Selective migration of population in functional urban regions of Slovakia

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ABSTRACT
Majority of research on urban development perceive migration as internally homogeneous phenomenon that influences growth and spatial redistribution of population. This enables to identify certain general migration patterns, but understanding regularities and consequences requires looking at internal structure of migration. This paper aims to visualise the impact of selective migration to the population structures across multiple spatial scales and in a complex way taking Slovakia as the case study. By this means spatial patterns of migration are demonstrated in a more efficient way. The resulting maps show the impact of migration is selective at various spatial levels regarding age and educational attainment. In comparison with general migration, selective migration shows stronger spatial polarisation in Slovakia.

1. Introduction

Many countries across the world experienced a decrease in the intensity of natural reproduction over the last decades what strengthened the role of migration in urban development considerably (cf. Drewett & Rossi, 1981; Mykhnenko & Turok, 2008). This fact stimulated research on intranational migration of population as a phenomenon playing decisive role in new patterns of spatial redistribution of population. General migration patterns were thoroughly examined over the past decades in various kinds of regions including developed (e.g. Drewett & Rossi, 1981; Fielding, 1989; Cheshire, 1995; Champion, 2001; Stephen & Jenny, 2017), developing (e.g. Gwebu, 2006) as well as socialist (e.g. Musil, 1980) and post-socialist countries (Tammaru & Sjöberg, 1999; Hirt, 2007; Bezák, 2011). Selectivity is one of the revealed features of migration and it depends on the characteristics of the migrant.

Age, social status, educational attainment and in specific cases also ethnicity were identified as main factors determining individuals’ migration preferences (García Coll & Stilwell, 1999; Kok & Kovács, 1999; Kontuly & Tammaru, 2006; Bailey & Livingston, 2007; Mollov, Smith, & Wozniak, 2011; Rérat, 2014; Kashnitsky & Gunko, 2016; Novotný & Pregi, 2017). This naturally causes diversity in spatial patterns of migration within individual population subgroups. Although disparate preferences for migration of various population subgroups are generally accepted across geographic community as a feature of urban development, only limited empirical research on this issue was conducted, mainly for the lack of reliable data.

Some evidence from local or regional case studies, such as peri-urban region of Adelaide, Australia (Fisher, 2003), the region of Sofia, Bulgaria (Hirt, 2007) and Bratislava, Slovakia (Novotný & Pregi, 2017), suburban zone of Prague, Czechia (Ourendiček, 2007), the city of Moscow, Russia (Kashnitsky & Gunko, 2016), confirms selective character of migration and various migration patterns of specific population subgroups by age and education. Nevertheless, there is still no comprehensive research integrating and visualising selective migration of specific subgroups at intraregional and interregional levels in a nationwide scale.

Therefore, the aim of this study is to visualise the impact of selective migration on the population structures across multiple spatial scales and in a complex way taking Slovakia as the case study. This knowledge is believed to be applicable to other countries and regions to a large extent. Age and educational attainment were chosen as main determinants of selective migration and the factors are analysed and visualised separately and integrally over the period 1996–2016. Although Slovakia is a relatively small country, it is characterised by deep regional disparities reflected in intensive interregional migration which patterns underwent substantial changes during the post-socialist period.

Urban development in socialist countries was shaped by specific economic and political measures employed by socialist regimes, thus often labelled socialist urbanisation (Horská, Maur, & Musil, 2002, pp. 43–44). This made socialist migration patterns...
different from these developed under capitalist and democratic conditions. However, there were also considerable differences among socialist countries and even among the regions within individual countries. Since the early 1990s, the transformation to capitalism and democracy took place in the post-socialist Central European countries which led to break-down of migration patterns from previous era and formation of new patterns. These initially had features specific to post-socialist countries (cf. Hirt, 2007; Novotný 2016), but later urban development indicates convergence of migration trends with those of the western countries. That is why we consider Slovakia to be a suitable example to illustrate regularities in relations between general and selective migration patterns. For more details on specific features of migration trends during the socialist and post-socialist periods see the study by Novotný (2016).

Next sections introduce theoretical background, data, spatial frame and methods employed in this paper. The visualisation and the results regarding main inter- and intraregional processes of general and selective migration are introduced before the conclusions are drawn.

2. State of the art and theoretical background

Migration is usually perceived as a phenomenon contributing to spatial redistribution of population. However, beside changes in the size of population, migration may cause also considerable changes in population structure due to its selective character. The studies by Braun and Tiefelsdorf (1993), Coupleux and Duhamel (1993), Drbohlav (1993), Hall (1993), Karjalainen (1993), Potrybowska (1993), Fugitt and Heaton (1995), Bauer and Zimmermann (1999), Kok (1999), Kok and Kovács (1999) were among the first emphasising different aspirations of migrants of different age and social status, and subsequently important role of education in shaping the migration patterns and generally urban development. Later, various aspects of relations between age and/or education of migrants and migration preferences in urban regions were indicated by Kontuly and Tammaru (2006), Ouředníček (2007), Berzinš and Krišjāne (2008), Sýkora (2009), Molloy et al. (2011) and others.

Social status, education and age of migrant have been identified as crucial differentiating factors when considering motivation for migration (cf. Kok & Kovács, 1999; Kontuly & Tammaru, 2006; Molloy et al., 2011; Johansson, 2016; Faggian, Corcoran, & Rowe, 2017; Hochstenbach, 2018; Kooiman, Latten, & Bontje, 2018). The role of age results from close relation with changes in family status and career development stimulating mainly intraregional and interregional migration respectively (cf. Bezák, 2000; Faggian et al., 2017; Hochstenbach, 2018). Kontuly and Tammaru (2006) consider age as the most important determinant of migration.

Employing education as a determinant of selectivity in migration is beneficial as the educational attainment of migrants is believed to be appropriate proxy also for the social status of individuals (cf. Sýkora, 2009; Marcińczak, Gentile, & Stepiak, 2013; Novotný & Pregl, 2017). Moreover, data on educational structure of population are much more comparable than data on social structure across regions and countries with various levels of economic and social development. Education can facilitate migration by reducing costs and barriers to movement and increasing economic return (cf. Bernard & Bell, 2018). Educational attainment and age of migrant are not autonomous attributes, they are closely related to each other (cf. Kontuly & Tammaru, 2006; Tammaru & Leetmaa, 2007; Šprocha, 2011). This points to the need for a complex evaluation of selective migration, incorporating both key characteristics of a migrant – the age and the education.

The above studies indicate many regularities in selective migration development but they are usually aimed either at interregional or intraregional migration separately so they lack a comprehensive approach. The results of such research are usually presented by tables or charts. This often creates useful statistical representation, but without cartographic visualisation it provides readers only very limited spatial insight, which is fundamental in geography.

3. Spatial frame, data and methods

The effects of selective migration are visualised and assessed at local and regional scales in Slovakia. Communities (LAU2) are the basic spatial units applied in this research representing local scale. They are the smallest units for which the SOSR provides data on migration.

For regional scale, functional urban regions (FURs) were used. Regional networks of FURs have been delimited for many countries since the 1960s (Klapka & Halás, 2016) to provide a spatial network suitable for analysis of mainly human geographic phenomena based on horizontal relations. Among various approaches to delineation of FURs, the regional taxonomic procedure developed by Centre for Urban and Regional Development Studies (CURDS) in Newcastle upon Tyne (UK) became the most frequently applied (cf. Coombes, 2014; Klapka, Halás, Erlebach, Tonev, & Bednář, 2014; Klapka & Halás, 2016). Regional networks based on the CURDS methodology were delimited also in Slovakia by Bezák (2000, 2014), Halás, Klapka, Bleha, and Bednář (2014) and Halás et al. (2018). In this paper we employ the regional network delimited by Bezák (2014). This way we built our analysis on the spatial frame which is common in the
research of migration in Slovakia and so enables better comparability of results.

These FURs were delimited on the basis of data from the population census 2001. Due to problems with the 2011 census and disputability of its results, it is the most recent reliable source of data on commuting in Slovakia (cf. Bezák, 2014; Halás et al., 2014). The 2011 census results were applied in common delimitation of FURs for Slovakia, the Czech Republic and Hungary (Halás et al., 2018). The thoroughly elaborated methods employed in this study are optimised for international delimitation of regions while not being necessarily the most appropriate spatial framework for each country. Therefore we employ regional network delimited specifically for Slovakia. The regions are internally coherent and externally relatively closed, when flows of daily commuting are considered. Bezák (2014) proposed three levels of the regional networks differing by the criterion of lower population limit for the FURs (FUR C – no limit, FUR B – 15,000, and FUR A – 30,000 inhabitants). In this study, we employ the version with the lower limit 15,000 inhabitants (Figure 1) which eliminates three smallest regions, but leaves a relatively large group of regions with a population from 15 to 30 thousand. The FURs, in contrast to administrative units in Slovakia, define the sphere of influence of the city by commuting. It is likely, the change of the place of residence within the region is possible without changing the place of employment. This results into estimation that majority of migrations at interregional level are driven mainly by the migrants’ job aspirations, while the intraregional migrations are motivated mainly by seeking better environmental conditions for living, more privacy or larger household, which is related to the change of family or social status of migrant (Bezák, 2000). Within the network, every FUR consists of the core and the ring. The core is one or more central towns concentrating employment and services, and the ring is represented by adjacent area where communities are tied by commuting with the core and also with each other.

The FURs are geographical but not statistical units. Therefore to examine selective migration at the regional level the aggregation of data on individual communities is necessary.

Difficult obtaining of sufficient and reliable data on the structure of migrants complicates research on migration of population subgroups especially at lower spatial levels. Some authors employ data from population censuses (e.g. Kontuly & Tammaru, 2006; Bailey & Livingston, 2007; Tammaru & Leetmaa, 2007; Marcinczak et al., 2013), but more researchers conduct own public surveys in given urban regions or rather chosen localities within them (e.g. Kok 1999; Kok & Kovács, 1999; Berzíňš & Krišjane, 2008; Brade, Smigiel, & Kovács, 2009; Kurek, Galka, & Wójtowicz, 2014), and some combine them (Sýkora, 2009). Both kinds of data sources provide valuable information but suffer from certain shortcomings with respect to the focus of this study. For more details see the study by Novotný and Pregi (2017).

The analysis in this paper is based on Anonymised data on individual intranational migrations at the level of communities (LAU2) provided for scientific purposes by Statistical office of the Slovak Republic (SOSR, 2017). The data provide information on the community of origin and destination of migration, and age and educational attainment of migrant on an annual basis. The data on mid-year population for each community and each year are drawn from Annual Registration of Population (SOSR, 1996–2016).

Employed data on individual intranational migrations are the most comprehensive and reliable database on individual migrations in Slovakia, but there are two main possible shortcomings that can affect the results and that should be regarded in the interpretations of results. The characteristics of migrants are collected by local authorities in individual communities and there is no guarantee on full reliability of their evidence (Novotný & Pregi, 2017). Similar problem was reported in the Czech Republic by Ouředníček (2007). Much more important issue is the way how and when the migration is registered. In Slovakia, migrations are recorded only when migrants change their permanent address, for which the migrant usually has to be the owner of the dwelling or must have the owner’s permission. Many migrations are therefore not registered, especially when students or career starters rent a dwelling. Furthermore, migrations within individual municipalities are not recorded. These methods of collecting statistical data are similar to those used in other Central European post-socialist countries, but differ considerably from those in Western countries. In case of citizens – entrepreneurs, massive bureaucracy related to the change of permanent address may be another reason why movers keep original permanent address even when they own the dwelling where they reside (cf. Ouředníček, 2007).

The analysis starts in the late 1990s when first signs of new migration patterns appear in Slovakia after an early stage of post-socialist transformation accompanied by the collapse of patterns characteristic for socialist urbanisation.

The international migration is omitted in this paper. Although its impact on urban development in Slovakia is not negligible, its recorded volume is too low to impact general trends of urban development at regional level significantly. Moreover, similarly with the Czech Republic, there is certain inconsistency between registration of intranational and international migration (Ouředníček, 2007; Novotný & Pregi, 2017) making the data incompatible.

The net migration (difference between the number of immigrants from and number of immigrants to a
given spatial unit) and the net migration rate (net migration divided by the number of inhabitants of a given spatial unit considering mid-year population in this paper) are among the indicators commonly used for migration analyses. The net migration indicates total population change due to migration, the net migration rate expresses the impact of migration on the population growth of a given spatial unit. Both indicators are employed in this study to point to the changes in the spatial distribution of the population by migration which is subsequently compared with the results of analysis of selective migration. For the multiannual period, the average annual net migration rate is calculated as the weighted average of net migration and population for all considered years.

The population is divided into four categories by educational attainment as follows: (1) Tertiary education (university/college graduates with at least bachelor degree); (2) Secondary education (with passed matriculation examination, equivalent to A-level exams in United Kingdom); (3) Primary education (those who finished elementary education and those who continued education but finished without matriculation exam) and (4) Youth up to 24. The latest category is based on age primarily, because the 24 is standard age of finishing master degree or equivalent tertiary education; there is high probability that an individual in this age is in the process of learning; there is also high probability that individual migrates together with parents, since moves to schools/universities, as explained by Novotný and Pregi (2017), are usually not registered as migrations in Slovakia.

By age, six subdivisions of population are adopted as follows (generalised features in the brackets): (1) 0–14 (pre-productive population, demands on pre-primary and primary education capacities, potential future labour force); (2) 15–24 (end of compulsory schooling, possible completion of secondary education, entry into reproduction age, youngest career starters); (3) 25–34 (possible completion of tertiary education, majority of career starters, young and perspective labour force, the most intensive fertility) (cf. Šprocha & Vaňo, 2014); (4) 35–44 (economically active population, finishing reproduction, older but experienced labour force); (5) 45–64 (economically active population in pre-retirement age; experienced labour force but often struggling with the inability to adapt to new labour market demands) and (6) 65+ (retired population, growing demand for social and health care).

To indicate generalised impact of migration on the development of human capital (in terms of the age and educational structure of the population) in a given spatial unit, we adjust net migration rate attributing a specific weight to each category of population.

Figure 1. Basic features of Functional urban regions in Slovakia as delimited by Bezák (2014) at the level FUR 01B.
The values of coefficients are designed to reflect their importance from a perspective of human capital (the demand for individual categories in the labour market, the rate of long-term unemployment in each category) and the potential of their further economic contribution to the region as indicated by the report of Institute for Financial Policy established by Slovak Ministry of Finance (Hidas, Valková, & Havran, 2016).

The coefficients for the net selective migration rate by education are attributed as follows: (0) for youth up to 24 years, (−1) for those with primary educational attainment, (+1) for those with secondary attainment, and (+2) for those with tertiary attainment. For net selective migration rate by age following coefficients are attributed: (+1) for 0–14, (+2) for 15–24, (+3) for 25–34, (+2) for 35–44, (+1.5) for 45–64, and (−1) for 65+. Likewise in net migration rate, the resulting value is divided by mid-year population and a final value is expressed in per mille (‰). The results are presented for all categories by age and education in the complex way and separately for categories by age, and categories by educational attainment. The weight of education and age in calculation of the net selective migration rate is one to one.

The higher value, the more positive impact to the population structure by education and age, and vice versa. The positive value of rate can be also a result of negative net migration if migration loss is driven by migrants with primary educational attainment or/and retired migrants. It is because the migration contributed to the improvement of the structure of population in a given spatial unit from the human capital point of view, although it also contributed to its shrinkage. Similarly, a spatial unit with migration gain can show negative value of this rate, when migration gain is based on migrants with primary educational attainment or/and retired migrants.

Cartographic interpretation is based on traditional choropleth maps and diagram maps. The uniqueness of the final maps stems from the combination of these traditional cartographic methods visualising results of analysis. The values for regional scale are visualised on choropleth map by bipolar colour progression from cold colours indicating negative and warm colours indicating positive values of annual average net selective migration rate. At the forefront of the choropleth map, there are diagrams indicating impact of selective migration at the local level. The size of each diagram is proportional to the population size what enables visual identification of the core in each FUR. The colour progression, similarly with the choropleth map at the background, indicates values of annual average net selective migration. Such cartographic interpretation allows for easy visual identification of the impact of selective migration on development of human capital at the interregional level within Slovakia, at the level of individual regions, and intraregional and even local levels within individual regions.

4. Results

Slovakia is economically polarised into the developed west and north-west of the country while the south and east are lagging behind (cf. Halás, 2008). Migration at regional level contributed considerably to the outflow of population from central and eastern regions to the south-west, particularly to the Bratislava FUR and adjacent FURs over the past 20 years (Figure 2). Majority of regions in central and eastern Slovakia recorded migration loss. The only significant exception is the Žilina FUR in the north-west of central Slovakia, which is an important transport and industrial hub. The Bratislava FUR gained over 50,000 new inhabitants by migration which is the number exceeding the sum of the gains of all other regions with a positive migration balance. Generally, it shows that concentration of population to the region of national major and capital city is dominant interregional process in urban development of Slovakia.

![Figure 2. Net migration and annual average net migration rate in functional urban regions of Slovakia, 1996–2016.](image-url)
Much more complex spatial differentiation is observable when descending to the local spatial level (Figure 3). Among the larger towns and cities, Bratislava is the only with annual average net migration rate nearing the equilibrium. All other recorded migration loss, although some of them are centres of regions with migration gains.

Migration loss of various intensity in the core and migration gains in the communities in the ring are characteristic features of the FURs of all sizes of cores. It means that the process of decentralisation of population from the cores to the rings is significant intraregional process of urban development.

Results of selective migration analysis visualised in the Main Map show some surprising trends which are not apparent when general migration considered. Bratislava confirmed the outstanding position as it is the only core of FUR which recorded positive impact of migration to the city’s population structure, and the effect of selective migration to population structure of the Bratislava FUR was the most positive among all regions in the country. Selective migration affected more positively the communities in the region’s ring in terms of age (Figure 4), and the core in terms of educational structure (Figure 5).

Positive impact of selective migration was recorded also in the regions adjacent to the Bratislava FUR, and the regions of important economic hubs in western and north-western Slovakia, i.e. Nitra, Trnava, Trenčín, Žilina, but their cores suffered from negative impact of migration to their population structure. Positive results in these regions were achieved by the effect of selective migration by age (Figure 4), while the effect was rather neutral in terms of educational attainment (Figure 5).

The regions in southern and eastern Slovakia recorded a negative and even very negative impact of selective migration to the population structures. The only regions affected neutrally were those of major national regional centres (Košice, and Banská Bystrica with adjacent Zvolen), although the Banská Bystrica and the Košice FURs were losing population by migration during the observed period. On the other hand, despite migration balance nearing equilibrium, the effect of selective migration to the region of the third largest city in Slovakia – Prešov was negative.

Some regions adjacent to the regions of major regional centres reached migration gain during the observed period (Figure 2) but they recorded negative values of annual average net selective migration rate.
This can be a result of specific features of post-socialist decentralisation of population as described by Hirt (2007). Decentralisation of population in post-socialist countries emerged during an economic decline and was partially motivated by ‘survival strategy’ of poor households (characteristic generally with low educational attainment or retired persons). Such development was already confirmed in the Bratislava metropolitan region (Novotný 2016; Novotný & Pregi, 2017) and indicated that poor households have tendency to move even beyond the border of the FUR. The same process is seen at the intraregional scale. Communities in the rings of the regions across the whole country recorded positive migration balance (Figure 3), but only those in proximity of larger and medium-sized towns were affected positively by selective migration.

Migration clearly contributed to the improvement of age structure of population in many regions in western Slovakia. In southern and eastern Slovakia, contribution of migration to the age structure was negative in most cases, only a few regions recorded neutral impact (Figure 4). At the intraregional level, all medium-sized and larger towns except for Bratislava, suffered from negative effect of migration to the population structure by age. On the other hand, the region of eastern Slovak major city – Košice recorded positive impact of migration, as well as the region of Banská Bystrica in central Slovakia did in terms of education (Figure 5). In western Slovakia the Trenčín FUR is the only one along with the Bratislava FUR which recorded positive impact. Observed pattern confirms very strong position of Bratislava, that neighbouring regions are not able to compete with, what may explain also the results for the cores of the regions. While majority of larger towns and university centres across Slovakia recorded neutral effect of selective migration by education, Nitra and Trnava in proximity of Bratislava recorded negative impact. This shows central resemblance to development in Poland where only the largest and most prestigious academic cities are successful in keeping the colleges and universities graduates while remaining cities, even those with long tradition of university education lose substantial proportion of graduates after completion of studies (Janc, Czapiwski, Bajerski, & Churski, 2012).

5. Conclusions

Visualisation of selective migration by age and education at local and regional levels across the whole country demonstrated migratory processes and urban development phenomena that are invisible when general migration analysed. Migration patterns in Slovakia are more polarised in terms of selective migration. Although general migration indicates certain south-western – north-eastern gradient with migration gains in the south-west and migration losses in the north-east, selective migration much more reflects division of Slovakia into economically much more developed west and north-west, and lagging east and south.

Generally, analysis of selective migration proves the outstanding position of the Bratislava city and its region, and relatively better performance of regions of major regional centres regarding the situation in the broader regional framework. This indicates process of metropolisation which means the selective migration is contributing to the improvement of population structure in of major regional centres at the expense of other regions, particularly those peripheral.

Improved population structure in terms of human capital can be seen as an additional stimulus for development of positively affected regions. The migration loss driven by young and well-educated migrants in other regions may be also be seen as a loss of strong potential labour what may act as an obstacle for further economic development of recently lagging regions.

Software

The maps were generated in ArcGIS 10.1 by ESRI and finalized in CorelDraw X5.
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