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Examining a theoretical concept – (Im)Mobility as a factor of perforation in a rural Hungarian context

Levente B. Alpek[A], Gábor Pirisi[A], Róbert Tésits[A], András Trócsányi[A], Éva Máté[A*], Ádám Németh[B]

[A] Department of Human Geography and Urban Studies, Institute of Geography and Earth Sciences, Faculty of Sciences, University of Pécs, Ifjúság útja 6. Pécs, H-7624; alpeklevente@gmail.com; pirisi.gabor@pte.hu; tesitsr@gamma.ttk.pte.hu; troand@gamma.ttk.pte.hu; mate.eva@gamma.ttk.pte.hu

[B] Institute for Urban and Regional Research, Austrian Academy of Sciences Bäckerstraße 13, 1010 Vienna, Austria; adam.nemeth@oeaw.ac.at

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Abstract

Rural restructuring became a frame definition to describe the changing circumstances of rurality within modernization and post-modernization processes. When it comes to modernization, differentiation mostly denotes an increasing urban lifestyle, higher level of mobility and flexibility and dynamic society of the rural. However, a brief overview on rural spaces proved, that in many cases the new challenges of modernization or post-modern values indicate a fragmentation in societies. The approach to reach a higher level of mobility due to the centralized spatial structure of workplaces results in a distinction between social groups; what is more, demographic decline intensifies because of the relatively high mobility of certain rural groups. This paper focuses on those social groups, which have a relatively low level of mobility, therefore they get isolated in a rural locality. The settlements, where most of the local society lacks mobility, could cause the perforation of the settlement system, thus the isolation of some rural social groups leads to a dysfunctional settlement structure. In these terms, perforation means a process, in which a settlement loses connections with local centres or other communities due to the low mobility of residents. Therefore, perforation refers to the lack of local networks, an immobile society, and a set of problems, like unemployment, deprivation, or deviant behaviour. According to the author's presumptions, the mobility of residents could express the volume of perforation as the more isolated the residents are, the less network functions in a rural settlement system can be found. For this reason, this research measures the mobility level of residents in a Hungarian rural locality named Baranyai-Hegyhát, located in the Southern-Transdanubia Region. According to survey data, a mathematical model can describe mobility patterns in this area, which is used as a method to find isolating settlements in a disabled space. The theoretical concept of perforation is supposed to be an experimental approach to interpret complex isolation processes in rural spaces, as such, in this paper, we are to test our theory with the method of the Corrected Mobility Index.

Keywords: post-socialist rurality; rural restructuring; perforation of settlement structure; mobility; labour market; Hungary

[*] Corresponding author: Éva Máté; e-mail: mate.eva@gamma.ttk.pte.hu

Introduction

The international geographic community—and many others—take different approaches when dealing with the issue of rural areas. Out of these approaches, perhaps the most significant trends in geography are those that deal with the transformation of rural societies (Cloke, 1993; 1995; Cloke & Little, 1987), the reorganization of the workforce (Massey, 1984; Massey, 1994; Milbourne & Kitchen, 2014) and issues such as the effect of the contraction of public utilities and local political interventions (Steinführer et al., 2014; Woods, 2005). The framework for research is rural restructuring, which largely covers the research dilemmas listed (Marsden et al., 1990; Lowe et al., 1993; Halfacree, 2006), although they may be quite different in their nature and approach to the topic. In the process of rural restructuring, the countryside reflects a reorganized socio-economic system as a result of modernization and post-modern transition, where the transformation of rural societies is governed by the need to adapt (Woods, 2005; Woods, 2011; Halfacree, 2006; Da Silva Machado, 2017). Adaptation manifests itself in achieving a higher level of mobility, which means social and spatial mobility at the same time, requiring a degree of flexibility for the success of economic restructuring and, finally, a kind of identity change by settlement communities through job centralization and specialization (Clout, 1972; Milbourne, 1997; Milbourne & Kitchen, 2014; Massey, 1984, Tigges et al.,1998).

One of the general characteristics of globalization is that the system of ideas and values of the global locations of the world has been able to reach almost every part of the space through the development of telecommunication tools, although their local interpretation is in accordance with local conditions may vary greatly (Castells, 1996; Soja, 1989; Massey, 2005). Out of all the ideas and values that span the world, perhaps the most spectacular is the spread of urban lifestyle in non-urban spatial segments (Cloke & Little, 1987; Hoggart, 1990; Halfacree, 1993; Dirksmeier, 2009; Woods, 2009). This can be explained by the increasing trends in the use of space by the societies of rural areas since perhaps the most significant benefit of modernization in these areas has been the centralization of jobs and the reduction of locally available employment (Massey, 1984). The working classes of the rural population thus typically find new jobs in cities, with many social consequences (Bourdieu, 1996). On the one hand, the disposition of the commuter layers is changing, which is manifested both in their way of life and their new way of raising capital (Dirksmeier, 2007; Dirksmeier, 2009; Vaishar & Zapletalová, 2009; Burdack, 2013; Milbourne & Kitchen, 2014; Kühn, 2014). If space is to be considered as a social formation, defining the countryside will prove to be an extremely difficult task, as the spatial practice and behaviour of an urbanized society in a rural space may refute its rural character (Woods, 2011; Dirksmeier, 2009; Fekete, 2005). In addition, there is another effect on the qualitative urbanization of rural areas, which is the fragmentation of local communities (Marsden et al., 1990; Halfacree, 2006; Lennert, 2017).

The society of a rural area, which is typically less differentiated than an urban society, may have distinct internal fractures. In Western European countries, counter-urbanization plays an important role in the development of internal fractures, which denotes the appearance of urban strata in rural areas and the emergence of a group with a different financial status (Cloke & Milbourne, 1992; Milbourne, 1997; Cloke & Little, 1987; Novotná el al., 2013). However, apart from the tendencies of counter-urbanization, there are other reasons for the internal fragmentation of the countryside. The issue of mobility thus becomes a central issue, as residents with commuter skills are already a separate segment of rural society (Andorka, 1979; Enyedi, 1980; Milbourne & Kitchen, 2014). As a more extreme example, young and educated populations migrating from rural areas can also be regarded as separate groups. Conversely, some rural societies may become characterized by immobility if their population lacks material assets, adequate education, or training, or if there are no accessible jobs. The number of jobs available locally is limited, so many people can become jobseekers, which

further strengthens their marginal position (Enyedi, 1975; Markuszewska, 2015; Nagy et al., 2015). A particular consequence of the demographic and economic crisis is that elements of locally available infrastructure are becoming more and more scarce (Naumann & Reichert-Schick, 2012).

In the case of Hungary, general processes typical of post-socialist countries and some specific tendencies characterize rural areas. In this region, the process of rural restructuring differs from that of Western Europe, mainly due to earlier forced industrial development and the consequent depopulation of rural areas (Kovács, 2001; Kiss, 2004; Kovács, 2010, Šimon & Bernard, 2016; Spellerberg et al., 2007). Although the forced emergence of industrial societies may be regarded as a kind of modernization process, it pushed the transformation of the traditional peasant society at an extremely rapid pace, often not even lasting a generation, which has slowed rather than facilitated the transition (Kovács, 2001; Kovách, 2012). In the case of rural spaces, especially in Hungary, after the political transition, rural societies that were only superficially undergoing modernization are not able to cope with the challenges of the post-modern age (Fekete, 2005; Fekete & Lipták, 2011; Fekete 2016; Źonková, 2018).

In addition to the fragmentation of society, the Hungarian countryside faced a wider economic crisis during and after the political transition. On the one hand, the dissolution, transformation, and privatization of socialist cooperatives resulted in the loss of a significant part of agricultural jobs (Nagy, 2007; Bandelj & Mahutga, 2010; Takács, 1999; Kovács, 2016). Moreover, a substantial proportion of those employed entered the labour market, as low-skilled, unqualified jobseekers (Pénzes, 2013; Alpek et al., 2016). Another problem was the bankruptcy and closure of mainly light and food industries established in small towns because of centralized decisions, as part of a kind of decentralization industrial policy (Nagy, 2007). Although the crisis in the industrial sector had often meant the release of skilled, qualified masses, the escalated and protracted structural crisis and the lack of a new economic profile also led to the otherwise educated section of society losing their jobs (Molnár & Lengyel, 2015; Pirisi & Trócsányi, 2014b; Barta, 2002). In addition, in the case of small-town jobs, a significant proportion of workers came from the surrounding villages and suburbs, who commuted every day and who often lost their former (rural) social status as they had lost their previous jobs (Kovács et al., 2015; Pirisi et al., 2016).

In parallel, shrinking opportunities for marginalized groups also lead to the decline and often disappearance of elements of the service sector in villages. The deterioration of care systems pushes the less mobile and immobilized strata to a worse position, as they are typically poorer groups, marginalized people, who are already heavily burdened with having to spend on transport to meet their daily needs: shopping, medical care, arranging official matters, etc. (Kučerová et al., 2015; Kovács, 2016; Kovách, 2012; Nagy et al., 2015). Another issue is the sustainability of village small shops and pubs, which, in parallel with the shrinking rural population (Reichert-Schick, 2008), is no longer profitable to run. At the same time, small businesses are unable to compete with the price level of smaller or larger supermarkets and chain stores in the regional centres and so local retail outlets are forced to close their shops (Bajmócy & Balogh, 2002). Another element of the functional decline of rural settlements is the gradual withdrawal of public service providers, which is also justified by the principles of economies of scale (Kučerová et al., 2015, Sousa & Pinho, 2015).

When a significant part of the society of the settlements gets isolated, it could be interpreted as the perforation of the settlement network (Máté, 2017; Alpek & Máté, 2018). In the case of perforating villages and areas, a multilateral social space is emerged, which contains social groups characterized by higher mobility, while the communities that are immobilized or have extremely low mobility are higher in number and proportion than their more mobile counterparts. In this way, isolated members of settlements may lose contact with those living in other settlements, although we would emphasize that isolation in this sense is

more about the degradation of informal relationships, since formal settlement connections, such as the need for an administrative office or access to educational institutions, may encourage (and force) the population to move. Rural perforation may rather be an advanced stage of a process where marginalized, isolated groups are drifting away from their wider municipal environment, both financially and mentally, and in the terms labour market.

According to the authors' assumption, the network of rural settlements could go under perforation if spatial interactions of communities are concentrated dominantly in their own locality. Of course, the scarcity of the 'space of personal practice' is extremely variable and unique, but it can be assumed that in many cases, without regard to official matters, it simply refers to the immediate environment.

The paper focuses on the issues of spatial mobility which is considered to be an important factor of perforation processes. As a part of the rural restructuring, perforation expresses the differentiation of rural societies according to their distinctive spatial practice, though the social background and the spatial disparities challenge rural inhabitants in everyday life. A further assumption is that the lack of mobility in rural areas could increase the negative effects of the erosion of rural settlement networks. According to the societal kind of our theoretical concept, the paper focuses on the subjective willingness and personal preferences of mobility in a rural area, the Baranyai-Hegyhát in Hungary. Thus, while most papers and theories presented above focused on the question, of what objective conditions obstruct inhabitants in their mobility according to statistics, hereby this study questions the subjective features and opportunities that rural inhabitants may hold, and furthermore, may create circumstances in which they become spatially mobile. According to these presumptions, the goals of this research are:

(1) to interpret the weakness of spatial mobility—out of the perforation/isolation processes—mainly through the spatial dimension of the working age population in the labour market;
(2) to use a multivariate mathematical measure, the Corrected Mobility Index (CMI) (Alpek et al., 2016), to express the degree of mobility of the population of a given settlement;
(3) to place particular emphasis on the role of subjective factors experienced by individuals upon examining mobility;
(4) with the help of the numeric Corrected Mobility Index identify villages which are undergoing perforation.

The present study was evaluated by a model based on a questionnaire survey, which was named the average of continuous degrees of mobility (Alpek et al., 2016). The model provides a means of measuring job mobility opportunities for job seekers and workers, considering individuals' cost, travel distance, and travel time preferences in an employment centre/catchment area relation. The Corrected Mobility Index was deducted from the average of continuous degrees of mobility, using metrics that expressed personal abilities and availability of different transport options. With CMI values, the exact spatial layout of commuter networks could be detected, which describes the exact mobilities of rural inhabitants. In this study, mobility is interpreted as the opportunity and the willingness of commuting to work, which could underline the exclusion processes of certain social groups in rural areas.

Research methods

The main methodical challenge of this research was to measure the mobility of local residents. The basis for determining the degrees of mobility was a complex questionnaire survey conducted shortly before the pandemic in 49 settlements in the Baranyai-Hegyhát area. The target group of the questionnaire survey was the economically active population; 368 people

gave valid answers. The selection of the survey pool was random sampling within the active age group, paying attention to involve at least 1% of the residents by settlements and gathering a gender-balanced sample. In total, 35.6% of the respondents were male, 64.4% female. During the evaluation, the gender imbalance was corrected by weighing the data. Regarding the age distribution, the average of the sample was 46 years, and the median value was 42 years, which we considered to be a representative sample according to the statistical mean age of the study area.

In the questionnaire, respondents gave their preferred time, distance, and cost preferences for commuting as well as the transport options available for them, along with several other mobilities modifying variables. In addition, questions related to the identification of employment centres and the financial situation also came up, which allowed the authors to define the subjective parameters of possible mobility. Thus, the survey and the index do not express the exact commuting networks (anyhow the statistics gather such data) but show the potential and limits of respondents to mobilise themselves.

the objective abilities of mobility were conducted by using secondary data as well by each settlement. The space/time/cost matrices of the mobility model are derived from different sources, depending on the means of transport and the connections studied. For car-based commuting, Google Maps' route planner (https://www.google.com/maps), and for public transportation alternatives (bus and train), the associated timetable databases (www.menetrendek.hu, www.volan.hu, www.mav.hu) provided information.

The framework for running the model was provided by simplified commutation graphs of the studied area. The peaks of these graphs were the 'attracted' places of the area, as well as the settlements that might function as employment centres. The latter was selected in several dimensions. First, relevant pieces of literature were used which focused on the commuting centres of Hungary (Pénzes et al., 2014). Secondly, the Hungarian Central Statistical Office (CSO) gathers commuting data at each census. The third dimension was the authors' own survey, in which respondents named the centres of Baranyai-Hegyhát they consider to be. Centres defined were divided into internal (with settlements which have small attractivity and are placed within the borders of the research area) and external (bigger towns and cities partly with regional importance, extended attraction zones). Commuting routes were calculated by the time, distance, and cost preferences the answerers gave.

The cost (Cx), distance (Dx) and time (Tx) thresholds used to quantify the degree of mobility were determined from the results of the questionnaire survey. In all cases, they are the first, third, sixth and ninth deciles of the answers to the questions about the maximum cost, travel distance and time that the respondents should spend. Costs are calculated in Hungarian Forint (HUF), distances in kilometres, and time values in minutes. For this paper, HUF values were converted into Euro (EUR) as a ratio of 1 EUR = 325 HUF, which was the annual average exchange in 2019. Related parameters for the most disadvantaged unemployed group under study were: C1 = 0.003 C2 =9.25, C3 = 30.75, C4 = 76.90; D1 = 10, D2 = 25, D3 = 30, D4 = 50; T1 = 10, T2 = 40, T3 = 60, T4 = 120.

In this case, according to the calibration of the model, an excellent mobility opportunity is identified if the cost and time factors affecting commuting in the municipality are appropriate for 90% of the respondents. In contrast, the model shows highly unfavourable mobility within the limits of the analysis, provided that the transport conditions for commuting to work are appropriate for up to 10% of the study population. If full mobilization of the target group is a high priority, raising the thresholds is justified and vice versa.

Once the basic parameters were identified, the cost (CBV), distance (DBV), and time (TBV) baseline values were required to calculate the degree of mobility for each settlement. These baseline values in the three dimensions of mobility examined (cost, distance and time) show the extent of mobility that is provided by a given means of transport (the present study

examined the possibilities of car, bus and train transport) in a particular commuter relationship applicable to the locality, considering the differing limit values given by the respondents. The minimum of default values is zero and their maximum is four. For a cost base value, the minimum is reached if, in each relation, the means of transport tested in one month is more expensive than the ninth decisimilarlyle of responses to the maximum acceptable cost, and the maximum is reached when commuting is free of charge for the commuter. The model calculated the baseline cost of settlements (CBV) for each examined transport vehicle and relation:

$$the\ CBV\ = \begin{cases} If\ x \le C_1;\ 4 - x\ * \frac{1}{C_1} \\ If\ x \le C_2; 3 - (x - C_1) * \frac{1}{C_2 - C_1} \\ If\ x \le C_3; 2 - (x - C_2) * \frac{1}{C_3 - C_2} \\ If\ x \le C_4; 1 - (x - C_3) * \frac{1}{C_4 - C_3} \end{cases} \quad [1]$$

The distance (DBV) and time (TBV) defaults were determined similarly:

$$DBV\ = \begin{cases} If\ x \le D_{.1}\ ;\ 4 - x\ * \frac{1}{D_1} \\ If\ x \le D_2; 3 - (x - D_1) * \frac{1}{D_2 - D_1} \\ If\ x \le D_3; 2 - (x - D_2) * \frac{1}{D_3 - D_2} \\ If\ x \le D_4; 1 - (x - D_3) * \frac{1}{D_4 - D_3} \end{cases} [2], TBV\ = \begin{cases} If\ x \le T_1;\ 4 - x\ * \frac{1}{T_1} \\ If\ x \le T_2; 3 - (x - T_1) * \frac{1}{T_2 - T_1} \\ If\ x \le T_3; 2 - (x - T_2) * \frac{1}{T_3 - T_2} \\ If\ x \le T_4; 1 - (x - T_3) * \frac{1}{T_4 - T_3} \end{cases} [3]$$

where "x" always represents the travel cost, distance or tie calculated in each relation. With the help of the CBV, DBV and TBV values thus obtained, we can calculate the Vehicle Mobility Factor (=VMF) values for each transport alternative as follows:

$VMF_{ij} = \frac{TBV_{ij} + DBV_{ij}}{2} + CBV_{ij}$, where

"i" represents the code of the device and "j" indicates the relationship between a specific employment centre and the settlement it is located in. But still, VMF is a result of abstract and theoretical calculations and does not exactly reflect the significance of subjective factors, personal availability, and preferences. Therefore, on the basis of the VMF values, a new, *Corrected Mobility Index* (CMI) was introduced.

The basis for the calculation of the CMI is that spatial mobility conditions, besides distance, time, and cost preferences, depend significantly on the subjective availability of devices, since there is no use in the availability of a transport alternative if it is not available to use effectively because of the discrepancies between public transport timetables and work schedule or other reasons. The degree of mobility can be improved if the commuter is more likely to have access to alternatives that make a significant contribution to mobility, otherwise, isolation may increase.

When calculating the CMI values, the alternative providing the best degree of mobility available to the individual under the conditions of the particular model—the highest VMF value—was considered, that is, we were looking for a maximum degree of mobility that also takes into account the subjective availability of devices. In view of the above, the CMI values were determined using the following formula:

$CMI_j = \frac{\sum_{i=1}^{n} K_{:i.} * VMF_{ij}}{\sum_{i=1}^{n} K_i}$, where

- CMI_j – the value of the corrected mobility index for the studied commuting relationship and settlement;
- K_i – the proportion of those surveyed who, considering that they are striving for the highest degree of mobility, have the means of transport at their disposal;
- VMF_{ij} – VMF value of the given "i" device in relation to the examined "j";
- n - code of the tested devices (1 - passenger car, 2 - bus, 3 - train)

As to divide conditions, two variants were considered when determining CMI values. In the first case (CMI_1), in the case of commuting to work, the area-specific bus and train pass prices provided monthly costs, whereas, for cars, we used the average annual unleaded petrol ESZ-95 and diesel prices typical for the time of the survey, considering the consumption of six litres per 100 km. In the assisted version (CMI_2), we assumed that commuters would all use the highest possible reimbursement of travel costs[1], which is 14% (up to 111.35 EUR) of the monthly bus and train passes, and 0.027 EUR/km for cars. The former model shows the "minimum" mobility without support, while the latter quantifies the average of the "maximum" degree of mobility, considering the opportunities and commuting preferences of the subjects.

The two models of CMI were conducted in an internal and an external dimension as well, as earlier suggested. The internal CMI values show commuting opportunities to short distance travels to microcenters (inside the case study area), the external defines the opportunities of longer distance everyday routes, making relative bigger towns and cities available outside the area. The importance of an extended model with big cities was justified simply by the fact that higher salaries and better working conditions are available in these centres, while in the internal model though the availability should be better, the job opportunities are narrower.

The individual questionnaires were processed after coding using MS Excel 2016 software. This software was also used for some data sorting, coding solutions, and for calculating descriptive statistical parameters and determining VMF and CMI values. The statistical operations were run using IBM SPSS Statistics 23.0. Libre Office 3.6 was used to populate the attribute tables of the digital maps, to arrange the data groups, and for QGIS 3.2.2 (Quantum GIS) and rendering.

Thus, the CMI can, overall, express the level of mobility opportunities and willingness to work for the active population of each municipality, thus providing an answer to the extent and level of participation of the settlement in regional labour market networks. Therefore, it also expresses the perforation processes of the examined settlement network, defining the range of immobilized settlements. It, therefore, examines a specific phenomenon of rural restructuring, which can examine opportunities and barriers to the financial security of the working-age population at a regional level.

Research area of the Baranyai-Hegyhát

The case study could be considered in many aspects as being typical for rural regions in East-Central-Europe. Located in South-West Hungary, the area has an extension of about 25 km from North to South, and 32 km from East to West. The name “Baranyai-Hegyhát” is not an exact name for the area, but this physical geographical unit fits the best to area, which

[1] The Government Decree 39/2010 bids the employers to reimburse the costs of commuting to the workplaces up to a specific and annually revised value.

overlaps administrative borders, including the counties Baranya (HU231 in EU nomenclature) and Tolna (HU233) counties. The case study was delimited by statistical methods, primarily focusing on commuting relations (Pénzes et al., 2014; Alpek & Máté, 2018). As it has been earlier described, the commuting centres of the area were first defined by literature, then by the census from 2011. Subsequently, proportions of commuters were calculated by settlement to one of these centres and a minimum of 20% was set. With this method 49 in a total of settlements were identified, which create a compact working entity.

Among the almost 50 settlements four own urban status and concentrates more or less complex central functions. Typical small towns in Hungary, not affected by suburbanisation or mass tourism, are usually shrinking (Pirisi & Trócsányi, 2014a). There are two towns being rich in central functions and urban character: Komló, a former socialist coal-mining town, completely deindustrialised after 1990, losing one-third of its population and now owning 22,000 inhabitants; and a more traditional small town of Dombóvár, originally a railroad junction with more diverse industry and services (population 18,000). The two other small towns, Sásd (pop. 3,000) and Mágocs (2,200) have limited functions and their urban character is less explicit as well, due to their size (Beluszky & Győri, 2011). Although their spatial role is important in such a region characterised by tiny and sometimes dead-end villages, they suffer themselves by lacking fundamental functions.

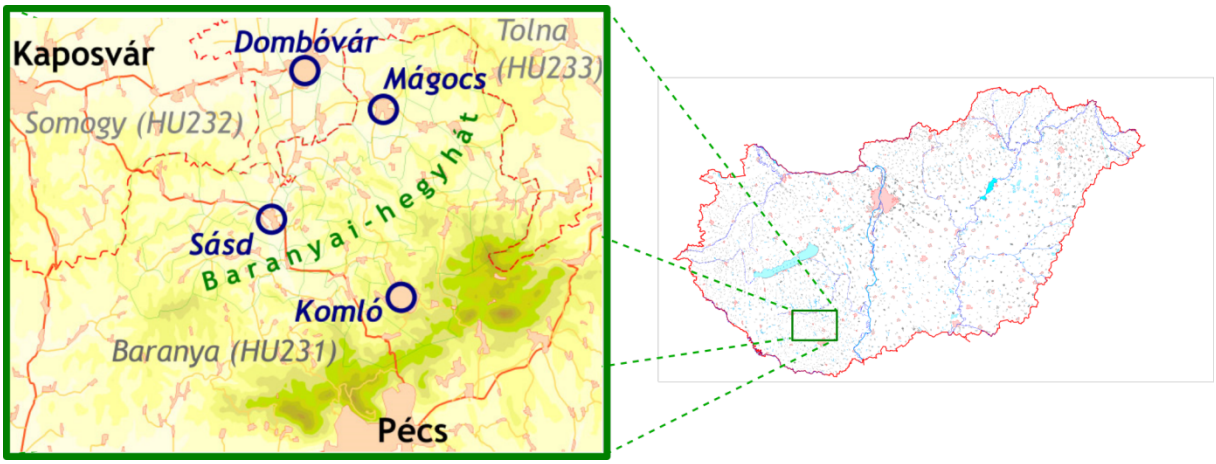

Figure 1. The location and landscape of the Baranyai-Hegyhát area
Source: edited by the authors

The fragmented settlement structure is combined with a small-village settlement system; the average size of the communities in the area is less than 300 people. The largest village in the region, Szászvár, with its 2,282 inhabitants, is comparable to more urbanized settlements at a regional level. Beside Szászvár, there are only just over a dozen of the villages with more than 500 inhabitants, while the number of settlements with a population of less than 200 is 14. The smallest village has a population of 30, according to statistics from 2017, but the survey revealed that the current population is less than 20 residents (Alpek & Máté, 2018).

As already has been noticed, the case study area could be considered as typical for the rural regions of East-Central-Europe, because of the followings:

(1) The highly dispersed structure of population. Although the population density is not especially low (82.7 ppl/km^2), the almost 70,000 inhabitants of the region are deconcentrated into 49 settlements, and almost half of them lives in 47 villages. The low number of inhabitants in these villages makes local markets unfunctional: the lack of consumers creates no opportunities for shops and makes public services locally unavailable, the lack of potential employees keeps potential investors away.

(2) Despite the overall favourable situation of the country's labour market, unemployment cannot be abolished in the region. After 1990, the collapse of the highly intensive, industrialised, and concentrated agriculture and the socialist industry (in this area: coal mining in Komló and Szászvár) could never been fully replaced with new investments. Today, the local labour market is still based on micro-sized enterprises, basically in low-tech sectors. That leads to the outmigration of capable workforce, with the intensive mobility of better-educated women (Timár & Velkey, 2016)
(3) The area is not directly connected with any bigger city. Although Pécs, a regional centre with 140,000 inhabitants is only 15 km's away to the south, that city is also a small island of urbanity in a dominantly rural region with a minor economic power (Molnár et al., 2018) practically unable to dynamize the research area.
(4) Although the hilly landscape has high aesthetic value and some potential in tourism, the slopes and valleys of the Hegyhát mean the lack of major roads crossing the areas. Still today, there are lot of "dead-end-villages", having only a single and poor connection to network. The closest motorway ends in Pécs, while many secondary roads have serious quality issues. The only primary railway line serves rather the traffic to cross the area, not the local demands.

The role of mobility in perforation processes

Endogenous (internal, partially changeable by individual choice) and exogenous (external, only improved through broader community involvement and/or governmental measures) factors that are decisive for the mobility of society, including individual communities and individuals, affect the willingness of commuting and its parameters. These factors exhibit unique patterns across demographic groups as well as in space, and include, in addition to various objective factors (travel time, distance, cost), the subjective availability of individuals to each means of transport and commuter preferences. The importance of the latter is that even acceptable travel distances and costs can reduce the degree of individual mobility if, for some reason, the individual is unable or unwilling to do so. First, models of Corrected Mobility Index, both the internal and external are shown. Second, the internal and external models are being corrected with the possible financial reimbursement. Finally, authors made an attempt to define the positions of settlements according to the results if they were perforated or not.

Examining the spatial effects of endogenous and exogenous factors together, correcting for the degree of individual availability of each transport alternative, significant spatial differences can be observed in the examined area with the relations of the inner centres (internal model) of the area (Figure 2).

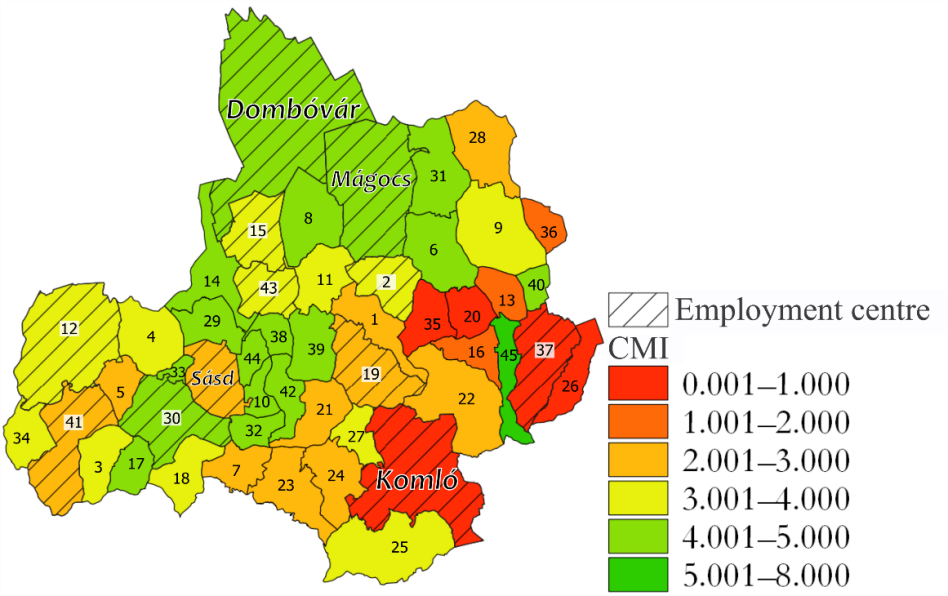

Figure 2. CMI-values of the settlements according to the internal model.
Source: based on the authors' own calculation.

Table 1. Codes used in the maps to label villages in the research area.

Name of village	Code in map	Name of village	Code in map	Name of village	Code in map
Ág	1	Kárász	16	Nagyhajmás	31
Alsómocsolád	2	Kisbeszterce	17	Oroszló	32
Bakóca	3	Kishajmás	18	Palé	33
Baranyajenő	4	Kisvaszar	19	Szágy	34
Baranyaszentgyörgy	5	Köblény	20	Szalatnak	35
Bikal	6	Liget	21	Szárász	36
Bodolyabér	7	Magyaregregy	22	Szászvár	37
Csikóstőttős	8	Magyarhertelend	23	Tarrós	38
Egyházaskozár	9	Magyarszék	24	Tékes	39
Felsőegerszeg	10	Mánfa	25	Tófű	40
Gerényes	11	Máza	26	Tormás	41
Gödre	12	Mecsekpölöske	27	Varga	42
Hegyhátmaróc	13	Mekényes	28	Vásárosdombó	43
Jágónak	14	Meződ	29	Vázsnok	44
Kaposszekcső	15	Mindszentgodisa	30	Vékény	45

Source: by the authors

The most isolated area of the region runs in the southeast and includes predominantly low mobility areas (three or less). There is a clear difference between the two centres in the area with the highest number of agglomerations, Komló and Sásd (both with 12-12 settlements). Komló is the direct centre of about 60% of the settlements with low mobility (less than 2) in the region. The low degree of mobility in the urban environment is due to the transport geography and the peculiarities of the settlement structure and the high prevalence of dead-end villages. Although there are a larger number of dead-end villages in the vicinity of Sásd, but they have typically quick and in most cases direct access to the centre. This is reflected in commuting times as well as travel distances.

A low degree of mobility reduces the rate and extent of the spill over of socio-economic impacts, so in a centre surrounded by low mobility settlements, the risk of isolation can be significantly increased, which poses a major challenge to the studied area, especially to Komló and its caption area. At the same time, in the case of Sásd, the dead-end villages in the vicinity are more integrated, and their relevance is enhanced by the examination of the relations with big cities (external model) (Figure 3).

In particular, the significantly less favourable mobility opportunities in these relations make it more difficult to obtain better labour market opportunities offered by external centres. Contrary to the model of inner centres, the external transport links of the area and the lack of financial resources are the ones that reduce mobility the most. The spatial segment, characterized by an increased risk of isolation, expands considerably, and there are also large numbers of settlements that show zero or near zero mobility (Settlements nr. 20; 34; 42; 44; Figure 3).

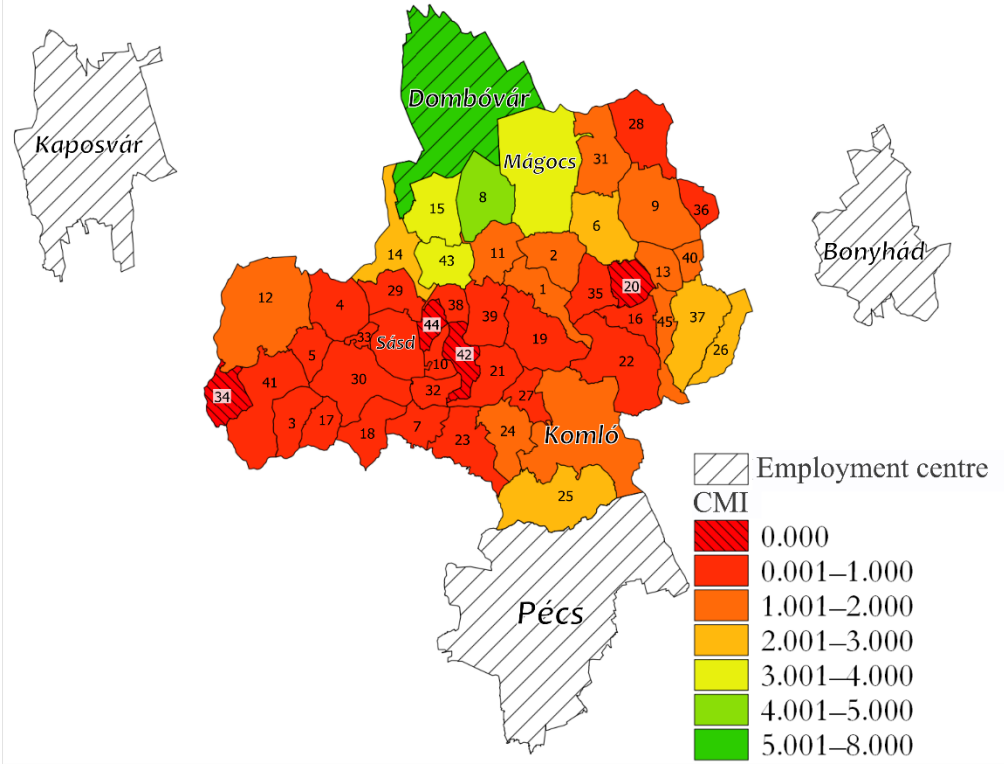

Figure 3. CMI-values of the settlements according to the external model.
Source: based on the authors' own calculation.

A major zone in the West-East is emerging where commuting is a major challenge for the local population. This 'isolated' area comprises approximately 79.6% of the settlements examined and constitutes an inland area with a high degree of unfavourable mobility due to the remoteness of the centres, travel costs and times, i.e. (in a broader sense) the available means of transportation and the location of the settlements. Although these villages showed a higher degree of mobility in the internal model, the numerical results do not adequately reflect the fact that the labour supply of the internal labour markets in the region do not provide sufficient living conditions. The ability of reaching external centres could thus ensure the well-being of society.

The tensions revealed in the degree of mobility are alleviated by the range of transport subsidies, which, assuming the highest available reimbursement for all commuters in all relations, possibly could increase the average degree of mobility of the settlements in the region in the internal model (Figure 4).

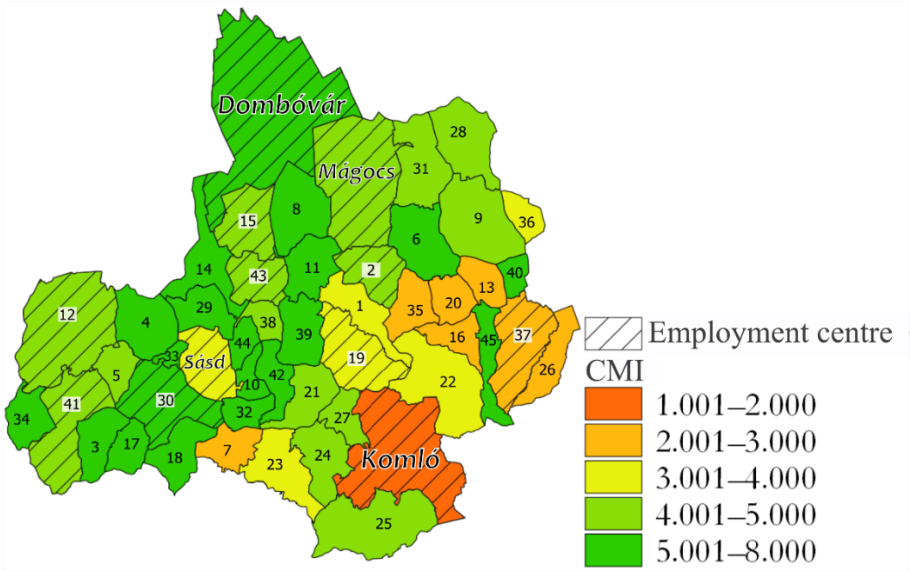

Figure 4. Modified CMI-values including transport subsidies (internal model).
Source: based on the authors' own calculation.

The most important change resulting from the subsidies, examining the internal model, is that the zone with a moderate degree of mobility is significantly widening, and the proportion of associated settlements (with a CMI-value of four to six) increases 1.9 times (Figure 4). This is primarily due to the differentiated impact of transport subsidies on different means of transport. In 71.4% of the municipalities, cars are the "most efficient" commuting alternatives, 22.4% uses the train, and only 6.1% uses public buses. In contrast, if subsidies are considered, the ratio will be significantly reorganized, where 95.9% of settlements uses public transport, with more than 70% favouring bus service. Thus, in the case of transport subsidies, car is replaced by bus and, to a lesser extent, by train, the former remaining the best option in only 4.1% of the settlements. The effect is reinforced by the fact that the subjective accessibility of bus transport at the regional level is the highest among the respondents, which further weighs the extent of the improvement.

All in all, in the subsidized model, the low mobility zone is reduced to 16% of the settlements and to the south-east of the region. The position of dead-end villages (e.g., Hegyhátmaróc nr. 13, Köblény nr. 20) is particularly unfavourable in this area, where the higher travel distances are associated with connecting buses and the lack of rail transport. In general, less favourable commuting opportunities in this area are due not only to car costs, but also to the lower availability of cheaper buses with significantly longer travel times and rail transport, and, in the latter case, to the lack of connecting points.

In contrast, the external model features the subjective availability of devices in the full-price model to reduce mobility by 27.2%, which is a significant value, but the overall challenge for the entire region is that the Corrected Mobility Index in the region would not reach the two-limit value even if the "best" commuting alternative were available to the public (Figure 5). Costs play an important role here, which has primarily been a constraint in the preferences. At full cost in the external model, relations are 49% higher than the 77 EUR/month limit, identified as the maximum limit of extremely low mobility. It draws attention to the role of travel subsidies in improving mobility in the region.

In the model, which considers the cost-reducing effect of travel subsidies, the area of the inner isolation space segment is slightly reduced, the zero-mobility zone disappears, but the number of settlements with extremely low mobility rates remains high (Figure 5). Thus, in the case of a model with travel subsidies, the accessibility of the bigger centres is not

improved to the same extent as was the case with the similar model of the inner centres, which further strengthens the closed nature of the area. Although there is some improvement in mobility due to the supposed reimbursements, it is not able to resolve the issue that certain groups of settlements are difficult to reach, and in these cases one's financial situation also severely hinders individual transport alternatives.

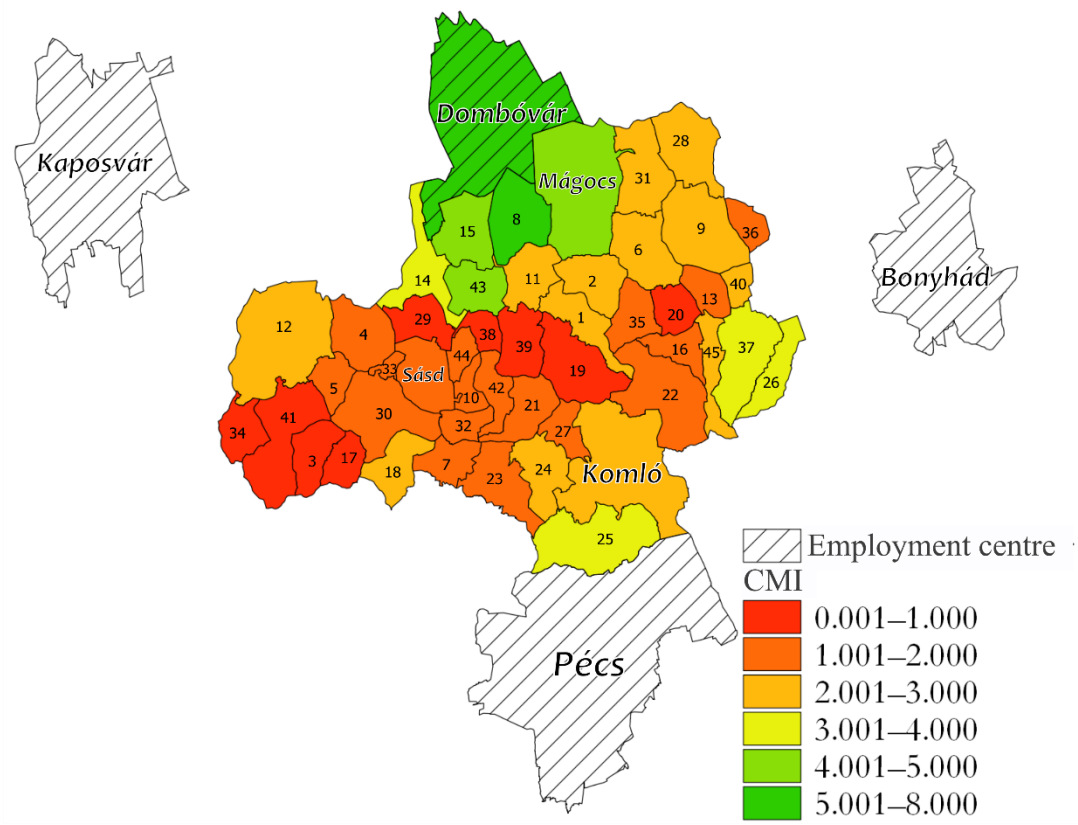

Figure 5. Modified CMI-values including transport subsidies (external model).
Source: based on the authors' own calculation.

More than 55.1% of the settlements do not even reach the extremely low degree of mobility of two, and the availability of devices reduces the degree of mobility by about 14.3% compared to the available maximum. The rate of decline is lower than in the full-price model, which is due to the higher availability of public transport. Therefore, it is visible that the isolation of the settlements of Baranyai-Hegyhát is not really alleviated even when we include the travel allowance provided by the employer.

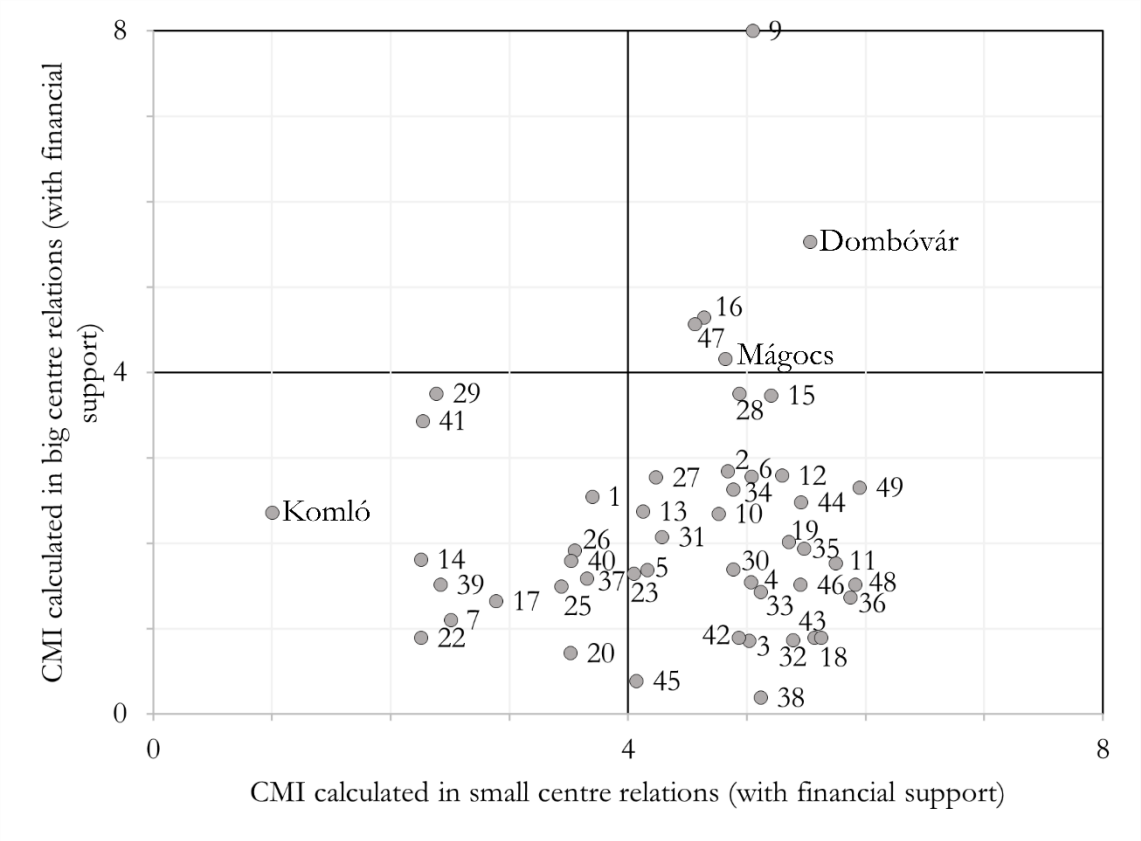

Figure 6. Comparing the CMI-values of settlements including subsidies according to the internal and external model.
Source: based on the authors' own calculation.

Based on the experience of the models, the settlements of the region could be separated by three main groups (Figure 6).

(1) Only 10% of the settlements exhibited values above four in both relations (internal and external model), that is average or higher mobility. This is due to the interaction of several factors. Most of the transport alternatives in the studied relations can achieve a high level of mobility alone (except for one, in almost all commuting dimensions, each studied device had a direct connection to the centre). This way, the opportunities of the population are wider, which has a positive effect on mobility since high values can be achieved even if the availability of the primary alternative is lower. On the other hand, in these settlements the subjective availability of individual devices is higher than the regional average or not significantly below the average (cars had a 13.9% higher subjective availability than the regional average, while trains had a 10.5% higher subjective availability than the regional average.)

(2) However, the risk of isolation is unquestionably present in the area, which is supported by the fact that 28.6% of the settlements had mobility values below four in both the internal and external model. These communal societies struggle to even reach the inner centres of the region, which, however, would not necessarily ensure them progress. The small towns in the area, which can be interpreted as potential employment centres, offer extremely limited opportunities with low income. If the opportunities were given, then the education attainment of the working age citizens would pose a problem. The average educational level of people living in rural areas in Hungary is extremely low, which was confirmed by the results of our questionnaire survey related to demography. The negative mobility characteristics of the region is

thus related to the question whether the population can be integrated into the labour market or not, and if yes, to what extent.

(3) Finally, for more than 60% of the settlements, their degree of mobility in the internal model was medium or higher value, while it remained below four in the external relations. Although they have shown signs of dynamism in internal relations, in fact their disconnectedness to external networks creates a high risk of long-term isolation.

Conclusions

The study of subjective mobility gave answers to a specific, post-socialist process of rural restructuring, the perforation of the settlement network, in the sample area of a well-defined rurality, the Baranyai-Hegyhát. The application of the model in a rural area has highlighted a more general problem that is often overlooked in mobility-focused research, which is that individual mobility opportunities cannot be explored in detail by examining transport and communication infrastructure alone. On the other hand, subjective mobility also evaluates statistically less measurable parameters, such as financial status, available transport options or an individual's willingness to travel, which may give a more accurate picture of the internal dynamics of a settlement network in a region.

According to the results, the application of the model does not only reveal the internal characteristics of the given area of Hungary, but also provides more general experience of the transformation of the Eastern European countryside. The perforation process, which primarily refers to the weakening of local inter-settlement relations, can be well illustrated by the commuting constraints of the working age population of locals, considering the constraints of the financial resources involved and thus the constraints of other mobility. For small scale settlement systems, this is often less of a problem if the availability of local resources (material, intellectual, human, etc.), together with shorter mobility distances, ensures the internal functioning of the area. In the examined case (and possibly in other Eastern European relations as well) the internal resources of certain rural areas are extremely scarce, which is exacerbated by their gradual erosion because of shrinkage. In this way, not only the external, but also the internal communication systems of rural settlements become limited. In addition, the "rationalization" or "withdrawal" of state-run public services puts further pressure on more marginalized communities. The seriousness of the latter can be measured primarily by the fact that the conditions of electronic administration are provided from an institutional point of view, but in many cases the level of development of the local infrastructure does not reflect the needs involved. On the other hand, the user side is not adequately equipped either.

Although the concept of rural restructuring is of general application, local particularities distinguish it from the Western European type of differentiation processes in which the phenomenon is described. In our research, we have concluded that the following criteria can be seen at our test site, compared to Western samples.

1. The mobility opportunities of the stationary rural population are limited by both transport and financial means. The former does not only concern the regularity of public transport but is primarily concerned with access to any transport system, either if it is a bus, a train or even a car. Financial shackles are not only represented in the lack of money for transport, but they also pose a problem in workplace integration, for example. Most of the respondents do not have proper clothes, shoes and coats, and in some cases, they do not even own a bathroom at their place of residence.

2. The receiving side of the labor market discriminates in many ways against (potential) rural workers. Among the results, there was a model presented, that supported commuting and one that did not, based on the assumption that the employers would provide some sort of financial support. Unfortunately, however, the reality is, according to the respondents in the research, that when the employer would have to provide travel allowance,

they would rather not employ these candidates. This is a spatial discrimination in Hungary, which makes it impossible for the rural population to find employment on the labor market, thus weakening the internal relations of rural areas.

3. One of the characteristics of the processes of rural restructuring in Western Europe is the emergence of post-modern social values in rural areas. One of the more pronounced manifestations of this is the intensified disorganization tendencies, which are primarily due to recreation, appreciation of natural values, calm environment, and self-realization. The background of this migration process is the individual decision and subjective motivation of individuals, which is often coupled with the values and mentality of middle-class groups involved in counter-urbanization. In contrast, in post-socialist rural areas, moving to the countryside is often caused by the rise in the cost of urban life. This way, the rural lifestyle is not a path chosen by individuals, but a constraint created by living conditions. All of this is reinforced by the fact that, in post-socialist areas, mobility opportunities in the traditional population tend to be based on constraints rather than on free choice. All in all, the counter-urbanization processes only have a marginal, yet specific (indicative of international migration) presence in these areas.

These differences are confirmed by the results of the research, which, while focusing on the issue of mobility, have highlighted other features of the field, such as the particular problem of counter-urbanization, the economies of scale of market services or the withdrawal of local public services. The examination of the Baranyai-Hegyhát pilot area, applying the subjective mobility model, draws attention to the deficiencies of the area's permeability, its external and internal communication systems, and the weakening of the connection intensity of its networks. At the same time, the model may also respond to the post-socialist features of rural restructuring, which may be expressed, for example, in the processes of isolation of an active society in rural communities.

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