



# **Changing disparities of unemployment in Hungary – Assessment of 25 years after the regime change**

**Máté Farkas**

(Hungarian Central Statistical Office – Budapest, Hungary)

**László Czaller**

(HÉTFA Research Institute – Budapest, Hungary)

Paper prepared for the 35th IARIW General Conference

Copenhagen, Denmark, August 20–25, 2018

Session 7C-2: Short Paper Session

Time: Friday, August 24, 2018 [Afternoon]

# Changing disparities of unemployment in Hungary – Assessment of 25 years after the regime change

Máté Farkas\* & László Czaller†

## Abstract

In Hungary the basic socio-economic changes launched by the political transition of 1989 have been almost completed by the end of the 1990s, i.e. the institutions of political democracy and market economy have been established and a new regional spatial structure has emerged. While the effects of these processes are widely discussed in the literature, the effects of transition on labour market and income inequalities from a spatial econometric viewpoint are mostly omitted. In our paper we aim to analyse how stable was the spatial pattern of the labour market (unemployment) with different spatial econometric methods (mobility matrices, Markov-chains). There is no doubt that the transition from state socialism to free market economy had serious impact on the activities of labour market and highly transformed the previous spatial pattern of the economy and society. Unemployment as a new socio-economic phenomenon had started to rise promptly soon after 1990 and affected more heavily the former industrial areas of the country. In our paper the main objective is to review the main changes, both inequalities and changes in spatial distribution that have occurred during the last two and a half decades in the unemployment situation of Hungary. Firstly, we will be focusing on the disparities and inequalities at micro-regional level, then we will be analysing the stability of spatial pattern of the labour market (measured by the unemployment rate). We pay special attention on the role of space and location and how geographical position affects the spatial distribution of job seekers. With the newest available data, we reflect some effects of the crisis and the public works programme.

---

\* Hungarian Central Statistical Office – Budapest, Hungary

† HÉTFA Research Institute – Budapest, Hungary

## Introduction

Although labour markets are usually analysed on the national level, in the past two decades within-country disparities of unemployment have attracted considerable attention among policymakers and academics worldwide (see *Overman & Puga* 2002; *OECD* 2005). The main cause of this growing interest could be linked to the persistency and significance of regional disparities which were believed to have adverse effects on aggregate economic performance. Another important aspect of the recently increasing number of inquiries could be linked to the global economic crisis and its effects not solely on spatial inequalities but also on national employment policies. In the case of Hungary, the transformation process from state socialism to a liberal market economy also shed light on the inner problems of socialism's inherited ideological goals (e.g. full-employment, unneeded and low-skilled labour force). The main aim of our paper is to analyse the changes that have occurred during the last 25 years in the spatial structure of unemployment focusing mostly on the catching-up and divestment processes of micro-regions. Behind these we pay special attention on the role of spatiality and geographical position by testing the spatial autocorrelation in our analysis. The data that were used come from several sources. For the year 1990 we used the unemployment data of the Census, that were aggregated to micro-regional level. From 1993 onwards, we rely on the database of Public Employment Office which has been providing detailed spatial data on the number of registered jobseekers/unemployed since the mentioned year<sup>1</sup>. Data is aggregated and updated according to the LAU-1 classification of 2015 consisting 174 micro-regions in Hungary.

The study is organized as follows. First, we make a short review of the evolution of unemployment in Hungary after the regime change by paying attention to the different periods that followed the transition and by putting our article into a historical perspective. Then we briefly analyse the structural characteristics of unemployment through detailed educational data. In the third section with the adaptation of a Markov chain model) we aim to reflect the transition probability of Hungarian micro-regions in their unemployment status in order to test how stable has been the spatial structure of jobseekers. Last section concludes our main results.

## Unemployment situation after the regime change

During the long decades of state socialism one of the main objective had been to implement the total employment, i.e. the elimination of unemployment in the Hungarian economy. In fact, massive unemployment ceased to exist soon after the communist take-over: according to *Bánfalvy* (1989) the number of jobless people was over 400 000 in the summer of 1948, while the 1949

---

1 Up to 2016 unemployment data were collected by the Ministry for National Economy that were renamed in 2018 into Ministry of Finance.

Census also registered a number of 126 000 unemployed people in Hungary.<sup>2</sup> Although ideological considerations of the socialist system tried to conceal unemployment (as we know it today), the seeds of the problem started to appear already in the second half of the eighties. During this period, it became apparent that the state must find a legal and financial solution to the problem of those citizens who had previously lost their jobs for reasons which may not be ascribed to them, but to their employers. The first instruments set out to remedy the problem were purported to sustain ongoing employment and to temporarily pay social welfare benefits to those who did not have a job and were looking for work. These can be considered as the first instruments of the Hungarian employment policy, whose introduction undermined the rationality of the ideologically declared aim of full employment. According to *Ferge* (1988), the unemployment rate was about 1–3 percent in the middle of the eighties, however this approximation does not include the mass of those who had jobs, but whose employment was unnecessary and undue. Other authors claim about a national unemployment average of 70–80 000 people in the mid-1980s (see *Fóti & Illés* 1992), while some estimates assume that only 0.1% of the active population was jobless through the 1980s (e.g. *Timár* 1991). From the beginning of the seventies larger firm size and more employment meant proportionally more operational aid and also more beneficial taxation conditions which incited employers to hire more workers than reasonable (see *Kornai* 1993). Although this practice was in line with the Marxist ideological premises of right-to-work and full employment, it worsened productivity and caused the phenomenon commonly referred to as “unemployment behind the gates” which concerned about 15–20 percent of the workforce in Hungary at the end of the eighties (*Meusburger* 2001).

Structural problems arising from the system-specific regulations of the socialist labor market revealed themselves most conspicuously after the regime change in 1990. Many state-owned enterprises, especially the less productive and competitive ones collapsed under the pressures of the new market economy environment. The situation was exacerbated even further by the disintegration of COMECON (Council for Mutual Economic Assistance) in 1991, which curtailed the agricultural sector from its stabile markets. These processes led to mass layoffs of which the first victims were day-laborers and those unskilled workers who had been unnecessarily employed during the previous decade. As Figure 1 below shows, due to the mass layoffs, the number of registered unemployed reached 100 000 persons with an unemployment rate of 1.9% in the 4th quarter of 1990. Paraphrasing *Dövényi* (2001: 208) this period from early 1989 until the end of 1990 is usually called the ‘latent unemployment’ phase with a slow rise in the number of unemployed people. The

---

2 Since the unemployed were not officially registered during the socialist era, only a few approximations on the number of unemployed are available. The 1949 Census was the last one to collect data on unemployment, but the results had not been published until the late sixties, when they were labelled as obsolete.

next two-and-a-half-year period was a critical one in the history of Hungarian unemployment often called as the ‘running unemployment’ phase, when the number of registered unemployed rose to more than 600 000, i.e. the rate increased from 2% to around 10% by the end of 1993.<sup>3</sup>

Following its peak in 1993, the number of unemployed people started to decrease right until the millennium (‘decreasing and stagnating unemployment’ phase) reaching its minimum point in 2001, when the number of jobseekers was around 343.000 which meant a 5.3% unemployment rate nationally. From that time onwards – and especially soon after the crisis – the number of unemployed have been increasing again, culminating in 2009 (unemployment rate: 9.4%, cca. 600.000 unemployed). Since 2012, partly due to the public works programs the number of registered jobseekers has fallen under 6%. However, the effects of public works policies are rather contradictory: as *Cseres-Gergely and Molnár* (2015) concluded, from those 517 000 people who had been involved in public works program (PWP hereinafter) in 2011–12, 180 days after its ending 50 percent of them became unemployed again, 34 percent was involved in another PWP, while only 13.3 percent could start to work in the labor market (see further *Fazekas & Varga* 2015).

Obviously over the last decade before the millennium there have been changes in the social composition of those seeking work as well. How the position of the different social groups has been changed over time can be seen in Figure 2, expressed by the development of the educational level within the registered unemployed. Employment growth occurring in the second period of

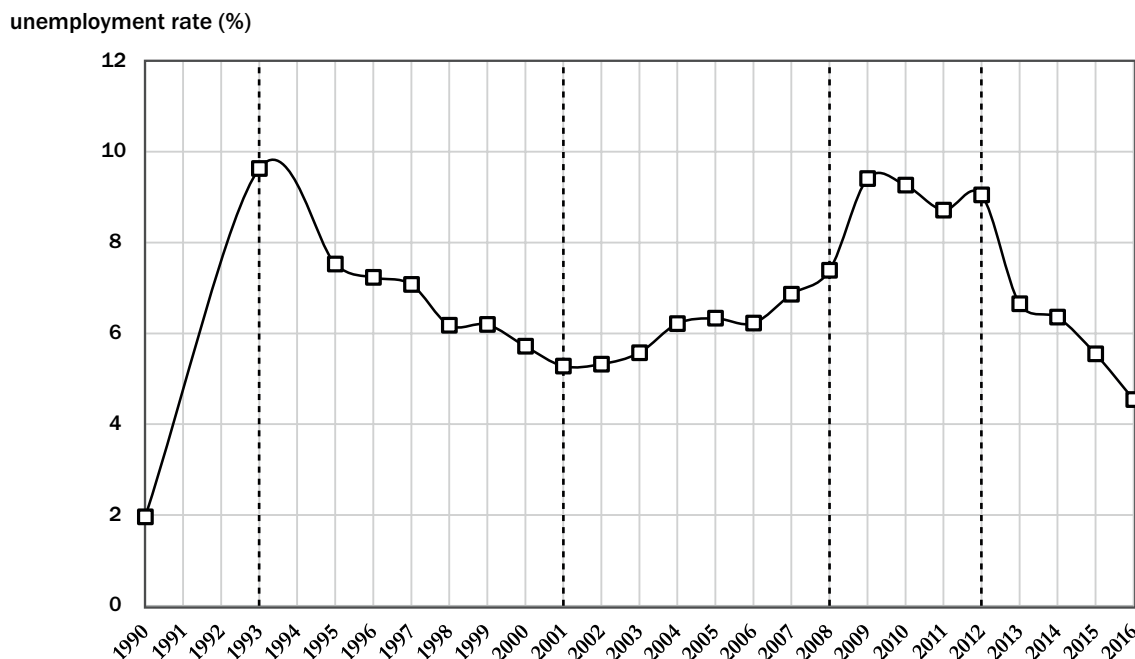


Figure 1. The development of unemployment rate in Hungary (1993–2016)

3 Our results might differ from other data sources as the unemployment rate in our study refers to the percentage share of the unemployed in the labor force aged 15–59, while other researchers used the age class 15–64.

transition did not affect all educational groups equally. Price liberalization and the restructuring of international trade have changed the structure of demand for products and services, shifting production largely toward skill-intensive industries as a result (see *Commander & Köllö* 2008). The inter-sectoral reallocation of employment was mostly triggered by the inward flow of FDI which indeed played a significant role in the emergence and development of high-tech industries and the technological improvement of the Hungarian economy (*Kézdi* 2002).

During the first half of the nineties the main losers of the transition were those with the lowest education. Jobseekers with less than or maximum 8 classes of primary school, and those with vocational and technical school had been most affected, 70% of unemployed were given by these skill groups. On the other hand, the percentage share of higher educated remained quite low albeit showing an increasing trend over the past decades as the enrollment rates in the upper secondary education started to increase during the nineties and the expansion of tertiary education made the supply of college-educated workers more elastic. Educational attainment however could be perceived as a stable structural constituent of unemployment which is also reflected in the micro-regional variations of unemployment rate. *Czaller and Lőcsei* (2015) found that between the share of college-educated population (1990) and the unemployment rate (1993) the estimated slope coefficient was significant and negative (-0.762), suggesting that the stock of higher educated individuals had noticeable impact on the regional unemployment in the latter stages of the transition. *Ábrahám and Kertesi* (1998) drew similar conclusion from their inter-temporal analysis of regional unemployment and its determinants. They found that during the entire transitional period the regional

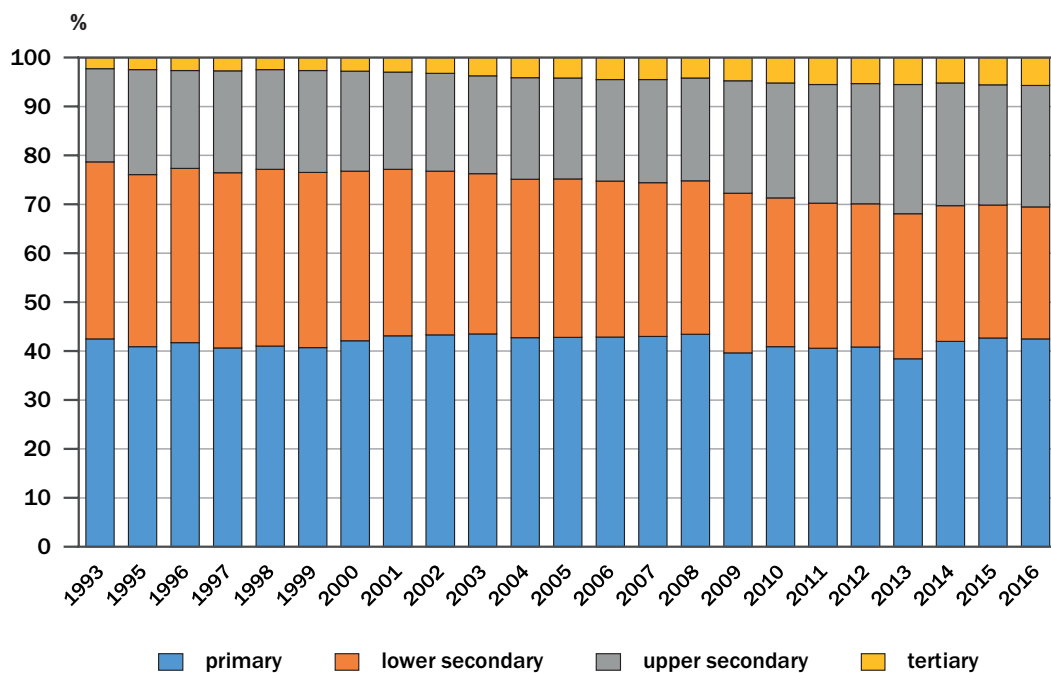


Figure 2. Distribution of the unemployed by educational level (1993–2016)

variations of two factors, namely the Romani population (the largest ethnic minority in Hungary) and human capital endowments measured as the average years of schooling had the largest impact on the regional unemployment differentials. With the progression of the transitional process, however, only human capital was proved to be a permanently important explanatory factor, the share of Romani population reduced in significance. The reason is probably that regions with higher levels of human capital attracted FDI during the second period of transition. Questionnaire-based surveys inquiring the motivations behind the location decisions of foreign firms confirmed the importance of the educational level of the regional workforce. Moreover, quantitative studies showed that the inflow of FDI tend to follow the spatial patterns of human capital (*Fazekas 2005; Jurajda & Terrell 2009*). This was particularly true for high-tech industries where applied technologies require an increasingly larger spectrum of skills and up-to-date knowledge.

In our further analysis however, we do not pay special attention on educational inequalities and their changes over time. Our main focus on the one hand is on the changes of micro-regional inequalities of jobseekers and the stability of spatial unemployment distribution from the regime change onwards on the other.

### **The development of spatial inequalities of unemployment**

In this section the spatial inequalities and distribution of unemployment will be analyzed in a nearly 25-year time period with different methods. Firstly, we use simple inequality indices to measure the size of inequalities since the early nineties. Secondly, we examine the development of unemployment by focusing on its distribution (both vertical and horizontal) using kernel-density estimations and paying special attention to extremities (e.g. unemployment-deciles).

In the analysis of labor market inequalities, it's a widely accepted method in the literature when regional unemployment rates are compared to national averages (see *Glave 1987; Martin 1997; Pehkonen & Tervo 1998*), considering either the difference or the ratio of the two indicators to each other, and then predicting the evolution of disparities over time. However, the index of relative dispersion can be considered as a more complex inequality indicator, which correlates the unemployment rates observed in each micro-region to a hypothetical situation where unemployment throughout the whole country is homogenously equivalent to the national unemployment rate. The mathematical derivation of the index is quite simple (cf. *Martin 1997: 240*).

Define  $u_n$  and  $u_r$  as the ratio between unemployed persons ( $U_n, U_r$ ) and economically active-aged population ( $L_n, L_r$ ) in each  $r$  region of a given  $n$  country, hereby in the micro-regions of Hungary:

$$u_n = \frac{U_n}{L_n} \quad \text{and} \quad u_r = \frac{U_r}{L_r} \quad (1)$$

If the value of  $u_r$  is equal in each region, than the national value is also equal with  $u_r$ , therefore  $u_r = u_n$ . In this case the equation could be  $U_r / U_n = L_r / L_n$ . Any other cases however the formula will be the following:

$$\frac{U_r}{U_n} = \left( \frac{u_r}{u_n} \right) \left( \frac{L_r}{L_n} \right) \quad (2)$$

An important aspect of the relative dispersion (RD) is that it points out the differences between the hypothetic total geographical equality and the ‘real situation’, and then it sums their absolute values:

$$RD = \sum_{r=1}^n \left| \left( \frac{U_r}{U_n} \right) - \left( \frac{L_r}{L_n} \right) \right| \quad (3)$$

After putting equation (2) into (3) and doing some minor substitutes the formula of relative dispersion is the following:

$$RD = \left( \frac{1}{u_n} \right) \sum_{r=1}^n \left| \left( \frac{L_r}{L_n} \right) \left( \frac{u_r}{u_n} \right) \right| \quad (4)$$

The index above is very similar to the Hoover-index, as the indicator shows as a proportion of the national unemployment rate how many unemployed should find a job in disadvantageous areas and how many people should lose their jobs in developed areas so that the spatial differences in unemployment would be completely disappeared (see *Dixon, Shepherd & Thomson* 2001; *Dixon & Mahmood* 2007).

The development of inequalities expressed by relative dispersion is shown in Figure 3. What is most obvious from the graph is that the development of inequalities over time is negatively correlated with the size of unemployment<sup>4</sup>. (For better comparison, unemployment rates are also shown in the figure again.) In the era of transformation crisis, up to 1993 when unemployment was rising constantly the disparities were in a reducing phase which could be explained by the decreasing role of short-term differentiating factors and by the strengthening of long-term equalizing effects (*Ábrahám & Kertesi* 1998; *Fazekas* 1997). In the second half of the 1990s the consolidation of unemployment were in parallel with the increase of inequalities, but soon after the millennium this trend has reversed and until the crisis (2008/2009) remained significant. The global economic

---

<sup>4</sup> The Pearson correlation calculated between the two time series were  $-0.917$ .



crisis caused a sharp change in the direction of these trends: as a result the number of unemployed grew rapidly while the micro-regional inequalities fell constantly. This happened due to the fact that economies of the western, export-oriented regions were more affected by external shocks unlike the eastern regions and the tourist centers in the Balaton region where the economic drop had lesser extent and occurred with some latency (Lőcsei 2010).

With the aim of providing further insights into the regional pattern of unemployment rates in Hungary, we estimated the density function associated with the distribution of unemployment in 1993, 2001, 2009 and 2016, ie. the starting and final year of our time series and two intervening years where the development of unemployment showed significant changes. This function proxies the shape of distribution and actually gives more information than the single measures of position and dispersion. The density function is estimated non-parametrically by the kernel method where the selection of bandwidth parameter is of crucial importance as it controls the smoothness of the density estimate; the larger the bandwidth, the smoother the estimate. Although various methods have already been suggested in the literature, now we use the data-based automatic bandwidth suggested by *Silverman* (1986).

Figure 4 plots the estimated densities for the four years mentioned above. As already illustrated by the relative dispersion the figure would seem to show that the shape of the distribution underwent important changes in the last quarter century. As for the first year (1993), the distribution's shape is close to normal, with most of the micro-regions clustering around the average unemployment levels, and the peak of the distribution is also the highest at this time-period. The distribution is right-skewed (with a skewness of 0.547) meaning that however the curve itself might appear to be skewed to the left, the majority of the micro-regions (115 from 175) had an unemployment rate higher than the average. The 'almost-normal' distribution is de-

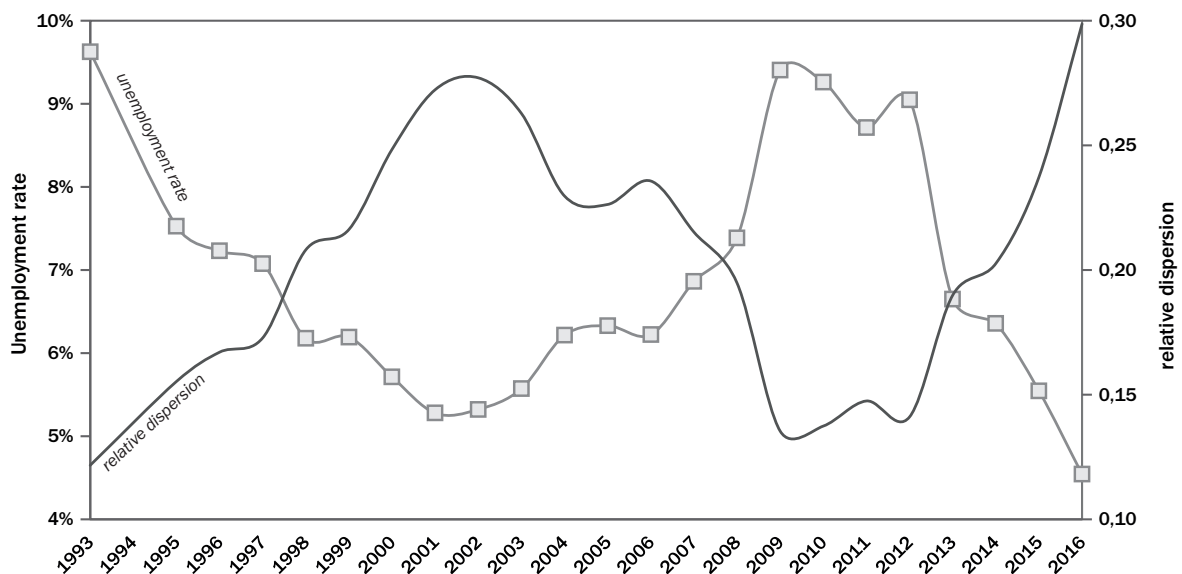


Figure 3. The evolution of relative dispersion of unemployment rate (1993–2016)

Figure 4. Kernel density estimations for the distribution of unemployment rate



monstrated by the kurtosis of the curve as well, which is very close to zero that would mean normal distribution ( $-0.088$ ). How the unemployment was distributed in space and across micro-regions is shown on Figure 5a, where we categorized all maps based on previously fixed categories in the ratio of national unemployment rates: below 50%, 50–75%, 75–90%, 90–110%, 110–125%, 125–200% and above 200%. As the map shows, the number of micro-regions with extreme values is relatively low, but a clear East-West dualism in the country can be observed: those micro-regions located in the eastern part of the country usually had higher-than-average unemployment rates which was particularly critical (and remained so) in the areas along the North-Eastern border (Cserehát-area). In those areas it was not only the high rate of jobseekers that caused problems, but also the unfavorable structure of employment (high rate of low-skilled and long-term unemployed people). In areas burdened by social and often ethnic tensions (with Romani population) and with low entrepreneurial activity, labor demand is very low due to the absence of large enterprises. Additionally, these areas are far from major cities that could possibly offer job opportunities.

By 2001 the height of the peak shrank noticeably and the two tails of the curve moved to more extreme values especially in its right end. This fact is in parallel with the above mentioned trends: in 2001 the size of inequalities were amongst the highest since the early nineties while the unemployment rate was around 5.3% at the turn of the millennium. Another important observation is that

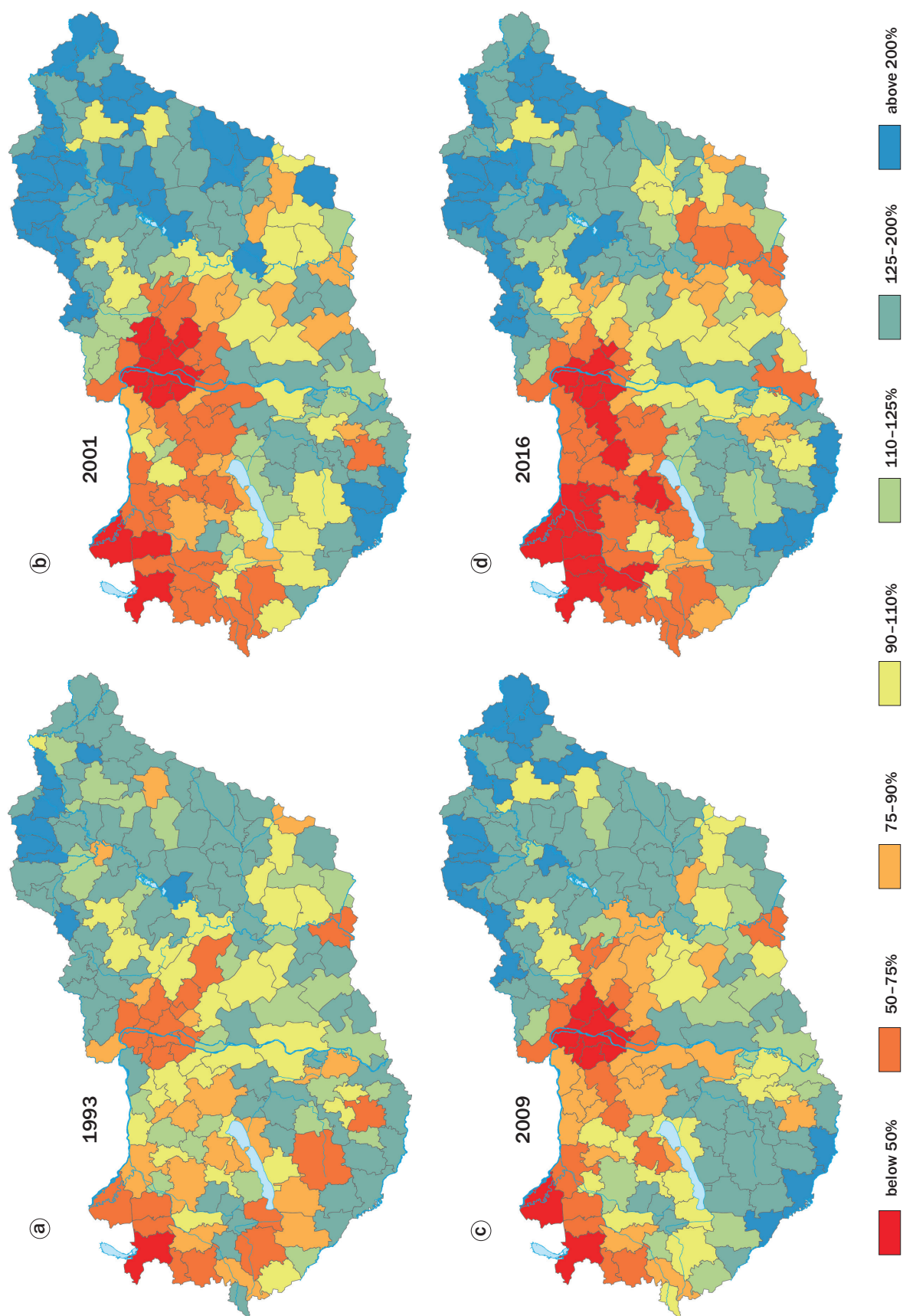


Figure 5. Spatial distribution of unemployment rate across the Hungarian micro-regions

the local characteristics of the distribution function has changed: from a clearly one mode type it turned to a slight two mode distribution. After the recovery of formerly heavy industrial areas in Western Transdanubia the unemployment decreased considerably in these areas (see Fig. 5b), and by the millennium a cohesive zone formed both around Budapest and in the northwestern parts of the country with high economic activity, relatively high income and low unemployment. On the other hand the situation of Northeastern Hungary has worsened (marked by the upper tail of the kernel density curve) with the emergence of an inner periphery in the Közép-Tisza area and another one in Southern Transdanubia (Ormánság). These regions such as those in Northeastern Hungary have been traditionally backward small village areas with disadvantageous demographic and economic situation.

In 2009, right after the outbreak of the crisis the changes in unemployment showed a clear regional image, and affected mostly the northwestern part of the country. In centers of manufacturing industry in Komárom-Esztergom, Győr-Moson-Sopron and Vas counties as a result of the large companies' holding back production and substantial layoffs, there were 1,5–2 times more jobseekers registered in employment centers of the area than a year before. Comparing Figure 5c and 5b, it can be seen that in the western country part a 'downward equalization' occurred as many micro-regions fell back to higher unemployment categories while in Eastern Hungary the recession did not cause too great shock on the labor market, however regions located east of the hypothetical 'BB-line' (an imaginary line between Balassagyarmat and Békés-csaba) were still in the worst labor force situation. The kernel density function became narrower at both tails with a positive skewness of 0.365, and the two-mode distribution were also significant in 2009.

In the last year of our investigation the form of the curve became very similar to the curve of the year 2001, proving again the existence of relatively high labor market inequalities. The upper tail of the distribution retracted, and also the left end moved to lower unemployment values. Spatial distribution (see Fig. 5d) has become 'less mosaic' again particularly in Western Transdanubia: with the exception of the inner peripheries of Kemeneshát area, north to the Balaton lake a cohesive zone has been formed with high economic activity and low unemployment values. The 'quasi-positive' effects of PWP are also demonstrated when looking into the map: PWPs are basically programs of the eastern part of the country and not evenly distributed across space and have been allocated mostly to small village areas. It is clear, that the most critical parts of Hungary are still located in the northeastern part, however in the Southern Great Plain area (Bács-Kiskun and Csongrád counties) many micro-regions have improved their situation in the last few years (for further analysis of the effects of PWPs see *Czirfusz* 2015).

The development of inequalities could also be studied by taking a closer look into unemployment deciles over time. In Figure 6 the unemployment rates of the first and tenth decile, and

the median rate was compared from 1993 to 2016. The paths and trends were quite similar by the mid-nineties, but from that time period the ‘gap’ between the lowest and the highest group started to widen. Whilst the average unemployment rate of the 10th decile was growing until 2010, it was stagnating in the 1st decile, so differences between those unemployment groups increased. Important findings can also be observed taking into account the relative positions of the different unemployment deciles; if we compare the unemployment rates of different groups (10., 9., 8., 7., 4., 3., 2., 1. decile) with the median rate (i.e. 50th percentile) we could easily gather information on the relative differences. This measure, due to its definition is independent from the absolute values of unemployment rates. As it can be seen on Figure 7 in the early nineties relative differences were not as high as around the millennium, in 2002 the average unemployment in the ‘worst’ (10th) decile was almost 3 times higher than the median rate and after a small decrease up to 2010, relative differences have started to grow again. On the other hand, those groups with lower unemployment were stagnating for almost the whole period compared to the median.

To sum up this section we can say that the short history of unemployment and labor market opportunities of jobseekers could be divided into different stages. Earlier works on the unemployment situation of the transition (*Ábrahám & Kertesi* 1998; *Dövényi* 2001; *Meusburger* 2001) usually used quarterly data in order to analyze labor market processes, but the time period of their investigation was shorter. In our case we relied on annual data which although hides the differences within given years, their use seems more reasonable for a relatively long time series. Right after the transition it was general in the whole country that the number of jobseekers raised dramatically month by

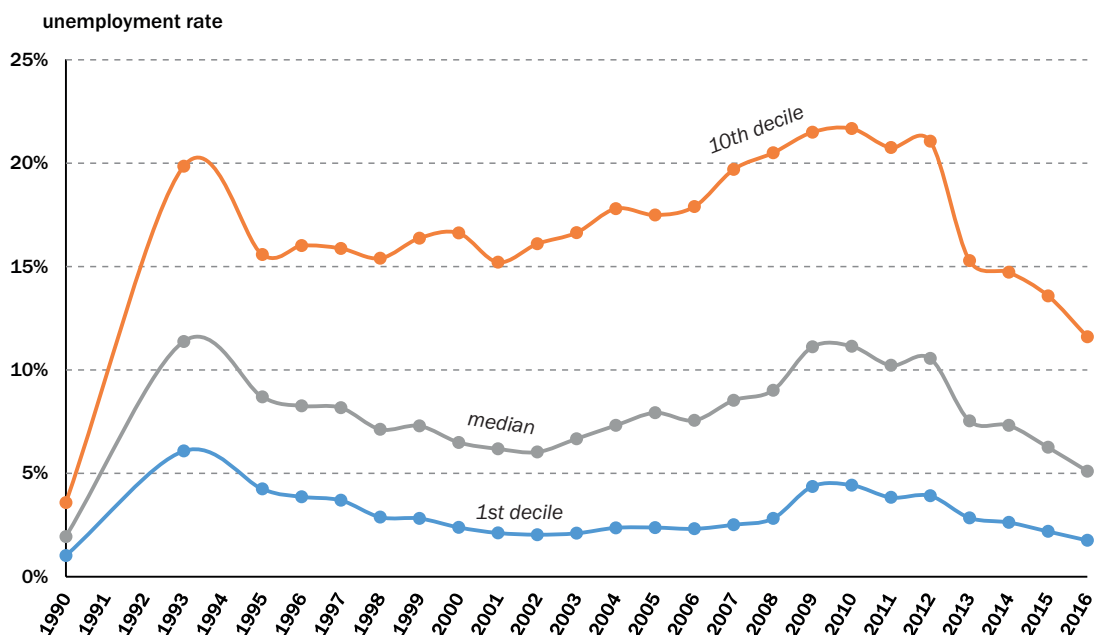
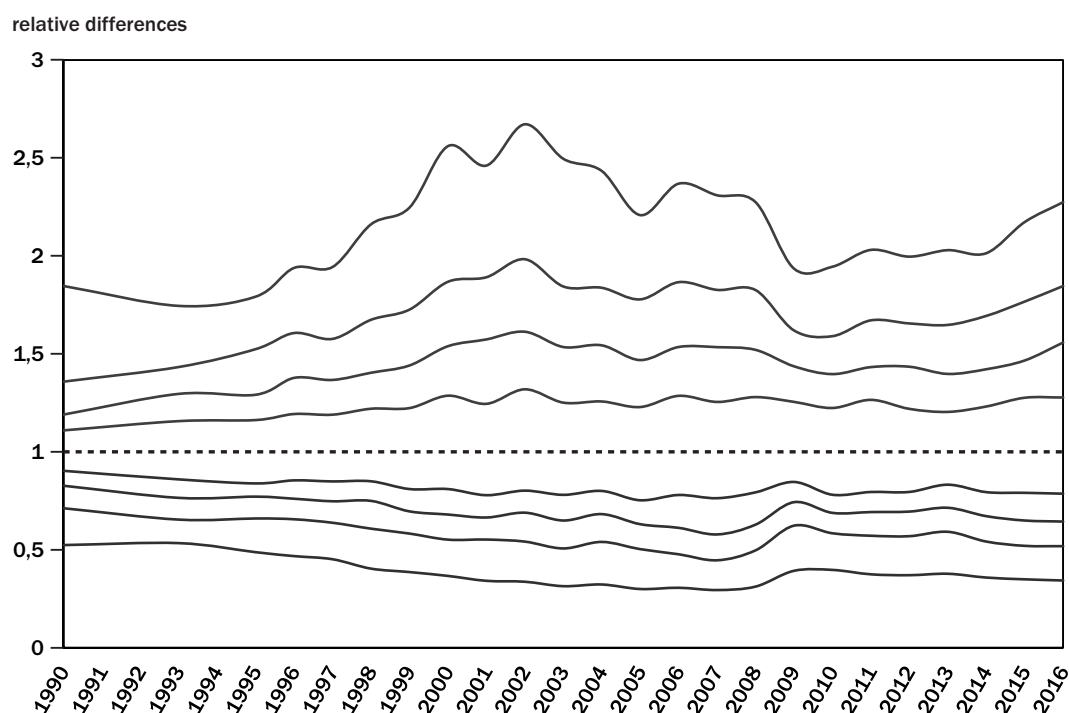


Figure 6. The evolution of unemployment rate in different unemployment categories

Figure 7. Relative differences of the unemployment rates  
(from the top to the bottom: rates of the 10th, 9th, 8th, 7th, 4th, 3rd, 2nd and 1st decile  
divided by the median unemployment rate; median rate = 1)



month which reached its maximum in 1993. In the second half of the decade the fast recovery of former industrial areas ('re-industrialization') led to growing inequalities. In the labor market of Hungary PWP's also had (and still do have) crucial importance, but their judgement is rather contradictory. As *Czirfusz* (2015: 141) puts it: "[...] public works employment is unevenly distributed among counties, districts and settlements. One might conclude that this policy measure is *unable to decrease unemployment differences within Hungary*. [...] It is clear, however, that these units of public administration have not been able to concentrate public works employment into settlements with the highest unemployment – thereby public money is used for maintaining uneven geographical development in the country" (own emphasis). We share the opinion of *Czirfusz* that more detailed analysis would be needed to discover whether inequalities are consequences of deficiencies in the hierarchical, power-laden allocation mechanisms or 'simply' management problems. PWP's acted as a part of the answer to decreasing employment after the 2008 crisis, and in 2013 their share was almost 4% in total employment, but one of the biggest problem was that the state directly employed (still does) people for low-skilled works, only for  $\frac{3}{4}$  of the minimum wage, therefore PWP's as spatial public policies only reproduce socio-spatial inequalities (see *Peck & Theodore* 2000).

In the next section we will focus on the characteristics of unemployment spatial structure. Albeit many important changes could be read from the maps of Figure 5, with the use of a simple Mover-Stayer approach, we try to reveal the transition probabilities of the Hungarian micro-regi-



ons: i.e. how they changed their relative position over time and where can we find those which stayed in a pre-defined unemployment category and those which were able to move from one another.

### **A model for analysing the mobility of Hungarian microregions**

The very basic idea of the Markov-chain approach is used to focus on the direct evolution of the distribution of a given phenomenon. Basically, both models were used to analyse the changes of income distributions (see the influential paper of *Quah* 1993; *Le Gallo* 2001). The basic Markov chain model assumes that the process under investigation is time-homogenous and the population is homogenous too. It is clear however, that these assumptions are too restrictive, and the empirical results of these models could be misleading when they are used for prediction. There exist several ways to dissolve this assumption either by assuming time-changing transition probabilities (adapting non-stationary Markov processes) or by assuming population heterogeneity. Inasmuch as in our analysis we don't use these models for predicting, just for reviewing past tendencies, problems that are mentioned will not be relevant. In our approach it is assumed, that population could be divided into two subgroups: one consists of units that never change their position (the 'stayers') and the other that can move from one category to another (the 'movers'). We however only calculated the transition matrices 'globally', without dividing movers or stayers separately, and those micro-regions which haven't changed their relative position were called the 'stayers' over time. During the calculations we followed the time breaking approach of the previous session; firstly, we analysed the whole time-period (1993–2016) separately by a one-step transition matrix and then we broke this period into 3 subperiods: 1993–2001, 2001–2008/9 and 2008/9–2016. In those probability matrices we combined the first and final years' data and then a quantile-based 5 category grouping were created with equal number of micro-regions in each category.

#### *Empirical results*

The one step transition matrix (1993–2016) of the model is calculated from the data considering all the  $2 \times 174 = 348$  observed transitions (Table 1). The dynamics described by the matrix can be summarized as follows and are very similar to those found in the literature elsewhere about the income-dynamics of the micro-regions (see e.g. *Major* 2008). The probabilities of not-moving at the extreme low and high unemployment states are very high (78.3 and 82.6% respectively) and are much lower for the middle groups, the mobility measure for the whole period is 66.5%. As it can be seen the probability of getting from one state to another is much higher between the neighbouring categories, and micro-regions with worse unemployment situation are more likely to move downwards (e.g. those in the 4th state in 1993 had a probability of 48.9% to worsen their situation to 2016, but only 19.2% moved upwards and stayed in that group).

Table 1. One step transition matrix (1993-2016), mobility measure = 66.5%

	1	2	3	4	5
1	0.783	0.130	0.087	0.000	0.000
2	0.410	0.308	0.128	0.103	0.051
3	0.302	0.233	0.233	0.163	0.070
4	0.000	0.128	0.192	0.192	0.489
5	0.000	0.000	0.044	0.130	0.826

Using thematic maps again we could take a closer look on local differences what global results remained hidden. In Figures 8 and 9 locally stayer and mover regions are indicated; the darker shade means worse unemployment state on average on the first map. As a result, during the whole analysed period 68 micro-regions were stayers, from which 18 can be observed in the lowest, and another 19 in the highest unemployment state. In space these stayers show a clear regionalization: those who remained in lowest unemployment categories generally concentrated on the western part of the country, around Budapest and near bigger cities, while stayers with high unemployment were located in the northeast. On Figure 9 potentially movers can be seen; we marked the ‘upward movers’ with red shades, and the downward ones with bluish colours. Their spatial distribution is more concentrated in the country showing sharp differences between Eastern and Western Hungary.

If we break the time series into 3 different periods, the tendencies are quite similar, however show some minor changes when comparing them (upper part of Table 2). From the regime change up to the millennium the mobility measure was 60.2%, and the probability of staying in one category was the highest in the extreme high and low unemployment states. At the same time moving probability was relatively high and observable in the third state; around 45% of the regions moved upward, another 39% downward, while only 16% stayed at the same state, so it can be concluded that significant changes occurred in the inner states in the nineties and the regions usually moved only one category from one to another (see Figure 1 of Appendix).

In the first half of the 2000s the transition probability reduced to 43% marking a relatively stable period in the unemployment distribution. Values in the diagonal of the transition matrix are above 50% everywhere and the probability of moving does not exceed 30 percent anywhere, although showing a bit higher values in the ‘upper’ part of the matrix, which means a higher downward moving probability. The ratio of stayers in the distribution was 65.1%, and the movers like in the earlier period were more likely to move only one state between 2001 and 2008.

In the recovery period after the economic crisis (after 2008) the ratio of stayers in the highest unemployment groups decreased significantly (was 92.3% before 2000, 74.3% up to 2008, and 55% after the crisis), at the same time the transition to lower unemployment states was observable. However, it is less likely that behind the convergence of disadvantaged areas had been the sudden



Table 2. One step transition matrices (3 time periods)

	1	2	3	4	5
1	0.8148	0.1481	0.037	0	0
2	0.3684	0.3684	0.2105	0.0526	0
3	0.1591	0.2955	0.1591	0.3182	0.0682
4	0	0.025	0.225	0.325	0.425
5	0	0	0.0385	0.0385	0.9231

1993–2000 (mobility measure = 60.2%)

	1	2	3	4	5
1	0.8788	0.1212	0	0	0
2	0.1795	0.5641	0.2564	0	0
3	0.027	0.1351	0.5135	0.3243	0
4	0	0	0.129	0.5806	0.2903
5	0	0	0	0.2571	0.7429

2001–2008 (mobility measure = 43.0%)

	1	2	3	4	5
1	0.7576	0.2121	0.0303	0	0
2	0.2424	0.4848	0.2424	0.0303	0
3	0.125	0.3438	0.375	0.1563	0
4	0	0.0811	0.4595	0.2432	0.2162
5	0	0	0	0.45	0.55

2009–2016 (mobility measure = 64.7%)

increase in labour demand or the successful application of active labour market instruments (e.g. labour market services, trainings, housing allowance, wage subsidies); rather a gradual increase in the volume of public works, whose targets were primarily isolated and disadvantaged areas. On the other hand, during the period the number of micro-regions moving to better labour market state (i.e. lower unemployment group) was growing. This was primarily due to the fact, that those regions that had been in a favourable labour market position before the crisis recovered sooner and the growth in labour demand is expected at the earliest.

As the maps in the Appendix and Table 1 and 2 suggest, there seemed to be moderate unemployment mobility during the last quarter century across Hungarian microregions, so our analysis confirms previous results on this topic. With the use of transition matrices however, the stability of unemployment spatial distribution could be tested, which approach usually was not applied in previous studies on labour market processes. Another important note is that the (micro-)regional pattern of unemployment in Hungary has been relatively stable since the mid-nineties which clearly reflects also the spatial structure of socio-economic development.

In the last section of our brief analysis the role of geographical position will be tested through the application of spatial autocorrelation statistics. Undoubtedly, the most striking changes could be read from the maps, but the impact of geography on the dispersion of the distribution and on the process of cluster formation over the period, detected by means of the estimated densities, cannot be assessed.

### **The role of spatial association in the distribution of unemployment**

The type and the intensity of spatial interaction in the distribution of unemployment rates can be easily depicted by an X-Y scatterplot, in which the standardized values for each region is represented on one axis, and the same values of neighbouring regions ('spatial lag') is represented on the other (see *Anselin* 1996). The degree of global spatial association could be defined by the Moran's I statistic (*Moran* 1948) with the following equation:

$$I = \frac{\sum_i^N \sum_j^N w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^N (x_i - \bar{x})^2} \quad (5)$$

where  $x_i$  and  $x_j$  are the observations for micro-region  $i$  and  $j$  of the variable under analysis;  $\bar{x}$  is the average of that variable in the sample of the regions; and  $w_{ij}$  is the  $i$ - $j$  element of a row standardized matrix of weights,  $\mathbf{W}$ . This is an  $N \times N$  matrix of spatial weights whose characteristic element  $w_{ij}$  summarizes the interaction between regions  $i$  and  $j$ .  $x_i - \bar{x}$  and  $x_j - \bar{x}$  could be denoted as  $z_i$  and  $z_j$ . Different definitions of interactions cause different weight matrices, hereby we used the simplest but probably also the most popular definition, the binary contiguity matrix. Figure 10 illustrates the evolution of the 'global' autocorrelation explained by Moran's I statistic: as it can be seen a positive spatial relationship is observable and it became even stronger until the crisis. In the first year (1993) the spatial independence of unemployment was relatively low (Moran's I: 0.475), and its value was increasing steeply up to the millennium, then the growth rate became even slower. After 2007/2008 the trend has reversed, marking the decreasing role of spatial association in the distribution of unemployment. It is important however, that global spatial autocorrelation analysis yields only one statistic to summarize the whole area, in other words it assumes homogeneity. With the use of Local Moran's statistic (see *Anselin* 1995) we can determine those 'spatial clusters' where the autocorrelation is high or low, i.e. the similarity of micro-regions and their neighbours could be examined if we do not assume homogeneity across space. According to *Anselin* (1995: 94) a local indicator of spatial association (LISA) must satisfy two basic requirements, namely "the LISA for each observation gives an indication of the extent of significant spatial clustering of similar values

Figure 8. Potentially stayer micro-regions, 1993–2016 (darker shade means higher unemployment state)

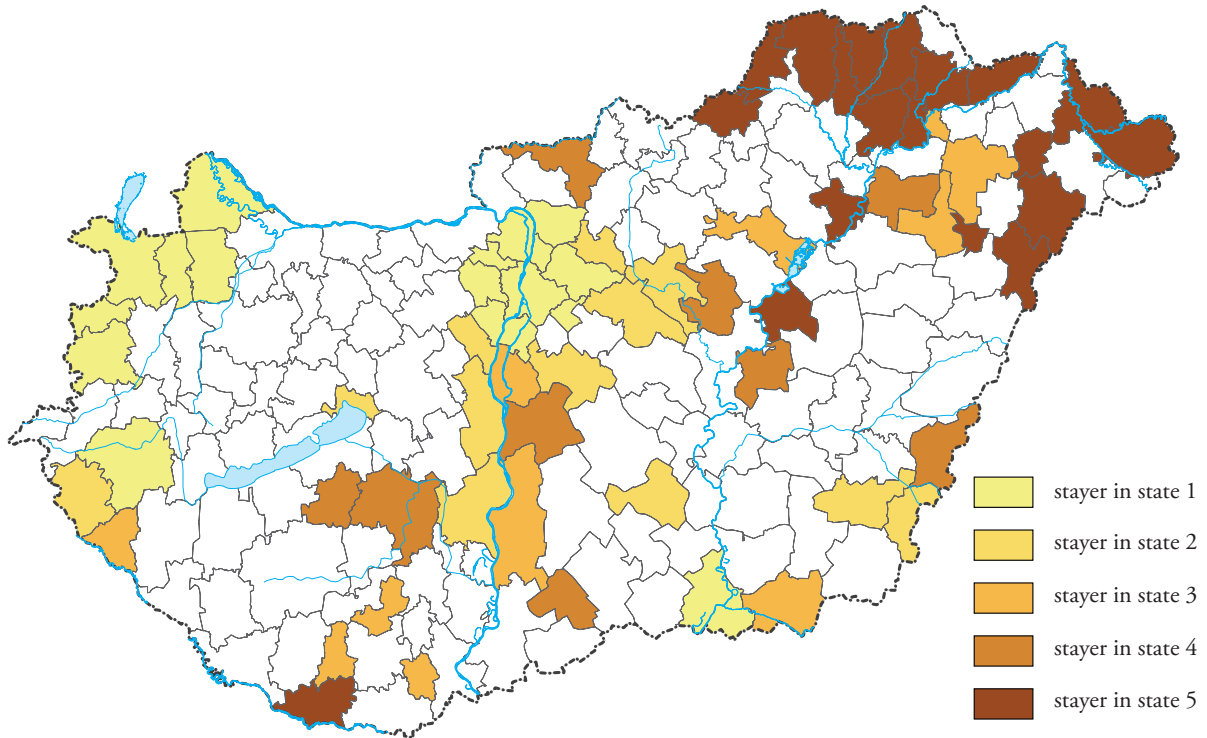
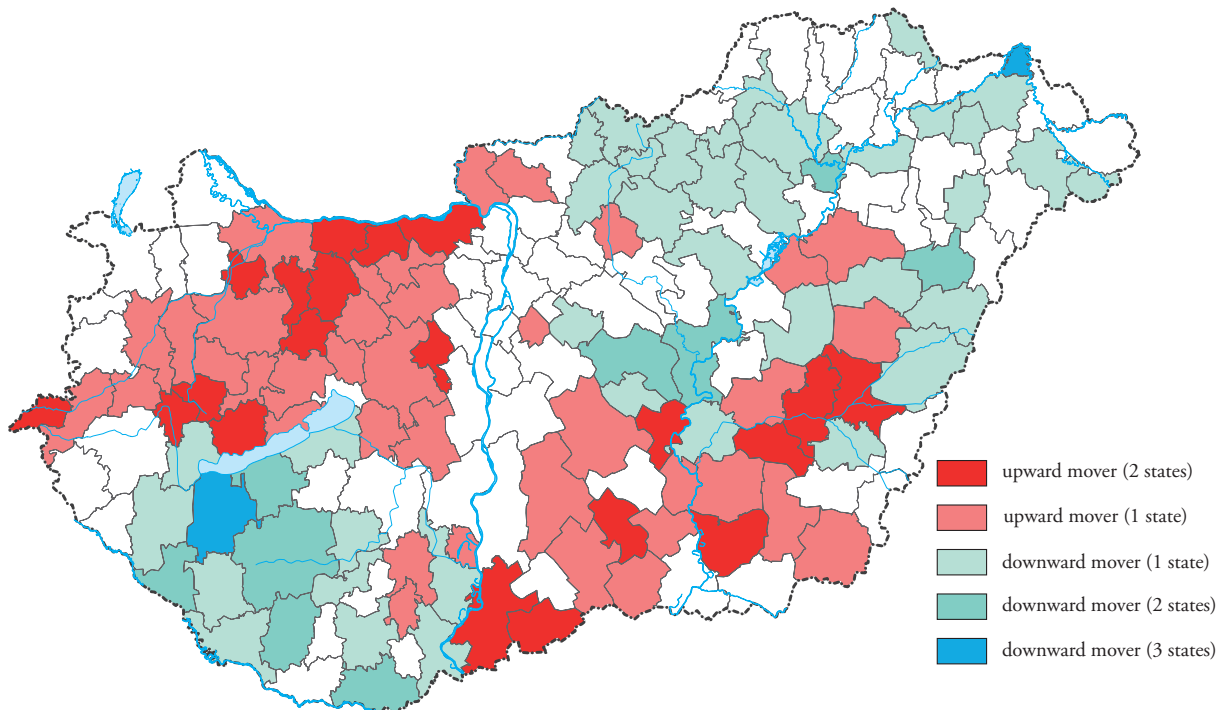


Figure 9. Potentially mover micro-regions, 1993–2016



around that observation” and “the sum of LISAs for all observations is proportional to a global indicator of spatial association”. The Local Moran indicator can be defined as follows:

$$I_i = z_i \sum_j w_{ij} z_j \quad (6)$$

where  $z_i$  and  $z_j$  again are in deviations from the mean and the summation over  $j$  is such that only neighbouring values  $j \in J_i$  are included. It can be easily seen that the corresponding global statistic is indeed the Moran’s I, where the sum of local Morans is:

$$\sum_i I_i = \sum_i z_i \sum_j w_{ij} z_j \quad (7)$$

When using local autocorrelation statistics, the method is usually called ‘hot-spot analysis’, as in the cluster maps of spatial interaction those areas where the values of a given region and its neighbours are both high are marked with red colour (‘hot-spots’ or HH), while those with low values are marked with blue (‘cold-spots’ or LL). Another two group could be when the value is high in the region, and low in its surroundings (HL) or low in the region itself and high in its neighbourhood (LH).

Following once again the breakdown of the whole analysed period Figure 11 shows the local spatial association clusters for 4 years. As the unemployment rate itself is a ‘negative’ indicator, those micro-regions with relatively high unemployment are illustrated by reddish colours on the maps. The first LISA map (Fig. 11a) is in correspondence with the one which shows the absolute values of unemployment; the spatial structure seems mosaic with low unemployment clusters located in the north-western part of the country and around Budapest, and high ones in North-eastern Hungary.

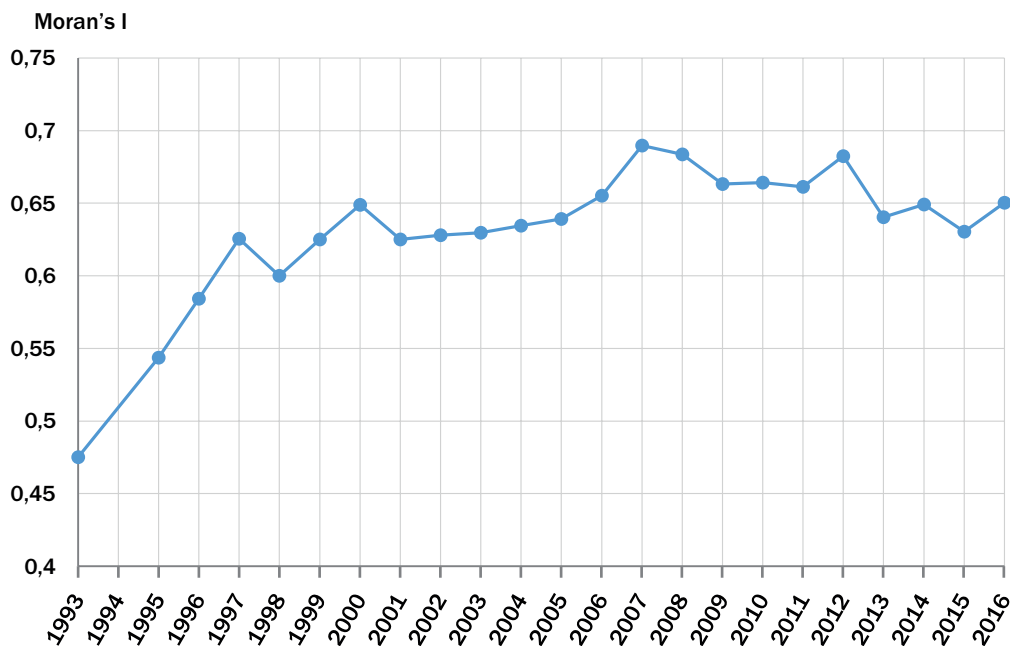


Figure 10. Spatial autocorrelation of the unemployment rate, Moran's I (1993–2016)

LH category regions were also located in this area, those were usually bigger city-regions (around Miskolc, Nyíregyháza and Debrecen) and industrial areas (like Kiskőrös or Záhony) where the impact of the transition in the early 1990s wasn't as high as in former heavy industrial regions.

In 2001 the map shows a stronger regionalization where regions around the capital and in North-western Hungary formed a coherent low-unemployment zone, while in the eastern part of the country the 'HH' macro-region also became more extended with outlier clusters of Debrecen and Nyíregyháza. By 2009 the spatial structure didn't change significantly, however the autocorrelation became even stronger (Moran's  $I = 0.663$ ) than at the turn of the millennium; both the western and the north-eastern areas became more coherent and spatially associated. In the last year analysed the formerly cohesive zone around Budapest split, the eastern agglomeration of the capital has no longer showed significant spatial association, whilst the eastern macro-region was expanded by some inner peripheries of high-unemployment clusters. We can therefore conclude that the micro-regional distribution of unemployment rates in Hungary were characterized by intense spatial dependence which seems to have increased over the last two decades and has become a bit weaker by 2016.

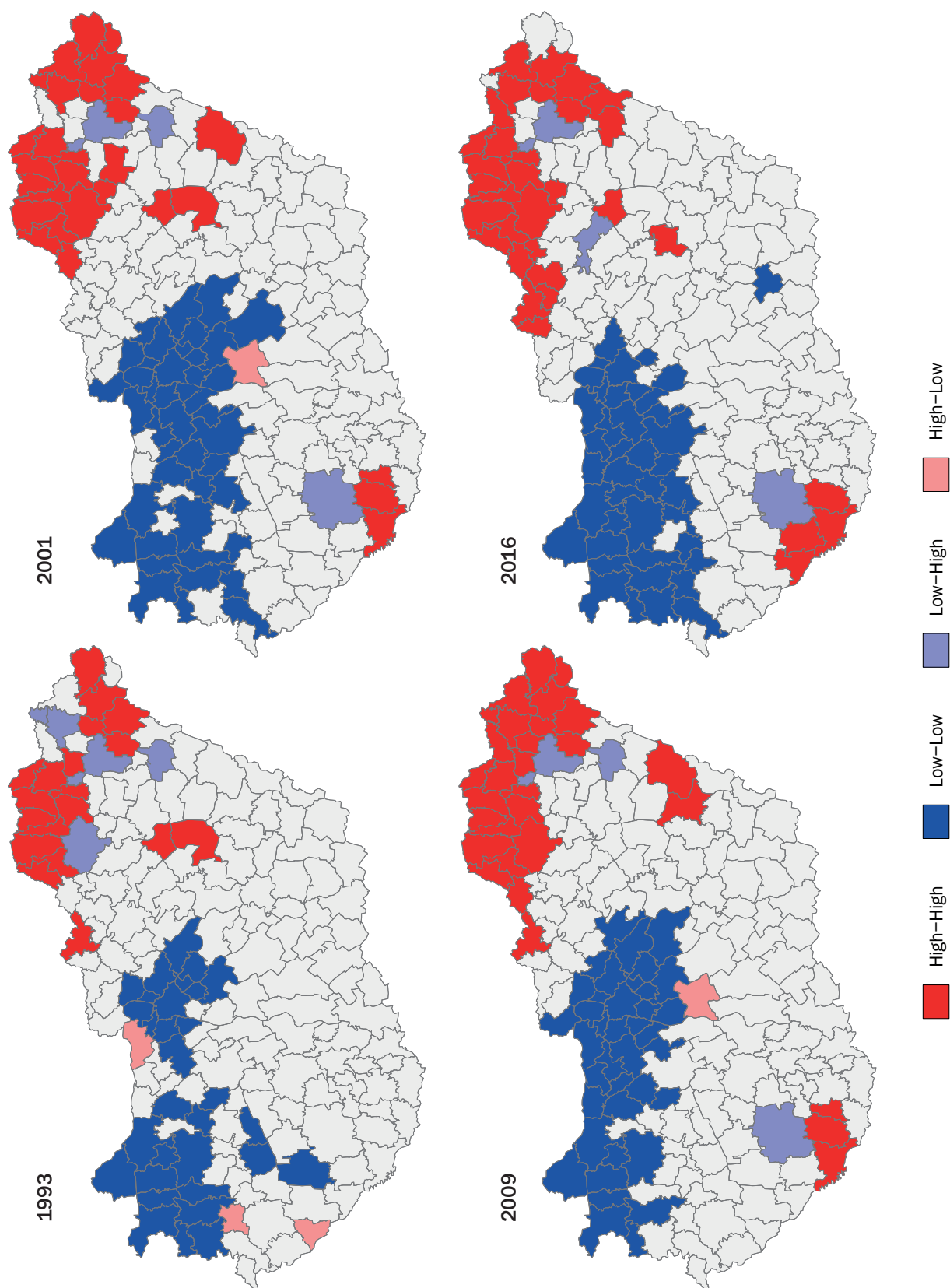
## Conclusion

In this paper we have analysed the spatial unemployment dynamics in Hungary after the regime change. A set of statistical tools for studying both changes over time in the distribution of the unemployment rates has been proposed.

What is important to conclude, is that the structure of unemployment seemed to be stable (both spatially and vertically) during the years of transition and its spatial distribution clearly follows that of socio-economic development. A sharp east–west division has been observable in the last 25 years with some local differences in the western part of the country where a north–south divide also been existed. Besides, over the past two and a half decades, there has been a notable similarity across Hungarian micro-regions in the local dynamics of unemployment rate. During the transformational recession and more recently after the financial crisis of 2008, all the micro-regions experienced the same rise in the unemployment rate, while regional disparities narrowed. However, during the economic recovery after the first recession, the disparities widened. These patterns suggest the existence of an equilibrium relationship between economic performance and spatial disparities of unemployment, which has been described for several countries with fully developed market economies, but so far has not been analysed in the situation of an economic transformation following a change of the political system.

When analysing the transition probabilities, the relative stability of unemployment was also confirmed; as Table 2 and 3 illustrated the mobility between different 'states' was rather mo-

Figure 11. Local clusters of unemployment measured by Local Moran's I (1993, 2001, 2009, 2016)





derate, especially right after the millennium. The ratio of stayers was the highest in the lowest and highest unemployment groups which means a 'rigid' vertical distribution of unemployment and a higher transition mobility between inner states. What was important to note, is that during the last period (2008–2016) micro-regions with highest unemployment rate had a probability of 45% to catch up one state, which could clearly be explained by the effects of public works programmes in the most disadvantageous areas of the country. Since 2009 budget spending on public works has increased from 200 million to almost 1100 million euros, which undoubtedly shows the efforts to a workfare, rather than a welfare state, where constitutional right to work became an obligation to work in order to establish livelihoods. For a further analysis in the future the local spatial effects of public work programmes shall be analysed by focusing on the most disadvantageous areas of Hungary through face-to-face surveys and with more detailed data on settlements supplemented by econometric analysis.

## References

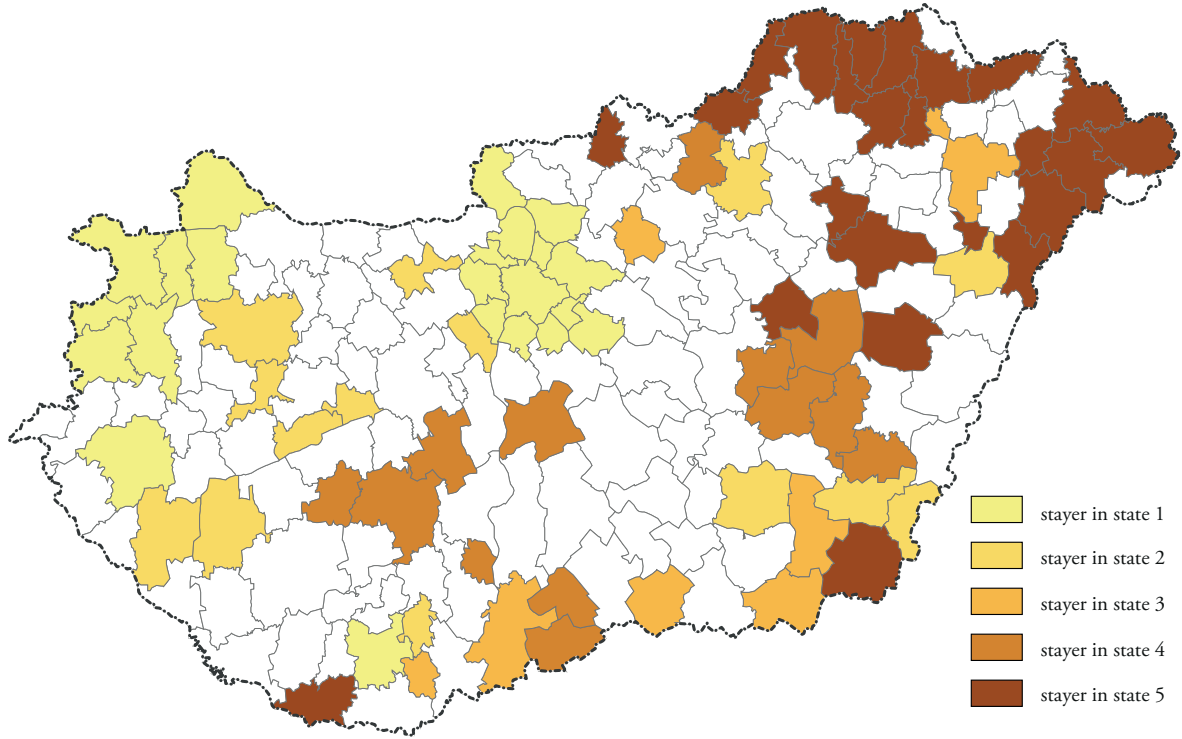
- Ábrahám, Á., & Kertesi, G. (1998): Regional unemployment rate differentials in Hungary 1990-1995. The changing role of human capital. In: L. Halpern & C. Wyplosz (Eds.): *Hungary – Towards a Market Economy* (pp. 351–377). Cambridge: Cambridge University Press.
- Anselin, L. (1995): Local Indicators of Spatial Association – LISA. *Geographical Analysis*. 27(2): 93–115.
- Anselin, L. (1996): The Moran scatterplot as an ESDA tool to assess local instability in spatial association. In: Fisher, M., Scholten, H. & Unwin, D. (eds.): *Spatial analytical perspectives on GIS*. Taylor and Francis, London.
- Bánfalvy, Cs. (1989): *A munkanélküliség*. (Unemployment). Budapest
- Commander, S., & Köllő, J. (2008): The changing demand for skills Evidence from the transition. *Economics of Transition*, 16(2), 199–221.
- Czaller, L. & Lőcsei, H. (2015): *Skill distribution and regional unemployment disparities in Hungary*. Manuscript, 21 p.
- Czirfusz, M. (2015): Spatial inequalities of public works employment. In: Fazekas, K. & Varga, J. (eds.): *The Hungarian Labour Market, 2015*. Budapest. Institute of Economics. 128–143.
- Cseres-Gergely, Zs. & Molnár, Gy. (2015): Labour market situation following exit from public works. In: Fazekas, K. & Varga, J. (eds.): *The Hungarian Labour Market, 2015*. Budapest. Institute of Economics. 148–160.
- Dixon, R., Shepherd, D. & Thomson, J. (2001): Regional unemployment disparities in Australia. *Regional Studies*, 2. 93–102.
- Dixon, R. & Mahmood, M. (2007): *Unemployment rate dispersion in Melbourne: the regional dimension*. University of Melbourne, Department of Economics. (Research Papers 983).
- Dövényi, Z. (2001): Development and Spatial Disparities of Unemployment in Hungary. In: P. Meusburger, & H. Jöns (Eds.): *Transformations in Hungary Essays in Economy and Society* (pp. 207–224). Berlin: Springer-Verlag.
- Fazekas, K. (1997): Válság és prosperitás a munkaerőpiacon. A munkanélküliség regionális sajátosságai Magyarországon 1990 – 1996 között. (Crisis and prosperity in the labour market. Regional characteristics of unemployment in Hungary, 1990–1996). *Tér és Társadalom*, 4. 9–24.

- Fazekas, K. (2005): Effects of FDI Inflows on Regional Labour Market Differences in Hungary. *Économie Internationale*, 102(2), 83-105.
- Fazekas, K. & Varga, J. eds. (2015): *The Hungarian Labour Market, 2015*. Budapest. Institute of Economics.
- Ferge, Zs. (1988): Teljes foglalkoztatás – foglalkoztatáspolitikai – munkanélküliség. [Full Employment – Employment Policy – Unemployment]. *Valóság*, 31(6), 19–31.
- Fóti J. & Illés S. (1992): *A munkanélküliség demográfiai vonatkozásai*. (Demography-related Issues of Unemployment). Budapest. NKI report 43.
- Glave, D. (1987): Dynamics in spatial variations of unemployment. In: Fisher, M. & Nijkamp, P. (eds.): *Regional labour markets: analytical contributions and cross-national comparisons*. North-Holland, Amsterdam. 269–288.
- Jurajda, S. & Terrell, K. (2009): Regional unemployment and human capital in transition economies. *Economics of Transition*. 17(2): 241–274.
- Kertesi, G. & Köllő, J. (1997): Reálbérek és kereseti egyenlőtlenségek, 1986–1996. A bérszerkezet átalakulása Magyarországon, I. rész. (Real wages and wage disparities, 1986–1996. The transformation of wage structure in Hungary, part I.). *Közgazdasági Szemle*. 44: 612–634.
- Kézdi, G. (2002): *Two phases of labor market transition in Hungary: Inter-sectoral reallocation and skill-biased technological change* (Budapest Working Papers 0203). Budapest, MA: IE-CERS, Hungarian Academy of Sciences.
- Kornai, J. (1993): Transzformációs visszaesés: egy általános jelenség vizsgálata a magyar fejlődés példáján. (Decline in the course of transformation: studies on a general phenomenon, the case of Hungarian development). *Közgazdasági Szemle*. 40(7–8): 569–599.
- Le Gallo, J. (2001): *Space-time Analysis of GDP Disparities among European Regions: A Markov Chains Approach*. Technical Report 2001–06, Bourgogne: Laboratoire d'Analyse et de Techniques Economiques.
- Lőcsei H. (2010): A gazdasági világválság hatása a munkanélküliség területi egyenlőtlenségeire. (The effects of global economic crisis on the spatial inequalities of unemployment.) In: Fazekas K. & Molnár Gy. (eds.): *Munkaerőpiaci tükrök. (Labour market yearbook)*. MTA KTI, Budapest. 126–141.
- Major, K. (2008): Income disparities among Hungarian micro-regions: the Mover-Stayer model. *Acta Oeconomica*. 58(2): 127–156.
- Martin, R. (1997): Regional unemployment disparities and their dynamics. *Regional Studies*, 3. 237–252.
- Meusburger, P. (2001): Spatial and social disparities of employment and income in Hungary in the 1990s. In: P. Meusburger, & H. Jöns (Eds.), *Transformations in Hungary Essays in Economy and Society* (pp. 173–206). Berlin: Springer-Verlag.
- Moran, P. (1948): The interpretation of statistical maps. *Journal of the Royal Statistical Society B*. 10: 243–251.
- OECD (2005): *Employment Outlook*. Paris, OECD.
- Overman, H. G. & Puga, D. (2002) Regional unemployment clusters. *Economic Policy*. 17(34): 115–148.
- Peck, J. & Theodore, N. (2000): Commentar. 'Work first': workfare and the regulation of contingent labour markets. *Cambridge Journal of Economics* 24(1): 119–138.
- Pehkonen, J. & Tervo, H. (1998): Persistence and turnover in regional unemployment disparities. *Regional Studies*, 5. 445–458.
- Quah, D. T. (1993): Empirical Cross-section Dynamics in Economic Growth. *European Economic Review*, 37: 426–434.
- Silverman, B.W. (1986): *Density estimation for statistics and data analysis*. Chapman and Hall, New York.
- Timár, J. (1991): Foglalkoztatás egy új Rubicon közelében. (Employment relations in a new stage of development). *Társadalmi Szemle*. 5. 38–47.

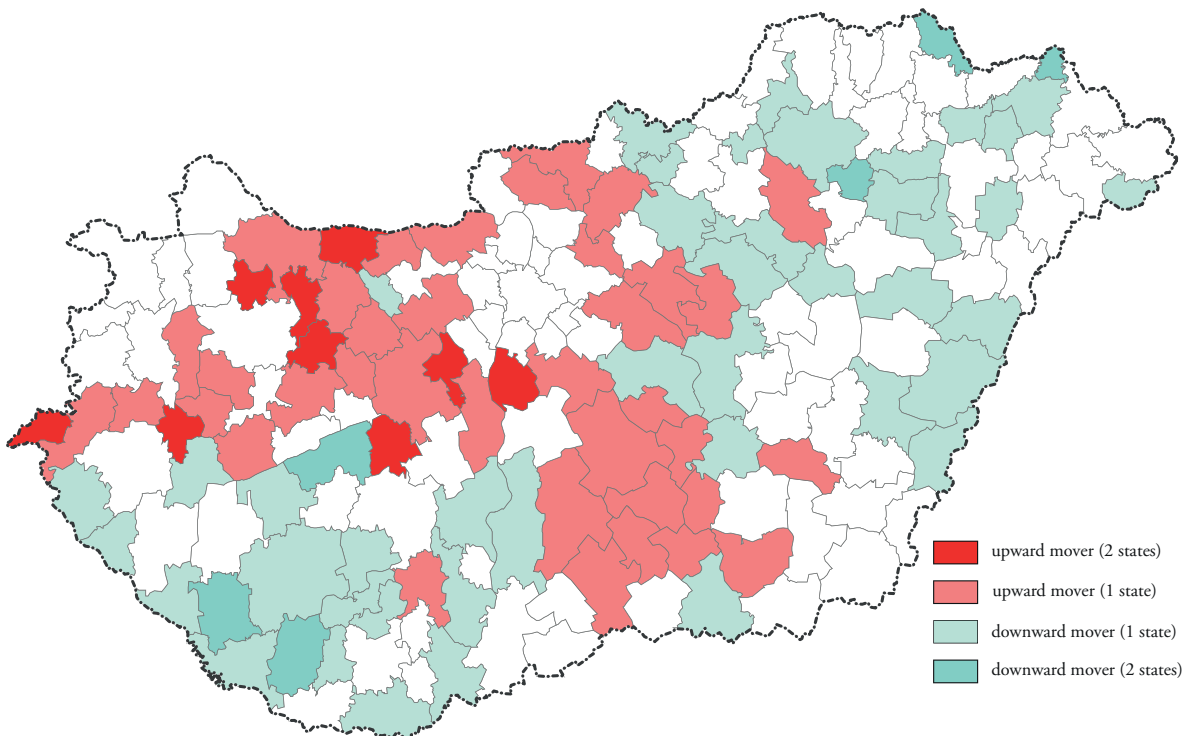


# Appendix

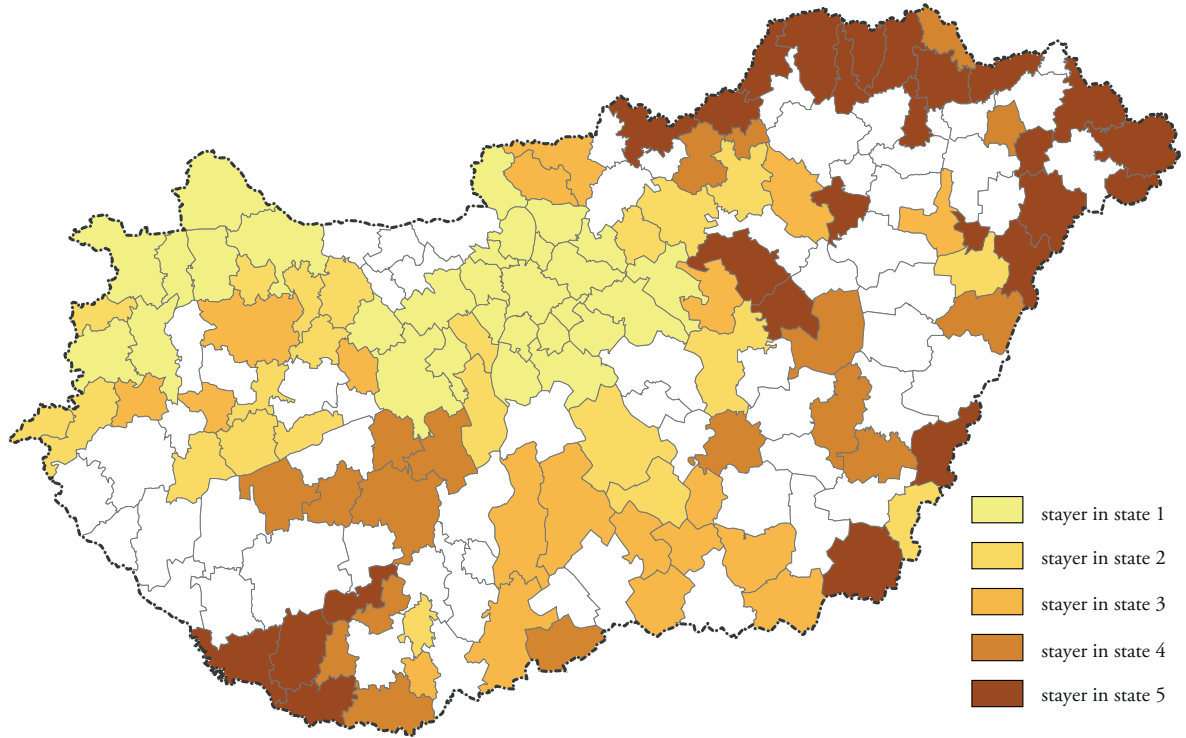
*Map 1. Potentially stayers between 1993 and 2000*



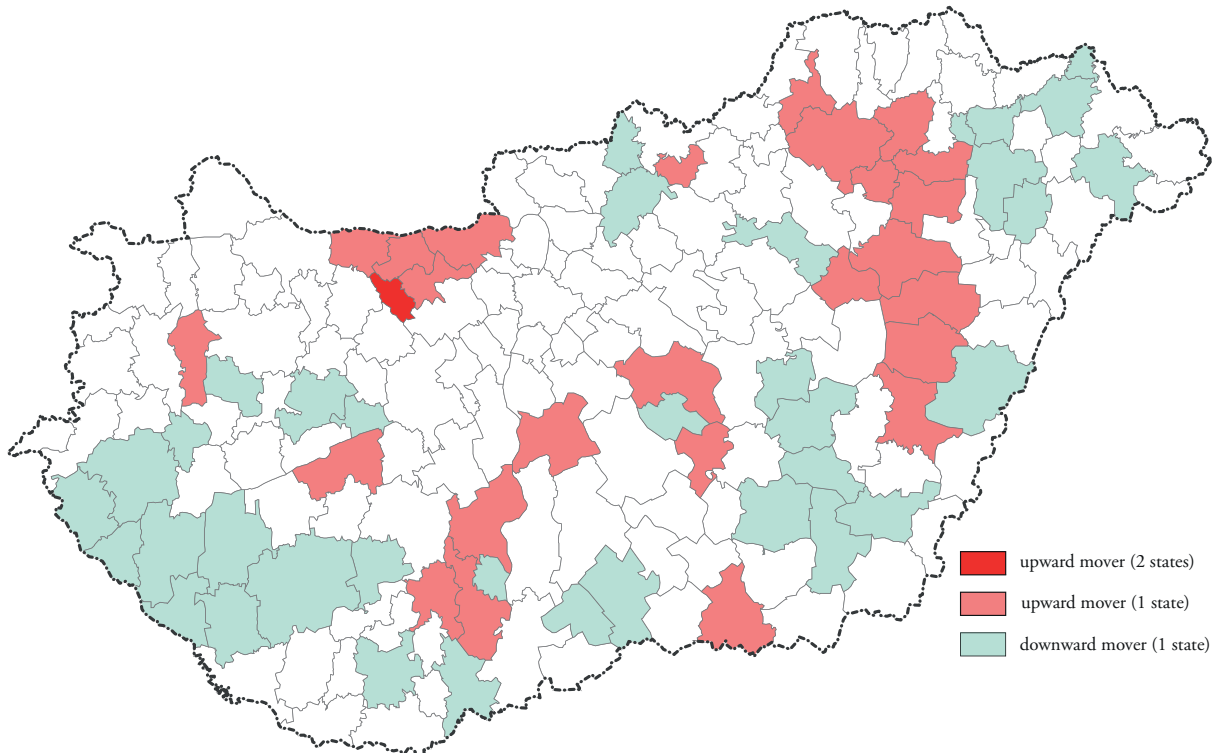
*Map 2. Potentially movers between 1993 and 2000*



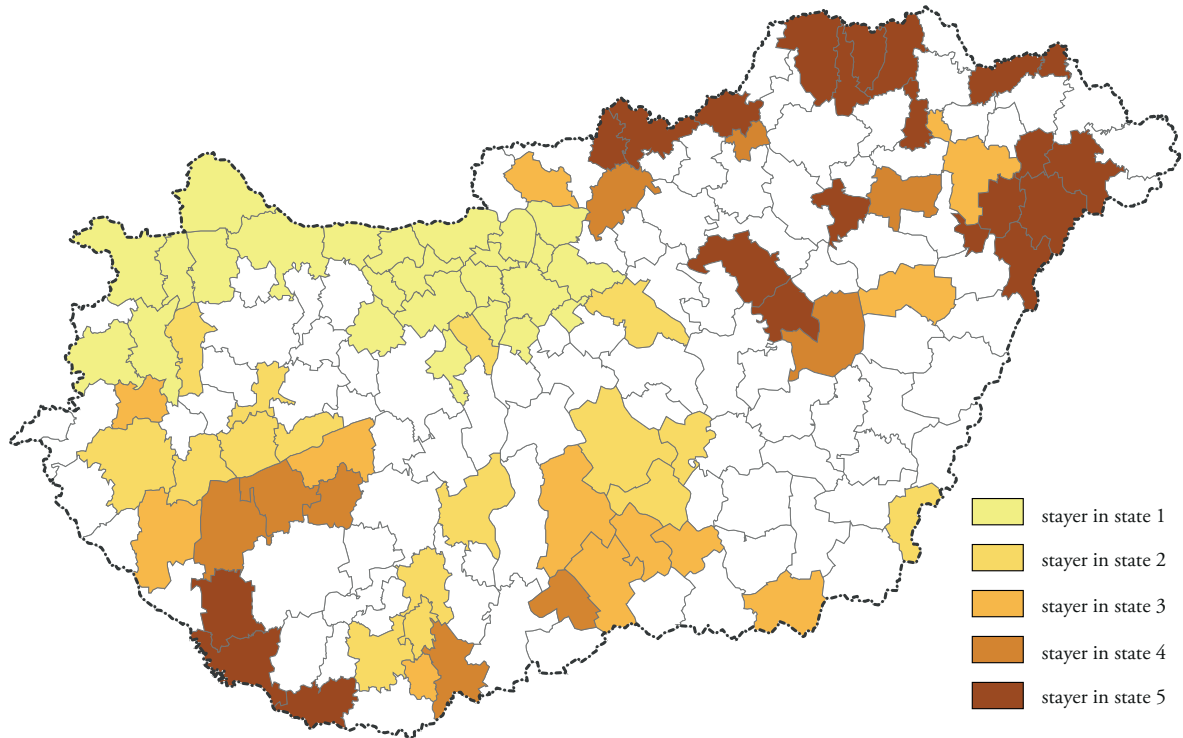
*Map 3. Potentially stayers between 2001 and 2008*



*Map 4. Potentially movers between 2001 and 2008*



*Map 5 Potentially stayers between 2009 and 2016*



*Map 6. Potentially movers between 2009 and 2016*

