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.

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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

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