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ANALYSIS OF EMIGRATION IN EUROPE USING THE SPATIAL DYNAMIC SHIFT-SHARE METHOD

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Abstract

The aim of the paper is to examine the pace of change in emigration levels in 24 selected European countries from 1999 to 2012, by age, country and the reference area. The spatial dynamic shift-share method is used in this research. The study analyses each country's share and identifies structural as well as geographic factors in the volume of the net global effect. It also considers a spatial weights matrix. Results reveal that the global mean pace of change in the emigration is positive. The pace of phenomenon is the fastest among individuals aged 45–64 and also 35–44 years and in Czech Rep., Lithuania, Spain, Hungary and Germany.

Keywords: emigration, spatial dynamic shift-share analysis, spatial interactions, peace of change, net effect

JEL classification: F22, O15, C49

Introduction

In 1985 in Schengen, five European countries, Belgium, the Netherlands, Luxembourg, France and the then Federal Republic of Germany, signed an agreement pursuant to which checks of individuals crossing the common borders were to be gradually abolished. At present the signatories of the Schengen Agreement include 22 European Union countries as well as Iceland and Norway. Switzerland and Liechtenstein are associated with the Schengen group. Cyprus and Croatia are not members of the Schengen Area but have adopted regulations arising from the agreement. Bulgaria and Romania are also candidates for accession to the Area. Commitments signed on the free movement of people, which is one of fundamental human freedoms, are thus respected almost Europe wide.

Abolition of controls at European borders is a long and complex process. Many countries introduced the so-called transitional periods for the freedom of movement of individuals. Generally the European Union member states gradually abolished limitations or initially only facilitated the process of granting work permits. Upon the 2004 accession to the EU of Estonia, Lithuania, Latvia, Poland, the Czech Republic, Slovakia, Hungary, Slovenia, Malta and Cyprus, only three countries – the United Kingdom, Ireland and Sweden – did not introduce such limitations. It was only in 2011 that the last restrictions were removed and thus all institutional barriers to the free movement of European Union citizens ceased to exist and labour markets were fully opened.

The gradual lifting of institutional barriers led to an intensified phenomenon of migration in Europe (Bonifazi et al., 2008). Thanks to the introduction of cheap and fast connections between countries (e.g. by air), limitations to the movement of people do not actually exist. That increased awareness and tolerance, which, in turn, caused language and cultural barriers to disappear. Over time, differences in the treatment of native citizens and immigrants from other European countries were also reduced, which was reflected in the legislation of specific countries, too (Bonifazi et al., 2008). There are more than four hundred million Europeans who may currently take advantage of unlimited movement opportunities.

As the phenomenon of migration has intensified in Europe, many countries have become both the source and destination of migration (Castels, Miller, 2003). Thus, issues connected with causes, effects and directions of the movement of people are a frequent topic of political and academic discussions. The specialist literature most commonly focuses on issues of immigration (temporary or permanent settling in a destination country) as well as benefits and costs borne

by countries accepting immigrants, whereas the phenomenon of emigration (temporary or permanent leaving of the country of origin) is rarely examined.

Emigration can be divided into temporary (including seasonal and circular) associated with, for example, entering education, and permanent – when emigrants leave their country of origin with no plans to return.[1] Causes of emigration are often very complex. The so-called 'push factors' encompass environmental, psychological, political, cultural and economic issues that can simultaneously affect the decision to leave one's home country (Bonifazi et al., 2008). In Europe, economic aspects connected with seeking better living conditions are currently the most important. A majority of modern research into the causes of migration draws on a hypothesis put forward by J.R. Hicks, according to which differences in economic gains and, in particular, differences in earnings, are the main cause of migration (Hicks, 1932). Asymmetry in socioeconomic development among countries, problems in the labour market and the desire to develop (acquire knowledge, learn foreign languages) all make Europeans emigrate from their countries of origin in pursuit of better prospects in a different country.

The emigration entails many positive and negative consequences. Positive effects of the emigration include, for instance, an improved situation in the labour market, both nationally and across Europe (with a possibility of correcting maladjustments or imbalances), which is among the principles of the sustainable development strategy. Another significant consequence is the fact that money earned abroad is spent in the country of origin, i.e. the so- called transfers of capital that increase along with increasing migration. This money is usually spent on consumption, although a part of it is allocated to investment, including human capital, e.g. for children's education. Thus, it can be concluded that the transfer of money affects the development of economies at local and regional levels through the multiplier effect. Consumption expenditures, for example, on education or renovation or purchase of flats, fuel domestic demand, which contributes to creating new jobs and thus generating additional earnings (Kaczmarek, Tyrowicz, 2008).

On the other hand, one of the most important negative consequences of migration is that it is usually the brave, resourceful, mobile, often highly qualified, young individuals with a higher education who emigrate, which is undoubtedly a great loss to the emigrant's country of origin. Nevertheless, if an individual returns to the country, he or she most often brings not only savings but also experience and international contacts. Return to the home country is, then, a very desirable phenomenon. Therefore, governments of specific countries develop

[1] According to Eurostat emigration denotes the action by which a person, having previously been usually resident in the territory of a Member State, ceases to have his or her usual residence in that Member State for a period that is, or is expected to be, of at least 12 months.

strategies to encourage citizens to return from emigration, e.g. in Poland a website "Return Kit – Navigation for Returning Poles" was launched to help emigrants navigate all the practical and formal difficulties connected with return.

The main aim of this article is to use the spatial dynamic shift-share method to analyse multidimensional changes in emigration levels (per 1 million people) in 24 selected European countries from 1999 to 2012. The first detailed aim of the study is to exam and assess the rate of change in emigration volumes by age and country of origin, as well as for the reference area in the analysed period. The next purpose is to take into consideration spatial aspects of the examined phenomena. Interactions among countries are expressed by the asymmetrical spatial weights matrix **W**, based on the volume of directional emigration in a given year. The study will also help to distinguish countries and age groups that, during the period 1999–2012, are less competitive (due to the number of emigrants) and these which are the most attractive. Finally, the research will allow to analyse, identify and compare shares and factors in the net volume of the pace of change in the number of emigrants per 1 million people in specific countries.

The remaining part of this paper is structured as follows. Section 2 introduces the preliminary analysis of general emigration levels in selected countries in the time span 1999–2012. Section 3 develops theoretical issues (also with the review of literature) of the shift-share method in the migration analysis in case of traditional static approach, dynamic recursive model and with the spatial weights matrix, as well as other modifications. Section 4 contains the empirical analysis and discusses its results, while Section 5 delivers some summary of the analysis.

1. Statistical data – preliminary analysis

Emigration levels (per 1 million people) were analysed for 24 European countries,[2] 21 of which are members of the European Union: Austria (AT), the Czech Republic (CZ), Croatia (HR), Cyprus (CY), Denmark (DK), Estonia (EE), Finland (FI), Spain (ES), the Netherlands (NL), Ireland (IE), Lithuania (LT), Luxembourg (LU), Latvia (LV), Germany (DE), Poland (PL), Slovenia (SI), Slovakia (SK), Sweden (SE), Hungary (HU), the United Kingdom (UK), and Italy (IT) and three of which are not: Iceland (IS), Norway (NO) and Switzerland (CH). All the countries belong to the Schengen Area or are signatories to the Schengen Agreement.

[2] This analysis takes into account European countries for which statistical data were available for the entire analysed period from 1999 to 2012 (data base: Eurostat).

European countries use different ages for maturity, compulsory education, pre-working and retirement ages, so a subjective age division of the population was made. Children and adolescents were divided into two age groups: 0–14 years (children travelling with parents) and 15–19 years (adolescents going abroad to attend schools or foreign language courses). Mobile working age was divided into two groups: 20–34 years (young people undertaking studies and gaining professional experience) and 35–44 years (mature people establishing families). Finally, two further groups were identified: immobile working age (45–64 years) and post-working age/retirement (65+ years).

Hence, the statistical database is made up of information about emigration per 1 million people (for both temporary and permanent stays) from 24 countries in six age groups for a period between 1999 and 2012. Appropriate statistical data were taken from the Eurostat database and Central Statistical Offices of specific countries.

Preliminary analyses of statistical data indicated that the highest numbers of emigrants (per 1 million people) in all age groups as a whole from 1999 to 2012 were from Luxembourg, Iceland and Ireland, and the lowest numbers were from Slovakia, Hungary and Poland. In the 0–14 age group, the highest number of individuals emigrated in 2012. In the 15–19 group, the busiest year was 2001. In the 20–34 and 65+ age groups, it was 2010, in the 35–44 group, it was 2008, and in the 45–64 group, it was 2012. In total, the highest number of emigrants (per 1 million population) was observed in 2012. In general, in all the years of study, the most mobile group was those aged 20–34 years and the least mobile was those aged 65+ years. In the 20–34 age group, the largest single group of individuals emigrated from Lithuania in 2010 (14,727 per 1 million people).

It should be emphasized that despite the general increase in population movements in Europe, there was no distinct linear rise in emigration in the analysed countries from 1999 to 2012. The phenomenon is characterized by very distinct fluctuations, undoubtedly connected with the socioeconomic conditions in those countries in a given year.

Figure 1a and Figure 1b show the total level of emigration for all the age groups as a whole in the first and the last year of study, i.e. 1999 and 2012. The numbers in the two figures show that there was a general increase in emigration in Europe. Thus, the maps cannot be directly compared. It can, however, be noted that in 1999, Iceland, Ireland and Switzerland had the largest numbers of emigrants per 1 million people. However, by 2012, those countries had been joined by Lithuania and Latvia. In both periods, the countries of East-Central, Southern Europe and Finland had the lowest levels of emigration (the number of emigrants per 1 million population).

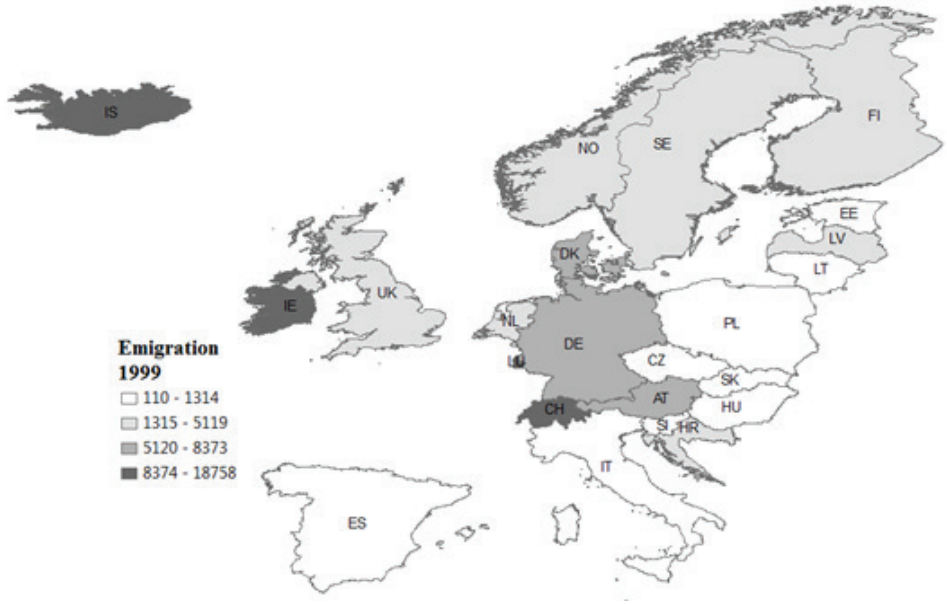

Figure 1a. Total emigration levels (per 1 million population) in 1999

Source: own elaboration in ArcMap 10.2.

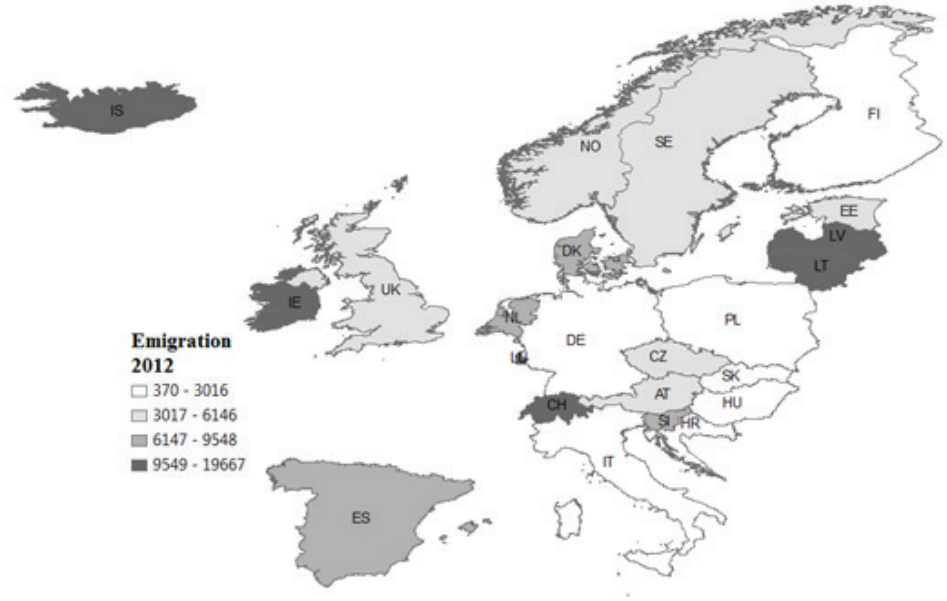

Figure 1b. Total emigration levels (per 1 million population) in 2012

Source: own elaboration in ArcMap 10.2.

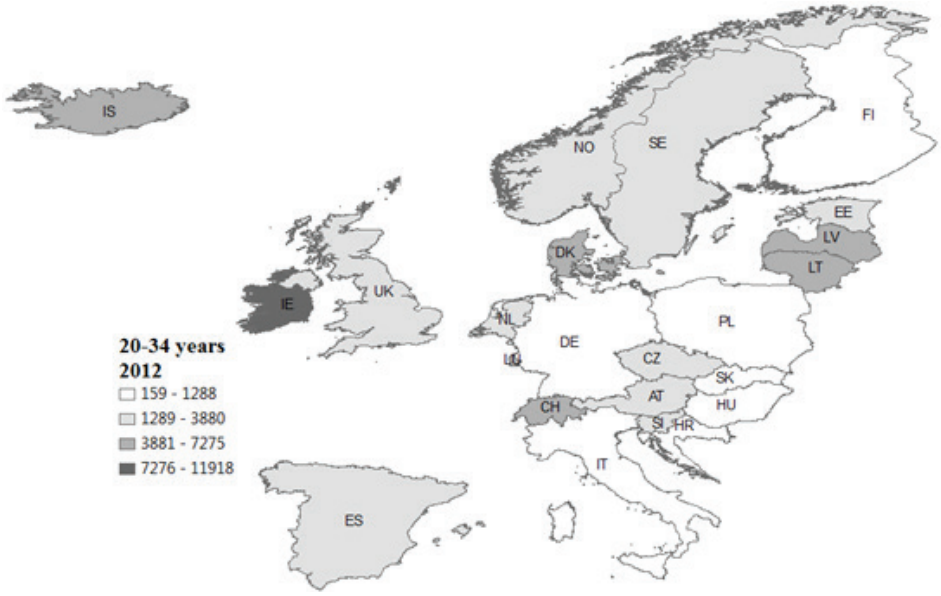

Figure 2. Level of emigration (per 1 million population) in 20–34 age group in 2012

Source: own elaboration in ArcMap 10.2.

Figure 2 shows levels of emigration per 1 million population in the most mobile group in the last year of the study, i.e. 2012. It can be observed that Ireland had the largest numbers of emigrants, while Germany, Finland, Poland, Slovakia, Hungary, Croatia and Italy had the lowest levels of emigration.

Results of detailed analysis of the pace of change in emigration per 1 million people from 1999 to 2012 in the observed European countries will be presented later. In the empirical section, a spatial recursive shift-share method with a spatial weights matrix changing over time was applied.

2. Shift-share method in migration analysis

2.1. Traditional static approach

The shift-share analysis was first proposed by Creamer (1942), and then formalized and popularized in research on differentiation of regional economic growth in the 1960s (Dunn, 1960). It allows us to divide a change (most often a relative one, i.e. a rate or pace of change) into regional (geographic, spatial), cross-sectional (structural) and global (domestic) factors in

relation to one or more features. Net effects are determined as a relative change in a region reduced by a constant global change. A global net effect enables us to distinguish structural and spatial effects. In the traditional shift-share approach, the net change is calculated as follows:

$$tx_{r\bullet} - tx_{\bullet\bullet} = \sum_i w_{r\bullet(i)}(tx_{\bullet i} - tx_{\bullet\bullet}) + \sum_i w_{r\bullet(i)}(tx_{ri} - tx_{\bullet i}) \quad (1)$$

where $tx_{r\bullet}$ is the pace of change in the phenomenon in the current period as compared with the base period in the *r*-region, $tx_{\bullet\bullet}$ is the global effect, $w_{r\bullet(i)}$ is the regional weight for the *r*-region, $(tx_{r\bullet} - tx_{\bullet\bullet})$ is the total/net regional effect, $(tx_{\bullet i} - tx_{\bullet\bullet})$ is the structural factor of regional growth, and $(tx_{ri} - tx_{\bullet i})$ is the local (geographic, competitive, differentiating) growth factor in the *i*-sector of the *r*-region.

The shift-share analysis is also used in empirical research into migration. The static shift-share approach to migration was first adopted by Plane (1987). He analysed geographic factors determining a change in the structure of interregional migration movements in the United States in the 1980s. Plane and Rogerson (1989) continued the analysis, looking at structural changes on the level of migration in selected US regions in the face of economic recession. Ikishawa (1992) used this method to explore the issue of interregional migrations in Japan in the context of migrant numbers. In the same year, the results of Plane's (1992) research were also published, on the age structure of migrants in the United States. The traditional static shift-share method of research into the phenomenon of migration was also used by, among others, Wright and Ellis (1997), Perry and Hayward (2003), and Franklin (2012).

2.2. Dynamic recursive model

A disadvantage of the traditional approach is its static nature. Structural and spatial division is applied to changes in values from the initial to the final period. If the analysed points are not excessively distant in time, the adoption of constant weights does not generate significant errors. If, however, a change in value over several years is studied, it seems wrong to assume that shares of the regions reference variable in the total reference value are constant in time. In the late 1980s, Barff and Prentice (1988) proposed to dynamise the traditional approach of the shift-share analysis. The main assumption of the dynamisation was to assume changing weights and perform calculations recursively. That means determining a change (relative, absolute or net) in the value of a studied feature and specific effects sequentially, for each pair of consecutive periods.

The dynamic shift-share was first employed in research into migration by Plane (1989). Plane and Rogerson (1994) used it when conducting an analysis of geographic determinants

of demographic processes. The method was also applied in empirical research into migration by, among others, Ishikawa (1999), Franklin and Plane (2004), Franklin (2012) and Chen et al. (2014).

2.3. Spatial shift-share analysis (with spatial weights matrix) and other modifications[3]

The traditional and dynamic approaches to shift-share analysis take into consideration the geographic aspect of changes in the value of a studied variable. They do not, however, assimilate the idea of spatial relationships among regions; instead, they see them as economically and geographically unconnected objects. Nazara and Hewings (2004) proposed introducing a spatial weights matrix to the traditional shift-share analysis, to take into account the spatial dependencies.[4] In that case, along with the ordinary weights of the traditional and recursive approaches, weights of spatial interactions among regions were also taken into account. Spatial relationships are included in the structural or geographic effects, or in both at the same time. For dynamisation of the spatial shift-share method, the analysis proposed by Nazara and Hewings has to be repeated for each pair of consecutive periods, and changes and the effects have to be summed (Antczak, Żółtaszek, 2010). Spatial weights do or do not change. Therefore, the compilation of the spatial and dynamic approaches indicates that the pace of change in an analysed variable, and thus structural and geographic effects, and in elements of the spatial weights matrix (including spatial interactions and relationships), change from one period to the next, rather than only between the last time point of analysis and the first. Attention should also be paid to attempts to transform the deterministic model into the stochastic one. Berzeg (1978; 1984) proposed the SSANOVA[5] approach. Another path appeared to be a combination of shift-share analysis and panel data models proposed by Marimon and Zilibotti (1998). They constructed a theoretical cross-sectional (temporal and spatial) model in which dynamics were not recursive but simultaneously-considered changes in time and space. Research by, among others, Berzeg (1984), Knudsen (2000), and Emmerson, Ramanathan and Ramm (1975) are, for now, the closest fulfilment of Marimon and Zilibotti's ideas.

A compilation of the spatial shift-share method, stochastic and panel data models in the migration analysis was attempted, among others, by Sweeney and Goldstein (2005), Chen and Xu (2006), D'Amurii and Peri (2010), Etzo (2011), Franklin (2012) and Bell and Brown (2014).

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[3] For further information see Suchecki et al. (2010).

[4] The first law of geography, according to Tobler (1970), is: "*Everything is related to everything else, but near things are more related than distant things."*

[5] SSANOVA-Shift-Share Analysis of Variance (Suchecki et al., 2010).

This article analyses changes in emigration levels and in the pace of emigration volume taking into account migrants' ages. The empirical section applies the spatial dynamic shift-share method with a matrix characterised by spatial weights with values that change over time.

3. Results of analysis

In this article, the studied variable was a relative increase in the number of emigrants per 1 million population (in the pace of change) in the 24 selected European countries from 1999 to 2012, with the base period always being the preceding year. Regional weights were defined as 'the number of emigrants in the given age range in the country as a proportion of the total volume of emigration from countries in that region'. The reference variable was the total number of emigrants in the studied countries. In the dynamic approach, an analysis was carried out separately for every two periods. The final result was obtained by summing the results for each pair of years. The applied spatial shift-share model also considered the spatial weights matrix based on the binary directional emigration matrix (**W**) standardized in rows to one (Equation 3).[6] The form of the model that was used, where the pace of net change in emigration was broken down into its constituents, is as follows:

$$\sum_{s}(tx_{r\bullet}-tx_{\bullet\bullet})=\sum_{s}\sum_{i}u_{r\bullet(i)}(\mathbf{W}tx_{i}-tx_{\bullet\bullet})+\sum_{s}\sum_{i}u_{r\bullet(i)}(tx_{ri}-\mathbf{W}tx_{i}) \tag{2}$$

where $tx_{r\bullet}$ is the pace or rate of change in the number of emigrants in the current s_n-period as compared with the base s_i – period, i.e. the period preceding the current one, in the r-country; $tx_{\bullet\bullet}$ is the overall pace of change in the reference variable (total number of emigrants in the selected European countries); $u_{r\bullet(i)}$ is the regional weight for the r-country in the form of shares of the analysed variable in the total value of that variable for a given country; $(tx_{r\bullet} - tx_{\bullet\bullet})$ is the total regional effect (net effect); $(\mathbf{W}tx_{\bullet i} - tx_{\bullet\bullet})$ is the structural regional growth rate (here, by the age range of emigrants); $(tx_{ri} - \mathbf{W}tx_{\bullet i})$ is the local (geographic, competitive, differentiating) growth factor in the i-age range (sector) of the r-region.

The spatial shift-share method is characterized by elements reflecting interregional interactions:

$$\mathbf{W}tx_{i}=\frac{\left(\sum_{k=1}^{R}w_{rk}x_{ki}^{*}-\sum_{k=1}^{R}w_{rk}x_{ki}\right)}{\sum_{k=1}^{R}w_{rk}x_{ki}}\ \text{for } i=1,\ldots,M \tag{3}$$

[6] For further information on spatial weight matrices see Anselin (1988).

where **W** is the asymmetrical spatial weights matrix constructed based on information about the volume of emigration in a given year according to its direction (between two of the 24 analysed countries);[7] i is the age group number; r and k are country numbers for r, $k = 1, ..., R$; x_{ki} is the volume of emigration in the k-country for the i-age group; x^*_{ki} is the respective value for the final period (assuming recursiveness); and w_{rk} is the element of the spatial weights matrix for the r- and k-countries.

The first element of the net effect is the structural effect and the other is the geographic effect. Equation (2) can therefore be written as follows:

$$\textit{Net Effect} = \textit{Structural Effect} + \textit{Geographical Effect} \tag{4}$$

The values of the calculated effects for changes in total emigration volumes of specific countries for the period from 1999 to 2012 (including changes from year to year, in a recursive way) are shown in Table 1.

Table 1. Values of component effects calculated using the spatial recursive shift-share method for emigration volumes

	Net effect in percentage points	Structural effect in percentage points	Geographic effect in percentage points	Regional rate in percentage
1	2	3	4	5
CZ	740.3	232.6	507.7	772.1
DK	–25.9	222.8	–248.7	5.9
DE	–89.8	231.8	–321.6	–58.0
EE	100.5	234.5	–133.9	132.3
IE	34.4	215.2	–185.8	66.2
ES	311.2	231.8	79.4	343.0
IT	66.8	232.1	–165.3	98.6
CY	–22.3	232.8	–257.0	9.5
LV	284.7	235.8	48.9	316.5
LT	579.6	230.1	349.5	611.4
LU	–18.0	231.2	–249.1	13.8
HU	258.8	232.3	26.6	290.6
NL	27.3	229.2	–201.9	59.1
AT	–48.9	234.1	–282.9	–17.1
PL	52.6	236.5	–183.9	84.4
SI	135.9	237.0	–101.2	167.6
SK	191.7	229.1	–37.5	223.5
FI	–6.6	227.4	–234.0	25.1
SE	–3.9	229.7	–233.7	27.9

[7] "One" was inserted in the matrix (proving the importance of spatial interaction), when the proportion of the number of migrants from the country to the selected region (destination) exceeded 1% of the total number of emigrants characterizing this country. "Zero" was entered for participation when the value was equal to or less than 1%. The weight matrix is standardized in lines, so the sum of the weights in each row is equal to one.

1	2	3	4	5
UK	–10.0	228.9	–238.8	21.8
IS	–9.4	221.3	–230.7	22.4
NO	–19.7	227.7	–247.5	12.1
CH	–32.5	231.6	–264.1	–0.7
HR	95.5	234.4	–138.9	127.3
Average European rate 31.8%				

Note: results were obtained using Equation (2).

Source: own calculations.

Table 1 indicates that the mean pace of change in total emigration volumes in Europe was 31.8% from 1999 to 2012. That means that there was an increase in the number of emigrants per 1 million people of more than 31% in 2012 compared with 1999, when we take into account the pace of change in each analysed year-pair (hence, also from 2000 to 2011). For example, the Czech Republic, Lithuania, Spain, Latvia and Hungary show a positive mean regional pace of change over the same period. The highest increase in the number of emigrants occurred in those countries (of 772.1%, 611.4%, 343%, 316.5% and 290.6%, respectively, in 2012 as compared with 1999). In Poland, the value of the mean pace of change in the number of emigrants was also positive, with a 84.4% increase in the number of emigrants in 2012 compared with 1999. The pace of change in Poland was faster by 52.6 percentage points than the mean pace in Europe. A decrease in the number of emigrants was observed in Germany (−58%), Austria (−17.1%) and a slight drop in Switzerland (–0.7%). Between 1999 and 2012, the highest drop in emigration occurred in Germany (Table 1). The pace of change in emigration in Germany was 89.8 percentage points lower than the mean pace in Europe. This shows that the absolute pace of emigration from that country was lower than from other countries.

When comparing pace of change in emigration volumes for specific countries with the mean pace in Europe over the studied period, it can be seen that there are countries whose rate of emigration rose by far more than the average, from 27.3 percentage points in the Netherlands to as much as 740.3 percentage points for the Czech Republic. There are also several countries whose rate of change was much slower than the average, including Germany (−89.8 percentage points), Austria (−48.9 percentage points), Switzerland (–32.5), Denmark (−25.9 percentage points), Cyprus (−22.3 percentage points), Norway (–19.7 percentage points), Luxemburg (–18 percentage points), the United Kingdom (–10 percentage points), Iceland (–9.4 percentage points), Finland (–6.6 percentage points) and Sweden (–3.9 percentage points) (Table 1). The results indicate that changes in emigration volume in specific countries resulted either from changes in the age ranges of emigrants (structural effects) or from local competitiveness

(geographic effects). The results are affected by the character of the assumed spatial weights matrix. In the case of the described phenomenon (as a depressor of development), a positive value for the geographic effect reflects excessive outflow of individuals from a given unit to other countries, i.e. that a given region is uncompetitive, according to the assumed spatial weights matrix. Negative values of the geographic effect show countries where the number of emigrants per 1 million of people is lower than average, i.e. they are more competitive than other countries in the study, according to the assumed **W** matrix. For example, from 1999 to 2012, the Czech Republic showed the highest increase in the emigration level (of 772.1%, i.e. 740.3 percentage points above the mean rate of emigration in Europe), which was caused more by changes resulting from local competitiveness, affected by relationships among countries (507.7 percentage points), than by changes in the age structure of emigrants (232.6 percentage points) (Table 1). Thus, in the Czech Republic, an adverse trend can be observed of excessive outflow of population to other, more attractive European countries. The Lithuania is the only country where the situation is comparable with the Czech Republic's case. In Poland, the rate of change in emigration volume is also positive (84.4%). Like the Czech Republic, this reflects a rise in the number of emigrants per 1 million people that is faster than the mean pace in Europe by 52.6 percentage points (Table 1). However, the value of the net effect is significantly affected by changes in the age structure of emigrants (236.5 percentage points), with the geographic effect at −183.9 percentage points (analogous e.g. Estonia, Slovenia, Slovakia, Croatia) (Table 1). The opposite situation occurs, for example, in the United Kingdom, where the domestic pace of change is positive (21.8%) but the changes are marginally slower than the pace of change in the reference area (−10 percentage points). The value of the net effect there is more influenced by the negative value of the geographic effect (−238.8 percentage points), which reflects the smaller scale of migration from the United Kingdom to other European countries (i.e. competitiveness of that country as compared with others, according to the assumed spatial weights matrix). There are also several countries whose reflects the smaller scale of migration to alternative units in Europe, including Denmark, Cyprus, Luxemburg, Finland, Sweden, Iceland and Norway (Table 1).

Table 1 shows that the value of the net effect of emigration volume in specific European countries from 1999 to 2012 can be significantly affected by changes in the age structure of emigrants (e.g. Ireland, Spain, Latvia, Poland, Hungary) or that the change can result from a local effect (e.g. Denmark, Germany, Finland). The values of both structural and geographic effects are influenced by shares of the volumes of changes in a specific age category (Table 2).

Table 2. Share of specific volumes of changes in the emigration level in the values of structural and geographic effects (data in percentage points)

	<15	15–19	20–34	35–44	45–64	>65	Structural effect	<15	15–19	20–34	35–44	45–64	>65	Geographic effect
CZ	13.4	14.3	104.7	53.3	43.4	3.5	232.6	13.4	–13.9	274.5	137.1	90.9	5.8	507.7
DK	26.4	13.6	122.4	32.9	24.7	2.8	222.8	–30.7	–20.2	–132.1	–35.9	–27.1	–2.6	–248.7
DE	16.4	6.9	101.2	54.6	44.6	8.0	231.8	–26.0	–11.5	–143.7	–72.9	–55.8	–11.7	–321.6
EE	19.7	13.0	80.1	53.5	51.7	16.5	234.5	–1.3	–11.8	–26.4	–35.4	–40.3	–18.8	–133.9
IE	6.9	33.6	120.7	40.7	8.4	4.9	215.2	–7.4	–46.8	–89.1	–38.0	–2.26	–2.3	–185.8
ES	11.0	6.7	124.2	42.1	33.5	14.5	231.8	22.7	7.7	–7.3	31.5	24.4	0.3	79.4
IT	27.5	7.5	81.1	51.9	48.3	15.9	232.1	–20.4	–6.2	–63.1	–32.7	–32.8	–10.1	–165.3
CY	3.2	3.9	114.7	71.3	38.0	1.6	232.8	12.1	1.3	–124.2	–94.1	–49.0	–3.1	–257.0
LV	10.7	11.5	71.1	50.3	62.8	29.5	235.8	6.0	8.2	91.4	–7.6	–28.1	–20.9	48.9
LT	33.2	11.7	85.6	45.4	42.9	11.2	230.1	29.9	24.0	213.8	52.4	30.2	–0.8	349.5
LU	31.4	6.6	93.0	51.6	42.6	6.0	231.2	–33.3	–7.2	–107.9	–53.7	–42.0	–5.1	–249.1
HU	13.1	9.5	110.8	49.2	44.8	4.8	232.3	–0.6	–8.4	36.4	6.0	–7.7	1.0	26.6
NL	35.4	7.7	85.5	51.3	42.8	6.7	229.2	–34.9	–8.5	–70.3	–45.5	–36.9	–5.8	–201.9
AT	19.0	9.3	95.6	48.3	48.4	13.4	234.1	–24.7	–13.6	–118.9	–57.2	–53.6	–14.9	–282.9
PL	16.6	26.2	63.5	62.5	58.2	9.5	236.5	–9.3	–20.4	–22.1	–71.3	–51.0	–9.9	–183.9
SI	12.6	7.2	103.6	55.2	51.2	7.2	237.0	–5.0	–2.7	–40.1	–29.7	–25.3	1.6	–101.2
SK	17.2	8.2	99.4	50.2	40.9	13.3	229.1	–0.7	–1.6	–1.4	–6.5	–8.3	–18.9	–37.5
FI	31.3	8.5	104.4	43.3	35.3	4.6	227.4	–36.3	–9.9	–108.8	–40.8	–34.6	–3.6	–234.0
SE	33.3	6.9	92.9	48.7	39.3	8.6	229.7	–37.0	–7.1	–91.0	–49.1	–40.3	–9.2	–233.7
UK	14.8	5.8	128.2	42.5	33.2	4.3	228.9	–18.7	–7.7	–132.4	–43.6	–34.2	–2.3	–238.8
IS	35.7	10.7	111.4	34.5	27.7	1.2	221.3	–41.0	–15.4	–118.1	–34.2	–21.1	–0.9	–230.7
NO	32.6	10.1	101.9	39.5	37.0	6.6	227.7	–39.3	–14.3	–107.4	–40.6	–38.8	–7.0	–247.5
CH	25.4	8.9	92.2	46.9	48.5	9.7	231.6	–32.1	–11.3	–106.6	–52.1	–51.6	–10.3	–264.1
HR	14.6	10.4	67.7	47.9	64.1	29.8	234.4	–8.9	–5.4	–40.8	–28.8	–34.5	–20.6	–138.9
C.V.	47%	60%	18%	17%	29%	77%	2%	–154%	–150%	–247%	–176%	–139%	–106%	–165%

Note: C.V.-coefficient of variation. The results were obtained from Equation (2).

Source: own calculations.

Table 1 has already shown that the value of the net effect in the Czech Republic was mainly affected by the volume of the geographic effect (507.7 percentage points). However, Table 2 shows that the value of the local effect in that country was most significantly affected by the pace of change in the number of emigrants aged 20–34 years (274.5 percentage points). That means that the pace of emigration of individuals aged 20–34 years was significantly faster than in other age groups (a similar situation was also seen in Lithuania). In Poland, the net pace of change in emigration volume was most affected by changes in the age structure of emigrants (236.5 percentage points), with the geographic effect at −183.9 percentage points. In turn, the value of the structural effect was mainly affected by the pace of change in the number of emigrants aged 20–34 years (63.5 percentage points), individuals aged 35–44 years

(62.5 percentage points) as well as people aged 45–64 years (58.2 percentage points). Moreover, the analogous changes in the age groups were noticed in Slovakia, Slovenia, Hungary and Croatia as well. In Germany, the net effect was more affected by local competitiveness factors. The biggest share in the volume of the geographic effect was the negative pace of change in the number of emigrants aged 20–34 years (−143.7 percentage points), meaning that fewer individuals in this age range were willing to emigrate over the period compared with other age ranges (analogous in Luxemburg, Cyprus, Austria, Finland, the United Kingdom, Sweden, Norway and Switzerland). This shows that some of these countries were more competitive than others (see the Section 2). By examining values of the coefficient of variation due to the age groups, in addition to the structural and the geographic effect, one will notice that the variation of structural effects are not excessively large (C.V. = 2%), (Table 2). However, the growth rates in age groups do not exhibit low coefficients of variation indicating that the pace of change in the number of emigrants in the certain age category is not relatively proportionate among these groups and countries (e.g. the C.V. in individuals aged 15–19 is 60%, in the age category over 65 is 77%). On the other hand, there are the extreme disproportions in the values of geographical effects among countries (the absolute value of C.V. of the geographical effect is 165%) and also among the age groups (e.g. the C.V. in individuals aged 15–19 is 60%, in the age category over 65–77%), (Table 3). This indicates that in Europe a given region is uncompetitive or shows which countries are more competitive than other units in the study, according to the assumed **W** matrix.

The volumes of the net effects can also be explained by analysing absolute values of changes in the number of emigrants as well as verifying the sectoral pace of changes and net effect in specific countries in the studied period (Table 3).

Table 3 shows that from 1999 to 2012 the fastest rate of change in the number of emigrants was in individuals aged between 35–44 years (295.1%) and 45–64 years (307.4%). In those age categories, the pace of emigration was faster than the mean pace of change in Europe by more than 263.3 and 275.6 percentage points, respectively. The slowest rate of change occurred in the age category under 15 years (the sectoral effect at 221%, the sectoral net effect at 189.2 percentage points) and in the aged 15–19 years group (the mean sectoral pace of change was 209% and the sectoral net effect 177.2 percentage points).

For those aged under 15 years, the biggest changes in the volume of emigration from 1999 to 2012 were from Czech Republic and Spain (an increase of more than 56.8% and 53.3% on average) and Germany (a decrease of 2.2%). In group aged 15–19 years, the largest number of individuals emigrated from Cyprus (a rise of about 94%); the biggest decrease was again

Table 3. Mean pace of change and sectoral effects of migration according to the age structure of emigrants (in percentage and percentage points, pp.)

	Less than 15 in %	15–19 in %	20–34 in %	35–44 in %	45–64 in %	More than 65 in %	Structural effect in pp.	Geographic effect in pp.	Net effect in pp.
CZ	56.8	58.9	110.0	78.1	86.2	39.4	232.6	507.7	740.3
DK	1.3	–3.9	0.9	0.8	0.3	3.7	222.8	–248.7	–25.9
DE	–2.2	–5.8	–4.1	–3.2	–1.0	–2.0	231.8	–321.6	–89.8
EE	14.4	13.3	13.0	12.7	17.2	3.8	234.5	–133.9	100.5
IE	10.1	–0.9	7.0	19.5	16.4	17.4	215.2	–185.8	34.4
ES	53.3	32.2	20.6	38.4	39.5	28.0	231.8	79.4	311.2
IT	6.2	5.4	5.5	9.4	9.8	13.2	232.1	–165.3	66.8
CY	22.2	94.0	1.5	–4.1	–3.3	16.1	232.8	–257.0	–22.3
LV	37.0	31.1	23.6	14.2	12.6	6.6	235.8	48.9	284.7
LT	35.7	45.1	73.2	48.5	43.7	36.3	230.1	349.5	579.6
LU	1.2	0.5	–1.2	1.0	1.9	3.3	231.2	–249.1	–18.0
HU	15.6	4.3	22.3	19.7	19.5	27.7	232.3	26.6	258.8
NL	4.8	1.4	4.3	4.4	5.0	5.2	229.2	–201.9	27.3
AT	–1.7	–1.8	0.3	0.2	1.6	7.2	234.1	–282.9	–48.9
PL	6.8	5.4	10.3	–0.3	2.9	–2.9	236.5	–183.9	52.6
SI	10.0	9.1	13.8	9.7	10.8	17.8	237.0	–101.2	135.9
SK	14.7	21.0	23.2	47.2	68.3	92.5	229.1	–37.5	191.7
FI	–0.3	–0.3	0.5	1.9	1.4	4.1	227.4	–234.0	–6.6
SE	0.4	2.2	2.3	2.0	1.9	1.4	229.7	–233.7	–3.9
UK	2.6	0.1	1.6	3.8	3.0	31.3	228.9	–238.8	–10.0
IS	0.6	–2.6	2.9	6.5	12.0	14.1	221.3	–230.7	–9.4
NO	–0.5	–1.3	2.6	1.7	1.4	4.1	227.7	–247.5	–19.7
CH	–1.8	–1.5	–1.0	–0.5	0.2	1.0	231.6	–264.1	–32.5
HR	6.0	7.7	5.2	4.3	5.5	2.8	234.4	–138.9	95.5
Sectoral rate in %	221.0	209.0	253.4	295.1	307.4	260.4	Average European rate 31.8%		
Net sectoral effect in pp.	189.2	177.2	221.6	263.3	275.6	228.6			

Source: own calculations.

observed in Germany (of about 6%). In the studied period, the biggest rise in the number of emigrants aged 20–34 years was from the Czech Republic (about 110% on average) and a fall in the number of emigrants in that group was seen only in Germany (−4.1%). A similar situation occurred in two other age ranges, i.e. 35–44 years, where the biggest increase in the number of emigrants was from the Czech Republic (78.1%) and a large decrease occurred in Cyprus (–4.1%) and in Germany (−3.3%), and in the group aged 45–64 years, where the Czech Republic saw a rise of 86% and Cyprus a fall of 3.3%. The biggest increase in the number of emigrants aged over 65 years was observed in Slovakia (92.5%), and the biggest decreases in Poland (−2.9%) and Germany (−2%). In Poland the biggest increase in the number of emigrants

was among individuals aged 20–34 years (10.3%) and under 15 years (10.1%). Those changes significantly affect the value of the structural effect whose value, in turn, determines the value of the net effect in that country.

Across all the studied countries, all the analysed age ranges showed a positive mean rate of change in the total number of emigrants, which demonstrates a rise in the mean emigration level in Europe from 2012 to 1999 (taking into account recursive changes from year to year).

Conclusions

Favourable political and economic conditions, but also social and cultural ones, facilitate free movement of people in Europe, thus intensifying migration processes over time. As migration is a very complex phenomenon entailing many effects, both positive and negative, on the individuals, the families, countries of emigration and immigration, and, in consequence, for the whole of Europe, it has been analysed in detail in the specialist literature.

In this study, a multidimensional analysis was performed of the pace of change in emigration levels in 24 European countries from 1999 to 2012, by age group and country and for all the countries as a whole (the reference area). Using the dynamic approach, the analysis was carried out for each pair of consecutive periods separately. The final result was achieved by summing the research results for each pair of years. The applied spatial shift-share model also considered the spatial weights matrix based on the binary directional emigration matrix (**W**) standardized in rows to one. The use of the dynamic spatial shift-share method enabled us to draw many interesting conclusions. The mean pace of change in emigration volumes in Europe (in general, not divided by age) was positive, and at a level of 31.8%. There were countries with a rise in the number of emigrants per 1 million people exceeding the European mean by more than 27.3 percentage points (the Netherlands) to as much as 740.3 percentage points (the Czech Republic). There were also the most competitive countries characterised by a negative change in the emigrant numbers compared with the mean in Europe, e.g. Germany, Austria and Switzerland. The changes in emigration volume in specific countries resulted either from changes in the age structure of emigrants (structural effects) or from local competitiveness (geographic effects). The results were also affected by the character of the assumed spatial weights matrix. An adverse trend was seen in some, less competitive countries of the excessive outflow of population to other, more attractive European countries (Czech Republic and Lithuania). In certain countries, such as Ireland, Estonia, Hungary or Italy, the value of the net effect of emigration volume from 1999 to 2012 was significantly affected by changes in

the age structure of emigrants, whereas in Denmark, Germany, Norway, Sweden or Finland, for example, the net change arose from the geographic effect (local determinants). The results also indicated that the values of the structural and geographic effects were influenced by the volumes of shares of changes in specific age categories. From 1999 to 2012, the fastest pace of change in the number of emigrants was among individuals aged between 45–64 years and 35–44 years. In those age categories, the pace of emigration was significantly faster than the European average across all ages. The slowest changes in the number of emigrants occurred in those aged 15–19 years and in the group aged under 15 years.

The results suggest the need for further analyses concerning interregional migrations. The next stage of research will be to try to identify socioeconomic variables that may affect the level and pace of change in emigration volume in Europe. Owing to the fact that population movements may also be influenced by various spatial aspects, e.g. geographic location, adjacency and distance, it seems reasonable to use spatial econometrics tools in the analysis, namely spatial panel models or multi-equation spatial regression models.

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