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JAN EVANGELISTA PURKYNĚ UNIVERSITY

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**Adaptation of Post-Industrial
Society to Global Changes**

**Social & Economic Development & Regional Policy
Adaptation of Post-Industrial Society to Global Changes**

Edited by Jan Slavík & Lucie Povolná

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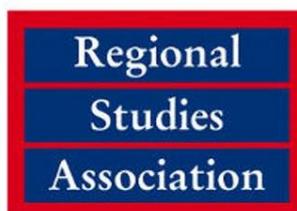
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Ladies and Gentleman,

I'm pleased to introduce to you the proceedings from the 18th International Scientific Conference devoted to the '*Social and Economic Development and Regional Policy*' in the European Union, that especially focused on the vulnerable post-industrial regions in the central European countries (incl. the Ustecky region). The ideological purpose of the conference reflects the strategic document: '*Regional challenges in the perspective of 2020*', which calls attention to substantial global based challenges within European regions. According to this strategy, the regions of the Czech Republic, Poland, Slovakia, and Hungary belong to highly vulnerable European regions that are dealing with multiple challenges (especially those of globalization and energy security matter). Therefore, looking for methods as to how to turn global changes into higher competitiveness and innovation potential, as well as better environment and higher quality of life for the Central Europe regions, these were the central focuses for conference participants.

To tackle the previously mentioned challenges of post-industrial regions, the conference participants concentrated on regional policy and its effectiveness, environmental consequences of regional development, social opportunities and risks, and local economy and regional competitiveness. Special attention was devoted to young researchers and their scientific skills. Therefore one workshop was led by a GeoScape Journal editor-in-chief, and another workshop aimed at introducing experience with international scientific projects, both were an important part of the conference.

We are fortunate to have been able to use the conference as an opportunity to circulate research results among young and senior researchers in the international academic environment of the Central European region. Also, to share each other's experience regarding the specific regional problems of the post-industrial society and about its adaptation to global changes, and to search ways as to how to increase the competitive power of post-industrial society in the European environment.

I'm looking forward to seeing you in June, 2020!

Dr. Jan Slavík

Member of the Organizing Committee,
Faculty of Social and Economic Studies, Jan Evangelista Purkyně University in Ústí nad Labem, Czech Republic

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DIVERSIFICATION OF THE SPATIAL DISTRIBUTION OF ENTITIES PROVIDING BUSINESS SERVICES – THE CASE OF LOWER SILESIA

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Abstract

The purpose of this paper is to present and evaluate the relationship between the location of entities providing business services (the business service firms) and investment expenditures of municipalities and enterprises, as well as enterprise development in Lower Silesian Voivodship, and to indicate the determinants of these dependencies. Lower Silesian Voivodship is one of the leading regions in Poland in terms of socio-economic development, on the other hand it is an area characterised by significant spatial development disproportions. Apart from the areas with a high rate of growth and social and economic development, we can observe areas (some of them of post-industrial character) which are characterised by slow overcoming of development deficiencies or even over-coming stagnation. The analysis was carried out at the level of counties (LAU 1, formerly NUTS 4). During this study quantitative methods were used, including synthetic measures of development and correlation, descriptive method and graphical method.

Key words: *business services, investment, post-industrial economy, territory, location*

1. Introduction

The approach to the analysis of the diversity of the socio-economic space of the region, as well as to the very essence of the space, is currently changing. The regional space is identified as a territory in which specific relations take place and the society living there identifies itself with it. The current state of knowledge, along with the ongoing research, allow us to state that at the stage of rapid and multidimensional changes occurring in the global economy, these are endogenous factors that become the basis for social and economic development. Their specific combination together with the support of exogenous factors can play a decisive role in shaping development. In post-industrial economies and societies, the priorities and the foundations of the region's development are being re-established. The frequently occurring polarisation of the socio-economic development of the region, results from the diversification of the supply of endogenous factors, incompetent use of these factors and the lack of human resources or their inadequate structure. An important element

contributing to the polarisation is also the unequal access to the business service firms. The activation of the region through the development of entrepreneurship and investment expenditures of municipalities and enterprises are the basis for maintaining the development trend over time. The relations between the factors determining the development and the spatial polarisation of this development are differentiated in various regions. A good example of such inconclusive relations is Lower Silesian Voivodship.

The purpose of this paper is to present and evaluate the relationship between the location of entities providing business services (the business service firms) and investment expenditures of municipalities and enterprises, as well as enterprise development in Lower Silesian Voivodship, and to indicate the determinants of these dependencies. The analysis, which has been conducted, included the location of companies from the M and J Polish Classification of Activities sections (PKD 2007). The classification contains the broadly understood entities providing business services: from accountancy, consulting, IT,



information and many others, to specialized designing and architectural services. Lower Silesian Voivodship is an area characterised by significant spatial development disproportions. Apart from the areas with a high rate of growth and social and economic development, we can observe areas (some of them of post-industrial character) which are characterised by slow overcoming of development deficiencies or even overcoming stagnation. The analysis was carried out at the level of counties [poviats] (LAU 1, formerly NUTS 4), during the study quantitative methods were used, including synthetic measures of development and correlation, descriptive method and graphical method.

1. Polarisation of the Social and Economic Development of the Territory of the Region in the Light of the Theoretical Consideration

The contemporary form of organisation of socio-economic and investment processes focuses on the local and regional dimension. This means that regions and local units bestow a new meaning on space. In this approach, space is tantamount to territory, which becomes the basic guideline for decisions made by enterprises, which is emphasized, among others, by Ph. Aydalot (1998), D. Maillat (1998), I. Pietrzyk (2001), A. Jewtuchowicz (2005), A. Nowakowska (2011). The definition of the concept of territory is identified in different ways. The essence of the territory is presented as:

1. A system where development is a social process and not just a technical one.
2. M. Le Berre (1992): *“part of the land on which a social group operates in order to ensure reproduction and preservation of its existential needs”*.
3. A. Bailly (1994): social relations, relations between the community of people and the space in which they live, belonging to the area.
4. Physicality and its impact on social interaction (Gregory, 1986).
5. The space in which a particular society lives, cooperates and carries out exchanges. According to C. Lacour (1996), it connects

the inhabitants in three dimensions of time: past, present and future.

Territory is therefore related to such notions as identity, appropriation of space or being embedded in a given location, which all give it proper positioning in the decisions concerning the development of the region. The characteristics of the territory describe the specificity of the region and its potential for growth and development. The characteristics of the territory include: individualised social bonds, specific culture, its own history and tailored economy, private and professional relations and management strategies. The transition from location to territory indicates the dynamics of the processes we are dealing with in the contemporary space, as opposed to the previous static approach (Nowakowska, 2018). The relations taking place in the space define the nature of the territory. The space of the region and the conditions of its functioning outline the scope and extent of autonomic character of the territory. The relationships and emerging dependencies as well as the cooperation between the local firms, including the business service firms, shape the basis for innovative processes and subsequent location decisions.

The success of the territory is the social and economic development of the region's space which depends on a system of endogenous and exogenous factors in the area. Exogenous resources are largely independent of the regional and local level. They result from the high level guidelines in the country or international factors. In principle, exogenous factors in the new paradigm of development based on the territory refer to legal regulations, conducted policies, financial support, favourable conditions and institutional base, creating the basis for conducting business activity of public and private entities. In a turbulent environment, the durability of positive solutions in terms of support for undertakings becomes an advantageous factor. This, however, does not mean that the system should be rigid and not responsive to changes; on the contrary, flexibility and adaptation are becoming the requirement of the present day.



Endogenous factors result from the nature of the region's combination of resources (Stough, 2001). Traditional and modern endogenic resources define the specificity of space and funnel social and economic development. At the same time, endogenous resources and their unique (specific) combinations become the element that gives the final advantage to the location. It is important from the point of view of long-term capital, which wants to be embed in a given territory, which is widely described by Polanyi (1957), Nootboom (2005) and Grzeszczak (1999). The endogenous development described by Romer (1986), extended by the achievements of the knowledge-based economy (Solow, 1956) and creative economy (Florida, 2002), strengthens the position of territory in the global economy, since knowledge and the skills of its creative application play a decisive role in the success of a given space. Therefore, the basic endogenic resource becomes the human resource, especially the one of high quality and the emerging social capital, whose activity makes it possible to obtain the synergy effect in the development of the region.

Particular resource combinations individualise space and give it a unique character, furthermore they define the market gap in which this area may regard the origins of its developmental advantage. This development may be supported by the activity of modern service firms, including business services. The differentiation in the supply of endogenic factors, low or uneven use of them and low current level of social and economic development determine the polarisation of the development of the region's transformation. In addition, supporting non-competitive, traditional industries is the reason why an area is lagging behind. Problems in a polarized space accumulate because the area with a reduced level of social and economic development is exposed to: departure of human capital, low interest of investors, lack of innovative and creative capital, increase in social pathologies and social exclusion. Such a territory requires the application of a focused bundle of activities by all actors of local economic and social development (in cooperation with external authorities). It is very important that the

above-mentioned entities cooperate in order to achieve the synergy effect. The cohesion of the region's space (territory) is a priority for the EU and a bottom-up approach provides a solid basis for the sustainable development (Yotopoulos, Lau, 1970) of the entire region (independent of the present economic situation).

2. Diversification of Development in Lower Silesia

Lower Silesian Voivodship (Lower Silesia) is an area characterised by significant polarisation of distribution in terms of space. Although the region as a whole is one of the leading regions in terms of GDP growth and socio-economic development in Poland, it is characterised by significant internal disproportions in development at the level of cities, municipalities and counties. Wrocław, the capital of region, and the counties located in its metropolitan area (particularly the Wrocław County) are developing dynamically, another area of growth is the Legnica-Głogów Copper Belt Area based on the monoculture of mining and smelting of copper and other raw materials, encompassing the Legnica city, Legnica, Głogów, Lubin and Polkowice counties. On the other hand, the areas with a significantly lower level and pace of development are in the south of the region, mainly peripheral areas (mountainous, border areas), including post-industrial areas (e.g. Wałbrzych City, Wałbrzych, Lwówek Śląski, Kamienna Góra, Dzierżoniów, Kłodzko counties) and peripheral located in the north of the voivodship: Góra County. The paper presents the diversification of regional development based on the synthetic measure of propensity to invest (both from the point of view of local territorial authorities and entrepreneurs). Against this background, diversification of locations of business service firms is under scrutiny. Considering the available data of the Central Statistical Office (CSO), which is analysed by sections and divisions of the PKD 2007, special attention has been laid on the location of the firms registered in sections: M (Professional, scientific and technical activities) and J (Information and communication). Mentioned entities primarily provide services for business concerning:



- section M - legal, accounting, bookkeeping and auditing activities, tax consultancy, architectural and engineering activities, technical testing and analysis, scientific research and development, advertising and market research, other professional, e.g. translation and interpretation activities, specialised design activities etc. Whereby, firms providing: legal, accounting, bookkeeping and auditing activities, tax consultancy, architectural and engineering activities and the so-called other professional, scientific and technical activities have a specific role in Lower Silesia.
- section J: programming and informatics activities (these kinds of activities prevail in the analysed area) and information service activities (like publishing, audio-visual, telecommunications activities) – these kinds have marginal share.

2.1 Deployment of Business Service Sector

The survey covered the whole voivodship, i.e. 30 counties (26 land counties and 4 city counties). The study period embraced 2009-2017 when data on entities registered in the REGON register by PKD 2007 sections and divisions was used to analyse the spatial distribution of the business service firms, with particular attention drawn to the distribution of firms from sections M and J. The number of

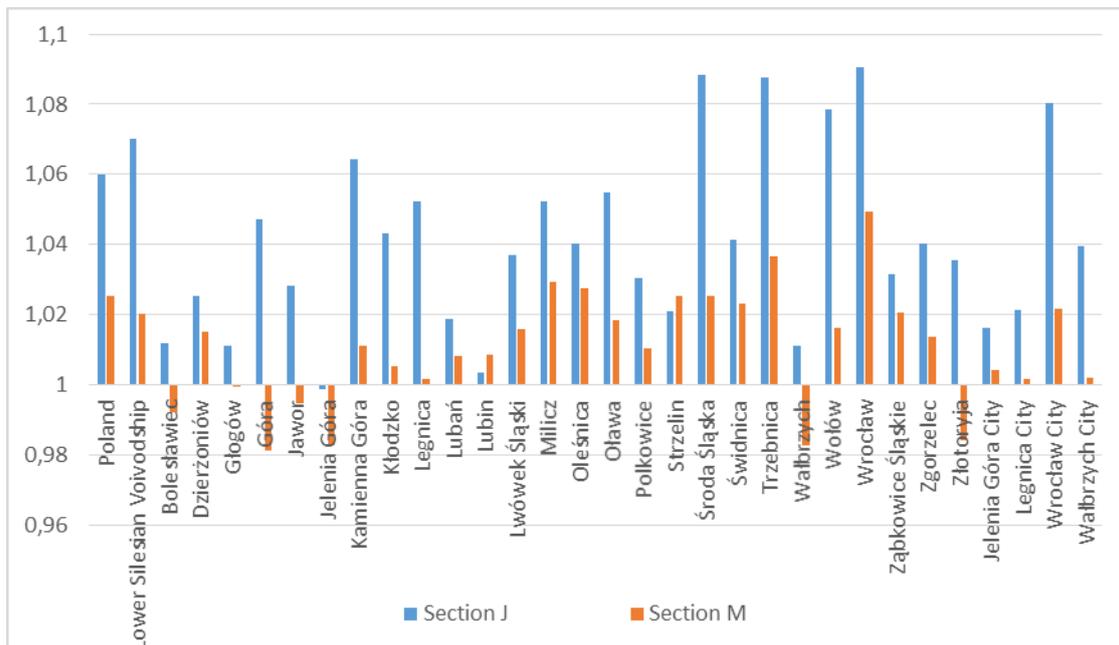
companies, as well as newly registered and deregistered firms, was also taken into account.

As of the end of 2017, the share of M-firms in the total number of registered firms was significantly higher in Wrocław than in the remaining counties (this share amounted to over 15 % of registered firms in the city) and Wrocław County (nearly 14 %). However, in the twelve counties of the region it did not exceed 6 %. In Jelenia Góra County (which had the lowest share of Section M in the total number of firms) it amounted to about 4 %, and in the period of 2009-2017 a negative rate of change of this share was recorded. On average, the share of section M firms in the total number of firms in Poland as of the end of 2017 amounted to approx. 10 %. Lubin County and the city of Legnica were ranked at a level close to the national average.

The share of section J was much lower than that of section M. As of the end of 2017, it ranged from approx. 7 % in Wrocław to approx. 1 % in the county of Złotoryja. In 12 counties it did not exceed 1.5 %, while the average share of this section in the total number of firms in Poland was about 3.6 %. Apart from Wrocław City, only Wrocław County was at a higher level than the national average (with a share of ca. 5 %), while Oława County reached a level similar to the national level (3.2 %). In the years 2009 - 2017 the average rate of changes in the share of sections J and M in the counties under analysis was diversified (Figure 1).



Figure 1: Average rate of change in the share of a given section of Polish Classification of Activities (PKD 2007) in the total number of firms registered by counties of Lower Silesian Voivodship in the years 2009-2017 (as on December 31)



Source: Authors' calculation on the basis of data from the CSO Local Data Bank.

However, as shown in Figure 1, in most counties the average rate of change in the years 2009-2017 was positive, with a much higher growth rate being recorded for the share of firms from section J, and only in one county (Jelenia Góra) there was a negative rate of change in the share of firms from this section. On the other hand, the average rate of change in the share of firms from section M was negative in 7 counties: Góra, Jelenia Góra, Wałbrzych, Złotoryja, Bolesławiec, Jawor and Głogów. The fastest positive rate of changes in section J was recorded in the following counties: Wrocław, Trzebnica and Środa Śląska. The average rate of changes in the share of firms from section M was the fastest in Wrocław and Trzebnica counties. It should be noted that these counties, with the exception of Wrocław County, were included in the group with a low share of business service firms and a low propensity to invest (see: Point 2.2, Table 1).

2.2 Synthetic Measure of Propensity to Invest

The synthetic measure of propensity to invest was based on the following variables calculated as an average for given years:

1. Entrepreneurship indicator value in counties from 2009-2017 (calculated as the number of registered firms per 1,000 of the working age population).
2. Share of investment expenditure in total budget expenditure of municipalities and counties from the years 2009-2016.
3. Investment outlays of enterprises per 1 inhabitant of working age from 2009-2016 (in enterprises employing more than 9 persons).
4. Share of municipality expenditure on municipal economy and environmental protection per 10,000 inhabitants in the years 2009-2016.

These diagnostic variables have been selected due to: the relevance for determining the inclination to



invest, availability to all territorial units surveyed, significant volatility and low correlation within the selected groups. The coefficient of variation for the indicators selected for the analysis ranged from above 20% to over 100%, the Pearson correlation coefficient between particular groups of diagnostic variables was about 0.4 and less. All variables were stimulants. In the next step, in order to make them comparable, they were unitized in the range of 0-1, using the zero unitarization method in accordance

$$\text{with formula: } z_{ij} = \frac{x_{ij} - \min_i \{x_{ij}\}}{\max_i \{x_{ij}\} - \min_i \{x_{ij}\}}$$

where: $i = 1, 2, \dots, n; j = 1, 2, \dots, m$.

The synthetic measure has been designed in accordance with the non-standard method of linear order (Strahl, 2006). Subsequently, the ranges grouping the examined units (counties) according to their levels were determined: [100; 80] - very high; (80; 60] - high; (60; 40] - medium; (40; 20] - low; (20; 0] - very low.

Table 1 groups and compares the analysed counties according to the achieved level of synthetic measure

and the share of firms in sections J and M in the total number of firms. It should be noted that in terms of inclination to invest, only two counties (with a high level of development and GDP growth) reached a high level: Wrocław City and Wrocław County, the same which were leaders in terms of the share of firms from sections J and M. In terms of the synthetic measure of propensity to invest on medium level were located 2 counties: Polkowice and Wałbrzych City, and they were characterised by a relatively low share and changes in the share of firms from sections J and M. Jelenia Góra County, which was at the upper limit of its low level with the synthetic measure (mainly due to its relatively high entrepreneurship indicator), had the lowest share of section M and one of the lower section J in the total number of firms, which indicates a different profile of specialisation (predominance of enterprises from traditional industries and services). The very low level of investment propensity reached 4 counties: Dzierżoniów, Kamienna Góra, Lwówek Śląski and Góra; these counties were also in the last group considering the share of business service firms.

Table 1: County groups according to the synthetic measure of propensity to invest in municipalities, counties and businesses and the share of firms in sections J and M in the total number of firms

Level	Synthetic measure – Counties	No of counties	Share of a given section - counties	No of counties
Very high	-	0	Wrocław City	1
High	Wrocław City, Wrocław	2	Wrocław	1
Medium	Polkowice, Wałbrzych City	2	Oława	1
Low	Jelenia Góra, Trzebnica, Jelenia Góra City, Głogów, Zgorzelec, Środa Śląska, Oława, Świdnica, Milicz, Oleśnica, Bolesławiec, Strzelin, Lubin, Jawor, Lubań, Kłodzko, Legnica, Legnica City, Wałbrzych, Ząbkowice Śląskie, Wołów, Złotoryja	22	Legnica City, Lubin, Trzebnica, Jelenia Góra City, Głogów, Środa Śląska, Oleśnica, Świdnica	8
Very low	Dzierżoniów, Kamienna Góra, Lwówek Śląski, Góra	4	Wołów, Strzelin, Wałbrzych City, Legnica, Polkowice, Dzierżoniów, Jawor, Milicz, Bolesławiec, Zgorzelec, Kamienna Góra, Lubań, Ząbkowice Śląskie, Lwówek Śląski, Kłodzko, Góra, Wałbrzych, Złotoryja, Jelenia Góra	19

Source: Authors' calculation on the basis of data from the CSO Local Data Bank.



Interesting conclusions are also drawn from the analysis of the arrangement of counties by individual variables included in the synthetic measure (Appendix 1 - Table 2). First of all, there is no clear leader who would lead the way in the values of all diagnostic variables. Secondly, counties which belonged to the group defined as high (80%; 60%) are located in its lower part, the difference between them and Polkowice County, the medium level included in the group (60%; 40%) is relatively low - about 6 percentage points. Polkowice County achieved poor results in terms of variables 1 and 2 (Table 2), while high in terms of the other two; despite its high position according to the measure of propensity to invest, it was unattractive for the location of companies providing business services. The city of Wrocław recorded relatively poor results in terms of the variable 3, however, it was attractive for the location of business service sector.

2.3 Correlation between the Location of Business Service Firms and the Propensity of Local and Regional Authorities and Enterprises to Invest

In order to determine the relationship between the location of business service firms and the inclination of local territorial authorities and enterprises to invest, rankings were carried out and then the relationship between the synthetic measure ranking and the location ranking was examined. Using the the Spearman rank correlation coefficient (it amounted to 0.53), a moderately strong positive correlation was found between the inclination of local territorial authorities and enterprises to invest and the location of business service firms in municipalities and counties of Lower Silesian Voivodship in the years 2009-2017. 7 counties had identical rankings in both categories: cities: Wrocław, Jelenia Góra, counties: Wrocław, Trzebnica, Głogów, Jawor, Ząbkowice Śląskie; similar (difference of up to 2 ranks) - two counties: Środa Śląska and Świdnica. In the case of 7 counties the difference was 10 or more ranks. The greatest differences were observed in the Jelenia Góra County, which has already been discussed - a significant advantage of the inclination to invest over the attractiveness of business service firms for development, and in Legnica City - a significant

advantage of the location of business service firms over the inclination to invest, resulting from the attractiveness of the average city of the region, including its local human resources.

3. Results and discussion

On the basis of the literature of the subject, it has been stated that today the core of the analysis is the territory as an area of internal connections of a given space, sense of identity and relations between the inhabitants and the area, as well as the area where bottom-up initiatives are created, a tendency for entrepreneurship is developed, and conditions for the establishment of new undertakings are also created. The research conducted by the authors showed that there are conditions to a further searching for relations between decision on location of business service firms and endogenous factors, level of development or unique combinations of endogenous and exogenous factors determining the specificity of a given territory. These are preliminary studies which is going to be continued by the authors. Constraints imposed by results of the research are a consequence of availability statistics data. In further studies the authors will concentrate on verifying data from various sources and in subsequent approximations will create synthetic measures with advanced high of detail.

The reasons for the polarisation of the socio-economic development of Lower Silesian Voivodship should be seen, inter alia, in the connection of the part of its territory with historical conditions - industrialisation and the decline of industries in the southern part of the region. In post-industrial economies and societies, the process of adaptation to new realities and development guidelines is relatively difficult and slow. Shaping a new development path requires a separate approach to regional analysis, which will take into account such elements as: the distribution of business service firms, as well as the correlation between the location of these firms and the inclination of local government authorities and enterprises to invest. The aim of activities undertaken in a polarized region should be to develop a diversified range of specialisations for its individual parts, in which



innovation will be supported by the available post-industrial facilities (capital, material and human).

It remains to be discussed how the intervention should be conducted and whether it should be implemented from the regional level, whether the actions at the sub-regional level will be sufficient, and whether the intervention itself is necessary, perhaps the changes should take place automatically on the basis of the market mechanism?

The question of who creates the development impulses and under what conditions and who is responsible for the success of these projects, remains debatable. Will further saturation with investments on the part of local territorial authorities have the same impact on the location of enterprises that provide business services in a given area? Do the specificity of Lower Silesian territory, the traditions of these subregions affect their development opportunities? And finally, what is the sociological basis of economically determined research?

4. Conclusions

Based on the results of the research, it was found that:

1. There is a strong link between territory, traditional and modern specialisations and human resources.
2. In most cases, investment expenditures of municipalities provide reliable information on their developmental prospects and stimulate potential investors.
3. Despite the progress made in the socio-economic development of Lower Silesia, it is characterized by low level of regional cohesion.
4. The polarisation of Lower Silesian Voivodship has its roots in its traditional specialisations.
5. In the years 2009-2017, there was a moderately strong positive relationship between the inclination of local territorial authorities and enterprises to invest and the location of business service firms in

municipalities and counties of Lower Silesian Voivodship.

The location of business service sector might depend on endogenous factors (including the development of entrepreneurship and the quality of human resources), the level of growth and development achieved, as well as unique combinations of endogenous and exogenous factors. These determinants are most present in large (possibly medium) cities and metropolitan areas. Post-industrial areas have great difficulties in moving to a higher development path based on modern services, which is facilitated by a high propensity to invest, but it is not a sufficient condition. The areas based on the monoculture of raw materials are to varying degrees attractive for the development of business services (e.g. counties Polkowice and Lubin), which confirms the importance of unique (specific) combinations of factors (including factors based on human resources) related to a specific territory.

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ECONOMIC PERFORMANCE OF MANUFACTURING INDUSTRY IN PRODUCING AGGLOMERATIONS IN THE CZECH REPUBLIC: A CASE STUDY OF JIHLAVA AND ZLÍN AGGLOMERATION

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Abstract

The goal of this article is to assess the economic performance of the manufacturing industry in agglomerations with a long tradition in the manufacturing industry – namely the agglomerations in the cities of Jihlava and Zlín. For the purpose of defining agglomerations, data on commuting to work is used. The economic performance of the manufacturing industry is assessed on the basis of aggregated data of corporate accounting of medium-sized and big enterprises. In this article, a considerable emphasis is given to proportional indicators consisting of data of corporate accounting. The economic performance is mainly assessed according to work productivity from the value added. For the past few years, both analysed agglomerations have been showing a very decent economic performance in comparison to the Czech nation-wide average. While the driving force of the regional economy in Jihlava is the automotive industry, the Zlín agglomeration is dominated by the chemical industry.

Key words: *economic performance, manufacturing, Jihlava agglomeration, Zlín agglomeration*

1. Introduction

In the Czech Republic, there are a number of important concentrations of population constituting, to a greater or lesser extent, economic centres of territories on the mesoregional level. That means that they create a substantial proportion of the (gross) value added of the whole (meso)region, and apart from their dominant work function, they are also strongly focused on service. In regional economies of the majority of the Czech regions and their centres, a very crucial role is played by the manufacturing industry. The authors of this article strive to assess the economic performance of the manufacturing industry in the centres of two Czech regions with a strong orientation towards production sectors. An important factor is that Zlín and Jihlava are both centres of regions where a more significant wave of industrialization had only arrived during the 20th century. Despite this fact, the structure of the manufacturing industry in this territory transformed rapidly in a short period of time. Another important question is, what role is played by the structure of the manufacturing industry in the economic performance of the

analysed agglomerations, i.e. whether there is one single dominant sector or whether the range of sectors is varied.

From the spatial point of view, the subject of interest of this article is a type of an urbanized area called agglomeration. The term *agglomeration* is used not only in settlement geography, but also in other scientific fields, e.g. economics (the advantages of agglomerations). The question is what kind of an urbanized area makes an agglomeration and what does not. According to Votrubec (1980), an agglomeration must have a capital centre with a concentration of smaller settlements in its surroundings benefiting from the attractiveness of the dominant centre which leads to the increase of population in the near surroundings. According to Hampl (2005), agglomerations are the most important element of settlement systems and simultaneously, agglomerations create the core of regions with an order of greater magnitude; mesoregions. In the process of the establishment and growth of agglomerations, a vital role is played by suburbanization. In a suburbanized area, there



are not only strong ties to the core but also ties of the core to its agglomerated municipalities. There is a reciprocity of spatial relations which has been used as a basis for defining regional labour markets in the work of Tonev (2013).

According to Hampl (1988), there are a total of eleven significant concentrations of population in the Czech Republic. Prague with its suburbanized surroundings can be designated as a core of a metropolitan area. Expert literature and documenting of regional development also view the city of Brno as such a core. In the central European conditions/context, it is possible to regard other mesoregional centres (mesoregions are defined by e.g. Hampl 2005) as cores of agglomerations which are the centres of self-governing regions. Although the regional city of Jihlava does not belong among these centres in a theoretical structuring of the Czech Republic, Hampl (2005) admitted that Jihlava may be capable of fulfilling the role of a regional city (even despite the lower ability of integration of its region's territory). With regard to strategic documents of regional development deeming Jihlava with 50 thousand inhabitants a core of agglomeration, the authors of this article have decided to also operate with the term "the Jihlava agglomeration". In doing so, they are aware of a possible justified argumentation against the use of the term *agglomeration* in the context of the regional city of Jihlava.

In terms of population, the regional city of Zlín with 70 thousand inhabitants is not much bigger than

Jihlava. Yet, the immediate surroundings of Zlín shows a much higher population density than the central part of the Vysočina Region where Jihlava lies. Hampl (2005), too, mentions "the Zlín agglomeration", though in a considerably much more limited territory definition than the authors of this article. For these reasons, there is no doubt that Zlín truly is the centre of the agglomeration.

2. Geographic Scope of Agglomerations

Defining boundaries of cities is a frequently discussed problem (e.g. Calafati, 2013). In the Czech

Republic, the settlement structure is greatly disintegrated, and the administrative definition of municipalities reflects this issue. The growth of cities exceeds the spatial framework set by their administrative definition. In the case of Zlín and Jihlava, the suburbanization processes have been going on since the nineties. That way, agglomerations are being formed which not only include the core city but also the surrounding municipalities.

At the moment, there is no single universal method for defining urban agglomerations, as pointed out by Kraft, Marada a Popiaková (2014). In his monography, Hampl (2005) carried out a definition of settlement agglomerations. Nevertheless, this definition was, as he himself admits, done in a minimal extent with the absence of a methodological explanation.

Novák (2017) used the method of defining agglomerations on an example of the cities in the North-West Bohemia making use of data on daily commute to work. The problem of the insufficiency of the data base, which has been pointed out by Hampl and Marada (2015), was solved by relativizing the commute ratio. It is presumed that the unregistered cases of commuting to work are spatially even. The method used works with two shared values:

- the share of daily commuters to work from the municipality into the agglomeration in the total number of daily commuters to work from the municipality (in %),
- the share of daily commuters to work to the municipality from the agglomeration in the total number of daily commuters to work to the municipality (in %).

The summation of shared values shall be called a summation parameter which basically expresses the intensity of reciprocal relations given by the daily commute to work between the agglomeration and the tested municipality. If the value of the summation parameter is higher than the threshold set for each municipality individually, the



municipality becomes a part of the agglomeration. With each merging of a new municipality with the agglomeration, the commute attractiveness of the agglomeration increases and with it, therefore, the probability of agglomerating another municipality in the immediate proximity of the agglomeration's core. On the other hand, though, it is logical that the bigger the distance from the core, the lower the probability of merging of new municipalities. The defining of an agglomeration is finished when all the municipalities neighbouring with the agglomeration do not exceed their value stated by the summation parameter. The existence of enclaves – i.e. not-agglomerated municipalities inside a defined agglomeration – is not acknowledged. Such cases are solved by an automatic merge with the agglomeration. The existence of enclaves of agglomerations is also not acknowledged. In order to be able to be assessed according to the summation parameter, the municipality has to meet the condition of having at least 10 commuters to work.

As mentioned above, thresholds are set for each municipality individually. The testing of agglomerations defined by Hampl (2005) revealed an

inverse proportionality between the relative interconnectedness of a municipality with the core according to daily commute to work and the number of commuters to the municipality. Similarly, an inverse proportionality applies between the relative interconnectedness of a municipality with the core and the value of the commute index which is constructed as a ratio of commuters to the municipality to work to commuters from the municipality to work multiplied by a hundred. On one hand, it applies that the bigger municipalities near the core with a higher number of daily commuters to work are not, in relative terms, interconnected with the core so closely as the smaller municipalities with a low commute index. On the other hand, however, the same applies with the smaller municipalities where the number of commuters to the municipality sometimes largely exceeds the number of commuters from the municipality. Such cases of municipalities are very often observable near strong cores of agglomerations due to the commercial suburbanization. Thresholds of the summation parameter therefore respect the number of commuters to work to the municipality and at the same time the amount of the commute index according to Table 1.

Table 1: Thresholds of the summation parameter based on the total number of commuters to work and the commute index of the municipality tested

COMMUTE INDEX	TOTAL NUMBER OF COMMUTERS TO WORK					
	10-100	100-500	500-1000	1 000-2 000	2 000-5 000	5 000 and more
0-30	130	125	120	115	110	105
30-50	125	120	115	110	105	100
50-70	120	115	110	105	100	95
70-90	115	110	105	100	95	90
90-110	110	105	100	95	90	85
110-150	105	100	95	90	85	80
150-200	100	95	90	85	80	75
200-500	95	90	85	80	75	70
500 and more	90	85	80	75	70	65

Source: Novák (2017)



The applied method defined agglomerations with cores of comparable population and territory. Nevertheless, a significant difference has been noted in terms of non-core zones. While the Jihlava non-core zone includes 10 municipalities, the Zlín non-core zone includes 34. Both non-core zones greatly

differ in population. The population of the Zlín non-core zone is comparable to its core, whereas the population of the Jihlava non-core zone is approx. 10 times lower than the core's. This implies that in the case of Jihlava, it is the initial stadium of an emerging agglomeration.

Table 2: Defining territories of observed agglomerations to 01.01.2017

Name of Agglomeration	Territory	Number of municipalities	Population to 01.01.2017	Area (in square kilometres)
Jihlava Agglomeration	Core	1	50 559	87,86
	Non-core zone	10	5 958	83,77
	Total	11	56 517	171,63
Zlín Agglomeration	Core	1	75 117	102,83
	Non-core zone	34	64 212	340,74
	Total	35	139 329	443,57

Source: Little Lexicon of Municipalities of the Czech Republic – 2017, the Czech Statistical Office, Prague, 2017, own calculations

In total, the territorial and population scope of both agglomerations is different. For the cartographic depiction of the agglomerations see the annexes.

3. Economic Performance of Manufacturing Industry of Agglomerations

The publicly accessible corporate accounting of firms presents data which can be used as a basis for the assessment of the importance of a surveyed territory by only using the absolute values of data from corporate accounting. First and foremost, the findings of the second chapter also apply here. The Zlín non-core zone of the agglomeration shows a much higher economic potential than the non-core zone of the Jihlava agglomeration. The economic power of the Zlín non-core zone even dominates the core in all aspects. This could be partially traced to the fact that the shoe-making industry in Zlín has declined – ever since the 1920s, this industry had been the main initial factor of population growth and development of Zlín. Nevertheless, the fall of the major sector did not cause the fall of the agglomeration thanks to Zlín becoming a centre of service with the manufacturing industry developing in its close proximity. Small and big centres of the

manufacturing industry have been set up in the non-core zone offering in total tens of thousands of jobs. In the surveyed sample of enterprises with more than 50 employees, it was almost 20 thousand work places in contrast to the 13 thousand work places in the core of the agglomeration.

The situation in Jihlava agglomeration is utterly different. According to all the indicators of corporate accounting, the whole agglomerated area is dominated by Jihlava. Industrial zones are located within the area of the core of the agglomeration. The majority of enterprises in the manufacturing industry is located in the area between Jihlava and the motorway D1 – the spine of the economy of the Vysočina Region (Novák, 2009). Jihlava itself is the pole of the growth of the whole region (Toušek, Novák, 2009). Nevertheless, from the economic point of view, the non-core zone of the Jihlava agglomeration has not yet started reaping benefits of the economic power of its core and the local processes of suburbanization are only taking place on the level of residential suburbanization.



Table 3: Economic indicators of enterprises in the manufacturing industry in Zlín and Jihlava agglomeration in 2016

Name of Agglomeration	Territory	Number of entities	Number of Employees	Value Added (in Billion CZK)	Salary Expenses (in Billion CZK)	Economic Outcome (in Billion CZK)
Jihlava Agglomeration	Core	26	12 060	12,25	4,59	3,16
	Non-core zone	4	1 242	0,70	0,36	0,06
	Total	30	13 302	12,95	4,95	3,22
Zlín Agglomeration	Core	35	5 586	4,12	1,71	1,25
	Non-core zone	50	13 338	27,04	4,77	14,57
	Total	85	18 924	31,16	6,47	15,81

Source: Accounts of enterprises; own processing

Work productivity from the value added has been chosen as the major indicator of the economic performance of the regions. It is calculated as a ratio of the value added to human capital (Truneček, 2004). "The value-added employees" basically states how much money is each worker capable of earning for his/her employer whereby this figure does not include expenses on his/her wage and other related revenues and expenses which, however, do not directly come out of the manufacturing activity of the industrial enterprises" (Novák, et al; 2012). In case of working with aggregated values of more entities, the diverse duration of accounting periods must be converted to a constant one. Considering that the majority of accounting periods are one year long, the period of 12 months has been chosen to represent the standard length of an accounting period.

The spatial use of indicators of corporate accounting of entities in the manufacturing industry was carried

out in the USA by Hulten and Schwab (2004). Using the example of the Ústí Region according to indicators based on data of corporate accounting, Novák and Drdová (2013) assessed the economic performance of the automotive industry.

According to the work productivity from the value added, it is the Zlín agglomeration which is more productive. Nevertheless, considering only the cores of the agglomerations, the higher productivity of work from the value added would be found in Jihlava's manufacturing industry. In other words, the non-core zone of the Zlín agglomeration shows above-average figures of one value-added employee which is more than 2 Million CZK. The core of the Zlín agglomeration and the non-core zone of Jihlava agglomeration are under the Czech nation-wide average – somewhere around 0.9 Million CZK on one employee. Overall, the performance of the manufacturing industry of both agglomerations in the nation-wide comparison is outstanding – as centres of country regions, they are shown in a very good light.



Table 4: Indicators of the economic performance of the manufacturing industry of the Jihlava and Zlín agglomeration in 2016

Name of Agglomeration	Territory	Work Productivity from the value added (in thousand CZK)	Average Monthly Salary (in thousand CZK)	Outcome of economic activities on employees
Jihlava Agglomeration	Core	1 016	32	262
	Non-core zone	563	24	47
	Total	974	31	242
Zlín Agglomeration	Core	738	25	223
	Non-core zone	2 027	30	1 092
	Total	1 647	29	836

Source: Accounts of enterprises; own processing

Surprisingly, the very high work productivity from the value added is not reflected on the level of average salaries in the manufacturing industry of the Zlín agglomeration. Or rather, even despite the lower economic performance, the Jihlava agglomeration's manufacturing industry evinces higher salaries by approx. 2 thousand CZK per month.

Another indicator of the economic performance – with a less representative value than the value-added employees – is the outcome of economic activities per employee (profitability). It is the manufacturing industry of Zlín agglomeration which shows a significantly higher level of profitability. In the case of the cores of the agglomerations, however, the more profitable manufacturing industry is in Jihlava.

The following table shows what sector is behind the outstanding economic performance of the Zlín agglomeration. More than a half of the employees in medium-sized and big enterprises of the

manufacturing industry work in the plastics and rubber industry. This sector represents a 4/5 proportion of the total value added and almost a 90 percent proportion of the total generated profit of the manufacturing industry of the Zlín agglomeration. The most important enterprise in the agglomeration is the company *Continental Barum* manufacturing pneumatics for passenger cars in Otrokovice. The fact that the company *MITAS*, a producer of pneumatics for agricultural and construction machines, has two of its manufacturing plants located here only further consolidates this regions' status as the centre of pneumatics production.

In other sectors of the manufacturing industry, more than 1 000 workers are employed in the metal-working and mechanical engineering industry. Other sectors are marginal, including the leather industry which used to be the major sector in the Zlín agglomeration before 1990 (shoe-making).



Table 5: Economic indicators of the manufacturing industry in the Zlín agglomeration in 2016

Sectors of Manufacturing Industry	Number of Entities	Number of Employees	The Value Added (in Billion CZK)	Salary Expenses (in Billion CZK)	Outcome of economic activities (in Million CZK)
Food	5	745	581	228	148
Leather	5	873	285	175	16
Paper and Printing	5	741	335	199	27
Chemical	5	422	546	152	354
Plastics and Rubber	23	10 067	24 921	3 790	14 135
Metal-working	19	2 903	2 269	924	587
Electrical-engineering	3	675	249	147	44
Mechanical-engineering	11	1 559	1 231	563	352
Furniture	3	255	150	73	10
Other	6	684	597	224	141
Total	85	18 924	31 163	6 475	15 814

Source: Accounts of enterprises; own processing

The manufacturing industry of the Jihlava agglomeration also has a dominant industrial sector – thanks to two companies manufacturing components for the automotive industry. Above all, it is a producer of pumps for diesel engines – the company *BOSCH DIESEL* – which has been operating in Jihlava in three locations and also the company *Automotive Lighting*, a producer of headlights for passenger cars. These two companies employ 45 % of the workers in all medium-sized and big enterprises in the manufacturing industry of the Jihlava agglomeration. However, these two companies are the sole producers in the automotive industry in the agglomeration. This is significantly different to the Zlín agglomeration – in the dominant sector, there are 23 entities. The explanation is simple: while in the Zlín agglomeration, the plastics and rubber industry has got a one-hundred-year tradition and has gradually developed into the major producing sector in the region, the representatives of the automotive industry in Jihlava only came there after 1990 and despite of developing their own production know-how right in Jihlava, they remain

rather a mere cathedral in a desert without any major influence on the development of the automotive industry in the agglomeration.



Table 6: Economic indicators of enterprises in the manufacturing industry in the Jihlava agglomeration in 2016

Sector of Manufacturing Industry	Number of Entities	Number of Employees	The Value Added (in Billion CZK)	Salary Expenses (in Billion CZK)	Outcome Of Economic Activities (in Million CZK)
Food	4	1 445	721	392	37
Textile and Clothing	2	290	210	95	45
Wood-working	4	1 029	1 876	316	780
Glass and Building Materials	2	216	159	67	4
Metal-working	4	1 203	871	400	145
Electrical Engineering	5	1 095	1 036	383	376
Metal Engineering	5	1 796	541	445	-283
Automotive	2	5 985	7 395	2 784	2 123
Other	2	243	143	70	-5
Total	30	13 302	12 953	4 952	3 221 234

Source: Accounts of enterprises; own processing

The structure of the sectors of the manufacturing industry in the Jihlava agglomeration is somewhat more balanced than the one in the Zlín agglomeration. Apart from the automotive industry, 5 further local sectors reported more than 1 000 employees in 2016.

4. Conclusion

Both the Zlín and Jihlava agglomerations are, without a doubt, economically strong settlement structures forming economic regional centres. Both agglomerations are strongly oriented towards the manufacturing industry. Its productivity is a very important prerequisite for the regional economic stability. Good news for both agglomerations is that in the times of conjuncture, they are very highly productive. The productivity of the Zlín agglomeration is even high above the average in comparison to the Czech average which is quite surprising.

The consequences of the financial crisis on the Czech regions were quite considerable (Blažek, 2010). In

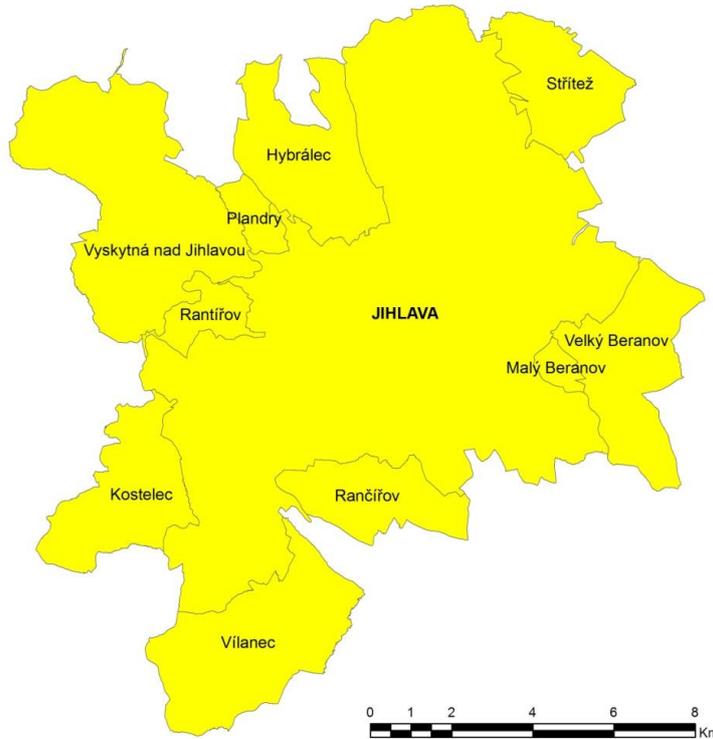
this view, it is rather alarming that the high economic productivity of both agglomerations can be attributed to only one sector of the manufacturing industry. Even though it can be expected that in the long-term outlook, the international importance of the rubber and plastics industry and even the automotive industry is not going to falter, some minor crisis could pose considerable threats not only to the Jihlava and Zlín agglomerations, but also to their regions. In other words, stability and resilience of agglomerations is quite small. Due to the fact that in these regions the development is important both for local and foreign companies, it is important from the practical point of view to support small and medium-sized enterprises of local character as well as to maintain good relations with foreign investors. Another surprising finding is that despite the higher productivity, the salary appropriations on one employee in the manufacturing industry in the Zlín agglomeration are lower than in the Jihlava agglomeration. This ultimately applies to the whole regions where Jihlava and Zlín are the centres. The Zlín region does show a higher per capita GDP than the Vysočina Region; nevertheless, the average



monthly salaries are higher in the Vysočina Region (in 2016). In the Zlín Region, it can therefore be expected that the salaries are going to grow

significantly quicker than in the Vysočina Region or in the whole of the Czech Republic.

Annex 1: Municipalities of the Jihlava agglomerations



Annex 2: Municipalities of the Zlín agglomerations





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IDENTIFICATION OF DEFUNCT AND ENDANGERED SMALL TECHNICAL-AGRICULTURAL OBJECTS USING CARTO-GRAPHIC DOCUMENTS AND AIRBORNE LASER SCANNING DATA FOR TOURISM

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Abstract

Rural landscape of the Czech Republic is a varied mosaic of landscape details created by human. Objects that are located in the rural space create the character of the cultural landscape having a high cultural-historical, identity-making and esthetical value. The aim of the paper is to present the project of the study of documentation of endangered and defunct small technical-agricultural objects, including their follow-up infrastructure. The study is located in sub-mountain and mountain landscape of the Moravian-Silesian Beskids in the municipality of Morávka. The work is based on the research of historical cartographic documents, from which the information about the occurrence of possible objects was drawn. The second part of identification of objects took place with the aid of the data from aerial laser scanning

Key words: *small technical-agricultural objects; cultural landscape; Stable Cadastre; Digital terrain model; Morávka*

1. Introduction

Rural landscape is the cultural landscape, in which there are a number of small or larger objects that create the unique character of landscape. These objects have originally been not only highly functional objects but also esthetical elements. The object of researches and documentations are especially small monuments, particularly the sacral ones as chapels, crucifixes or wayside shrines. Crucial stones are also a significant object of interest. On the other hand, minimal interest is on nowadays endangered or extinct small technical-agricultural objects including their follow-up infrastructure. These objects are very valuable because of performing many secondary functions. The examples of little buildings could be watermills, sawmills or charcoal piles. The follow-up infrastructure is for example represented by splash dams, millraces, canals or old roads.

The aim of this paper is to present the project of the study of documentation of the mentioned endangered and defunct objects. The ongoing study is located in mountain and sub-mountain landscape of the Moravian-Silesian Beskids in the municipality

of Morávka. Localization of the research was chosen on the basis of choosing a representative of the territory of mountain pastoral farming. Intensive using of land used to take place even in mountain homesteads that either had ceased or no longer serve their original purpose.

The work is based on the research of historical cartographic documents, from which the information about the occurrence of possible objects was drawn. The second part of the identification of objects took place with the aid of the data from aerial laser scanning. The visualization which was created from digital terrain model served not only to identify unusual shapes of relief in the locality, but also to document the current range of technical-agricultural objects. The documentation in field itself is the object of author's diploma thesis. The documentation will be done by means of using mobile mapping method in an application called Collector for ArcGIS, which allow its users to work in offline mode. The documented objects will eventually be used especially for the suggestion of the possibilities of application in the area of tourism.



2. Cultural landscape, landscape character and small technical-agricultural objects

The landscape we are everyday moving in, is the cultural landscape. It is a landscape that was created by the common influence of human and natural influences (Jelínek, 2000). Because of the long farming of the originally untouched nature, the unique character of the cultural landscape has emerged. It varies from region to region. According to the law No. 114/1992 Coll. On Nature Protection and Landscape Protection, the landscape character is considered as “the natural, cultural and historical characteristics of a particular place or area” and it is “protected from activities that reduce its esthetical and natural value”. According to the law it is necessary to “the preservation of important landscape elements, especially protected areas, cultural landmarks of the landscape, harmonious scale and relations in the landscape”. Just these important landscape elements touch the issue of small technical- agricultural objects (Zajoncová, 2009).

Particular objects in the landscape become valuable due to their age value. When object bears information in it about its own history, it becomes monument (Zajoncová, 2009). Monuments are not only large scale objects such as castles, chateaus, churches or chapels. On a scale of the small ones, it cannot be seen only the sacral or memorial objects. It is necessary to consider objects of everyday farming in the landscape to be monuments with high value (Kmínek, 2000). Precisely they shaped the cultural landscape as we know it nowadays.

Small technical-agricultural objects have already little or no economic importance at all. On the other hand, they perform many other functions (Lokoč, Ulčák, 2009). First of all, their historical function and value that proves the development of farming in the landscape. In the case of mountain and sub-mountain areas it is particularly an evidence of farming in the landscape during the renaissance period and further the baroque period. For example, we can mention objects associated with using the energy of water flow such as hammer mills, sawmills

or watermills, with production of charcoal such as charcoal piles and also objects associated with logging that represent especially the adjustments of small streams for transportation of timber (Löw, Míchal, 2003). In the mountain areas it is for example small splash dams. In the space of threshing floor small farming buildings appear. Examples can be fruit driers, haylofts or hives (Kyselka, 2001).

Some of the objects have been distinguished by its organization function and they are still being used for it. Bounds, clearance cairns, various canals or ditches are associated with delimiting boundaries of different units. Some of the elements have high ecological function because they are small unique flora and fauna habitats (Lokoč, Ulčák, 2009). Typical examples include clearance cairns, small ponds or other small dams. Finally, it is definitely esthetical function because these objects create the already mentioned character of cultural landscape. They are elements that make the unique landscape.

The cultural landscape is made up of three structures or layers that are closely interconnected. When evaluation character of landscape, it is important to consider all three landscape structures at the same time. These landscape structures are the key to proper landscape character assessment. The primary structure of cultural landscape is otherwise called a natural subsystem. These are the characteristics of the area that originated independently on human. Human cannot control this layer and also this layer affects all human activities. Examples of elements belonging to this layer are: terrain roughness, soil-forming substrates, elevational zonation or waters. The secondary landscape structure is also called as a cultural-technical subsystem. It has been created by transforming of the primary structure by human and it is also associated with its use of already created systems. Within this structure it is distinguished using of space from agriculture, forestry, and mining, industry to housing, transport and recreation. The tertiary structure of cultural landscape or its cultural-historical subsystem represents a material evidence of the activity of our ancestors. It is basically a material expression of ideas about life, farming, beauty and belief. This structure creates a cultural



value of the landscape, its visible and hidden esthetical value. Relevance for landscape character has especially the characteristics associated with historical evolution and the ones that show values shared by our ancestors (Löw, Míchal, 2003).

3. The area of interest

The study is localized in the sub-mountain and mountain landscape of the municipality of Morávka. It is located in the Moravian-Silesian Region and belongs to Frýdek-Místek district. With its area of 87,29 km² (Czech Statistical Office, 2017), the municipality is the largest cadastral area in the Beskids Mountains and also one of the largest municipalities in the Czech Republic. To 31st December 2017, 1184 inhabitants lived in the municipality (Czech Statistical Office, 2017). The whole area of the cadaster of the municipality is located in the Beskids Protected Landscape Area that greatly affects the development of the municipality. In the southern part of the area the river Morávka springs. The river divides the area into the western and eastern part. The entire area is interwoven with valleys and a number of mountain streams leading to the mentioned river of Morávka. On the river there is a dam of the same name which is a source of drinking water. Water reservoir is located above the center of the village.

Natural characteristics are closely related to the structures of the cultural landscape. As outlined above, character of the cultural landscape of the locality can be described within three interconnected structures. In the case of the primary structure or layer, it is for example the differentiation of terrain roughness. The cadaster belongs to the areas of significant foothills with terrain roughness over 600 m on 16km². From the point of view of the altitudinal zonation, it is a fir-beech level, for which extensive forest complexes in combination with number meadows, pastures and fields are typical. The area was influenced by Wallachian colonization, where scattered glade settlement arose (Löw, Míchal, 2003).

Within the secondary landscape structure, two types of layers are particularly significant for the character of landscape. The first layer depends on historical use of landscape; the second one can be evaluated through the land use. Because the absolutely greatest share of land use in the area has forest land (83%), it is a forest landscape (Czech Statistical Office, 2017). Within the historical point of view on the landscape, the types of original ploughlands and settlements are significant. The area belongs to the type of solitary farmsteads and homesteads with a sectional plow. It is a type of dispersed settlement. This is due to the high terrain roughness and subsequent very late colonization. Layers of tertiary landscape structure, that are significant, reflect historical development. Particularly the type of landscape in terms of duration of its settlement can be mentioned. It affects appearance of the landscape and its general change over time. The area belongs to the landscapes of modern mountain colonization. Further, the areas of vernacular architecture are distinguished. The area belongs to the area of the Moravian-Wallachian log house (Löw, Míchal, 2003). There are also other monuments in this layer as historical legacies including small technical-agricultural objects.

3.1 Historical context

All monuments, including small technical-agricultural objects, are closely related to historical development. The village of Morávka was probably founded between 1615 and 1620 (SPOM, 2011). Since 16th century to 18th century the so called Wallachian colonization took place in the Cieszyn, Moravian Beskids and Maple Mountains. On the one hand it was a surplus of population from the lowlands of Moravia and Slovakia, on the other it was a massive flow of colonization coming out of the Romanian ethnic region. During the 17th century the so called "back mountains" were gradually settled and the mountain pastoral farming and logging were developed. In the highest altitudes the deforestation occurred due to the creating of pastures. There were locally tiny fields in the saddles (Löw, Míchal, 2003). Since 1797 until 1918 the whole Frýdecko belonged to the principality of Těšín, where Morávka was the

border village of Frýdek court (Mácha, 2013).

From the modern history, the Second World War was signed on the history of the village most. Firstly there was an occupation by Poland subsequently replaced by the German occupation. Morávka became a border municipality and inhabitants of it were assisting the people during the crossing the border. Morávka citizens also significantly manifested themselves in resistance activity. The most important activity was the help to partisans located in the mountains above the village, for which many citizens fell (Kovář, 1982). Another milestone was the year 1961, when the construction of the dam began. It was the most significant intervention in the continuity of the municipality. The construction was completed in the year 1967. By damming there were inundating of less than three kilometers of the valley and the demise of several homesteads including the surrounding farms. At the same time, the original center of the village has been lost (Mácha, 2013).

4. Research of cartographic documents

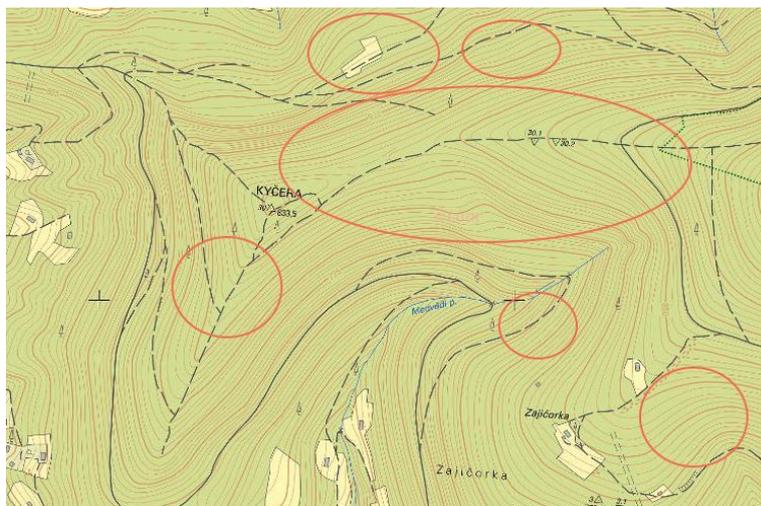
The research of cartographic documents served to draw information about the occurrence of possible objects. Historical cartographic documents as well as contemporary have been used for the research. The basic source from the historical category is Imperial

Obligatory Imprints of the Stable Cadastre that originated in 1826-1843 (Geoportal CUZK, 2010). The next source is an orthophotomap from the 1950s, which was created from the photos of the first areal national aerial photography (Geoinformace, 2014). The second part of the identification of objects took place with the aid of the Digital Terrain Model of the 5th generation. It was created from the data of airborne laser scanning. Supplementary current sources are The Base map of the Czech Republic at 1:10 000 or the current orthophotomap.

Each of the sources reveals different types of objects. In the case of the study of the Stable Cadastre of the area of interest, some small monuments such as wayside shrines and boundary stones have been discovered. Important object of interest is also small water reservoirs, in the mountain area splash dams. Another important object is a defunct water ditch and its remains can also be observed on a digital terrain model. In the process of comparing of the Stable Cadastre with the current Base map of the Czech Republic at 1:10 000, it is possible to notice a number of defunct settlements. These are often peak areas. In some areas, the entire ridges have been settled and intensively used, however nowadays the entire areas are forested. Of a few dozen homesteads, only a few buildings of the second home remain. In the case of these defunct homesteads it is possible to expect the occurrence of agriculture related objects.

Figure 1: The example of the locality with defunct homesteads, comparing the Stable Cadastre with the Base map



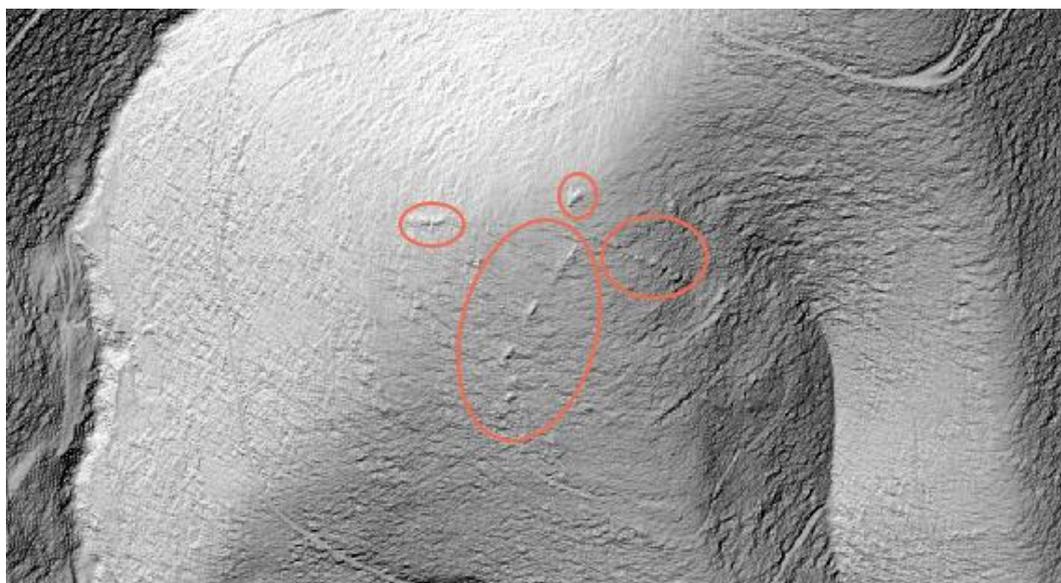


Source: Map source © Czech Office for Surveying, Mapping and Cadastre, www.cuzk.cz

The digital terrain model is a source of completely different information. It is for example a locality of defunct small ponds where currently only one little pond occurs in the area. However, it is possible to detect several more in the shapes of relief. Another noticeable object is the clearance cairn, some of them are located on the edges of fields that are still used, but others are located in the middle of forests.

The clearance cairns are also often associated with the aforementioned defunct homesteads. Possible other objects are other unusual shapes in the nature. These were created by human, but it is not possible to determine from the digital model of the relief what object exactly is it or whether any object of interest is at all. These findings will be further identified during the documentation in field.

Figure 2: Identification of the examples of clearance cairns and other unusual shapes on the digital terrain model. Comparing the locality with the Stable Cadastre





Source: Map source © Czech Office for Surveying, Mapping and Cadastre, www.cuzk.cz

The research of the basic data sources, which means the digital terrain model and the Stable Cadastre, cannot do without certain problems. In case of the Stable Cadastre these are various smaller or larger inaccuracies. Although a triangulation network was created during the making of the Stable Cadastre, mapping was still inaccurate. The consequences of it are varied deviations of maps from the real situation. In the case of this research, there are deviations from current Base map, especially at higher altitudes. For example, if a river system does not fit and there are

mountain homesteads in the area, then it can be assumed that even these defunct homesteads are not located exactly. On the other hand, there is an airborne laser scanning. There are very problematic particularly areas with a dense young vegetation. In such cases very little data are scanned or even none. The outcome is an incorrect digital terrain model. Additionally a significant object can be located in the area, but under the dense vegetation it cannot be identified.

Table 1: Results of the research of cartographic documents

	Defunct homesteads	Agriculture	Water management	Other unidentified objects	Small monuments
Description/ Examples of the objects	Assumption of intensive use of land	Clearance cairns, terraces	Splash dams, little ponds	Unusual shapes of relief	Wayside shrines, crucifixes, boundary stones
Quantity of findings	42	20	16	45	23

Source: Author's research

After completion of the research of the cartographic documents, it is possible to say that there is a relatively high occurrence of small technical-agricultural objects in the area, but especially its follow-up infrastructure. Findings are divided into

five categories. The largest group is the "other unidentified objects", which are shapes of relief that were most likely created by human. The second largest category is the defunct homesteads with the assumption of intensive use of the surrounding



lands. The next one is a group of objects related to agriculture. The most significant examples are clearance cairns and terraces. The last group of the small agricultural-objects is objects related to water management which represent splash dams, little ponds or water ditches. A special category that is not directly the object of this work is small monuments.

5. Conclusions

Small technical-agricultural objects are part of a cultural landscape similarly as other monuments. The cultural landscape is formed of three structures or layers. The small objects belong to a tertiary landscape structure, otherwise called a cultural-historical subsystem. For this structure, significance has especially those elements that reflect historical development. That includes various monuments and historical legacies. Small technical-agricultural objects are ones of them. Their value is particularly based on the age value. They are an evidence of historical development of everyday farming of our ancestors in the landscape. Although they often do not fulfill their original functions, they perform many secondary functions nowadays. At first it is necessary to mention their landscaping and esthetical function, because they create the unique landscape character. A landscape without these elements becomes a mediocre and uninteresting. Their other functions are ecological, organization and more.

The area of interest is represented by the extensive municipality of Morávka. The landscape is unique for two main reasons. Firstly, it is a mountain and sub-mountain area with a well-preserved nearly natural landscape. Secondly, due to its historical evolution. The landscape was untouched until the 16th century, but during 16th to 18th century the so-called Wallachian colonization took place, which also affected the area. Precisely this colonization has fundamentally transformed the local landscape. There was the development of the mountain pastoral farming and logging. This fact was also the reason for choosing this area for further research. The landscape of the municipality is an example of the landscape of Moravian-Silesian Beskids which evolved in a unique way.

The aim of the paper was to present the first part of the documentation of small technical-agricultural

objects, a research of the cartographic documents. The two basic sources have been chosen Imperial Obligatory Imprints of the Stable Cadastre and Digital Terrain Model of the 5th generation complemented by orthophotomap from the 1950s. Each of the sources was helpful with different information. It is possible to say that the work cannot be based only on one source of information or one of the sources cannot be deleted because the information about the occurrence of the small technical-agricultural objects would be incomplete. There must necessarily be a combination of multiple sources, because what can be discovered from one source may not be on another one and vice versa. The ideal situation is a combination of the all three sources at the same time. Both basic sources have their disadvantages. In a case of the Stable Cadastre there are problems with inaccuracies of mapping. In a case of the digital terrain model there are problematic areas with dense vegetation where poor data was scanned. This is another reason why it is important to combine and supplement the sources.

The second part of the thesis is the documentation of objects in field itself. It will be done by means of using mobile mapping method in an application called Collector for ArgGIS which allow working in offline mode. The collected data will be synchronized into the web environment of ArcGIS Online, which as well serves as platform for presentation of results. The final result of the work will be a complete database of objects with significant esthetical, functional or cultural-historical value that are located in the municipality of Morávka. The database will include the objects that are the subject of this work, but also small monuments which were the subject of documentation of the author's bachelor thesis. The documented objects will be eventually used mainly in the area of tourism. Their other use will be constantly found out during the documentation. In addition, the traditions can be restored and moreover the inhabitants can restore the area's knowledge. Thus, the added value of the research can be seen not only for potential tourists but also for citizens of the municipality.

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REGIONAL DETERMINANTS AND THE SITUATION OF YOUTH IN REGIONAL LABOUR MARKETS

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Abstract

Strengthening the situation of youth in labour market is one of the key priorities of the EU employment policy, within the context of the Europe 2020 growth and jobs strategy. Regional markets offer young people different entry and functioning conditions in labour markets. They differ in economy structure and the model of youth employment (e.g. part-time or fulltime). Another element differentiating the situation of young people is the regional educational capital. The results of spatial analyses (Bal-Domańska, Sobczak, 2018) suggest the significance of education capital for the development of labour market available for young people. The main purpose of the study is to assess the relationship between the situation of youth in labour markets and the economy and labour market structure expressed as the level of regional educational capital (the part of human capital related to formal education and upgrading professional qualifications). The assessment of the relationship between the level of educational capital in a region and the situation of young people will be performed based on the estimation of spatial econometric models. They allow statistical verification of the discussed correlations and the identification of educational capital factors which support, to the greatest extent, the favourable situation of young people in regional labour markets.

Key words: *youth, labour market, European Union, spatial econometric models*

1. Introduction

One of the most important issues raised on the European and global forum is the situation of young people on regional labour markets. The emphasis on this particular subject matter results from the problems observed over the years regarding economic activity of young people who find themselves at the threshold of professional and family life. A successful start of their professional career and having a stable work is one of the essential elements influencing proper functioning of an individual in a society as it allows the realisation of professional aspirations, and owing to a stable job also safeguards most aspects of family life. The phenomenon of low professional activity of young people, especially those not working and not continuing education represents an important element of socio-economic policy considered on the global forum. The reports covering the problem of youth on labour markets are highlighting the difficult situation in this respect in many regions worldwide. According to the information presented in the

comprehensive Report (International Labour Organization, 2017), published by the U.N. agency, around one fifth of the world's young people are not in employment, education or training (NEET). As ILO Report states *the global youth unemployment rate is expected to rise slightly in 2017, reaching 13.1 per cent - and it is the highest in the Arab States, at 30.0 per cent (...). In Latin America and the Caribbean, the youth unemployment rate is expected to continue increasing (since 2013), while European youth will see further improvement in unemployment* (International Labour Organization, 2017, p. 1). Referring once more to the results published in *trends from the last decade suggest that prominent growth sectors for young workers include: financial services; trade, hotels, and restaurants; transport and storage, information and communications; and health services (including care work and social work activities)*. In case of European countries the percentage share of young workers in financial services has grown, among others, in Eastern Europe, while it has declined in Northern, Western and Southern Europe. For Eastern Europe the



important sector for work places is manufacturing offering 20 per cent of employment (International Labour Organization, 2017, p. 4)

Negative trends observed on a global and regional scale impose actions to be taken and focused on improving the situation of youth on both national and regional labour markets. At the European Union level this problem is perceived as central to the EU's employment policy, within the context of the Europe 2020 growth and jobs strategy. The EU has launched programmes dedicated to young people, including as follows:

- The Youth on the Move flagship initiative (European Commission, 2010), a comprehensive package of education and employment measures for young people aimed at cutting youth unemployment; a job mobility scheme which helps young people to find a job, traineeship or apprenticeship in other EU countries,
- The Youth Employment Package (European Commission, 2012) includes a Recommendation to Member States on introducing the Youth Guarantee (European Council, 2013), which aims, among others, at ensuring that all young people up to the age of 25 receive a quality job offer, the opportunity for further education, an apprenticeship or a traineeship within 4 months of leaving formal education or becoming unemployed; trainees to acquire high-quality work experience in safe and fair conditions. The Youth Guarantee is accompanied by additional EU-initiatives: the European Alliance for Apprenticeships (since 2013) and the Quality Framework for Traineeships (since 2014). The Youth Employment Initiative also strengthens the Youth Employment Package. It emphasises support for young people not in education, employment or training in regions with a youth unemployment rate above 25%.

These activities are supported by the policies at national level. This is particularly important for initiatives that required changes in national

employment policies in line with the paradigm of an activating state and social investment. As Dingeldey and Steinberg (2016, p. 5) stresses in case of the Youth Guarantee *the implementation of program in the member states will influence changes in national policy regimes, depending, however, on the type of youth employment and educational policy already established in the respective country.*

For example, in 2014, in Poland, amendments were initiated to the Act of 20 April 2004 on the promotion of employment and labour market institutions (unified text, Journal of Laws 2017 item 1065). The focused on increasing employment and mitigating the consequences of structural mismatch in the labour market and introduced among others the incentives for employers, instruments for upgrading qualifications and the elimination of competency limitations, individualisation of activities addressed to the unemployed seeking work, adjustment of job offers to the realities of the labour market and the beneficiary's conditions (Baron-Wiaterek, 2016).

Along with the politicians' increasing interest in the situation of young people on the European labour market, the development of statistics and studies covering this problem was observed, including the EU regions. Regional markets represent a particularly important component of the EU space assessment in the case of large and internally highly diversified countries such as Italy, Poland, Spain, or federal states as Germany or Austria (Bal-Domańska, Sobczak, 2018). Macro-level analysis focused on factors as economic growth, the education system and labour market institutions, minimum wage regulations. Regional (NUTS-2) analyses allow for differences within a nation, linked to a large variation of the economic and cultural factors influencing regional labour markets (Bacher et al., 2017).

The research problem addressed in the article is focused on linking the level of educational capital in a NUTS-2 regions with the situation of young people. Educational capital is understood as part of human capital including formal education and the improvement of professional qualifications on the regional market. Educational capital is defined as the characteristic of the regional labour market as



whole. It presents the characteristics of socio-economic development linked to knowledge based economy across European Union regions focusing on human capital strengthening, which facilitates the emergence of high-tech services and industry sectors replacing simple, routine work by automation processes and expecting from employees such skills as problem-solving, critical thinking, openness and willingness for learn and creativity. The development of modern sectors based on high-technologies and digitization should directly favour the employment of young people who were brought up on the achievements of technology.

The correlations between economy structure and the offered jobs remain a natural consequence, which should be taken into account when assessing the situation of young people on regional labour markets. This problem will differentiate the situation of young (and not only) people on the markets of developed and emerging economies, predominantly the ones characterised by a high level of services and production processes automation.

The purpose of the study is to perform the assessment of relationships between the educational capital involved in regional labour markets and the situation of young people. This will allow answering the question whether the level of labour market development, measured with the capital related to knowledge and education (educational capital) is important for improving the situation of youth on the labour market. It was adopted that regional labour markets, with the developed educational capital, favour employment in innovative sectors offering attractive jobs. The need to have proper education confirming the acquired skills and competences may become the barrier to entering such labour market.

2. Selected aspects related to the problems of youth in labour market

Prior to the presentation of the conducted analysis results it is worth considering the information collected based on the existing research, covering the situation of young people on national and regional labour markets. The available data and

research results allow hypothesizing that both education and the period of learning are essential for transition into the labour market. The ILO Report (International Labour Organization, 2017) informs that the length of studies has a positive effect on young people's entry into the labour market. According to the authors of the Report the longer a young person studies, the shorter his/her transition time into employment. Moreover the ILO Report authors emphasize that the observations of labour markets worldwide indicate that combining work and studying substantially shortens the transition period to decent work in all regions. The labour market entering processes are diverse and depend on the level of education, place of residence and external factors, such as the size of entities operating on the labour market, the level of technological advancement of production and service sector enterprises.

According to the study conducted by the ILO *School-to-Work Transition Surveys (SWTS)* (International Labour Organization, 2017, p. 3), which presents findings from 34 countries surveyed between 2012 and 2016, the average time for the full transition to a stable and satisfactory job was 13.8 months. In case of young people who have relevant education and training, the transition time was shorter, in other words they are more likely to start their careers in a stable, satisfactory employment. Globally, for primary school graduates the transition took 22.2 months on average (based on the data from 2012–16), for tertiary graduates it was 8.5 months. The average duration was 2.6 times longer for primary than tertiary graduates. The time devoted to searching for a satisfactory job was shorter in the countries characterised by a higher level of development and in urban areas. In the case of young people living in rural areas the transition period was 15.4 months, 2.1 months longer compared to their urban counterparts (13.3 months). Taking into account the region (country) the longest average transition time was recorded in Eastern Europe and Central and Western Asia (17.9 months).

The problem of education as a factor related to the lack of employment is also indicated by the results of



research conducted within the framework of individual countries. For example, according to studies covering employment policy, carried out by important institutional players in two Czech regions (the Ústecký Region and the Jihočeský Region), presented by Novák et al. (2016), the unemployed usually have no previous job experience, completed only primary education and are not willing to travel to work. The researchers suggest that the pressing problem is also the quality of education and the generous social benefits. The author underlines that all the institutional players emphasize the need for appropriate education, which remains problematic.

In the literature the role of education in the position on the labour market focused on the importance of both vocational and higher education (Gangl et al. 2003; Hunady et al. 2018; Ionescu, 2012; Diaconu, 2014). Higher education is perceived as a prerequisite for providing the most attractive inroad into the upper segments of the occupational structure (individual perspective) and for taking up employment in professions requiring knowledge, thus fostering the development of a knowledge-based economy (economic perspective). At the same time Hunady et al. (2018, p. 226) research results strongly suggest that *higher education can often be very beneficial for starting up a new business and this seems to be one of the factors determining the success of new businesses. Furthermore, those respondents who attended courses related to entrepreneurship appear to be more active in starting-up a business and this seems to be also positively correlated with the company's future success.*

Other element significantly affecting the situation of young people on regional labour markets is the structure of enterprises operating on such markets. Small and large enterprises prefer employees presenting different competences and skills. According to a survey carried out in 2010, commissioned by Polish Confederation of Private Employers Lewiatan *the tendency to employ experienced candidates is more often shown by micro and small enterprises, which may not be able to afford a long-term training process for a young person, just starting his/her professional activity and,*

moreover, they need versatile employees who can be delegated to various tasks. Large entities have the resources for intense investments in human capital. Attracting young, promising employees, the selection of talents and intensive training for work at a specific work station, during which the person employed also learns and internalizes the organizational culture, remains the component of HR strategy carried out by such companies (Sztandar-Sztanderska et al., 2010; Pańków, 2012). The survey also highlights the specificity of employment strategy in the so-called “personnel” and “executive” companies. The first of them are focused on top-class specialists, both the ones presenting extensive experience and young talents in which significant resources are invested, providing them with rare and specific qualifications, essential from the perspective of the company functioning. The latter group of companies employs less qualified workforce for performing simpler tasks and in this case experience is often desirable.

3. Research procedure

The answers to the above-mentioned research problems were investigated on the basis of econometric models describing the occurring relationships between the situation of young people on labour markets and the level of educational capital involvement in the European Union regions.

The main problem faced by the author was providing the definition of a young person on the labour market. The available statistical data describe the situation of various groups of people, e.g. aged 15-19, 20-24 or larger aggregates as 15-34 in the context of employment, unemployment or NEET (Not in Employment, Education or Training). Different age groups of the population make it difficult to compare the situation of particular youth groups on the labour market. In addition, the NEET definition is very broad and sometimes difficult to interpret. The indicator groups together young people with very different problems and needs (Bacher et al., 2017). Young adults can belong to the NEET group if they are unemployed or take a break between school and university/work, or they are young mothers with care responsibilities who are not actively looking for a job. Due to the heterogeneity, the NEET indicator



is insufficient to explain the relation between the professional situation of youth and the situation in regional labor markets, therefore the analysis shall evaluate both the NEET indicator focused on unemployment and lack of occupational activity, and the employment indicator illustrating the professional activity of youth.

Finally, taking into account the availability of statistical data at the regional level two indicators were chosen:

- NEET rates – share of people aged 18-24 not in employment, education or training (percentage) by the assessment of the situation in terms of professional inactivity;
- YEMPL – employment rates of young people aged 15-34 not in education and training (percentage), i.e. the age group covering the first years of undertaking professional activity until the majority of people achieved a strong position on the labour market as employees.

The application of two variables allows verifying the conducted analysis results. In the case of youth unemployment and professional inactivity of youth, a negative correlation between the level of educational capital and *NEET* is expected. It results from the adopted assumptions and directions of the current EU and Member States' development policy, which is focused on educational capital strengthening in the regions as a tool supporting the knowledge potential and indirectly high technology sectors in the regions perceived as engines of economic competitiveness. A statistically significant, negative relationship between educational capital and NEET will confirm the importance of regional determinants for the improvement of opportunities supporting young people in transition from school to work. These results should be reflected in the statistically significant, positive parameters of the model explaining the development of employment indicator (*YEMPL*). It would imply that the situation of young people is better in the regions featuring higher educational capital.

Educational capital has been illustrated using four

variables. Three of them represent the resources of educational capital in a region characterised by various levels of specialization:

- *SE* – % scientists and engineers of active population (%), characterizing the best educated and most specialized group of employees represent the part of human resources in science and technology (HRST) with strong qualifications in science and technology, covering the 'professionals' subgroup of people employed in science and engineering, health and information and communications technology,
- *ETER* – population aged 25-64 with tertiary education (levels 5-8) (%), showing the general level of formal education of the regional population,
- *LL* – participation rate in education and training (last 4 weeks) of people aged 25-64 (%), stands for the measure of lifelong learning which characterizes the tendency of companies and institutions, as well as employees in the region to acquire the missing skills and upgrade qualifications outside the traditional system of education. It covers participation in formal and non-formal education and training. The reference period for the participation in education and training is four weeks prior to the interview. The data shown are calculated as annual averages of quarterly EU Labour Force Survey data (EU-LFS);

and one variable presenting a negative phenomenon i.e. the percentage of people completing education at a very early stage:

- *EL* – early leavers from education and training aged 18-24 (%) - refers to a person aged 18-24 (recorded in the Labour Force Survey (EU-LFS)) out of the total population aged 18-24 who has completed the lowest secondary education and is not involved in further education or training.

The analysed models took the following form:



$$YEMPL = f(SE, ETER, LL, EL, \varepsilon) \quad (1)$$

or

$$NEET = f(SE, ETER, LL, EL, \varepsilon). \quad (2)$$

The estimations performed using the models were based on spatial data covering 267 NUTS-2 European Union regions selected based on NUTS 2 (*The Nomenclature of Territorial Units for Statistics*) classification in 2016. The statistical information required for the empirical research was obtained based on Eurostat database.

The decision to apply spatial models in the study resulted from the conclusions drawn from the spatial analysis of the discussed phenomena presented in (Bal-Domańska, Sobczak, 2018). Based on the values of Moran's *I* Global statistics the tendencies for cluster development were identified (characterised by high or low level of its particular components), primarily regarding the participation rate in education and training (LL) and also employment rates of young people neither in education nor training (YEMPL). The lower tendency for clustering was observed in the case of early leavers from education and training (EL). The analysis also showed

a well-developed educational potential of the NUTS-2 regions located in the northern and central part of Europe, while the worse situation was recorded in the southern ones, primarily Italian (south of the country), Greek, Bulgarian, Romanian and also Spanish regions.

The application the information potential inherent in spatial data requires taking into account the spatial structure illustrating the position of regions against each other – it takes the form of **W** adjacency matrix. The study uses the first-order adjacency matrix, which means that the interaction of objects directly adjacent to each other was taken into account.

For the purposes of spatial models' estimation two structures differing in the method of taking spatial dependence into account can be used (Suchecky, 2010; Suchecka, 2014). Spatial dependencies can be brought into the model using:

1. spatial autocorrelation of a error term (*Spatial Error Model*, SEM), when the spatial component is a part of a random component (error term), its introduction to the model structure is justified by the non-spherical nature of the random component resulting from the failure to meet one of the assumptions of the model estimation using OLS method. In this case, the model takes the following form:

$$NEET_i = \alpha_0 + \alpha_1 SE_i + \alpha_2 ETER_i + \alpha_3 LL_i + \alpha_4 EL_i + \varepsilon_i \quad \varepsilon = \lambda \mathbf{W} \varepsilon + \zeta, \quad (3)$$

$$YEMPL_i = \alpha_0 + \alpha_1 SE_i + \alpha_2 ETER_i + \alpha_3 LL_i + \alpha_4 EL_i + \varepsilon_i \quad \varepsilon = \lambda \mathbf{W} \varepsilon + \zeta, \quad (4)$$

2. spatial autoregression (*Spatial Lag Model*, SAR/SLM), when spatial lags are brought into the structure of the model through the values of *Y* (dependent variable), suggesting that the dependent variable development is also influenced by the processes occurring in the adjacent units:

$$YEMPL_i = \alpha_0 + \delta \sum_{j=1}^n w_{ij} YEMPL_j + \alpha_1 SE_i + \alpha_2 ETER_i + \alpha_3 LL_i + \alpha_4 EL_i + \varepsilon_i \quad \varepsilon \sim IID, \quad (5)$$

$$NEET_i = \alpha_0 + \delta \sum_{j=1}^n w_{ij} NEET_j + \alpha_1 SE_i + \alpha_2 ETER_i + \alpha_3 LL_i + \alpha_4 EL_i + \varepsilon_i \quad \varepsilon \sim IID. \quad (6)$$

where: $i, j = 1, 2, \dots, n$; w_{ij} -th element of **W** a weighting matrix, such that $w_{ij} = 0$ for all $i = 1, \dots, n$, **W** row normalized such that the elements of each row sum up to unity, $\sum_{j=1}^n w_{ij} YEMPL_j$ or $\sum_{j=1}^n w_{ij} NEET_j$ is the weighted average of the dependent variable; ε_i is the error term such that $E(\varepsilon_i) = 0$; λ - the autoregressive parameter for the error



lag W_u in SEM models; δ - the spatial autoregressive parameter which measures the intensity of spatial autocorrelation in SAR models.

LM (*Lagrange Multiplier*) method (Anselin, Bera, 1998) was used for the selection of the correct model construction as well as the statistics based on likelihood function (Akaike Information Criterion (AIC)) (Akaike, 1974).

The SAR spatial lag models were estimated using the highest likelihood method, while the SEM spatial error model was estimated using the GLS method. All calculations were performed using R CRAN program (Arbia, 2006; Kopczevska, 2006).

4. Results and discussion

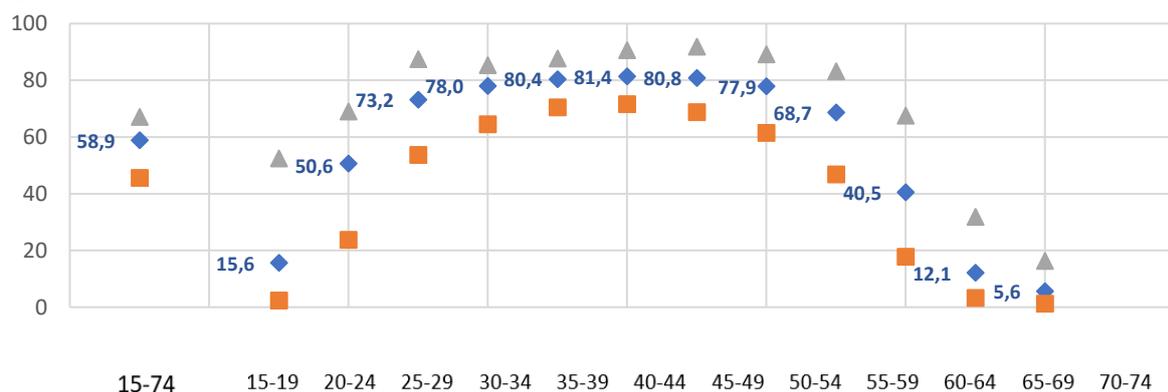
4.1 Statistical presentation of the indicators dedicated to youth employment and educational capital

The population aged 15-34 represent to the group characterised by the lowest employment rates in the EU (Fig. 1). In the subsequent age groups employment rate goes up to reach the highest share on the labour market for the groups aged 35-44.

According to the data for 2016, in 28 EU countries the employment rate of people aged 15-19 was only

15.6 %, which should be referred to the short period of education, young age and limited preparation for performing a given occupation. This indicator is spatially strongly differentiated, the median for this indicator amounted to 8 % indicating that in 50 % of the EU countries, per 100 people at this age, only 8 had employment. The lowest indicator values were recorded in Italy and Greece. In these countries it did not exceed 3 %, in five countries it was lower than 5 %, whereas in total in 18 countries it did not exceed 10 %. In five countries with the highest level of the discussed indicator, i.e. in Germany, United Kingdom, Austria, Denmark and Netherlands it amounted to approx. 30 %, exceeding the level of 50 % in the latter two. The employment rates of people aged 20-24 were at the level of 50.6 %, with the median of 48 % in the EU 28. The indicator value ranged from 24 % in Greece to 69 % in United Kingdom and the Netherlands. In the age group of 25-29, the average level of employment in the EU 28 in 2016 was 73.2 % with the median at the level of 74.6 %. In subsequent age groups the average level of employment was increasing along with the simultaneous decline in employment level differences between countries. In the age groups over 44 this positive trend presented a slumping tendency, which resulted from lower employment rate and more extensive differences in employment level between different countries.

Figure 1: Employment rates by age groups at national level in EU 28 in 2016



Source: Own work on the basis on Eurostat data.

Among the indicators, selected for the analysis in the discussed study, the youth employment rate was the least diversified one in 2016 among NUTS 2 regions (13.3 %). Significantly larger interregional

disproportions were recorded for NEET indicator (48%). The NEET group is characterised by high heterogeneity associated with national conditions.



Table 1: Selected statistics of indicators for 267 NUTS-2 region of EU 28 in 2016

	YEMPL	NEET	SE	ETER	LL	EL
Median value	76.8	13.6	6.4	29.4	9.6	9.8
Minimum value	34.2	2.7	1.8	11.5	0.7	0.9
Maximum value	89.2	46.5	13.4	74.9	31.3	27.7
Coefficient of variation (V) %	13.3	48.0	38.7	32.3	61.9	46.1

Source: Author's calculations based on Eurostat data.

Among the indicators illustrating the extent of regional educational capital, the largest disproportions are observed regarding the measure of residents' tendency for participation in adult formal and non-formal education and training (LL), and also regarding the indicator presenting the level of early school leavers (EL). High variation level of LL indicator is related to model of adult education and training characteristics in a given region (country). Similarly, large disproportions in the level of (EL) indicator reflect the attitude of youth to the role of education and training in a given country (region). The situation improvement in this area requires using systemic tools (activating population) and introducing structural changes (facilitating the creation of attractive jobs). The level of educational capital illustrated by working tertiary education graduates (ETER) remains most levelled off between the regions.

4.2 Results of spatial model estimation

The carried out estimation of models describing the situation of young people on labour markets in line with four variables characterizing the level of

regional educational capital development, allowed the identification of factors which enhance the youth situation improvement, understood as drop of the NEET rate or rise of employment rate (YEMPL).

Among the analysed spatial model constructions – with spatial error (SEM) or with spatial lag (SAR) – the SEM spatial error models are characterized by better qualities. It is indicated by higher values of LM test statistics based on Lagrange multipliers, as well as lower values of Akaike information criterion (AIC) – compared to OLS and SAR models. Regardless of the model characteristics' assessment, the obtained parameters are consistent with the sign and level of significance despite of the model construction (SEM/SAR).¹ The selection of SEM spatial error model shows that the processes of spatial autocorrelation are related to the dependence in the disturbance process. In all models the spatial autocorrelation parameters (λ for SEM models; δ for SAR models) showed statistically significant, positive values suggesting the tendency for the occurrence of similar values (low or high) in adjacent regions.

Table 2: Results of spatial econometric models (3) – (6) estimates (linear) for NUTS 2 regions in 2016

Specification		SE	ETER	LL	EL	AIC	LM (<i>robust</i>)
YEMPL model	SEM (3)	1.21 (0.00)	-	-	-0.59 (0,00)	1733.3 (OLS: 1852.6)	101.2
model	SAR (5)	1.45 (0.00)	-	-	-0.33 (0,00)	1812.2 (OLS: 1852.6)	6.2

¹ In addition, to confirm the correctness of the results the estimates of analogical models for 2015 data, covering

265 NUTS-2 regions, were prepared. The results are consistent with those presented in Table 2.



<i>NEET model</i>	<i>SEM</i> (4)	-0.83 (0.00)	-	-0.2 (0,07)	0.65 (0,00)	1548.8 (OLS: 1647.2)	100.4
<i>model</i>	<i>SAR</i> (6)	-0.87 (0.00)	-	-0.12 (0,016)	0.63 (0,00)	1620.5 (OLS: 1647.2)	2.5

Source: The author's estimations in R CRAN.

Tab. 2 presents the statistically significant (significance level < 0.07) assessments referring to the structural parameters of models (3) - (6). The econometric analysis results show that in the case of regional employment level of young people their situation is the better the higher the share of specialists in a region (SE) and the lower the level of tendency towards premature termination of education (EL). The significance of SE variable, illustrating the part of human resources in science and technology with the highest competencies, indicates higher employment opportunities for young people on the regional markets presenting high level of knowledge based development and, consequently, economic sectors based on the development of advanced technologies and services.

Both variables showing statistical significance in the economic activity models of young people (3) and (5), i.e. SE and EL, also represent an important factor in counteracting youth professional inactivity, what is indicated by the statistically significant parameters in models (4) and (6). In the regions with large number of specialists in the structure of educational capital and a low percentage of early school leavers, the number of young people with NEET status was lower. In addition, as an important factor in reducing NEET, the indicator characterizing the regional level of participation in formal and non-formal education and training (LL) was identified (although presenting a lower level of significance than in the case of SE and EL variables). The significance of this factor (LL) aimed at the situation of the NEET youth can be related to the regional model of formal and non-formal education and training system and development of labour market institutions in the region (these issues require further research).

None of the models allowed obtaining a statistically significant parameters of the share of population with tertiary education in the region (ETER). This factor cannot be clearly linked with employment (YEMPL) or the absence of professional and educational activity (NEET) of young people. No clear spatial pattern (correlation) was identified in this respect. The reason may be a strong correlation between the percentage of scientists and engineers (SE) and the population with tertiary education (ETER) in the region.

5. Conclusions

The majority of research conducted in the field of young people's activity in the labour market, the phenomenon of unemployment or NEET is analysed. In the explanation of these phenomena, the individual characteristics such as gender, migration background, education (vocational, tertiary, dual), or macro-level factors of nations, including economic growth, education system, employment policy and market institutions are analysed. Less often the level and factors of the regional diversity of young people employment/unemployment/NEET are investigated. The obtained results indicate the great importance of regional educational capital for the situation of young people on the regional EU labour markets in 2016. The regions featuring high level of specialization constitute a more favourable place for young people to take up professional activity. The share of workers with tertiary education employed on the regional market is of lesser importance for the situation of youth on the labour market, whereas the willingness to continue learning (EL) is of greater importance. In addition, regional markets with well-developed formal and non-formal adult education and training (LL) facilitates facilitate reducing the problem of professional and educational inactivity among young people (NEET).

The significance of the level of early leavers from education and training (EL) for the situation of young people on the labour market can be linked to employment rates by educational attainment level. EUROSTAT data show that the lowest employment rates characterize young people with the lowest educational attainment level. Employment rates are increasing along with the completion of subsequent levels of education.

The significance of linking the situation of young people with the participation of tertiary education graduates in the region could not be confirmed. The reason may be a strong correlation between the percentage of scientists and engineers (SE) and the population with tertiary education (ETER) in the region. The regions with a high share of scientists and engineers are also characterized by a high proportion of people with higher education.



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SHAPING SPATIAL STRUCTURES OF LOWER SILESIA REGION ON THE BACKGROUND OF GLOBAL CHANGES

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Abstract

Contemporary development processes are taking differential in social and economic space. The diversity occurs as in inter- as in intraregional scale. Lower Silesia region belongs to one of the most dynamically developing in our country. However, in the region, development processes are taking place at different rates. Wrocław with its milieu dominates by creating a modern spatial center, the southern subregions of the voivodship notice a significantly lower rate of development, which results in a growing divergence in the region's economy. The purpose of the paper is to determine the development processes of Lower Silesia region and its individual areas (subregions will be adopted as basic units here) and identification of the causes of such shaping of phenomena. A descriptive method, literature studies, source data analysis and simple statistical methods were used to achieve this purpose.

Key words: *region, regional development, subregions, spatial differentiation of development*

1. Introduction

Progressing processes of globalization, but properly glocalization (understood as indigenization of globalization), internationalization and the turbulences caused by world financial crisis, all they result in the growth of interest of regional problems. Regionalism allows local communities for greater engagement in processes of social and economic transformations and optimal realization of challenges faced states which are members of European Union. Regions and cities are becoming more reliant on interregional flows of trade, labor and resources. Patterns of interactions among regions are experiencing rapid changes as a result of dramatic shifts in production and consumption patterns, advances in information and communication technologies and creation of new, creative and dissipative structures. Necessary conditions for the occurrences of dissipative structures are, that the system is open, that it is in a state far from thermodynamical equilibrium, and that nonlinear processes occur within the system (Bodifée, 1986). These changes pose many challenges for the analysis and management of spatial units. They are also leading to new ways of activities and relationships and new forms of clustering and networking among regions. At the

same time, regions are becoming increasingly fragmented in many ways: economically, socially, environmentally and also politically. The governance of regions faces multi-level, multi-actor and multi-sectoral challenges. New spatial interactions at new scales demand new approaches for consultation and coordination. More flexible forms of governance are beginning to emerge which seek to work around traditional governmental arrangements. The result is a complex pattern of overlapping governance and fuzzy boundaries, not just in a territorial sense but also in terms of the role of both public and private actors (MiszczaK, 2012).

Contemporary processes of development are subject to an increasing phenomenon of territorialisation. They are spatially localized and concentrated around modern spatial units where most phenomena of the civilization development are realized. At the same time, there is less and less influence on such processes because of that individual resources are distributed heterogeneously in space, and the ways and effectiveness (rationality) of using them are increasingly decisive. The description of these phenomena indicates the growing incomes and accompanying innovations, knowledge or the emergence of other external effects (MiszczaK, 2004). Such shaping of these processes is a



consequence of the fact that in highly developed regions there are other causative mechanisms than in less developed regions in which they are subject to the law of decreasing revenues from total capital. In the most developed regions we can observe the phenomenon of dematerialisation of production factors which is the consequence of knowledge based processes (Rogowska, 2013). As a result of this phenomenon, an increase in revenues is observed, because the benefits caused by the increase in the importance of knowledge reduce the decline in material capital revenues.

Nowadays, we observe many attempts to explain this phenomenon in the subject literature. Among the most important ones describing the reasons for uneven development of particular areas we can indicate The New Economic Geography (NEG). P. Krugman is considered as a precursor of NEG. The main discovery of the core and periphery model (CP) - created as a part of NEG - was to show that regions with a larger internal market, have a relatively larger industrial processing sector (than it could be due to the size of their market). The existing demand-supply connections cause that concentration of economic activity within one area is profitable for both companies operating there and employees (Korenik and Miszczak, 2011). The benefits for companies result from better access to a larger market or cheaper intermediates. On the other hand, workers in a situation of increased demand for labor can negotiate higher real wages (Krugman and Veenables, 1996). Such phenomena occur in contemporary socio-economic realities not only between regions, but also in the space of such individual regions. That is why more and more often in the new epistemological concepts, the assumptions of the new geographic economy are merged with endogenous models of growth, indicating that the immediate consequence of the accumulation of economic activity in specific places in a given region is the acceleration of their development. This results in a growing diversity among particular areas of the region, at the level of both per capita production and real wages, which, in consequence, rearranges into different tempo of their development, resulting in a growing divergence process. The above described phenomena, are also

visible in the regions of our country (Poland). An example of such a region with a diversified economic space is undoubtedly Lower Silesia.

The purpose of the paper is to determine the development processes of Lower Silesia region and its individual areas (subregions will be adopted as basic units here) and identification of the causes of such shaping of phenomena. A descriptive method, literature studies, source data analysis and simple statistical methods were used to achieve this purpose.

2. Development processes in Lower Silesia region

On January 1, 1999, a new reform of the administrative division of the country entered into force, as a result of which 16 voivodships were established in place of 49 existing ones. In place of four Lower Silesian voivodships, one large one was created. The new voivodship has become a large and important region in the country. At the same time, the districts were restored in the form of local government, and the voivodship was granted the status of a government and self-government unit. Lower Silesian voivodship covers an area of 19,950 km², which is 6.38 % of the entire country. The total population as at 31 December 2016 was 2903,7 thousand people (Statistical Office in Wrocław), which constituted 7.7 % of the population of Poland. Wrocław - the capital of the voivodship with district rights - is the largest city in this voivodship in terms of population (635 759 inhabitants).

Lower Silesian voivodship is distinguished by a high level of demographic urbanization. In 2016, over 69.2 % of the total population inhabited the cities of the region, while on average in the country - 60.3 %. In this aspect, Lower Silesian voivodship takes the second place in the country (the first place – Silesian voivodship - 77.8 %). The population density is 146 people per km², while average in the country is 123 people per km². According to this, Lower Silesia region is ranked 4th in the country (higher rank in Silesia, Lesser Poland and Masovia).

Significant changes occurred in the economic structure of both the region and the entire country in the first 15 years of the 21st century. The source of these changes was the preparation and



subsequent accession of Poland to the structures of the European Union on May 1, 2004. Global phenomena, progressive globalization, increasing uncertainty in political and economic terms, the 2008 crisis, as well as changes in the national economy and in the region's space have overlapped with these processes. This led to a re-evaluation of not only the current principles of the functioning of the economy, but also implied significant transformations in the economy of individual areas of the country, as well as changes in the situation and, consequently, in social attitudes. The influence on effects of changes in the socio-economic situation of individual regions in this period has parallel processes, such as:

1. changes in the labor market resulting in a different level of unemployment in the regions,
2. inflow of funds from EU and a different level of their absorption in spatial units,
3. different distribution of foreign capital,
4. spatial diversified development of business environment institutions,
5. different degree of adaptation to changes in individual areas.

It is worth mentioning that analyzing the transformations taking place in the economic structure of both Lower Silesia and individual areas included in its composition, it is also necessary to take into account changes in the whole national economy.

The economic space of the region, developing in relative proportion to the end of the 1980s, began to show various tendencies, e.g.: in the areas of Podgórze Sudeckie, so far very industrialized and urbanized, symptoms of a strong economic collapse followed by civilization collapse emerged, while the neighbourhood of Wrocław and the so called "copper district", after the initial turbulence, began to develop more intensively (wherein the sources in both cases were different) (Miszczyk, 2004). In the first case, a modern metropolis began to form, in the second case - copper monoculture depending on the price level on the London Stock Exchange shaped.

A significant phenomenon for the region was the establishment of cross-border cooperation with the areas of northern Bohemia and Upper Lusatia in Germany. As a result of these processes, two Euroregions have been created in Lower Silesia, i.e., Nysa and Glacensis. The other forms of cross-border cooperation should be also mentioned, such as the creation of Cross-border Union of Cities and Municipalities Czech Republic - Poland (Koreník, 1996). There are more such examples; they have influenced the stimulation of mutual contacts in various areas of socio-economic life and, consequently, they favor the integration of border areas, favorably affecting their development.

Moreover, the creation of three special economic zones was of great importance for economic and social situation of the region. The Wałbrzych Special Economic Zone was established on the basis of the Ordinance of the Council of Ministers of April 15, 1997. The specialization of this zone is the development of the electrotechnical, electronic, machine, metal and clothing industries. The zone initially included four subzones: Wałbrzych, Dzierżoniów, Kłodzko and Nowa Ruda (currently the zone has 48 locations in south-western Poland). The next zone is the Kamienna Góra Special Economic Zone of Small Entrepreneurship, established by the Ordinance of the Council of Ministers of 9 September 1997 (in September 1998 it was extended to the subzone in Nowogrodzicek - currently 16 locations, including one outside the region). The specialization of this zone is manufacturing products of the textile and clothing industry, plastic products, small household appliances, small devices, photo cameras, paper and packaging products, caravans, etc. The third zone is the Legnica Special Economic Zone, established by the Ordinance of the Council of Ministers of April 15, 1997. It consisted of three subzones (currently 18 locations).

The turn of the century brought positive trends in the development of the region, which means that Lower Silesia is in economic terms in the forefront of highly developed regions of Europe. In the 21st century, the region is seen as a voivodship with a relatively modern economic structure. For example, the indicator of the number of people working in



agriculture on the area of 100 ha of agricultural land - amounting to 9 people - places the voivodship at 12th place in the country, with a national average of 16 people (in agriculture, forestry, hunting and fishing section 10.7 % of the total number of employees worked in 2016, when in the country this rate amounted to 21.1 %).

Undoubtedly, the use of EU funds played an important role in the development of the region. In the previous two programming periods the chance given to this region has been used properly. Now we are entering the third phase, it seems that in terms of means and tasks so far the most important one. In 2004-2006, the Integrated Operational Programme was coordinated by the central departments, which exceeded the amount of 860 000 000 PLN. The next budget period in the EU has goals to decentralized means prepared by individual Marshal offices. Under the Regional Operational Programme (ROP) for the years 2007-2013, the region received 1.213 billion euro from the European Regional Development Fund (ERDF).

On December 18, 2014, the European Commission adopted the Regional Operational Programme 2014-2020 for the Lower Silesian Region. Under this programme, the region will receive 2.252 billion euro. The programme consists of 11 priority axes, including 7 co-financed from the European Regional Development Fund (1618,9 million euro) and 4 from the European Social Fund (554,4 million euro).

In addition, the region will receive funds under the Integrated Approach to Sustainable Urban Development programme, which will be implemented through Integrated Territorial Investments and through actions for the benefit of urban areas that require revitalization (in total 173 million euro).

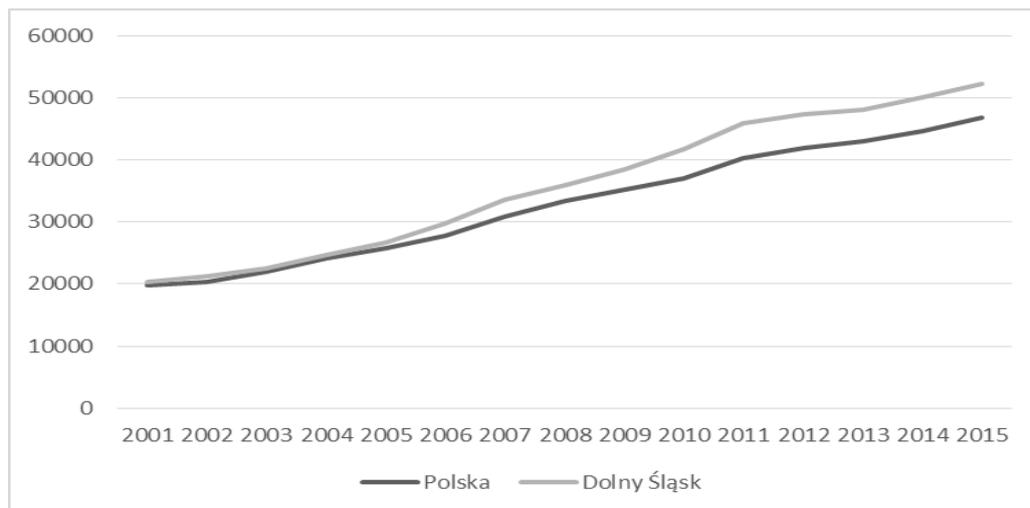
It should be also remembered that in the region, funds from other sources of aid, and not only EU funds, were also used.

When assessing the region as a whole, it should be pointed out that undoubtedly the beginning of the 21st century is an intense development unprecedented in the past. Practically from day to day, Lower Silesia has become a modern spatial unit where all socio-economic parameters have improved (see Scheme 1). Confirmation of that we can find in the evolution of the GDP per capita index, which in the region after 2004 started to differ significantly from the national average and causes that in 2015 the region was ranked high, the second position in the country (52,203 PLN per capita). In 2015, with a share of 8.4 %, Lower Silesia was the fourth producer of domestic GDP, after Mazovian voivodship (21.9 % of GDP), Silesian voivodship (12.5 %) and Greater Poland voivodeship (9.7 %).

The share in the production of GDP in Lower Silesia by sectors is: 55 % - the services sector; 35.4 % - the industrial sector; 7.5 % - the construction sector; 1.9 % - the agricultural sector. On a national scale, the region produces: 100 % of the domestic production of copper ore; 50.6 % of domestic production of household refrigerators and freezers, 43.7 % of domestic production of household washing machines, 16.5 % of domestic production of lignite. An important place in the region's economy is the mining of copper and silver ores in the Legnica-Głogów Copper Basin. KGHM "Polska Miedź" company manages this area, and this company is a major producer of electrolytic copper, silver and rhenium on global markets (Urząd Marszałkowski Województwa Dolnośląskiego, 2017).



Figure 1. GDP per capita in Poland and Lower Silesia for the years 2001-2015



Source: Own elaboration based on Central Statistical Office (2016a).

Summing up, it should be emphasized that Lower Silesia is the region that has made the best use of the opportunity given to the Polish economy from being a member of the European Union (Kolany, 2014). In the years 2001-2015, GDP per capita calculated in PLN increased by 145 %, which is the highest growth within all Polish voivodships (the country's average is 124 %) (*Statistical Office in Katowice*). In relation to the EU average, region made up 18 percentage points in GDP per capita within 8 years (Kolany, 2014) and at the end of 2015, according to Eurostat, Lower Silesia reached 75.6 % of GDP per capita of the average for 28 EU countries (Central Statistical Office, 2016b).

3. Directions of spatial development processes on the example of Lower Silesia' subregions

The Lower Silesia region, as shown earlier, is subject to intensive development processes, however, strong spatial differentiation of the level of economic and social development is also observed. The report prepared by the Institute for Territorial Research (Institute for Territorial Research, 2016) shows that in general the population in the region has decreased (in 2010-2015 there were 15 thousand people lost - it is 0.4 population of the region, at that time in the whole scale the country's loss was 0.2). However, this process was not evenly distributed in the voivodship's space. The population decreased in the southern and northern parts of the region, whereas

in the central belt and in the vicinity of Wrocław it increased. The largest losses of inhabitants (above 4 %) were observed in urban communes located in the southern part of the region: Świeradów-Zdrój (decrease by 5.7 %), Kamienna Góra (5.4 %), Duszniki-Zdrój (5 %), Nowa Ruda (4.9 %), Szklarska Poręba (4.5 %), Boguszów-Gorce (4.5 %), Kowary (4.4 %) and Polanica Zdrój (4.2 %), as well as urban-rural communes: Mieroszów (5.6 %), Głuszyca (4.6 %), Bogatynia (4.6 %), Lądek-Zdrój (4.3 %), Bolków (4.2 %), Lubawka (4.1 %) and the rural community Przeworno (4.3 %). In turn, the increase in the population (over 4.8 %) was recorded in communities located around the largest city of Lower Silesia - Wrocław: Siechnice (22.2 %), Długołęka (18.8 %), Czernica (18.5 %), Kobierzyce (13.7 %), Miękinia (10.4 %), Żórawina (10.4 %), Kąty Wrocławskie (8.9 %), Wisznia Mała (6.9 %) and Oleśnica (4.9 %), as well as in communes: Jerzmanowa (14.3 %), Lubin (12.4 %), Kunice (12.3 %) (Institute for Territorial Research, 2016).

The development of regional development processes can also be expressed, among others with the value of GDP per capita. The lowest values of GDP / 1 inhabitant are recorded in the Wałbrzych subregion - less than 28 thousand PLN, while the highest in the Legnicko-Głogów subregion - over 66 thousand PLN. The two strongest subregions in the voivodship, are the city of Wrocław (the 3rd largest



in the country) and the Legnicko-Głogów subregion (6th in the country) are in the lead in terms of development (Nazarczuk, 2013) their development potential was the third and sixth place), and their GDP per capita in 2015 is respectively 145 % and 164.5 % of the national average (*Statistical Office in Katowice*). In these two subregions, the voivodship's income is concentrated - they generate nearly 53 % of the region's GDP, but also the Wrocław subregion records rapid

development, which indicates that the north of the region is showing an increasing distance to the southern areas. This is confirmed by the table below, which shows changes in the share of individual subregions in the GDP of the region, where Wrocław and the surrounding Wrocław sub-region reach almost 50 % of the region's value. The above data indicate an increase in economic activity in the area of the copper basin and the growing primacy of Wrocław and the surrounding poviats.

Table 1. Share of % of individual subregions in the GDP of the region in selected years

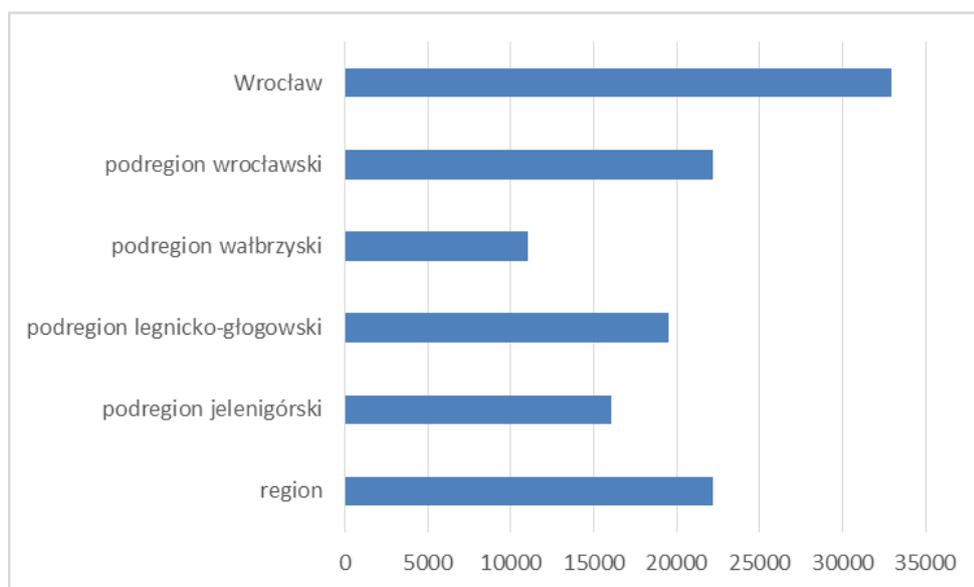
podregion	2004	2006	2008	2010	2012	2014	2015
jeleniogórski	16,5	14,8	14,7	14,3	15	15	14,5
legnicko-głogowski	20,1	24,4	21,8	25,0	23,4	20,6	20,2
wałbrzyski	18,9	17,5	16,9	15,7	15,1	15,2	15,2
wrocławski	13,9	13,2	15,1	15,3	16,8	17,3	18,2
Wrocław	30,6	30	31,4	29,7	29,7	32,0	32,2

Source: Own elaboration based on Central Statistical Office (2016a).

Analyzing GDP per capita in 2006-2014 (Scheme 2), it should be noted that in all spatial units of the voivodship there was an increase, however, only Wrocław was recorded by the Wrocław region and the Wrocław subregion practically reached the

region's average. The Legnicko-Głogów subregion (88%) recorded a slightly lower value and the Jelenia Góra subregion accounted for 72% of the region's average, the lowest increase, because it did not exceed 50%, occurred in the Wałbrzych subregion.

Figure 2. The increase in GDP per capita (in PLN) for the years 2006-2015



Source: Own elaboration based on Central Statistical Office. (2016, 19 March). Retrieved from <http://stat.gov.pl>



When assessing the general space of the Lower Silesia region, it should be stated that it is diverse and not only in terms of terrain, climate, population distribution, but also economic activity. The processes that have recently become more pronounced are, first and foremost, the economic decline in the belt of Sudeten districts (excluding Jelenia Góra), i.e. old industrial areas, monoculture of the mining and processing industries in the poviats of the Legnica-Głogów Copper District, in Polkowice, Lubińskie and Głogów and parts of the Zgorzelec powiat (brown coal and energy). A separate phenomenon is the intensive development of the Wrocław metropolitan area, whose development is increasingly moving towards the multifunctional metropolis.

The number of business entities also determines the basis for development. In the region in 2015, there were 1,230 business entities entered into the REGON register for 10,000. population, which is well above the national average of 1,089. However, as many as 50 (out of 169 communes in total), there were less than 500 business entities in the region in the region of 10,000. inhabitants and these were peripheral communities, mostly from the Jelenia Góra and Wałbrzych sub-regions (Institute for Territorial Research, 2016).

An important component of development is the inflow of foreign investment. Currently, in Lower Silesia among economic entities in the REGON register there are approximately 5,500 active companies with foreign capital registered. Foreign investors chose the capital of Lower Silesia and its immediate surroundings for their headquarters - in Wrocław, in 2015, more than half (51.2 %) were operating, that is, 2,837 companies with foreign capital from the whole province, and 6.2 % in the powiat of Wrocław (343). In total, the capital of the region and the Wrocław subregion gathered over 68 % of all foreign investors operating in the voivodship.

An important indicator showing the condition of the economy is the unemployment rate. Also in terms of unemployment there was quite a spatial diversification in the region. The unemployment rate, which in May 2017 was 6.6 % for the region in the cross-section of subregions, is presented in Table 2. At the same time, the highest unemployment rate was recorded in the Wałbrzych powiat and it amounted to as much as 16.5 %.

Table 2. Unemployment rate in Lower Silesia subregions (%) in 2017

podregion	2017
jeleniogórski	8,8
legnicko-głogowski	7,5
wałbrzyski	10,5
wrocławski	6,7
Wrocław	2,7

Source: Own elaboration based on Central Statistical Office (2016a).

4. Conclusions

When assessing changes in the area of Lower Silesia in the analyzed period, it should be stated that there was an economic growth throughout the region. However, the sources of this growth and its level were different in individual parts of the voivodship. Such a diversity of reasons for this process is a

positive element, because the diversification of the bases of socio-economic development based increasingly on endogenous resources means that the process will be increasingly stabilized on the one hand and adapt to local resources in an efficient manner in the other. used them. As a result, the process of declining economic activity in the south of the region (Sudeten foothills) and the increase in



activity near Wrocław and in the central belt of the region are still being maintained. The economic downturn in the world during this period caused a greater dependence of copper counties on KGHM's operations. The incoming financial crisis translated into the economic picture of the Legnica-Głogów subregion and the entire voivodship. At the same time, we observe the phenomena of changes in demographic processes and economic activity reflecting local development opportunities, which naturally causes the region's space from the point of view of economic indicators to resemble a mosaic with a clear dominance of Wrocław and the copper basin. It should be expected that the dichotomous division of the region will continue in terms of pace and scale of development. However, the sources of socio-economic phenomena will be different, at the same time it seems that an increasingly important role in the economic life of the region will be played by the emerging modern Wrocław Metropolitan Area and, on the other hand, will develop various forms of recreational activity in attractive areas of the region. Such course of development processes will undoubtedly create a solid basis for the growth of the competitive position of the region both in the national and international cross-section.

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SHEEPSKIN EFFECT IN HIRING: EVIDENCE FROM A PILOT EXPERIMENT IN THE CZECH JOB MARKET

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Abstract

The sheepskin effect is an explanation for the non-linear relation between the amount of education and income. The hypothesis is that the awarding of an educational degree yields a higher income than the same amount of education without possession of a certificate. We conducted a correspondence experiment that examines the effect of college diploma on the behavior of potential employers in the hiring process. In the experiment, job applications were sent to 36 potential employers by three fictional job candidates. The candidates differed in their education; the first held a degree from a low-ranking regional university, the second held a degree from the top Czech university in the field, and the third was a dropout from the same university. Other characteristics of the candidates were roughly equal and varied across the education. The results show somewhat higher success rate of college graduates (although, the difference is not statistically significant) and no difference in success rate between the graduates of the regional and the top university. However, the sample is quite small and the results are not persuasive.

Key words: *sheepskin effect, job market, education, certification, experiment*

1. Introduction

Almost half a century has passed since the publication of signaling (or screening) hypothesis explaining the returns to education. The hypothesis provides an alternative to the traditional explanation based on the human capital acquired through education. The debate about the importance of signaling versus human capital is not only interesting from a theoretical perspective. Proper understanding of the role of educational institutions is necessary to guide their operation and government educational policy. This paper aims to provide additional empirical content to the debate employing a novel, experimental method.

The sheepskin effects are the returns to educational certification rather than to the amount of education. The hypothesis is that the awarding of an educational degree yields a higher income than the same amount of education without possession of a certificate. The theory of human capital (e.g., Becker, 1964) holds that education provides productivity enhancement to an individual, thus increasing the reward in the labor market. The signaling theory starts with a different assumption; productivity is a

characteristic of an individual that is difficult to observe to the employer. Education serves as a screening mechanism that sorts individuals into groups with different productivity.

The theory was first advanced by Michael Spence and Kenneth Arrow. Spence (1973) presents the job market signaling theory as follows. Hiring is an investment under uncertainty, a lottery. The employer does not know the productivity of the particular individual; he is only able to discriminate between different groups based on indices and signal. Indices are unalterable attributes of an individual, such as gender, race or age, while signals can be manipulated by the individual. Education is a signal.

Signaling only works if signals are costly and the cost is related to productivity. If cost of education were the same to everybody, it would not provide any useful information to the employer. Disregarding the potential productivity boost in the form of human capital, education only works as a signal if the cost of education is inversely related to productivity. In the equilibrium, education will only be purchased by the



individuals that are more productive and face lower cost of education. Thus, education serves as a signal to the employer providing useful information regarding productivity of the potential employee.

Arrow (1973) provides a simple formal model explaining the screening function of education. Colleges are filtering at two levels – admission, as the capacity is limited, and graduation. The college is interested in admitting the candidates with the highest chance of graduating conditional on their pre-college records. If productivity is related to that probability – and there is a good reason to believe it is – than graduation from a college provides useful information regarding productivity.

The signaling theory was soon criticized by some economists. Layard and Psacharopoulos (1974) raised objections to three predictions of the theory. First, they claimed that the rates of return to uncompleted courses are as high as to completed courses. Second, they claimed that the differences increase with age, although the information asymmetry should be decreasing. Third, if screening is the main function of education, it could and would be done more cheaply, but it is not. Indeed, the empirical studies cited by Layard and Psacharopoulos do not provide much evidence for the signaling theory.

However, more recent empirical studies support the signaling theory. Hungerford and Solon (1987) provided statistical analysis proving the existence of the sheepskin effect in the United States using the data from 1978 Current Population Survey. They used a simple econometric model explaining wages by experience and years of education, adding dummy variables for the diploma years. The dummies were jointly significantly different from zero, particularly due to the significant value of the college degree dummy (education equal or exceeding 16 years).

There are several empirical other studies returning the issue of sheepskin effect. Belman and Heywood (1991) examined the same data but focused on women and minorities. The results show that the

sheepskin effect among women and minority males is somewhat smaller for lower diploma years but larger for higher diploma years compared to white males. This suggests that minorities have larger returns to high productivity signals.

Jaeger and Page (1996) found strong evidence of sheepskin effect using data on actually completed degrees, not just years of education. They used the 1992 Current Population Survey from the United States and an empirical approach similar to Hungerford and Solon (1987). Although, the results do not confirm the observations of Belman and Heywood (1991) about race and gender.

Belman and Heywood (1997) use a slightly different empirical strategy focusing of different cohorts. Combining the data from 1979 and 1991 Current Population Survey they construct cohorts that are examined separately. The results show that the importance of education actually declines with the age; the result is fully in line with the predictions of the signaling model. Empirical studies from other countries also provide evidence of sheepskin effect, e.g., in Northern Ireland (McGuinness, 2003), Sweden (Antelius, 2000), Colombia (Mora and Muro, 2008), or Libya (Arabsheibani and Manfor, 2001). The existence of sheepskin effect was also confirmed in the Czech Republic (Munich, Svejnar and Terrell, 2004).

This paper takes a different approach from the previous research. It does not focus on wages but the probability of being hired. The sheepskin effect in hiring means higher chance of being hired other things being equal. It is implicitly assumed that the wage rate is related to the particular position and not related to the productivity. If the employer has a chance to select among several candidates, he is assumed to choose the one with the highest expected productivity. Thus, if education is perceived as a signal conveying positive information regarding productivity, it shall increase the chance of being hired.

To examine the sheepskin effect in hiring, we conducted a correspondence experiment in the



Czech job market. The rest of the paper is organized as follows. First, it briefly introduces the Czech education system and the current situation in the labor. Then, the experiment is described, followed by the presentation of its results. The final section discusses the results and concludes.

2. Education and the labor market in the Czech Republic

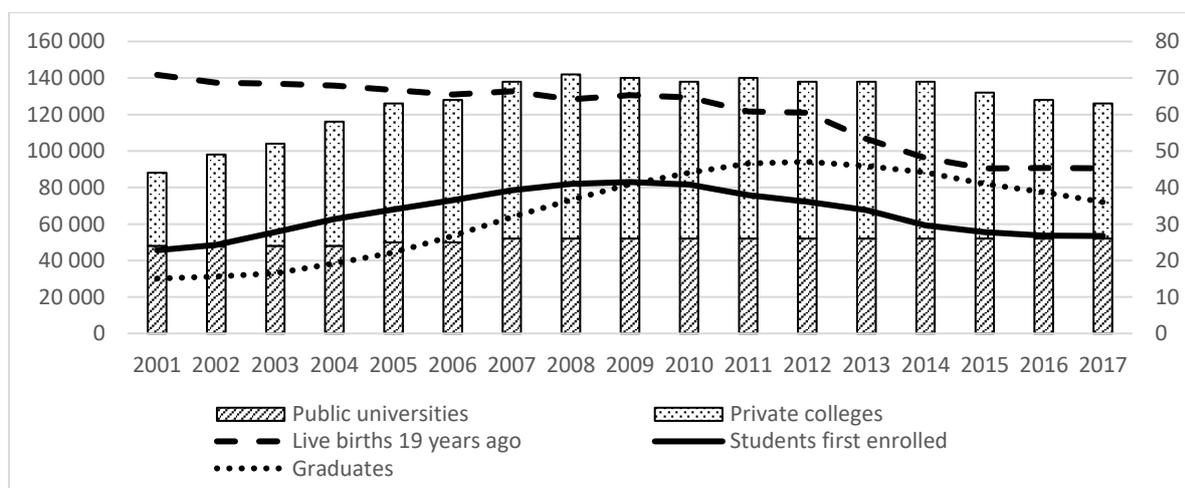
In the past three decades, the Czech Republic is has successfully transformed from a centrally planned socialist economic system to a free market economy. The transition has necessarily touched both the education system and the labor market. Basic information about these processes seems necessary for correct interpretation of the results.

Before 1989, under the communist rule, the role of education was subject to ideology and politics. Tertiary education was relatively small and elitists. Primary and secondary education was deemed adequate to supply the labor force necessary for manufacturing. In the tertiary education, sciences, agriculture and medicine were favored to technology and social sciences. Social sciences and humanities were neglected and heavily politicized. The selection of candidates was also subject to ideological criteria and cronyism.

The post-communist transition brought about democratization, de-politicization and gradual transition from elitist to mass or nearly universal access to tertiary education. New public universities were created soon after the Velvet revolution and the 1998 reform allowed private colleges to enter the market. Over the first two decades after the fall of the communist regime, the number of students more than tripled. The composition of study majors changed in favor of social sciences, especially economics and the law, and technology at the expense of sciences and agriculture. This new composition reflects the dynamics of the economic transition.

Figure 1 shows the development of tertiary education in the new millennium. In the first decade, it is characterized by an expansion of private providers in response to the 1998 reform and increase in enrollment. The ratio between the number of 19 years old (a proxy for the number of potential entrants) and the actual number of students enrolled in the universities almost doubled over the period. The number of entrants was also inflated by public sector employees who were forced to increase their qualification in order to keep their jobs. Only in the second decade the number of entrants to universities started to decrease, following the demographic trends.

Figure 1: Development of tertiary education after 2000



Source: Data from the Czech Statistical Office



The labor market in the Czech Republic has performed well during the transition. The unemployment rate has been low not only in comparison with other post-communist economies but also with regard to many developed West European nations. In the 1990s, the unemployment rate slowly increased; although, it has never exceeded nine per cent. In the new millennium, it has declined – with a short rise after the 2008 global crisis – down to an all year average of 2.9 per cent in 2017 (according to data from the Czech Statistical Office). Thus, competition for skilled and educated labor force has been tough in the recent years.

The premium for tertiary education differs between private and public sector. According to data from the Ministry of Labour and Social Affairs (2018), the differences were following: In the private sector, the average of employees with a bachelor degree was 21 per cent higher than the wage of employees with complete secondary education; with a master degree, it was 70 per cent higher. The difference in median wages was 17 and 49 per cent. In the public sector, a bachelor degree increases the salary by 11 per cent and master degree by 35 per cent compared to the complete secondary education. Median salaries differed by 9 and 20 per cent. Clearly, the degree pays in the Czech Republic, especially in the private sector; however, it is not clear whether the difference is caused by additional human capital or the sheepskin effect.

3. Experimental design

We designed a correspondence experiment to verify the sheepskin effect in hiring. First, we constructed CVs of job applicants with various level of education. Then, we selected employers advertising vacancies fit to our fictional candidates. We have responded to employers advertisements through response forms of job advertisement web portals. Finally, we recorded the responses from the employers.

The fictional candidates' CVs were created in the following way. The names were selected from the database of the most frequent first names and surnames in the Czech Republic (the names were Jan

Novotný, Jiří Dvořák, and Petr Svoboda). The address of residence for each candidate was chosen in a mid-sized city between Prague and Ústí nad Labem (Louny, Roudnice nad Labem, and Litoměřice). The street address was chosen randomly in one of the prefab quarters typical for post-communist cities. For the secondary education, we used the general high schools (gymnázium) in the respective cities.

We have created three different generic letters of interest. They were set up in a way that allowed filling in the name of the potential employer, title of the position and a reference to the advertisement website. All job candidates have similarly structured email addresses formed by the first name, first name initial and surname at a major Czech free email service domain email.cz (e.g. janjnovotny@email.cz).

For the education, we chose the J. E. Purkyně University in Ústí nad Labem as an example of a regional university and the University of Economics in Prague, as the top Czech university in the field of business economics. In all cases, the job candidates studied business economics at the bachelor level. One of them was a dropout from the University of Economics, Prague, reporting to have left the school just before the final examination. The job experience part of the CVs contained two different jobs per candidate, and we used jobs typical for Czech students (e.g., store assistant, administrative staff).

We created 27 different CVs that covered all possible combination of name/address, education and experience. Also we varied the order in which the CVs were sent to the employers; the order corresponds to the job experience (thus, the data do not allow to distinguish between the effect of order and experience). In total, we had 36 combinations of CVs in different order that were sent to the employers.

The employers were selected from those that were currently advertising vacancies at major Czech job advertisement websites jobs.cz and prace.cz. We selected vacancies that fit the profile of our fictional candidates; i.e., they were related to business



economics and they did not explicitly require higher education. We selected positions that required high school final exam (maturita) or those that require high school or university education. Unfortunately, due to the limited capacity of the research team we had to exclude the advertisement that required disclosure of candidate's telephone number to the employer.

The job applications were sent from mid-April to mid-May. We recorded the response from the employer as positive if he invited the candidate to a job interview or if he asked for a telephone number to invite him for an interview. If the employer did not respond within a month we recorded his response as negative.

3. Results

The results are based on 108 observations from 36 firms. Out of those 36 firms, 10 have not responded at all, we have received neither a positive nor a negative response. It must be said that some firms have stated beforehand, in an automated reply, that no response means a negative response. The overall response rate was 58.3 % with an average waiting time of 7.98 days, half of the firms responded within 6 days. A positive response was received in 28.7 % of cases; considering only the firms that actually responded, the success rate was 49.2 %. Waiting time for a positive answer was 3.84 days; half of the positive responses were received within 2 days.

The effect of education has manifested, but the differences are not statistically significant. There was not difference between the graduate of the regional university and the top university; both had a success rate of 30.6 %. The dropout had a success rate of 25.0 %. The results are similar if we consider only those firms that have responded (the success rates are 52.4 %, 55.0 % and 40.9 %). Response rate is very similar for all education types, between 55.6 % and 61.1 %.

There is a more notable effect of the order of application or the work experience. These effects cannot be distinguished as they are perfectly correlated. First or second responder to an

advertisement had both a success rate of 36.1 %, while the third responder only received a positive response in 13.9 % of cases. The dependence of the success rate on the order is statistically significant ($p=0.055$ in Pearson's chi-square test). The situation is similar with the response rates (66.7 %, 63.9 % and 44.4 %), although the difference is not significant at $\alpha=0.10$. Thus, it is likely that some of the employers had realized that they are being tested and behaved accordingly.

Finally, the effect of personality (name, address, high school, letter of interest) is also present, although it is statistically insignificant. One of the fictional personalities had a success rate of 38.9 %, while the other two had it much lower (25.0 % and 22.2 %), although the response rates were not so different (66.7 %, 58.3 % and 50.0 %). We have no explanation for this result; perhaps the difference came from a better letter of interest.

The data from the experiment do not provide a clear answer regarding the sheepskin effect in hiring. However, they do not rule out the possibility of such effect. The pilot experiment also provides some methodological guidance for the future work in this area.

4. Discussion and conclusion

The results do not provide support for the hypothesis about the sheepskin effect in hiring in the Czech job market. The effect manifests only weakly and it is not statistically significant. There are two possible explanations for those results. First, it may be that the effect does not actually exist in the market or at least not in the first stage of hiring. Second, the negative results may be due to the experimental design. Thus, further investigation is need.

There is a good reason to assume that Czech employers do not take college diploma as a serious signal. Although previous research confirmed the existence of sheepskin effect in the Czech Republic (Munich, Svejnar and Terrell, 2004), the situation may have changed since then. Enrollment in higher education has increased rapidly during the previous two decades and the average quality of the



graduates has lowered as a result. Employers may be skeptical especially with recent graduates. It is also possible that the effect would manifest in a later stage of hiring process.

The pilot experiment presented in this paper suffers from certain shortcomings. Perhaps a better experimental design would provide different results. First, the design does not allow distinguishing between the effect of candidate's work experience and the order of application. However, it seems likely that the observed effect is due to the order; some of the employers have probably realized that they are being tested. Second, a larger dataset would allow to deal with possible confound between education and other variables such as the order of application, work experience, secondary education, address of residence and the letter of interest. An absence of telephone number assigned to our fictional candidates also reduces external validity of the experiment.

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SPATIAL DISTRIBUTION OF INVESTMENT INCENTIVES IN NORTHERN PART OF CZECHIA AT THE LEVEL OF DISTRICTS: COPY THE SPATIAL PATTERN OF DEVELOPMENT AND BACKWARDNESS?

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Abstract

The paper focuses on the evaluation of the position of the Ústí Region and its districts in terms of the transfer of investment incentives and financial costs to the created jobs. Investment incentives have been unevenly distributed among the regions in the north of Bohemia, most of them in the Usti region, followed by the Liberec region and the Karlovy Vary Region. In the more detailed examination of the investment incentives provided per job created, jobs were created at the highest cost in the Liberec District, while in the districts lagging behind, more jobs were created with a lower investment incentive. In some regions, it was quite an effort to increase the number of jobs even at the cost of the lower investment demand of the job created. The research findings show that the system of spatial distribution of investment incentives, to a certain extent, replicates the spatial scheme of underdeveloped and developed regions.

Key words: *investment incentives, regions, Czechia*

1. Introduction

The granting of investment incentives pursues the goal of influencing the placement of the investment in order to attract new investments or retain the existing ones. The investment incentives have successively turned into a common economic and political instrument in both developed and emerging countries (Pavlínek 2004; Ginevicius and Simelyte, 2011; Bevan and Estrin, 2004) and regions (Bondonio and Greenbaum, 2006). The state can influence the transformation of the regional economy through the incentive system. The aim of the public policy is to attract investors into the priority branches of the national economy. As regards the investment incentives as a localisation factor, the incentives play a limited role only in selecting a location where the investment is to be made because aspects such as production costs and accessibility of the markets still play a considerable role. According to Blomstrom and Kokko (2003), the role of the investment incentives is now important or even decisive, when the investor can choose from several similar industrial zones (Hlaváček, 2009).

In the Czech regions, the investment incentives should be used to transform industry and attract

foreign investors and large enterprises (Sucháček et al., 2017) that can sell domestic production on developed markets or integrate the newly established factories into global production chains.

Many factors influence the concentration of investments in the industrial zones (Manea and Pearce, 2004). First of all, the decision-making of the investors on the selection of an industrial zone is related to the form of their economic activities. In the case of the Bohemian regions, the traditional localization factors are, in particular, a lower workforce and operation costs, and the geographical proximity of Czechia to the western markets, and good quality of the workforce. The others include political and economic stability and the institutional quality of the environment (Pavlínek, 2002; Damborský, 2008). Over time, the localization of sub-contracting and customer companies has also become attractive depending on their position in the production chain in the spatial proximity of the follow-up companies. Significant factors today include the form of the investment conditions providing the benefit to the regions within the competition from other regions in Czechia or Central Europe.



The article particularly focuses on the role of investment incentives and their relation to industrial zones and investors; the analysis of the influence of other factors is a topic for further research as it is a complex of factors where the importance for localization is also conditioned by the individual priorities of each company. The article also focuses on the assessment of the position of the Ústí Region and districts in the context of neighbouring regions (Liberec Region and Karlovy Vary Region), the inflow of the foreign direct investments, the investment incentives, and the financial costs for the created jobs. One can assume that the investment incentives were distributed unevenly among the regions of Northern Bohemia and that there are differences in the localization of the industrial zones and use of the investment incentives at district and regional level. The aim of the article is to determine the differences in the concentration of investment incentives at a regional level and the incentives granted for a created job, which can be regarded as an indicator of sophistication and the quality of the created jobs.

2. The system of the investment incentives

The support for the industrial zones is aimed at preparing the conditions to develop investments in industry, strategic services, and in R&D. Public support was firstly specifically focused on establishing the assumptions for new jobs. The programme of investment incentives (Government Decision No. 298/98) was implemented in April 1998. Since its onset, it has been proposed as a programme applicable to both foreign and domestic investors under the same conditions. The investment incentives are income tax discounts, transfer of a technically equipped land parcel, material support for the creation of new jobs, material support for the re-qualification of employees, transfer of lands registered in the land register as agricultural plots, and the transfer of other types of plots. The general conditions include, in particular, that the investment must be used for a new production plant or the expansion or modernization of the existing one.

Table 1: Forms of support for investors in Czechia

type of investment	forms of investment incentive	maximum level of support
Processing industry	<ul style="list-style-type: none"> - Income tax discount for 10 years - support for a new job of up to 300,000 CZK for training employees for up to 50% of the training costs - Property tax exemption for 5 years in the preferential industrial zones 	25 % of eligible costs, except for Prague
Technological centres (R&D)	<ul style="list-style-type: none"> - Income tax discount for 10 years - Material support for a newly created job up to 300,000 CZK - Material support for training employees for up to 50% of the training costs - Property tax exemption for 5 years in the preferential industrial zones 	25 % of eligible costs, except for Prague
Strategic service centres	<ul style="list-style-type: none"> - Income tax discount for 10 years - Material support for a newly created job up to 300,000 CZK - Material support for training employees of up to 50% of the training costs - Property tax exemption for 5 years in the preferential industrial zones 	25 % of eligible costs, except for Prague

Source: www.czechinvest.org

The realization of large investment projects usually attracts the inflow of other investment projects. This may include, among others, moving foreign suppliers to Czechia or the investment may open up an opportunity for domestic suppliers who can participate in production. The growing production volume in a location and the growth of employment

may increase the tax revenues in the state budget (income tax from employees, income tax from legal and natural persons). Investments from the processing industry, strategic service centres, and technological centres are all supported in Czechia.



3. Data and Methods

The data for processing the work on the provided investment incentives is included in the Investment and Business Development Agency Czechinvest database, and the article analyzes the investment projects where investors received financial subsidies through Czechinvest. The analysis used the information about individual investment projects, the amount of the investment and its location, including the planned number of jobs created. Information about the localized industrial zones in the Ústí Region comes from the database of the Ministry of Regional Development of the Czech Republic, including information on potential forms of investment in industrial zones. The macroeconomic data was taken from the Czech Statistical Office.

The article uses the quantitative geographical methods for the description of the environment and spatial comparisons of the territorial units completed by cartographic data processing. Based on the database of the investment incentives, the size of the investment incentive is then calculated per number of economically active persons in a district. This value indicates the differences in the concentration of public support at the regional level. The methods enable a visual review of the spatial differences in the territory, and to identify the spatial relations among the indicators in question. The analysis of the spatial differences in the concentration of the investment incentives then enables to identify whether the investment incentives are provided to more troublesome regions.

4. Results and discussion: spatial differences in the concentration of investment incentives in the regions

The structure of the economic environment in northern Bohemia contains different regional development processes. The structurally affected Ústí Region has a series of socio-economic problems that point to the weaker level of the region compared to data for Czechia, e.g. a higher unemployment rate, an inferior education structure, persisting traditional industrial base, and extensive

brownfields. A large share of the workforce is still employed in stagnating and declining industries (mining of mineral resources, heavy and chemical industry). Viturka (2010) ranks the Ústí Region in the group with the weakest competition position among the regions in his analysis of the regional disparities and regional competitiveness. The economic structure of the Ústí Region is highly persistent, characterized by a large share of traditional branches. The still high but successively decreasing employment, despite the sharp reduction in brown coal mining, is seen in the fuel-energy complex (mining of brown coal, power engineering and heat production). In particular, due to the inflow of foreign investors, the region can see higher-than-average employment in industry. Today, the importance of the automotive industry is obvious because it helped to reduce the negative impact of the decline in traditional industrial branches in northern Bohemia, such as brown mining and chemicals.

Many branches in the Karlovy Vary Region and the Liberec Region were known in the 1990s as a traditional region for glass and textile production. Today, many of these traditional companies no longer exist; former factories, like brownfields, became an almost irresolvable problem of the municipalities. At present, the Liberec Region considers the production of components for the automotive industry as the most important branch. In the region, there are various sized companies delivering almost all automotive components placed at the different hierarchal levels of the value chains.

The Sokolov area is the traditional industrial area of the Karlovy Vary Region with significant branches being power engineering, energy coal mining, the chemical and engineering industry, the textile and clothing industry, as well as the production of building materials. The processing industry also had a long tradition in other districts and the plastic materials processing industry is now the most developed there. The spa industry has a significant position in the Karlovy Vary Region (the highest concentration of spa places in Czechia) and the related tourist industry, transport, and services. Regarding the share of individual branches in this



region, the glass industry, with its many years of tradition, still prevails here.

The values achieved in the Ústí Region were above average between 2008 and 2012 while the amount of revenue per employee dropped in the last monitored period between 2012 and 2014. The lowest revenue per employee has been reported in the Karlovy Vary Region, which indicates stable values without significant growth changes.

When monitoring the number of patents created by private businesses, it can be said that the baseline of the Ústí Region was above average from among the monitored regions. In the following years, the patent results of private companies in the Ústí Region grew slowly when compared to the other regions. Although the graph shows the number of patents in absolute values (the results were not converted to another general indicator due to the low patent activity), the weaker position of the Ústí region is evident despite the differing potential and size of the regions.

Table 2: Main industrial zones in the Ústí Region

industrial zone	activity	area (ha)
Havraň - Joseph	industrial production	190
Industrial park Krupka	production and storage, services, research, transport and technical infrastructure.	77
Jirkov - Otvice	production and storage (predominantly light industry).	40
Kadaň	industrial and logistics	81
Kláštevec n.O.	production, transport and warehouses	155
Libouchec (ÚL)	commercial, industrial, logistics activities, technology park	70
Litvínov - Louka	light industrial and pharmaceutical production, food industry	30
Lovosice	light and heavy industrial production	120
Most	production and services	12
Podbořany - Alpka	industry and logistics without spatial regulatory constraints.	80
Rumburk	light and medium-sized industrial production.	29 -70
Triangle	manufacturing, strategic services, technology centres, or R&D.	363
Ústí n. L- Jižní Předlice	production and storage - light industry	32
Ústí n. L.- Severní Předlice	multifunctional use - business activities, warehouses, transport and technical services.	61

Source: www.risy.cz

Tables 2 and 3 show the main industrial zones in the selected regions. These localities do not have any specifically designed regulations for some of the

industry branches; the development plans for most industrial zones are generally determined.



Table 3: Main industrial zones in the Liberec region and the Karlovy Vary region

industrial zone	activity	area(ha)
Hrádek nad Nisou	service zone - light industrial production.	30
Liberec - zóna Jih	light industry, data and telecommunication services, logistics.	125
Nový Bor -	light industrial production.	21
Vesecko	light industrial production.	41
Liberec Sever - Růžodol	shops, warehouses, integrated equipment for science and research, industrial production, warehouses, commercial and industrial areas.	67
Okrouhlá	light industrial production, logistics, services.	26
Ralsko - Kuřivody	light industrial production, logistics, services.	75
Stráž pod Ralskem	industrial production.	56.7
Hospodářský park AŠ	industrial production, light industry, trade and craft.	32
Průmyslový park Cheb	industrial production.	245
Ostrov	small industrial production, logistics, services.	16
Vítkov	small industrial production, logistics, services.	18
Sokolov - Silvestr	small industrial production, logistics, services.	18.8
Sokolov - Staré Sedlo	industrial production and storage.	159

Source: www.risy.cz

There are already several important industrial zones in the Ústí Region, such as Triangle and Havraň-Joseph. Their establishment and subsequent development were co-funded by the state and from municipal budgets. Other important zones are located in Klášterec nad Ohří, Chomutov, Bílina, Přestanov, and Podbořany. It can be said that the industrial heart beats in the North Bohemia brown coal basin and its centres (Chomutov, Litvínov, Most, Teplice, and Ústí nad Labem). It can be assumed that in the future industrial development will particularly focus in the region on the development axes. Investments will also be directed outside the development axes if the locations are interesting to the investors, e.g. Louny and the Aisan company. A large share of the industrial zones is designed for the industry where light industrial production prevails. The logistics services and warehousing will follow the industry. More sophisticated activities in the form of technological centres or multifunctional centres are

only assumed in some cases, e.g. in the Sever industrial zone or the industrial zone in Libouchec in the Ústí Region, where the Nupharo technological park failed.

Although the Ústí Region was a quite attractive region compared to the Liberec Region and the Karlovy Vary Region for investors (Hlaváček and Koutský, 2011), the gross domestic product of the Ústí Region and the Karlovy Vary Region is lower (CZSO 2018), because the foreign investors were looking for a less-qualified workforce for less sophisticated assembly activities. On the other hand, the foreign direct investments inflow influenced the course of the structural changes and contributed to the improved quality and competitiveness of the economy of the problematic regions by dampening the impact of both the economic transformation and the recent economic crisis.



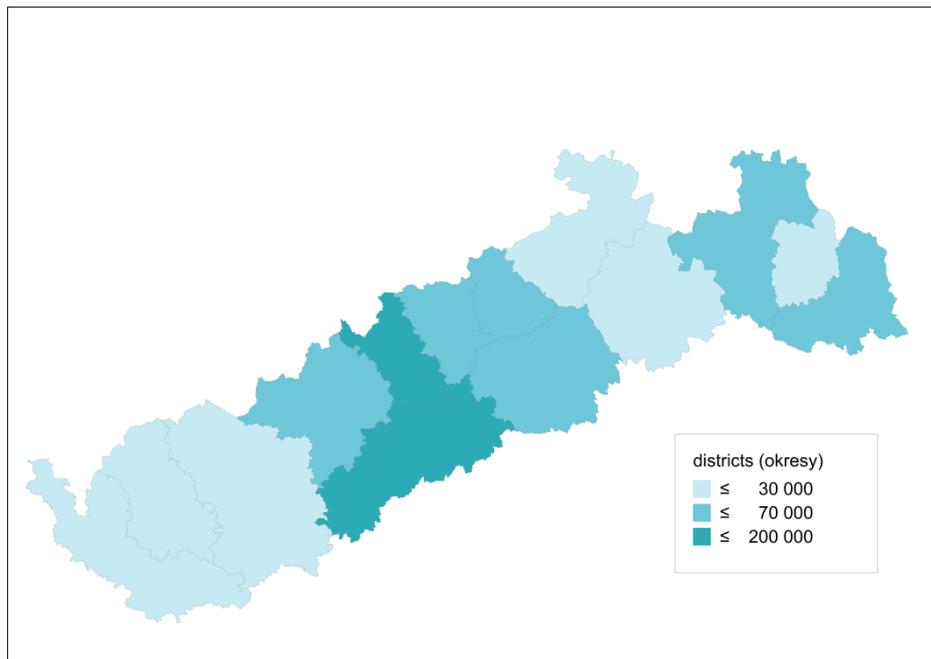
region/district	unemployment rate (%)	investment incentives (mil. CZK)	number of job places created	average incentive per new job place (mil. CZK)
Karlovy Vary	7.1	4714.5	2556	1.84
<i>Cheb</i>	5.5	1416.1	1136	1.25
<i>Karlovy Vary</i>	7.0	2364.2	1310	1.8
<i>Sokolov</i>	8.7	934.2	110	8.49
Ústí Region	8.9	44170.7	31096	1.42
<i>Děčín</i>	8.8	2182.6	662	3.3
<i>Chomutov</i>	9.4	4972.1	6286	0.79
<i>Litoměřice</i>	7.3	6091.6	1484	4.1
<i>Louny</i>	8.0	7997.6	10159	0.79
<i>Most</i>	11.1	11626.3	6242	1.86
<i>Teplice</i>	7.4	6870.4	3406	2.02
<i>Ústí nad Labem</i>	10.4	4430.2	2857	1.55
Liberec Region	6.4	11469.1	3234	3.55
<i>Česká Lípa</i>	5.7	562.1	652	0.86
<i>Jablonec nad Nisou</i>	5.6	1168.8	747	1.56
<i>Liberec</i>	7.1	6640.6	524	12.67
<i>Semily</i>	6.6	3097.7	1311	2.36

Source: Own elaboration based on data from Czechinvest database

The investment incentives were located irregularly among the regions of Northern Bohemia, with the largest amount going to the Ústí Region followed by the Liberec Region and the Karlovy Vary Region (Table 4). When reviewing the amounts of the investment incentives granted for the created jobs in detail, the highest costs were seen in the Liberec

district, where in the economically lagging districts new jobs were created at the lower investment incentive granted. In some regions, attempts to increase the number of jobs at the cost of the lower investment demands for the created job prevailed.

Figure 1: Spatial deployment of the investment incentives granted; amount of the incentive per capita (in CZK)



Source: Own elaboration based on Czechinvest database (2017)

The position of the cities in the hierarchy of the settlement system and the geographical position of a district play the same key role. Particularly in the 1990s, a higher concentration of foreign investors in the Czech-German border could be observed (Toušek and Tonev 2003). As for the deployment of the foreign investors, differences can be seen in the West-East axis with the higher concentration in the Western part of the country. The territorial differences are reflected on a long-term basis and support the growth of the regional differences in the areas attractive for investment and other regions of the country.

Another problem is that the large offer of the zones exceeds the demand of the investors. Industrial zones were regarded as a key factor for the creation of a competitive environment and the attractiveness of the regions. It can now be assumed that despite the high economic growth in recent years, the industrial zones will not be fully occupied and the amount of land in the unsuccessful zones will drop. The problematic issue will be the zones that are not attractive for logistic reasons or for any further possible method for use. For the industrial zones in the regions to operate, another risk lies in the stagnation of the FDI inflow with higher added value

because the growth of the production costs in Czechia will result in the partial exit of the assembly productions and the subsequent transfer to cheaper countries.

4. Conclusions

The article focuses on the assessment of the Ústí Region's position and its districts with respect to the transfer of the investment incentives and financial costs for the created job. Regarding the assessment of the impact of the selected indicators characterizing the innovation potential of the regions of Northern Bohemia, there is a difference between the performance of the Liberec Region compared to the Ústí Region and the Karlovy Vary Region. The in-depth analysis of the investment incentives granted for the creation of jobs shows that the Liberec Region created the jobs at the highest costs, whereas in the lagging districts, the jobs were created at a lower amount of the investment incentive per one job because the creation of new jobs was preferred. In some regions, there were attempts to increase the number of new jobs at the expense of lower investment requirements for the created jobs. The investment incentives achieved lower concentrations in the



districts of the Karlovy Vary Region and in Děčín because fewer investors came to the territories. The Liberec district achieved an above average volume of investment incentives per capita. It could be stated based on the findings shown and the goals of the research that the system for the spatial distribution of the investment incentives replicates, to a certain level, the spatial pattern of the underdevelopment and development of the regions. Therefore, the investment incentives attenuated the growth of the regional differences to a certain extent only.

Due to workforce insufficiency, the government will cancel the support for the investors solely due to the number of new jobs created, and it may be assumed that vacant areas in the industrial zones will remain available because more sophisticated forms of investment will be supported, which may not be suitable to the environment of the structurally impaired districts or underdeveloped territories, e.g. due to the insufficiency of a qualified workforce (Novák et al., 2016). Therefore, large industrial zones are moving away from attempts to win a strategic investor, and the space available in the industrial zone is being fragmented for smaller investors.

The importance of the traditional comparative advantages of Czechia in international competition has been decreasing in recent years and on the contrary, the importance of qualitative factors (e.g. R&D, innovative potential) with the potential to attract new foreign investors is growing. At present, the Czech economy is on the edge of its production capacities, and the inflow of further investment to create new jobs without higher added value is no longer a priority for retaining economic growth. The investment incentives should be focused on higher technological and productivity levels.

Revitalization of the economy of the Ústí Region and the Karlovy Vary Region should continue with the trend of reducing the share of traditional industrial branches of the region in favour of the new industries, which - in the context of other necessary economic and social changes - requires the re-qualification of the workforce, the reform of the regional education system and action by regional and local government. The development should, therefore, be based on the development networks

that will further integrate the regional economy into inter-regional and global production networks through the foreign investors as described e.g. by Coe et al. (2008), Blažek (2012).

The undervaluation of the new development tendencies having strategic development for reinforcement of the regional competitiveness may be reflected in the future in the stagnation of economic growth at the regional level and going backwards in the technological development of the companies and the weak potential of the regional innovation system (Žitek, Klímová 2016).

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SUSTAINABLE DEVELOPMENT IN THE EGTC NOVUM AREA – AN INDICATOR-BASED APPROACH

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Abstract

The European Grouping of Territorial Cooperation NOVUM (EGTC NOVUM) was established in 2015 and conducts its activities in the Polish-Czech borderland. The main aim of NOVUM is to intensify, facilitate and promote Polish-Czech cross-border cooperation aimed at the strengthening of economic and social cohesion of the area of operation of the Grouping.

Sustainable development is a widely accepted concept of development. Currently, striving for sustainable development is one of the biggest challenges. This concept is implemented at various levels of development from international, through national, regional to local.

The article attempts to determine the degree of implementation of sustainable development in the area of operation of EGTC NOVUM. Indicators describing the social, economic and environmental situation have been chosen in order to achieve this objective. The analysis was carried out for the years 2014-2016. Among the indicators selected for analysis were, inter alia: gross domestic product per capita, expenditure on R&D, employment rate, unemployment rate, gross fertility rate, protected area.

Key words: *EGTC NOVUM; sustainable development; indicators*

1. Introduction

The European Union has created the European grouping of territorial cooperation (EGTC) as a legal instrument to facilitate cross-border cooperation. EGTCs conduct their activities based on Regulation (EC) No 1082/2006 of the European Parliament and of the Council of 5 July 2006 on a European grouping of territorial cooperation (EGTC), which allows for the creation of cooperation units by public entities from different Member States. In addition, it provides these entities with a Community legal framework. Thus, it can be generally written that European groupings of territorial cooperation are legal entities created by Member States, local and regional authorities and other entities governed by public law. Such an entity is of course created on the territory of the European Union and allows for the establishment of formal cooperation groups by public entities from different Member States.

It should be noted that the first EGTC, Eurométropole Lille-Kortrijk-Tournai, was created in January 2008. It enables cooperation between significantly different authorities from three

different administrative levels in Belgium and France. The official headquarters are in France and the French authorities have accepted the EC Regulation as a basic right, allowing them to employ staff in accordance with Belgian law (Mędza, 2015).

The European Grouping of Territorial Cooperation NOVUM (EGTC NOVUM) was established in 2015. The Convention and Statute of the Grouping were signed in September of that year, while its legal personality was established in December. NOVUM operates in the Polish-Czech borderland. Its founders and members are institutions from the Czech Republic and Poland. There are five regional authorities: one from Poland – Dolnośląskie Voivodship (Region) and four from Czech Republic (Hradec Králové Region, Liberec Region, Olomouc Region and Pardubice Region), as well as two Polish-Czech Euroregions: Nysa and Glacensis. NOVUM was established in order to intensify, facilitate and promote Polish-Czech cross-border cooperation aimed at the strengthening of economic and social cohesion of the area of operation of the Grouping. NOVUM conducts its activities based on the Strategy



of integrated cooperation of the Czech-Polish border 2014-2020. The main areas of activities are: economic cooperation, transport, environmental protection, health protection, spatial planning and administrative problems.

The literature emphasizes that the creation of EGTC NOVUM increases the economic attractiveness of the Polish-Czech borderland area and that this grouping, as a new subject of European Union law, advances the Polish-Czech cross-border cooperation in the implementation of the European Union's regional policy (Adamczuk, 2015). It is also pointed out that the Polish-Czech borderland has become a model example of the most innovative cross-border cooperation. The first Euroregions in Poland were created here, followed by the European Grouping of Territorial Cooperation (EGTC). For example, December 2016 marked the twentieth anniversary of the Polish-Czech Euroregion Glacensis. However, there is still untapped potential. Overcoming difficulties in contacts and effective implementation of new forms of cooperation may increase the chances for development of this region (Skorupska, 2014).

Sustainable development is a widely accepted concept of development. Currently, striving for sustainable development is one of the biggest challenges. This concept is implemented at various levels of development from international, through national, regional to local. Sustainable development is a concept that integrates various aspects. Research concerning the implementation of sustainable development takes into account the social, economic, environmental and institutional dimensions. The monitoring of this development concept is carried out using indicators that describe each of the areas included in sustainable development. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In its essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in

harmony and enhance both current and future potential to meet human needs and aspirations (WCED, 1987). The subject literature lists three basic qualities of sustainable development, i.e. sustainability, durability and self-sustenance. T. Borys indicates that the concept of sustainable development refers to a process of changes which is characterized by an attribute of sustainability evaluated positively from the point of view of at least anthropocentric system of values or – briefly, though less precisely – to development which has an attribute of sustainability (Borys, 2005; Borys, 1999; Michałowski, 2012). At this point, it should be emphasized that despite many years of research and discussions, this concept has not received any clear and uniform definition. As a partial explanation of the emerging differences, one can point to an extensive and complex number of elements included in the concept of sustainable development. One of the most frequent inaccuracies and simplifications is reducing sustainable development to environmental or ecological aspects (Pawłowski, 2011; Faucheux et al., 1998).

The article attempts to determine the degree of implementation of sustainable development in the EGTC NOVUM area. In order to achieve this objective, indicators describing the social, economic and economic situation have been selected from generally available statistical sources for Dolnośląskie Voivodship, Hradec Králové Region, Liberec Region, Olomouc Region and Pardubice Region. The analysis was carried out in the years 2014-2016. Among the indicators selected for analysis were, inter alia: gross domestic product per capita, expenditure on R&D, employment rate, unemployment rate, gross fertility rate, protected areas. The analysis will show how the concept of sustainable development is implemented in the area of EGTC NOVUM. The spatial diversity of individual indicators and their changes in the analyzed period will be shown.

2. Research methodology, sustainable development indicators

Indicators represent quantity specific tools which



synthesize or simplify the data crucial for the assessment of certain phenomena. These tools are useful in communicating, assessing and making decisions (Geniaux et al., 2009). Indicators are the basic instruments used in the monitoring of sustainable development, since they present such a concept of development in a rational and measurable way (Borys, 2005). Sustainable development indicators can be defined as a statistical measure that gives an indication on the sustainability of social, environmental and economic development (UN, 2003).

The indicators used for the purposes of the conducted analyses allow for the analysis of progress in the implementation of sustainable development in the selected territorial units (regional level in this case), in accordance with the European Union's approach to the measurement of sustainable development. Sustainable development is a diverse phenomenon that integrates the economic, environmental and social dimensions. In order to conduct an analysis regarding the implementation of sustainable development, one should select the indicators describing each of these areas. The list of the selected indicators is presented in tab. 1.

Table 1. Sustainable development indicators chosen for EGTC NOVUM area

No.	Indicator
1.	GDP per capita (EUR)
2.	General unemployment rate (%)
3.	Infant mortality rate
4.	Population ages 65 and above (% of total)
5.	Life expectancy at birth, Males
6.	Life expectancy at birth, Females
7.	Percentage of households with Internet access
8.	Physicians per 1,000 population
9.	Registered criminal offences per 1,000 population
10.	Municipal waste per capita (kg)
11.	Share of population supplied with water from public water supply systems (%)
12.	Share of population living in houses connected to public sewerage systems (%)

Sources: Own elaboration

For each of these indicators, data for the years 2014-2016 were collected and subsequently analyzed. This made it possible to show the basic values characterizing the phenomenon of sustainable development in the EGTC NOVUM area. This is the first analysis for this area. The main difficulty was the selection of indicators for which comparable data would be available. The ability to present indicators Table 2. Population and area of EUWT NOVUM

at the regional level is always very limited due to the availability of data. However, it is very important to conduct this analysis. The establishment of EGTC NOVUM resulted in the creation of a joint cross-border Polish-Czech region of approximately 37.7 thousand km², which is inhabited by over 5 million people (Table 2).



Region	Population (persons)	Area (km ²)
Dolnośląskie	2 930,710	19,947
Hradec Králové	550,804	4,759
Liberec	440,636	3,163
Olomouc	517,087	4,519
Pardubice	633,698	5,271
Total	5 072,935	37,659

Sources: Statistical yearbook Dolnośląskie Voivodship (2017), Statistical yearbook of the Liberec region (2017), Statistical yearbook of the Hradec Králové region (2017), Statistical yearbook of the Olomouc region (2017), Statistical yearbook of the Pardubice region (2017).

Out of all of the inhabitants of the EGTC NOVUM area, 58% live in Poland, and 42% in the Czech Republic. The area on the Polish side constitutes almost 53% of the entire NOVUM area. Therefore, the EGTC forms an area of cooperation split roughly in half between the two countries, both in terms of population and area. Before the creation of NOVUM, the "large" Polish voivodship was cooperating with

the relatively "small" Czech regions.

3. Results

The analysis included selected indicators for which comparable data for all regions could be obtained. The values of individual indicators in 2014-2016 are presented in tab. 3.

Table 3: Sustainable development indicators in the EGTC NOVUM members in the years 2014-2016

Region	2014	2015	2016
GDP per capita EUR			
Dolnośląskie	11,954	12,477	12,290
Hradec Králové	13,043	13,858	14,835
Liberec	11,539	12,356	13,032
Olomouc	11,571	12,271	12,828
Pardubice	12,097	12,993	13,330
General unemployment rate (%)			
Dolnośląskie	10.4	8.5	7.2
Hradec Králové	6.2	5.6	4.1
Liberec	6.5	5.5	4.4
Olomouc	7.7	5.9	3.7
Pardubice	6.4	4.6	3.7
Infant mortality rate			
Dolnośląskie	4.6	3.8	3.8
Hradec Králové	2.4	1.8	3.2
Liberec	2.5	2.1	2.6



Olomouc	4.5	2.9	2.5
Pardubice	2.2	1.9	1.8
Population ages 65 and above (% of total)			
Dolnośląskie	15.52	16.2	17
Hradec Králové	19	19.6	20.2
Liberec	17.6	18.3	18.9
Olomouc	18.2	18.7	19.3
Pardubice	18	18.5	19
Life expectancy at birth, Males			
Dolnośląskie	73.1	73.2	73.5
Hradec Králové	76.19	76.64	76.96
Liberec	75.09	75.67	76.15
Olomouc	74.5	74.95	74.43
Pardubice	76.08	76.35	76.41
Life expectancy at birth, Females			
Dolnośląskie	81.1	81	81.4
Hradec Králové	81.84	81.89	82.23
Liberec	81.47	81.45	81.82
Olomouc	81.38	81.02	81.55
Pardubice	81.61	82.06	82.38
Percentage of households with Internet access			
Dolnośląskie	68.4	72.2	72.9
Hradec Králové	71.5	73.8	75.4
Liberec	69.1	71.2	72.9
Olomouc	62.2	65.2	67.3
Pardubice	71.3	73.3	75
Physicians per 1,000 population			
Dolnośląskie	2.2	2.3	2.3
Hradec Králové	4.7	4.5	4.6
Liberec	3.9	4	3.9
Olomouc	4.8	4.8	4.8
Pardubice	4.1	3.9	4



Registered criminal offences per 1,000 population			
Dolnośląskie	21.1	20	19
Hradec Králové	18.5	15.6	13.2
Liberec	28.8	25.4	20.9
Olomouc	22.1	19.9	18.3
Pardubice	16.2	13.2	11.5
Municipal waste per capita (kg/per year)			
Dolnośląskie	324	340	361
Hradec Králové	272	295	304
Liberec	272	295	304
Olomouc	312	330	350
Pardubice	303	315	332
Share of population supplied with water from public water supply systems (%)			
Dolnośląskie	94.8	94.9	94.9
Hradec Králové	93.8	94.4	94.9
Liberec	91.8	92.7	92.7
Olomouc	90.5	91.4	91.8
Pardubice	97.3	97.6	97.5
Share of population living in houses connected to public sewerage systems (%)			
Dolnośląskie	75	75.7	76.3
Hradec Králové	77.1	78.1	78.5
Liberec	68.5	68.9	69
Olomouc	80.5	82.4	82.9
Pardubice	72.8	73.7	74.4

Source: Own elaboration based on Statistical yearbook Dolnośląskie Voivodship (2017), Statistical yearbook of the Liberec region (2017), Statistical yearbook of the Hradec Králové region (2017), Statistical yearbook of the Olomouc region (2017), Statistical yearbook of the Pardubice region (2017).

In each of the analyzed years, the Hradec Králové region had the highest GDP per capita. The lowest value in 2014 was recorded in the Liberec region, in the following year in Olomouc and in 2016 in Dolnośląskie. It should also be emphasized that the regions are slightly diversified in terms of this indicator.

The highest unemployment rate throughout the

analyzed period occurred in Dolnośląskie. The lowest rate in 2014 was recorded in the Hradec Králové region, in 2015 in the Pardubice region, and in 2016 in the Olomouc and Pardubice regions. The regions are little different in terms of unemployment rate, but this variation is increasing.

The lowest infant mortality rate in 2014 and 2016



occurred in the Pardubice region, and in 2015 in the Hradec Králové region. The worst situation in each of the analyzed years was in Dolnośląskie. It is also worth emphasizing that the regions are moderately different in terms of this index and this diversification is diminishing each year.

The lowest share of population aged 65 and above (% of total) in each of the analyzed years occurred in Dolnośląskie, while the highest share was recorded in Hradec Králové. The regions are slightly different in terms of this indicator and the variation is getting smaller each year.

The shortest life expectancy at birth, both for women and men, occurred in the Dolnośląskie voivodship in each of the analyzed years. Life expectancy for men was the longest in the Hradec Králové region each year. For women, it was the longest in Hradec Králové in 2014 and in the Pardubice region in subsequent years. The regions show virtually no differentiation in terms of these indicators.

The next indicator analyzed was the percentage of households with Internet access. The research conducted shows that this share has been increasing in each of the regions from year to year. The minimum value in each of the analyzed years was recorded in the Olomouc region, and the maximum in the Hradec Králové region.

The lowest number of physicians per 1,000 population in each of the years was recorded in Dolnośląskie region, and the highest in Olomouc region. It is worth noting that in the Czech regions the value of this indicator is almost twice as high as in the Polish region. Diversity in each of the analyzed years was on the average level.

The highest rate of registered criminal offenses per 1,000 population in each of the analyzed years occurred in the Liberec region and the lowest in the Pardubice region. A positive phenomenon is the diminishing value of this indicator for the period.

The largest amount of municipal waste per capita (kg) in each of the surveyed years was produced in the Dolnośląskie Voivodship, and the least in the

Hradec Králové region. An unfavorable phenomenon is the year-by-year increase in the amount of waste generated.

The percentage of water supply systems (%) in the surveyed regions is at a high level exceeding 90%. The lowest was recorded in the Olomouc region, and the highest in the Pardubice region.

The share of population living in houses connected to public sewerage systems (%) was on a lower level. The highest value was recorded in the Olomouc region and the lowest in Liberec.

4. Results and discussion

EGTC NOVUM is a grouping that has been functioning for less than 3 years. Its activity focuses on building partnerships between entities in the area of its operation. Nevertheless, sustainable development of the entire area seems to be an important issue. The attempt to analyze the implementation of the concept of sustainable development based on selected indicators showed some very important issues. First of all, the Czech and Polish regions are very similar to each other in terms of the majority of indexed indicators. Differentiation at a noticeable level can be noted in relation to the following indices: Infant mortality rate, physicians per 1,000 population and registered criminal offenses per 1,000 population. Another very important conclusion that can be formulated is the fact that positive changes can be observed for all indicators except municipal waste per capita. In the case of the stimulant, the value of the indicators increases, and in the case of the destimulant decreases. The analysed regions are very similar to each other. The creation of EGTC NOVUM will, however, contribute to strengthening the cooperation between them. It will be possible to implement common projects, which in turn may contribute to a more complete implementation of the idea of sustainable development. The projects currently being implemented concern all areas of sustainable development. There are projects concerning cooperation in the fields of economy and environmental protection, as well as social aspects. The effects of these projects will be visible in a few



years. After this time, it will be also possible to estimate the impact of NOVUM on the implementation of the idea of sustainable development in the Czech-Polish borderland.

5. Conclusions

In conclusion, it should be stated that EGTC NOVUM is an important instrument of cross-border cooperation between Poland and the Czech Republic. Its activity has a significant impact on strengthening cooperation between entities in the area of its operation. This attempt at an analysis was the first to concern the scope of implementation of the concept of sustainable development. It was carried out based on available indicators for which comparable data could be obtained. This analysis has shown that it is necessary to carry out comprehensive quantitative research to determine the progress in implementing this development concept. The analysis also showed a very close resemblance between the Czech and Polish regions. It can therefore be pointed out that this area shows little diversity and that the regions are very similar in many aspects.

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THE BURNOUT SYNDROME AS A FACTOR INFLUENCING THE QUALITY OF LIFE

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Abstract

The article is concerned with the problematics of the burnout syndrome. It defines the basic theoretical background and causes for this phenomenon including its identification; together with the most frequent methods and techniques used to detect the degree of exposure to the burnout syndrome on the theoretical and practical levels. The empirical part analyzes the results of the research that was realized in selected Retirement Homes in Ústí nad Labem and Chomutov areas. Our aim was to detect the degree of the burnout syndrome among assisting professions; namely, among social workers employed in those Retirement Homes.

Key words: *social worker, burnout syndrome, diagnosis of the burnout syndrome, questionnaire*

1. Introduction

The term "Burnout Syndrome" often comes in connection with workplaces, where the target groups are clients or customers. Nevertheless, the first references to this phenomenon are associated with alcoholics, who could only focus on their primary want for alcohol and nothing else (the 1980s). Later, this term was associated with the area of drug addicts or addictions as a whole, where the motivation of these people narrowed down solely to drugs. With time, the term started to break into other areas; it is possible to claim that it was the previous name for workaholics (a person feeling exhausted, overworked, overwhelmed by everyday obstacles, the individual starts to behave anti-socially).

1.1 Definitions

H. J. Freudenberger used this term for the first time. In his article Staff Burn-Out, published in Journal of Social Issues, he defined the burnout syndrome as an „*extinction of motivation and incentive impulses in situations, where the care about an individual and dissatisfactory relationships are the cause for the absence of desired work results*“ (Freudenberger, 1974). The syndrome is associated with a state of physical and mental exhaustion after tiring long-term stress. It means "*the loss of all energetic resources of originally very intensively working*

person (e.g. people, who are trying to help others in their hard times and feel overwhelmed by problems of others afterwards.)" (Freudenberger, 1974). The first research demonstrating the existence of the burnout syndrome was realized among the service personnel of health institutes "Free Clinics"¹. Later, it was found out that it is possible to use the concept of the burnout syndrome also in conventional and adequately paid job positions: doctors, psychiatrists, nurses, teachers and also social workers in different types of facilities offering social services or perceived as assisting professions.

There is a lot of definitions, which specify the burnout syndrome; they differ according to dynamics of perception: some of them concentrate on the terminal state – emotional, physical and mental exhaustion, some of them perceive burnout as a process with its own specific development. Angelika Kallwass (2007) describes the burnout syndrome as a state of extreme exhaustion, inner distance, a strong decrease in efficiency and adds also other different psychosomatic difficulties. According to the Psychological dictionary, the burnout syndrome represents "the loss of professional interest or personal concern within workers in the area of assisting professions" (Hartl, Hartlová, 2009). The definition by Maslach is this: „*Burnout is a syndrome involving emotional exhaustion, depersonalization and decrease in*



personal performance, and a diminished sense of personal accomplishment that occurs among various professionals who work with other people in challenging situations." (Maslach, Leiter, 2012). J. Křivohlavý (2012) offers in his book quite a holistic idea of the development, differences and common features of definitions. The definitions are usually consistent in claiming that the syndrome is "a psychological state, characterized by exhaustion and decrease in work performance as a consequence of intense long-term stress" (Pešek, Práško, 2016). The burnout syndrome may be described as a mental state of people working with other people and those, whose profession is dependent on communication between people. This state signifies a whole number of symptoms: a person feels overall bad, he or she is emotionally, mentally and physically exhausted. They have feelings of frustration and despair, no drive to work nor joy of living (Tošner, Tošnerová, 2012).

The burnout syndrome occurs mostly within "committed helpers", i.e. people for whom interpersonal contact is an everyday routine and is absolutely crucial for their professions." *The burnout syndrome is always the resultant of the interaction between the work conditions, in which the assisting professional works and the subjective expectations of a particular worker*" (Hrozenská, Dvořáčková, 2013).

In some cases, the burnout syndrome is confused with the boredom syndrome (the so-called "boreout" is described as a counterpart to "burnout" - lack of workload, lack of interest and boredom)¹. We can, however, consider common features such as:

- Presence of negative emotional states (depression, exhaustion, despair, hopelessness, aggression, inferiority, total devotion)
- Consistency with certain types of professional orientation (risk rate)
- Lower efficiency of work of the burnout person cannot be associated with bad working habits or skills (bad working

ethics), but with negative attitudes (and behavior based on those attitudes)

- Emphasis is placed (above all) on mental symptoms and behavioral factors, but psychosomatic or physical symptoms cannot be underestimated
- The burnout syndrome occurs in otherwise mentally healthy people, it is not related to psychological pathology.

As Křivohlavý (2012) says, in helping professions it is important to burn but not to burn out.

2. Theoretical background and influencing factors

Due to the fact that the burnout syndrome cannot be detected by "hard" data, i.e. by the classical investigation techniques, its causes can be called multifactory. The panel of experts agrees on a set of external determinants, the most common of which is the long-term experience of the stressful situation. Kallwass (2007) states that the following elements can be included: conflict of roles, excessive expectations, lack of autonomy, relationship conflicts, a lot of work and disproportionate time to fulfill it, high responsibility (too burdensome), lobbying or bossing at the workplace; and others.

At the same time, it may be the intersection of professional and personal levels (family, partner) where it is not explicitly stated that any individual facing any of the external burdens may be endangered and affected by the burnout syndrome. For this condition, the mental area (resistance) is important, when the first signs of the burnout syndrome begin to appear when the external stresses touch the limits of the physical and mental capabilities and the possibilities given by the personality of the individual (Kallwass, 2007). These data are also confirmed by V. Kebza and I. Šolcová (2003) and Ch. Stocka (2010), according to whom the burnout syndrome is a consequence of the current exposure to three risk categories, namely categories associated with the work sphere, categories belonging to the sphere of non-working life and categories related to personality (Pešek, Práško 2016)



2.1 Risk of the working environment

According to Stock (2010), this can include an increased workload, a lack of autonomy, and a permanent control restricting one's own creativity, which in some cases can lead to minimal (or no) self-realization. If we add a lack of recognition, inadequate job evaluation (both tangible and intangible), an inconsistency of personal values and organization values (often a conflict or even alienation), the level of demotivation is very high and the possibility of the burnout syndrome is also high. We mustn't forget to mention the function of the working team, its possible malfunction as one of the factors contributing to the emergence of the burnout syndrome.

2.2 Risk outside the workplace

Pešek, Práško (2016) state that the primary non-work factors include those related to the partner's (family) status (absence of a partner, existence of a misguided or too ambitious partner, conflicting love relationship, lack of deeper love relationship) or personal factors related to self-realization and a healthy lifestyle (lack of hobbies and interests, lack of physical movement, bad eating, high number of difficult life situations, poor living conditions - housing, finances) etc. From the sociological point of view and the position of the aging society, it is possible to include to this category also the need to take care of an aging generation of parents or grandparents.

2.3 Personal Risk Factors

Stock (2010), in his publication, states that for each individual, certain elements and rules of behavior can be traced, allowing us to divide them according to their typology into type "A" and type "B". Type A is characterized by competitive, impatient behavior, the individual is a highly ambitious perfectionist, with a strong sense of duty, inclining to aggression. Type "B" is marked by the behavior to the other side of the polarity profile - less hostile, less aggressive, less competitive, more patient, calm and relaxed, which can lead to persistent inactivity and deep

dissatisfaction with low engagement, initiative, and motivation. Pešek, Práško (2016) also add low self-esteem among the personality factors, a high degree of empathy, exceeding expectations and enthusiasm at work, a tendency to suppress emotions, low assertiveness, mental health hygiene, etc. In his book, *Burnout Syndrome of Social Workers* (2012) Maroon complements Kallwass and Křivohlavý with personality risk factors such as age, gender, education, marital status, or a number of years worked.

3. Methods for "measuring" the burnout syndrome

We generally use different types of questionnaires or an additional interview to identify the burnout rate. Křivohlavý (1998) introduces the use of the so-called semantic differential, working with bipolar adjectives – extreme in both directions. Basic methods include self-observation, observation by other people or anamnestic interview (self-diagnosis techniques). Hawkins, Minirth, Maier, and Thurstman present a method of recognizing the mental state of the person, whether or not it is a state of psychological burnout. The questionnaire created by them is based on simplicity, speed and anonymity *"it has a great merit in respecting mental burnout as a process (a forward-going action) and not as a static current state. It regards the birth of this mental state, its development, progress, and culmination."* The questionnaire is based on 24 questions - a statement to which person answers either "yes" or "no". Among the statements are, for example, "I am getting headaches more and more often" or "I feel helpless and I do not know how to get out of the problems I have."

3.1 Questionnaire BM (Burnout Measure, Psychic Burnout)

The questionnaire contains 21 questions, the authors of this questionnaire are Dr. Aiala Pines, Ph.D. and Elliot Aronson, Ph.D. The respondent decides, using the intensity scale of 1-7 for each phenomenon, how high the intensity of perception corresponds to his or her experience. These are answers to simple questions. It identifies the intensity of total exhaustion, i. e. physical, emotional



and mental exhaustion. It is the second most commonly used tool to measure the burnout syndrome in the world.

3.2 Maslach Burnout Inventory (MBI)

At the time of its introduction in 1981, this technique was originally designed to measure the rate of burnout in assisting professions. It focuses on sub-scales characterized as emotional and physical exhaustion, depersonalization and personal accomplishment. According to the author, the method shows a relatively high reliability (the intrinsic consistency value for individual sub-scales ranges from $r = 0.71$ to $r = 0.90$, the "test-retest" reliability is in the range $r = 0.53$ to $r = 0.82$). In 1996, MBI-GS, the general survey (Schaufeli et al., 1996) was created, and the items were modified so as to reflect the employee's exhaustion based on work in general, not particularly on work with other people. The depersonalization item, renamed to cynicism, now reflects a sense of disconnection, a sense of distance to work as such instead and to other people, and the factor of personal effectiveness has then expanded to include both social and non-social aspects of work. Factor analysis confirmed that the three-factor structure was maintained regardless of the type of job position of the respondent or his nationality (Schaufeli et al., 2000).

After 2000, new diagnostic methods - OLBI (Oldenburg Burnout Inventory) or CBI (Copenhagen Burnout Inventory) - have been used as part of diagnostic tools (Halbesleben, Demerouti, 2005).

4. Methods for the research and results

In our research, we were occupied by identification of the level of the burnout syndrome within social workers in chosen institutional facilities of social services – Retirement Homes (DpS) in Ústí and Chomutov areas.

The target group was formed by social workers and workers in social services regarding the fact that all those are working positions with a direct contact to the client. Therefore, based of its nature and job

description, they are becoming vulnerable by the possibility of the burnout syndrome emergence.

The aim of our research was to figure out the level of the burnout syndrome in three areas (sub-scales) – the factor of emotional and physical exhaustion (EE), the factor of depersonalization (DP) and the factor of personal accomplishment (PA) and to identify the main risk factors connected with the rise of the burnout syndrome (personal, spare-time, related to workplace) at the same time. Some of the authors introduce and specify also the physical exhaustion (PE), however, most of it is perceived as EE. The MBI questionnaire was used to ascertain the data; we had specified the particular data with the help of a follow-up questionnaire with open questions and in some cases even with an individual or group interview.

The emotional exhaustion (EE) is described as a loss of joy of life, a person has not enough strength to do anything, he or she is demotivated. Another factor is depersonalization (DP), which is a mental exhaustion emerging in people, who have an urgent need for positive feedback (reciprocity) from those, who they occupy themselves with. If they get no reciprocity, the workers get cynical, they stop to see others as human beings, they lose respect for others and in worse cases, they start to treat people as inanimate objects. The last factor is a personal accomplishment (PA). The degree of PA depends on personal pre-conditions as well as on extrinsic factors, such as working environment, staff, attitude and support of superiors. In some studies, this factor is identified as a significant factor for the decrease in work performance.

4.1 Research in Ústí area

In the area of Ústí, the Retirement Homes Orlická, Dobětice, Severní Terasa, Bukov and Chlumec were addressed; the total of 147 questionnaires were distributed and 108 questionnaires were filled and given back. The overall return on questionnaires is 73 %. The respondents were social workers, workers in social services and health-care workers, who at least partly practiced some of their work duties in social services and hence can be classified as assisting professions.



Table 1: Return on questionnaires

	Distributed questionnaires	Returned questionnaires	Return on questionnaires (in %)
Orlická	15	9	60
Dobětice	60	45	70
Bukov	30	21	75
Severní Terasa	15	9	60
Chlumec	27	24	89

Source: Own calculation

Table 2: Length of practice (in years of employment)

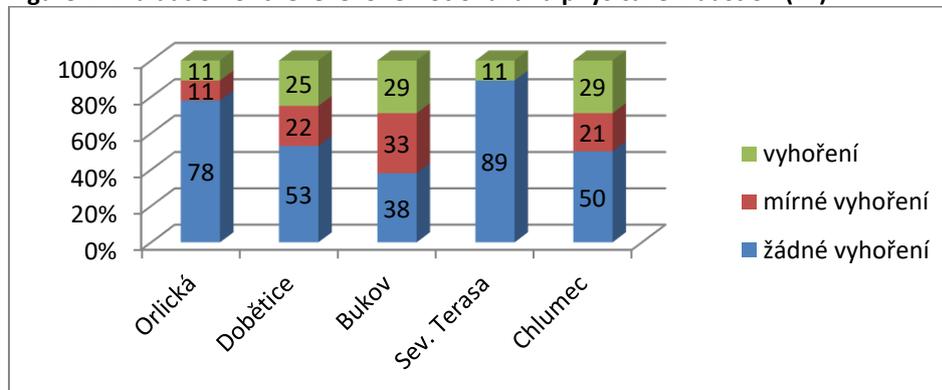
	0-5	6-10	11-15	16-20	21-25	26 and more
Orlická	4	2	1	1	0	1
Dobětice	17	13	4	8	1	2
Bukov	7	7	3	1	1	2
Severní Ter.	2	1	2	0	2	2
Chlumec	10	1	2	1	6	4

Source: Own calculation

In terms of gender, the sample is gender unequal; out of the total number of respondents, only 5 were men, which is a very typical situation in the area of assisting professions. In our research, we were also

investigating the structure according to age and education, however, for the use of this article the data are not significant, as well as the position held (Paulík, 2004).

Figure 1: Evaluation of the level of emotional and physical exhaustion (EE)



Source: Own calculation

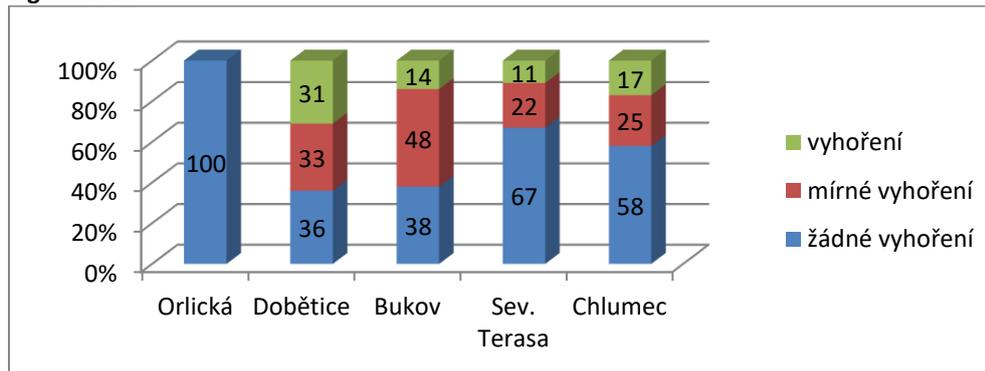
Due to possible comparison, the data are introduced in percents, it can be said, that in the terms of the level of emotional and physical exhaustion, we can find the highest number of endangered workers in DpS Chlumec and Bukov, which partly corresponds to the length of practice. Researchers prove that the most endangered people are those with a short practice (new information, disillusionment, surprise, shock) and then those with a long practice (fatigue, apathy, lack of interest).

Evaluation of the level of depersonalization factor (DP)

Depersonalization is a state, when a person is not able to perceive those, to whom he or she is helping, as full-fledged human beings (Křivohlavý, 2012). Dullness or a loss of emotions appear with him or her, which leads to cynical or even inhuman attitudes towards clients. This state and attitudes reflect in client care.



Figure 2: DP



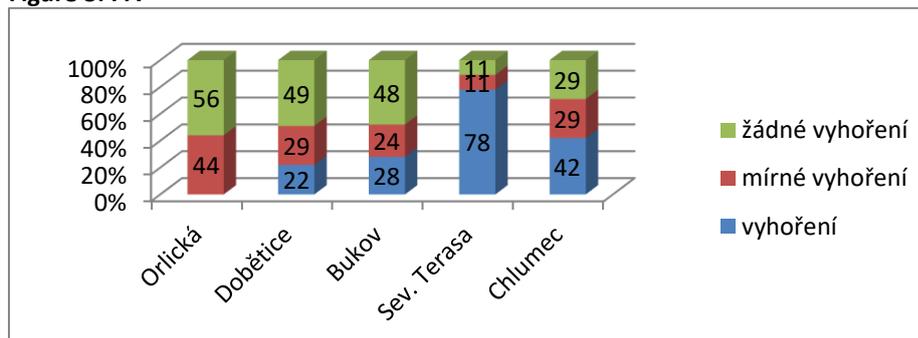
Source: Own calculation

In the sub-scale of depersonalization, differences between each DpS are remarkable. An interesting detail is from Orlická, where the workers have no problem with depersonalization, which might be caused by the high number of worked years; the people with long practice know what to expect from their job and how to deal with difficulties.

Evaluation of the personal accomplishment factor (PA)

The feeling of personal work accomplishment depends on personal pre-conditions as well as on extrinsic factors, such as working environment, staff, attitude and support by superiors and overall socio-psychological conditions of work.

Figure 3: PA



Source: Own calculation

The results of research related to the factor of personal work accomplishment reported alarming numbers in DpS S. Terasa, where 7 respondents (78 %) are already in the area of burnout and only 1 respondent (11 %) shows no burnout in this area.

The resulting values may be related to a perceived lack of support from executives that has been identified through supplementary questions in this DPS.

Figure 4: Overall summary

Factors MBI Level of Burnout	EE	DP	PA
None	59 (55 %)	53 (49 %)	45 (42 %)
Moderate	23 (21 %)	33 (31 %)	30 (28 %)
Burnout	26 (24 %)	22 (20 %)	33 (30 %)

Source: Own calculation

A moderate burnout of 23 (21 %) respondents and burnout in 26 (24 %) respondents was found in the

emotional and physical exhaustion factor (EE) factor. In the case of the depersonalization factor (DP), 33



(31 %) respondents with mild burnout were identified and 22 (20 %) respondents already crossed the burnout threshold. In the area of personal accomplishment (PA), the results showed moderate burnout in 30 (28 %) respondents and burnout in 33 (30 %) respondents. As far as the overall results are concerned, they can be labeled as slightly worrying, since they do not reach critical values in any of the three factors but they are in moderate burnout values (EE - average 17.9, DP - average 7.5, PA - average 33.54).

When comparing the burnouts in the DP and PA area with a self-perceived threat, most of the respondents who did not answer the question of their own threats, were identified in the areas of burnout. In the area of DP, there are 5 respondents out of the total of 8, and in the area of PA there are 6 respondents out of 8 who did not answer this question. This may be due to the fact that these

respondents do not want to admit their threats and therefore prefer not to answer the question (the problem of imperfect self-reflection, which is one of the symptoms of a particular stage of the burnout syndrome). Out of the total of 108 respondents, eight reported burnout in all three areas, and 12 respondents did not report burnout in any area, two respondents said they had had burnout in the past.

4.2 Research in Chomutov area

In the area of Chomutov, we have addressed DpS Chomutov - Písečná, Kadaň, Klášterec nad Ohří and Vejprty. Overall number of 90 questionnaires was distributed and 70 questionnaires were given back, i. e. the overall return on questionnaires was 85,5 %. It is possible to classify all the respondents as assisting professions. The sample was again gender unequal; the women were represented by 70, men by 7 in total.

Figure 5: Return on questionnaires

	Distributed questionnaires	Returned questionnaires	Return on questionnaires (v %)
Kadaň	30	23	77
Klášterec n. Ohří	20	18	90
Chomutov	20	16	80
Vejprty	20	20	100
Total	90	77	85,5

Source: Own calculation

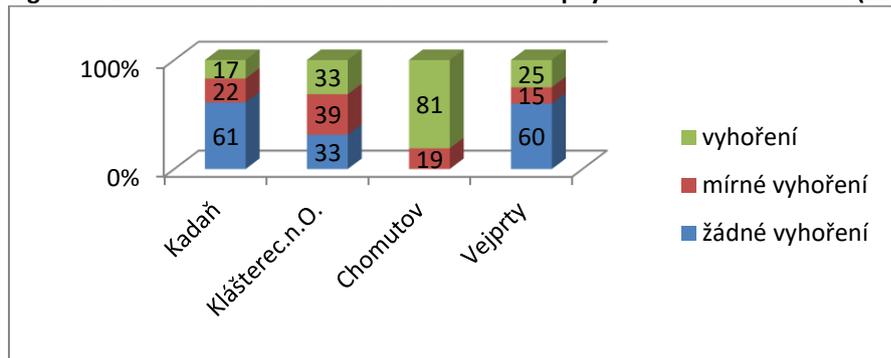
Figure 6: Length of practice

	0-5	6-10	11-15	16-20	21-25	26 and more
Kadaň	7	8	1	0	0	6
Klášterec n. Ohří	4	1	1	7	3	2
Chomutov	8	3	2	0	0	3
Vejprty	11	3	3	1	1	1

Source: Own calculation



Figure 7: Evaluation of the level of emotional and physical exhaustion factor (EE)

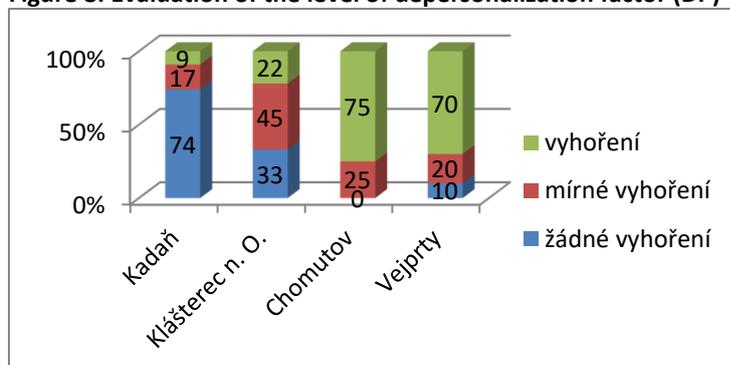


Source: Own calculation

From the chart above, it is apparent, that most problematic from the point of view of the burnout syndrome is Chomutov with its high level of

emergence, or the process already in progress. Kadaň and Vejprty have this representation on a low level.

Figure 8: Evaluation of the level of depersonalization factor (DP)

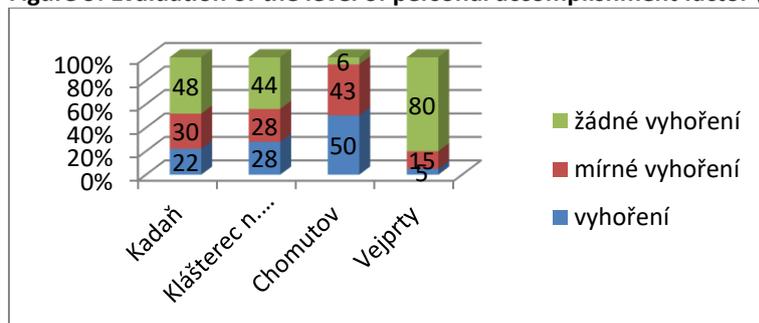


Source: Own calculation

14 questioned people suffer from the strongest feeling of DP in DpS in Vejprty, right on the second place is DpS Chomutov – Písečná. An interesting fact is that in DpS Vejprty, as it is possible to see in the chart n. 4, there is low EE even though most of the questioned people suffer from DP. Eight out of eighteen respondents in DpS Klášterec characterized themselves with a moderate feeling of the burnout syndrome in the area of DP. As well as on the chart

n. 4, the chart n. 5 shows the fact that in DpS Kadaň we can find the lowest number of workers threatened by the burnout syndrome in EE and DP area – the level of burnout among employees is there very low. We assume that it is caused by preventive measures, which are in DpS Kadaň realized and close cooperation of superiors and subordinates.

Figure 9: Evaluation of the level of personal accomplishment factor (PA)



Source: Own calculation



As we can see from the chart, the most work accomplishment is perceived among the workers in Vejprty and Kadaň, as DsP Kadaň undertook transformation to a higher application of the process of reconciliation of private and working life; quite often there are non-professional events organized not only for employees but also for their family members. At DpS Vejprty, this information is not very much correlating with the fact that employees of this facility have the highest DP rate. Possible reasons for this may be the significant personnel changes that took place at the time of the investigation (or shortly before its implementation), and the DpS currently has relatively young service staff, which is related to the shorter practice in the field of assisting professions. On the contrary, DpS Chomutov Písečná proves the highest percentage of professionally burnout people, but this situation is also similar to other sub-scales (EE and DP).

From the other additional information, the total number of 77 respondents show burnout in all three measured areas of 6 respondents, 16 respondents out of the total 77 have a low level of EE and DP and a high level of PA (therefore, they are not endangered by the burnout at the time of the measurement at all), two respondents from the total sample were found with moderate values for all EE, DP and PA scales. These workers may be expected to experience burnout syndrome in the event of a deterioration of their working and/or private conditions, and the application of specific, up-to-date and workable preventative measures will not be taken into account.

5. Discussion

In International Classification of Disease ICD-10, Burnout Syndrome is included in category Z 73.0 - extinction/burnout, state of life exhaustion. The category is included in the chapter Health Factors and Contact with Health Services, depending on the clinical picture, can be classified as Diagnosis Neurotic Disorders or Reaction to Heavy Stress and Disability Adaptation - In chronic stress, as a link to working life. That is why we can say that this is a phenomenon that we will encounter more and more often, and organizations should, in their own

interest, implement preventive measures to eliminate the risk.

There are a number of factors involved in the occurrence of the burnout syndrome (as mentioned above), which is a multispectral phenomenon. But a great number of measures against its origin could be applied and initiated.

As our research has shown, we can distribute the employees in Retirement Homes into groups at different risks of the burnout syndrome, especially thanks to factors resulting from the nature of their work. Main preventive measures should include regular supervision, leadership and staff meetings of the organization, verification of employee satisfaction (in the context of performance evaluation and performance feedback), adequate financial evaluation, reduction of administrative burdens, promotion of reconciliation of professional and personal interests, effective education, selection of suitable workers (psychological resistance), application of principles of mental hygiene, etc.

6. Recommendations and conclusions

The burnout syndrome is a phenomenon, whose perception is to a certain extent subjective and individual and in its social level, it is perceived on the basis of many factors, which are not always correctly specified and identified by respondents. Some factors influencing the possible emergence of the burnout syndrome could be defined as factors of the organization itself, some are perceived by the respondents intuitively, the personality of the employee plays an important role as well.

And exactly these facts influence different results in the individual analysed organisations, where a relatively strong influencing factor can be especially the relationship and approach of superiors and their ways of management, motivation, participation in tasks and supervision of employees in their direct care for the clients.

From the point of view of the organisation, the following events could be used as preventive measures against the burnout syndrome emergence:



- Regular appointments of employees
- Education for employees
- Supervision
- Individual approach and individual appointments
- Providing relief at work with a higher physical and psychical load

From the point of view of the employer (on the basis of the question about experience, which may help to prevent or manage the burnout syndrome in respondents) the following measures could be recommended and applied:

- Spending more time with families and friends
- Pastime activities, interests, creative activities
- Sport, exercises, walks in nature, trips
- Physical work, manual activities, work in the garden
- Possibilities to speak to colleagues, share feelings
- Good sleep, holiday
- Positive thinking, joy of life, details
- Relaxation, reading, stress-relaxing activities
- Good planning of working activities
- Separation of working and free time
- Work on his or her own personality, setting values, reasonable grade of empathy
- Not expecting the problems, rather solving them when they come

The aim of our research was not an identification of single factors, causing the burnout syndrome, but the effort to find out, to what extent the employees perceive their score in individual described subscales and what has a significant influence on that. The research has shown that the employees in assisting professions are threatened by the burnout syndrome to a high degree, but on the other hand, they realize this fact and in most cases, they are able to work with this information and they try to prevent it or to currently manage and solve it.

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TYPOLOGY OF THE EU COUNTRIES IN TERMS OF INNOVATION IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT ASSESSMENT

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Abstract

The purpose of the study is separating the relatively homogeneous classes of the EU countries in terms of innovation in the context of sustainable development. Sustainable development monitoring is based on a set of systematized indicators in the areas of social, economic, environmental and institutional-political order. Among the numerous observed processes and phenomena, the ones which combine the orders, contributing to coherent development (integrated order) are of particular importance. Innovation remains one of such characteristics. Its measurement in the research on sustainable development is carried out using 6 indicators (share of net revenues on the sales of innovative products in net revenues on total sales, share of human resources in science and technology as percentage of economically active population, percentage change in labour productivity, expenditure on R&D against GDP, eco-innovation, the number of inventions filed by residents to the European Patent Office per 1 million population). The data collected within their framework (source - Eurostat) were adopted as the basis for the EU countries classification in terms of their capacity to develop and implement innovations. Multidimensional statistical analysis methods, with particular focus on aggregate measures of development, were applied in the assessment. The conducted research resulted in separating the relatively uniform classes of the EU countries in terms of innovation, including the identification of leaders in the analysed years.

Key words: *innovation, sustainable development, aggregate measure of development*

1. Introduction

Integrated order represents, among others, the substantiation of sustainable development. This clarification seems necessary, as it determines the quantification of processes and phenomena responsible for both lasting and consistent economic, social and environmental development. The very concept of sustainable development should be referred to in the category of an idea defining the general direction of process changes characterized by their positive nature, i.e. related to the transition from a less desirable to a more desirable state. Such more desirable state can be approached as a vision, i.e. the situation we wish to achieve in the future. This pattern, however, will keep evolving, because continuity remains the constant feature of development, which means that one can always define a more desirable state than the current one. For this reason it is important to observe the indicators describing orders and mutual relationships between them, which justifies the need to

search for countries-leaders of sustainable development and its components (e.g. in terms of innovation which co-creates economic order). The purpose of this article is to assess the innovation level of the European Union countries, using innovation indicators covering national economies, applied in sustainable development monitoring. The classification of the countries is carried out using aggregate measures of development, and also the identification of the EU countries as innovation leaders, moderate innovators, modest innovators and non-innovators is performed.

2. Innovation in the system of sustainable development assessment

The concept of sustainable development monitoring is based on the assessment of integrated order components. It covers economic, social (including institutional-political) and environmental (including spatial) (Borys, 2011) order, emphasizing that the target state of each of them may not remain in



contradiction with the others. These relationships are of particular importance while assessing economic changes resulting not only in economic, but also in social and environmental consequences (Michalski et al., 2015). In this perspective, the implementation of sustainable development principles into economic system is of key importance. Innovation can and should support their implementation, however, under certain conditions.

Innovation is perceived as the feature of enterprises or economies and stands for their capacity to develop and implement innovations, including their absorption, combined with active participation in these processes, e.g. by acquiring resources and skills essential for carrying out innovative activities. The measurement of innovation understood in this way is usually performed by defining the number of developed and implemented innovations (Niedzielski, 2011), i.e. “new or significantly improved products (goods or services), or processes, new marketing methods, or new organizational methods in business practice, workplace organization or external relations” (Oslo Manual, 2005). This approach does not take into account the need to balance three crucial systems (economic, environmental and social), nor the nature of introduced changes. Not every new or significantly improved solution has a positive connotation, because innovations can refer to something new, i.e. multi-directional changes in relation to the existing state (progress, regression, neutrality) (Madej, 1970). This observation is particularly important in the process of assessing these innovations which trigger economic, environmental and social changes. Even if it is assumed that innovations result in positive economic effects only, it should not be automatically translated into their environmental and social effects. The solution to this problem can take a twofold form. Firstly, an innovation and the

related innovative activity should be subordinated to the criteria of sustainable development. In practical terms it means the reconstruction of the definition of innovation considering the condition of its harmlessness to both environmental and social spheres. Taking this criterion into account, none of the new or significantly improved products, processes, or organizational or marketing methods would be recognized as innovations if their implementation resulted in the violation of sustainable development harmony (Białoń, 2012). Both complex and subjective nature of this assessment seems to undermine the sense of its using. Another, better solution is to extend the spectrum of indicators diagnosing innovation with features and/or their relationships describing the capacity presented by entities (economies) to develop and implement innovations which affect both environmental and social orders in a positive way. This concept covers e.g. a group of eco-innovation indicators characterizing new or significantly improved solutions for the benefit of air, water, soil, flora and fauna protection, etc. This option was adopted in public statistics.

3. Methodology and Data

The diagnosis of innovation in the context of sustainable development assessment is based on the set of six indicators which describe (Central Statistical Office, 2018): X1 – share of net revenues on the sales of innovative products in net revenues on total sales, X2 – human resources in science and technology (%), X3 – labour productivity (%), X4 – expenditure on R&D against GDP (%), X5 – eco-innovation (EU=100), X6 – the number of inventions filed by residents to the European Patent Office per 1 million population.

The methods of their value measurement and their importance for sustainable development are presented in Tab. 1.



Table 1: Innovation indicators in economic order and sustainable development measurement

Indicator	Value measurement method	Importance for sustainable development
X ₁	Share of net revenues on the sales of new and significantly improved products launched on the market in the recent three years in net revenues on total sales.	The degree of enterprise innovation. The level of economy innovation. The saturation of economy with innovative products boosts its competitiveness and creates basis for sustainable development.
X ₂	Share of human resources in science and technology as percentage of economically active population aged 25-64.	Human resources for science and technology create the potential for stimulating the innovative capacity of economy.
X ₃	Percentage change in labour productivity in the analysed year against previous year. Labour productivity is measured by the value of gross domestic product at fixed prices per unit of workload, i.e. per 1 hour worked.	The pace of changes in labour productivity is correlated with the dynamics of economic development. The level of labour productivity represents economic growth factor and determines economy competitiveness.
X ₄	The total amount of internal expenditure incurred on research and development by all entities in the country conducting this activity, regardless of the source of funds, against GDP.	Research and development activity is translated into the technological level of economy, and thus affects socio-economic development to a great extent. X ₄ shows the scale of GDP redistribution in the activities aimed at transforming economy towards a knowledge-based economy. R&D expenditure offers the opportunity to change the direction of particular economy sectors' development by implementing innovative and socially desirable solutions, e.g. pro-ecological, less energy- or material-intensive ones, and also by developing technologies friendly for people and protecting their health.
X ₅	The indicator is based on 16 indicators from five areas: 1) expenditure (government expenditure on R&D in terms of environment and energy against GDP, share of employment in R&D in total employment, value of early-stage green investments), 2) activities (carried out by an enterprise implementing eco-innovations improving material and energy efficiency and having ISO 14001 certification), 3) results (patents, publications, media information on eco-innovation), 4) environmental effects of implementing eco-innovations (efficiency of energy, raw materials, water use and greenhouse gas emissions),	Eco-innovations limit harmful impacts of economic processes on the environment. Ecological innovations result in cost reductions and rational use of natural resources. Eco-innovations allow not only competitive position strengthening but also establishing a strong position on the market. Eco-innovations contribute to the elimination of unfavourable, man-made changes in the environment.



Indicator	Value measurement method	Importance for sustainable development
	<p>5) socio-economic effects of implementing eco-innovations (the development of “eco-industries” in economy measured as percentage of workforce, share of exports of eco-innovative products in total exports and turnover in eco-industries).</p> <p>The overall result of the EU Member State is calculated as weighted average of 16 sub-indicators (partial indicators). It shows the level of eco-innovation in individual Member States against the EU average, compared to 100 (EU indicator = 100).</p>	
X ₆	The number of inventions filed by residents of particular countries for protection in the European Patent Office (EPO) according to the partial calculation method per 1 million inhabitants of a given country.	Developing new solutions determines sustainable economic development by affecting the quality of life while protecting natural resources.

Source: Authors' compilation based on (Central Statistical Office, 2018).

The above listed innovation indicators can be systematized in three groups by arranging them according to orders and mutual relations between them. The first group covers these indicators which create the basis for formulating valuation judgments about the occurring changes in the area of economic order (X₁, X₂, X₃). The second group includes indicators diagnosing the phenomena and processes in the economic area, which simultaneously influence the environmental order (X₅), whereas the third group lists measures assessing economic order and, at the same time, influencing both environmental and social order (X₄, X₆).

The statistical information necessary to quantify the innovation level of the 28 European Union countries, in the context of sustainable development, comes from the Eurostat database. The research period covers the years 2008 and 2017. Due to the absence of available statistical data the values of X₁ indicator come from the years 2008 and 2012, X₂ indicator from 2010 and 2017, whereas X₆ from 2008 and 2014.

The empirical analysis was carried out in accordance with the following stages of the research procedure (Hellwig, 1968; Walesiak, 2006):

1. The selection of innovation indicators used to monitor sustainable development.
2. Linear ordering of the European Union countries in terms of innovation development level, in the context of sustainable development, using aggregate measures of development.
3. The assessment of the indicator values' diversification and the innovation development level in the EU countries, using basic descriptive parameters, in the years 2008 and 2017.
4. The classification of the European Union countries in terms of innovation level development in the context of sustainable development in the years 2008 and 2017.

Due to the fact that all identified innovation indicators are stimulants (the increase in indicator values results in the increase of innovation level in the context of sustainable development), the normalization formula presenting the following form was used:

$$z_{ij} = \frac{x_{ij}}{\max_i x_{ij}} \quad (1)$$

where: z_{ij} – normalized value of j -th indicator in i -th country, x_{ij} – value of j -th indicator in i -th country.



The method of average standardized sums was used as the aggregating function of normalized indicator values:

$$AMI_n = \frac{1}{m} \sum_{j=1}^m z_{ij} \quad (2)$$

m – number of indicators describing a given complex phenomenon, $n = 1, 2, \dots, N$ number of the country, where: AMI_n – aggregate measure of innovation level in the context of sustainable development.

Both normalized values of innovation indicators and aggregate measures of development take values in the range [0, 1]. Next, the division of the European Union countries into classes presenting different levels of innovation, in the context of sustainable development, was carried out by specifying the following ranges of aggregate measures values:

Class I – countries characterised by the lowest level of innovation:

$$AMI_n \leq \min_n \{AMI_n\} + \frac{1}{k} R \quad (3)$$

Class II – countries presenting higher innovation level than the ones grouped in class I:

$$\min_n \{AMI_n\} + \frac{1}{k} R < AMI_n \leq \min_n \{AMI_n\} + \frac{2}{k} R \quad (4)$$

(4)

Analogically, the subsequent classes and the last of the identified k -th class - countries with the highest innovation level:

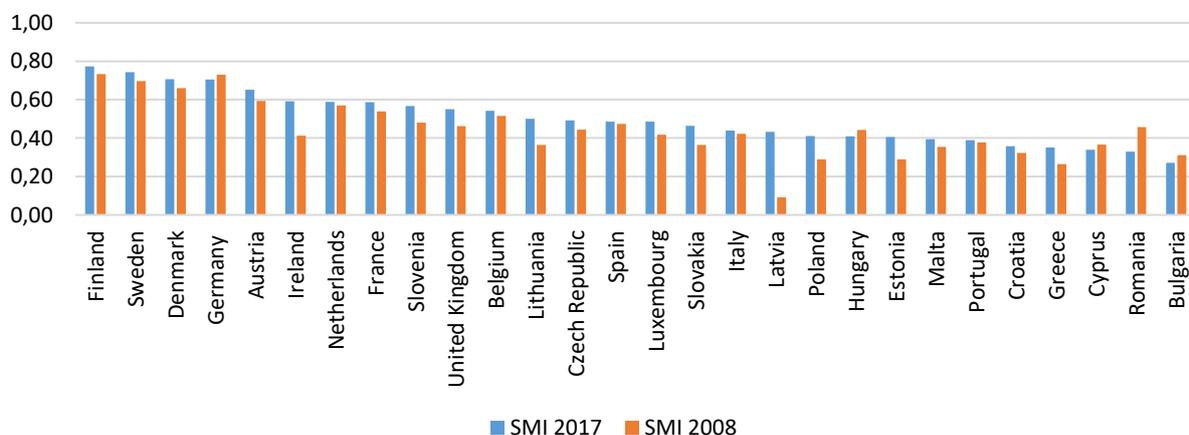
$$\min_n \{AMI_n\} + \frac{k-1}{k} R < AMI_n \leq 1 \quad (5)$$

where: R – range of aggregate measure value of the complex phenomenon development, k – the number of classes adopted *a priori*.

4. Results and discussion

Fig. 1 shows the linear ordering of the European Union countries, in the years 2008 and 2017, in terms of economy innovation level in the context of sustainable development. The EU countries were ordered by the decreasing values of particular aggregate measures in 2017. The analysis of Fig. 1 shows that Finland recorded the highest level of innovation development in both analysed periods. In Finland the share of R&D expenditure in GDP (3.55% and 2.75%) was very high against the other European Union countries, as well as the share of human resources for science and technology in the economically active population (49.8% and 57.7%), the value of eco-innovation indicator (139 and 141, EU=100) and the number of inventions filed in EPO per 1 million population (238.89 and 341.72). In 2017 the second place, in terms of the innovation development level, was taken by Sweden, where the highest values of four out of six innovation indicators were recorded, including human resources for science and technology (58.6%), expenditure on R&D in GDP (3.25%), eco-innovation (144, EU = 100) and the number of inventions filed in the EPO per 1 million population (350.41).

Figure 1: Linear ordering of the European Union countries in terms of economy innovation level in the years 2008 and 2017



Source: Authors' compilation based on the Eurostat database



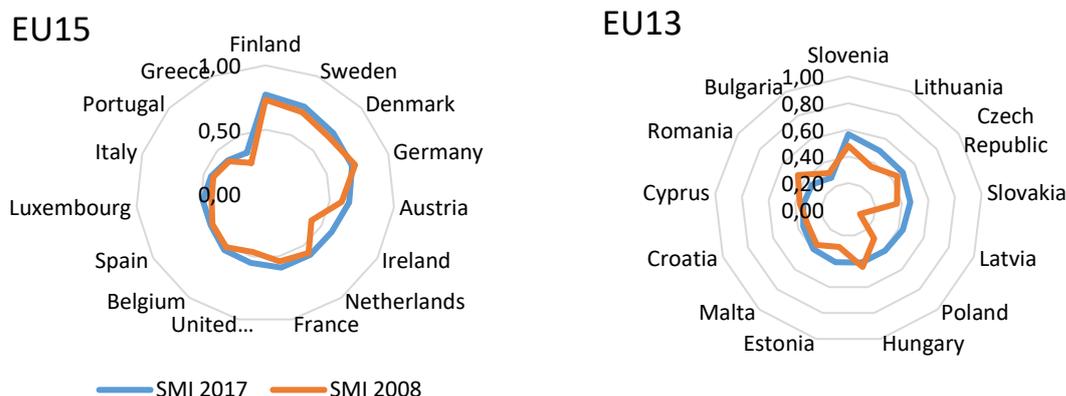
The lowest level of innovation development in the context of sustainable development in 2017 was characteristic for Bulgaria, and in 2008 for Latvia. Bulgaria recorded the lowest in the EU share of net revenues from sales of innovative products in net revenues from total sales (4.2 %), the lowest eco-innovation indicator (38, EU=100) and a very small number of inventions filed in EPO per 1 million population (6.55). In Latvia, the first of the analysed periods featured the lowest in the European Union share of net revenues from the sale of innovative products in net revenues from total sales (5.9 %), negative rate of labour productivity changes (-8.8 %) and only 10.39 inventions filed in the EPO for 1 million population.

Fig. 2 presents the values of innovation development measures separately for the EU15 and the so-called countries of the new accession EU13. It can be noticed that in both groups of countries in most cases the values of aggregate measures improved in 2017. However, there occur clear disproportions between the identified groups of countries. The EU15 represent a clearly higher level of innovation development than the EU13, with Greece and

Portugal being the exception.

Table 2 presents the descriptive parameters of indicators and aggregate measures regarding innovation development level. The European Union countries, in both analysed periods, featured by far the largest diversification in terms of the number of inventions filed in the EPO per 1 million population. The coefficient of variation was 112.9 % in 2008 and went up to 116.8 % in 2017. In 2008 this indicator was the lowest in Bulgaria (1.62) and the highest in Sweden (303.59). In the subsequent analysed period only 3.43 inventions per 1 million population were reported in Croatia, whereas at the same time 350.41 applications were filed in Sweden. The occurred disproportions in this respect were enormous. In 2017 a large dispersion (95.79 %) was recorded in the rate of changes in labour productivity. In Luxemburg it presented the level of -0.9 % and was the smallest, while in Lithuania an increase was recorded in labour productivity against the previous year by 6.7 %. In 2008 it was impossible to determine the coefficient of variation (negative average value of the indicator).

Figure 2: The values of innovation development measures for the EU15 and the so-called countries of the new accession EU13



Source: Authors' compilation based on the Eurostat database

The smallest diversification of the EU countries in both periods was observed in terms of the share of human resources for science and technology in the economically active population, the coefficient of variation was 19.68 % in 2008 and 18.74 % in 2017, respectively.

The diversification of the EU countries regarding the value of innovation development measure, calculated using the coefficient of variation was 33.55 % in 2008, and in 2017 it went down to 26.8%, which should be assessed as a positive trend.



Table 2: Descriptive parameters of indicators and aggregate measures regarding innovation development level in the European Union countries in 2008 and 2017

Index	Year	Min	Max	Median	V(%)
X ₁	2008	5,90 Latvia	18,7 Czech Rep.	12,50	26,59
	2017	4,20 Bulgaria	19,6 Slovakia	10,75	33,67
X ₂	2008	23,00 Portugal	51,1 Netherlands	39,75	19,68
	2017	27,70 Romania	58,6 Sweden	48,25	18,74
X ₃	2008	-8,80 Latvia	8,2 Romania	-0,10	-
	2017	-0,90 Luxembourg	6,7 Lithuania	1,3	95,79
X ₄	2008	0,39 Cyprus	3,55 Finland	1,29	62,44
	2017	0,44 Latvia	3,25 Sweden	1,26	56,14
X ₅	2008	31,00 Bulgaria	149,00 Denmark	80,50	42,37
	2017	38,00 Bulgaria	144 Sweden	87,00	31,35
X ₆	2008	1,62 Bulgaria	303,59 Sweden	28,98	112,90
	2017	3,43 Croatia	350,41 Sweden	37,33	116,80
AMI	2008	0,09 Latvia	0,73 Finland	0,43	33,55
	2017	0,27 Bulgaria	0,77 Finland	0,49	26,80

Source: Authors' compilation based on the Eurostat database

Table 3 presents the linear ordering and classification of the European Union countries in terms of innovation level in the context of sustainable development. In 2008, due to higher diversification and the occurring disproportions between the EU countries, it was decided to distinguish four classes of the EU countries, and in 2017 the division into three classes was made. In

both analysed periods the composition of the class of innovation leaders was identical. Fig. 3 presents the values of aggregate measures for the class of innovation leaders. As it can be noticed, among the listed countries only Germany came out worse in the ranking (from the second position in 2008 to the fourth in 2017).

Table 3: Classification of the European Union countries in terms of the level of innovation development in 2008 and 2017

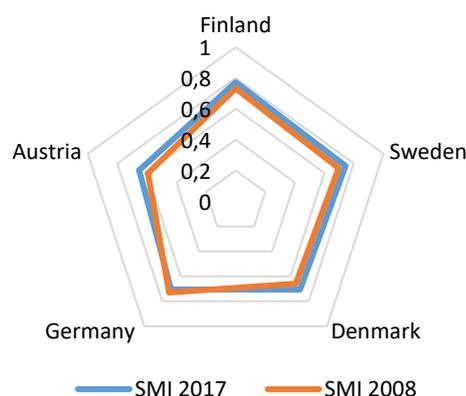
No.	Countries	SMI 2008	No.	Countries	SMI 2017
Class 1: Innovation leaders					
1	Finland	0,732	1	Finland	0,773
2	Germany	0,729	2	Sweden	0,743
3	Sweden	0,697	3	Denmark	0,706
4	Denmark	0,660	4	Germany	0,705



5	Austria	0,593	5	Austria	0,652
Class 2: Moderate innovators					
6	Netherlands	0,570	6	Ireland	0,592
7	France	0,538	7	Netherlands	0,589
8	Belgium	0,515	8	France	0,588
9	Slovenia	0,480	9	Slovenia	0,567
10	Spain	0,473	10	United Kingdom	0,550
11	United Kingdom	0,462	11	Belgium	0,541
12	Romania	0,457	12	Lithuania	0,500
13	Czech Republic	0,444	13	Czech Republic	0,492
14	Hungary	0,443	14	Spain	0,486
15	Italy	0,423	15	Luxembourg	0,486
16	Luxembourg	0,417	16	Slovakia	0,465
17	Ireland	0,412	17	Italy	0,439
Class 3: Modest innovators					
18	Portugal	0,378	18	Latvia	0,433
19	Cyprus	0,365	19	Poland	0,411
20	Lithuania	0,365	20	Hungary	0,409
21	Slovakia	0,363	21	Estonia	0,405
22	Malta	0,354	22	Malta	0,394
23	Croatia	0,323	23	Portugal	0,389
24	Bulgaria	0,311	24	Croatia	0,358
25	Estonia	0,289	25	Greece	0,351
26	Poland	0,289	26	Cyprus	0,339
27	Greece	0,265	27	Romania	0,329
Class 4: Non-innovators			28	Bulgaria	0,271
28	Latvia	0,092	-		

Source: Authors' compilation based on the Eurostat database

Figure 3: Aggregate measure values of innovation development for the European Union countries included in the class of innovation leaders in 2008 and 2017



Source: Authors' compilation based on the Eurostat database

Class 2 is the most numerous since it includes 12 countries assessed as moderate innovators. The compositions of moderate innovator classes are different in 2008 and in 2017. In 2008 Romania and

Hungary were included in this class at 12 and 14 position respectively, whereas in 2017 their positions were lower (Romania dropped to 27 position, Hungary to 20) and thus they changed their



class into modest innovators. The improvement of innovation level in the context of sustainable development was observed in the case of Lithuania and Slovakia, which in 2008 were listed in the class of modest innovators at 20 and 21 positions, whereas in 2017 they improved respectively to 12 and 16 place, and therefore moved to the class of moderate innovators. In 2008 class 3 of modest innovators covered 10 and in 2017 11 countries, including only Greece and Portugal from among the so-called EU15 countries. In 2018 a single-element class of 4 non-innovators was distinguished, which included Latvia characterized by just slight development of innovation.

5. Conclusions

The following conclusions result from the conducted studies and analyses:

1. The EU countries are characterised by a significant diversification in terms of indicators describing innovation in the context of sustainable development which, however, shows a decreasing trend over time (the exception was the share of net revenues from the sale of innovative products in net revenues from total sales). The EU countries featured the greatest dispersion regarding the number of inventions filed by residents in the European Patent Office per 1 million population, and the smallest in terms of human resources for science and technology.

2. In 2008 4 classes and in 2017 3 classes of the EU countries were distinguished regarding the level of innovation in the context of sustainable development. In the years 2008 and 2017 the composition of the innovation leaders' class did not change and included Finland, Sweden, Denmark, Germany and Austria. The most numerous class of moderate innovators covered, in 2008, the other EU15 countries excluding Greece and Portugal, whereas in 2008 Romania and Hungary, and in 2017 Lithuania and Slovakia. The class of modest innovators in both analysed years included, apart from Greece and Portugal, 8 other countries of the new EU accession. In 2008, a one-element class of non-innovators was identified, which included Latvia

presenting a diagnosed insignificant level of innovation development (the value of development measure was 0.092).

3. In both analysed periods the highest innovation level was diagnosed in Finland, while the lowest in 2008 in Latvia, and in 2017 in Bulgaria and then Romania.

The continuous monitoring of innovation indicators and the diagnosis of innovation development level in the context of sustainable development is of key importance for designing the development strategy and objectives of the European Union economic policy, as well as for the individual Member States. Public statistics faces the challenge of improving the currently used and identifying new indicators aimed at diagnosing the capacity of economies in creating and implementing innovations which have positive environmental and social impacts, as well as increasing the availability of data, the scope and quality of indicators used to measure and monitor progress in terms of innovation.

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USING CHARGES AND TAXES TO MITIGATE CLIMATE CHANGE: A CASE STUDY FROM POLAND

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Abstract

The aim of the paper is to analyse taxes and charges levied on air pollution, fuels, electricity and vehicles in Poland by reviewing design of such levies from the perspective of climate change mitigation policy. The analysis includes tax rates, tax exemptions to promote electricity from renewable sources or electromobility and impact on objectives in relation to emissions from stationary and mobile sources. The article also contains a brief comparison of environmental taxes applied in Poland and in other European countries. The analysis shows that tax measures used in Poland could be improved to support a shift towards green economy based on energy efficiency and cleaner energy sources. The shift towards greener economy can be affected by the introduction of carbon tax which also is analysed in the paper. The article reviews recent literature on carbon, vehicle and energy-related taxes.

Key words: *climate change, climate policy, environmental taxes*

1. Introduction

The main cause of anthropogenic climate change is the enhancement of the greenhouse effect which is a natural process associated with the composition of the Earth's atmosphere (Wigley, 2001). The most important contributor to the human-enhanced greenhouse effect is a carbon dioxide (CO₂) which is emitted in large quantities and remains in the atmosphere for decades (Barrett, 1991). Human-produced CO₂ is created mainly through the combustion of fossil fuels in the industry and transport sectors. Other greenhouse gases (GHG) emitted from the various economic activities include inter alia: methane, nitrous oxide and fluorinated gases (F-gases) such as sulphur hexafluoride, hydrofluorocarbons and perfluorocarbons. All of these gases are the main GHG and are covered by the Kyoto Protocol.

To tackle climate change governments use a variety of tools, including for example command-and-control regulations, taxes, emission permits, subsidies and renewable energy certificates. Tax instruments are indirect (market-based) instruments which create incentives to reduce emissions, save energy, switch to alternative fuels or develop electromobility which can be interpreted in terms of the increase in the number of electric vehicles. Levies used to achieve climate policy objectives can take

the form of pollution charges, excise duties, carbon taxes, and vehicle taxes.

2. Price of GHG emissions

The only tax instruments intentionally introduced to reduce greenhouse gas emissions in Poland are the emission charges. Theoretically speaking, emission charges (or emission taxes) are levied on each unit of pollution discharged into the environment. Such instruments are environmentally effective as there is a direct relationship between tax base and environmental pollution. On the other hand, emission charges may not be easy and cheap to administer because of emission measurement difficulties and large number of polluters.

In Poland air pollution charges are levied on all of the six greenhouse gases covered by the Kyoto Protocol and on other 61 polluting gases and particles. Revenues from the charges are earmarked for environmental purposes.

Substances subject to the emission charges are released from:

- 1) combustion of fuels in stationary sources (eg. CO₂ and N₂O from various equipment used to generate electricity or heat),
- 2) animal husbandry (methane emissions from



- dairy farms),
- 3) coal mines and gas pipelines (methane),
 - 4) equipment containing F-gases like refrigeration and air conditioning systems.

The emission charge on carbon dioxide was implemented in Poland in 1993. In the years 1993-2018 the rate of the charge increased 3-fold to 0,1 euro per tonne of CO₂. The current rate is very low compared to monetary estimates of the damage done by additional tonne of carbon dioxide emitted or additional tonne of CO₂ equivalent in case of other GHG. The central (average) estimate of social cost of GHG according to the U.S. Interagency Working Group on the Social Cost of Greenhouse Gases is 50 dollars per ton of carbon dioxide (Revesz et al., 2017). Some of the European Union countries (Germany, Sweden, the United Kingdom) have adopted estimates of more than 100 dollars per tCO₂ (Paul et al., 2017). Calculations of social cost of GHG (also referred to as the carbon price) differ due to uncertainty about climate change impacts and differences in the discount rates applied in the analyses.

The current price of carbon dioxide emissions in the form of emission charge rate does not correspond to the prices of CO₂ European emission allowances. In 2015-2018 the price of CO₂ emission ranged from 4 to 16 euro (CIRE.PL, 2018). Hence, sectors not included in the EU Emissions Trading System do not have sufficient incentive to undertake measures to mitigate emissions.

The rate of emission charge levied on carbon dioxide in Poland is also lower than in other Central and Eastern European countries where CO₂ emissions are

subject to emission charges. In Estonia the rate of the charge in 2018 is 2 euro per tonne and in Latvia – 4,50 euro per tonne (Environmental Fees Act, 2018; Natural Resources Tax Law, 2018). Other greenhouse gases are not subject to emission charges.

Rates of charges levied on other GHG could be based on their global warming potential (GWP) in relation to CO₂. In Poland this is a case for nitrous oxide which has a GWP of 310 over 100 years. Nitrous oxide emissions are charged at a rate 300 times higher than CO₂. On the other hand, methane which is estimated to have a GWP of 21 is charged at the same rate as carbon dioxide². It should be noted that in the second half of the 2000s Ministry of Environment proposed 21-fold increases in rate of the charge on methane emissions. The proposition was criticized by the mine industry (Górnictwo preciwne..., 2008).

In Poland the price on different F-gas emissions is the same (Table 1). The rate of emission charge (104 thousand higher than that of CO₂) does not reflect the GWPs of sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) which are respectively 23.900, 140-11.700 and 7.000-23.900.

Taxes on F-gases are applied only in a few European countries including Denmark and Spain. Taxes levied on hydrofluorocarbons in those countries are differentiated and provide incentives to promote the use of low-GWP substances. The rate of tax imposed on a given HFC is calculated as follows: a base rate of 0,02 euro per kg is multiplied by a GWP of a gas³.

² There is no reliable data on taxes levied on methane and nitrous oxide in other EU countries. Available data suggests that in Denmark tax rate on methane emissions is equal in terms of CO₂ equivalents to the

carbon tax (Danish Ministry of Energy, 2017).

³ A base rate in Denmark is equal to the tax on CO₂ emissions from fuels.



Table 1: Rates of charges and taxes levied on F-gases in Poland, Denmark and Spain in 2018 (euro per kg)^{a)}

	Poland	Denmark	Spain
SF ₆ and PFCs	7,0	80,6	100,0
HFCs (minimum tax rate)	7,0	2,0	6,6
HFCs (minimum tax rate)	7,0	80,6	100,0

a) In Denmark and Spain the tax rate cannot exceed the limit of 80,6 and 100 euro respectively. As a result, tax rates do not fully reflect the global warming impact of all F-gases. In Spain, for example, the tax rate for HFC-23 should be 240 euro per kg.

Source: Announcement of the Minister for the Environment (2017), Iberley (2018), Skatteministeriet (2017)

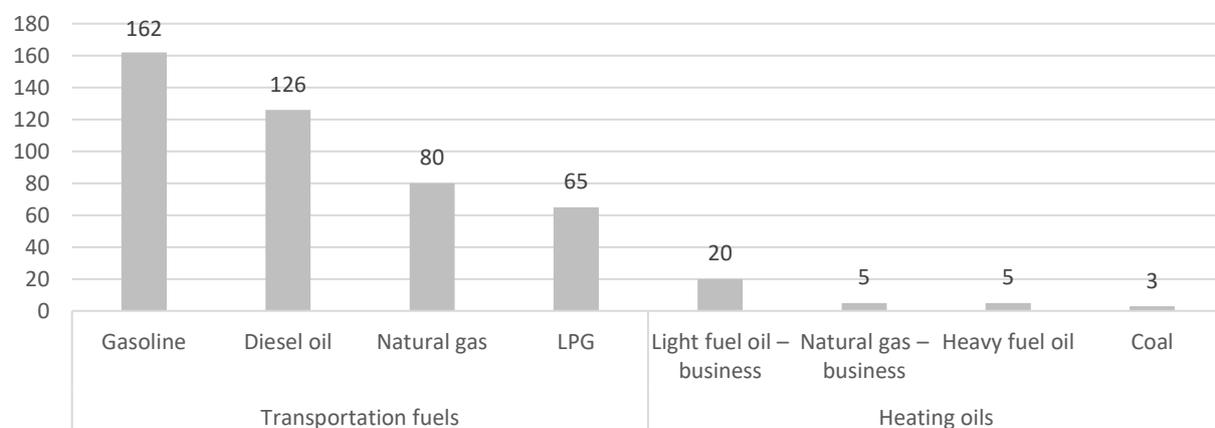
It can be assumed that CO₂ emissions are also implicitly taxed in Poland as there is a traditional excise duty levied on transportation fuels, heating oils and electricity. Generally speaking, excise duty are indirect and mostly revenue-generating taxes (Jovanović, 2005). Excise taxes are imposed on the production, sale, or consumption of certain goods (Giertz, 2005; Smith, 2015). Commodities subject to excise duties may include environmentally and socially harmful goods creating negative external effects. This applies, among other things, to fossil fuels and electricity. By affecting the prices of fuels excise duties provide incentives to use energy efficiently. It is remarkable that rates of excise duties in Poland are relatively low compared to other

European countries.

Motor fuels sold in Poland are also subject to a modest fuel charge. The charge has no explicit environmental purpose. The revenues from the charge are used to finance rail and road investments.

Excise duty and fuel charge in Poland are applied by volume, weight or heating value of different energy carriers. However, it is possible to express total tax rates on a particular fossil fuel in terms of CO₂ emissions (Figure 1). As one can see the highest effective taxes on CO₂ emissions are imposed on transportation fuels.

Figure 1: Implied carbon price in Poland in the form of energy taxes (2018, euro per tCO₂)



Source: Own calculation based on the Excise Duty Act (2009)



In all European Union countries carbon dioxide emissions from transport are more or less affected by vehicle taxes. In Poland there are two taxes levied on motor vehicles. The first one is a one-off excise tax on passenger cars, while the second one is a recurrent annual tax (payable in two instalments) on other transport vehicles. None of them is based on carbon dioxide emissions.

The excise duty relates to sales or imports of a vehicle. The tax rate is a percentage of amount due for sale of a passenger car or the customs value of a passenger car (The Excise Duty Act, 2009). For cars with an engine capacity over 2000 cc the rate is 18,6% and for cars with smaller engines the rate is 3,1%. Trucks, semi-trailer truck, trailers, semi-trailers and buses are subject to the tax on transport vehicles. Tax rates are determined by municipal

councils and may not exceed statutory levels. Some of the councils introduce rate differentiations based on environmental criteria. For example in some municipalities vehicles with higher Euro standards are taxed at lower rates (Uchwała nr XV/396/15, 2015). Hence, the transport vehicle tax has a potential to generate environmental and social benefits by reducing local air pollution.

2.1 Tax exemptions

In Poland there are a few tax exemptions which can provide economic incentives to change the behaviour of polluters and energy users. In the case of excise duty the extent of tax exemptions is affected by the EU directive 2003/96. The directive sets out tax exemptions which may be implemented by Member States (Table 2).

Table 2: Tax exemptions to mitigate climate change

Products which may be exempted from energy taxes according to the 2003/96/EC Directive	Tax exemptions in Poland and in other EU countries ^{a)}
Electricity of solar, wind, wave, tidal or geothermal origin.	In Poland electricity from renewable sources is fully exempted from excise duty. Electricity from renewable sources is also exempted in Latvia, Lithuania and Romania.
Energy products and electricity used for combined heat and power (CHP) generation and electricity produced from combined heat and power generation, provided that the combined generators are environmentally friendly.	In Poland energy products and electricity used for CHP generation are fully exempted from the excise duty. Tax exemptions or tax refunds for energy products used for CHP generation are also in place in Austria, Finland and Luxemburg. In Poland there is no tax exemption for electricity produced from CHP generation.
Energy products and electricity used for the carriage of goods and passengers by rail, metro, tram and trolley bus.	In Poland tax exemption is limited to coal and gas intended for use as heating oils used for the carriage of goods and passengers by rail. Hence, the environmental impact of exemption is modest. In at least 16 other EU countries there are tax exemptions or tax reductions for gas oil, coal or electricity used for the carriage of goods and passengers by rail.
Natural gas and liquefied petroleum gas (LPG) used as propellants.	Compressed natural gas (CNG) and LPG are not exempted from excise duty in Poland. In at least three EU countries CNG is exempted from the tax.
Taxable products in the field of pilot projects for the technological development of more environmentally-friendly products or in relation to fuels from renewable resources.	In Poland there is no relevant tax exemption. In the Czech Republic second generation biofuels intended for use as motor fuel in the field of pilot projects for technological development are exempted from the excise duty.



a) Tax exemptions used in Poland in 2018. Information on other EU countries as of January 2016.

Source: Council Directive 2003/96/EC (2003), European Commission (2016), the Excise Duty Act (2009)

2.2 Fiscal measures to promote electromobility

One of the important contributor to meeting the European Union's climate and energy targets is electromobility which is "an alternative transportation system based on vehicles propelled by electricity" (Sandén and Wallgren, 2014; Directive 2014/94/EU, 2014). The set of policy tools to promote electric vehicles in Poland is outlined in the Electromobility Development Plan developed by the Ministry of Energy in 2016 (The Ministry of Energy, 2016). The plan assumes that the number of electric cars registered in Poland will increase by 2025 to one million (Rządowy projekt ustawy..., 2018; Krajowe ramy..., 2017). Fiscal provisions proposed in the document includes changes in excise duties, more favourable depreciation of electric vehicles and the implementation of charges for combustion-engine cars entering the city centers.

New regulations proposed in the Electromobility Development Plan relating to the excise duty came into force in February 2018. Excise duty provisions include total tax exemptions for electric and hybrid passenger cars and for hydrogen-powered vehicles⁴. Favorable tax treatment of electric passenger in terms of tax depreciation must be approved by the European Commission before entering into force.

Measures outlined in the The Electromobility Development Plan are to contribute to improving air quality and public health (The Ministry of Energy, 2016). However it should be assumed that electric cars would contribute not only to reduction of (local or regional) air pollution but also to greenhouse gas emissions cut. Emissions will be transferred from individual cars to power plants where greenhouse gases can be reduced more easily and cheaply. Significant climate benefits can be obtained by generating electricity from renewable energy

sources or in combined heat and power plants. Environmental benefits can also be obtained because energy efficiency of electric vehicles is much higher than that of cars with combustion engines (Christensen and Kjær, 2012).

3. Results and discussion

There are some tax provisions in Poland which may discourage the adoption of climate-friendly practices. As shown in Figure 1, the current taxation scheme favours heating fuels over motor fuels. Such a tax differentiation may provide incentives to use carbon-intensive forms of energy. This is primarily the case for coal which has the highest carbon content per energy unit. In Poland coal is subject to the lowest implied carbon tax. Furthermore, railways, power plants and households are exempted from the tax on coal.

Tax rates in Poland are not regularly adjusted to reflect the raising cost of carbon. For example, excise duty on gasoline is almost constant since 2009. In some of the European countries, such as Denmark and Sweden tax rates on gasoline are subject to annual increases since 2013.

As shown in Table 2, there are some tax exemptions which could be introduced in Poland to encourage the consumption or production of environmentally friendly fuels. Tax exemption for natural gas used as propellant would promote CNG-powered vehicles.

In Poland there is no a product carbon tax levied on the carbon content of fuels. Carbon contained in fossil fuels can be considered proxy for carbon dioxide emissions. Carbon taxes on fuels are believed to be more efficient than other types of fuel taxes in that their impact on reducing CO₂ emissions. Taxes levied on the carbon content of fuels cut emissions at the lowest cost by equalising marginal abatement across fuels. Hence carbon taxes affect the most

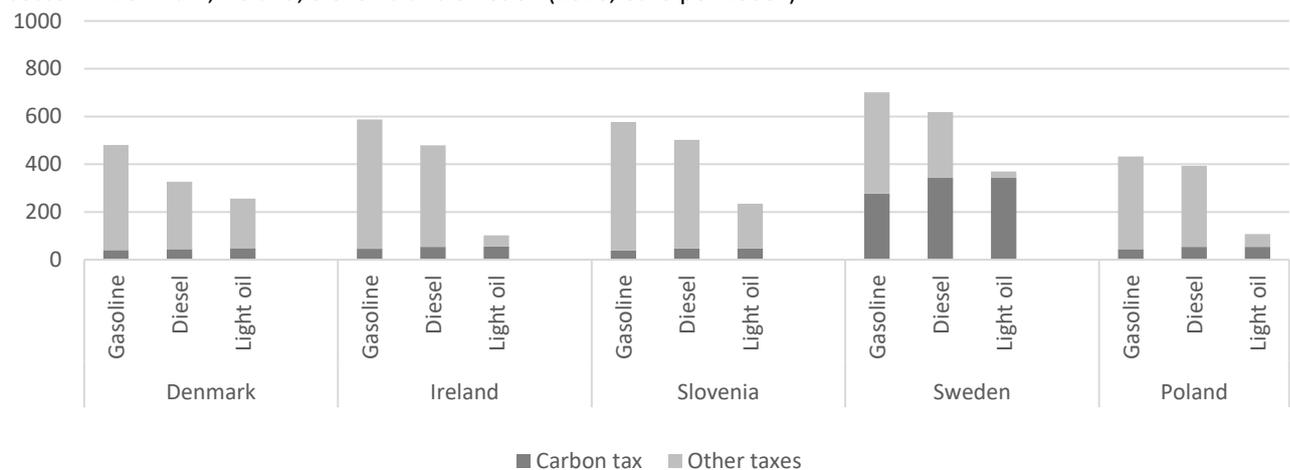
⁴ Tax exemption for hybrid passenger cars is valid until 2021.



carbon-intensive fuels and provide direct incentives for all energy users to switch to lower carbon fuels (such as gas). Traditional excise duties based on the quantity of fuels used or energy taxes levied according to the energy content of fuels provide abatement at higher cost (Markandya, 2012; Stavins, 1997). As shown in Figure 1 implied carbon taxes in Poland are widely different across fuel used.

Carbon taxes on fuels are applied only in a number of the European Union countries such as Denmark, Ireland, Slovenia and Sweden. Carbon taxes applicable in these countries are accompanied by other taxes imposed on fuels which, in particular, are excise duties (Figure 2). As one can see, rates of the carbon taxes are rather small compared to other levies (with the exception of Sweden).

Figure 2: Taxes levied on motor fuels (gasoline and diesel oil) and on light fuel oil for heating purposes in business sector in Denmark, Ireland, Slovenia and Sweden (2018, euro per 1000 l)



Source: European Commission (2018), Irish Tax and Customs (2018)

Taking into account the carbon content of fuels it can be assumed that the rates of the carbon taxes in Denmark, Ireland and Slovenia are about 17-25 euro per tonne of CO₂ which would be released into the atmosphere if a given fuel was burned. In Sweden the tax rate in terms of euro per tonne of CO₂ is more than 120 euro. However, it is remarkable that there are tax some exemptions and reductions which make the effective rate of carbon tax in Sweden lower for selected sectors. For example, the rate of carbon tax on diesel oil for agricultural purposes is about 50 percent lower than that of regular diesel oil used as propellant (European Commission, 2018).

Figure 2 also presents the hypothetical design of energy taxation in Poland assuming that the carbon tax is implemented at a rate of 20 euro per tonne of CO₂. The rate of 20 euro per tonne of CO₂ corresponds to 45 euro per 1000 l of gasoline and about 54 euro per 1000 l of diesel and light heating oil. The carbon tax would also be levied on other

heating fuels, including coal or coke. Thanks to this, all energy users will face the same carbon price. In other words, carbon dioxide emissions from fuel combustion will be fully internalized (assuming that the rate of 20 euro per tonne represents marginal damage of emissions).

The imposition of the carbon tax in Poland would result in some additional incentives to reduce fuel consumption, increase in the number of electric-powered vehicles and in additional tax revenues for the state budget. The revenues can be partially used to provide financial support for green technologies.

There is no current plan to implement a carbon tax in Poland. Instead, a new emission charge is planned to be introduced in 2019 (Government Bill, 2018). The charge is projected to be levied on gasoline and diesel oil at the same rate of 18,5 euro per 1000 l. The revenues from the charge are to be earmarked for investments in biofuels or in electric vehicles.



Carbon dioxide emissions could also be taken into account when designing taxes on vehicles⁵. In a number of European Union countries such taxes based on CO₂ emissions per kilometer exist. Taxes can be one-off (eg. registration taxes) or recurrent (eg. annual circulation taxes for the use of vehicles). Such taxes are not mentioned in the Polish Electromobility Development Plan.

Some climate benefits can be expected with regard to the prospective implementation of road user charges for combustion engine cars entering the city centers. According to the Electromobility Development Plan for Poland such fees can be charged in zones where air pollution generated by transport-related activity exceeds the admissible level and in spas. Revenues from the charge may be earmarked for improving the standard and electrification of public transport. Electric vehicles could be exempted from the charge. The implementation of the charge would require a change in the current regulations (The Ministry of Energy, 2016).

Road user charges in the form of congestion charges imposed on motorists were implemented in a number of European cities. In London a reduction in road transport CO₂ emissions is estimated at 16-19%, in Stockholm – at 13%, in Milan – at 9% (Hodson and Marvin, 2010; OECD, 2013). The revenues from the charges are used for urban investments. Congestion charging systems in Milan, London and Stockholm provide net annual benefits. The annual costs associated with the functioning of charges are 1,4–3,3 times lower than the benefits which include time gains, lower congestion or reduced emissions (De Borger and Proost, 2015).

4. Conclusions

In Poland all six greenhouse gases covered by the Kyoto Protocol are targeted by specific charges levied directly on emissions. This could contribute to achieving climate policy objectives in a cost-effective

manner. However, the emission charge system is not properly designed. The rates of the charges are too low and do not reflect the GPW of different substances.

Other tax instruments are not originally intended to cut GHG emissions. However one can assume that excise duty on fuels may be a powerful instrument to alter the behavior of energy users and to speed up the development of electromobility.

The scope of policy tools could be expanded by carbon taxes on fossil fuels, carbon-based vehicle taxes and congestion charges. Such taxes could improve the overall cost-effectiveness of emission-related taxation scheme in Poland.

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⁵ Alternatively vehicle taxes can be based on fuel use as CO₂ emissions are highly correlated to fuel consumption.



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