Analysis of the Number of European Union Citizens Working in the Regions of Slovakia in the Period 2013-2019

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Abstract: The paper aims to analyse the regions of Slovakia based on the number of working citizens of the European Union. The contribution method is used to find out in which region the number of working foreigners increased the most, and in which the least. Suslov´s coefficient of similarity of structures is used to analyse changes in the structure of the analysed indicator. From the results of the realized analysis we found out that the number of working foreigners in Slovakia increased the most in the year 2014 compared to 2013, by 63.40%. Bratislava Region (16.92%), Žilina Region (11.37%) and Prešov Region (9.63%) contributed the most to this increase, while Košice Region (0.91%) and Trenčín Region (1.07%) contributed the least. In the year 2019 compared to 2018 was recorded an increase of only 6.10%. Suslov's coefficient of similarity of structures acquires the value 0.0230, which means a high degree of similarity of structures of the number of working foreigners in the years 2013 and 2019.

1. INTRODUCTION

Migration has been around the world since time immemorial, with people traveling to other countries for better work or better living conditions. It is part of the life cycle and effects, on the one hand, the countries from which people leave, but also the countries that are attractive to people traveling for a better life.

In this paper, we deal with the topic of employment of citizens of the member states of the European Union in Slovakia. In the past, our country was not very popular for foreigners, more people left Slovakia going abroad than they arrived. From the point of view of migration, it was rather a transit country. Slovakia's accession to the European Union has changed many things. We have become a more stable country in all directions. Foreigners who took us as a transit station began to perceive us as an opportunity to work in better conditions compared to the home country. If migration is reasonably regulated, it is good for the economy. Foreigners working in another state contribute to its state budget in the form of taxes, support domestic consumption and create pressure to increase competitiveness in the labour market. However, higher added value is primarily brought by highly qualified employees performing more sophisticated activities.

The coronary crisis reduces the number of foreigners working in Slovakia. While at the end of February last year 78.2 thousand citizens from other countries worked for us, at the end of last year their number gradually decreased to 69 thousand (SITA, 2021).

The aim of the paper is to analyse the regions of Slovakia based on the number of working citizens of the member states of the European Union in the years 2013 – 2019.

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2. METHODOLOGY

We will use the contribution method to find out which region contributed the most to total increase in the number of working citizens of the EU Member States. We will use Suslov's coefficient of similarity of structures to analyse changes in the structure of the given indicator.

2.1. The contribution method

The contribution method is used for the analysis of additive indicators (Yt), which are the sum of individual components (y_t^i), while (Hindls, Kaňoková, Novák, 1997):

$$Y_t = \sum_{i=1}^{n} y_t^i \tag{1}$$

We use this method when we want to find out to what extent the changes of its individual components contributed to the change of the additive indicator.

The procedure of the contribution method is as follows. First, we calculate the relative increase of the additive indicator:

$$k_{\Delta t} = \frac{Y_t - Y_{t-1}}{Y_{t-1}} \tag{2}$$

and relative increases of its individual components:

$$k_{\Delta t}^i = \frac{y_t^i - y_{t-1}^i}{y_{t-1}^i} \tag{3}$$

Then we calculate the structural number in the period *t-1*:

$$s_{t-1}^i = \frac{y_{t-1}^i}{Y_{t-1}} \tag{4}$$

Contributions for individual components are calculated according to the relationship:

$$k_{\Delta t}^i \cdot s_{t-1}^i \tag{5}$$

The contributions for the individual components are then interpreted as the value in percent that the *i*-th component contributed to total change in the additive indicator *Yt* (Hurbánková, Sivašová, 2018).

The relative increase of the additive indicator is equal to the sum of the relative contributions of the individual components (Hindls, Hronová, 1997):

$$\sum_{i=1}^{n} \left(\frac{y_t^i - y_{t-1}^i}{y_{t-1}^i} \right) * \frac{y_{t-1}^i}{Y_{t-1}} = \frac{1}{Y_{t-1}} \sum_{i=1}^{n} \left(y_t^i - y_{t-1}^i \right) = \frac{1}{Y_{t-1}} \left(\sum_{i=1}^{n} y_t^i - \sum_{i=1}^{n} y_{t-1}^i \right) = \frac{Y_t - Y_{t-1}}{Y_{t-1}} \tag{6}$$

2.2. The Suslov's coefficient of similarity of structures

The Suslov´s coefficient is one of the measures for the analysis of the similarity of structures. We proceed as follows to calculate it. We find out how many and what components z_i has the analysed additive indicator and define the compared situations *t* and *t-1*. We quantify the share of each

component in the total value of the aggregate (we calculate the structural numbers x_i and y_i). We verify whether

$$\sum_{i=1}^{n} x_i = 1 \text{ and } \sum_{i=1}^{n} y_i = 1 \qquad \text{(Kahounová, 1994).}$$

We calculate the absolute differences of the paired structural numbers belonging to the i-th component in the situations t and t-1:

$$\left| x_i - y_i \right| \tag{7}$$

We calculate the Suslov´s coefficient of similarity of structures according to the expression:

$$d_{sus} = \frac{1}{n} \sum_{i=1}^{n} \left| x_i - y_i \right| \tag{8}$$

The values of the Suslov´s coefficient are in the interval $\langle 0; 2/n \rangle$. If the value of the coefficient is near to 0, the similarity of the compared structures increases. If the value of the coefficient is near to 2/n, the similarity of the compared structures decreases, resp. their difference increases. If the coefficient is equal to 0, it means the equality of the analysed structures and the value 2/n means the complete difference of the structures (Karpov, 2007).

Suslov's coefficient expresses by how many percentage points on average one part (component) of the structure in situation t differs from situation t-1, resp. what is the deviation in percentage points on average per one component of the given additive n-component indicator (Pozdniaková, 1981).

3.　RESULTS AND DISCUSSION

The numbers of citizens of EU Member States working in the regions of the Slovak Republic (excluding Slovak citizens) are shown in Table 1. In the observed period, the number of citizens of European Union member states working in Slovakia increased more than fourfold. In absolute expression, it increased the most in the Bratislava region by more than 11,000, the least in Prešov region by less than 900. In that period, the number of working foreigners from EU countries increased almost every year in each region, with the exception of the year 2019, when it (in Trnava, Trenčín and Prešov regions) slightly decreased.

The relative increases (calculated according to Kotlebová et al., 2017) of EU citizens working in individual regions of the Slovak Republic in the years 2013 – 2019 can be seen in Table 2. The highest year-on-year growth in the number of EU citizens working in Slovakia occurred in the year 2014, when their number increased by more than 60% compared to the previous year. The working population of the EU member states in Žilina region increased the most in that year, where their number increased 3.5 times compared to the previous year. The number of working citizens of EU member states increased by more than 100% in Banská Bystrica and Prešov regions; the slowest increase occurred in the year 2019, when this indicator increased by only 6%; in three regions (Trnava, Trenčín and Prešov) it even decreased.

Using the contribution method, we will find out how the individual regions of the Slovak Republic participated in the change in the number of working citizens of the EU member states. The calculations are shown in Table 3 (contributions are in percentages).

Table 1. Number of citizens of EU member states (except Slovak citizens) working in individual regions of the Slovak Republic in the years 2013 – 2019

Regions of Slovakia	2013	2014	2015	2016	2017	2018	2019
Bratislava region (BA)	3 165	4 525	6 298	8 267	9 867	12 958	14 260
Trnava region (TT)	1 530	2 214	2 492	3 312	4 382	5 047	5 032
Trenčín region (TN)	770	856	975	1 253	1 789	2 354	2 251
Nitra region (NR)	1 077	1 723	2 310	3 157	4 058	4 730	5 056
Žilina region (ZA)	257	1 171	1 724	1 896	2 032	1 526	1 910
Banská Bystrica region (BB)	376	936	1 350	1 398	1 355	1 479	1 501
Prešov region(PO)	509	1 283	1 745	1 942	1 686	1 710	1 394
Košice region (KE)	357	430	619	1 010	1 418	1 748	2 073
Slovakia total	8 040	13 137	17 513	22 234	26 586	31 553	33 477

Source: Labour, Social Affairs and Family Office, 2021

Table 2. Relative increases of citizens from EU member states working in individual regions of the Slovak Republic in the years 2014 – 2019

Regions of Slovakia	2014	2015	2016	2017	2018	2019
BA	0,4297	0,3918	0,3126	0,1935	0,3133	0,1005
TT	0,4471	0,1256	0,3291	0,3231	0,1518	-0,0030
TN	0,1117	0,1390	0,2851	0,4278	0,3158	-0,0438
NR	0,5998	0,3407	0,3667	0,2854	0,1656	0,0689
ZA	3,5564	0,4722	0,0998	0,0717	-0,2490	0,2516
BB	1,4894	0,4423	0,0356	-0,0308	0,0915	0,0149
PO	1,5206	0,3601	0,1129	-0,1318	0,0142	-0,1848
KE	0,2045	0,4395	0,6317	0,4040	0,2327	0,1859
Slovakia total	0,6340	0,3331	0,2696	0,1957	0,1868	0,0610

Source: Own calculations according to Hindls & Hronová (1997) and Hurbánková & Sivašová (2018)

Table 3. Calculation of the contribution method for the number of EU citizens working in individual regions of the Slovak Republic in the years 2014 - 2019

Regions of Slovakia	2014	2015	2016	2017	2018	2019
BA	16,92	13,50	11,24	7,20	11,63	4,13
TT	8,51	2,12	4,68	4,81	2,50	-0,05
TN	1,07	0,91	1,59	2,41	2,13	-0,33
NR	8,03	4,47	4,84	4,05	2,53	1,03
ZA	11,37	4,21	0,98	0,61	-1,90	1,22
BB	6,97	3,15	0,27	-0,19	0,47	0,07
PO	9,63	3,52	1,12	-1,15	0,09	-1,00
KE	0,91	1,44	2,23	1,84	1,24	1,03
Slovakia total	63,40	33,31	26,96	19,57	18,68	6,10

Source: Own calculations according to Karpov (2007)

Bratislava region contributed most significantly to the growth in the number of citizens of the member states of the European Union working in the Slovak Republic. This applies to each of these years and it results from the fact that more than a third of all citizens of EU member states working in Slovakia live in Bratislava region. The analysed indicator increased the most in the year 2014 compared to 2013 by 63.40%. Bratislava region (16.92%), Žilina region (11.37%) and Prešov region (9.63%) contributed the most to this increase. Košice region (0.91%) and Trenčín region (1.07%) contributed the least. The number of working EU citizens increased the least in the year 2019 compared to 2018, by only 6.10%.

In terms of the structure of the distribution of workers in individual regions, there were slight changes in the analysed period. The percentage of working citizens of EU member states living in individual regions of Slovakia is shown in Table 4.

Despite the fact that there are slight changes in the structure in the observed period, we can state that the situation is relatively stable. The highest number of citizens of EU member states works in Bratislava region, although in the year 2014 it dropped more significantly to the level of 34.44%, but from the year 2017 it started to grow to the level of 42.6% in 2019. We can expect this situation, because in the main city is the highest concentration of headquarters of international companies. Many of them sent their employees to Slovakia, working mainly at various levels of management.

Table 4. Percentage representation of citizens of EU member states working in individual regions of the Slovak Republic in the years 2013 – 2019

Regions of Slovakia	2013	2014	2015	2016	2017	2018	2019
BA	39,37	34,44	35,96	37,18	37,11	41,07	42,60
TT	19,03	16,85	14,23	14,90	16,48	16,00	15,03
TN	9,58	6,52	5,57	5,64	6,73	7,46	6,72
NR	13,40	13,12	13,19	14,20	15,26	14,99	15,10
ZA	3,20	8,91	9,84	8,53	7,64	4,84	5,71
BB	4,68	7,12	7,71	6,29	5,10	4,69	4,48
PO	6,33	9,77	9,96	8,73	6,34	5,42	4,16
KE	4,44	3,27	3,53	4,54	5,33	5,54	6,19

Source: Own calculations according to Kahounová (1994)

The largest decrease in the level of representation of working citizens of EU member states occurred in Trenčín region (from 9.58% in the year 2013 it decreased to 6.72% in the year 2019), the lowest share (5.57%) reached in the year 2015. There was a slight decrease in Prešov region (from 6.33% in the year 2013 to 4.16% in the year 2019). The share increased in Nitra region (from 13.40% in the year 2013 to 15.10% in the year 2019), which may be due to the arrival of the Jaguar carmaker.

In other regions, the structure of EU citizens working in the Slovak Republic is developing steadily and there are no significant fluctuations in them.

For better illustration, we will display the data for the first and last year using a pie chart (Graph 1).
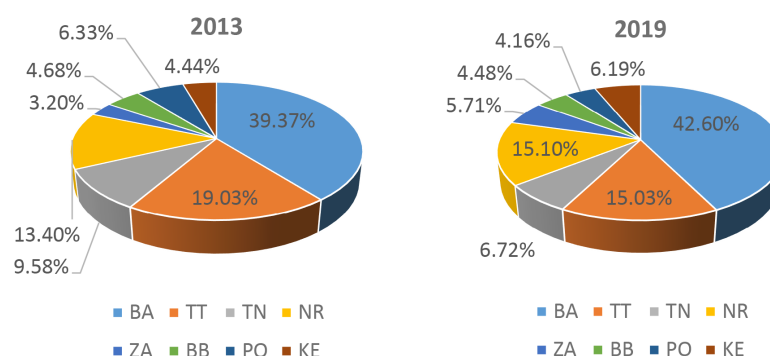
Graph 1. Percentage share of citizens of EU member states working in individual regions of the Slovak Republic in 2013 and 2019

Source: Own processing

Changes in the structure of the distribution of working foreigners from EU countries will be further analysed using the Suslov's coefficient of similarity of structures. We examine the similarity in the structure in the years 2013 and 2019. The value of this coefficient in the 8-component aggregate can take values from the interval <0, 0.25>. The calculation is given in Table 5.

Table 5. Calculation of the Suslov's coefficient of similarity of structures for the number of EU citizens working in individual regions of the Slovak Republic in the years 2013 and 2019

Regions of Slovakia	x_i	y_i	$|x_i-y_i|$
BA	0,3937	0,4260	0,0323
TT	0,1903	0,1503	0,0400
TN	0,0958	0,0672	0,0285
NR	0,1340	0,1510	0,0171
ZA	0,0320	0,0571	0,0251
BB	0,0468	0,0448	0,0019
PO	0,0633	0,0416	0,0217
KE	0,0444	0,0619	0,0175
Slovakia total	1,0000	1,0000	0,1841
d_{sus}	x	x	0,0230

Source: Own calculations according to SME (2021)

The Suslov's coefficient has a value of 0.0230, which means a high degree of similarity in the structures of the number of EU citizens working in individual regions of the Slovak Republic in the years 2013 and 2019.

4. CONCLUSION

From the realized analysis, we can draw the following conclusions:
- In the observed period, the number of citizens of European Union member states working in Slovakia increased more than fourfold. Their number increased almost every year in each region, with the exception of the year 2019, when it (in Trnava, Trenčín and Prešov) regions slightly decreased.
- The most of EU citizens work in Bratislava region (up to 42.60% in 2019).
- The working population of the EU member states in Žilina region increased the most in the year 2014, where their number increased 3.5 times compared to the previous year. The number of working citizens of EU member states increased by more than 100% in Banská Bystrica and Prešov regions. In the year 2019, that indicator decreased in three regions (Trnava, Trenčín and Prešov).
- The number of working foreigners in Slovakia increased the most in the year 2014 compared to 2013, by 63.40%. Bratislava region (16.92%), Žilina region (11.37%) and Prešov region (9.63%) contributed the most to this increase. Košice region (0.91%) and Trenčín region (1.07%) contributed the least. In the year 2019 compared to 2018 was recorded an increase of this indicator of only 6.10%.
- The Suslov's coefficient of similarity of structures has a value of 0.0230, which means a high degree of similarity of structures of the number of working foreigners in the years 2013 and 2019.

Despite the fact that based on available data in the years 2013 – 2019, the growing trend of the number of working EU citizens in Slovakia seemed to be unambiguous, the crisis caused by the global pandemic of the covid-19 virus may bring significant changes. The measures taken to

prevent the spread of the virus are mainly based on reduced mobility. Therefore, we expect that the growth in the number of working EU citizens in Slovakia will slow down in the near future. Another factor that negatively affects changes in the number of working citizens of European Union in Slovakia may be the expected economic effects of the crisis, which are likely to lead to a reduction in the number of jobs and thus the number of foreigners. In the long term, we expect that the growing trend in the number of working EU citizens in Slovakia will continue. One of the reasons is that Slovakia is one of the countries with the lowest number of working foreigners.

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