

SLOVAK REPUBLIC IN THE CONTEXT OF DISPARITY DEVELOPMENT

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Abstract

Many countries try to settle differences between their regions by implementing their economic policy. There are various key factors of development for each country or different indicators that also affect criteria selection, upon which the regional disparities are to be evaluated. Author focuses on regional disparities in the development of individual Slovak regions. The aim of the paper is to define regional disparities, the reasons for disparities and to analyse development of disparities in the particular Slovak regions using a set of selected social and economic indicators.

For this purpose, the multi-criteria method – cluster analysis - has been used. It is a statistic method, which forms clusters based upon the similarity within the cluster, i.e. region, as well as the major difference between individual clusters. This method is considered to be more precise than the other ones (e.g. point method) and that is why it is often used for regional homogeneity determination.

The following indicators have been chosen: unemployment rate, average wages, number of small and middle-size companies, the number of entrepreneurs per 1,000 citizens, density of road network, density of highways and speedy-ways. Based on the analysis of selected indicators, we can confirm that the Bratislava region has been the most developed region within the Slovak Republic for a long time, followed by the Žilina region, which is closest to Bratislava the most. The Košice and the Banská Bystrica regions belong to the least developed ones.

Paper type: Research paper.

Keywords: Regional Disparity, Regional Development Indicators, Cluster Analysis.

JEL Classification: R11, C38.

1. Introduction

The Slovak Republic is a member country of the European Union. Within regional policy, the EU has set as one of its goals speeding up the convergence of the least developed member countries, respectively regions. The settlement of differences between regions within country represents economic policy concern in many countries. The selection of the criteria to evaluate regional disparities becomes an important aspect.

By various inland and foreign scientific and specialized sources, **disparity** within regional development is interpreted as different stages of social and economic development that form inequalities between individual units which are compared. The approach and the classification upon the O.E.C.D. method is different where disparity represents dimensional differences as well as distance ones. It is necessary to see regional disparities as a complex multi-dimensional phenomenon. That is why we think that simplified evaluation of regional development just upon the GDP which is used very often is biased and many experts argue and have reservations about such a flat view.

According to Habánik (Habánik, Koišová, 2011), regional policy attributes are the following:

Reduction of disparities between development levels within regional parts, support of economic and social development, referring especially to their inner potential activation and ensuring of the increase of the quality of life and the regional sustainable development.

Indicators are values and parameters resulting from measured or estimated data which are intended for analyzing and demonstrating given subject changes. The regional development level being reached is measured by using statistics indicators where we are observing, evaluating and analyzing representativeness, verify and methodic unity of basis. However, the indicator set deals with areas of sustainable development of social cohesion and inclusion, economic growth and employment. Unified sustainable development indicator system which would be generally respected does not exist, yet. There have been developed many indicator systems in the world (e.g. U.N.O., resp. E.U. institutions - eStatistical Office of the European Union - Eurostat, European Environmental Agency (EEA), Organisation for Economic Co-operation and Development (OECD), own systems of particular countries). These systems are either numerical or based upon graphical display but their mutual characteristic is that they are complex systems consisting of plenty of components. Suhányi (Hudec *et al.*, 2009, p.178).

In the paper, we analyze selected indicators that may significantly affect development or attenuation of region. The objective of our paper is to determine development of the similarities between Slovak regions in the context of indicators selected in 2002, 2006 and 2011 and to evaluate their development. Theoretical and methodological bases are described in the core of the paper in detail.

2. Method

For needs of our research we have used one of multi-dimensional statistics methods, the Cluster analysis that analyses hidden relationships. „Cluster analysis is general logical proceeding formulated as a procedure according to the objects are organized into groups upon their similarities, respectively differences“ (Lukasová, Šarmanová, 1985) Using Cluster analysis, the units are organized into groups in order to get as big similarity between units inside the group as possible, as well as to differ them maximally from the ones in other groups. (Grmanová, 2010)

The result of the Cluster analysis are clusters, respectively groups that are created by procedure of the Cluster analysis.

The most frequently used rates of similarity are metrics. In particular way, they use geometric representation of the object in space as point. The most common metric is the Euclidean distance.

Let us have two-dimensional space ($m=2$) and two points $A=(x_1, x_2)$, $B=(y_1, y_2)$ while Euclidic distance between these two points is d_{AB} . Then upon the Pythagorean theorem applies:

$$d_{AB} = \sqrt{(y_1 - x_1)^2 + (y_2 - x_2)^2}$$

In the case of m -dimensional space, the Euclidean distance between points:

$A=(x_1, x_2, x_3, \dots, x_m)$, $B=(y_1, y_2, y_3, \dots, y_m)$ is equal

$$d_{AB} = \sqrt{\sum_{k=1}^m (y_k - x_k)^2}$$

The squared Euclidean distance is also used:

$$d^2_{AB} = \sum_{k=1}^m (y_k - x_k)^2$$

The result is the graph having Euclidean distance on the y-axis and is called dendogram. We use Statistica software for the Cluster analysis. „After entering data, very important part of this method is also data standardization. Standardized data arithmetic average is equal to zero, while standard deviation is equal to one. Even after standardization it is possible to divide subjects into clusters and depict them in graphs“ (Grmanová, 2012).

3. Results

Regional disparities and regional development indicators

As already mentioned in the introduction, regional policy attributes are the following:

Reduction of disparities between development levels within regional parts, support of economic and social development, referring especially to their inner potential activation and ensuring of the increase of the quality of life and regional sustainable development.

In our paper we compare and assess regional disparities upon development of selected indicators which are unemployment rate, average wages, number of small and middle-sized companies, number of entrepreneurs, density of road network, highways, respectively speedy-ways.

Unemployment rate indicates what percentage of total number of economically active population is represented by unemployed people. In the paper, we use data of unemployment rate provided by the Slovak Statistics Office upon results of Labour force sample survey.

Statistical data of **average wages** in the Slovak regions are provided by the Slovak Statistics Office upon quarterly reportings of industries. As regards value of average gross nominal monthly wages including amount of wages paid out to own employees as a pay for work, respectively its recompensation upon legal relationship (employment, service relationship, civil service employment, respectively membership) to employer in euros.

Number of SMEs, respectively of entrepreneurs are the indicators of entrepreneurial activities in particular region. For SMEs we consider companies of employee number from 0 – 249. Traders perform their activities aimed to profit, on their own behalf, responsibility and upon terms regulated by law. With regard to different size of individual Slovak regions, we have converted indicators to 1000 population.

As for used regional road infrastructure, we have chosen two indicators: **density of roads in km to 1 000 km²**, resp. **density of highways and speedy-roads in km to 1,000 km²**. „Road transport is the most frequently used way of transport, representing quite dense network of communications enabling transportation of various goods. Its functioning is conditioned by sufficiently developed and high-quality road infrastructure“ (Masárová, Ivanová, 2012). Road network includes highways, speedy-ways and roads of 1st, 2nd and 3rd class within regional territory. Separately, we observe used regional roads of the top quality that are highways and speedy-ways. For better comparison, we have converted both indicators to 1,000 km².

Analysis of Regional Development Selected Indicators of the Slovak Republic

Territorial and self-regulatory organization of the Slovak Republic includes 8 higher territorial units, 79 districts and 50 district offices.

Basic data are shown in Table 1:

Table 1. Basic Data on Regions of the Slovak Republic

Higher Territorial Units	No. of Districts	No. of District Office	No. of Towns	No. of Municipalities	Area in km ²	Population (Dec. 2011)	Population Density per km ²
Banská Bystrica (BB)	13	7	24	516	9 455	660 128	70
Bratislava (BA)	8	4	7	65	2 053	606 537	295
Košice (KE)	11	6	17	444	6 752	792 991	117
Nitra (NR)	7	7	15	339	6 343	689 564	109
Prešov (PO)	13	9	23	643	8 973	815 806	91
Trenčín (TN)	9	5	18	258	4 502	594 186	132
Trnava (TT)	7	5	16	235	5 147	555 509	134
Žilina (ZA)	11	7	18	315	6 809	689 601	101
SLOVAKIA	79	50	138	2891	49 034	5 404 322	110

Source: ŠEDIVÁ, M., 2012, pp.28.

In analytic part we observe similarities between regions in context of regional development selected indicators which have been defined above. Indicators are observed and evaluated within 2002, 2006 and 2011 when 2002 being starting point of reporting period. Year 2006 has been chosen as a year when the Slovak economy showed favorable economic growth rate and other economic indicators were developing positively, as well. The last year of reporting period is 2011 due to availability of all indicators statistic data in order to maintain statistical series.

1. Cluster Analysis of Regional Development Selected Indicators in 2002

Values of regional development selected indicators are shown in Table 2.

In 2002 **unemployment rate** reached significant levels. Significantly lowest value was recorded in the Bratislava region. However, unemployment rate exceeded 20 per cent even in three Slovak regions – the Banská Bystrica region 25.2 %, the Košice region 24.1 % and the Nitra region 23.8 %.

The lowest average wages were recorded in the Prešov region, the Nitra region and again in the Banská Bystrica region from 359 – 386 EUR. In the Trenčín, the Trnava and the Žilina regions, amount of wages ranged around 400 EUR. The highest wages were in the Bratislava region.

The highest value of indicator **number of SMEs**, approx. 26 to 1000 population, was recorded in the Bratislava region. Neither region was close to this value. The lowest value was recorded in two regions – in the Nitra and the Prešov regions – only 7 SMEs to 1000 population. In the Trnava, the Trenčín the Žilina, the Banská Bystrica and the Košice regions, the indicator's value ranged from 8 – 9 ones.

The next indicator, **number of entrepreneurs to 1000 population**, showed the highest value in the Bratislava region. The least one was recorded in the Košice region, just 38.94. The Trnava, the Trenčín and the Žilina regions ranged in interval 50 - 56. In the Nitra, the Banská Bystrica and the Prešov regions, this value ranged approximately from 42 – 48 entrepreneurs.

Density of road network is the highest in the Trnava region, up to 470 km/1000 km², followed by the Trenčín and the Nitra regions. The lowest value, just 290 km/1000 km², was recorded in the Žilina region. Other Slovak regions, including the Bratislava one, ranged approximately from 330 – 390 km/1000 km².

However, **density of highways and speedy-ways** is the highest in the Bratislava region – up to 50.19 km/ 1000 km². The weakest regions as regards highways utilization are the Košice, the Banská Bystrica, the Prešov and the Nitra ones where this indicator ranges just up to 3 km/1000 km².

Table 2. Selected Indicators Values in 2002

Region	Unemployment Rate (%)	Average Wages (EUR)	No. of SMEs to 1000 Population	No. of Entrepreneurs to 1000 Popul.	Density of Roads /1000 km ²	Density of Highways and Speedy-ways km/1000 km ²
BA	8,6	585	25,94	77,04	388	50,19
TT	16,1	414	8,74	55,59	470	21,70
TN	11,3	404	8,46	50,27	413	14,69
NR	23,8	379	6,93	47,93	403	2,95
ZA	17,3	400	8,82	56,10	290	6,73
BB	25,2	386	8,21	42,99	334	1,17
PO	20,1	359	6,79	44,04	343	2,09
KE	24,1	433	8,75	38,94	353	0,82

Source: Custom processing according to Slovak Statistics Office and Road Database of Slovak Road Headquarters

Explanation of abbreviations in tables and graphs:

BA – Bratislava region TT – Trnava region TN – Trenčín region NR – Nitra region
 ZA – Žilina region BB – Banská Bystrica region PO – Prešov region KE – Košice region

Upon data as quoted in Table 2, we have processed Cluster analysis for 2002 (Figure 1).

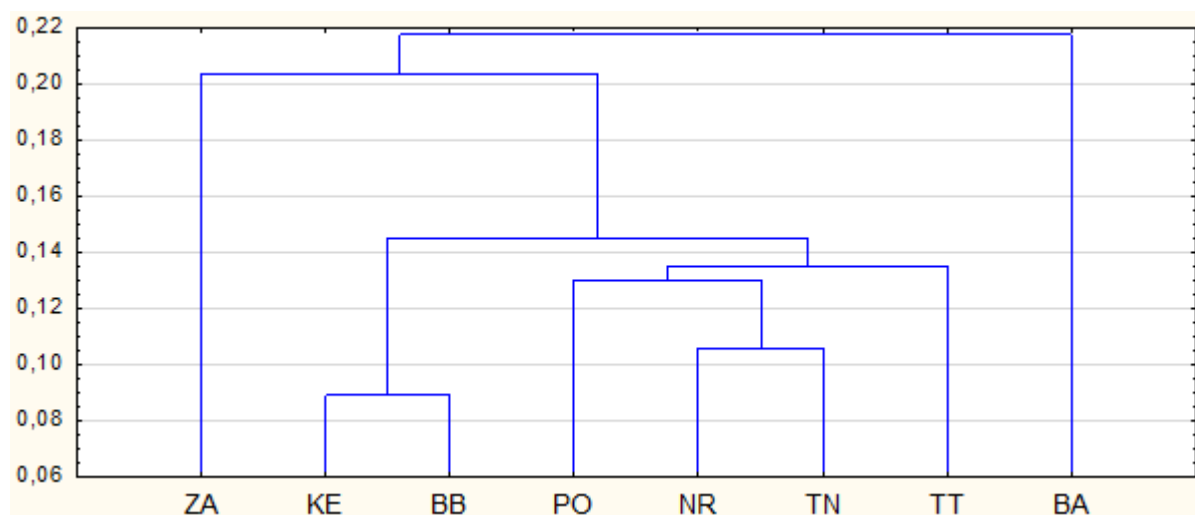


Figure 1. Cluster analysis of regional development selected indicators for 2002

Source: Custom processing in Statistica programme

Two main clusters can be seen from figure as shown above: Separate one is representing the Bratislava region where almost no one of its indicators shows similarity with the ones of other regions. The other cluster is formed by indicators of other Slovak regions – the most significant similarity among regions is shown in cluster of the Prešov, the Nitra, the Trenčín and the Trnava regions.

2. Cluster Analysis of Regional Development Selected Indicators in 2006

The values of the regional development selected indicators in 2006 are shown in Table 3.

In 2006 the highest **unemployment rate** was recorded again in the Banská Bystrica region with the value of 21,1%, followed by the Košice region with 20,3 % and the Prešov region with 18,1 %. The lowest value was recorded in the Bratislava region – just 4,3 %. However, in comparison with 2002 we can observe significant decrease of the unemployment rate.

Table 3. Selected Indicators Values for 2006

Region	Unemployment Rate (%)	Average wages (EUR)	No. of SMEs to 1000 Popul.	No. of entrepreneurs to 1000 Popul.	Road Density km/1000 km ²	Highway and Speedy-way Density km/1000 km ²
BA	4,3	825	43,83	97,76	390	52,14
TT	8,8	584	13,92	72,44	470	22,45
TN	7,1	544	14,76	70,23	416	17,43
NR	13,2	511	11,69	63,53	403	3,41
ZA	11,8	546	13,22	75,60	293	7,22
BB	21,1	520	13,27	59,72	337	8,21
PO	18,1	468	11,56	61,24	344	3,40
KE	20,3	595	13,27	47,66	352	4,35

Source: Custom processing

The lowest **average monthly wages of 468 EUR**, were recorded again in the Prešov region, followed by the Nitra region with 511 EUR and the Banská Bystrica region with 520 EUR. On the contrary, the highest average wages were in the Bratislava region – up to 825 EUR. In the Košice, the Trnava, the Trenčín and the The Žilina regions this amount did not exceed 600 EUR.

The indicator of **SMEs number** was developing favorably – in comparison to 2002 this number has been increased in all regions. In the Bratislava region it reached up to 43.83 followed

by the Trenčín and the Trnava regions ranging 14.76, respectively 13.92 SMEs to 1,000 population, followed by the Banská Bystrica, the Košice, the Žilina, the Nitra and the Prešov regions.

As for **density of the road network**, no significant changes were recorded comparing with 2002. In some regions, even no changes took places, e.g. in the Trnava, respectively the Nitra ones. In other regions, only small changes were recorded, especially due to the completion of some road sections.

Significant increase of **highway, respectively speedy-way density** in 2006, comparing with 2002, was recorded in the Banská Bystrica region (from 1.17 to 8.21 km/1000 km²), due to the completion of some R1 speedy-way sections. In other regions, this indicator changed just slightly.

Upon data as quoted in Table 3, we have processed Cluster analysis for 2006 (Figure 2).

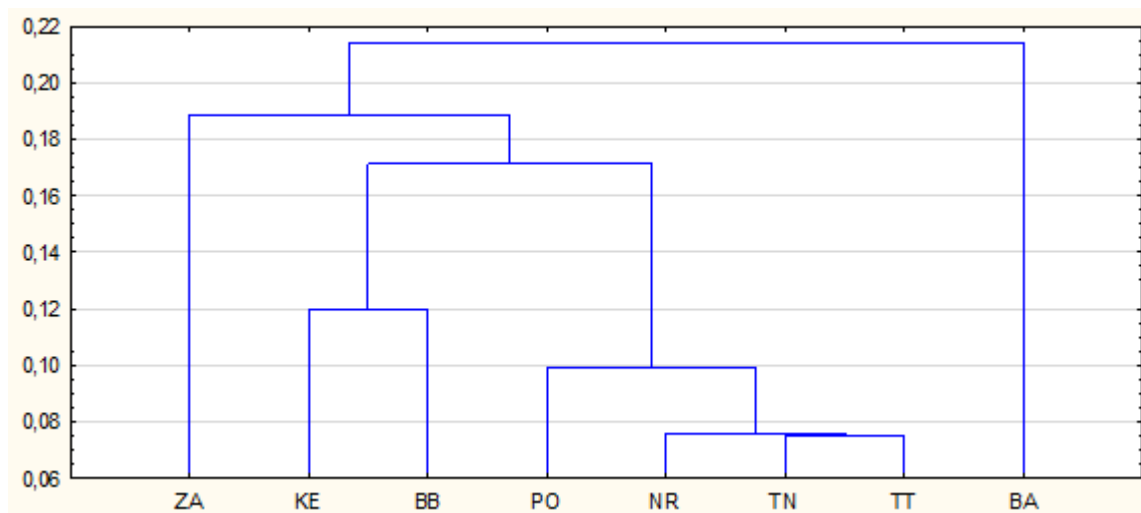


Figure 2. Cluster analysis of regional development selected indicators for 2006

Source: Custom processing in Statistica programm

As it can be seen above, two main clusters have remained, e.i. that the Bratislava region still forms separate cluster, respectively the other one is formed by all other Slovak regions. Within the second cluster, two clusters have been formed again – separately standing the Žilina region, respectively the most significant similarity has been recorded with the Trnava, the Trenčín and the Nitra regions. The figure above, shows that there is still significant difference between the Bratislava region and the rest of Slovakia.

3. Cluster Analysis of Regional Development Selected Indicators in 2011

In 2011 the highest **unemployment rate** within Slovak Republic was recorded in the Košice region followed by the the Prešov and the Banská Bystrica regions. The lowest value was recorded in the Bratislava and the Trenčín regions where this indicator did not exceed 9.0 %. However, in comparison with 2006, the unemployment rate decreased in the Košice, the Banská Bystrica and the Prešov regions. On the contrary, it increased in the Trenčín, the Žilina, the Trnava, the Nitra, respectively the Bratislava regions.

Average monthly wages increased in comparison with 2006 in all regions. The one-thousand „boundary“ was exceeded only in the Bratislava region, 700 EURO limit was overcome in the Košice, the Trnava and the Žilina regions.

Indicator of **SMEs number** continued its favourable development – we can conclude that number of SMEs to 1000 population increased in all regions. The most significant growth in comparison to 2006 was recorded in the Bratislava region – by more than 25 SMEs. On the contrary, the smallest increase was recorded in the Trenčín region – only by 4.4 SMEs to 1000 population. In other Slovak regions, increase exceeded 5 SMEs to 1000 population.

As for the **density of road network**, the highest level is still in the Trnava region, the lowest one in the Žilina region. In comparison to 2006, almost all regions, with the exception of the Košice one, showed slight increase of the density of road network in 2011, e.g. by 7, respectively more km to 1,000 km² in the Prešov, the Nitra and the Žilina regions. This is closely related to the increase of **highway, respectively speedy-way density** in these regions. On the contrary, the lowest growth was recorded in the Košice and the Trnava regions. Significantly highest density of highways, respectively speedy-ways is still in the Bratislava region showing significant distance from other ones.

Table 4. Selected Indicators Values for 2011

Region	Unemployment Rate (%)	Average Wages (EUR)	No. of SMEs to 1000 Popul.	No. of Entrepreneurs to 1000 Popul.	Road Density km/1000 km ²	Highway and Road Density km/1000 km ²
BA	5,8	1 001	69,52	93,29	394	55,33
TT	10,6	735	21,24	72,41	471	22,55
TN	8,7	687	19,16	70,94	420	20,79
NR	12,5	662	20,11	66,88	410	10,72
ZA	14,3	707	19,93	84,99	300	12,82
BB	17,5	652	18,76	60,07	339	10,44
PO	17,8	608	17,31	67,58	352	9,84
KE	19,6	726	18,49	46,97	352	4,38

Source: Custom processing

The graphical representation of individual regions similarities in indicators is shown in Figure 3.

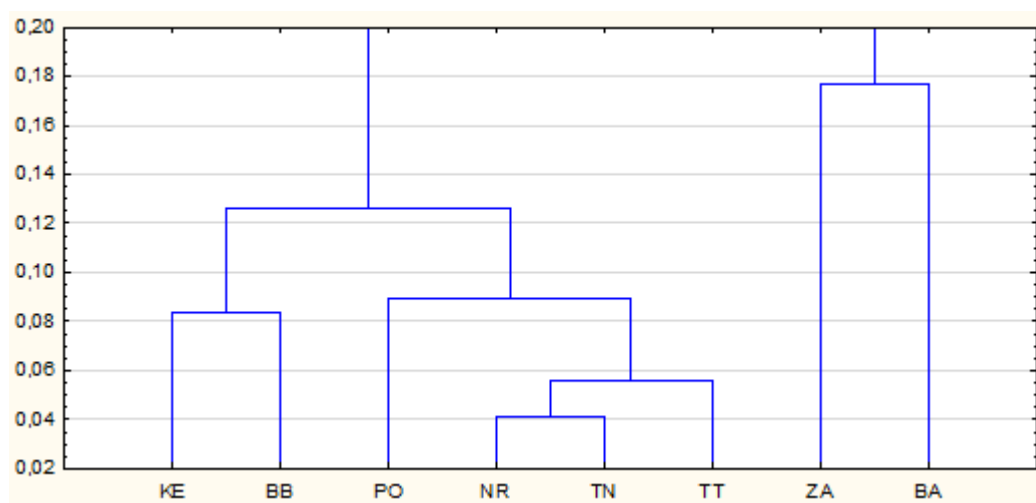


Figure 3. The cluster Analysis of the Regional Development Selected Indicators for 2011

Source: Custom processing in Statistica programme

In 2011, two main clusters were formed. However, while in two previously observed periods the Bratislava region represented separated cluster, in 2011 this cluster comprises also the the Žilina region for the first time. This favorable progress resulted from increasing number of entrepreneurs to 1,000 population, density of highways and speedy-ways, respectively number of SMEs. The second cluster is formed by other Slovak regions. Within it, separately standing cluster can be seen formed by two regions with the most unfavorable values – the Košice and the Banská Bystrica ones. The cluster comprises the Prešov, the Nitra, the Trenčín and the Trnava regions where the Nitra and the Trnava ones showing greatest similarity.

4. Discussion

Many European Union countries try to settle differences within their countries through economic policy. For each country, there are different key development factors, respectively indicators that also affects selection of criteria upon which the regional disparities are to be evaluated in certain country. In our paper, we have compared and evaluated regional disparities upon the development of the selected indicators, as e.g.: unemployment rate, number of SMEs, number of entrepreneurs, density of roads, highways and speedy-ways. The analysis of the regional disparities of the selected indicators within Slovak regions using multi-criteria method highlighted differentiated evolution of the indicators. We have compared three years, 2002, 2006 and 2011. Resulting from the Cluster analysis of indicators in 2002 and 2006 as shown in Graphs 1 and 2, we can say that two main clusters haven't changed and the difference between the Bratislava region and other ones remained. Different development was in 2011 where isolated cluster of the Bratislava region was joint by the Žilina region, suggesting that the similarity value of indicators of the Bratislava, respectively the Žilina regions, has increased and the differences between these two regions decreased. The Košice, the Banská Bystrica, the Prešov, the Nitra, the Trenčín and Trnava regions still form one large cluster and they have not succeeded to approach and reach values of the Bratislava region.

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