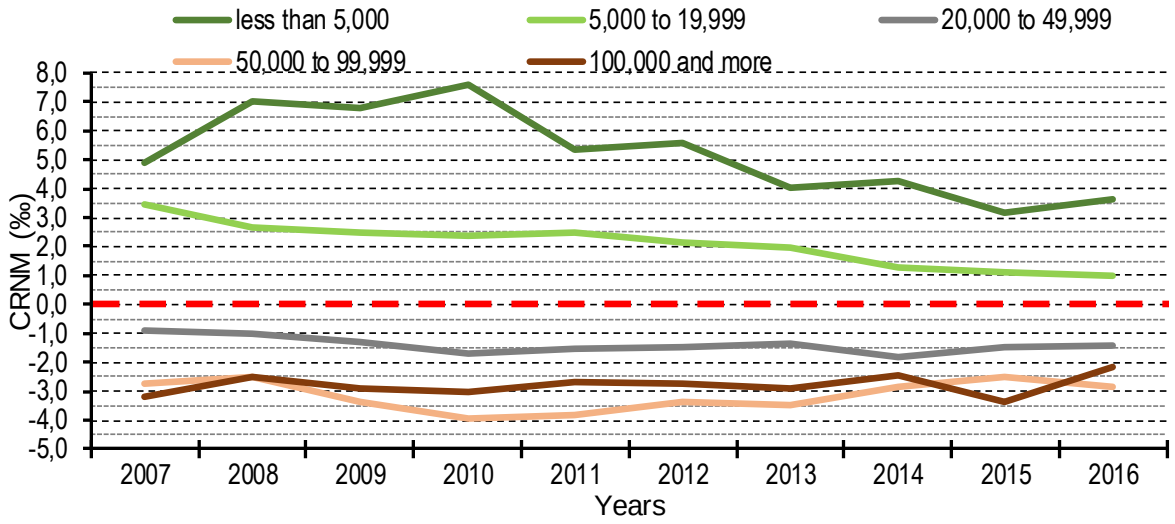
- The average long-term migration losses of regions, expressed as a share of their current total population, reach low values in the range of annual decline from 0.3 ‰ to 2.0 ‰.
- The Moravian-Silesian Region shows a slightly larger loss in the observed period, when the highest value of the migration loss was reached in 2010 at the level of over 3.3 ‰. In recent years, the migration loss of MSR has decreased to 2 ‰.
- In both Polish regions, the migration loss has long been below 1 ‰.
- The lowest migration loss falls on the Žilina self-governing region with a long-term value below 0.5 ‰.

Migration behaviour already decides to a greater extent today on the total population and subsequently on its structural characteristics (Šotkovský, 2016a). The values of migration loss for 4 regions are not essential. Therefore, in this study we will try to assess the migration behaviour on a smaller spatial order than the whole region of Tritia with its four basic regions. Research at the municipal level thus seems to be the most appropriate (Sucháček et al., 2018). Due to the large sample (853 municipalities), it is more appropriate to perform an analysis at the level of the five selected size categories already mentioned.

Much more interesting is the distribution of migration behaviour at the municipal level of the Tritia region. This is both in terms of differences in CRNM values, and especially with regard to the population size of the municipality (FIGURE ). Although the Tritia Region and its four sub-regions as a whole are losing population, there are a large number of people at the municipal level who have gained new inhabitants through the decade under review. These are mainly municipalities with a smaller population, especially municipalities with a population of up to 5 thousand, or up to 20 thousand. On the other hand, the largest migration losses concern large municipalities, especially those with more than 50,000 inhabitants. The average value of the gross rate of migration balance of the size category of municipalities with less than 5,000 inhabitants exceeds 5 ‰. For municipalities in the size category from 5,000 to 19,999 inhabitants, the average annual growth rate according to CRNM is over 2 ‰. The following applies to the remaining three categories:

- The largest value of migration loss measured by the CRNM indicator was reported by municipalities in the size category of 50,000 to 99,999 inhabitants (average CRNM over -3 ‰).

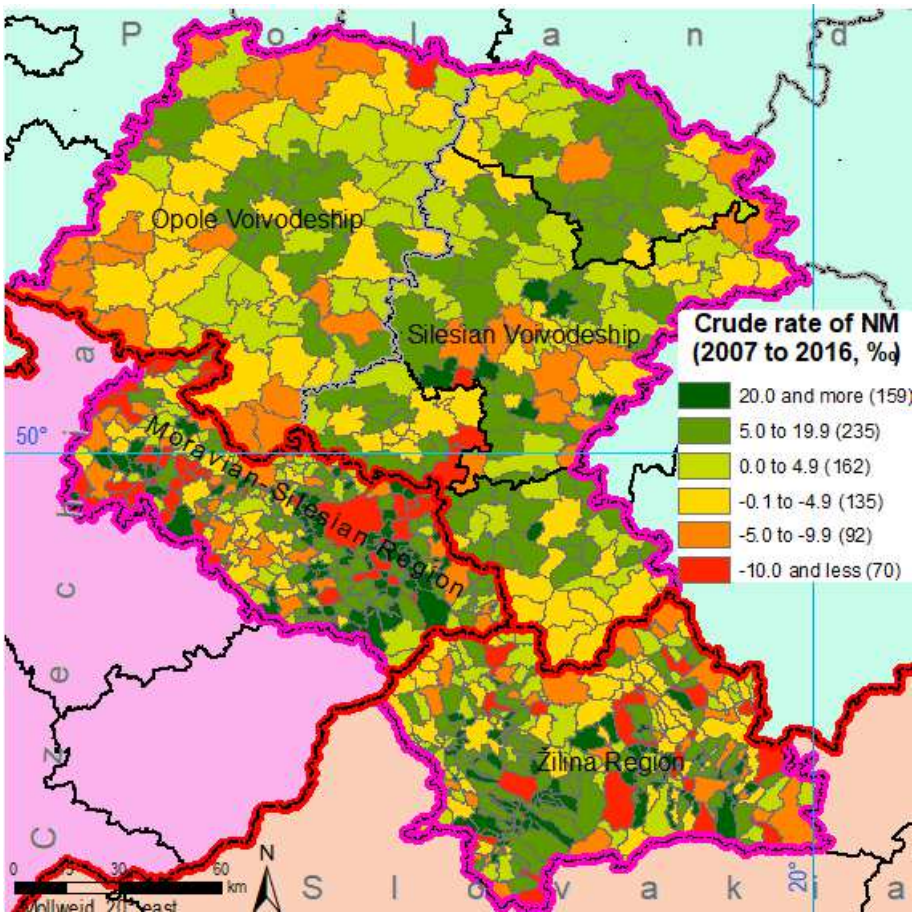
**Figure 3** – Migration behaviour of the Tritia region by size categories of municipalities in the years 2007 to 2016.




Source: author (national statistical offices data)

- The second most losing size category of municipalities are the largest municipalities with more than 100,000 inhabitants (less than -3 ‰).
- Municipalities with a size of 20,000 to 49,999 inhabitants (CRNM -1.5 ‰) are also affected by the loss of migration.

**Figure 4** – Migration behaviour of the Tritia Region municipalities in the 2007 to 2016 (CRNM).

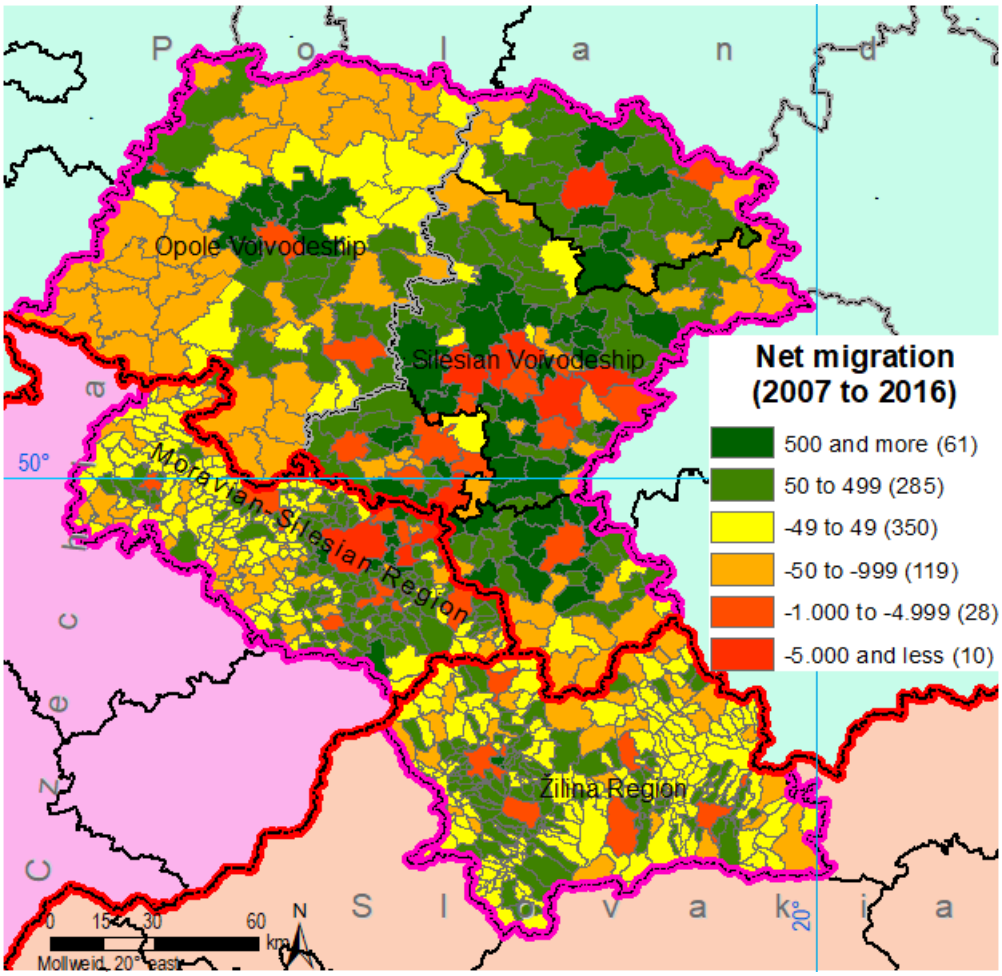



Source: author (national statistical offices data)

In the period between 2007 and 2016, more than 550 municipalities showed population growth due to the migration balance. There were almost 300 loss-making municipalities. The differences in migration behaviour at the municipal level can be clearly seen in the FIGURE:

- Almost 160 municipalities in the Tritia region had the CRNM growth in the monitored period exceeding 20 ‰.
- The largest share of migration profitable municipalities was in the group with CRNM growth from 5 to 20 ‰. There were 235 of these municipalities.
- There were almost three hundred municipalities with an almost imperceptible influence of migration behaviour on their population size. Their CRNM ranged from 5 to -5 ‰ over a period of tens of monitored years.
- Seventy municipalities were the most loss-making in terms of migration. For them, the CRNM exceeded the value of -10 ‰.

**Figure 5** – Migration behaviour of the Tritia Region municipalities in the 2007 to 2016 (net migration).




Source: author (national statistical offices data)

In the monitored period, the ten most municipalities were the most loss-making (loss of migration over 5,000 inhabitants): Ostrava, Katowice, Sosnowiec, Częstochowa, Havířov, Bytom, Karviná, Zabrze, Jastrzębie Zdrój and Gliwice (FIGURE). It is thus clear that Ostrava, Havířov and Karviná are the municipalities with the largest losses in the Tritia region in terms of the overall migration balance. The other seven municipalities are Polish. From a long-term perspective, we can assign another 28 municipalities to even more significant losses. There are 15 Polish municipalities, seven Czech municipalities (Frýdek-Místek, Orlová, Opava, Kopřivnice, Třinec, Bohumín and Bruntál) and six Slovak municipalities (Martin, Žilina, Ružomberok, Dolný Kubín, Čadca and Liptovský Mikuláš). On the contrary, among the most profitable from the point of view of net migration, we rank 61 municipalities, which have grown by more than 500 inhabitants during the ten monitored years. There are seven Czech municipalities in this group: Šenov, Petřvald, Vratimov, Dolní Lutyni, Rychvald, Čeladná and Horní Bludovice. Only two Slovak municipalities belong to this group (Tepličanka nad Váhom and Mojš). The remaining 62 municipalities belong to both Polish voivodeships, of which 55 belong to the Silesian Voivodeship.

Another 86 municipalities gained 200 to 499 inhabitants by migration, of which 36 municipalities are located on the territory of MSR.

## 4 Conclusion

The analysis of the migration at the level of municipalities of the Tritia region showed a number of interesting aspects of the migration behaviour of its inhabitants:

- The total migration losses of the four main areas of the Tritia region are not high and cannot be described as serious or even alarming. They are thus exclusively the result of long-term economic and social changes.
- Important economic changes certainly include the fact that the whole region was deeply affected by industrial industrialization before the revolutionary year, with a focus on the mining and metallurgical industries. With this economic development, urbanization deepened. This was dominated by large cities. For example, from the Polish villages of Częstochowa, Sosnowiec, Katowice, Gliwice, Bytom, Zabrze, Bielsko-Biala, Jastrzębie Zdrój, Rybnik and others. On the territory of MSR, these were settlements such as Ostrava, Havířov, Karviná, Frýdek-Místek, Orlová, Opava, Kopřivnice and Třinec. On the territory of ŽSK it was the cities of Žilina, Ružomberok, Čadca, Martin and Liptovský Mikuláš.
- Subsequently, the expected stage of changing the structure of industries occurred. All the above-mentioned large centers of former industrial development were objectively most affected by the restructuring of the economy and subsequently by the process of de-urbanization. As is clear from the analysis, a significant part of de-urbanization manifested itself in its strength in the immediate hinterland of large cities. Here we find mainly municipalities with the highest migration growth in the period from 2007 to 2016.
- Clearly, the smallest group of municipalities is the group where we include all municipalities with virtually zero or very low levels of migration. In these 350 municipalities (41% of the total number of municipalities in the Tritia region), we can say that migration tendencies, including various impacts, did not have any significant effect on their territory.
- Another almost 350 municipalities (41% of the total number of municipalities in the Tritia region) are profitable in the long run.
- Only 18% of municipalities (157 municipalities) of Tritia region significantly lost their population due to migration behaviour. From this group of municipalities, 38 of them can be described as problematic due to population loss, when their losses in ten years exceeded at least the value of one thousand inhabitants.
- It is certain that only a small number of municipalities contributed to the migration loss of the Tritia region. This set of settlements is dominated by large cities with a population of over 50,000.
- MSR lost almost 28,000 inhabitants during the entire period. But in its territory, there was a loss exclusively in municipalities with a population of over 20 thousand.
- This fact is most pronounced in MSR and especially in its eight largest cities: Ostrava (-14 thousand inhabitants), Havířov (-7.5 thousand inhabitants), Karviná (-6 thousand inhabitants), Frýdek-Místek (-3 thousand) and Orlová (3 thousand), Opava (-2 thousand), Kopřivnice (-1.5 thousand) and Třinec (-1.5 thousand). Together with the towns of Bohumín and Bruntál, these 10 towns created a ten-year loss of over 40,000 inhabitants. It is thus clear that 60 to 70% of migrants did not cross the MSR borders and thus contributed to the growth of the population of municipalities, especially in the size category of settlements up to 5,000 inhabitants.

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# Evaluation of Efficiency of Healthcare in Hospitals: a Regional View

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## Abstract

The aim of this paper is the use of a non-parametric method of data envelopment analysis to evaluate the technical efficiency of health care of hospitals in particular regions of the Czech Republic in 2011-2018. The method of window analysis was used to evaluate the dynamization of the efficiency of production units. The method is based on moving averages and is suitable for evaluating efficiency in time series. For the purposes of the analysis, three input and two output variables were defined. The input variables were the number of beds, the number of medical staff and equipment (specifically the number of CT devices and MR tomographs). The output variables for the analysis which was based on an output-oriented 3-year window DEA model, were the number of hospitalized patients and the number of treatment days. For the purposes of the analysis, the data were taken from selected health registers registered by the Institute of Health Information and Statistics of the Czech Republic. The best results were achieved by the Zlin Region, which became effective unit in six of the eight years examined. Demonstrably the worst overall efficiency rate reached The Capital City of Prague, which was not an efficient production unit in any of the monitored years.

***Keywords:*** *data envelopment analysis, efficiency, healthcare care, hospitals, regions, window analysis*

***JEL Classification:*** *C44, C61, I10*

### 1 Introduction

The health condition of the population is an important determinant of the development of society. Health is the highest value of human potential. It is the subject of discussions of many politicians, economists, healthcare providers at the national and supranational levels. Each developed country sets its goals and priorities in this area. The basis for determining the concepts of health care development are mainly demographic and socio-economic factors determining the development of health care needs. The population of the Czech Republic is experiencing a long-term decline and the share of people in the post-productive age is increasing. Population aging is a European problem that individual governments must prepare for. Higher morbidity is typical for older populations. Population models point to the expected increase in the number of patients with cancer, circulatory system diseases and neurogenerative diseases. Life expectancy at birth is significantly improving, both at the level of the whole Czech Republic and in individual regions. However, the data show that there are appropriate differences between individual regions, which is an impulse for setting the objectives of regional health policies both in terms of the construction of targeted prevention programs and in terms of implementing changes in the organization of health services to increase their availability and quality. It is clear that the future demographic development of the population will affect the structure of health care provided and will be aimed at changing the organization and financing of the whole health care system. Unbalanced migration of inhabitants between regions and migration of inhabitants to large cities or agglomerations will also affect the health care system and it will be necessary to create a backbone network of providers with regard to the population density in a given region.

The significant providers of health services are hospitals, whose primary activity is to provide mainly secondary and tertiary health care. Within the individual regions of the Czech Republic, there is a clear differentiation of the network of hospitals in terms of the number of providers, the legal form of hospitals, the types of care provided or equipment.

As at 31 December 2018, the hospital care network consisted of 194 providers with a total of 60,328 beds. Compared to 2011, the number of hospitals and the number of beds did not change significantly (60,336 beds were registered in 2011). The Capital City of Prague is typically characterized by a high concentration of university hospitals and specialized centers, whose care is consumed irregularly, especially depending on the emergency income (e.g. IKEM). A similar situation is also in the South Moravian Region, where there are two university hospitals and other hospitals that provide highly special and comprehensive health care (e.g. Masaryk Cancer Institute, Brno). Within the Czech Republic, the inclination of patients to health care is not defined. Defining the reference network of hospitals in individual regions is one of the goals of the Ministry of Health of the Czech Republic, both to define the availability of hospitals and to monitor the consumption of health care by patients and set up a suitable reimbursement mechanism for valuing a hospitalization case of acute inpatient care.

The aim of the paper is to evaluate the technical efficiency of hospitals (in-patient and out-patient care) in the regions of the Czech Republic in the years 2011-2018 on the basis of selected input and output variables. The method of window analysis was chosen to evaluate the technical efficiency. The time window analysis method is a dynamic DEA method that is based on moving averages and estimates the efficiency trend of homogeneous production units over time. The purpose of this analysis is to trace whether there are significant differences between individual regions, which represent homogeneous production units, in the observed period and whether there has been an improvement or deterioration in technical efficiency trends in time series.

### 1.1 Performance of Health Services

Healthcare is an important segment of the public sector and a sector of the national economy. The health care system is confronted with the performance of the whole economy. Incomes in health care are derived from pensions and expenditures reflect the budgetary constraints of the system (Vrabková, Vaňková, 2015). Performance is evaluated at both the macro and micro levels of the economy. The individual elements of performance are economy, efficiency, effectiveness, and equality. These elements complement each other and logically follow each other, together creating a comprehensive framework for the performance of the organization or program (Vrabková, Vaňková, 2015). Many authors (e.g. Talbot, 2007, Flynn, 2012, Dooren, Bouckaert, Halligan, 2015) focus on a partial part of performance evaluation, namely efficiency, which is an essential part of management and decision-making. Efficiency can have a dynamic or static form and is influenced by a number of internal and external factors. Various methods of single-criteria and multi-criteria decision-making are used in the healthcare system to evaluate the efficiency of production units. In general, it is appropriate to assess efficiency in the context of the quality of care provided and equality of access to health care.

## 2 Material and Methods

Cooper et al. (2011), Zhu (2014), “DEA is a relatively new“ data oriented ”approach for evaluating the performance of a ser of peer entities called Decision Making Units (DMUs) which convert multiple inputs into multiple outputs”. The DEA method is a very widespread tool for evaluating the efficiency of homogeneous production units, both in the private sector and in the public sector. Homogeneous production units are characterized by their equivalent input and output variables. Production units that lie on the border of production possibilities are technically efficient. If the units are below the limit of production possibilities, then they are technically inefficient and their degree of inefficiency can be measured by the distance from the effective limit. The choice of evaluated units is very important. The bigger the homogeneity between the units, the more informative the evaluation of technical efficiency is and it is possible to more accurately interpret the obtained results. The aim of the DEA method is not only to determine the degree of efficiency of production units, but also to determine the possibility of improving the production unit that is being evaluated, based on defined input and output characteristics. It is evident that in the case of input parameters it is desirable to achieve the efficiency of the production unit to minimize them and vice versa in the case of output parameters to maximize them. The DEA method is a tool for evaluating the degree of technical efficiency of these production units. In order to determine the form of the effective limit and thus also the set of production possibilities, it is necessary to make an assumption about the nature of the returns from scale. Return to scale can be constant or variable, or increasing, decreasing, non-decreasing, etc. The first DEA models were formulated as early as 1978 (Charnes et al, 1978). Since then, many other models and extensions of this method have arised (Dlouhý, Jablonský, Zýková, 2018).

In the field of healthcare, this method has found wide application. Classical DEA models (evaluation of production units is carried out within one year) are applied both in the field of outpatient care and especially in the field of inpatient care, as evidenced by many publications. Zakowska, Godycki-Cwirko (2020) made a systematic review of the literature on the use of the DEA method in estimating the technical efficiency of primary health care and identified the input and output variables used. A total of 54 studies were included in the analysis. Input variables often included, for example, personnel costs, number of registered patients, number of employees (general practitioners, nurses, other staff), number of devices. Output variables included e.g. number of consultations, number of visits, number of examinations, number of recipes. In the field of inpatient bed care, it is one of the most frequented medical facilities for evaluating the technical efficiency of the hospital. Barpanda, Sreekumar (2020) analyzed the technical efficiency of 20 private hospitals in India. They used the following variables for the inputs: the number of beds, the number of medical staff and the list of services offered. The output variables were determined by the following variables: number of outpatient treatments, number of surgeries, mortality rate. In his article, Al-Shayea (2011) focused on evaluating the technical efficiency of individual hospital departments that form the backbone network of medical facilities in King Saud. The input variables were the total salary for doctors and the total salary for nurses, the output variables were the number of in-patients and out-patients, bed productivity, and average turnover interval. Asandului, Roman, Fatulescu (2014) focused their attention on evaluating the efficiency of health care systems on a European scale. For this purpose, they analyzed statistical data from 30 European countries for 2010. For the input variables, they chose life expectancy at birth, health adjusted life expectancy and infant mortality rate. Three indicators were defined as output variables - number of doctors, number of hospital beds and public health expenditure as a percentage of GDP. From the above, it is clear that the evaluation of technical efficiency using the DEA method is implemented in the health care system at both the macro, meso, and micro levels.

The evaluation of efficiency using the DEA method is focused on only one time period, usually 1 year and allows to divide production units into efficient and inefficient, to propose corrective measures on the side of inputs and outputs with regard to the examined DEA model. As stated by Dlouhý, Jablonský, Zýková (2018, p. 83), *DEA models do not assume a possible change in technology or the possibility that outputs within one period could depend on inputs in one or several previous periods.* Four models in particular are used to evaluate the efficiency of production units over time: the Malmquist productivity index, sequential production frontier, intertemporal production frontier, and window analysis. These dynamic models are derived from data envelopment analysis. Paulus, Kellner (2018) report the weaknesses of individual models. Multiperiod models have decreasing discriminative abilities with increasing number of periods, Malmquist's productivity index is insufficient in a situation where a given production unit improves more year-on-year than others and also approaches the effective limit faster, but still remains the least efficient of all (Paulus, Keller, 2018). The time window method is not ladened with these lacks.

The DEA window analysis is a dynamic DEA method of efficiency analysis. It is suitable for determining trends in the efficiency of production units in time series. Window analysis or a method based on moving averages has been used in a number of professional papers. Weng, Blackhurst, Mackulak, 2009 state that *"when applying this approach, additional calculations in the field of efficiency stability can be used, which would provide additional information about the evaluated set towards management and allow finer differentiation of production units".* Flokou et al. (2017) used the DEA method extended by window analysis to measure the efficiency of Greek hospitals in 2009-2013. The window-DEA method was chosen because it leads to an increase in discriminatory results when applying this method to a small set of production units and allows an annual comparison of the results. They took the number of beds, the number of doctors and other health care workers as input variables. The output variables included in the analysis became indicators of the number of cases hospitalized and the number of treatment days. Štefko, Gavurová, Kocisová (2018) dealt with the evaluation of the efficiency of hospital care in individual regions of the Slovak Republic in the years 2008-2015. In the article, they presented an extended DEA model using time window analysis to identify the best performing hospitals in different time periods. Finally, they used the Malmqust productivity index to verify the productivity of the evaluated production units over time and in the effectiveness of the proposed approach. Tongying, Yuan (2017) examined the efficiency of public hospitals in China in terms of a 7-year period in which hospitals were reorganized. The aim of this study was to provide evidence for strategy making on the management and development of multi-branched hospitals by evaluating and comparing the operational efficiencies of different hospitals before and after their establishment of branched hospitals.

### 2.1 Methodology and Data

To evaluate the efficiency of production units, the DEA method was chosen, specifically the output-oriented CCR model assuming constant returns to scale (CRS). To evaluate the development of efficiency over time, the analysis of time windows was chosen. Individual regions were chosen as homogeneous production units, ie 14 DMUs were subjected to analysis for the period 2011-2018. For the purposes of determining input and output

variables, data were taken from the National Register of Health Service Providers, the National Register of Healthcare Professionals, the National Register of Hospitalized Persons, and from the Annual Report on Medical Equipment for individual monitored years. The data are always monitored as of 31 December of the given year and were provided for the purposes of analysis by the Institute of Health Information and Statistics of the Czech Republic.

*2.1.1 Methods*

To evaluate the technical efficiency of hospital health care at the level of the regions of the Czech Republic, an output-oriented CCR model, based on the DEA window analysis, was chosen. The primary output-oriented CCR DEA model, which assumes constant returns to scale, is formulated by the following formula:

$$\text{minimize} \qquad g = \sum_j^m v_j x_{jq}, \tag{2.1}$$

$$\text{under conditions} \qquad \sum_i^r u_i y_{ik} \leq \sum_j^m v_j x_{jk}, \qquad k = 1, 2, \ldots, n,$$

$$\sum_i^r u_i y_{iq} = 1,$$

$$u_I \geq \varepsilon \qquad I = 1, 2, \ldots, r,$$

$$v_j \geq \varepsilon, \qquad j = 1, 2, \ldots, m.$$

where: $u_i$ is the weight given to output $i$, $y_{iq}$ is the amount of output $i$ produced by DMU $q$, $v_j$ is the weight given to input $j$, $x_{jq}$ is the amount of input $i$ produced by DMU $q$.

The optimal value of the purpose function is $U_q \geq 1$. The degree of technical efficiency is given by the ratio of the weighted sum of inputs to the weighted sum of outputs, but weights are sought such that the value of the efficiency measure is equal to or greater than one. A value of 1 is therefore assigned to effective units, a value greater than 1 to inefficient units.

Window analysis allows the evaluation of the development of efficiency over time. As stated by Dlouhý, Jablonský, Zýková (2018), in the calculation, one production unit in several different periods is treated as several different units from one period. In this analysis, it is very important to determine the number of windows and the length of the window, and it is true that the length of the window cannot be greater than the number of periods examined (Cooper et al., 2007). The windows overlap each other.

The total number of windows w in the solved problem can be expressed by the following relation:

$$w = k\text{-}p + 1 \tag{2.2}$$

For following relatioship apply to:

number of DMUs in each window: $np/2$ (2.3)

number of different DMUs: $npw$ (2.4)

where: w = number of windows; n = number od DMUs; k = number od periods; p = length of window ($p \leq k$).

Within the analysis of technical efficiency of 14 regions, for which inputs and outputs were defined in 8 consecutive periods and with the selected width of window 3, a total of 45 DMUs were analyzed in each of the six window.

The total efficiency rate for the monitored period is given by the relation:

$$E_q = \frac{\sum_{i=1}^{z} \sum_{t=1}^{w} E_{iq}^{t}}{z \,.v}, \qquad q = 1, 2, \ldots, n, \tag{2.5}$$

*2.1.2 Chosen Input and Outputs Parametres*

For evaluation, input and output variables, which are documented in Table 1, were chose. The number of beds, the number of medical staff and the number of medical equipment were defined as input parameters. The number of beds is an indicator that indicates the size of the facility and also the availability of health care in the area and is one of the common input parameters for evaluating technical efficiency. As of the last monitored year, the network of institutional care facilities consisted of 194 hospitals (acute and subsequent care), which had a total of 60,328 beds. Compared to 2011, the number of beds did not change significantly, but within the years there were fluctuations in this indicator. The absolutely lowest number of beds was in 2015, by 56,960 beds. The largest number of beds is registered in The Capital City of Prague, the South Moravian Region and the Moravian-Silesian Region, which reflects the number of inhabitants of the region and the location of teaching hospitals, which are highly specialized hospitals not only for the inhabitants of the region. The number of medical staff represents the recalculated number (according to hours) of doctors and independent non-medical

staff. The availability of instrumentation is monitored within the number of computed tomography devices (CTD) and the number of magnetic resonance (MR) devices. The number of CTDs was recorded at the end of 2018, 171 pieces and 1,178 million operations were performed on these devices. The highest availability of CTD was in The Capital City of Prague and the Karlovy Vary region. Most inhabitants per one CTD device were recorded in the Central Bohemian, Zlin and Pardubice regions (ÚZIS, 2020). Compared to 2011, the number of these devices increased by 16. MR tomography enables the imaging of patients' bodies by magnetic resonance technologies and does not burden the human body with radiation. As of 31 December 2018, a total of 110 MR tomographs were registered in the Czech Republic. The number of available MR tomographs almost doubled during the monitored period. There are significant differences in the availability of these devices within individual regions, which also reflects the possibilities and specialization of individual hospitals.

The number of hospitalized patients and the number of treatment days were defined as output parameters. The number of hospitalized patients is reported by the relationship (admission + discharge + death) / 2. The number of treatment days in the hospital is reported as the number of days for which the patient was provided with health care.

**Table 1** - Specification of DEA model variables

| Labels | Variable | Definition |
|---|---|---|
| Inputs | | |
| x1 | Number of beds | Number of specified beds as of 31 December of the given year. |
| x2 | Number of medical staff | Recalculated number of medical staff, including the number of physicians and nurses (non-professional medical staff). (§ 5 to § 21e according to Act No. 96/2004 Coll.) |
| x3 | Number of medical equipment (CT and MR) | Number of computed tomography devices (CT) and number of magnetic resonance devices (MR). |
| Outputs | | |
| y1 | Total number of hospitalisation patients | (approved+discharged+dead) / 2 |
| y2 | Number of treatment days | Number of days for which the patient was provided with health care. The first day and the last day of the patient's stay in the hospital are counted as one treatment day. |

Source: Prepared by author

The basic characteristics of input and output variables in the years 2011 to 2018 are given in Annex 1. The table shows that there are significant differences between individual regions, which is influenced by the population of the region, population density and the network of hospital care providers. The largest values in all monitored variables are recorded in The Capital City of. Prague, the smallest values in the Karlovy Vary region. In terms of the observed period, it can be stated that in The Capital City of Prague, the number of beds increased slightly between years (183 beds), but there was a significant increase in the number of doctors and non-doctors with professional qualifications (by 1194.32). On the other hand, the number of hospitalized patients decreased by 11,737. The Karlovy Vary Region also recorded a decrease in the number of hospitalized patients, but it also reduced the number of beds (by 327 beds) and the number of medical staff decreased (-76.38). There was also a reduction in the number of beds between the years in the Zlin Region, but the number of health care staff and the number of hospitalized patients also increased significantly (by 9,496). All regions of the Czech Republic recorded an increase in instrumentation. The largest increase was recorded in the Plzen Region, followed by The Capital Ciy of Prague and the Central Bohemian Region. In the Central Bohemian Region, there was a significant increase in all input and output variables.

## 3 Results and Discussion

In the analysis of time windows, several separate calculations of efficiency measures are specified. For each homogeneous production unit, a total of $w\,(T\text{-}w + 1)$ values were calculated, ie a total of 18 efficiency measures. The calculated values were aggregated according to the arithmetic mean of all detected values (according to Equation 2.5), as documented in Table 2.

Based on the dynamization of the efficiency of production units within the monitored period, the order of production units was determined according to their resulting average efficiency rate. If a production unit reaches the value of one, it is once efficient and lies on the production possibilities frontier. A resultant efficiency value

greater than one means that the production unit is inefficient. For an output-oriented model, inefficient units should increase their outputs while maintaining the same level of inputs. The Zlin Region became an effective unit, which became an efficient production unit in all monitored years, except for 2017 and 2018. The Central Bohemian Region, which was an effective unit in 2011, 2012 and 2014, became the second region in terms of average efficiency. The largest distance from the limit of production possibilities is reached by The Capital City of Prague, whose average efficiency rate in the years 2011-2018 reached the value of 1.1296. Table 2 also shows that multiple production units have the same or similar degree of efficiency. For this reason, the variance and the coefficient of variation were calculated in order to determine the order of the production units. From the point of view of dispersion, units with lower dispersion are preferred, i.e. units with smaller fluctuations in production.

**Table 2 -** Estimation of the efficiency of the DEA window analysis model average for whole analysed period

| DMUs | Average efficiency rate | Order | Stability | |
|---|---|---|---|---|
| | | | $S_n^2$ | $R$ |
| The Capital City of Prague | 1.129630423 | 14. | 0.00534339 | 0.17912 |
| Central Bohemian Region | 1.013911550 | 2. | 0.00036385 | 0.06572 |
| South Bohemian Region | 1.050317949 | 11. | 0.00024798 | 0.03600 |
| Plzen Region | 1.042299154 | 9. | 0.00071184 | 0.07682 |
| Karlovy Vary Region | 1.015047843 | 3. | 0.00047810 | 0.06432 |
| Usti Region | 1.033727697 | 5. | 0.00057084 | 0.08825 |
| Liberec Region | 1.033968292 | 6. | 0.00112749 | 0.09642 |
| Hradec Kralove Region | 1.091687625 | 13. | 0.00046597 | 0.07723 |
| Pardubice Region | 1.066053351 | 12. | 0.00176254 | 0.14830 |
| Region Vysocina | 1.029986798 | 4. | 0.00114629 | 0.10312 |
| South Moravian Region | 1.039719721 | 7. | 0.00078587 | 0.09023 |
| Olomouc Region | 1.046743557 | 10. | 0.00096478 | 0.11788 |
| Zlin Region | 1.000582283 | 1. | 0.00000001 | 0.00538 |
| Moravian-Silesian Region | 1.042432344 | 8. | 0.00024274 | 0.05162 |

Source: Own calculations.
*Legend: $S_n^2$ – variance; R – range of variation*

## 4 Conclusion

Within the Czech Republic, the Strategic Framework for Health 2030 (hereinafter referred to as the Strategy) was approved, which defines the objectives of health policy for this defined period. Improving the health condition of the population, optimizing the health system, supporting science and research are key objectives of this Strategy. Optimizing the structure of the network of providers and the inpatient fund in relation to the demand for health care is one of the essential goals of both national and regional health policy.

The subject of the article was the evaluation of the technical efficiency of health care provided by hospitals in individual regions of the Czech Republic within the monitored period 2011-2018 on the basis of selected input and output variables. The input variables were the number of beds, the number of medical staff (doctors and non-medical staff, non-medical doctors with professional competence) and the number of selected medical devices. The number of hospitalized patients and number of treatment days became the output variables for the given analysis. The evaluation of technical efficiency was performed on the basis of the DEA method, which is used in many professional articles and studies to evaluate the efficiency of this sector. For the analysis, an output-oriented DEA model was chosen, assuming constant returns to scale, extended by the analysis of time windows in order to evaluate the technical efficiency of production units over a multi-year period. The time window analysis was performed on an eight-year period, when the window width w = 3 was taken, and thus the total number of windows was six. Based on all calculations, 18 values were determined for each production unit, ie efficiency measures, the aggregation of which, using the arithmetic mean, calculated the resulting efficiency rate and determined the order for the given unit. The Zlin Region became the most efficient unit, and The Capital

City of Prague became the least efficient unit within the period under review. The variance was calculated for the evaluation of the unit, as several production units had a similar degree of efficiency. This calculation also allows a finer differentiation of production units (Paulus, Keller, 2018). Units with lower variance within the resulting values in the observed period were units with lower fluctuations in production and became more preferred.

The window analysis method is a suitable method for detecting efficiency trends in time series. It is based on moving averages and is considered a more objective method compared to the Malmquist productivity index or multiperiod methods. Based on the results of the average efficiency rate for the monitored period, the order of production units was determined, with the Zlin Region becoming the best rated unit.

The worst rated unit became the Capital City of Prague. The freedom of movement of patients without given rules of system throughput and the capacity problems of regional healthcare affect hospitals in large cities. (44% of acute hospitalizations in the Capital City of Prague are consumed by inhabitants of other regions, not only the Central Bohemian Region) ÚZIS, 2020. The inpatient care in Prague is limited by a lack of medical staff. The number of doctors and nurses per 1 bed reaches the highest value of all regions of the Czech Republic. For 2018, the value of this indicator is 1.71. The best value was reached by the Ústí nad Labem Region (1.06), the Pardubice Region (1.28) and the Zlín Region (1.33). Sufficient staff is very important. It is an essential factor in maintaining the quality of health care. It also has an effect on the number of beds, which, among other things, in the Capital city of Prague is declining year on year.

It is obvious that, in view of the aging population and health trends, it will be necessary to implement certain measures to support the availability and quality of healthcare. The ratio of the number of acute care beds to aftercare beds has been unbalanced for a long time in all regions. Substantial steps should also lead to health care support of primary care. The availability of outpatient health care providers is a basic element of the health care system, which is also linked to the use or overuse of inpatient care providers.

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## Appendix

| | | Variables inputs / outputs | | | | |
|---|---|---|---|---|---|---|
| | | **x1** | **x2** | **x3** | **y1** | **y2** |
| **2018** | Min | 1 187 | 1 535,47 | 9 | 51 830 | 300 071 |
| | Max | 9 713 | 16 644,55 | 51 | 327 459 | 2 119 583 |
| | Average | 4 309 | 6 055 | 20 | 158 884 | 1 049 357 |
| | Median | 3 406 | 4 722 | 17 | 129 820 | 842 136 |
| **2017** | Min | 1 269 | 1 595,07 | 8 | 54 430 | 320 817 |
| | Max | 9 726 | 16 375,46 | 50 | 329 696 | 2 140 364 |
| | Average | 4 321 | 5 924 | 19 | 159 750 | 1 050 759 |
| | Median | 3 408 | 4 637,03 | 17 | 132 110 | 860 551 |
| **2016** | Min | 1 412 | 1 529,39 | 8 | 56 726 | 334 4782 |
| | Max | 9 784 | 15 818,94 | 53 | 333 554 | 186 696 |
| | Average | 4 302 | 5 666 | 18 | 161 446 | 1 060 860 |
| | Median | 3 405 | 4 452,44 | 15 | 133 487 | 884 397 |
| **2015** | Min | 1 348 | 1 436,46 | 7 | 53 197 | 350 214 |
| | Max | 9 226 | 15 634,58 | 52 | 339 390 | 2 312 349 |
| | Average | 4 069 | 5 597 | 18 | 153 875 | 1 049 613 |
| | Median | 3 168 | 4 417 | 16 | 125 046 | 816 366 |
| **2014** | Min | 1 397 | 1 447,74 | 8 | 54 377 | 361 153 |
| | Max | 9 093 | 15 533,76 | 48 | 345 246 | 2 343 566 |
| | Average | 4 042 | 5 529 | 17 | 155 952 | 1 065 360 |
| | Median | 3 160 | 4 423,96 | 13 | 124 7256 | 822 911 |
| **2013** | Min | 1 372 | 1 507,9 | 8 | 54 017 | 356 780 |
| | Max | 9 091 | 15 459,72 | 47 | 341 743 | 2 346 360 |
| | Average | 4 058 | 5 509,57 | 17 | 154 038 | 1 052 945 |
| | Median | 3 229 | 4 433,96 | 13 | 122 200 | 823 289 |
| **2012** | Min | 1 487 | 1 653,98 | 8 | 56 291 | 356 776 |
| | Max | 9 275 | 15 529,29 | 42 | 345 827 | 2 393 658 |
| | Average | 4 202 | 5 544,40 | 16 | 155 815 | 1 078 091 |
| | Median | 3 341 | 4 456,91 | 13 | 122 458 | 843 704 |
| **2011** | Min | 1 514 | 1 611,85 | 8 | 53 935 | 360 422 |
| | Max | 9 530 | 15 450,23 | 44 | 339 196 | 2 437 532 |
| | Average | 4 310 | 5 514,30 | 16 | 152 296 | 1 091 |
| | Median | 3 437 | 4 374,1 | 13 | 119 036 | 849 021 |
| **2011-2018** | Min | 1 187 | 1 436 | 7 | 51 830 | 300 071 |
| | Max | 9 784 | 16 645 | 53 | 345 827 | 2 437 532 |
| | Average | 4 581 | 6 876 | 22 | 168 683 | 1 133 178 |
| | Median | 3 739 | 5 116 | 16 | 142 891 | 966 877 |

Source: Own calculations

# Regression Analysis as a Part of Spatial Assessment based on Multi-Criteria Approach

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## Abstract

Making correct managerial decision in the 21st century requires assessment of a wide range of alternatives within each economy sector. TOPSIS technology combined with CV method (Coefficient of Variance) has been used to specify weights of indicators in order to make acquired results more objective. Sixty-eight district towns have been assessed by means of 6 indicators in the Slovak Republic during 2016. The key benefit of the research is to emphasize complex assessment of the selected subject group concerning local self-government. Results are also used as input data for 5 regression models. Different assumptions have been tested, one of them was identified and used for the purpose of this assessment concerning spatial analysis. Based on the performed analyses, completion of results by means of regression model is considered as meaningful. It enables to identify over-estimated or underestimated fields for even more detailed research. The analysis proved necessity to devote mayor attention to the choice of the regression model. It is not sufficient to base the choice exclusively on coefficient of determination.

***Keywords:*** *Coefficient of Variance, regression analysis, spatial comparison, TOPSIS technique*

***JEL Classification:*** *C52, C58, P43*

### 1 Introduction

Under the conditions in the Slovak Republic (Act No. 583/2004), the municipal management is set out by the law. Pursuant to the legislation, the only criteria to assess municipal management is its indebtedness (see also Papcunová et al. 2018). The municipality is obliged to implement an adjustment programme provided that its total commitments exceeds 15 % of real current income acquired during the previous financial year, and provided that the municipality did not pay certain recognized commitments within 60 days to the maturity date. The adjustment programme precedes the imposition of forced administration in the municipality and represents the loss of freedom to manage its own financial affairs. The above mentioned Act also states, that municipality may accept returnable financial resources (i.e. loans), only if "the overall amount of financial debt of the municipality or larger regions does not exceed 60 % of real current incomes from the previous financial year and the amount of annual instalments of returnable financial means including revenue payments does not exceed 25 % of real current income from the previous financial year.

Act on Financial Control and Audits (Act. No 357/2015) makes these subjects responsible for dealing with public financial means economically, effectively and efficiently. According to the Act, effectiveness means "the most beneficial mutual relationship among public finances used in the public sector and achieved results." The problem of public sector is its effectiveness. Effectiveness as such is denied by Siegl et al. (2011). In their view, effectiveness is possible under the condition of perfect competitiveness. However, this represents economy model. Peková (2011), Hamerníková et al. (2010) or Rektořík et al. (2003), understand effectiveness as a status, when it is possible to acquire maximal amount of properties and maximal benefits from available social sources (see also Kozun-Cieslak 2018, Majerová et al. 2018). However, the tendency leading to inefficiency but giving the impression of efficiency is considered a main problem. It is not possible to monitor efforts for maximizing

inputs in organizations, absence of intensive pressure in order to lower costs used in organizations and stagnation of inputs or their minimization on a long-term basis.

Specialised literature mentions several possibilities to measure efficiency of public administration. The submitted research results have been divided and this division stems from complexity of the applied methods and identifies 3 categories:

- assessment methods based on the single criteria,
- assessment methods based on several criteria,
- managerial methods,

The first group of methods may comprise financial factors and "input-output" methods including e.g. Cost Minimizing Analysis (CMA), Cost Benefit Analysis (CBA) or Cost Effectiveness Analysis (CAE). These methods were developed for private sector, i.e. enterprises, but their modification may be used even to assess efficiency in public sector. Therefore, they are easily implemented, but also the most distorted. Efficiency assessment based on several criteria (the second group of methods) represents more complicated variant, but on the other hand says more about real effectiveness in the public sector. This group comprises methods such as AHP, ANP, COPRAS, ELECTRE, PROMETHEE, TOPSIS, VIKOR and many more. The last group consists of managerial methods designed to increase quality of management and altogether with modernization represents the main prospect of the increase in effectiveness of using financial means. These methods include benchmarking, benchlearning CAF, BSC method, SWOT analysis and many others.

## 2 TOPSIS Technique as a Tool of Efficiency Assessment

Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) as multi-criteria decision making (MCDM) method represents a practical tool for selection and creation of greater amount of alternatives. It can be applied in various economy fields (see Ardielli 2019, Zhang et al. 2013, Gallego-Ayala 2012, and others). Result of TOPSIS technique can be described as a solution existing in the moment, when levels of satisfaction with distances between alternatives from Positive Ideal Solution (PIS) and Negative Ideal Solution (NIS) are identical. Opricovic and Tzeng (2002) characterize PIS as a solution or an alternative, which maximizes criteria for returns and minimizes cost criteria at the same time. NIS can be characterizes as its opposite, i.e. NIS maximizes cost criteria and minimizes return criteria. TOPSIS technique calculation involves the aim to achieve the highest values of return criteria as well as the aim to achieve the lowest values of cost criteria.

Noryani et al. (2018) characterize this method as compensatory. We share their opinion, that this method makes it possible to find compromises among criteria, where possible negative result in one of them can be compensated by a good one in another criterion. Bhutia and Phipon (2012) in this respect also mention simplicity or directness of calculation. Shih et al. (2007) consider logic representing rationality of human choice as well as general value taking into account the best and the worst values at the same time a strong point.

According to Kandakoglu et al. (2008) and Shih et al. (2007) the greatest disadvantage of TOPSIS method lies in the fact, that it is not possible to assign weight to the observed criteria as well as the absence of consistent control from decision maker's point of view. This method therefore depends on the fact, whether it is possible to find relative importance of various attributes regarding the achievement of the given objective. One of the most important factors in the whole process is thus the way of setting up weights for each criterion.

In combination with TOPSIS technique, several methods are being used to determine weights of indicators representing input data for calculation. One of the most important subjective factors is comparison of individual indicator pairs, used by Ardielli and Vavrek (2015) or Vavrek et al. (2017), when assessing subjects of local self-government in the form of Fuller method or Fuller triangle. Entropy method (Aouadni et al. 2017) may be used as an objective method for setting up weights (Milani et al. 2008, Srdjevic et al. 2004) or Coefficient of Variance methods (Singla et al. 2017). Other objective methods for setting up weights may include methods such as Criteria Importance Through Incriteria Correlation (CRITIC), Mean Weight (MW), Standard deviation (SD) or Statistical Variance Procedure (SVP).

## 3 Material and Methods

The submitted manuscript follows our own research dealing with 69 district towns in the Slovak Republic. This research sample is assessed on the basis of the data accessible in 2016. The analysis excludes Bratislava and Košice, which are divided into urban parts with their own autonomy, which means, that they manage resources on their own. Within our own research a total of 6 indicators to assess economic efficiency of local self-government have been identified.

- R1 – total expenditures per capita,
- R2 – share of foreign resources on the total assets of the municipality,
- R3 – total income of the municipality per capita,
- R4 – current expenditures per inhabitant of the municipality,
- R5 – foreign sources per inhabitant of the municipality,
- R6 – current income per capita of the municipality.

Assessment of the above identified group of municipalities is carried out by TOPSIS technique, which we have used in previous articles describing this technique in the greater detail, e.g. by Vavrek et al. (2017). CV (Coefficient of Variance), an objective method for setting up weights, has been used to make TOPSIS method results objective. According to this method, the weights of indicators have been calculated as follows.

**Table 1** – Weight of particular indicators calculated by means of CV method.

| $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_5$ | $R_6$ |
|---|---|---|---|---|---|
| 0,164 | 0,171 | 0,177 | 0,155 | 0,176 | 0,157 |

Source: Own processing.

### 3.1 Model and Data

CV-TOPSIS technique results are then used for identification of residua within regress model. Its informative value is assessed by determination coefficient.

$$R^2 = \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{\sum_{i=1}^{n}(y_i - \bar{y}_i)^2}$$

where: $y_i$ - measured value of dependent variable
$\hat{y}_i$ - estimated value of dependent variable
$\bar{y}_i$ - average value of dependent variable

A classic linear regression model assumes, that random errors $\varepsilon_i$ are mutually independent and normally divided random variables with middle value zero and constant dispersion $\sigma_\varepsilon^2$. The starting point for this statement is 5 presumptions on random part of regression model using the method of the smallest squares.

- division of random errors probability is normal with the middle value 0 and dispersion $\sigma_\varepsilon^2$, i.e. $\varepsilon_i \sim N(0; \sigma_\varepsilon^2)$ for i = 1, 2,... n,
- the middle value of random errors $\varepsilon_i$ equals zero for any random level $x_i$ of an explanatory variable X; E$\varepsilon_i$ = 0, pre i = 1, 2, ... n,
- random errors are mutually independent for any random pairx_i≠x_j an explanatory variable, meaning that their co-variance equals zero; $cov(\varepsilon_i, \varepsilon_j) = 0$ for all i≠j,
- dispersion (variability) of dependent variable Y values, for any value of explanatory value X is identical, i.e. a dispersion of a random part is constant; D($\varepsilon_i$) = $\sigma_\varepsilon^2$ for i = 1, 2, ... n,
- extreme values are excluded from the analysis, as they significantly influence the value of regression coefficients as well as estimations and residues.

Individual assumptions of the regression model are tested by the following methods: Shapiro-Wilk test, T-test, Durbin Watson test, Levene test, Dean Dixon text for each above-mentioned presumption.

Use of thus prepared regression model (depending on the number of inhabitants) and based on identified residues intends to identify fields with the presence of overestimated or underestimated subjects, which could subsequently act as factors of identification and grouping for the following research.

Individual analyses are processed in programmes MS Excel, Statistica 13.4 and Statgraphics XVIII.

## 4 Results and Discussion

Among all district towns included in the research in 2016, Ružomberok was identified as the best town, followed by Čadca and Spišská Nová Ves. On the other side of the assessment was Lučenec, Prešov a Komárno.

**Table 2** – Resulting order of district towns based on CV-TOPSIS analysis.

| Rank | District | $c_i$* |
|---|---|---|
| 1. | Ružomberok | 0,6129 |
| 2. | Čadca | 0,6075 |
| 3. | Spišská Nová Ves | 0,6028 |
| 4. | Galanta | 0,6027 |
| 5. | Vranov nad Topľou | 0,6005 |
| ... | ... | ... |
| 65. | Levice | 0,5168 |
| 66. | Partizánske | 0,5000 |
| 67. | Lučenec | 0,4800 |
| 68. | Prešov | 0,3914 |
| 69. | Komárno | 0,3507 |

*$c_i$ - relative distance from PIS

Source: Own processing.

Absolute differences among individual district towns in the overall result of CV-TOPSIS technique are minimal, i.e. each change in monitored indicators can trigger a change of the overall result or score of the subject. More significant difference has been observed only among towns placed at the last two positions. Regarding these results as well as the fact, that CV method identified individual indicators in terms of importance as homogenous, all results correspond with the idea of a complex assessment, i.e. if there is an intention to improve position/assessment of the subject (in this case a district town) it is necessary to pay attention to all indicators simultaneously.

### 4.1 Composition of the Regression Model Based on the Obtained Results

Choice of regression model is carried out and based on coefficient of determination of individual variants (Table 3). All models identify the number of inhabitants as an independent variable (variable x) and the result of CV-TOPSIS technique as a dependent variable (variable Y). In terms of an informative value of various regression models it is possible to monitor 5 variants with high informative and also comparative value. According to these results, other analyses use the following regression models.

**Table 3** – Comparison of alternative regression models.

| Model | | | |
|---|---|---|---|
| A | Square root-Y logarithmic-X | CV-TOPSIS = $(0,0755359*\ln(POP))^2$ | 99,27% |
| B | Logarithmic-X | CV-TOPSIS = 0,0570143*ln(POP) | 98,82% |
| C | Reciprocal-Y logarithmic-X | CV-TOPSIS = 1/(0,177599*ln(POP)) | 98,79% |
| D | Multiplicative | CV-TOPSIS = exp(-0,0569019*ln(POP)) | 97,73% |
| E | Squared-Y logarithmic-X | CV-TOPSIS = sqrt(0,0326098*ln(POP)) | 97,69% |

POP - population

Source: Own processing.

Despite identical or high informative value of individual models outlined in the previous table, there are some differences in residues calculated later. Residues of 42 subjects (district towns) calculated with the use of all 5 models were identical, i.e. positive or negative in all cases. Other 27 cases shown differences among individual models or calculated residues on the basis of individual regression models.

**Table 4** – Tests on assumptions of individual regression models.

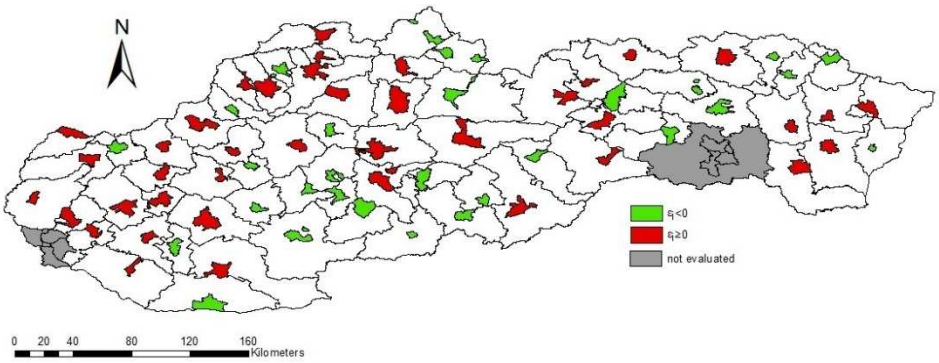
| | Model A | Model B | Model C | Model D | Model E |
|---|---|---|---|---|---|
| 1. assumption | 0,934 (<0,01) | 0,835 (<0,01) | 0,957 (0,05) | 0,872 (<0,01) | 0,696 (<0,01) |
| 2. assumption | 0,361 (0,72) | 0,434 (0,67) | -0,091 (0,93) | 0,092 (0,93) | 0,111 (0,91) |
| 3. assumption | 2,062 | 1,979 | 2,181 | 2,131 | 1,919 |
| 4. assumption | 9/10 | 9/10 | 9/10 | 10/10 | 9/10 |

| | |
|---|---|
| 5. assumption | 0, KH = 0,203 |

Source: Own processing.

Assessment of individual assumptions of the regression model (Table 4) does not identify any extreme values influencing results (5th assumption). The middle value (average) of residues is identical in all models - zero, which confirms the second assumptions. Oscillation of Durbin Watson test results around desired value 2 is considered as a confirmation of the 3rd assumption. Homoscedasticity tested by multiple use of Levene's test has also been confirmed. The only assumption which has not been confirmed was a normal division of residues (1st assumption). However, the difference between calculated p-value and the set level of importance in the third model was minimal. Not least in the context of this result, the following graphical design is based on calculated residues based on the third regression model (Model C).

**Figure 1** – Spatial identification of positive and negative residues. Source: Own processing.




In terms of spatial division of residues identified by Model C it can be said, that there is an overestimation of district towns particularly in Central and Eastern Slovakia. Positive residues, i.e. underestimation of management by means of a model is being observed particularly in economically stronger district towns in Western part of the country.

## 5 Conclusion

Assessment of the subject based on a single criterion is in our point of view insufficient in 21st century, as it does not depict a real situation of the given subject. Multi-criteria methods (MCDM) are being brought to the forefront, as they can assess individual subject in a complex way, depending on the chosen number of indicators and corresponding weights. Subjectivity of a decision-maker is a problem which significantly influences overall results of the used methods.

TOPSIS technique combined with and objective method of setting up weights - Coefficient of Variance have been chosen as the main assessment method used in case of district towns. The result of this method is then used as an independent variable in regression model. Its informative value is verified by coefficient of determination as well as by testing of all 5 assumptions. One of the conclusions resulting from the performed analysis is the fact, that it is not possible to assess feasibility of the regression model only according to the evaluation of its informative value by means of coefficient of determination. The choice of feasible regression model influenced its division, structure as well as absolute values of individual residues, which then directly determined overall results.

Results proved, that at the level of district towns it is not possible to identify areas which would influence results in positive or negative way. In terms of spatial distinction, we do not identify any areas within Slovakia, where district towns would be purposely underestimated or overestimated. The results should be perceived within their restrictions given by analysed time period as well as analysed set of subjects. Extension of the time period as well as analysed set of subjects for the purpose of further research shall remove these restrictions.

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# Where Are the Current Expenditures of Municipalities Going? Comparative Study

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## Abstract

The financial management of municipalities is governed by the municipal budget. The current budget is drawn up as a balance of current incomes and current expenditures relating to the financial year. The current budget is used by municipalities to ensure the normal (daily) operation of the municipality. The aim of the paper is to evaluate the total current expenditures of municipalities as well as their individual components in the conditions of Slovak and Czech municipalities on the basis of selected indicators in the period 2007-2018. The data sources for the individual indicators were obtained from the Ministry of Finance of Slovak Republic and from the Czech Statistical Office. The analysis showed, that in both countries, current expenditures of municipalities accounted for almost the same share in total expenditures (75% in the Slovak Republic, 71% in the Czech Republic). The biggest differences were found in expenditures related to wages and transfers. While wages expenditures accounted for a much bigger share of current expenditures in Slovak municipalities than in Czech municipalities (49.6% in the Slovak Republic, 19.9% in the Czech Republic), transfers accounted for 37.2% of current expenditures in Czech municipalities and in Slovak municipalities transfers accounted for 13.9% of current expenditures.

***Keywords:*** *current expenditures, Czech Republic, financing of municipalities, municipality, Slovak Republic*

***JEL Classification:*** *H72, H61, H83*

### 1 Introduction

Public budget systems are differently structured in different countries, the sources of public incomes and the principles of their creation are different, and also the purpose of public expenditures and the principles of their allocation may differ. It depends on economic, but also historical, cultural, as well as geographical and political

factors. The diversity of countries' financial systems also depends on what roles or public services they provide (Kološta et al. 2014, Kozun-Cieslak 2018, Urbanikova and Stubnova 2018).

Financial management in local self - government units has many definitions, which often complement each other. It is primarily a process of financial management that leads to the optimal implementation of public tasks that meet the needs of the local population. The financial management of local self - government is therefore one of the most important issues concerning of the functioning of local self - government. It determines the correct use of funds in each local self - government unit, the proper performance of tasks and ensuring long-term socio-economic development in its territory (Świrska 2016). The economy of municipalities is governed by a financial plan (budget), which is created for a period of at least two years in advance. The municipality's budget is defined by the municipality's objectives and related financial operations (Andrejovska and Pulikova 2018). The budget must be drawn up in such a way that it is possible to carry out all activities connected with the functioning of the municipality. The budget contains estimates of budget resources and incomes for the set goals of the municipality (Dusek 2017). Financing of local self-government in Finland is recorded in three basic financial books: profit and loss statement, balance sheet and cash flow statement (Sinervo and Haapala 2019). Financial stability and responsible financial management of municipalities are, as well as the budgetary stability of the government, an important starting point for their long-term sustainable development (Sebestova et al. 2018). A balanced budget of municipalities is a basic requirement in the financial management of local self- governments. However Clark and Gorina (2017) note that in the event of major operational and organizational changes, improving fiscal health at the budgetary level is often the first priority in emergency financial management. Unlike the elected mayor, who is accountable to the residents or the city administrator, who is responsible for the elected council, the emergency financial manager is usually accountable to the state governor and the legislature, which intervenes to prevent the bankruptcy of the municipality. Otrusinova and Kulleova (2019) note that one of the ways to increase the efficiency of municipalities is financial analysis, which usually leads to the practical use of knowledge and thus creates a basis for future capital appreciation of municipalities (see also Majerová et al. 2018). McDonald (2007) summarized responsible financial management and stability into four areas: (1) be able to meet immediate or short-term financial commitments; (2) be able to meet its financial obligations during the financial year in question; (3) be able to meet long-term financial obligations; and (4) be able to fund entry-level programs and services as required by law.

Local authorities in Spain manage very big budgets and provide a wide range of services, so they are essential factors in the financial sustainability of public policies. The authors' analysis shows that two types of political factors (mayor's profile and political-institutional factors) can affect the financial sustainability of municipalities. In addition, an analysis of both factors suggests that the mayor's influence on the financial sustainability of public services appears to be stronger than the influence of political-institutional factors (Bolívar et al. 2018). The budget of a municipality is a representation of the financial management of a municipality or city for a given calendar year. It is therefore a short-term tool for managing the municipality (Vojtech et al. 2019, Beresecka 2014). It is a key tool for expressing and implementing individual policies of the municipality. The budget serves as a decision-making tool, which is used to define the priorities of municipalities (Hrabalová, 2012). Municipalities in Italy operate a traditional system of budget accounting on the basis of commitments, which means that on the one hand there are incomes and on the other hand expenditures related to subsequent payments. At the end of the fiscal year, the surplus / deficit is calculated by increasing total cash by receipts not yet received (receivables) and decreasing by liabilities still to be disbursed. It is a measure of stocks that reflects the expected changes in the overall financial situation of the municipality. Municipalities are required to check the existence of their incomes and liabilities before accounting for the annual surplus / deficit and withdraw them from the balance if they are not expected to lead to a corresponding cash flow (Barbera, Guarini, and Steccolini, 2016). The budget of the municipality contains incomes and expenditures associated with the activities of local self-government (Hudakova 2016). Nam and Parsche (2001) note that expenditures of municipalities generally consist of operating (current) expenditures, which using for the provision of public services and from expenditures for the implementation of local infrastructure projects and from the expenditures for the provision of new infrastructure. According to the authors, cities and municipalities in transition countries suffer from a lack of the necessary funds to cover their increased expenditures. Such fiscal stress usually occurs when the cost of providing local services increases faster than municipal incomes to finance them. In the Czech Republic according to Černý et al. (2020) due to the division of municipalities according to the scope of delegated powers (basic municipalities, municipalities with an authorized municipal office and municipalities with extended powers), total expenditures increase with the size of municipalities. Even for municipalities of the same size, the expenditures will differ if one of them performs, for example, the activities of a registry office or building authority.

## 2 Material and Methods

The aim of the paper is to evaluate the total current expenditures of municipalities as well as their individual components in the conditions of Slovak and Czech municipalities on the basis of selected indicators in the period 2007-2018. The reason for choosing the countries which we compared is the fact, that both countries were in the past part of one country, but they chose different models of public administration. The object of the paper were cumulative data of municipalities in Slovak republic (2,890 municipalities) and cumulative data of municipalities in Czech Republic (6,271 municipalities).

In Slovak Republic, at the NUTS V level, we have representatives of local self-government - municipalities (as of 31 December 2019 - 2,890 municipalities, 140 of them have the status of a city). The NUTS IV level represents 79 districts and the NUTS III level - 8 regions. The NUTS II level is represented by 3 aggregated regions (Eastern Slovakia, Central Slovakia, and Western Slovakia).

The Czech Republic is the Unitarian state, applying the so-called combined model of fiscal federalism. The Constitution specifies three vertical levels of government in the Czech Republic with budgets of their own. The top level is represented by the Central Government; the fourteen higher self-administrating units are called Regional Governments, and the lowest level is represented by Municipal Governments. Regions and municipalities are responsible for expenses within their "own" and "delegated" responsibility (Dvořáková 2007).

We analyse also the total general government expenditures as a share of GDP issued at local self - government level in countries of V4 over the years 2007 - 2018. Expenditures of government institutions are defined in ESA2010 in paragraph 8.100 and Chapter 20 with a reference to the list of items: intermediate consumption, gross capital formation, employee remuneration, other taxes on production, subsidies, property income, ordinary taxes on pensions, property and other benefits, social benefits other than social transfers in kind, transfers - purchased market output, other current transfers, changes in pension entitlements, capital transfers and net transactions in non-produced assets.

The data sources for the individual indicators were obtained from the Ministry of Finance of Slovak Republic and from the Czech Statistical Office. The conversion of CZK into € was made on the basis of the Slovak National Bank's exchange rate in the appropriate year. Analysis and results were processed in MS Excel. We analyse following relationships:

$$E_T\text{- Slovakia, Czechia} = \frac{\text{total current expenditures of municipalities}}{\text{total expenditures of municipalities}} x100$$

$$E_w\text{ – Slovakia, Czechia} = \frac{\text{expenditures for wages, salaries, insurance}}{\text{total expenditures of municipalities}} x100$$

$$E_p\text{ – Slovakia, Czechia} = \frac{\text{expenditures for products and services}}{\text{total expenditures of municipalities}} x100$$

$$E_C\text{ – Slovakia, Czechia} = \frac{\text{expenditures for current transfers}}{\text{total current expenditures of municipalities}} x100$$

$$E_i\text{ – Slovakia, Czechia} = \frac{\text{expenditures for interest repayment}}{\text{total current expenditures of municipalities}} x100$$

For the classification of incomes and expenditures within individual budgets in Slovak municipalities, is valid the economic classification of the budget classification within the Measure of the Ministry of Finance of the Slovak Republic No. MF/010175/2004-42 establishing a species classification. Each municipality, in accordance with the Act No. 583/2004 Coll. on Budgetary Rules of territorial self-government, compiles and divides the budget according to the valid budget classification set by the decree of the Ministry of Finance of the Slovak Republic. Municipalities in the Czech Republic to create their incomes and expenditures on the basis of Decree No. 323/2002 Coll. Decree of the Ministry of Finance of the Czech Republic on the budget structure. According to the budget classification, incomes and expenditures are classified uniformly and their implementation is also monitored in a uniform manner.

**Table 1** – Categories of current expenditures by budget classification

| Slovak Republic | Czech Republic |
|---|---|
| 610 – wages, salaries, earnings and other personal compensation | 501, 502 – salaries and other payments for work performed |
| 620 – premiums and contributions to insurance | 503 - compulsory insurance premiums paid by the |

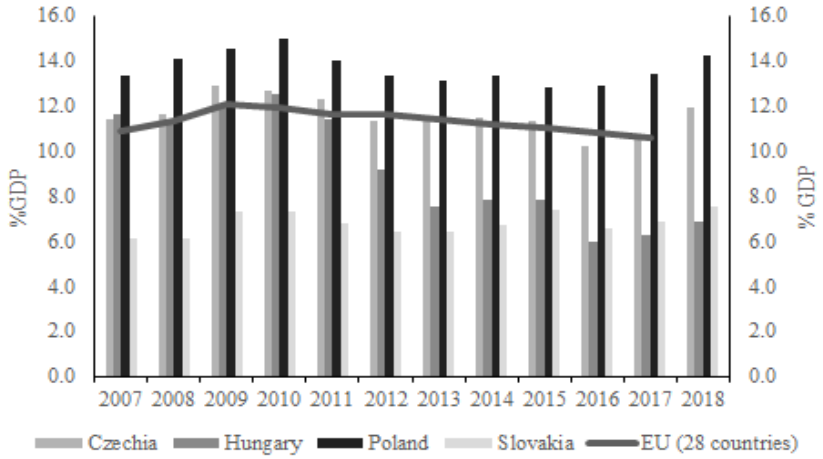
| | |
|---|---|
| companies | employer |
| 630 – goods and services | 513, 515,516 – purchase of water, fuels and energy, purchase of services, purchase of goods |
| 640 – current transfers | 521, 522, 533 – non - investment transfers |
| 650 – repayment of interest rates and other payments relating to credit, loan, repayable financial assistance and financial leasing | 514 – interest rates |

Source: Measure of the Ministry of Finance of the Slovak Republic No. MF / 010175 / 2004-42, Decree No. 323/2002 Sb. Decree of the Ministry of Finance of Czech Republic on the budget structure. own processing.

## 3 Results and Discussion

Compared to the EU average, Slovak republic to spend half of the funds on local self - government (EU in 2008 it was 11.30 % GDP, Slovak Republic in 2008 it was 6.10 % GDP; EU in 2017 it was 10.6 % GDP, Slovak Republic in 2018 it was 7.5 % GDP). Data for 2018 within the EU-28 is not available. Czech Republic and Poland spent almost the same amount of funds each year for financing of local self - government, although in the comparable years 2008 and 2016 there was a slight decrease of these funds in both countries. But in 2017 a 2018 there has been an increase in these funds in both countries. Surowka (2017) notes that local self - government units are an important subject of the public finance sector in Poland. The base of their operations are connected with meeting the needs of the population of municipalities (gminas), districts (poviats) and voivodeships. The basics of financial management are determined by legal regulations which thus define the scope of their activities and affect the state of financial resources at their disposal. The financial condition of Polish municipalities and districts are significant, because the local self - governments are responsible for funding more than 30% of public tasks in Poland. However Satoła, Standar, and Kozera (2019) note that financial autonomy varies significantly from one Polish rural municipality to another. Almost 60% of them are at a medium or low level. As a result, their financial situation and ability to perform their own tasks depend on the resources allocated from the state budget. This poses a significant problem for their ability to remain financially stable. We can see a significant decrease of funds also in Hungary, where the decline in 2016 compared to 2008 was 53.09%. However, over the next two years, these funds slightly increased (Figure 1). Hungary currently has a relatively complicated intergovernmental system and the most important sources of funding for local self-governments in this country are grants, which have accounted for around 60% of total incomes over the last 6 years (Nam and Parsche 2001).

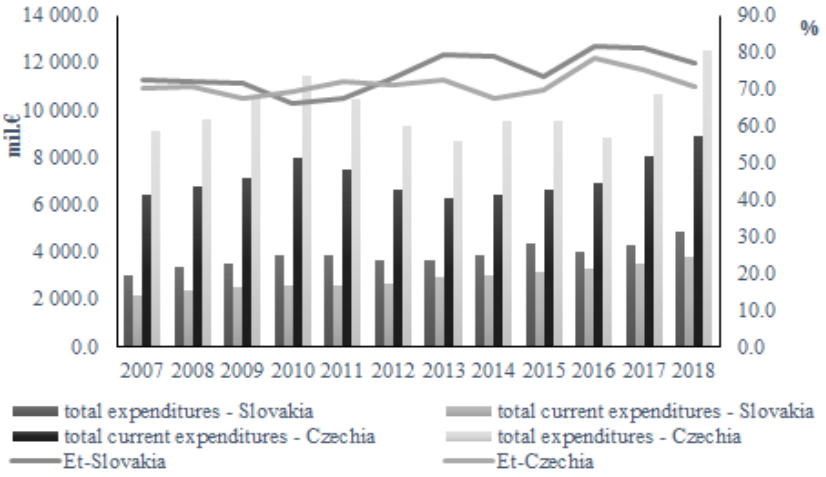
**Figure 1** - Development of general government expenditures (% of GDP) for local self – government. Source Statistical Office of the Slovak Republic, own processing




The total expenditures of municipalities are made up of current and capital expenditures. The total expenditures of Slovak municipalities had a fluctuating trend in the analysed period. From 2007 to 2010, the total expenditures of Slovak municipalities increased. In 2011, when the financial crisis broke out in Slovak Republic, the total expenditures of municipalities decreased by 44.2 mil. €, which represents 1.14%. This trend continued in the following year. The change occurred in the period 2013-2015, when the total expenditures of Slovak municipalities increased. We are again seeing a further decrease in total expenditures in 2016, when the decrease was 7.1%, which represents 306.1 mil. €. We also see a trend of increasing of total expenditures in the next two

years. Compared to 2007 and 2018, the total expenditures of Slovak municipalities increased by 61.4%, which represents 1,855.9 mil. € (Figure 2).

**Figure 2** - Development of total expenditures and total current expenditures in Slovak municipalities and Czech municipalities. Source Statistical Office of the Slovak Republic. Own processing.

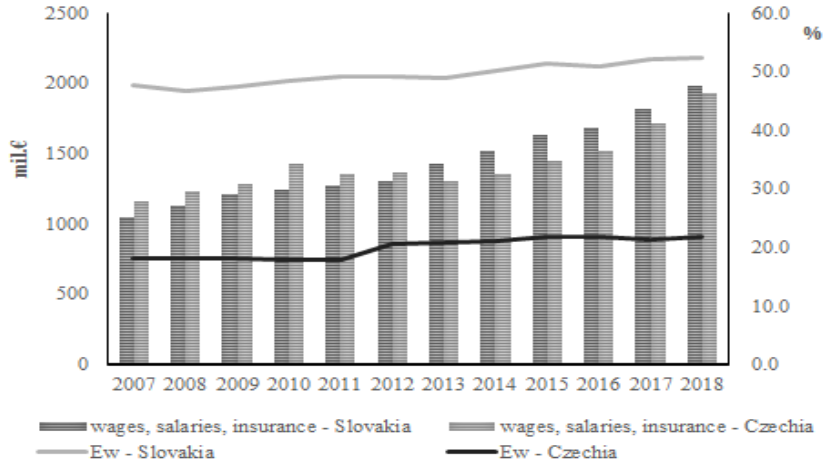



We are monitoring a similar development of total expenditures in the Czech Republic as well. The decrease of total expenditures occurred in 2011 and this decrease continued in the following two years. In 2014, compared to the previous year, the total revenues of Czech municipalities increased by 814.7 mil. €, which represents a 9.4% increase. Although the total revenues of Czech municipalities increased in 2015, they fell slightly again the following year. Over the next two years, there was an increase of total expenditures in Czech municipalities. Compared to 2007 and 2018, total expenditures increased by 3,381.4 mil. €, which represents 37.5% (Figure 2).

Current expenditures of municipalities serve to ensure the normal operation of the municipality. Nam and Parsche (2001) note that in Hungary and Poland, current expenditure accounts for about 80% of total expenditures. In the conditions of Slovak Republic, these expenditures make up 75% of the total expenditures of municipalities. With the exception of 2011, when current expenditures decreased, they increased every year. The decline in 2011 was caused by the financial crisis, when municipalities received less funding, which was subsequently reflected in the current expenditures of municipalities. The total increase of current expenditures in 2018 compared to 2007 was 71.5%, which represents 1,571 mil. € (Figure 2).

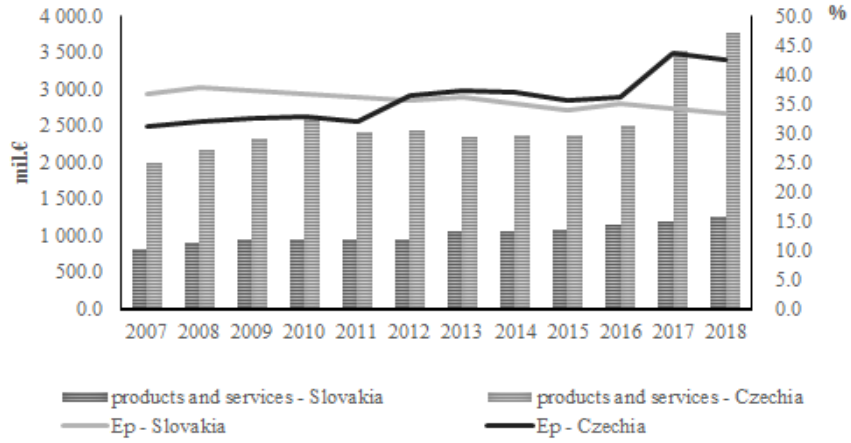
In the Czech Republic, total current expenditures decreased only in 2012-2013. Since the incomes of Czech municipalities, unlike Slovak municipalities, is not linked to only one income from the state (in Slovakia it is the income from personal tax, but in the Czech Republic it is a mix of taxes), so Czech municipalities did not feel the financial crisis as significantly as Slovak municipalities. In the coming years, current expenditures had grown every year. Compared to 2018 and 2007, the increase was 38.8%, which represents 2,482.2 mil. €. Similarly, as in Slovak municipalities, current expenditures of Czech municipalities on total expenditures accounted for an average of 71% of total expenditures (Figure 2). But Černý et al. (2020) note that current expenditures of Czech municipalities include expenditures on the operation of a municipal or city office, school operations, maintenance of streets, squares, public spaces, operation of public lighting, cemetery, municipal police, support of local culture, sports, etc. Some of them are more difficult to plan, for example heating or snow removal costs. There are also expenditures that elected representatives can hardly influence, as their amount is determined by a generally binding legal regulation, such as a government regulation on the salaries of employees in public services and administration, which sets the salaries of municipal officials. In addition to the municipality's expenditures on "matters that are in the interest of the municipality and citizens", it means on original competences, it is also necessary to take into account the expenditures on the transferred competences.

**Figure 3** - Development of expenditures for wages, salaries and insurance in Slovak municipalities and Czech municipalities. Source Statistical Office of the Slovak Republic. Own processing.



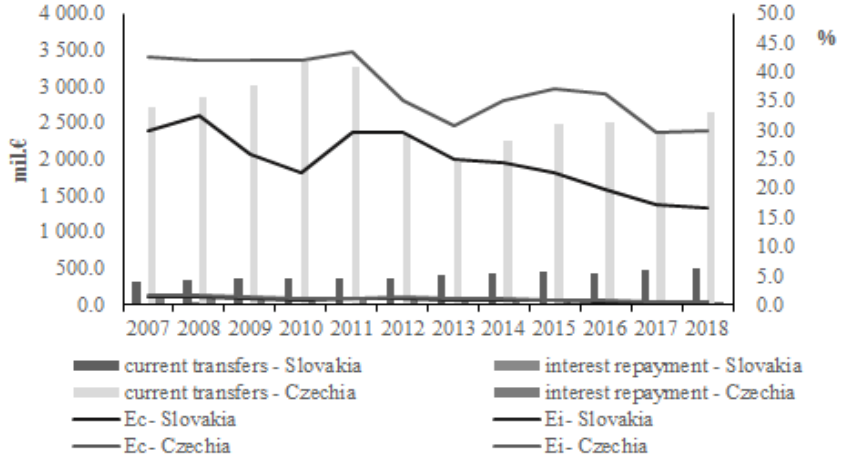

As current expenditures serve to ensure the daily operation of municipalities, which are mainly provided by municipal employees, the biggest share of total current expenditures is contributed by employees' wages and social and health insurance premiums. In Slovak municipalities, these expenditures made averaged 49.6%, but Czech municipalities spent on average only 19.9% of their current expenditures on these expenditures. The amount of these expenditures is closely related to the number of employees, as well as to the set legislation concerning wage policy. Despite the fact that there are 6,271 municipalities in the Czech Republic and 2,890 municipalities in the Slovak Republic, the wage expenditures of municipalities in the Slovak Republic are much higher than in the Czech Republic. In the Czech Republic the wage expenditures per municipality represent on average 0.22 mill. €. In Slovak Republic these expenditures per municipality represent on average 0.49 mill. €. In the conditions of Slovak municipalities, wage expenditures increased every year, in the Czech Republic these expenditures also increased every year, with the exception of 2011 and 2013 (Figure 3).

**Figure 4** – Development of expenditures for products and services in Slovak municipalities and Czech municipalities. Source Statistical Office of the Slovak Republic. Own processing.




Products and services represent the second highest share of total current expenditures after wages. In Slovak municipalities, these expenditures averaged 35.6% of current expenditures, in Czech municipalities these expenditures averaged 35.7% of current expenditures. The overall development of this group of expenditures was almost identical. Slovak municipalities recorded a decrease of these expenditures only in 2010 and 2011, Czech municipalities recorded a decrease of these expenditures only in 2012, 2013 and 2015. In 2018, compared to 2007, these expenditures increased in Slovak municipalities by 56.6% and in Czech municipalities by 90.3% (Figure 4).

**Figure 5** - Development of expenditures for current transfers and for interest repayment in Slovak municipalities and Czech municipalities. Source Statistical Office of the Slovak Republic. Own processing.




Within the incomes of the municipality, they receive current transfers to ensure primarily the transferred competencies that they acquired in the process of decentralization of public administration. Dvořák (2017) notes that the decentralization of public administration, including fiscal decentralization, was implemented in the Slovak Republic and the Czech Republic. The aim of fiscal decentralization was to increase the financial independence of municipalities. In addition to receiving transfers within their current incomes, municipalities can also provide current transfers to other subjects.

Current transfers in the expenditure part of the municipal budget represent transfers within public administration, to individuals and non-profit legal entities and to non-financial entities not included in public administration. The share of current transfers in the total current expenditures of Slovak municipalities averaged 13.9% and in the total current expenditures of Czech municipalities they averaged 37.2%. Their development in the municipalities of the both countries showed a fluctuating trend. In Slovak municipalities there was a decrease of these expenditures in 2011 and 2016, in Czech municipalities in the period 2011-2013 and subsequently in 2017 (Figure 5).

Municipalities in the Slovak Republic used 0.9% of total current expenditures to repay interest and other payments related to loans and repayable financial assistance, and in the Czech Republic it was 1.1% of total current expenditures. Slovak municipalities have recorded an annual decrease of these expenditures since 2014. Czech municipalities have recorded a decrease of these expenditures in the period 2013-2017 (Figure 5).

## 4 Conclusion

Municipal budgets can be considered as one of the important driving forces in the development of the territory. The municipality finances its daily needs mainly from its own revenues, subsidies from the state budget and other sources that are part of current expenditures. The basis for compiling the expenditure part of the budget is the obligation to give priority to the activities and services that are stipulated by law for the municipality. The analysis showed, that in both countries, current expenditures of municipalities accounted for almost the same share in total expenditures (75% in the Slovak Republic, 71% in the Czech Republic). The biggest differences were found in expenditures related to wages and transfers. While wage expenditures accounted for a much bigger share in current expenditures in Slovak municipalities than in Czech municipalities (49.6% in the Slovak Republic, 19.9% in the Czech Republic), expenditures on products and services were at approximately the same level (Slovak Republic - 35.6 %, Czech Republic - 35.7%). The municipality's budget is also an important part of the municipality's financial policy. A well-established financial policy of municipalities provides a framework for financial management and guidance for financial managers in the performance of local self- government financial affairs.

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# Technical Efficiency the Financing Public Services in the Conditions the Municipal Districts of the Statutory City of Ostrava

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## Abstract

The paper addresses the issue of a two-level system of public administration in the conditions of the Statutory City of Ostrava and related expenditures at the level of 23 the Municipal Districts. The aim of paper is to evaluate and compare the technical efficiency of financing - transport, culture and social care, for the year 2017. The evaluation is according to the input-oriented DEA model focused on the variable return scale. The most populous the Municipal Districts of Statutory City of Ostrava is Ostrava South was fully efficient (100%) in all models. However, the average level of technical efficiency of 23 city districts is very low, namely 38% in the Transport Model, 31% in the Culture Model and 42% in the Social Service Model.

***Keywords:*** *Data Envelopment Analysis, financing, Municipal Districts, public service, technical efficiency*

***JEL Classification:*** *H11, H41, H72*

### 1 Introduction

The statutory city is a specific unit of the system of basic territorial self-government (municipalities). The statutory cities of the Czech Republic can possible to implement a two-level model self-government and implement the principles of decentralization and subsidiarity at the local level. However, the division of decision-making in the city is associated with higher economic demands on the administration and more complex political negotiations in addressing issues of local interest, including the scope and availability of public services. Similar issues are also addressed by the third most populous city in the Czech Republic, the Statutory City of Ostrava (Ostrava or SCO), it is divided into 23 the Municipal Districts.

The Ostrava is possible to sort as the Urban Agglomeration of supra-regional importance. The size of the city itself, in addition to the population and area, is determined by the agglomeration factor, which results from the positive effect of the territorial concentration of economic activities on their costs. The agglomeration process results in economies of scale in the first stage and in the second stage of agglomeration economies, (Healeye, Ilbery, 1990, Kladivo et al., 2015).

**The aim of the paper is to evaluate and compare the technical efficiency of financing selected the public service - transport, culture and social care from the budgets of 23 the Municipal Districts of the Statutory City of Ostrava, for the year 2017.**

The evaluating of technical efficiency using an input-oriented model of the Data Envelopment Analysis is used and variable returns scale.

A basis for evaluating is the system of redistribution of income of SCO. The redistribution model is determined by the Statute of Ostrava. However, the amount of income of the Municipal Districts of the Ostrava are also affected by real estate taxes, local fees and the concentration of companies in the Municipal Districts, (Tománek, 2019).

### 1.1 The Concept of Two-Level Self-Government in the Ostrava

The Ostrava is divided into 23 Municipal Districts. The Association of Mayors of Municipal Districts is constituted by the Assembly in order to facilitate communication and operations between the bodies of the City and those of it's the Municipal Districts.

The management of the Ostrava operates on two levels. On the first level there are the City bodies, i.e. the City Assembly, the City Council, the Mayor, the City Authority and the City Police Force. On the second level, that of the Municipal Districts, are the District bodies: assemblies, councils, mayors and authorities.

The division of powers between the bodies of the City and those of the Municipal Districts is defined in the City's General Directive no. 14/2013 and in subsequent amendments and addenda – the Statute of the City of Ostrava. As part of the delegated powers conferred on the Statutory City of Ostrava, the City carries out activities in state administration as defined in relevant laws, its powers extending to health care, education, social services, urban planning, building regulation, the registration of births, deaths and marriages, business registration, land management, road management, water management and environmental management.

Independent competence is exercised by the Ostrava within the scope of Act No. 128/2000 Coll., on Municipalities and other special legal regulations, unless this competence is entrusted exclusively by the Municipal Districts by the Statute. The delegated competence is exercised by the bodies of the Ostrava and, to the extent provided by the statute, also by the bodies of the Municipal Districts.

The Ostrava is one of the three largest cities in the Czech Republic. The genesis of the current model of the organization of the SCO is atypical. The organization and size of the Ostrava were mainly influenced by the economic needs of the region. Ostrava is the industrial center of the Moravian-Silesian Region and also of the Czech Republic.

The Ostrava consists of 34 originally independent towns and villages. A fundamental modern reform of the territorial division of the Ostrava took place in 1971, when the territorial administrative division of Ostrava was defined by four the Municipal Districts of Ostrava 1-4.

Barcuch (in Przybylová, 2017) states that the reform in 1971 was later referred to as an administrative intervention, lacking a deeper justification. The most important motive was to reduce the number of national committees and save administrative effort. Further reforms of public administration were not made until 1990. In September 1990, a new administrative structure of the Ostrava was approved, 22 the Municipal Districts were established, and later 23 the Municipal Districts (see Table 1). The aim of the last change in the SCO organization was to minimize operating costs while ensuring the performance of state administration by professionally specialized officials. These requirements were to be achieved in particular by setting budget expenditures on infrastructure, social and cultural facilities as a percentage of budget expenditures, investment districts of city districts will be separate but based on a city-wide long-term investment plan, city finances will be managed as a whole with sub - accounts for the Municipal Districts.

### 1.2 Rules of Income Redistribution

The incomes of the Municipal Districts can be divided into own revenues and transfers from the SMO budget. The municipal district's own income includes property income, capital income from the sale of real estate entrusted to the Municipal Districts, from the results of its own economic activity and established legal entities, from its own administrative activities (administrative fees, fines), local fees, real estate tax revenue, subsidies from other public budgets and funds (region, state, EU), received monetary donations and repayable loans. The transfers from the SMO budget are made according to the tent methodology. They include non-investment non-purpose subsidy, non-investment purpose subsidy (for education, at least CZK 12,000 per pupil), investment non-purpose subsidy. Transfers are financed mainly from SCO incomes from shared taxes and a contribution to the performance of state administration.

When compiling the draft annual budget, the SCO will jointly allocate to the budgets of the Municipal Districts in the form of non-purpose non-investment subsidies an amount corresponding to 10% of the draft budget of the estimated annual municipal incomes from shared taxes. The redistribution of this amount between the individual municipal districts shall be determined according to the following criteria:

- 44 % of the amount proportionally between municipal districts according to the number of inhabitants of individual municipal district;
- 12 % of the amount proportionally between municipal districts according to the area of individual municipal district;

- 19 % of the amount proportionally between city districts according to the area of green areas in the territory of individual municipal districts and
- 25 % of the amount proportionally between municipal districts according to the area of roads in the territory of individual municipal districts.

When compiling the draft annual budget, the SCO allocates to the budgets of municipal districts for the purposes of expenditures of an investment nature realized by these municipal districts an amount corresponding to 3% of the draft budget of the estimated annual municipal incomes from shared taxes. The redistribution of this amount between individual municipal districts will take place in such a way that each municipal districts receives a basic amount of CZK 1 million and the remaining amount will then be redistributed between individual municipal districts according to the following criteria:

- 55 % of the amount proportionally between municipal districts according to the number of inhabitants of individual municipal districts;
- 15 % of the amount proportionally between municipal districts according to the area of individual municipal districts and
- 30 % of the amount proportionally between municipal districts according to the area of roads in the territory of individual municipal districts. (City's General Directive no. 14/2013, Statute of the City of Ostrava)

## 2 Material and Methods

### 2.1 Inputs and Outputs

The current solution of the SCO division includes 23 the Municipal Districts, see Tab.1. The Municipal Districts are in Tab. 1.1 sorted alphabetically. Inputs and outputs of the Municipal Districts include:

- number of inhabitants of municipal districts (I.);
- area of roads of municipal districts in $m^2$ (II.);
- expenditures of municipal districts on transport in CZK (III.);
- expenditures of municipal districts on culture in CZK (IV.);
- expenditures of municipal districts on social services in CZK (V).

**Table 1 -** Inputs and outputs of the selected models, 31.12.2017

| | I. | II. | III. | IV. | V. |
|---|---|---|---|---|---|
| **Model IO VRS Transport** | | ■ | ● | | |
| **Model IO VRS Culture** | ■ | | | ● | |
| **Model IO VRS Social Care** | ■ | | | | ● |
| **Hošťálkovice** | 1 639 | 73 858 | 269 770 | 19 492 | 136 865 |
| **Hrabová** | 3 766 | 157 765 | 8 384 159 | 304 218 | 1 716 639 |
| **Krásné Pole** | 2 664 | 66 278 | 976 116 | 261 406 | 199 000 |
| **Lhotka** | 1 347 | 37 028 | 802 184 | 249 903 | 64 000 |
| **Mar. Hory a Hulváky** | 11 915 | 375 432 | 22 380 326 | 757 821 | 10 352 666 |
| **Martinov** | 1 144 | 53 634 | 191 956 | 40 138 | 79 000 |
| **Michálkovice** | 3 371 | 124 219 | 11 394 808 | 1 244 187 | 270 325 |
| **Mor. Ostrava a Přívoz** | 36 924 | 1 075 528 | 35 577 950 | 16 751 353 | 25 989 329 |
| **Nová Bělá** | 2 035 | 53 946 | 3 133 735 | 192 140 | 1 220 514 |
| **Nová Ves** | 709 | 46 410 | 795 420 | 11 916 | 88 000 |
| **Ostrava-Jih** | 101 991 | 1 808 890 | 39 000 581 | 12 964 926 | 35 665 049 |
| **Petřkovice** | 3 144 | 87 132 | 2 751 878 | 53 888 | 190 084 |
| **Plesná** | 1 443 | 37 504 | 370 443 | 379 145 | 171 511 |
| **Polanka nad Odrou** | 5 003 | 147 654 | 9 120 548 | 530 776 | 224 600 |
| **Poruba** | 64 484 | 1 026 474 | 66 562 613 | 3 429 710 | 35 149 429 |
| **Proskovice** | 1 232 | 32 045 | 394 433 | 43 999 | 14 765 |
| **Pustkovec** | 1 283 | 61 455 | 1 049 238 | 1 466 | 99 000 |
| **Radvanice a Bartovice** | 6 312 | 320 985 | 15 590 703 | 41 000 | 2 035 330 |

| | | | | | |
|---|---|---|---|---|---|
| **Slezská Ostrava** | 20 711 | 848 987 | 32 737 873 | 1 843 006 | 23 862 742 |
| **Stará Bělá** | 4 103 | 151 726 | 7 831 183 | 204 824 | 494 367 |
| **Svinov** | 4 365 | 236 822 | 19 308 168 | 95 371 | 360 099 |
| **Třebovice** | 1 899 | 90 196 | 6 082 818 | 14 637 | 92 000 |
| **Vítkovice** | 7 674 | 323 484 | 32 330 035 | 442 671 | 7 273 583 |

Source: Internal documents of Ostrava. Own processing.
Note: ●input, ■ output

### 2.2 Input-Oriented with Variable Returns to Scale

DEA method enables to evaluate units set through the input-oriented and output-oriented models. The output-oriented model CCR (according to Charnes, Cooper and Rhodes) with constant returns to scale (CRS) and output-oriented model BCC (according to Banker, Charnes and Cooper) with variable returns to scale (VRS) are applied to evaluate the efficiency of the supply of retirement homes services. Output-oriented models are based on maximalization assumption – volume of outputs is increased when the given volume of inputs is respected (Cooper, Lawrence, Tone, 2007).

Efficiency calculation according to BCC model has one additional variable in the objective function (in comparison with CCR model). This additional variable represents condition of convexity, and it is not restricted by condition of non-negativity. Calculation is formulated as follows (1):

$$\text{minimize} \quad g = \sum_i^m v_j x_{jq} + v, \tag{1}$$

$$\text{on conditions} \quad \sum_i^r u_i y_{ik} \leq \sum_j^m v_j x_{jk} + v, \quad k = 1, 2, \ldots, n,$$

$$\sum_i^r u_i x_{iq} = 1,$$

$$u_i \geq \varepsilon, \qquad i = 1, 2, \ldots, r,$$

$$v_j \geq \varepsilon, \qquad j = 1, 2, \ldots, m,$$

$$v - free.$$

Coefficient of efficiency $g$ for both above formulated models is defined by the ratio of weighted sum of inputs and weighted sum of outputs when such weights are searched to have the $g$ greater than or equal to 1. Therefore, the efficient units have the value of the coefficient $g$ equal to 1, and inefficient units greater than 1 (Zhu and Cook, 2013).

## 3 Results and Discussion

For the needs of evaluation of technical efficiency of selected public services (Transport, Culture and Social Care) financed from the budgets of city districts according to the IO CRS DEA model, input and output parameters were determined, see Tab. 1. Table 2 shows the comparison of the results of three models (Model IO VRS Transport, Model IO VRS Culture, Model IO VRS Social Care).

The best results are achieved by city districts in the IO VRS Social Care model. Municipal Districts are fully (100 %) technical efficiency:

- Ostrava Jih, Polanka nad Odrou and Proskovice.

The worst average results are achieved in the Model IO VRS Culture. The Municipal Districts are fully (100 %) technical efficiency:

- Ostrava Jih, Poruba, Pustkovec, Radvanice and Bartovice.

The Model IO VRS Transport includes fully (100 %) technical efficiency the Municipal Districts:

- Hošťálkovice, Martinov and Ostrava Jih.

The average level of technical efficiency of 23 the Municipal Districts is very low, namely 38 % in the transport model, 31% in the culture model and 42% in the social service model. The biggest differences between the results in technical efficiency are in the Model IO VRS Culture.

The graph in Fig. 1 compares the results of the technical efficiency score in individual models and shows the average technical efficiency rate for all three models according to Municipal Districts. The Ostrava Jih is fully effective in all models. The Municipal District of Nová Bělá has the worst results in all models. Some the

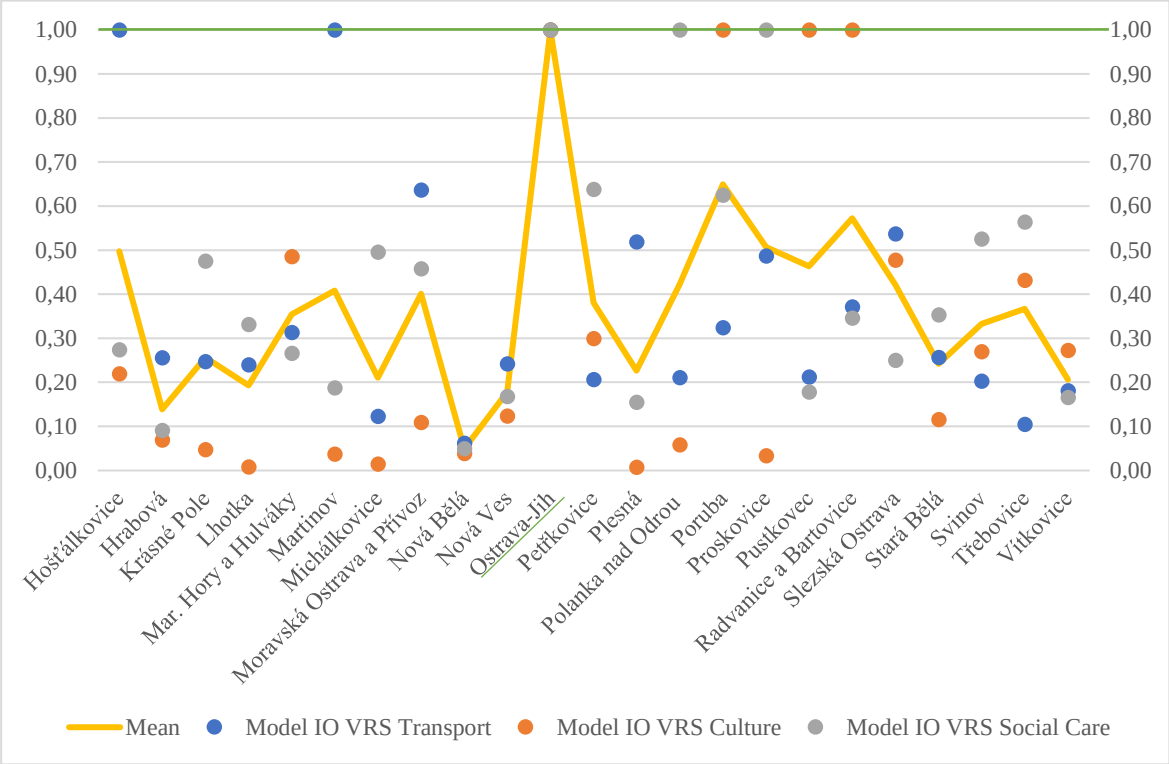
Municipal Districts are fully (100 %) technical efficiency in only one model and in others are highly inefficiency. Examples are the Municipal Districts of Hošťálkovice, Martinov, Proskovice, Polanka nad Odrou.

**Table 2** – Results technical efficiency of the Municipal Districts

| DMUs | Model IO VRS Transport | Model IO VRS Culture | Model IO VRS Social Care | Mean |
|---|---|---|---|---|
| Hošťálkovice | 1.000 | 0.219 | 0.273 | 0.497 |
| Hrabová | 0.256 | 0.069 | 0.091 | 0.138 |
| Krásné Pole | 0.246 | 0.047 | 0.475 | 0.256 |
| Lhotka | 0.239 | 0.008 | 0.331 | 0.193 |
| Mar. Hory a Hulváky | 0.313 | 0.485 | 0.266 | 0.354 |
| Martinov | 1.000 | 0.037 | 0.187 | 0.408 |
| Michálkovice | 0.122 | 0.014 | 0.495 | 0.211 |
| Moravská Ostrava a Přívoz | 0.636 | 0.109 | 0.457 | 0.401 |
| Nová Bělá | 0.062 | 0.038 | 0.049 | 0.050 |
| Nová Ves | 0.241 | 0.123 | 0.168 | 0.177 |
| Ostrava-Jih | 1.000 | 1.000 | 1.000 | **1.000** |
| Petřkovice | 0.206 | 0.299 | 0.637 | 0.381 |
| Plesná | 0.518 | 0.007 | 0.155 | 0.227 |
| Polanka nad Odrou | 0.210 | 0.058 | 1.000 | 0.423 |
| Poruba | 0.324 | 1.000 | 0.625 | **0.649** |
| Proskovice | 0.487 | 0.033 | 1.000 | **0.507** |
| Pustkovec | 0.212 | 1.000 | 0.178 | 0.463 |
| Radvanice a Bartovice | 0.371 | 1.000 | 0.345 | **0.572** |
| Slezská Ostrava | 0.537 | 0.477 | 0.250 | 0.421 |
| Stará Bělá | 0.256 | 0.115 | 0.353 | 0.242 |
| Svinov | 0.202 | 0.269 | 0.525 | 0.332 |
| Třebovice | 0.104 | 0.431 | 0.564 | 0.366 |
| Vítkovice | 0.181 | 0.272 | 0.165 | 0.206 |
| Mean | 0.379 | 0.309 | 0.417 | |
| SD | 0.278 | 0.348 | 0.279 | |

Source: Own processing.

**Figure 1** - Compares the results of the technical efficiency of the Municipal Districts




Source: Own processing.

## 4 Conclusion

The paper deals with the evaluation of the technical efficiency of selected services financed from the budgets of Municipal Districts of the Statutory City of Ostrava for year 2017. For the needs of the evaluation, the basic IO VRS model with one input and one output was selected. Selected inputs and outputs are therefore the limit factors of the achieved results.

The input parameter in the case of the Culture and Social Care models was the number of inhabitants of a given municipal districts. In the case of the Transport model, the input was the area of roads m2 of municipal districts. The output is always the expenditures that the Municipal Districts incurred in 2017 in the given area.

Large differences in the results of technical efficiency of all three models are affected by differences in circuit size. It turns out that the best and average results are achieved by the largest city districts, namely Ostrava South and Poruba.

The results of the technical efficiency of the Municipal Districts are also influenced by the concentration of specific services (schools, theaters, museums, zoo, hospitals) in a given city district (Bečica, 2016, Vrabková, 2016, Tománek, 2018). As the results show of the two Municipal Districts - Moravská Ostrava and Přívoz in the Culture model. The system of calculating the allocation from the budget of the Statutory City of Ostrava to Municipal Districts according to selected parameters (population, area, area of green areas and roads) is suitable for medium and small districts and not for the municipal district of Ostrava Jih, becouse it is incomparable in terms of population the size and economies of scale. The results of efficiency can also be described as limited, with regard to the significant expenditures of the statutory city Ostrava in all evaluated areas - transport, culture and social care.

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