From growth to shrinkage: The effects of economic change on the migration processes in rural Romania

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Abstract

Romania's current territorial development, the new spatial structure of the economy and the population are mostly determined – besides the process of path dependency – by new political, social and economic circumstances. With the transition from a planned to a market economy, the post-communist socio-economic changes have left their mark on the evolution of the rural population not just in terms of structure and quality, but also in terms of numbers. Deindustrialization and the restructuring processes that occurred in the late 1990s have had a negative effect that manifested itself not only in the rise of unemployment, but also in the directional change of the internal migration. The main objective of the paper is to show how the spatial pattern of migration flows has changed during two time periods: between 1990 to 1996, when the internal movement of people was characterized by rural-urban migration and 1997 to 2011, when – due to the economic restructuring processes – urban-rural migration has prevailed. To interpret this, the paper focuses on assessing the current state and the spatial differentiation of migration in Romania – based on settlement level data, regardless of the spatial conditionality of the phenomenon - using the technique of spatial autocorrelation. The aim is to establish and interpret the different clusters resulting from the similarities in the intensity of the net migration rate, as well as to compare the outputs of these two results. The analysis mostly focuses on the effects of economic change on the internal migration, regardless of aspects related to the emigration of the Romanian population.

Keywords: *Internal migration, ruralisation, disparities, spatial autocorrelation, Romania*

Zusammenfassung

Vom Wachstum zur Schrumpfung: Die Auswirkungen des ökonomischen Wandels auf Migrationsprozesse im ländlichen Raum Rumäniens

Rumäniens gegenwärtige territoriale Entwicklung sowie die neue räumliche Struktur der Wirtschaft und der Bevölkerung sind – jenseits von Pfadabhängigkeiten – vor allem durch neue politische, soziale und ökonomische Rahmenbedingungen bestimmt. Die Transformation von einer Plan- zu einer Marktwirtschaft und die damit verbundenen post-kommunistischen sozioökonomischen Wandlungen beeinflussen die Entwicklung der ländlichen Bevölkerung sowohl im Sinne von Strukturen und Qualitäten als auch deren Anzahl. Die Deindustrialisierung und die Umstrukturierungsprozesse, die seit den späten 1990er Jahren stattfanden, hatten einen negativen Effekt, der sich nicht nur in einem Anstieg der Arbeitslosigkeit, sondern auch in einem Richtungswechsel in der Binnenmigration zeigte. Das Hauptziel dieses Artikels ist zu zeigen, wie sich die räumlichen Muster der Migrationsströme geändert haben, und zwar in zwei Zeitperioden: zwischen 1990 und 1996, als die Binnenmigration durch Land-Stadt-Migration charakterisiert war, und zwischen 1997 und 2011 als – aufgrund des ökonomischen Restrukturierungsprozesses – Stadt-Land-Migration überwog. Um dies zu interpretieren, fokussiert dieser Artikel auf eine Abschätzung des gegenwärtigen Zustands und die räumliche Differenzierung der Migration in Rumänien, basierend auf Daten auf Siedlungsebene und einer Analyse der räumlichen Autokorrelation. Das Ziel ist es, die verschiedenen Cluster zu interpretieren, die sich aus Ähnlichkeiten der Intensität der Wanderungssalden ergeben. Die Analyse fokussiert vor allem auf Effekte der ökonomischen Änderungen auf die Binnenmigration, die Auswanderung aus Rumänien wird nicht untersucht.

Schlüsselwörter: *Binnenmigration, Verländlichung, Disparitäten, räumliche Autokorrelation, Rumänien*

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1 Introduction

The migration phenomenon in Romania goes back quite a long way – being a fairly permanent process – although its intensity has changed a lot over the last two decades. Following a short wave of rural-urban exodus in the 1950s, spatial mobility has been moderate. Moreover, it has been completely restricted in some large urban centres, while international migration was strictly controlled by governments.

The political and economic changes occurring at the beginning of the 1990s have brought about considerable changes in the territorial structure and migration behaviour of Romanian counties, along with a severe economic decline and deepening of the development discrepancies between the Eastern and Western parts. The restructuring of state-owned enterprises and privatization of economic structures were not done easily, influenced also by the difficulties that occurred in the country's external balance of payments and the deficit of the central budget. The inflation has risen to an alarmingly high rate, while, at the same time, closing down the industrial plants has boosted unemployment. All these had a negative effect on the entire economy of the country. One of the most important effects of the economic processes taking place in the 1990s was the change in the direction of internal migration as a reaction to deindustrialization. Beginning with 1997, for the first time in the last four decades, the urban-rural migration started to prevail. The trend of international migration has also escalated, starting with emigration motivated by ethnic and religious aspects, closely followed by permanent emigration and emigration based on economic reasons (Ilovan and Sochirca, 2011).

The aim of the paper is to use spatial autocorrelation techniques in order to present the current trends and spatial differentiation of migration in Romania in the light of socio-economic transition, based on data available for the smallest possible territorial units: communes. To view migration as a broader process of social and economic development and to identify spatial units consisting of communes with similar migration indicators we will make use of the net migration rate, comparing it between two periods: 1990 to 1996 and 1997 to 2011. The main question is whether we will be able to detect a spatial pattern in the relations of internal migration and analyze the main features of the neighbourhood effect.

One should mention that over the last few decades, the issue of spatial autocorrelation has received considerable attention not only among geographers but also among economists, biologists, urban planners and sociologists. Spatial autocorrelation can be used as a very effective technique in analyzing spatial distribution of objects, assessing at the same time the degree of influence of neighbouring entities upon each other (Borruso and Murgante, 2012). This concept is very well synthesized in the first law of geography defined by Waldo Tobler: "All things are related, but nearby things are more related than distant things" (Tobler, 1970: 236). Spatial autocorrelation tests whether the value of an observed variable is independent of values of the same variable in neighbouring localities (Cliff and Ord, 1973). The most prominent authors in exploring and using spatial autocorrelation were Cliff and Ord (1969, 1973, 1981) who have developed Moran's I statistics for measuring (global) spatial autocorrelation (author is Moran 1950). In the nineties, the focus shifted towards local patterns of association as a more appropriate perspective (Getis and Ord, 1992; Openshaw, 1993; Anselin, 1993; 1995). The Local Indicators of Spatial Association (LISA) was proposed by Anselin (1995) and has been used to identify possible centres of statistically significant clusters. In this paper the author will use both statistics of spatial autocorrelation mentioned above.

The paper has been divided into three parts. The first one includes an introduction to the dataset, describing the core-hypothesis of the analyses as well as the methodological approach regarding the spatial autocorrelation techniques. The second part will broadly analyze the migration trends in Romania over the last two decades, as well as the consequences and challenges provided by migration, resulting in a comprehensive overview on the current patterns of migratory flows. The final part the paper will focus on the significance of spatial autocorrelation analyses and the effect of neighbourhoods in shaping migration patterns in the case of internal migration flows. The findings of the analysis on the spatial differentiation of migration at communal level and the identified spatial clusters will help bring a new perspective on the understanding of the continuous changes taking place in core and periphery areas in the context of internal migration serving as a basis for drafting local development policies.

2 Data and Methods

The analysis on the spatial differentiation of migration was based on existing territorial statistical data obtained from the National Institute of Statistics (2014a-c), including the 1992 Census, the Tempo Online website and the 1990 to 2011 Statistical Yearbook. These databases enable us to use data at communal level corresponding to the EU NUTS[1] 5 level, in

[1] The Nomenclature of territorial units for statistics, abbreviated as NUTS (from the French *Nomenclature des Unités territoriales statistiques*) is a geographical nomenclature subdividing the territory of the European Union (EU) into regions at three different levels (NUTS 1, 2 and 3, respectively, moving from larger to smaller territorial units). Above NUTS 1 is the 'national' level of the Member State.

our case the level of the 2,861 communes[2].
The analysis was based on three core hypotheses:

- H1. The variations of the net migration rate are spatially auto-correlated.
- H2. The neighbourhood effects of the net migration rate in the Romanian communes can be proven with the help of ESDA (Exploratory Spatial Data Analysis) techniques.
- H3. There is a strong distinction in the spatial patterns of migration between 1990 to 1996 (in the case of rural-urban migration) and 1997 to 2011 (urban-rural migration).

The identification of representative groups of the territorial concentration of migration was based on the use of spatial analysis techniques, on the use of spatial autocorrelation. The most interesting feature of spatial autocorrelation is its ability to analyze location and attribute information at the same time (Goodchild, 1986). The analysis of spatial autocorrelation is based on the calculation of a global and a local Moran's I criteria. To measure spatial autocorrelation, first we use the global Moran's I statistic (Moran 1948, Anselin, 1996; Griffith, 2003; Pinkse, 2003). This is calculated as:

$$I = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}\left(x_i - \bar{x}\right)\left(x_j - \bar{x}\right)}{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}\sum_{i=1}^{n}\left(x_i - \bar{x}\right)} \quad (1)$$

where

I is the global Moran's I,
x_i is the value of the monitored variable in unit *i*,
x_j is the value of the monitored variable in unit *j*,
x with stripe is the arithmetic average of the monitored variable,
w_{ij} is the generic element of contiguity matrix.

Since the expression of spatial dependence refers to the connection between the nearest units, it is important to express the degree of proximity of the areas by defining the concept of spatial contiguity (O'Sullivan and Unwin, 2003). The concept of contiguity can be defined as a generalized matrix of W weight, usually symmetrical, representing the pattern of connections or ties and their intensity (Badaloni and Vinci, 1988), where w_i weights$_j$ denote the effect of the territorial unit on unit *i*. In this study, a dichotomy matrix of contiguity was used where $w_{ij} = 1$ if the *i* area touches the boundary of *j* area, otherwise $w_{ij} = 0$. This definition of neighboring areas is based on rook contiguity. In this study, the weighting matrix is row standardized, and the weights are defined as: $w_{ij}^s = \frac{w_{ij}}{\sum w_{ij}}$, such that $\sum_j w_{ij}^s = 1$ [3]
The row standardization has two important implications:

- it implies equal weights across neighbors of the same settlement;
- it implies that the sum over all elements of the row-standardized weight matrix (w_j^s) is equal to the total number of observations (N).

Therefore, the equation can be rewritten as:

$$I^s = \frac{\sum_{i,j} w_{ij}^s\left(x_i - \bar{x}\right)\left(x_j - \bar{x}\right)}{\sum_i \left(x_i - \bar{x}\right)^2} \quad (2)$$

With row standardization, the sum of weights in each row becomes 1. Since there is one row for each commune in the sample, there are N rows. Therefore, the sum over all weights in the matrix $\sum_{i,j} w_{ij}$, is N (Torres et al., 2011).

Moran's I reaches values from -1 to +1. The negative Moran's I value indicates negative spatial autocorrelation, the positive value of Moran's I indicates positive spatial autocorrelation. The closer the value of Moran's I to -1 or +1, the stronger the spatial autocorrelation. This index represents the global indicator of spatial autocorrelation, giving an indication about the presence of autocorrelation. The exact location of the values of autocorrelation is provided by the local spatial autocorrelation statistics. One of the most frequently used indices of local autocorrelation is the Local Indicator of Spatial Association (LISA) developed by Anselin (1988, 1995), being considered as a Local Moran's Index. This index is calculated as follows:

$$I_i = \frac{\left(x_i - \bar{x}\right)\sum_{j=1}^{n} w_{ij}\left(x_j - \bar{x}\right)}{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2} \quad (3)$$

The sum of all local indices is equal to the global Moran's I (Krejníková, 2013). Therefore, $I = \sum_i \frac{I_i}{n}$, which allows, for each

[2] Romania is organized in the following territorial-administrative units: counties (județe), cities (municipii), towns (orașe), communes (comune) and villages (sate). According to Law regulating the National Development Plan–Section IV: Settlements Network, cities are defined as territorial administrative units where most of the labour is employed in non-agricultural activities with a diversified level of equipment, exerting a constant and significant socio-economic impact on the surrounding area. Communes are defined as territorial administrative units comprising rural population characterized by common interests and traditions consisting of one or more villages, depending on the economic, social, cultural, geographic and demographic functions. In this paper the analysis refers to the existing cities and towns (320) representing Romania's urban area and to the 2,861 communes which encompass 12,957 villages representing the rural area. It must be mentioned that the number of cities (towns) and communes (villages) has changed considerably during the analyzed period: if at the beginning of 1990 there were 260 urban settlements and 2,688 communes (including 13,088 villages) until 2011 their number has increased up to 320 cities and towns and 2,861 communes (encompassing 12,957 villages). In order to increase the reliability of the analyses all the datasets were reconstructed in accordance to the latest administrative organization units.

[3] For example, if a territorial unit has 4 neighbours, $w_j^s = 1/4$ (Torres et al., 2011)

location, to determine the similarity of each observation with its surrounding elements. Thus, five scenarios occur (Borruso and Murgante, 2012):

- locations with a strong presence of the phenomenon and high level of similarity with their surroundings (high-high H-H), defined as **hot spots**;
- locations with low values of the phenomenon and low level of similarity with their surroundings (low-low L-L), defined as **cold spots**;
- locations with high values of the phenomenon and low level of similarity with their surroundings (high-low H-L), defined as potentially **spatial outliers**;
- locations with low values of the phenomenon and high level of similarity with their surroundings (low-high L-H), defined as potentially **spatial outliers**;
- locations completely lacking a significant autocorrelation.

It is worth mentioning that high-high and low-low types of spatial associations indicate positive spatial autocorrelation and vice-versa, high-low and low-high types denote negative spatial autocorrelation (Anselin, 1995). The Local Indicator of Spatial Association (LISA) can effectively bind a measure of the degree of spatial association relative to its surroundings to each territorial unit, enabling the highlight of the type of spatial concentration for the detection of spatial clusters (Scardaccione et al., 2010).

The values resulted from the spatial autocorrelation analyses have been calculated and illustrated with the help of the GeoDa Software version[4] 1.6.2 and are explained in more detail in chapter 3.2.

3 Results

3.1 Understanding the pattern of internal migration over the last decades: challenges and consequences

The main aim of this subsection is to present the economic transformation of the country during the last few decades which have had a significant effect on the evolution of the internal migration process and on the deepening territorial disparities within the country. Romania's internal migration processes, its spatiality cannot be correctly understood without mentioning briefly its political, social and economic history over the last 50 years. During 1948 to 1989 Romania was a totalitarian state, with a centralised socialist economy. At the same time, the structure of the economy has been characterized as mainly agrarian, with a predominantly rural population. The process of industrialisation during the socialist regime was based mostly on the transfer of capital and labour from agriculture (Kupiszewski et al., 1997).

The first part of this period (1948 to 1956) was characterized by deep political, social and economic changes in Romania: the nationalisation of the industry has taken place followed by the collectivisation of agriculture, which generated a massive population movement from rural to urban areas. The towns in Southern Transylvania and the industrial areas of Braşov and Hunedoara, in particular, and some developed urban centres (Cluj, Constanţa, Iaşi, Bucharest) represented the main attraction for the rural population from the surroundings, as well as the Eastern part of the country (Measnicov, 1969).

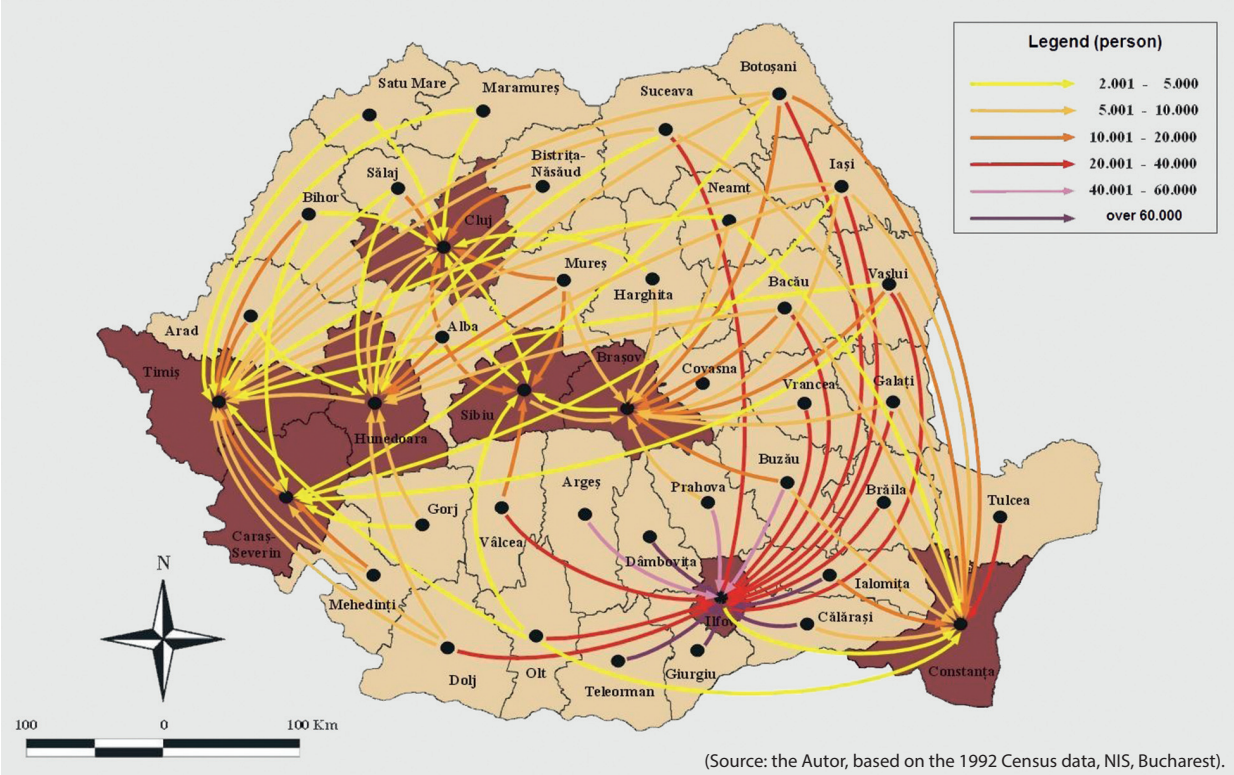
During the next period (1956 to 1966), the rural population has continued to be the most mobile, contributing to a migration from villages to towns twice as high as migration between urban settlements (Cândea and Baranovsky, 1985). The main feature of this pattern was the long-distance migration of the young, working-age population from the Eastern and South-Eastern rural areas towards the more developed Western urban settlements. As early as 1967, a decree has been adopted against migration into the largest towns of Romania, although these attempts have not proven successful as the urban population continued to increase due to migration but independent of their natural increase (Kupiszewski et al., 1997).

Following the year 1967, the highest level of migration has occurred from 1971 to 1974 and then between 1976 to 1978 when the pattern has remained the same as in the aforementioned period: from the undeveloped Eastern to the more developed Western areas. Figure 1 illustrates the intensity of rural-urban migration based on county-level migration data and the counties' urbanization rate.

In 1990, after repealing some of the restrictive aspects of the legislation referring to establishment of residence in urban areas, the rate of internal migration reached its highest level ever recorded (45.1 ‰). In fact, the majority of the registered migrants in 1990 were *de facto* already settled in these towns, and after the change of circumstances they have just officially legalized their residence (Kupiszewski et al., 1997). Since 1990, the territorial mobility was characterized by a series of particularities determined by major transformations in the political, economic and social life. The economic disparities already existing between the prosperous and the lagging regions have increased during the transition years, influenced to a great extent by institutional renewal, economic restructuring and privatization over the last two decades. Thus, the least developed regions have been represented by the North-Eastern and South-Western parts, showing a great lag as compared to Bucharest-Ilfov, West and Centre Regions (Table 1).

The declining economic situation, the high level of urban unemployment and the industrial restructuring have all induced important changes in the internal migration. Starting with 1992, the number of those moving from rural areas (villages) to urban centers (cities) started to decrease, conversely the mobility in the opposite direction (from urban to rural) increased, being mainly attributed to the economic transition and decreasing employment opportunities in cities. Urban-rural migration has become prevalent since 1997 (Alexe et al., 2012). We must also keep in mind the fact that the change in direction of internal migration in the case

[4] This software was developed by the Center for Spatially Integrated Social Science (CSISS) at the University of Illinois, Urbana-Champaign, Urbana, IL, USA.



(Source: the Autor, based on the 1992 Census data, NIS, Bucharest).

Figure 1
Number of individuals changing their country of residence based on data regarding county of birth and current county of residence

The colors of arrows represent the intensity of migration: the darker the color, the more people have migrated. The selection of counties was based on two criteria: they had the highest urbanization rate and the highest share of people changing their residence.

Table 1
The macro-economic indicators of development

Development regions	GDP/capita (country average=100)		Unemployment rate		SMEs/capita*		FDI/capita*	
	1998	2003	1998	2003	1998	2003	1998	2003
North-East	74.1	68.5	47.7	8.4	68.7	68.3	15.3	14.9
South-East	97.6	82.2	37.3	7.4	102.5	101.5	42.7	74.6
South-East	83.7	76.6	26.1	7.6	78.1	74.4	65.5	69.9
South-West	87.3	76.5	36.4	8.6	92.3	105.0	11.9	34.1
West	101.9	103.7	28.5	6.6	86.7	95.9	99.1	98.6
North-West	92.1	90.0	26.2	5.2	107.1	107.8	5.8	55.6
Centre	104.7	103.4	23.1	8.0	99.2	102.7	87.7	57.8
Bucharest-Ilfov	158.6	199.2	8.9	3.0	195.3	197.1	598.3	503.5

Source: Romanian Statistical Yearbook, NIS, Bucharest, 1998, 2003 (National Institute of Statistics, 2014a-c)

*Small and Medium-sized Enterprises
*Foreign Direct Investments

of a certain group with a relatively higher income did not represent a constrained migration, but rather – similarly to Western countries – a post-socialist sub-urbanization process, which has reached its peak in the last years of the 20th century. The main features of this migration are that it took place close to the large urban centres where the territorial and social infrastructure has been much better developed (Benedek, 2006). In this case, the internal migration has

represented two main trends: people with a better economic situation belonged to the group of welfare migrants, while those who have lost their job and had a worsening financial situation have represented the group of constrained migrants. Thus, while at the beginning of the transition period, urban-rural migration represented only 2.5 ‰, at the end of the 1990s, migration to rural areas almost quadrupled, reaching values of up to 9.8 ‰, maintaining this ration up until our days (10.1 ‰) (Figure 2).

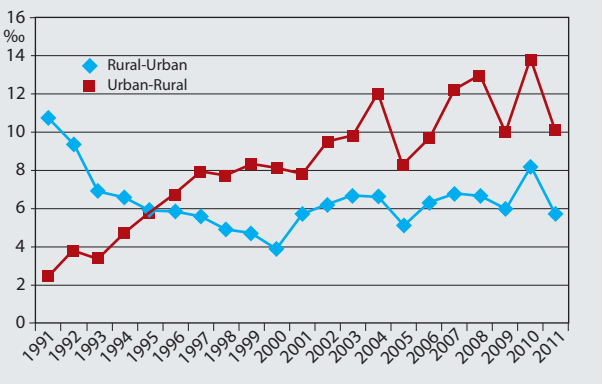


Figure 2
Evolution of the internal migration between 1991 to 2011 (Source**:** the author, based on data collected from the Romanian Statistical Yearbooks, 1991 to 2011, NIS, Bucharest (National Institute of Statistics, 2014a-c)).

Table 2 shows that most of the people migrating to rural areas generally belong to the age groups between 45 to 49 and 50 to 54 years. A relatively low or sometimes inexistent migratory movement can be noticed in the case of the young population (20 to 29 years), maintaining negative values throughout the examined period, letting us conclude that during the analyzed period the rural environment has failed to retain the most important population group capable of ensuring its reinvigoration and slowing down the advanced demographic aging process.

Migration to rural areas is closely connected with the process of industrial restructuring, which has lead to the decline of economic activities in certain urban centres and, consequently, to mass lay-offs. The return to villages has also been encouraged by the Law governing Agricultural land ownership (Law no. 18 / 1991) according to which agricultural land and forests have been restored to their former landlords, although these were not capable of providing a minimum standard of living due to lack of machinery and equipment (Kurkó, 2011). In addition, we should also mention the fragmentation of agricultural land which rendered it impossible to establish market-oriented production farms, hindering the competitiveness of agricultural products at international level. Therefore, one of the most important effects of economic change on rural population was the increase in the rate of people working in agriculture from 28.6 % (1990) to 41.4 % (2000). Naturally, the consequences of recession consist of a decrease of the number of people employed in industry and services, but this situation should not have led necessarily to the increase of the population working in agriculture. The rise and high share of the active

Table 2
Results of migration towards rural areas by age groups, period 1997 to 2011

Age brackets	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	1997-2011
	In percent of total (%)															Average value
0-15	12.7	68.8	48.5	31.2	3.5	10.5	0.6	7.8	6.6	5.5	6.7	8.4	14.1	15.4	17.9	
15-19	12.9	12.5	11.4	7.6	16.8	8.8	8.1	4.7	5.0	-0.1	1.8	1.6	-0.1	-0.8	0.1	
20-24	-65.4	-34.3	-15.0	-4.0	-34.4	-3.5	-3.9	1.3	-3.1	-14.6	-3.6	-2.5	-8.5	-6.7	-5.4	
25-29	-76.3	-43.7	-25.1	-11.4	-70.0	-18.7	-16.9	-4.0	-8.7	-16.1	-2.7	0.7	-0.8	1.5	2.1	**3.7**
30-34	-1.0	-3.3	-1.4	2.0	-28.4	-3.6	-9.5	-1.1	-6.5	-7.3	0.2	6.1	6.8	7.0	8.7	
35-39	25.3	17.0	13.2	9.6	19.0	9.9	8.3	8.6	8.2	8.0	6.4	7.4	8.9	9.5	9.4	
40-44	33.1	25.7	21.2	17.9	52.3	22.8	22.5	14.4	14.9	15.1	9.8	9.7	12.5	12.8	12.0	
45-49	24.8	21.8	18.6	16.8	54.7	28.0	32.0	21.6	25.3	28.3	16.3	12.5	13.3	12.1	10.2	
50-54	15.3	14.3	13.1	13.1	45.0	23.7	30.0	21.3	26.9	33.6	21.9	18.9	20.6	17.8	14.6	**18.6**
55-59	12.5	10.6	7.6	7.6	22.0	11.4	15.3	12.3	15.9	24.7	19.1	17.1	16.8	16.3	15.3	
over 60	8.0	10.5	7.9	9.7	19.5	10.7	13.6	13.2	15.5	22.9	24.1	20.1	16.5	15.1	15.2	

Source: the author, based on data collected from the Romanian Statistical Yearbooks, 1997 to 2011, NSI, Bucharest

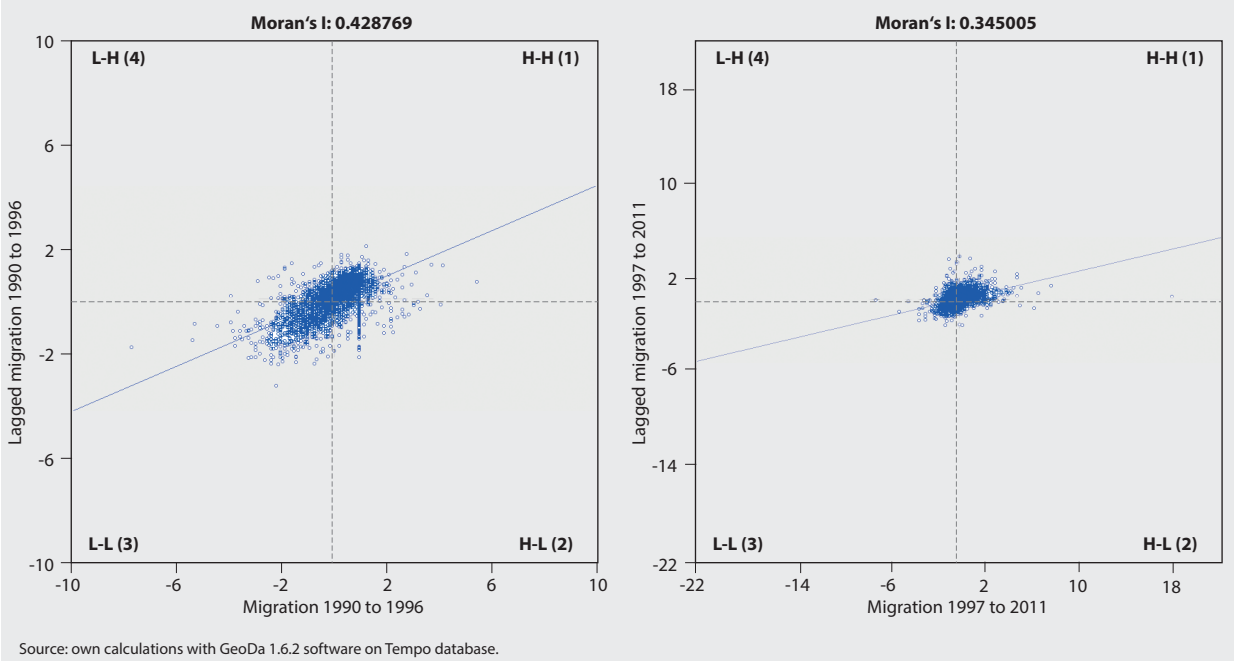
population working in agriculture are unique for a European country. One should mention that not all movements are related to a change from town to village. Massive lay-offs of rural-urban commuters working in urban industries who temporarily and involuntarily returned to agriculture may later return to towns to work in non-agricultural activities (Ronnas, 1996). But, as the analyses highlighted, the high share of older people returning to rural areas (usually from the Western part of the country to the less developed Eastern and Southern parts) parallel to the emigration of the young people to urban centres (and also to other foreign or European countries) will force demographic aging even more on the long term and will contribute to the reduction of rural population, leading to the disappearance of some rural communities and also to the deepening of the existing disparities (Kurkó, 2010).

After 1997, the increase of the migration balance in some rural settlements has constantly intensified until the point where it became a real trend. This process can be illustrated very well by the fact that due to a demographic aging and a negative migration balance affecting the majority of the rural population, the size of the rural population should have decreased. But population in rural areas has witnessed a slight increase over the last years as well, from 2000 until 2011, by 318,626 individuals. This relatively small number partly counterbalances the drop in population size resulting from negative natural increase, although it does not trigger the effect necessary to bring about spectacular changes in the evolution of the population. This entire evolution could be underlined by the value of the correlation coefficient ($r = 0.89$), meaning that the high share of the net migration rate in the 1990 to 1996 period is associated with the high value from 1997 to 2011 resulting from the remigration process. The most significant losses in population size during the last period can mainly be noticed in the case of some large cities where the effects of de-industrialization and implicitly mass lay-offs have urged certain population groups to move to rural areas. Here we could find two of the large urban centres with more than 300,000 inhabitants: Braşov (-23.7 %) and Galaţi (-10.9), while in the case of Constanţa (-15 %), Timişoara (-11.2 %), Iaşi (-8.9 %), Bucharest (-8.6 %) and Cluj-Napoca (-7.1) the decrease of their population and the increase of the inhabitants in their agglomeration clearly suggest a strong suburbanization process. The evolution of the net migration rate in rural settlements shows that Ilfov, Timiş, Cluj, Constanţa and Iaşi counties rank first among the winners of the transition period as their rural population has increased by more than 20,000 inhabitants during that time. The rest of the territories located outside of the polarizing urban areas underwent significant demographic losses determined either by negative natural increase, or by migration towards other regions or countries. Thus, from an initial population growth status, some cities entered a decrease process, while increase was noticed only in the case of some rural settlements.

3.2 Modelling migration with micro data

3.2.1 Application I. Analyzing the Spatial Autocorrelation of Internal Migration in Romania – The Moran Scatter Plot

The main question addressed in this section is whether the observed pattern of internal migration in Romania is similar to other spatial patterns or not. If there is a tendency, for example, that communes with low (high) migration rate tend to be surrounded by communes with low (high) migration



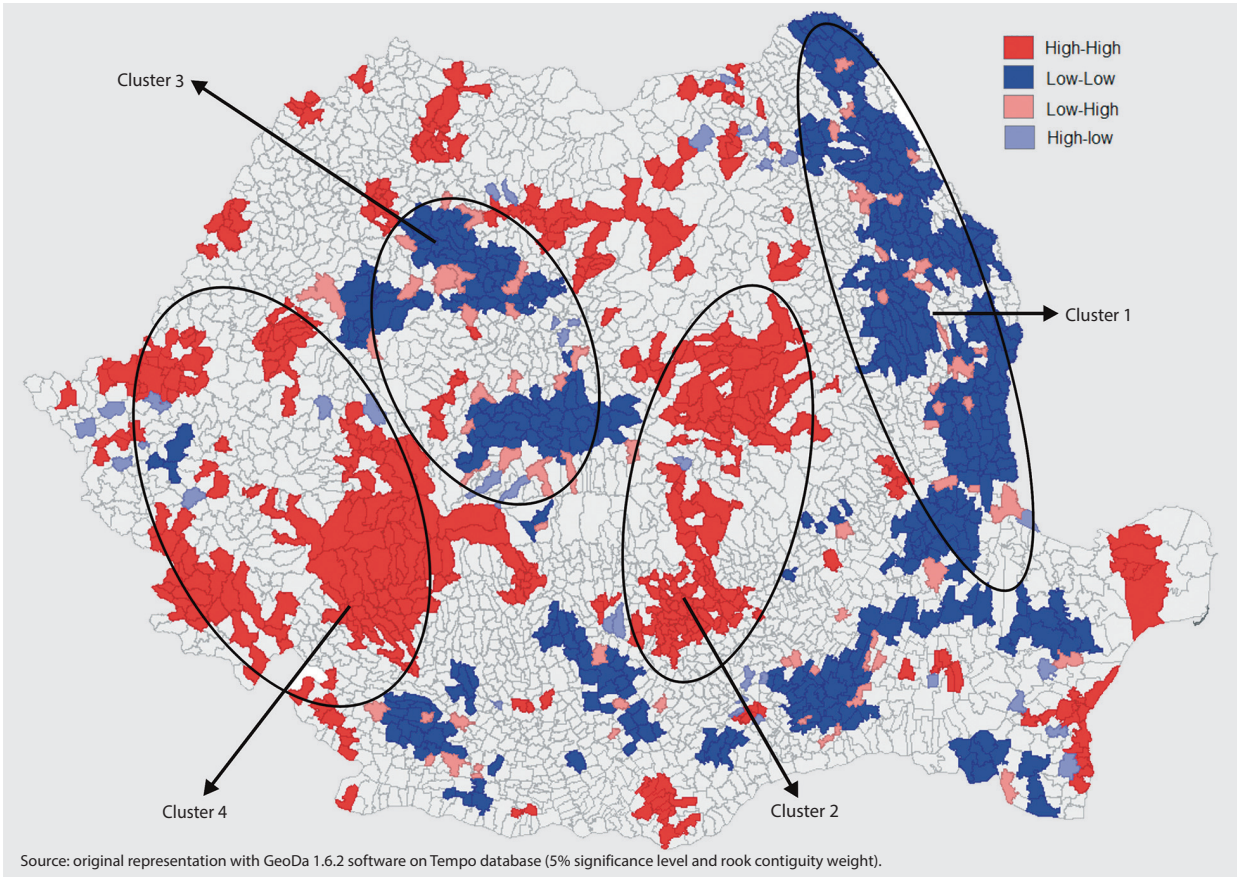
Source: own calculations with GeoDa 1.6.2 software on Tempo database.

Figure 3
Moran Scatter Plot for measuring the balance of internal migration (left 1990 to 1996, right 1997 to 2011)

rate, or vice-versa, this would indicate a positive spatial autocorrelation among the settlements. If, on the other hand, we find that communes with low (high) migration rate tend to be surrounded by communes with high (low) migration rate, we would then say there was negative spatial autocorrelation among settlements (Torres et al., 2011). In order to get a more comprehensive picture about the migration pattern in the database, we have included even the urban area (those 320 urban communes), as they have a significant role in shaping internal migration, although the main focus is still on the differentiation of the types of rural migration (i.e. welfare vs. constraint migration). The GeoDa software allows us to build a Moran Scatter plot with the calculation of Moran's I (Anselin, 1995). The graph represents the distribution of the statistical units of the analysis (Figure 3).

In this representation, the first and third quadrants represent areas with positive correlation (high-high, low-low) while the second and fourth quadrants are areas with negative correlation. In particular, if statistical units are distributed in the fourth quadrant, the relationship is of low-elevation and vice-versa, when they fall in the third quadrant (high-low) (Scardaccione et al., 2010). As Figure 3 shows, the value of Moran's I calculated for the net migration rate during the 1990 to 1996 period is equal to 0.42, while for the period 1997 to 2011 it is equal to 0.34. Since the value is higher than zero, it suggests a positive spatial autocorrelation for the analyzed variables. Thus, we could reject the null hypothesis as the *p* value is statistically significant ($p = 0.0001$ in both cases) and the z-core is positive (41.4 for the first- and 22.8 for the last period). These results suggest that the first hypothesis was clearly proven, stating that the spatial distribution of high values and/or low values in the dataset is spatially more clustered than it would be expected if underlying spatial processes were random.

One should mention that global Moran's I statistic does not exactly show us the communes characterized with a high (low) migration rate, but rather suggests that the spatial pattern of the analyzed index we observe is not random – there is more similarity by location than would be expected if the pattern was random (Torres et al., 2011). On the other hand, the Local Indicator of Spatial Association (LISA) allows us to consider local effects related to the phenomenon. In order to



Source: original representation with GeoDa 1.6.2 software on Tempo database (5% significance level and rook contiguity weight).

Figure 4
Cartogram of clusters representing the net migration rate, period 1990 to 1996

High-high represents a high migration rate both in the communes, as well as in their neighbourhood. Low-high represents those communes with low migration rate, but with a high value in the neighbourhood.
Low-low represents areas with low migration rate both in the commune, as well as in surrounding areas. High-low shows the communes with high migration rate, but with a low value in their neighbouring areas.

calculate LISA we used the same matrix weights we used to build the Moran scatter plot. In the significance filter, the value of *p* was determined as 0.05 and the software was using the permutation test in order to delimit the significant spatial units. Thus, the number of permutations was set at 999.

3.2.2 Application II. Analysis of the Local Indicators of Spatial Association in the case of Internal Migration in Romania – The Local Moran's I

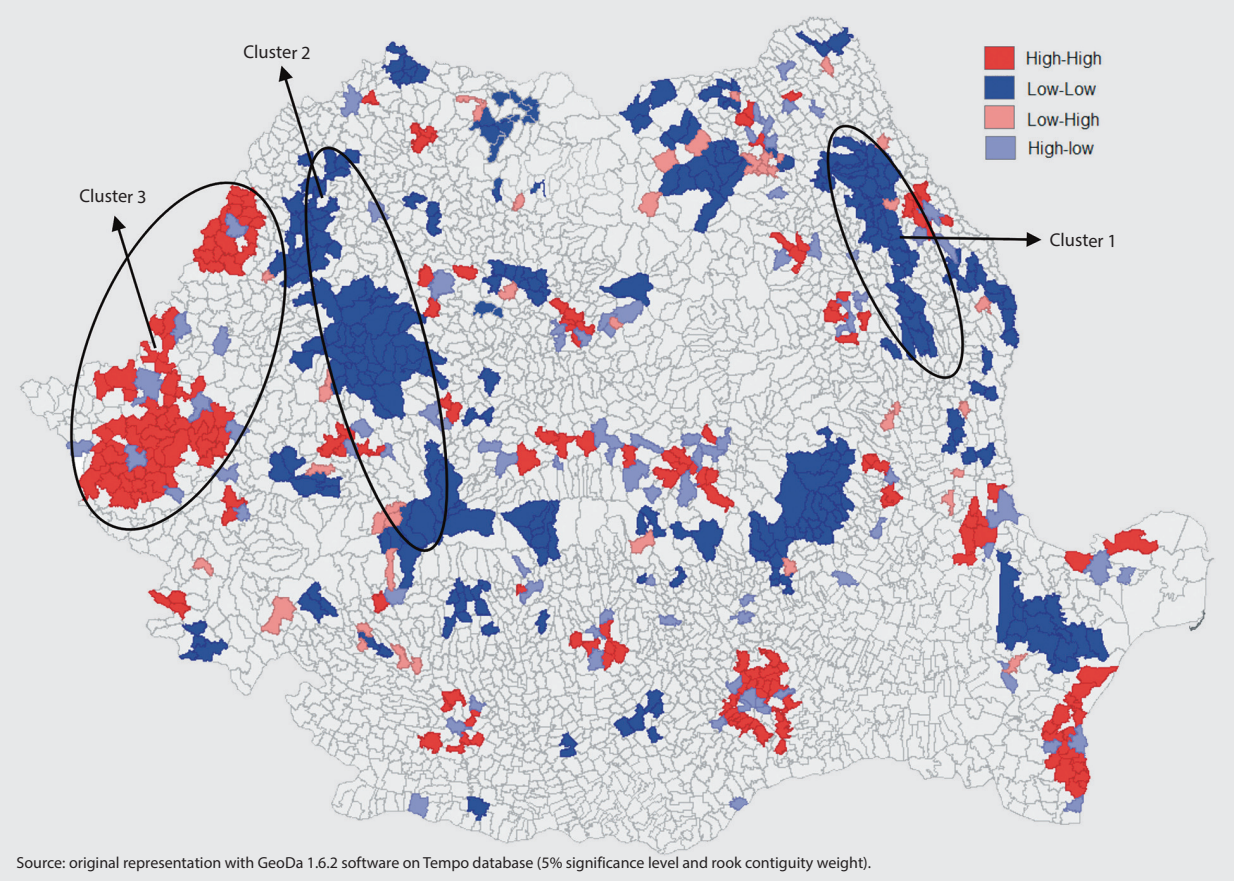
After determining the local Moran's I statistics for each of the communes, there is a possibility to classify them in homogenous groups, in clusters. During clusters identification, the most important decision criterion is to track down how it relates to the migration rate of a settlement in the neighbouring areas. The analysis was carried out for both the 1990 to 1996 period, when rural-urban migration was the dominant form of mobility, as well as for the 1997 to 2011 period, when the direction of migration has changed. After conducting the computations and the graphic representations of the results, we could identify 4 main clusters for the 1990 to 1996 periods. Cluster 1 and 3 are the net migration rate "cold-spots" and correspond to a positive but low-low spatial autocorrelation, indicating spatial clusters of communes with below-average migration rates. Clusters 2 and 4 are "hot-spots" and correspond to a positive, high-high spatial autocorrelation indicating spatial clusters of communes with above-average migration rates (Figure 4).

First of all, it can be concluded that the already mentioned East-West migration is very well represented. The communes belonging to the negative net migration rate can mainly be found in the Eastern parts of the country, especially Botoşani, Iaşi, Vaslui, Galaţi and Brăila counties (Cluster 1) which stood up as the most important sending counties and – in many cases – have formed the basis for long-distance rural-urban migration mainly in the socialist era and at the beginning of the 1990s. These people have usually migrated to the proximity counties, but as the 1992 census showed, sometimes even further, to the counties located in the Western and South-Western parts of Romania (Kurkó, 2010; see Figure 1). The only exceptions to the rule are the medium and large cities (marked with pink, which in the case of spatial autocorrelation analyses show the high outliers among low neighbours) where job opportunities, quality of life and the infrastructure were much more developed. In the Eastern parts, a positive net migration rate can only be found in Constanţa, which is mainly due to the advantageous geographical location and the favourable economic context (Constanţa hosts the largest commercial harbour of the country). The rises of exports during the communist period, the development of the port infrastructure, as well as the impressive investments have made the city a target for migrants. The second largest area characterized by a high out-migration rate (Cluster 3) is the Central-Western part of the country dominated by large mountainous area where the isolation of the population and the lack of infrastructural development contributed to an intense outflow of the young population.

Cluster 2, which indicates positive migration rates, characterizes territories where the extractive and heavy industries have at one time attracted thousands of workers from all over the country. The most eloquent example is Argeş county, which, during the communist period has benefited from a series of investments in innovative sectors (the automobile industry – "Dacia" at Piteşti, "Aro" at Câmpulung) and the small distance from the capital agglomeration economy, which also provided a wide range of job opportunities for migrants usually coming from rural areas (Benedek, 2004). The highest number of communes with a positive migration rate could be found in the Western parts of the country (Cluster 4), with Gorj county being the largest homogenous territory. Gorj has managed to develop a dynamic economy after 1945 due to the change of the economic profile (mining, energy sector), attracting a great number of workers even from a larger distance. If we consider the territorial dispersion of the results of spatial autocorrelation, 14 % of the communes belong to the group characterized by migration agglomeration (high-high groups), 14.6 % of the communes could be defined as peripheral areas from the migration point of view (low-low groups), 1.2 % are those where migration is high in the core area, but is low in the neighbouring areas. And finally, 2.2 % represent those suburban areas where the migration is low in the core area, but high in the neighbouring areas. In the case of 68.1 %, the results of spatial autocorrelation are not significant.

After 1997, when the direction of migration has changed, the territorial distribution of communes shows a totally different spatiality compared to the previous period. The number of communes characterized by a negative net migration rate from the Eastern part of the country has been significantly reduced as a consequence of the change in the direction of the internal migration, while the remigration process has not yet managed to counterbalance the rural-urban migration of the last decades. In this case we could identify three main clusters, but these could also be hiding some smaller clusters: the first two correspond to positive, but low-low spatial autocorrelation, while the third cluster illustrates the high-high spatial autocorrelation (Figure 5).

In Cluster 1 we could identify communes with a high negative migration rate from the Eastern part of the country. However, the number of communes belonging to this group has constantly decreased in comparison to the previous period. Similarly, a significant negative net migration rate could be observed in the North-Western part (Cluster 2) which coincides with large areas of the Apuseni Mountains characterized by an advanced demographic aging of the population, low birth rates and low level of development. What is particular interesting is that the suburbanisation process is very well outlined around large urban centres. Cluster 3 shows that the largest coherent territories belonging to this group could be found in the Western part of the country, namely around Timisoara, Arad and Oradea cities. This could also be proven statistically as the population of the settlements surrounded by the above-mentioned cities has increased on average by 10 to 20 % (Kurkó, 2010). The suburbanisation process has also had a great intensity in Romania's largest



Source: original representation with GeoDa 1.6.2 software on Tempo database (5% significance level and rook contiguity weight).

Figure 5
Cartogram of clusters representing the net migration rate, period 1997 to 2011

High-high represents a high migration rate both in the communes, as well as in their neighbourhood. Low-high represents those communes with low migration rate, but with a high value in their neighbourhood.
Low-low represents areas with low migration rate both in the commune, as well as in surrounding areas. High-low shows the communes with high migration rate, but with a low value in their neighbouring areas.

urban agglomeration, Bucharest (the population from the nearest rural areas has increased by 15 to 17 %). Along with the decline of its industrial function, the commuting level in Bucharest has been reduced, although new functions have gained ground, like the residential and commercial functions: for example new shopping centres have emerged in the nearby settlements, as well as new commercial units and residential parks (Benedek, 2006). In the Eastern parts also, the localities surrounding Iaşi, Galaţi and Constanţa cities underwent a slight increase, followed by Piteşti and Craiova cities, while in the centre, Cluj-Napoca and Târgu-Mureş cities belong to this group. As mentioned earlier, with the exception of Galaţi city where the de-industrialization process has contributed to the increase of the population in the nearest settlements, in the rest of the group the high increase of the rural population in areas surrounding large cities could be attributed to the suburbanisation process[5]. Figure 5 shows that these "little" clusters are the "hot-spots" of rural migration flows and correspond to a positive high-high spatial autocorrelation, indicating spatial clusters of settlements with above-average migration rates. Overall, the territorial dispersion of the results of spatial autocorrelation show that 6.4 % of the communes belong to the group characterized by a positive net migration rate (high-high groups), 10.5 % are characterized by a negative net migration rate (low-low groups), 2.9 % are those where the migration is high in the core area, but in the neighbouring areas it is low and 1.1 % are settlements with low migration rate surrounded by areas with a high migration rate. The results of spatial autocorrelation are not significant for 79 % of the settlements.

This finding allows to assume that the second and third hypotheses have also been proven: ESDA techniques have demonstrated that the neighbourhood effects of net migration rates in the case of Romanian communes have outlined both the "hot-spots" and "cold-spots" clusters very well. At the same time, we have found a strong differentiation in the spatial patterns of migration during the 1990 to 1996 and 1997 to 2011 periods.

[5] The most eloquent example for suburbanization process is Floreşti commune located near Cluj-Napoca city, as its population increased from only 5,868 in 1990 to 17,195 in 2011.

4 Conclusions

Over the last decade, a major concern has been centred on the phenomenon of international migration, both from the ethnic, as well as the demographic point of view, although very few studies have shown interest in the dynamics of internal migration, despite its obvious and serious consequences. The change of direction in the case of internal migration has lead to a polarization of the country's territory, emphasizing two types of areas. The first is represented by those with a much more diversified economy, a more developed territorial infrastructure, as well as a more favourable geographic position, being located around large and medium-sized cities, capable of attracting highly skilled workforce. The second type includes mainly peripheral areas (both rural and urban mono-industrial areas), which have entered a slow decline without any sign of revival (Suditu et al., 2013).

The research conducted in this paper was based on the application of spatial autocorrelation techniques for measuring the spatial differentiation of migration, focusing on the settlements of Romania. In particular, we have applied both the Global Moran's I statistics, as well as the LISA algorithms. Running the LISA method on net migration rates, we were able to identify some homogenous groups, some well defined clusters according to the spatial distribution of migration. Specifically, we have managed to point out some of the major features and migration trends between 1990 to 1996 and 1997 to 2011. During the first period, the East-West migration stands out underlying the fact that the Western and partially the central regions were the most active in terms of migration. The analysis of the net migration rate easily reveals that these regions are characterized by a positive spatial autocorrelation. In this sense, the most passive regions are located in the Eastern and South-Eastern parts (Moldova and partially Muntenia region). A different trend could be observed after 1997, when the direction of internal migration has significantly changed: the mass out-migration has slowed down in the Eastern part. This process has been replaced by the remigration (in the case of constrained migration) and suburbanisation processes (in the case of welfare migration). The latter could be observed very well around the large urban centres. Considering the outcomes of the analysis, it seems that the methods applied here were quite accurate in highlighting some of the characteristics of the migration phenomenon that could only be hypothesized by means of other, more traditional methods.

Looking more deeply into the local patterns of the spatial distribution of migration, we discovered that negative migration rate in one settlement is very much influenced by the negative migration rate in the neighbouring settlements. This is mainly due to the advanced state of demographic aging of the population and the low natural increase. The lack of companies and employment opportunities, as well as the low income in the agricultural sector make these territories much less attractive. It is therefore more and more difficult to get out of this vicious circle. The issue arises even more in counties where negative migration rate is accompanied by a negative natural growth. In these cases the negative spill-over effects resulting from increased out-migration flows, as it is highly important to identify strength points and the opportunities which might bring about further development should also be considered like the development of territorial infrastructure, identification of existing tourism objectives and development of a highly attractive business environment for direct foreign investments and for the best operation of the foreign capital. Thus the promotion of rural development based on the existing natural resources could represent one of the most important opportunities, as it has already been successfully proven in some cases.

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