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# SOCIO-ECONOMIC DEVELOPMENT AND DIVERSITY OF THE SELECTED CEC REGIONS AFTER THE EU ENLARGEMENT

Ingrid Majerová[1], Jan Nevima[1]

[1]Department of Economics and Public Administration, School of Business Administration in Karviná, Silesian University, Univerzitní nám. 1934/3, 733 40 Karviná, Czech Republic

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## Abstract

Development and diversity is connected not only with GDP or GNI per capita level, but often with measurement of another socio-economic indicators as rate of unemployment, health and education fields or households equipment. The aim of this paper is, with the quantification of socio-economic indicators, to describe the development of regional diversification using cluster analysis at the regional level of selected Central European Countries after enlargement of European Union. The regions at NUTS 2 level of the Czech Republic, Hungary, Poland, Slovakia and Slovenia were selected for this purpose. There are 37 regions on the NUTS 2 level – eight in the Czech Republic, seven in Hungary, sixteen in Poland, four in Slovakia and two in Slovenia. The research was made in the first two programming periods after the big enlargement of EU – from 2004 to 2006 and 2007 to 2013 with their comparison. According to hierarchical cluster procedures, using the Ward method, the five clusters were set and it was found that regional diversity still exists and positive development recorded only forty nine percent of the monitored regions.

Keywords: cluster analysis, development, diversity, regions, socio economic indicators, Central European Countries, Ward method

## INTRODUCTION

The socio-economic disparities among regions are of the primary interest of economists as well as politicians (Rovan and Sambt, 2003). The difference in the level of socio-economic indicators should be kept in sustainable limits for the welfare of the country as a whole. The analysis of these indicators can serve as the basis for the development policy on regional level. The difference between regions and countries is not always very clear, but the major distinction in most cases is the fact that regions are open spatial entities (in contrast to countries), while the competence of a region may normally be superseded by the nations (Nijkamp and Abreu, 2009). The cohesion policy of European Union tries to decrease this diversity, and so through the convergence targets of programming periods and support the regions, mostly in the Central Europe in the former socialist countries. Based on it, we decided to analyze the issue of regional diversity for selected Central European

countries (hereafter CEC) at the NUTS 2 level. These countries are the Czech Republic, Hungary, Poland, Slovakia and Slovenia. There are 37 regions on the NUTS 2 level – eight in the Czech Republic, seven in Hungary, sixteen in Poland, four in Slovakia and two in Slovenia. The research was made in the first programming period from 2004 to 2006 (after the biggest enlargement of European Union) and in the second period from 2007 to 2013. The other period (2014–2020) is not in the end and the data are not available for these years that is why we decided to close our research in the end of the last programming period.

The motivation of writing this paper is based on the idea of Zurn *et al.* (2004) that economic, sociodemographic, cultural and geographical indicators contribute to shaping and transforming society. The aim of this paper is, with the quantification of socio-economic indicators, to describe the development of regional diversification using cluster analysis. For measuring the socio-economic development of the region aforementioned economies, nine indicators were selected. Two economic indicators: income of households and unemployment, one environmental – municipal waste, three health variables: infant mortality, health personnel and hospital beds and three indicators of standard of living: stock of vehicles, motorways and nights spent at tourist accommodation establishments. We set two research assumptions: firstly that these differences among regions of the same historical economic development exist and secondly that most of these regions improve their level of socio-economic development in the second programming period.

These variables were than used and assumptions examined in a hierarchy cluster analysis in the Ward method. Five created clusters (from very high to very low level) include a plurality of regions based on their inner similarities that would not otherwise be apparent at first glance. The initially research approach that there exist regional disparities in monitored regions and that this diversity decreases, was confirmed only partially – diversity exists but on the other hand the vast majority of the regions have not changed their positions in the cluster in the monitored period.

The rest of the paper is organized as follows: Section 1 presents us with a brief literature review and Section 2 gives information about the sample and used variables. Section 3 describes the model and methodology used in the paper. Section 4 and 5 show and discusses the results in detail and the last section concludes the paper.

## Literature Review

The selection of the indicators was influenced by a previous research, in which the authors confirmed, although not so comprehensively, certain linkages among some of the indicators. Michaud and van Soest (2008) claim that in many industrialized countries, there is a positive association between health and wealth. On the other hand, population health tends to rise with the country's level of economic development (see Semyonov *et al.,* 2013). Health, like education, is a fundamental component of human capital and leads to economic growth. Health improvements tend to reduce the mortality rates of infants (Bloom and Canning, 2003). According to Anand and Bärnighausen (2004), the strong relevance between health personnel and infant mortality exists in more than 80 countries. Shafik (1994) found out that with an increasing income the waste generation indicates deterioration. Eugenio-Martin *et al.* (2004) claim that tourism provides two positive effects on the economy: on one hand, an increase in production and income; on the other hand, as the tourism sector is labour intensive, it causes an increase in employment. Thus, the tourism sector may contribute significantly to both economic growth and employment in these regions.

Halkos (2003) tested empirically the hypothesis of the inverted U-shaped relationship between environmental damage from sulphur emissions and economic growth as expressed by GDP, using a large database of panel data consisting of 73 OECD and non-OECD countries within the period of 31 years (1960–1990). Issa and Ouattara (2005) examined the impact of health expenditure (private and public) and other socio-economic indicators (as income per capita and education) on the infant mortality in 160 countries. Zhang and Zhuang (2011) examined the effect of the composition of human capital on economic growth in 31 provinces in China over the period 1997–2006. Their results show that tertiary education plays a more important role than primary and secondary education in economic growth in China. Moreover, the role of the composition of human capital in the regional economic growth is relevant to the level of the development. More developed provinces benefit more from tertiary education, while underdeveloped ones depend more on primary and secondary education. Comber *et al.* (2011) analysed the relationship between public perceptions of access to general practitioners surgeries and hospitals against health status, car ownership and geographic distance in

the UK county of Leicestershire. They claimed that the impacts of bad health and non-car ownership on the difficulties experienced in accessing health services varied spatially across the area, whilst the impacts of the geographic distance did not.

Saidi and Hammami (2015) investigated the economic and environmental issues, namely the impact of economic growth and $CO^2$ emissions on the energy consumption for a global panel of 58 countries using the dynamic panel data model in the period from 1990 to 2012. They also estimate this relationship for three regional panels, namely from Europe and North Asia, Latin America and Caribbean, and sub-Saharan Africa, North Africa and the Middle East. The empirical evidence indicated a significant positive impact of $CO^2$ emissions on energy consumption and economic growth in energy consumption and statistically significant only for the four panels, except the Middle East. Clayton *et al.* (2015) found a relationship between aggregate household debt and aggregate health outcomes (as life expectancy at birth, various causes of death and disorders) across 17 European countries in the period from 1995 to 2012. They used education, real GDP per capita or alcohol consumption as other variables and found out that the aggregate household debt affects health outcomes, and that this varies by debt maturity. Both short and medium-term debts have a positive effect on health outcomes. Long-term unsecured debt and mortgage debt are associated with poorer health outcomes. Overall, the results suggest that aggregate household debt is an important determinant of aggregate health outcomes across the countries.

With these cases in mind, we focus in our paper on a potential impact of socio-economic indicators on a development of regional diversification using cluster analysis in all regions of selected Central European Countries (CEC). Next, we describe our sample and the variables used in the analysis.

## Description of sample and variables

The economic geography of Europe is characterized by wide levels of a number of socio-economic variables that are both a cause and a response to differences in the growth and levels of income per capita (see Fingleton 2003). This section describes the sample and the indicators that influence and are linked to the regional socio-economic development.

### *Description of Sample*

We decided to analyse the above-mentioned issue for a group of previous socialistic economies in the CEC at the NUTS 2 level – Czech Republic, Hungary, Poland, Slovakia and Slovenia. There are 37 regions – eight in the Czech Republic, seven in Hungary, sixteen in Poland, nine in Austria, four in Slovakia and two in Slovenia. The list of regions with the statistical designation in our sample is shown in Tab. I.

The variables used in this paper consist of nine regional socio-economic indicators, which units and codes can be found in the Tab. II. In the process of selection of these variables we have to take into account that some variables are not available at the regional – NUTS 2 level. All variables are used in the period of 2004 to 2013 that are the two programming periods from admission of these countries to the EU and period when the latest data for all region were available.

### *Description of variables*

All of the monitored socio-economic variables were downloaded from the regional database of Eurostat (2018) at the regional level NUTS 2 in the years 2004 to 2013. As mentioned, for purpose of this paper two economic indicators (income of households and unemployment), one environmental (municipal waste), three health variables (infant mortality, health personnel and hospital beds) and three indicators of standard of living (stock of vehicles, motorways and nights spent at tourist accommodation establishments) were collected.

Income of households (INCOME) represents the disposable income that every citizen in monitored region can spent per year. Purchasing Power Standards (PPS) are fictive currency units that remove differences in purchasing power, i.e. different price levels between countries. These parities are obtained as a weighted average of relative price ratios in respect to a homogeneous basket of goods and services, both comparable and representative for each country.

Indicator of Unemployment (UNEMPL) by sex, age in NUTS 2 regions represents all inhabitants 15 years old or over and is expressed as percentage of all inhabitants. This indicator (his high level) has a lot of negative effects on regional development – it is social problem connected with effects on economic activities.

To the environmental indicators the quantity of waste is ranked. This variable reflects differences

I: *List of regions in selected CEC*

| Region | St. name | Region | St. name | Region | St. name |
|---|---|---|---|---|---|
| **CZECH REPUBLIC** | | **POLAND** | | **SLOVAK REPUBLIC** | |
| **Praha** | CZ01 | **Lódzkie** | PL11 | **Bratislavský kraj** | SK01 |
| **Střední Cechy** | CZ02 | **Mazowieckie** | PL12 | **Západné Slovensko** | SK02 |
| **Jihozápad** | CZ03 | **Malopolskie** | PL21 | **Stredné Slovensko** | SK03 |
| **Severozápad** | CZ04 | **Slaskie** | PL22 | **Východné Slovensko** | SK04 |
| **Severovýchod** | CZ05 | **Lubelskie** | PL31 | **SLOVENIA** | |
| **Jihovýchod** | CZ06 | **Podkarpackie** | PL32 | **Vzhodna Slovenija** | SI01 |
| **Střední Morava** | CZ07 | **Swietokrzyskie** | PL33 | **Zahodna Slovenija** | SI02 |
| **Moravskoslezsko** | CZ08 | **Podlaskie** | PL34 | | |
| **HUNGARY** | | **Wielkopolskie** | PL41 | | |
| **Közép-Magyarország** | HU10 | **Zachodniopo-morskie** | PL42 | | |
| **Közép-Dunántúl** | HU21 | **Lubuskie** | PL43 | | |
| **Nyugat-Dunántúl** | HU22 | **Dolnoslaskie** | PL51 | | |
| **Dél-Dunántúl** | HU23 | **Opolskie** | PL52 | | |
| **Észak-Magyarország** | HU31 | **Kujawsko-Pomorskie** | PL61 | | |
| **Észak-Alföld** | HU32 | **Warminsko-Mazurskie** | PL62 | | |
| **Dél-Alföld** | HU33 | **Pomorskie** | PL63 | | |

Source: Eurostat (2018)

II: *Socio-economic indicators and their codes*

| Indicator | Unit | Code |
|---|---|---|
| **Income of households** | in PPS per capita | INCOME |
| **Unemployment rate** | % of econom. active inhabit. | UNEMPL |
| **Municipal waste** | per 1000 inhabit. in tones | WASTE |
| **Infant mortality** | per 100,000 inhabitants | INF_MOR |
| **Health personnel** | total persons | HEALTH |
| **Hospital beds** | per 100,000 inhabitants | HOSPITAL |
| **Stock of vehicles** | per capita | VEHICLE |
| **Motorways** | total in km | NETWORK |
| **Nights spent in tourist accommodation establishment** | total | TOURISTS |

Source: authors' own according to Eurostat (2018)

in economic wealth between regions – wealthier regions usually generate more municipal waste per capita, and the recent economic downturn. According to Eurostat (2018) municipal waste (WASTE) consists of waste collected by or on behalf of municipal authorities, or directly by the private sector (business or private non-profit institutions). The bulk of the waste stream originates from households, though similar wastes from sources such as commerce, offices, public institutions and selected municipal services are also included. It also includes bulky waste but excludes waste from municipal sewage networks and municipal construction and demolition waste.

Infant mortality (INF_MOR) means the death of a live-born infant who has not yet completed 1 year of life. Regional differences in infant mortality may reflect differences in wealth and spending of healthcare. In this case infant mortality rate can be a measure of a regional's health and social condition. It is a composite of a number of component rates, which have their separate relationship with various social factors and can often be seen as an indicator to measure the level of socio-economic diversity within regions.

Number of health personnel and hospital beds has positive correlation with economic development as well. Health personnel indicator (HEALTH) includes all people that are active in the health care sector (doctors, physicians, dentists, nursing and caring professionals, pharmacists, physiotherapists, etc.), irrespective of the sector of employment (i.e. whether they are independent, employed by a hospital or any other health care provider).

Hospital beds (HOSPITAL) is another indicator from the health sector. It includes available beds in hospitals and subcategories (such as curative care beds, psychiatric care beds, etc.) and available beds in nursing and residential care facilities as well as medical technology and technical resources in hospitals (for people requiring ongoing health and nursing care due to chronic impairments and a reduced degree of independence in activities of daily living).

The indicators of standard of living connected with level of regional development are stock of vehicles, the number of motorway and night spent in tourist establishment. In our case, the stock of vehicles (VEHICLE) represents all vehicles (except trailers and motorcycles) per inhabitant in mentioned regions. The indicator of motorways (NETWORK) expresses roads, specially designed and built for motor traffic, which does not serve properties bordering on it, and which has no crossings at the same level with any road, railway or tramway track, or footpath and is especially sign-posted as a motorway and is reserved for specific categories of road motor vehicles, see Eurostat (2018).

Tourism has been regarded as playing a major role in bringing about social change. It has certainly exerted a very important economic, productive, and cultural influence (Pérez and Nadal, 2005). Tourism plays an important role in solving economic and social problems, providing more jobs, the employment growth of the economically active population and increasing the welfare of the nation, has stimulating effect on the development of many related fields of economic activity – it contributes to the socio-economic development (Gabdrakhmanov and Rubtsov, 2014). Because of that the variable Nights spent at tourist accommodation establishments (TOURISTS) was included to the group of socio-economic indicators. Overnight stays are calculated by country of residence of the guest and by month.

## MATERIALS AND METHODS

Cluster analysis is method, which is recognised as an appropriate technique for finding groups of cases and is primarily focused on the search for similarities or differences between examined objects. According Punj and Stewart (1983), cluster analysis provides one, empirically based, means for explicitly classifying objects. If the research object is the region, as in our case, only by applications of cluster analysis we can confirm our assumption about the most or the least developed regions in the area of socio-economic indicators.

The history of this method is quite long – at first these procedures were indroduced by anthropologists, later by psychologists (Blashfield and Aldenderfer, 1988). Clustering analysis became one of the qualifying methods in the 20$^{th}$ century, the usefulness of which immediately had an impact on practically all fields of science. The first comprehensive work dealing with cluster analysis was created by Tryon (Tryon, 1939). The main motivation for the use of clustering is uncovering of hidden similarities or differences. For this reason, a cluster analysis is now widely used by all scientific disciplines (for us is most interesting use in the field of economy, see e.g. Das, 1999 or Soares, Marques and Monteiro, 2003 or Halásková and Halásková, 2015). According Kronthaler (2005) cluster analysis makes possible to identify particular economic weaknesses of regions in terms of endowment with growth factor. It leads

in turn to political recommendations for regional policy.

The mathematical formulation of the clustering principles is based on idea that it is the decomposition of set $T^{(k)}$ by the objects to k certain groups of clusters *GC*:

$$T^{(k)} = \{GC_1, GC_2, GC_3, .....GC_k\}, \quad (1)$$

where $GC_i \neq 0$.

The sorting is the base of cluster analysis and we can use two assumptions. The first approach is hierarchy cluster method and is most widely used by software. It is based on the use of once formed clusters that are then used to create other clusters from the rest of the data file. This manner is then preceded until all elements of the data file are a part of the cluster. This procedure has been chosen for the analysis of the regional level of human development in the V4+ countries used in this paper.

The second approach is a non-hierarchy cluster method, which is based on cluster search on the principle of the smallest difference from the average. The procedure, however, is advantageous only if the number of clusters we want to achieve, is determined beforehand. However, this may become a significant limitation in a further research, because only such a number of clusters are finally formed, which we determined beforehand and for example, some extreme values may merge with average ones (K-means).

The selection of cluster methods is necessary after determining the clustering process. According Caliński and Harabasza (1974) there are seven methods. The first two methods are based on the Between Groups Linkage or Within Groups Linkage. Their use depends on good knowledge of the data file and information about the number of clusters that we want to achieve. In the case of ignorance of the total number of clusters we want to achieve, both methods are limitations in further research. The third method, Nearest Neighbour is based on the shortest distance between clusters. The fourth method, Furthest Neighbour method, searches the values in the data file that are furthest apart. The fifth method, Centroid Clustering method, may look at first glance like the most ideal. It is based on the Euclidean distance between the centroids of clusters. The closest are those clusters which have the smallest distance between the centroids. But it does not solve the differences that may occur due to different weights for equally large clusters. The sixth method - Median clustering - solves the problem of weights variance that the previous method gives to differently large clusters. The last method, the Ward method, focuses on the allocation of profiles to groups equally. The principle of the method is not optimization, but minimization of heterogeneity. The purpose is to find the greatest similarity.

For fulfilling the aim of our paper, the last kind of method was used. The reason is that other methods described, unlike the Ward method, regard the regions as static units that are not subject to structural changes, which does not allow us to analyse them deeper during the monitored period. For this reason, their implementation for this type of data is inefficient. In measuring the socio-economic development, it is necessary to look for similarities among the regions using this method.

Because the values of these indicators were in different units (PPS per capita, tones, inhabitants, percentage), we had have to use the standardization process of data. This procedure was followed: Firstly the medium value $\overline{z_k}$ and standard deviation $S_k$ were calculated according to (2) and (3).

$$\overline{z_k} = \frac{1}{n}\sum_{k=1}^{n} z_{jk} \quad (2)$$

and

$$s_k = \left[\frac{1}{n}\sum_{k=1}^{n}\left(z_{jk} - \bar{z}_k\right)^2\right]^{1/2}, \quad (3)$$

Secondly the standardization through normalization of each object in the z-score was made (the standardization z-function) according to (4).

$$x_{ik} = \frac{z_{jk} - \overline{z_k}}{s_k}. \quad (4)$$

The cluster analysis has one fundamental problem – the mutual similarity of objects and quantitative expression of this. This problem could be solved using the metrics. For our purpose the metric squared Euclidean distance was chosen (5).

$$d_e^2(x_i, x_j) = \sum_{k=1}^{n}(x_{ik} - x_{jk})^2, \quad (5)$$

where $d^2$ is Euclidean distance, $x_{ik}$ is the value of k-symbol for the $i$ observation of the variable, $x_{jk}$

is the minimum value of the variable $x_{ik}$ and $n$ is the total number of objects.

The advantage of using the Ward's method and also our motivation of its use, is the tendency to remove small clusters, thus forming clusters of about the same size, which is often welcome feature. This is because this method requires expression of objects' distance by the squared Euclidean distance. Since the Ward's method leads to minimization of intra-cluster dispersion, causing more accurate research examined objects, its choice was for our purposes the best option.

## RESULTS AND DISCUSSION

The subjects of cluster analysis – all 37 NUTS 2 regions of the selected Central European countries – have been evaluated by the metrics that was created in the program SPSS. The results/data of statistical description are shown in Tab. III. There are 370 numbers of observations, the spread varies widely for some indicators. The greatest deviation among the regions of CEC corresponds to the indicator of income; the second one is in the case of tourist beds in accommodations. These two components are the most heterogeneous ones, and in both cases they are affected by the inclusion of capitals that traditionally generate a higher income than other regions. At the same time, they are large and attractive to tourists and therefore offer much more nights than peripheral regions. A similar result, although with not so diversified deviation, is shown by indicators related to health – the number of health personnel and hospital beds and amount of waste. There the "phenomenon" of regional disparities shows a negative impact as well. The population is more heterogeneous for the component of number of roads, unemployment rate, infant mortality and the last number of cars.

According to the results of the Ward method and dendrogram, which is not displayed in the paper due to its size and unreadability, the following clusters were identified:

- Cluster 1
  very high level of socio-economic development.
- Cluster 2
  high level of socio-economic development.
- Cluster 3
  average level of socio-economic development.
- Cluster 4
  low level of socio-economic development.
- Cluster 5
  very low level of socio-economic development.

Based on the results, the regions will be then divided according to their socio-economic development. How socio-economic variables influencing the diversity and development of regions during the reporting period have changed, is shown in the Tab. IV. Some of the clusters remained unchanged throughout the monitored period, on the contrary some of them evolved over time. From this table, we derive whether developments in the regions when analysing the input variables are rather constant or whether the processes lead to dynamization – better position of regions.

III: *Descriptive Statistics for Components of Indicators*

| | N | Minimum | Maximum | Mean | SD | Variance |
|---|---|---|---|---|---|---|
| **INCOME** | 370 | 4900 | 17300 | 8915.41 | 2141.39 | 4585534.39 |
| **WASTE** | 370 | 138.72 | 606.84 | 337.53 | 86.02 | 7399.74 |
| **INF_MORTALITY** | 370 | 1.57 | 12.91 | 4.88 | 1.83 | 3.35 |
| **HEALTH** | 370 | 143.98 | 709.29 | 276.92 | 109.65 | 12024.10 |
| **VEHICLE** | 370 | 0.21 | 0.68 | 0.45 | 0.11 | 0.01 |
| **HOSPITAL** | 370 | 361.90 | 1239.30 | 669.34 | 134.76 | 18160.37 |
| **NETWORK** | 370 | 0.00 | 56.00 | 9.44 | 11.13 | 123.79 |
| **TOURISTS** | 370 | 354.00 | 11754.00 | 2363.59 | 1921.10 | 3690618.46 |
| **UNEMPL** | 370 | 1.05 | 12.39 | 4.62 | 2.04 | 4.14 |
| **Valid N (listwise)** | 370 | | | | | |

Source: authors'own according to the program SPSS. (Note: *N* – number of observations, *SD* – Standard Deviation)

IV: *Created and changed clusters of CAC regions in the years 2004-2013*

| NUTS 2 | Cluster (period) | NUTS 2 | Cluster (period) |
|---|---|---|---|
| **CZ01** | cluster 1 | **PL31** | 2004–2006 cluster 5<br>2007–2013 cluster 4 |
| **CZ02** | cluster 4 | **PL32** | 2004–2006 cluster 5<br>2007–2013 cluster 4 |
| **CZ03** | cluster 4 | **PL33** | 2004-2007 cluster 5<br>2008-2013 cluster 4 |
| **CZ04** | 2004–2006 cluster 5<br>2007–2013 cluster 4 | **PL34** | 2004–2005 cluster 5<br>2006–2013 cluster 4 |
| **CZ05** | cluster 4 | **PL41** | 2004–2005 cluster 5<br>2006–2013 cluster 4 |
| **CZ06** | cluster 4 | **PL42** | 2004–2005 cluster 5<br>2006–2013 cluster 4 |
| **CZ07** | cluster 4 | **PL43** | 2004–2006 cluster 5<br>2007–2013 cluster 4 |
| **CZ08** | 2004–2006 cluster 5<br>2007–2013 cluster 4 | **PL51** | 2004-2007 cluster 5<br>2008-2013 cluster 4 |
| **HU10** | cluster 4 | **PL52** | 2004–2005 cluster 5<br>2006–2013 cluster 4 |
| **HU21** | cluster 4 | **PL61** | 2004–2006 cluster 5<br>2007–2013 cluster 4 |
| **HU22** | cluster 4 | **PL62** | 2004–2006 cluster 5<br>2007–2013 cluster 4 |
| **HU23** | cluster 4 | **PL63** | 2004–2005 cluster 5<br>2006–2013 cluster 4 |
| **HU31** | cluster 4 (except 2009,<br>2011, 2012 – cluster 5) | **SK01** | cluster 1 |
| **HU32** | cluster 4<br>(except 2010 – cluster 5) | **SK02** | 2004–2005 cluster 5<br>2006–2013 cluster 4 |
| **HU33** | cluster 4 | **SK03** | cluster 5 |
| **PL11** | 2004–2006 cluster 5<br>2007–2013 cluster 4 | **SK04** | cluster 5 |
| **PL12** | 2004–2006 cluster 5<br>2007–2013 cluster 4 | **SI01** | cluster 4 |
| **PL21** | 2004–2006 cluster 5<br>2007–2013 cluster 4 | **SI02** | cluster 4 |
| **PL22** | 2004–2006 cluster 5<br>2007–2013 cluster 4 | | |

Source: authors' own

## CONCLUSIONS

Although the European Union within its cohesion policy seeks to reduce the differences between different regions in all areas, there are still some diversity. The aim of this article was to show a different development in regions of the selected CEC, on the example of nine selected socio-economic indicators. All of the 37 regions of the five countries were analysed in two programming periods of EU, namely in the years 2004–2006 and 2007–2013. These variables were used in a cluster analysis with hierarchy approach – Ward method. Five clusters from very high to very low level of socio-economic development were created.

The results show that only two regions have very high level of socio-economic development and belong to the cluster 1 (the regions of capital cities in the Czech Republic and Slovak republic). A high level of development (cluster 2) and an average level (cluster 3) does not occur in any region of the selected CEC. Almost all of regions were situated at low (cluster 4) or very low (cluster 5) level of socio-economic development, namely 35 of them, and so in the beginning of monitored period.

During the periods some of regions (19) recorded improvement of the level of their development, some of them not (18). Regarding Czech regions, two of the eight regions showed improvement in their cluster position (from 5 to 4), which is 25%. The same percentage of improvement was also seen in regions in Slovakia (1 from 4 regions) with the same level of improvement. No improvement was seen in the regions of Slovenia and Hungary (if we eliminate the fluctuating development of Észak-Magyarország and Észak-Alföld regions) over the period. In these regions the EU cohesion policy seem to be not successful. Very interesting is that the level of socio-economic development increased in all regions of Poland, even if only slightly (from cluster 5 to cluster 4). We can say that the cohesion policy of EU was completely successful in this country.

In the beginning of our research we set two research assumptions: firstly that these differences among regions of the same historical economic development exist and secondly that most of these regions improve their level of socio-economic development in the second programming period. The one part of research approach that there exist regional disparities in monitored regions was confirmed. The second part of approach, that this diversity decreases, was confirmed only partially – the mostly half of the regions (49 %) have not changed their positions in the cluster in the second monitored period. The rest of them improve their position only slightly – they moved from very low to low level of socio-economic development. On one side, the effectiveness of cohesion policy in the former socialist countries of Central Europe remains questionable. On other side we have to say, that a slight dynamization in the second monitored programming period has been achieved and it appears that convergence within the European Union is not an easy target.

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Contact information

Ingrid Majerová: majerova@opf.slu.cz
Jan Nevima: nevima@opf.slu.cz