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The use of migration data to define functional regions: The case of the Czech Republic

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ABSTRACT

The paper analyses migration flows with the purpose of defining functional regions at a micro level. It proposes an innovative approach to the processing of migration data. It includes a reflection on local level migration analysis in relation to local labour markets, and it is inspired by time geographical concepts and research into human spatial behaviour. Relevant identified migration flows are those that occur when a migrant only changes the place of permanent residence, and does not necessarily need to change workplace or most of the localities within a daily timespace context. The paper uses these migration data to delineate local migration areas (daily spatial systems) of the Czech Republic through the application of a standard rule-based procedure of functional regional taxonomy.

1. Introduction

Functional regions are usually defined as areas internally coherent and externally relatively self-contained with regard to a particular type of horizontal spatial interaction. A spatio-temporal framework of the spatial interactions (movements, flows) is very important because it forms the conceptual basis for the definition of various types of functional regions. The identification of functional regions is often based on the analysis of daily rhythms of aggregated human behaviour in a space. The most frequent manifestation of this kind of behaviour is shown in a residence-workplace spatio-temporal context and is expressed by the most significant regular movement of the population with a daily periodicity, i.e. labour commuting. Functional regions based on these spatial processes are referred to as travel-to-work areas or local labour market areas. As jobs tend to be concentrated in cities and towns, the term daily urban system is sometimes used for these spatial patterns.

This paper attempts to define functional regions through the analysis of migration data. It has two further crucial tasks: to identify the relevant parts of migration flows (as migration is a general term, comprising movements induced by a number of various factors), and to use the territory of the Czech Republic for the documentation of theoretical and methodological assumptions. The former is conceptually grounded in the spatial behavioural patterns of the population. The definition of functional regions itself is based on the application of the third variant of the CURDS regionalisation algorithm (Coombes & Bond, 2008; Coombes, 2010) adjusted according to suggestions made by Halás, Klapka, Tonev, and Bednář (2015). The procedure presented in this paper uses the example of the Czech Republic and incident detailed intrastate migration data. International migration is not relevant for this purpose. The hypothesis which this paper builds upon is that, regarding the fact that the Czech Republic does not show a high migration mobility of its labour force, i.e. people are generally not willing to move because of a new occupation, a considerable portion of migration movement is related to migrants in their productive age who change their places of residence while keeping their workplaces.

The remainder of the paper is organised as follows: The section on theoretical background discusses the issue of migration and its types. It then proceeds to the concept of a functional region. Afterwards it briefly comments on the relevant method of

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regionalisation. The next section describes the method and data used for a sufficiently detailed definition of functional regions. It also describes where the original approach is presented and, with only necessary references, where the standard methodology is applied. The use and adjustment of the data deserve special attention. The next section presents and discusses the results of the analysis. The final section returns to the hypothesis and objectives of the paper and assesses the suitability of the proposed procedure for geographical analysis.

2. Theoretical background

Intrastate (internal) migration is generally considered to be a process which occurs more on a regional than a local level. As the main issue of this paper is regionalisation, a number of works dealing with the use of migration flows to define functional regions can be listed. Pioneering studies in this respect were published around the mid-1970s by Paul B. Slater, who applied a reconcilable procedure to define migration regions in several countries such as Japan, France, Spain, Argentina, and Brazil (Slater, 1976a, 1976b, 1976c, 1976d). He continued this approach with several works over the following decade, his best known being the application which used the example of the USA (Slater, 1984). Masser and Scheurwater (1978) applied Slater's method and their own procedure Intramax on the territory of the Netherlands following the earlier work of Masser (1976). Other works worth noting in this respect include the regionalisation of Iran (Hemmasi, 1980) and Australia (Blake, Bell, & Rees, 2000). Coombes (2000) used migration flows as one of the characteristics on which synthetic locality boundaries had been defined at a micro scale in Britain. All these studies produced *de facto* functional migration regions, although not always in the sense of a correct definition of a functional region and its application. In most cases, regions at a higher hierarchical level are the results, because interregional migration flows enter the analyses.

During the last decade and a half there has been extensive literature on so called housing market areas. It is inspired by labour market areas, but is mostly based on the use of migration data (Maclennan & Bannister, 1995; Jones, 2002; Royuela & Vargas, 2009; Hincks & Wong, 2010; Jones, 2016; Jones, Coombes, Dunse, Watkins, & Wymer, 2012; Jones, Coombes, & Wong, 2012). Housing market areas can be defined as areas where people live, work and would seek a residential property in the case of moving without changing workplace (Brown & Hincks, 2008; Hincks, 2012). Jones (2002) proposes two concepts that stimulate migration with regard to housing: spatial arbitrage and spatial market search analysis. The latter is considered only the first stage in the migration process (Jones, 2002). Brown and Hincks (2008) propose a third concept based on the supply and demand of housing. No matter which concept prevails, in practise, functional regions based on migration data drawn from various sources can be defined at micro (local, intraurban) and sub-regional levels (Jones, 2002; Brown & Hincks, 2008; Hincks & Wong, 2010) using various methods of functional regionalisation. For instance Jones (2002), Jones et al. (2012, 2012) and Coombes (2014) apply various rule-based algorithms; Brown and Hincks (2008), Hincks (2012) and Jaegal (2013) use the Intramax procedure. Many of these procedures use additional criteria besides migration flows in order to define housing market areas, such as house price levels, boundaries of travel-to-work areas and estate agent knowledge.

Apart from the regionalisation tasks other types of analyses of interregional migration are very common in geographical research. They are focused for instance on the mutual relationships that exist between migration and labour markets (De Arcangelis, Di Porto, & Santoni, 2015; Kancs, 2011; Partridge, Rickman, Rose Olfert, & Ali, 2012), in the urbanisation (Itoh, 2009; Aunan & Wang, 2014) and suburbanisation (Halás, Roubínek, & Kladivo, 2012; Ott, 2001) processes. In this respect, Manson and Groop (2000) have brought out interesting findings claiming that, regarding the direction of intrastate migration flows of the US population, migration movements downwards in the urban hierarchy prevail over the reverse, upward movements.

This paper builds upon the concept of a functional region. The development and content of the term has been thoroughly discussed, for instance by Klapka and Halás (2016). Its subcategory, a daily spatial system, is used in this paper and is a clear analogy to the term daily urban system (e.g. Berry, 1973; Coombes, Dixon, Goddard, Openshaw, & Taylor, 1979; Hall, 1974), although it differs from a daily urban system in the sense that the interactions are not necessarily oriented and directed towards a city. In contrast, they can frequently have an inverse direction, or they are not incident to a city at all. The conceptual framework for functional regions based on daily rhythms often draws inspiration from the terminology and concepts of time geography (see for instance Lenntorp, 1976; Pred, 1977; Hägerstrand, 1982). The concept of "prism" (in other words a bounded region of time and space) sets up the theoretical or potential timespace framework of an individual, which is limited by the initial location and barriers which influence future activities in timespace. A very important factor framing the prism is the principle of return. This is responsible for the rhythms of human behaviour; for when an individual has a location in timespace, and for where they periodically return to, which is, most frequently, their place of residence (Frantál, Klapka, & Siwek, 2012). Another relevant time geographical term is "project", which represents a more tangible side of human behaviour, as it describes goal-oriented activities related to work, education, leisure activities, etc. Apart from the behavioural context there is also an economic theoretical underpinning for the specific type of functional regions discussed (local migration areas, housing market areas), and this is presented for instance by Jones (2002). It builds upon the presupposition that a region is defined by a uniform price for a selected item, housing in this case, for spatial accessibility, and for the relationship between supply and demand.

The relevance to this paper of these theoretical remarks is that it is possible to define the relevant type of migration, which is crucial for further analysis. If shorter distance migration prevailed significantly in the Czech Republic, it could be assumed that *daily* individual timespace (prism, project) is not significantly modified, with the one main exception being the place of residence; the choice of other locations ("stations") and time spent there during a *working day*, particularly the workplace, remain almost the same (see e.g. Kain, 1962). Another interesting fact is that migration is not predominantly oriented towards towns and cities, unlike daily travel-to-work flows for instance. In post socialist countries decentralisation and suburbanisation processes have prevailed over nodal migration flows since 1990 (e.g. Ott, 2001; Brown, Kulcsár, Kulcsár, & Obádovics, 2005; Tammaru, 2005; Potrykowska, 2007; Stanilov, 2007; Turok & Mykhnenko, 2007). For the Czech Republic the evidence is provided by, among others, Kostelecký and Čermák (2004); Ouředníček (2007); Ouředníček, Šimon, and Kopečná (2015).

The definition of micro regions usually depends on the analysis of daily travel-to-work flows; the resulting areas are called travel-to-work areas, local labour market areas, or just functional regions. The methods of their delineation have a long tradition and are permanently evolving (e.g. Casado-Díaz & Coombes, 2011; Klapka & Halás, 2016). A rule-based type of regionalisation algorithm is used in this paper (see below) and it is applied to migration data which is of a local nature. This type of methods comes from the application of various interaction measures, the setting of rules for the regionalisation procedure, and from the setting of the constraint function for the resulting regions. The resulting regions can be denoted as local migration areas or daily spatial systems. There are other methods for the identification of functional regions (see Klapka & Halás, 2016), but discussion related to them is not within the scope of this paper.

3. Method

Statistical data on migration in the Czech Republic are recorded when the place of permanent residence is changed and the change occurs between municipalities. There are around 6250 municipalities in the Czech Republic and they are among the smallest in Europe (Klobučník & Bačík, 2015). Their average size is 12.6 km^2, their average population is 1690. A change of permanent residence within a municipality is not regarded as migration and therefore is not registered. In order to minimise the influence of random values for migration the analysis takes into account a longer time span, the period 2001–2012.

The complete data set on migration has to be refined in order to identify a relevant portion of migration flows, which are used to define daily spatial systems, as was reasoned earlier in this paper. The first refinement is concerned with the demographic characteristics of the population. If the analogy for daily urban systems based on daily travel-to-work flows is kept, only the economically active population in a productive age should be analysed. However, the input data set does not allow such refinement; therefore the population in a productive age will be included in the first step. Children, who do not usually change their residence by themselves, but follow their parent(s), will be included in the next step. They add to the volume of migration, dependent on the decisions of people in a productive age. Therefore, the population segment aged between 0 and 64 will enter the analysis. As for the population in the post productive age (65+), it is left out of the analysis because its migration motivations and the context of its spatial behaviour is much less predictable.

The second refinement is concerned with the distance of migration flows. It is essential to identify those flows which are in line with the argumentation regarding the concept of daily spatial systems, i.e. the flows which do not modify a substantive portion of daily spatial behaviour. The first step is to take into account migration flows within existing functional regions of the Czech Republic, based on the analysis of daily travel-to-work flows. Out of four variants of the regional system of the Czech Republic (Klapka, Halás, Erlebach, Tonev, & Bednář, 2014), the variant of 104 regions based on the CURDS interaction measure has been chosen. This variant shows the total self-containment of the regional system up to 0.917, which has the highest value of all four variants. This means that 91.7% of daily travel-to-work flows occur within defined functional regions, and only 8.3% of these flows cross the borders of defined functional regions. Taking into account the refined migration flows now, up to 50.0% of them, for the period 2001–2012, occur within defined functional regions. Moreover, out of the interregional migration flows, a relatively high percentage occur at a shorter distance and it can be assumed that they are also relevant to the analysis.

The second step analyses the frequency of interregional migration flows according to distance. Around 10.7% of all intrastate migration flows (i.e. 21.4% of interregional migration flows) occur at distances shorter than 25 km and another 17.2% (34.4% of interregional migration flows) at distances between 25 and 75 km. It must be admitted that in this latter distance interval different type of migration flows can be included, however these cannot be completely separated from the type predominantly being analysed, thus they are kept in the analysis. In order to avoid an unexpected and unwanted loss of information, migration flows at distances between 75 and 150 km are also partly included in the analysis. Their number proportionally (linearly) decreases within the interval 75–150 km, when for 75 km the percentage of migration flows entering the analysis is 100 and for 150 km the percentage is 0. The frequencies of interregional migration flows depending on distance are presented in Fig. 1.

In order to secure a correct procedure for the definition of functional regions, the diagonal in $n \times n$ matrix storing migration flows between basic spatial units (municipalities) must not include zero values. It is important because the regionalisation algorithm is used to calculate the self-containment of functional regions. If the diagonal included zero values, each change in the spatial design of basic spatial units (amalgamation or dissolution; in fact the processes that are responsible for the modifiable areal unit problem) would result in considerable unwanted values for the self-containment of a region. Unfortunately inter-municipal migration is not statistically recorded, as has already been shown, and therefore the data to be included along the diagonal must be approximated.

Regarding the character of the data and the use of the analogy for daily flows, the approximation of intra-municipal migration flows based on the total population of municipalities seems to be the most simple and correct method. In this respect it is assumed that the proportion of the total intra-municipal migration flows in the regional system to the total migration flows in the regional system is equal to the proportion of the total intra-municipal daily travel-to-work flows in the regional system (those living and working in the same municipality) to the total number of daily travel-to-work flows in the regional system. The mathematical notation is given below; coefficient *k*.

Refined interaction data are processed using the third variant of the CURDS regionalisation algorithm (Coombes, 2010; Coombes & Bond, 2008). Moreover this variant uses the constraint function proposed and applied to the daily travel-to-work data by Halás et al. (2015). The constraint function sets the minimum size and self-containment for the resulting regions, where both parameters can be set individually and there is a trade-off between them. A minor innovation made by Halás et al. (2015) enables a continuous trade-off between the size and self-containment of final regions, and at the same time this procedure enables a more objective rather than normative estimate of the minimal criteria for size and self-containment. The regionalisation algorithm is a standard procedure used to define functional regions (particularly travel-to-work areas and local labour market areas) and modifications of its widely spread second variant have been used during the last decade and a half in countries such as Spain (Casado-Díaz, 2000), New Zealand (Newell & Perry, 2005; Papps & Newell, 2002), Australia (Watts, 2004), Ireland (Merdith, Charlton, Foley, & Walsh,

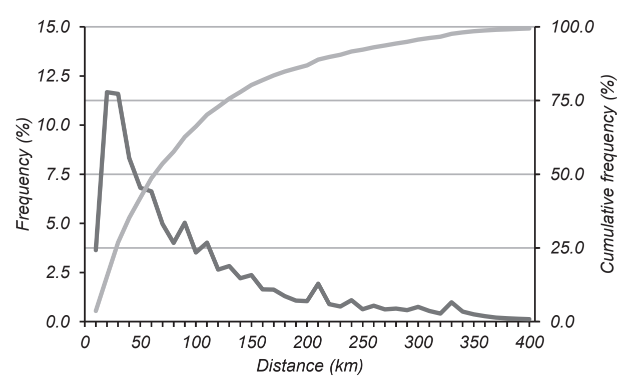

Fig. 1. Frequencies of interregional migration flows depending on distance.

2007), Belgium (Persyn & Torfs, 2011), Poland (Gruchociak, 2012), Slovakia (Halás, Klapka, Bleha, & Bednář, 2014), and the Czech Republic (Klapka et al. 2014, Klapka, Halás, Netrdová, & Nosek, 2016).

In order to understand the procedure properly, the necessary notations have to be explained. Migration flow from municipality i to municipality j is denoted as M_{ij}. Approximated inner flow is calculated as $M_{ii} = k \times P_i$, where P_i is the population in a municipality i and k is the approximation coefficient. The approximation coefficient k is expressed as:

$$k = \frac{\sum_i T_{ii} \times \sum_i \sum_j M_{ij}}{\sum_i P_i \times \sum_i \sum_j T_{ij}}, \quad (1)$$

where T_{ij} is a daily travel-to-work flow from municipality i to municipality j.

The migration within a region is denoted as M_{jj}, from a region to all other regions as $\sum_k M_{jk}$, and from all other regions to a region as $\sum_k M_{kj}$, subject to approximated migration flows within a municipality $M_{ii} \in M_{jj}$; $M_{ii} \in \sum_k M_{jk}$; $M_{ii} \in \sum_k M_{kj}$; and at the same time subject to intraregional flow $M_{jj} \in \sum_k M_{jk}$; $M_{jj} \in \sum_k M_{kj}$. The size of a region is calculated as:

$$S = \sum_i^m P_i = \frac{\sum_{i=1}^m M_{ii}}{k}, \quad (2)$$

where m is the number of municipalities in a region. The self-containment of a region is calculated by using the index of total self-containment, which was proposed and discussed by Halás et al. (2015):

$$SC = \frac{M_{jj}}{\sum_k M_{jk} + \sum_k M_{kj} - \mathrm{M_{jj}}}. \quad (3)$$

Smart's measure (Smart, 1974) is used as the criterion for amalgamation of municipalities and proto-regions:

$$M'_{ij} = M'_{ji} = \frac{M_{ij}^2}{\sum_k M_{ik} \times \sum_k M_{kj}} + \frac{M_{ji}^2}{\sum_k M_{jk} \times \sum_k M_{ki}}. \quad (4)$$

This measure is mathematically the most correct way to relativize and symmetrise the vector data (Halás et al. 2015) and at the same time it slightly evens out the size difference between the resulting regions. Final migration regions have to fulfil preset minimums for their size and self-containment, actually the trade-off between them. However, the interpretation of self-containment requires circumspection because the algorithm uses only approximated inner flows M_{ii}.

4. Results

Before the results of the regionalisation algorithm are commented on, it would be useful to present several lines on the structure of regionalisation interactions (migration flows) based on the distance along which they occur. This analysis, using the migration data for the Czech Republic between 2001 and 2012, has shown that up to 39.2% of migration flows between municipalities were less than 15 km (the respective percentage for 25 and 50 km was 55.7% and 70.8% – Fig. 2). Statistics for other countries can be slightly different, and they will not be completely comparable,

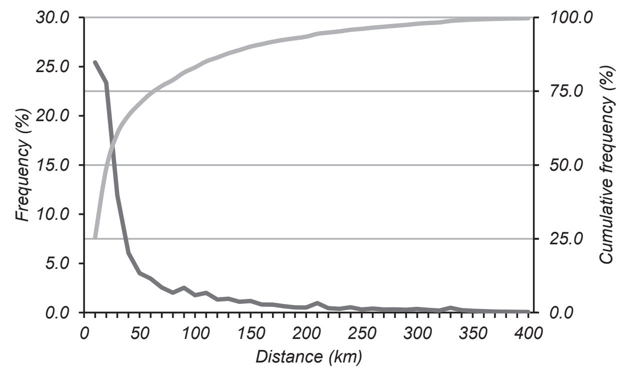

Fig. 2. Frequency of inter-municipal migration flows depending on distance.

because the statistical records for migration can vary, as well as the size of basic spatial units (municipalities). Nevertheless, the figures collected for the Czech Republic prove that migration cannot be considered as a process related only to regional and interregional levels, but that a significant proportion (in some regions even the biggest proportion) of migration has a local character.

According to works on local labour market areas of the Czech Republic based on daily travel-to-work flows (Halás et al. 2015; Klapka et al. 2014, 2016), the initial parameters for the minimum size and self-containment of resulting regions was set to 10,000 inhabitants and 0.6 respectively. This step is in line with one of the objectives of this paper, i.e. to define functional migration regions at the local (micro regional) level, and it has provided the initial spatial pattern of a regional system. Each region has been placed on a graph according to the values for its size and self-containment and new values for these parameters have been estimated by shifting the constraint function curve (see Fig. 3). The grey curve of the constraint function is shifted so that there is little increase in the minimum size and self-containment of the regions (the minimum size is between 15 and 30 thousand inhabitants; the minimum self-containment is between 0.6 and 0.7). Simultaneously the curve should be placed into the most significant gap between the field of points (regions), which would fulfil the criteria and those which would not. This procedure provides us with parameters for the minimum size and self-containment of regions (in fact a trade-off function between the size and the self-containment), which are estimated in a relatively natural, not normative, way.

The resulting regionalisation has been produced by the use of the parameter values provided by the shifted grey constraint function. This shift has produced 134 final functional regions of the

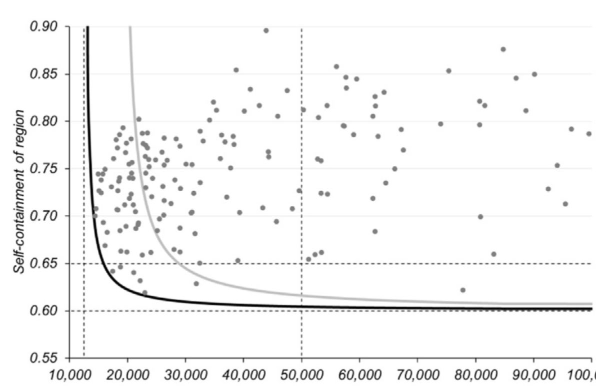

Fig. 3. Shift of the constraint function curve in the construction of local migration areas.

Czech Republic according to migration flows between 2001 and 2012, i.e. the local migration areas. The population of the smallest regions does not decrease below 21,000 and all regions exceed 0.65 level of self-containment (see Fig. 4). A simple graph does not allow the presentation of size and self-containment of all resulting regions, therefore a logarithmic scale for the size axis is used (Fig. 5).

The resulting local migration areas of the Czech Republic are presented in Fig. 6. This is a version with contiguous regions. However, the number of adjustments to the crude version produced by the regionalisation algorithm is very low (11). These were small municipalities of up to 300 inhabitants, whose affinity to a region could be affected by the migration of one or two families (the problem of small numbers). These municipalities have been reallocated in order to acquire contiguous regions, which fulfil the requirements set by the constraint function.

The resulting regional pattern gives a true picture of the spatial composition of the settlement and regional system of the Czech Republic (Fig. 6). Despite the levelling effects of the Smart's measure, the dominant position of the largest centres (Prague, Brno, Ostrava and Pilsen) is clearly documented. Spatially smaller local migration areas can be found in urbanised areas and in areas where distances between micro regional centres are smaller and none of the centres are dominant. Spatially larger local migration areas can be found either in the hinterlands of the largest cities or in predominantly rural and peripheral areas with a lower population density.

Local migration areas are similar to local labour market areas to a large extent (Halás et al. 2015; Klapka et al. 2014, 2016). The only significant exception is the intensely urbanised area of the Ostrava

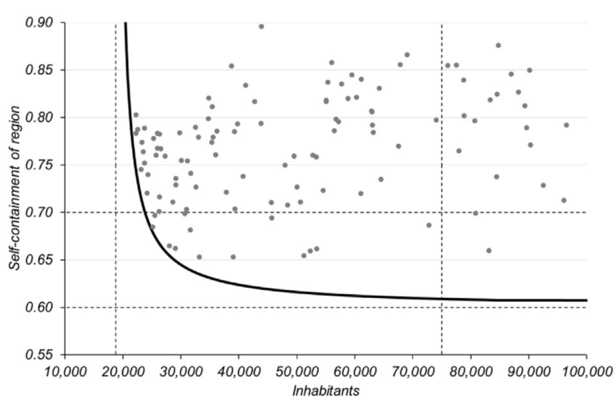

Fig. 4. Size and self-containment of local migration areas.

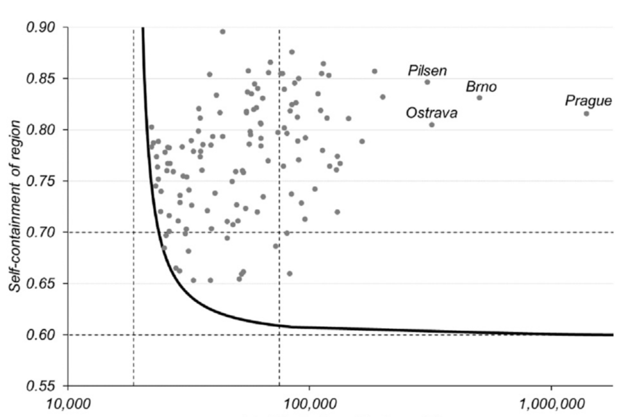

Fig. 5. Size and self-containment of local migration areas (logarithmic scale).

agglomeration in Silesia (the north-east part of the Czech Republic), where the analysis of the migration data shows a larger number of spatially (but not populationally) smaller regions (Fig. 6). They are formed around middle-sized towns, often without their own economic base. However, the centres themselves are large enough to form their own regions because they are able to fulfil the size criterion and also, together with their immediate hinterlands, the self-containment criterion. The absence of economic strength means these towns cannot establish their own local labour market areas.

Data analyses have confirmed that different population age groups can have partially different patterns of migration behaviour. These results conform to the findings of Coombes (2000) and Brown and Hincks (2008). Therefore the population in the post-productive age has been left out of the present analysis (see more in the methodological section). The transition between some life cycle stages is also partly related to the age structure. In this respect, it can be generally claimed that in the direction from a city to a suburban hinterland migration flows of families with children occur the most. In the opposite direction flows of single and childless people are dominant. These latter flows are emphasized in the case of the largest cities, which offer the highest number and variability of jobs. They are also university centres and a large number of students remain in these cities after their studies are completed.

The spatial distribution of migration flows shows a general pattern, when in the central parts of local migration areas (i.e. urban and suburban areas) there is higher concentration of migration flows in comparison to the peripheral areas of local migration areas. This is quite self-evident regarding the character and performance of the regionalisation algorithms and the interaction measure used. There is an exception to this rule, which is the hinterland of the largest cities (Prague, Brno, etc.). It can be documented by the spatial patterns of the self-containment and migration balance (Fig. 7). The self-containment calculated with equation (3) reaches the lowest values in the local migration areas neighbouring on the Prague region. The suburban hinterland of Prague is significantly larger than that of other regional centres. At distances 50–100 km from Prague there is a mix of migration links; those incident to the capital city and those that occur within regions of smaller regional centres (Fig. 7 left). Local migration areas in the wider hinterland of Prague have the highest migration growth due to the intensive suburbanisation. A similar pattern can be seen in the hinterland of Brno and partly in the hinterland of Ostrava. In contrast, the highest migration loss is recorded for local migration areas in the structurally afflicted region of north-western Bohemia (Fig. 7 right).

From the point of view of public administration the most important level in the Czech Republic is NUTS 3 (the level of regional self-government). A spatial comparison of these regions and local migration areas is shown in Fig. 8. The boundaries of the regions (*kraje* in Czech) conform fully to the boundaries of local migration areas only in some instances (the Karlovy Vary and Ústí nad Labem regions; the Ústí nad Labem and Central Bohemian regions; the Pardubice and Olomouc regions; the Olomouc and Moravian-Sileasian regions; and the Zlín and Moravian-Silesian regions – the latter has the city of Ostrava as its regional capital). Significant differences between the two boundaries are concerned with the area along the boundary between the Vysočina and South Moravian regions (respective regional capitals Jihlava and Brno). However, generally speaking, with the exception of the Vysočina region, which is located in a highland area along the historical border between Bohemia and Moravia and between the two largest cities of the Czech Republic (Prague and Brno), regional boundaries conform very well to the boundaries of local migration areas.

Fig. 6. Local migration areas of the Czech Republic (2001–2012).

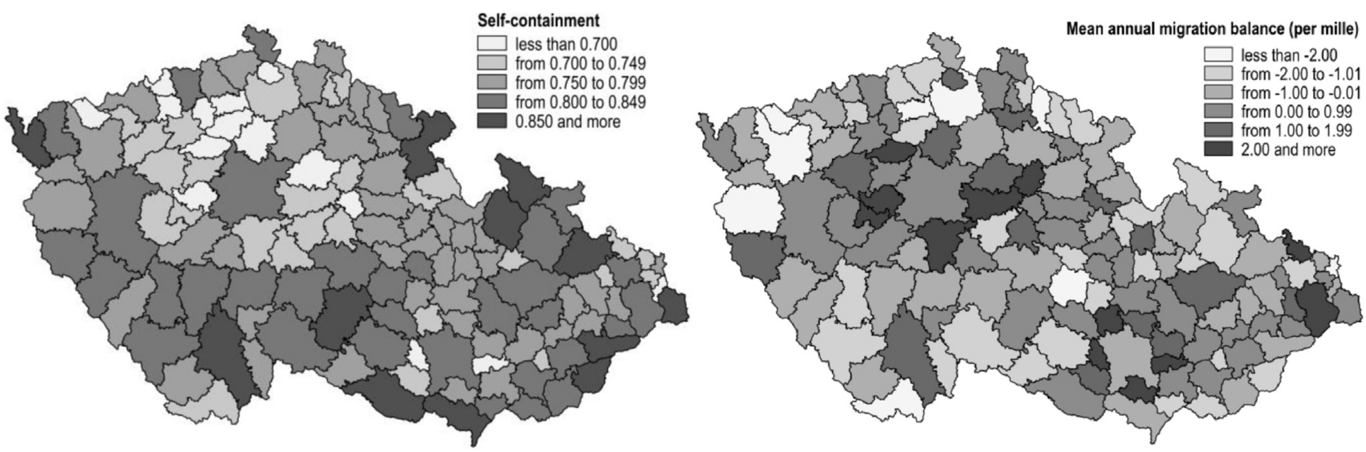

Fig. 7. Self-containment of local migration areas (left) and balance of migration (right).

5. Conclusion

Migration flows at a micro regional level represent a frequent and, in some regions, even a dominant component of intrastate migration flows. The migrants change their residences but, especially during the working day, their behaviour in a timespace is not considerably modified, with the exception of their location of return. This type of migration flow can be motivated by several factors, such as moving in with a life partner, moving into a different milieu, and these offer a person at a particular life cycle stage some comparative advantages; environmental, social, the elimination of wasted time during commuting, etc. It is not easy to identify these migration flows but the paper has relatively successfully attempted to present a procedure for doing so.

The analysis of distances of intrastate migration flows in the Czech Republic between 2001 and 2012 has shown that 39.2% of migration flows between municipalities occurred at a distance up to 15 km, 55.7% up to 25 km, and 70.8% up to 50 km. These are undoubtedly high percentages, although it is not possible to identify precisely whether these numbers are made up of the formerly described migration type. However, the percentage form a majority, which can be proof of a lower level of labour force mobility in the Czech Republic, and evidence of the dominance of migration flows where migrants (economically active persons) do not change their

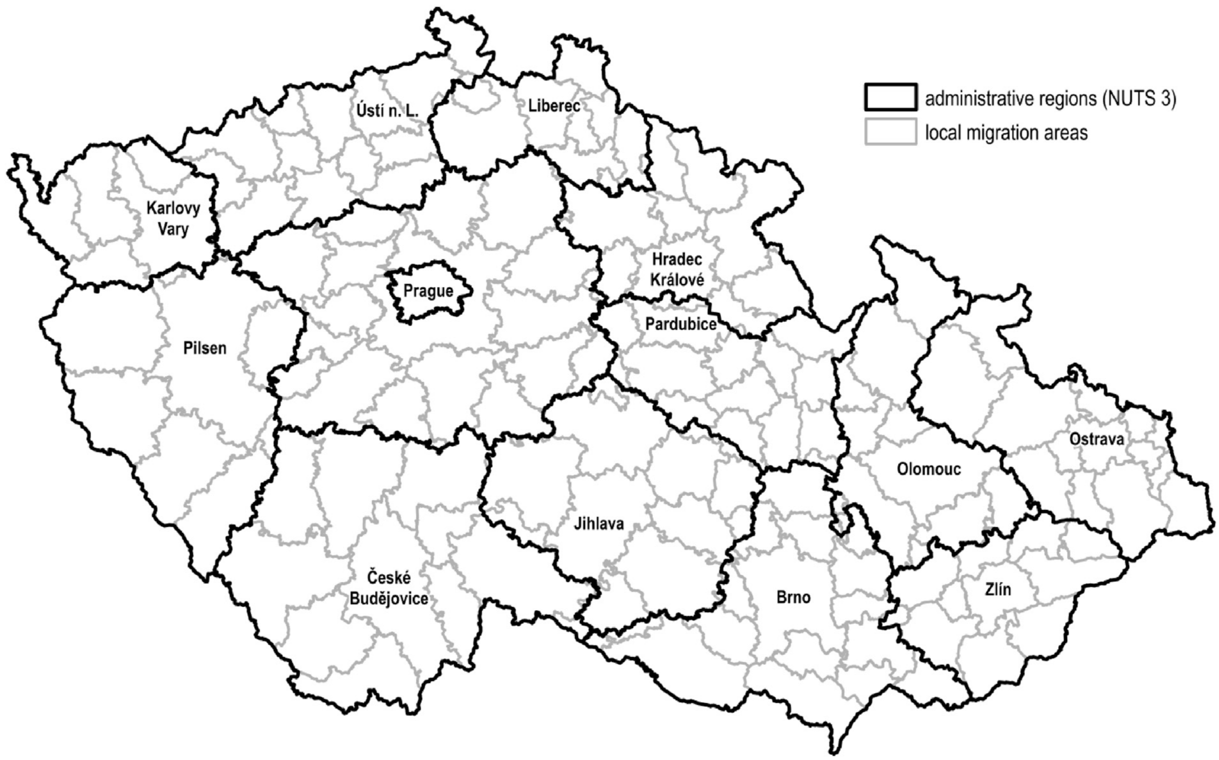

Fig. 8. Administrative regions and local migration areas of the Czech Republic.

workplaces. The remaining portion of migration flows; interregional migration, is a minor one.

This conclusion opens up a very interesting direction for future research. It would be attractive to study the changes in behaviour of the migrants in question during the working day, for instance by using the means and methodological apparatus of time geography. It is beyond the scope of this study, nevertheless the paper provides the reader with at least a generalised pattern of human behaviour in the urban and suburban environment. The average economically active individual of a suburb or immediate rural hinterland mostly works in a town or a city, where they spend a significant amount of their time (apart from working time there are shopping, social, cultural and leisure activities). Their daily routine is well planned and circular in its spatio-temporal shape. In contrast, the average urban-residing individual is not forced to plan their daily spatio-temporal schedule in similar detail, and their daily path has a radial form, with the place of residence as a focal point.

The refinement of migration, which was based on the above mentioned ideas and assumptions, has produced a data set that was used to define local migration areas through the application of standard methods of functional regional taxonomy. As it was argued, this migration type does not include a major modification in the general daily behaviour of migrants, the functional regions based on these data can be considered as a certain analogy for local labour market areas which are based on daily travel-to-work flows. The resulting regions are relatively self-contained, which means timespace prism and projects remain almost the same within these regions. Only the daily rhythms and routines of individuals may be slightly modified within this existing framework, particularly in reference to the previously stressed location of return.

The resulting local migration areas reflect the spatial design of the settlement and regional system of the Czech Republic very well. Their spatial pattern resembles local labour market areas (as defined by Halás et al. 2015; Klapka et al. 2014, 2016), which is only logical when taking into account almost the same procedure for their definition. More significant differences between the two regional patterns are witnessed only in the structurally afflicted old industrial region in the north-east of the Czech Republic. In this part of the republic local migration is not significant, as there may be no motivation to migrate over shorter distances. In contrast, migration flows (i.e. emigration in this case) at interregional level (directed to more successful areas) dominate, and these have been left out of the regionalisation algorithm.

Besides representing the relevant pattern of migration behaviour at the local (micro regional) level, local migration areas can have other applications. For instance they are suitable regions for the construction of an administrative division of a territory and they can represent suitable planning regions. Therefore their use in the administration and planning of a space is indisputable. At the same time, thanks to their relative self-containment in terms of migration flows at the micro regional level, local migration areas can be used as suitable areal units for many spatial analyses, particularly in the field of labour market, demographic prognoses, analysis of interregional migration flows, interregional labour and school commuting, with both daily and non-daily periodicity.

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