

Factorial analysis of the territorial disparities on the southern part of the Romanian – Hungarian border

Egon NAGY^{1,*}

¹ Department of Geography in Hungarian Language, Babeș-Bolyai University, str. Clinicilor 5-7, 400006 Cluj-Napoca, Romania

* Corresponding author, enagy@geografie.ubbcluj.ro

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Abstract

During the socialist era along the Hungarian-Romanian border region there emerged a significant developmental gap which separated a relative more advanced Hungarian side from a backward Romanian one. Using a quantitative methodology, we try to identify territorial disparities of these times on a lower spatial scale – namely on the level of communes – in order to highlight the presumably lagging-behind status of a narrower border strip. According to our hypothesis, this peripheral strip has a disadvantageous status mainly because its increased isolation. The factorial analysis confirmed this fact on the Hungarian side, however it was disproved on the Romanian side because the presence of the large cities and basic infrastructure networks on the proximity of the border. Thus, the paper underlines empirically former conception related to the geographical periphery regions along the border line.

Keywords: *Hungarian-Romanian border region, factorial analysis, social periphery, positional periphery*

Rezumat. Analiza factorială a disparităților teritoriale din partea sudică a graniței româno-maghiare

În perioada socialistă de-a lungul frontierei ungaro-române s-a instalat un clivaj economic evident ce a despărțit o regiune relativ mai dezvoltată pe partea ungară de una mai înapoiată pe partea română. Utilizând o metodologie cvantitativă am încercat săidentificăm disparități socio-economice din perioada contemporană pe o scară spațială inferioară – și anume la nivel comunal – pentru a scoate în evidență un statut presupus de înapoiere a fâșiei de frontieră. Conform ipotezei noastre, această fâșie are un statut dezavantajat în urma poziției periferice. Analiza factorială a confirmat această ipoteză pe partea ungară a fâșiei transfrontaliere, în timp ce pe partea română nu s-a adevărit datorită prezenței rețelei de așezări urbane însemnate și a infrastructurii lineare de mare importanță. În consecință, studiul subliniază și demonstrează din nou validitatea concluziilor anterioare ale studiilor transfrontaliere, conform cărora poziționarea lor periferică în cele mai multe cazuri le dezavantajează sub forme multiple.

Cuvinte-cheie: *regiunea transfrontalieră româno-ungară, analiză factorială, periferie socială, periferie pozițională*

Introduction

The present study examines the level of complex socio – economic development on the southern part of the Romanian – Hungarian border, trying to determine how the presence and vicinity of the border influences spatial patterns of development, generally. We tried to create dimensions form the indicators which, according to Nemes Nagy József can express the level of “economic health” (Nemes Nagy, 1995). Our study focuses of the neighbouring counties in the southern part of the border region, that is Békés and Csongrád counties in Hungary and Timiș and Arad counties in Romania; we used the indicators determining development in these counties as a starting point. In the recent past the border studies regarding to the Hungarian-Romanian border zone were predominantly one-dimensional descriptions, trying to depict the socio-peripheral status of this kind of regions using separately some relevant variables. In this paper we used a quantitative method for testing the validity of the supposition, that the proximity of the border can influence in a negative way the territorial disparities. In the same time we tested the more conclusive

explanatory force of this comprehensive method in pointing out these asymmetries.

Method

Expressing territorial disparities of development by factorial analysis is not a new method in territorial studies. Methods with multiple variables and multiple dimensions as well as data reduction have frequently been used when describing the spatial parameters of the two countries (Romania and Hungary), although the analysis of the border regions has not been so much in the centre of attention.

In the Romanian specialist literature the country and county level analyses were in the centre of attention. Voineagu outlined the territorial division based mainly on the achievements of the small and medium enterprises, but he did not conduct any analysis on the sub-regional administrative level (Voineagu et. al. 2002). According to these analyses, the two Romanian counties of our study fell into the category of those which had an economical growth higher than the average of the country. Kurkó (2010) also conducted county level analyses during the territorial analysis work, and the two studied counties (Timiș and Arad) ranked in top

positions in the different dimensions described (general development, employment, infrastructure, demographic conditions).

In the Hungarian specialist literature the territorial analysis with a single variant used by Süli – Zakar pointed out the underdevelopment of the northern Hungarian regions, among which mainly the peripheral character of the border zone in more aspects (Süli – Zakar, 1992, 1996, Süli-Zakar & Beres, 1993). Péntzes and Molnár (2007, 2008) also discuss the “dead-end”-like development and the limited possibilities of development for the agglomerations between neighboring county centers, mostly with a one-dimension character.

In the case of country analyses, Nemes Nagy József and Faluvégi Albert conducted studies on the micro-region level, which showed the border region of our study as the loser of the economic transition, as falling behind or stagnating micro – regions (Mezőkovácsházai, Szeghalomi, Sarkadi, Mórahalmi). Only the Szeged micro-region appeared to be an exception which, due to the vicinity of the big city, was developing, whereas Makó was catching up. (Faluvégi, 2000). The study conducted by Nemes – Nagy, similarly to that conducted by Faluvégi, outlined the countries NW – SE line of economic division, in the Romanian border region of the Dél-Alföld. This is the so-called BB (Békés – Balassagyarmat) line which more or less overlaps with the SS line (Sarkad – Szécsény) of Beluszky Pál (Nemes Nagy, 1995, 1999).

Our study wants to support these antecedents, which pointed out the disadvantages of being a border line region on the Hungarian side, with a multi-dimensional empirical demonstration. We would like to use this method as well to prove for the Romanian side the hypothesis according to which along the triple border zone, the so called “trium confinium” helps the overlapping of the geographical and social peripheries, while in the Arad and Békés part, the Romanian side is in a more advantageous position than the inner peripheral zones of the hilly and mountainous areas, due to the fact that the cities and the main infrastructural flow axes are positioned here. The same hypothesis was proved in the case of the northern part of the Romanian – Hungarian borderline in our previous studies (Nagy, 2011). In the same time we wanted to confront the factorial analysis with the results of the previous one-dimensional studies as well.

The factorial analysis was carried out separately for the Romanian and the Hungarian counties (with the SPSS software), because, aside from the demographical indicator, the economic variables of the two counties cannot be compared as they were determined using different statistical methods. The methodological background of the two demographical indicators, illiteracy and education, is

also very different in the case of the two countries’ statistical institutes. Unfortunately, due to this fact we could not analyze the two regions uniformly, but we were able to outline regions with different level of development and also to study if the presence of the border has any influence on the socio-economic development of the sub-regions. The aim is not to have a comparison between counties but to establish the effect of the borderline on territorial structure.

The Socio-Economic Effect of the Border’s Proximity on Romanian side of the Border Strip

A basic condition of the factorial analysis, which was fulfilled in the present study, is to have more study cases than the number of variables (in the case of the Romanian counties we analyzed 18 variables for 176 settlements, and on the Hungarian side we analyzed 25 variables for 135 settlements). The variables are partly the same, mainly the economical ones differ.

The variables taken into consideration on the Romanian side (Table 1) were:

- average infant death rate 2000 – 2007, for 1000 births
- average population increase 2000 – 2007 ‰
- average number of births 2000 – 2007 ‰
- average number of deaths 2000 – 2007 ‰
- average number of immigrants 2000 – 2007 ‰
- average number of emigrants 2000 – 2007 ‰
- average migration difference 2000 – 2007 ‰
- water supply infrastructure %, 2002
- sewage infrastructure %, 2002
- gas infrastructure %, 2002
- 0 – 14 year old, 2010 %
- 15 – 59 year old, 2010 %
- > 60 year old, 2010 %
- relative unemployment %
- income 2009, RON/capita
- profit 2009, RON/capita
- university studies % 2002
- illiterate %, 2002

The variables taken into account on the Hungarian side (Table 5) were:

- average immigration 2000 – 2007 ‰
- average emigration 2000 – 2007 ‰
- average migration difference 2000 - 2007‰
- average birth rate 2000 – 2007 ‰
- average death rate 2000 - 2007‰
- average population increase 2000 – 2007 ‰
- average infant mortality rate 2000 – 2007‰, for 1000 births
- 0 -14 year old, 2007%
- 15 – 59 year old, 2007 %
- > 60 year olds, 2007 %
- relative unemployment %
- rate of taxpayers from entire population %

- gas infrastructure, % of households, 2009
- sewage system, % of households, 2009
- water supply, % of households, 2009
- college, university graduates %, 2003
- illiterate %, 2003
- capital stock 2008 (thousand Ft/ capita)
- result before paying tax 2008, (thousand Ft/capita)
- net income of sales 2008, (thousand Ft/ capita)
- net income of exports 2008, (thousand Ft/ capita)
- total personal income tax 2007/capita
- employed in the primary sector %, 2001
- employed in the secondary sector % 2001
- employed in the tertiary sector % 2001

Both in the study of the Romanian and the Hungarian counties we tried for the analysis of decomposition for the main component, but the great number of variables produced several factors in the end, thus giving us the possibility to analyze development levels from more points of view. We did not manage to come up with such a component that would explain the variations with a suitably high value. Thus it is obvious that there is no such component neither on the Romanian, nor on the Hungarian side that would express development level clearly; development is expressed using certain demographical and economical dimensions, and within these components, the scores make a difference between settlements in a more advantageous situation and settlements in a more disadvantageous one. We determined the intensity relevant for the communalities in three categories, going from higher scores to lower ones. In the same time, in contrast with our expectations the presence of the county capital in the database did not have a biasing effect, did not homogenize the space outside them, that is why we did not take them out from the list.

In the case of the Romanian counties, because of the high commonality of the majority of variables we decided to keep all the studied variables, even those which fit less. The great number of high values in the correlation matrix showed that the factorial analysis was feasible.

As a result we got three factors, the first explained a quarter of the variants, whereas all the three explained three fifths of the variants (Table 2).

The first factor showed a strong positive correlation with the natural population increase, the active and highly qualified population (Table 3) (Fig. 1), thus we considered it as a dimension characterizing human resources, representing stability. In the same time, because it also strongly correlates with the public utilities infrastructure and the income indicator, as well as it has a negative correlation with unemployment, this is the only component where we dared use the term "developed" in relation with the general state of the economy.

The second factor is the dimension presenting good public service infrastructure, ageing, highly qualified population, characteristic for more urbanized territories, which received substantial infrastructure investments in the last years (Fig. 2).

Table 1: The values of the communalities in the Romanian counties

Variables	Initial	Extraction
Average infant mortality for 1000 live births, 2000-2007	1	0,095
Average natural population increase 2000-2007 ‰	1	0,938
Average number of births 2000-2007 ‰	1	0,736
Average number of deaths 2000-2007 ‰	1	0,771
Average number of immigrants 2000-2007 ‰	1	0,886
Average number of emigrants 2000-2007 ‰	1	0,406
Average migrational difference 2000-2007 ‰	1	0,759
Water supply system %, 2002	1	0,742
Sewage system %, 2002	1	0,742
Gas %, 2002	1	0,615
0-14 year olds, 2010 %	1	0,778
15-59 year olds, 2010 %	1	0,685
>60 year olds, 2010 %	1	0,911
Average rate of unemployment %	1	0,084
Income 2009, RON/capita	1	0,482
net profit 2009, RON/capita	1	0,024
Superior education %, 2002	1	0,698
Illiterate %, 2002	1	0,173

Source: own calculation

Table 2: The total variance explained by the components on the Romanian side of the territory

Component	% of the variance explained	Cumulative %
1	27,69543	27,69543
2	18,98235	46,67778
3	11,78388	58,46166

Source: own calculation

The third factor correlates positively mainly with the migrational indicators, but it correlates positively with most of the demographic indicators, thus reflects a balanced demographic background (Fig. 3, Table 3). It does not show strong correlation with the indicators of infrastructure and education and it has a slight positive correlation with the economic indicators, thus in this respect we notice a balanced situation. The Gipsy and the social groups with deviant behavior on the periphery of society can also be present due to their close relation with infant mortality, young population, number of births and emigration; these communities consider these urban or rural settlements as existential "asylums".

The first component is probably the one to best describe the development, highlighting the urban centres, it appears in a wide, coherent area around the county capitals. The western and central parts of the area are in an advantageous situation whereas in the eastern area only the urban centres excel with higher scores.

The high values of the second component appear, as it is expected, in the more developed urban settlements as well as in those rural regions

which are peripheral from the geographical and demographical point of view, but due to infrastructure investments they are in a better situation (in Arad County the upper, mountainous

part of the Fehér-Körös river, as well as the Maros gorge). On the opposite side there are the villages with an obvious agrarian character which demographically are growing at a faster pace.

Table 3: The matrix of the components for the Romanian counties

	1. Stable demographic workforce background developed infrastructure and economy	2. Good public utilities with infrastructure, ageing public service qualified population, and urbanized	3. Balanced situation from the demographical and economical point of view
Average infant mortality for 1000 live births, 2000-2007	-0,178	-0,033	0,249
Average natural population increase 2000-2007 ‰	0,743	-0,612	0,106
Average number of births 2000-2007 ‰	0,290	-0,709	0,387
Average number of deaths 2000-2007 ‰	-0,799	0,345	0,116
Average immigrants 2000-2007 ‰	-0,097	0,286	0,892
Average emigrants 2000-2007 ‰	-0,374	0,292	0,425
Average migrational difference 2000-2007 ‰	-0,002	0,228	0,841
Water supply system %, 2002	0,693	0,507	0,067
Sewage system %, 2002	0,693	0,507	0,067
Gas %, 2002	0,615	0,486	0,017
0-14 year olds, 2010 %	0,244	-0,763	0,369
15-59 year olds, 2010 %	0,817	-0,064	-0,113
>60 year olds, 2010 %	-0,814	0,484	-0,116
Relative unemployment %	-0,195	-0,167	0,134
Income 2009, RON/capita net profit 2009, RON/capita	0,570	0,395	0,033
Superior education %, 2002	-0,064	-0,117	0,077
Illiteracy %, 2002	0,592	0,590	-0,015
	-0,289	-0,292	-0,066

Source: own calculation

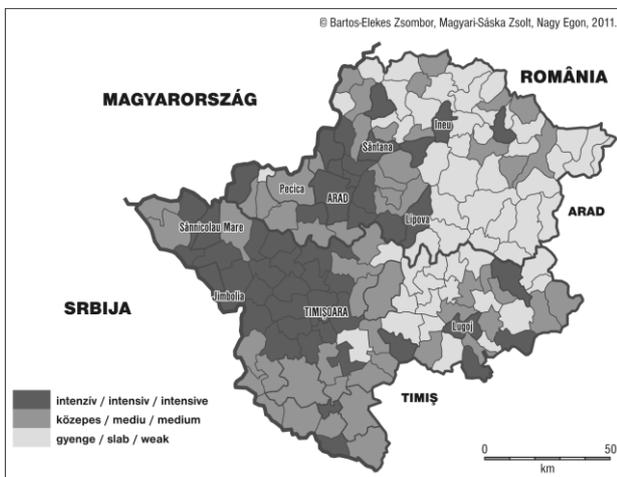


Fig. 1: The repartition of the villages with stable demographic and workforce market background, with developed infrastructure and economy based on the scores in Arad and Timiș counties

Source: own calculation

The third component is more of the descriptor of the balanced situation; it does not necessarily carry a negative connotation as related to development. It correlates strongly with such demographic data whose intensity is not a sign of development, such as infant mortality or the number of births, which can be related to the larger number of the Gipsy population in the plain areas. The city of Arad appears to have a lower intensity due to the

reduced number of Gipsy population, lower numbers of births and immigrations. The most developed county centres miss this turn, whereas the small and medium sized towns are well represented, thus it cannot be clearly related to underdevelopment.

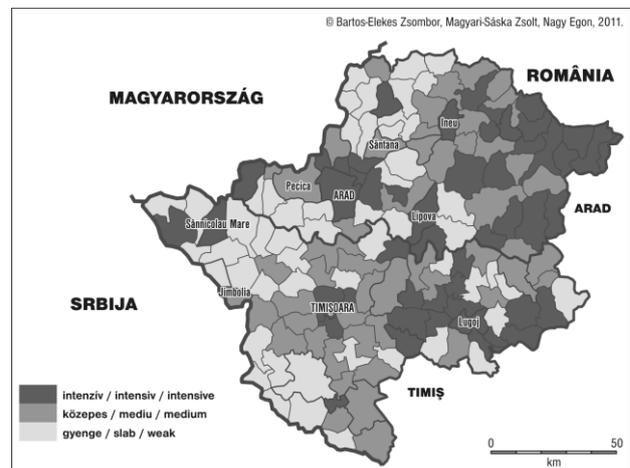


Fig. 2: The repartition of villages with good public service infrastructure, ageing, qualified population, in an urbanization process based on the scores in Arad and Timiș counties

Source: own calculation

According to all these dimensions, on the Romanian side our hypothesis proved to be true, that is the western parts, and among these the border zone areas are generally in a better situation

in spite of their geographical periphery character and the eastern hilly and mountainous areas represent the social periphery in spite of the fact that in many of these settlements the infrastructure improved. Although in the Bánság/Banat part of Romania the more developed western part is not so clearly outlined as it was in the case of the northern part of the Romanian – Hungarian border, in Szatmár and Bihar counties. In that case the hilly and mountainous areas had a more emphatic peripheral character as it was pointed out in our previous studies.

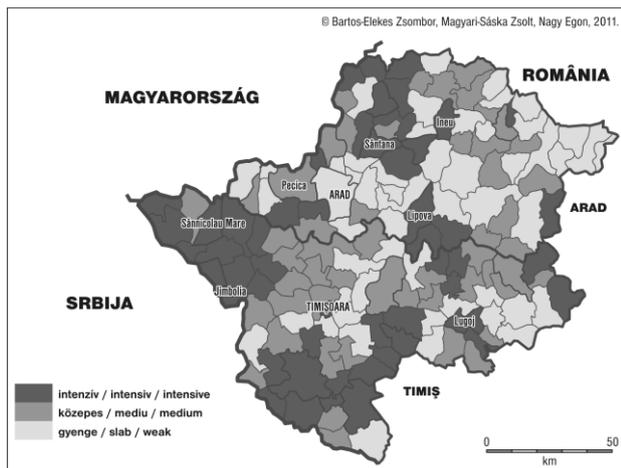


Fig. 3: The repartition of the villages in a balanced situation from the economic and demographic point of view based on the scores in Arad and Timiș counties

Source: own calculation

Territorial Disparities on the Hungarian Borderside

In the case of the Hungarian counties, after testing the factorial analysis several times we had to give up some of our variables; 13 remained out of 25 (Table 4), due to those communalities that did not reach a 0.25 value. The communalities represent the information-content of a variable, which content is not common for other variables (Table 5). If a variable has a low communality it should not be taken into consideration for the factorial analysis. The variables above 0,25 are fitting more for the factorial structure, so they can be preserved (Székely, Barna, 2004). The feasibility of the factorial analysis was also supported by the mostly high values of the correlation matrix (Table 6), as well as by the 0.05 values in the significance test. The same is proved by the KMO test's high value, 0.72.

The factorial analysis finally yielded three dimensions with the keeping of better fitting indicators, among which the first has the strongest explanatory potential, covering nearly two fifths of the variants. The three factors together explain two thirds of the variants. The first factor represents the

socio-economic development as it correlates positively with the demographical indicators, in the same time mapping economical dynamics and infrastructural development (Fig. 4).

The second factor emphasizes the disadvantageous demographic situation with an ageing population, decreasing in number and activity as well (Fig. 5).

Table 4: The values of the communalities in the Hungarian counties

Variables	Primary	Subtracted
Average migrational difference 2000-2007 ‰	1	0,575
Average natural population increase. 2000-2007‰	1	0,871
15-59 years, 2007 %	1	0,844
Relative unemployment %	1	0,792
Taxpayers ration from total population %	1	0,699
Gas %, 2009	1	0,523
Sewage %, 2009	1	0,515
University, college %, 2003	1	0,822
Tertiary sector %	1	0,696
Gross capital 2008 (thousand Ft/capita)	1	0,600
Total individual income tax 2007/capita	1	0,890
60-x year olds, 2007 %	1	0,794
Secondary sector %	1	0,217

Source: own calculation

Table 5: The ratio of the variants explained by the components

Components	% of the variants	Cumulative %
1	37,84151	37,84151
2	17,52632	55,36783
3	12,6121	67,97993

Source: own calculation

The third factor points to the unstable workforce market situation, which is in a critical state, that is, it carries the possibility of losing balance (Fig. 6). Higher levels of unemployment and emigration are characteristic for these areas, in the same time the larger number of people employed in the tertiary field can represent towns as well as smaller settlements which offer only basic public services, where employees carry out services with low levels of added value in the settlement with a unilateral economic structure.

Table 6: Matrix of the components for the Hungarian counties

	1. Socio – economic development	2. disadvantageous demographic situation	3. critical, unstable workforce market situation
Average migrational difference 2000-2007 ‰		0,594	-0,428
Average natural increase of the population 2000-2007‰	0,425	-0,807	
15-59 year olds 2007 %	0,708	-0,582	
Relative unemployment %	-0,646		0,605
Ratio of the taxpayers in total population %	0,716		-0,428
Gas %, 2009	0,628	0,351	
Sewage %, 2009	0,702		
University, college %, 2003	0,813		
Tertiary sector %	0,337		0,706
Capital stock 2008 (thousand Ft/capita)	0,601		0,389
Individual income tax 2007/capita	0,917		
60-x year olds, 2007 %	-0,561	0,687	
Secondary sector %	0,302		-0,345

Source: own calculation

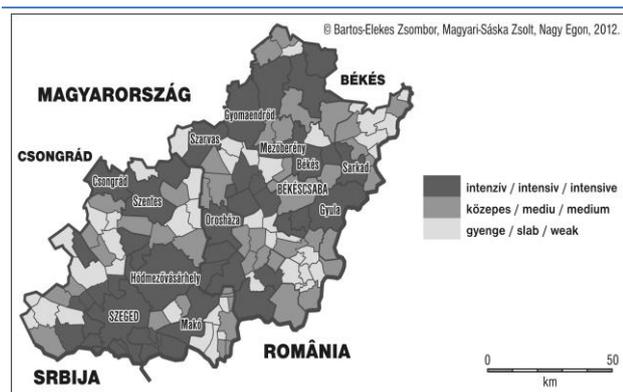


Fig. 4: The repartition of the socio – economic development based on the scores in Békés and Csongrád counties

Source: own calculation

The first component representing general development highlights the towns and it appears as a coherent block in the Szeged agglomeration. This group is highlighted more because of the positive character of the economic indicators and not so much because of the demographic indicators. In the border zone this component is only represented by towns with higher scores (Gyula, Sarkad, Mezőhegyes, Makó, Mórahalom) (Fig. 4).

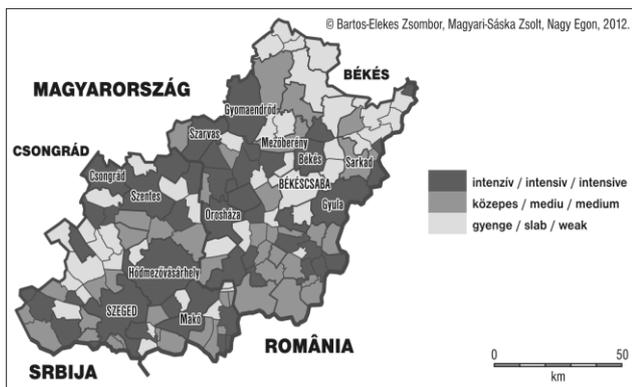


Fig. 5: The repartition of the disadvantageous demographic situation based on the scores in Békés and Csongrád counties. Source: own calculation

Source: own calculation

The second component correlates very negatively with the natural increase of the population, which also highlights the towns, and thus the northern part of Békés and the north-eastern part of Csongrád appear with lower scores due to the larger number of the Gipsy population (Geszt, Vésztő, Baks). In the same time, the ageing of the population also results in the urban population being better represented.

In the case of the third component the high levels of unemployment and the large number of people working in the services field (in some cases in low added value services) play an important role. The latter caused some non-peripheral cities from

the economical point of view to appear in this category (Szeged, Hódmezővásárhely) (Fig. 6). In this case, the eastern and south-eastern part of the border zone is outlined, with their small towns and villages form a coherent space with high scores.

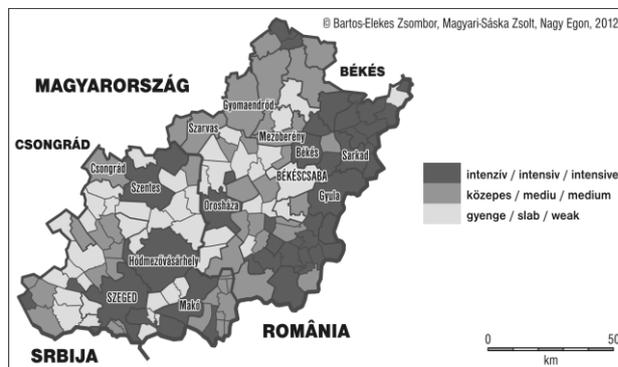


Fig. 6: The repartition of the critical, unstable workforce market situation based on the scores in Békés and Csongrád counties

Source: own calculation

As a consequence of the systematic analysis of social and economic variables regarding the spatial and social cohesion of the two sides of the border, one notices that the Hungarian part is better located especially in terms of the infrastructure of public utilities. However, this is also true for some human resources indicators and some demographic variables. Nevertheless, these differences are not insuperable and do not represent severe barriers for efficient cross-border collaboration.

Both in Romania and Hungary, as in transition economies generally but also in the Third World, the territorial disparities are visible especially at the level of urban-rural separation (between different types of settlements) rather than at regional level, as differences between regions are more difficult to notice.

Regional inequalities become obvious for the first time at once with an economic "boom" according to the "Williamson hypothesis" – 1965, or at the same time with the increase of disparities between social strata, according to "Kuznets hypothesis" - 1955, cited by Nemes Nagy J., 2005, within the process of economic convergence, following the stage of stagnation and depression of the national economy (characteristic for the transition period). At present, Romania passes through this stage of evolution, called "beta-type" convergence, taking into account the speed of the growth and the initial stage of low development. The duality of advanced and backward regions is revealed as the above-mentioned process advances, while the "urban-rural space" dichotomy gradually loses its importance. As a consequence, the spatial diffusion of development or of the "advanced" nature takes place in the shape of

spatial networks which overlap entire regions. This type of evolution characterizes the matured market economies. Thus, this process generates some sort of spatial homogenization within a region, irrespective of the fact that the people live in a town or a village. The defining thing is whether people live in an advanced or backward region. In other words, the nature of developed or underdeveloped state has the effect of lowering the territorial disparities, while the qualitative and quantitative leap from the lower to the upper state of development inevitably leads temporarily to the increase of differences in development.

Conclusion

To sum up, we can conclude that on the Hungarian side the positional periphery character represents in the same time socio-economic periphery only in the case of the eastern part of the border zone, in Békés county. This fact could not be counterbalanced by the spatial vicinity of the former and present county capitals (Gyula and Békéscsaba), which points out the functionally deficient character of the agglomeration in central Békés county. Sarkad, Elek, Battonya and Mezőhegyes are not capable of fulfilling their space organizing role either. This conclusion fits with the results of previous one-dimension analyses, which have shown the East-Hungarian border strip as a space of underdevelopment. In addition, the Hungarian border strip is suffering from the lack of a major transport-infrastructure line, which is parallel with the border and could efficiently contribute to the cohesion of this border-side.

As opposed to this, in the South Szeged, Makó and Mórahalom are more successful in fulfilling their role as activating regional and micro-regional centers, thus the social periphery character is not visible in that border zone. In the same way, the cities on the other side of the border are more successful in activating local energies: Arad and Curtici (especially due to the existing industrial parks and duty-free areas), Chișineu-Criș, Nădlac, Pecica, Sânnicolau Mare and Jimbolia. These towns with the main linear infrastructure networks provide enough local stimuli for a more vivid socio-economic activity even though the proximity of the border.

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