European Research Studies,
Volume XV, Issue (3), 2012

Geographical Economics and Per Capita GDP Growth in Romania*

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Abstract:

This paper analyses the growth dynamics in the Romanian economic over the period 1995-2008 and the link between them and the economic geography of the country in light of the transition process started in the early nineties. The analysis of the growth dynamics is carried out at different geographical scales and using different time spans. The analysis of the growth dynamics is followed by an econometric exercise which first tries to check for the (non)existence of convergence and then we have studied to which extend the economic geography of the country is a key ingredient in the observed growth dynamics. The results of our analysis point out that regardless of the period of study under consideration a catching-up process across Romanian counties is not taken place. Rather a divergence process is pretty much at work. Our second important conclusion is that the economic geography of the country is shaping the growth dynamics observed over the course of the years in Romania.

Key Words: *Convergence, Regional Disparities, Growth Dynamics, Divergence, Economic Geography, Romania*

JEL Classification*: R11, R12, R13, R14, F12, F23*

* **Acknowledgements:** The authors want to thank the editor of the journal (E. Thalassinos) and the conference participants at the ICABE 2012 conference held in Cyprus for the comments and suggestions they made to the previous version of this paper. A substantial part of this paper has been finished while the first author was a visiting scholar at the Harvard Economics department in 2012. The first author thanks professor Pol Antràs and Nathan Nunn for sponsoring his visiting position at Harvard University. The authors also wants to thank very specially Prof. Domingo Calvo Dopico and Prof. Atilano Pena for the comments and discussions related to the last section of the paper. Thanks also to Paulino Montes-Solla for superb research assistance while doing this work. Financial support from the Spanish Ministry of Science and Innovation through Grant ECO2011-28632 is gratefully acknowledged. The opinions, analyses and results of this work are the exclusive responsibility of the authors and do not represent the position of the European Commission. The usual disclaimer applies.

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1. Introduction

The processes of transition from a central planning economy to a more market oriented economy and EU accession, the two dominant political and socio-economic processes that characterized the countries of Central and Eastern Europe (CEE) since the collapse of communism, have, over the last two decades, been followed by different growth dynamics which lead to interesting patterns of convergence, divergence and polarization. CEE economies, contrary to Western European countries which have had the historical framework to be aware of the importance of protecting institutions and building a solid institutional framework, have ignored the important role of the institutions in their processes of transition, generating a defective institutional framework, with high transaction costs, uncertain property rights, inflation problems in many cases, not clearly imposed laws, barriers in the way products enter on the market, etc. Moreover, the accession of CEE countries to the European Union in 2004 and 2007 intensified the processes of economic integration, restructuring and national development, thus shrinking the evolutionary time during which the aforementioned processes were to take place. Economic transformations occurring globally and increased risk aversion contributed to a significant reduction of capital flows to Romania, increased pressures upon exchange rate[3].

Under the influence of these processes, the last twenty years have seen an important change in the old spatial economic structures and a sharp increase in regional disparities across many Central and Eastern European countries. Romania did not escape to such changes. The deindustrialization process in Romania was very important. The share of industry in Romania's GDP decreased from 46% in 1985 to less than 28% in 1999, however, its contribution to the export sector is still decisive. In 1997 and 1998 respectively, 97% of the value of exported goods in Romania was produced in the industry sector, while in 1999 the figure was 95%. Moreover, strong patterns of polarization and core-periphery structures emerged which were characterized by the concentration of economic activities around Bucharest-Ilfov, Timisoara and Cluj-Napoca, leaving other parts of the country, mainly in the North-East relatively underdeveloped. Therefore, the process of national convergence, stimulated by increasing openness and economic and political integration, has not been accompanied by a similar trend for cross-regional incomes equilibration.

Transition was soon followed by increasing economic openness, with substantial shifts in trade partners and specializations and significant inflows of foreign investments, both of which contributed further to altering the economic geography of the countries concerned among them it was also the case of Romania.

[3] Ungureanu D.M., Ruxandra D., Horia G., Florian B. – Romania´s real convergence to the European Union, volume 2, Econ papers, Bucharest, 2002

In order to analyze the growth dynamics of the Romanian economy during this twenty years[4] after the fall of its communism system in December 1989 we have broken down the whole period into 4 sub periods which are going to be analyze at national level and economic region[5] level.

- 1995-2008 which constitutes our whole sample period
- 1995-2000, this is a period mainly characterized by huge political instability, severe economic crises and also high inflation
- 2000-2004 a period characterized by the recovery of the economy and subsequent high growth rates as a result of the reforms of the 90s combined with the positive effects coming from the rest of the countries in Europe.
- 2004-2008 is a period characterized at the European level by a big enlargement of the European Union and unprecedented economic growth rates in Romania (average 8-10% annually).

The rest of the paper is structured as follows: Section 2 presents a brief overview of the analysis of the growth dynamics in Romania over the period 1995-2008. Section 3 analyzes in detail the regional growth in Romania by typology of region. Section 4 carries out an econometric exercise to link the economic Geography of the country with is growth performance over the period 1995-2008. Section 5 complements the analysis with a factor analysis and finally section 6 establishes the main conclusions of this paper.

2. Growth Dynamics in Romania at the Country Level

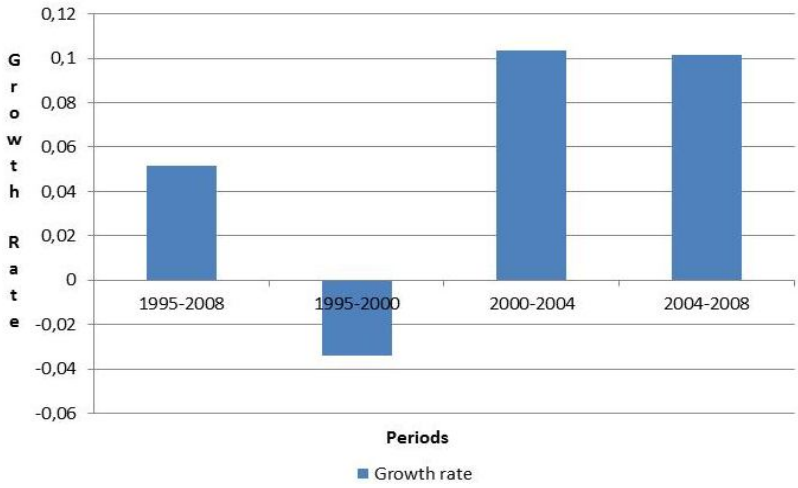
Due to the lack of reliable and homogeneous data for Romania we start our analysis in the year 1995. A first image of what was the situation like in terms of growth rates since 1995 can be seen in figure 1 which breaks down the growth rates in Romania for different periods. Growth rates were computed in real terms (base year 1995) using data from the Romanian national statistical institute (INSSE) and

[4] 1990-1994 is a period characterized by the beginning of the privatization process, the launching of the first economic reforms and also a period of high hyperinflation. The lack of a set of reliable and comparable data in this period is the reason why it is not incorporated in our analysis.

[5] The development regions of Romania refer to the eight regional divisions created in Romania in 1998 in order to better co-ordinate regional development as Romania progressed towards accession to the European Union. The development regions correspond to NUTS II-level divisions in European Union member states. Despite becoming increasingly significant in regional development projects, Romania's development regions do not actually have an administrative status and do not have a legislative or executive council or government. Rather, they serve a function for allocating European Union PHARE funds for regional development, as well as for collection of regional statistics. They also co-ordinate a range of regional development projects and became members of the Committee of the Regions when Romania joined the EU on January 1, 2007.

Eurostat. Figure 1 shows that for the whole period of analysis (1995-2008) the average real per capita GDP growth rate was slightly above 5%. However if we split the whole period of the sample in the different sub periods we have already mentioned, we can see that the second half of the nineties, especially after 1996 which was the last year of economic growth of the 90s, is a period of a deep recession in Romania which elongates until the year 2000 with negative real per capita GDP growth rates of around -3.4%. Moreover, within this period, the years from 1997 to 2000 can be seen as belonging to a black period where the Romanian transition was full of political and institutional storms. If we focus only on the data of these years, the negative GDP growth rates of the Romanian economy were far worse off reaching -5.7%. From 2000 onwards, the situation in Romania changed drastically. Both 2000-2004 and 2004-2008 periods were periods of economic expansion with high per capita GDP growth rates (8-10% annually). These periods were also accompanied by the negotiation of the different chapters of EU membership that Romanian authorities agree with their European counterparts.

Figure 1. Average Growth Rate in Romania by periods: 1995-2008



Source: Own elaboration based on INSSE and Eurostat data

Table 1 provides us with detailed information on the real per capita GDP growth rates of the different periods shown in figure 1.

Table 1. Average growth rate in Romania by periods

Period	% Growth rate		Period	% Growth rate
1995-2008	5.18 %		**1996-2008**	4.85 %
1995-2000	-3.41 %		**1996-2000**	-5.70 %
2000-2004	10.34 %			
2004-2008	10.16 %			

Source: Own elaboration based on data from the Romania Statistical Institute

3. Growth Dynamics at the Romanian Economic Regional Level

Our next step in the analysis of the growth dynamics across the different levels of aggregation-disaggregation of the Romanian economy goes one level down moving to the so called "Romanian economic development regions". Romania is divided into 8 economic development regions named on the grounds of their geographical location in the country: Northeast Region 1, Southeast Region 2, South Muntenia Region 3, Southwest Oltenia Region 4, West Region 5, Northwest Region 6, Center Region 7, and Bucharest and Ilfov Region 8.

Northeast Region 1 includes the following counties: Iasi, Botosani, Neamt, Suceava, Bacau and Vaslui. It has a total of 3.8 million inhabitants (about 14.6% of the total population of the country) and an area of 30,949 km2. Southeast Region 2 includes the counties of Vrancea, Galati, Braila, Tulcea, Buzau and Constanta with a total of 2.9 million inhabitants and about 35,770 km2. South Muntenia Region 3 is situated in the south includes 7 counties: Prahova, Dambovita, Arges, Ialomita, Calarasi, Giurgiu and Teleorman, it has a total population of 3.4 million inhabitants and a territory of more than 35,450 km2. The Southwest Oltenia Region 4 includes the county of Mehedinti, Gorj, Dolj, Olt and Valcea, the territory of these region is situated near the border between Bulgaria and Serbia is about 31,211 km2 and a population of 2.4 million inhabitants.

West Region 5 is one of the most developed in the country, the main county is Timis but other three are included: Arad, Hunedoara and Caras-Severin. The territory of this region represents over 14% of Romanian surface near the frontier with Serbia and Hungary. Northwest Region 6 represents 14.3% of national territory and about 12.6% of Romanians population. The counties included are Bihor, Cluj, Bistrita-Nasaud, Maramures, Satu Mare and Salaj.

The Center Region 7 includes Alba, Sibiu, Mures, Harghita, Covasna and Brasov county the hearth of Transylvania, the total population is 2.7 million inhabitants.

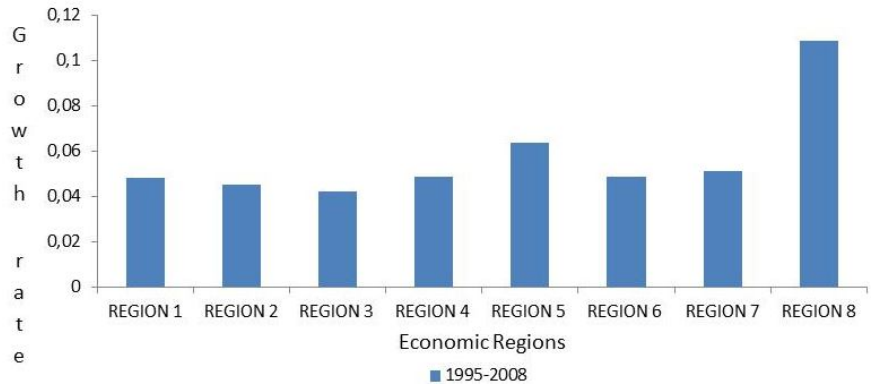
The smallest region is the Bucharest and Ilfov Region 8 that includes the capital Bucharest and the county that surrounds' him, it has about 1,821 km2 and 2.1 million inhabitants more than 10% of total population.

These 8 economic development regions are wrap up into four macro-regions; macro-region 1 (RO1) which includes Northwest Region 6 and Center Region 7, the macro-region 2 (RO2) which includes Northeast Region 1 and Southeast Region 2, the macro-region 3 (RO3) which includes South Muntenia Region 3 and Bucharest and Ilfov Region 8 and the macro-region 4 (RO4) which includes Southwest Oltenia Region 4 and West Region 5.

Our analysis of the growth dynamics for the Romanian economic development regions keeps the same structure than the analysis previously carried out at the country level, i.e, we divide the whole period of analysis into four sub periods, 1995-2008, 1995-2000, 2000-2004 and 2004-2008 using GDP data from the Romanian national statistical institute at 1995 prices and Eurostat data.

Figure 2 shows the 1995-2008 average real per capita GDP growth rates in the 8 Romanian economic regions. The most remarkable feature in this figure is the extraordinary performance of the Bucharest-Ilfov economic region which by far is the most developed region in the country with an average growth rate for the whole period over 10%. On the lower end of the scale are South Muntenia and North-East economic regions which are among the poorest economic regions in the country reaching during this period an average real per capita GDP growth rates slightly below 4.5%. If we exclude Bucharest Ilfov economic development region from our sample, which clearly acts as an outlier, the most developed economic regions in Romania are located in the Western and center parts of the county being form by the West, North-west and Center economic region (see also map 1). These regions are situated geographically close to Hungary (West economic region) and in some parts of Transylvania (North-west and Center economic regions) and therefore are benefited by having high market access, a better infrastructural endowment than the rest of the regions in the country and also by being closer to the Western European markets than their counterparts in Romania. On average during 1995-2008 they grew at rates ranging between 5- 6.3% annually.

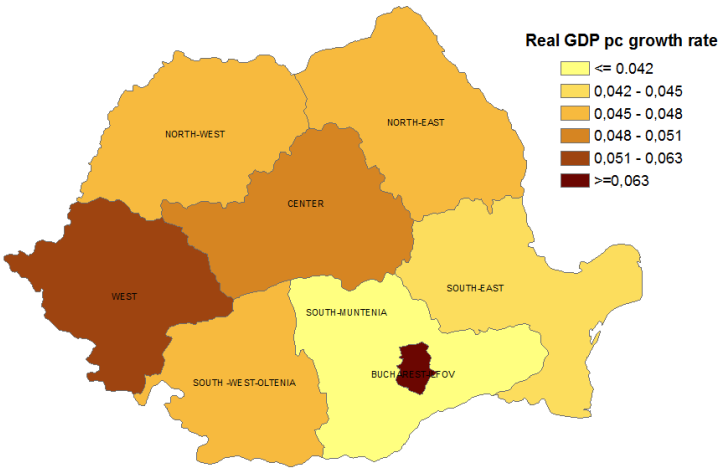
Figure 2. Average Growth Rate in Romania by periods: 1995-2008



Note: Region 1: North-East; Region 2: South-East; Region 3: South-Muntenia; Region 4: South –West Oltenia; Region 5: West; Region 6: North-West; Region 7: Center; Region 8: Bucharest-Ilfov

Source: Own elaboration based on INSSE and Eurostat data

Map 1. Real GDP per capita growth rate in Romanian economic regions 1995-2008

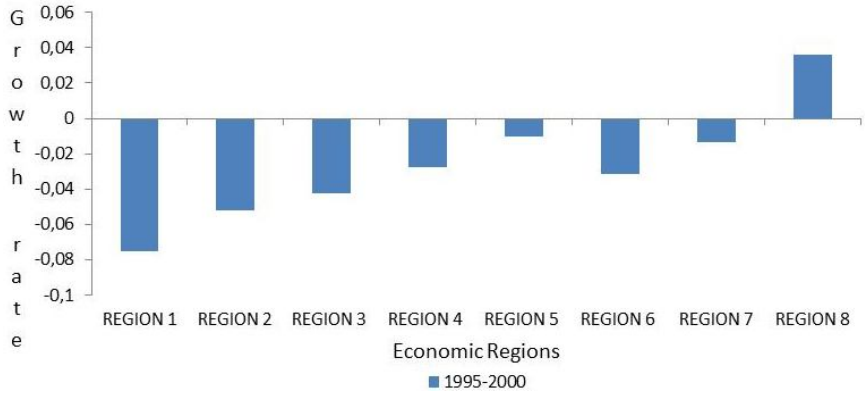


Source: Own elaboration based on INSSE and Eurostat data (GDP base year 1995)

If we analyze in more detail the different sub periods that form our sample at the Romanian economic region level we can see that during the first sub period 1995-2000, a period characterized by a deep economic fall and by the disastrous reforms carried out in the country between 1994-1996, Bucharest-Ilfov is the only economic region which emerge with positive growth rates achieving an average per capita GDP growth rate during this period of about 3%. Figure 3 and map 2 show the situation of the different economic regions during this period. As we can see all Romanian economic regions but Bucharest-Ilfov have negative growth rates. Among the looser regions their fall was very different ranging between -1% in the case of the West economic region and almost -8% in the North East region. Therefore it is quite clear that among the Romanian economic regions during this period took place a quite divergent process. This is a main characteristic of the Romanian regions in the road of convergence[6]. The 1995-2000 economic downturn is quite unequal even if we exclude the Bucharest-Ilfov region. West and Center economic regions fall around -1% and the North-East and South-East economic regions fall between -8 and -10.5% due to basically the crisis in the agriculture and industrial sectors.

[6] Iancu, A., *"Transition, Integration and Convergence - The Case of Romania"*, "Working Papers of National Institute of Economic Research 101222, National Institute of Economic Research, (Bucharest, 2002).

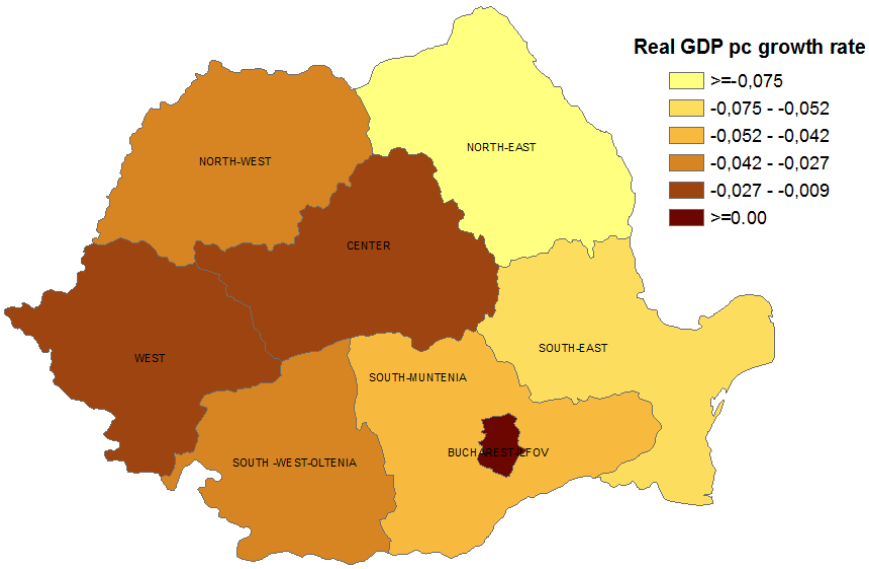
Figure 3. Average Growth Rate in Romania by periods: 1995-2000



Note: Region 1: North-East; Region 2: South-East; Region 3: South-Muntenia; Region 4: South –West Oltenia; Region 5: West; Region 6: North-West; Region 7: Center; Region 8: Bucharest-Ilfov

Source: Own elaboration based on INSSE and Eurostat data

Map 2. Real GDP per capita growth rate in Romanian economic regions 1995-2000



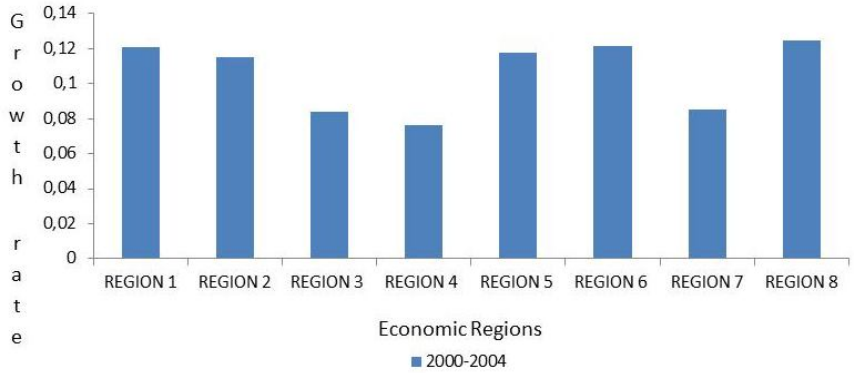
Source: Own elaboration based on INSSE and Eurostat data (GDP base year 1995)

The period 2000-2004 can be considered a period of prosperity in terms of economic growth although the growth rates among the Romanian economic regions vary greatly.

It ranges between 8% in the South of the county (South Muntenia and South –West economic regions) and up to 12% in the Bucharest Ilfov, West and North-West economic regions.

We see a spectacular uprising of the North-East and South-East economic regions which during the previous period had dramatically fallen. Figure 4 and map 3 show the results.

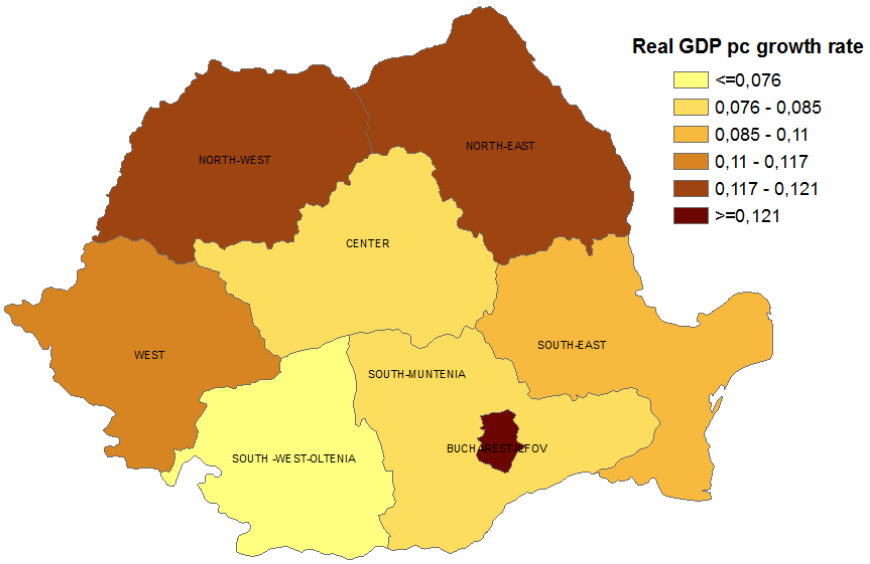
Figure 4. Average Growth Rate in Romania by periods: 2000-2004



Note: Region 1: North-East; Region 2: South-East; Region 3: South-Muntenia; Region 4: South –West Oltenia; Region 5: West; Region 6: North-West; Region 7: Center; Region 8: Bucharest-Ilfov

Source: Own elaboration based on INSSE and Eurostat data

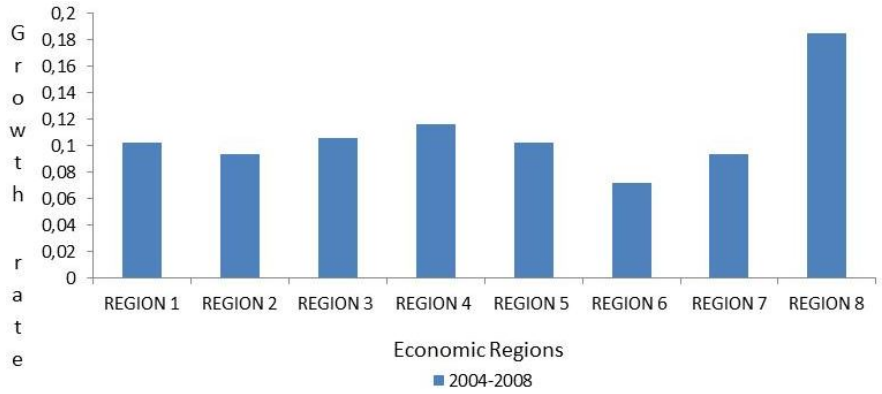
Map 3. Real GDP per capita growth rate in Romanian economic regions 2000-2004



Source: Own elaboration based on INSSE and Eurostat data (GDP base year 1995)

The period 2004-2008 is, as the previous one, characterised by high economic growth. Figure 5 and map 4 show that the Southern parts of the county grow much faster than the others. Again the Bucharest-Ilfov economic region is the one taking the lead. South Muntenia and Sowth-West economic regions have increased their growth rates from 7-8% in the period 2000-2004 to 9-10% between 2004-2008. West, North-West and Center economic regions had an economic slow down between 2004-2008 compared with the previous period.

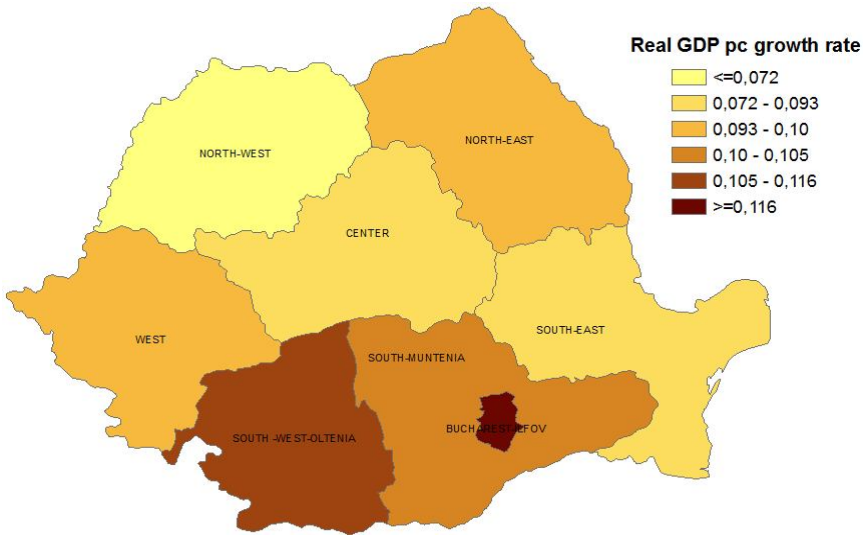
Figure 5. Average Growth Rate in Romania by periods: 2004-2008



Note: Region 1: North-East; Region 2: South-East; Region 3: South-Muntenia; Region 4: South –West Oltenia; Region 5: West; Region 6: North-West; Region 7: Center; Region 8: Bucharest-Ilfov

Source: Own elaboration based on INSSE and Eurostat data

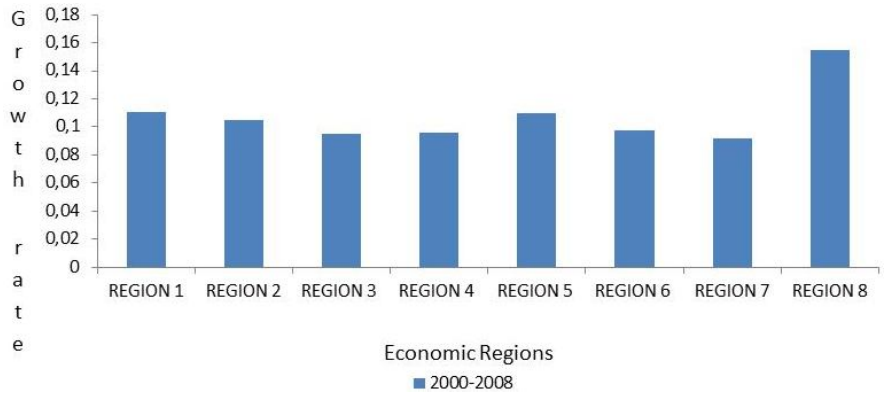
Map 4. Real GDP per capita growth rate in Romanian economic regions 2004-2008



Source: Own elaboration based on INSSE and Eurostat data (GDP base year 1995)

Finally for this analysis at the Romanian economic region level we have merged together the two periods of economic boom 2000-2004 and 2004-2008. Bucharest-ilfov economic region is shown up as the leading region with an average real per capita GDP growth rate of 15% followed by North-East, South-East and West economic regions with growth rates between 10-11%. The region with the lowest economic growth is the Center region. Figure 6 and map 5 show the results.

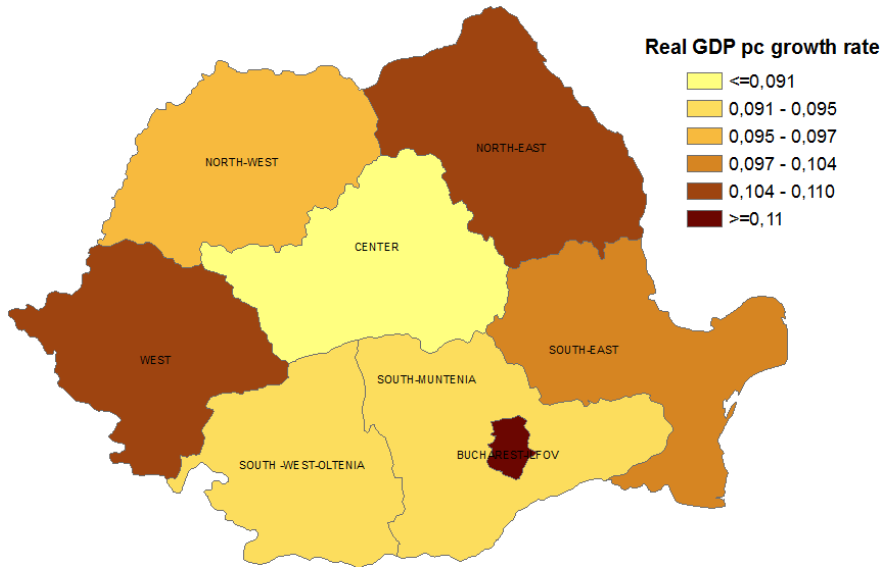
Figure 6. Average Growth Rate in Romania by periods: 2000-2008



Note: Region 1: North-East; Region 2: South-East; Region 3: South-Muntenia; Region 4: South –West Oltenia; Region 5: West; Region 6: North-West; Region 7: Center; Region 8: Bucharest-Ilfov

Source: Own elaboration based on INSSE and Eurostat data

Map 5. Real GDP per capita growth rate in Romanian economic regions: 2000-2008



Source: Own elaboration based on INSSE and Eurostat data (GDP base year 1995)

Table 2 provides us with the growth figures for the Romanian economic regions across the different periods covered by the analysis carried out above. The table is divided in seven columns which represent the growth rates for the whole period of analysis 1995-2008 (column 1) and 1996-2008 (column 2) [7], the period of recession 1995-2000 (columns 3) and 1996-2000 (column 4) [8], and the periods of expansion 2000-2004 (column 5) 2004-2008 (column 6) and both periods of expansion merged (2000-2008). The most remarkable feature is the one refering to the Bucharest-Ilfov economic region which was the only region that during the years of recesion stood up with positive per capita GDP growth rates. Bucharest-Ilfov economic region was able to grow at an average rate of about 2,5% during the black years of the transition 1996-2000 but reached growth rate values around 15% during the years of the economic boom 2000-2008. Another important feature in this table is that during the years of economic boom growth rates across the Romanian economic regions were not as variable as they were during the years of recession. During the recesion some regions fall down just -1% (the West economic region for example) while others fall more than -7.5% as is the case with the North-East economic region.

Table 2. Average growth rate by regions and periods

Region	1995-2008	1996-2008	1995-2000	1996-2000	2000-2004	2004-2008	2000-2008
REGION 1	4.8%	3.6%	-7.5%	-10.6%	12.1%	10.2%	11.1%
REGION 2	4.5%	4.5%	-5.2%	-7.5%	11.5%	9.4%	10.4%
REGION 3	4.2%	4.2%	-4.2%	-6.5%	8.4%	10.6%	9.5%
REGION 4	4.9%	4.4%	-2.7%	-6.1%	7.6%	11.7%	9.6%
REGION 5	6.4%	6.2%	-1.0%	-3.5%	11.7%	10.2%	11.0%
REGION 6	4.9%	4.7%	-3.1%	-3.9%	12.2%	7.2%	9.7%
REGION 7	5.1%	4.8%	-1.3%	-3.8%	8.5%	9.3%	9.1%
REGION 8	10.9%	11.2%	3.6%	2.6%	12.4%	18.5%	15.5%

Note: Region 1: North-East; Region 2: South-East; Region 3: South-Muntenia; Region 4: South –West Oltenia; Region 5: West; Region 6: North-West; Region 7: Center; Region 8: Bucharest-Ilfov

Source: Own elaboration based on INSSE and Eurostat data

[7] In column 2 we remove from the sample the last period of growth in the second half of the nineties (1996).

[8] Again these computations were carried out removing the data for the year 1996 and therefore all the years in this sub sample were years of recession and consequently the growth rates shown up more negative

4. Geographical Economics and Per Capita GDP Growth in Romania: 1995-2008

In this section we will carry out OLS estimations regressing growth rates for three periods, 1995-2008, 1995-2000 and 2000-2008 against the initial level of GDP per capita in 1995, 1995 and 2000 respectively and the increase in regional market potential observed over the period under analysis. The data for this analysis comes from the Romanian National Institute of Statistics located in Bucharest (NIS) which offers data on nominal GDP per capita (GDP p.c.) in the Romanian currency "new leu" (RON) at different levels of desegregation Nuts 1, Nuts 2 and Nuts 3 [9] and data on annual inflation rates at country level. In our case and following the vast majority of European regional convergence analysis, we will use data for the 42 counties in which Romania is divided at Nuts 2 level. Regarding the other key variable, the increase in the regional market access for the different periods of time, we have first computed the regional market potential for the years 1995, 2000 and 2008 by resorting to the, by now, well-known Harris´ (1954) market potential function. If we consider a world made up of n regions; i:1……..n, the Harris´ (1954). Harris´ (1954) market potential in its simplest formulation obeys to the following expression:

$$MP_i = \sum_{j=1}^{n} Y_j g(d_{ij}) \qquad (1)$$

where MPi is the market potential on location i, Yj is an index of purchasing capacity of location j (usually gross value added, gross domestic product or population), dij is the distance between two generic locations i and j and g(·) is a decreasing function. The market potential function can be understood as a measure of how far a location is from its consumer markets and therefore it can be used as a proxy for the demand potential that the whole population exerts over every location in the space. Therefore the higher is the market potential index of a location; the higher is its attraction power on production activities.

In our case we will compute market potentials for the years 1995, 2000 and 2008 proxying the volume of economic activity by the real Gross valued Added. In a second step we will compute the increase in regional market potentials over the period on which we run the estimations. Regarding the calculation of bilateral distances in the market potential function it is made on the basis of the road distances expressed in kilometres between the capital cities of each Nuts 2 region in which Romania is divided. For the calculation of the internal distance within each Nuts 2 region, it is approximated by a function that is proportional to the square root

[9] Nomenclature of Territorial Units for Statistics is a geographical division of the European Union´s territory that subdivides each Member State into a whole number of regions at NUTS 1 level. Each of them is then subdivided into a number of regions at NUTS 2 level and these again are subdivided into a number of regions at NUTS 3 level.

of each regions´ area. The expression used is $0.66\sqrt{\frac{Area}{\pi}}$ where area is each region area expressed in squared kilometres (km2). This expression gives the average distance between two points on a circular location (see Crozet 2004, Head and Mayer, 2000 and Nitsch 2000) for a discussion of this measure of internal distance).

Therefore the model adopts the following form:

$$\log\left[y_{i,t+T} \Big/ y_{i,t} \right] = \alpha + \beta \log\left[y_{i,t} \right] + \gamma \log[\Delta MP_{i,t,t+T}] + u_{it,t+T} \quad (2)$$

The term on the left-hand side of the equation is the growth of per capita GDP from the base year t to the year t+T. Initial per capita GDP in region i is given by $y_{i,t}$, $\Delta MP_{i,t,t+T}$ represents the change in market potentials between the base year, t, and the year t+T and and $u_{i,t,t+T}$ is the disturbance term.

As in the previous section, all data are nationally standardized in order to minimize spatial autocorrelation problems. Thus, our variables are indices of how well a county region is doing with respect to its national average or how much market potential a county has in relation to the national average. Results will tell us to which extend variations in market potentials are affecting counties 'performance.

Table 3 presents the results of estimating equation (2) on the sample of 42 regions in Romania for the periods 1995-2008, 1995-2000 and 2000-2008. In Columns 1 we regress the average per capita GDP growth rate in the period 1995-2008 on the 1995 per capita GDP level. In column 2 we regress the average per capita GDP growth rate in the period 1995-2000 on the 1995 per capita GDP level and in column 3 we regress the average per capita GDP growth rate in the period 2000-2008 on the 2000 per capita GDP level. The results of these first set of estimations show that the coefficient of the initial level of GDP per capita in each period is always positive and significant. Columns 3 to 6 introduce the effect of the variation in the market potentials over time. The results of these last set of estimations show once again that even after controlling for the effects of changes in regional market potentials over time the initial level of per capita GDP levels is positive and statistically significant. Moreover our results also point out to the fact that regional changes in market potentials positively affect Romanian cross-regional growth rates[10]. Similar results were obtained for the analysis of Polish regions (see Lopez-Rodriguez and Runiewizc-Wardyn, 2013).

[10] Lopez-Rodríguez et al (2011) in a related analysis linking market potential and the levels of wage disparities across Romanian regions showed that the spatial wage structure in Romania is pretty much affected by the economic geography of the country.

Table 3. Regional Growth estimations

Dependent Variable	**per Cápita GDP Growth**					
	1995-2008	1995-2000	2000-2008	1995-2008	1995-2000	2000-2008
Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.69** (0.06)	-0.25 (0.25)	0.94** (0.04)	0.56** (0.09)	-0.22 (0.26)	0.94** (0.095)
Log per cápita GDP 1995	0.29** (0.04)	1.44** (0.17)		0.52** (0.04)	1.42** (0.18)	
Log per cápita GDP 2000			0.026** (0.009)			0.034** (0.01)
Log inc MPGDP 1995-2008				0.11 (0.05)		
Log inc MPGDP 1995-2000					0.020** (0.009)	
Log inc MPGDP 2000-2008						0.094 (0.01)
Estimation	**OLS**	**OLS**	**OLS**	**OLS**	**OLS**	**OLS**
R2	0.55	0.69	0.51	0.59		0.57
Prob (F-statistic)	0.00	0.00	0.00	0.00	0.00	0.00
Number observations	42	42	42	42	42	42

Note: Table displays coefficients for OLS estimations and Huber-White heterocedasticity robust standard errors in parenthesis. The dependent variable is the log of per capita GDP growth in the years 1995-2008, 1995-2000 and 2000-2008 (Columns 1, 2, 3, 4 and 6). Log per capita GDP1995 and 2000, is the logs of per capita gross domestic product in the years 1995 and 2000, Log inc MPGDP1995-2008 , 1995-2000 and 2000-2008 are the increases in market potentials between 1995-2008 , 1995-2000 and 2000-2008 respectively. For data sources see text. * and ** signify statistical significance at the 5% and 1% levels

Source: Own elaboration based on INSSE and Eurostat data

5. Principal Component Analysis

So far in the previous sections of the paper we have analyzed the evolution of the Romanian economy from 1995 onwards by taking into consideration per capita GDP figures. Although looking at GDP figures give us a flavor of the state of the Romanian economy this basic macroeconomic indicator is not enough in order to describe all the social and economic turmoil that Romania has been going through especially during the 90s. In this section besides the per capita GDP figures we are going to take into consideration other set of relevant socio-macroeconomic indicators in order to disentangle the main factors behind the growth dynamics we have described in the previous sections of the chapter.

The study of the distribution of economic activity in space and the estimation of local income levels are two major problems presented by the Regional Economy. Although the growth of the economic activity can approach the level of

local development, in a strict sense it refers to the transformation of demographic, economic and social structures which usually accompanies growth. The multidisciplinary nature of this issue has led to the development of progressively more complex analysis that seeks to fit the new spatial economic systems and networks interactions (Nijkamp and Reggiani, 1998; Hewings et al., 2004; Capello and Nijkamp, 2004).

Among the difficulties that must save the studies on this subject, we should emphasize the choice of basic criteria from which to delimit the different frameworks, particularly when we find redundant information. At this point the so called Factor analysis or Principal Component Analysis (PCA) can be considered an appropriate tool since it eliminates all the redundant information based on the variables available. The program offers the possibility to analyze the internal logic of the data structure and facilitates the preparation of composite and interpretable structural variables under a given theoretical background, in our case under the growth dynamics across Romanian counties between 1995 and 2008.

In particular, the use of a reduction technique or data integration in aggregates or factors characterizing a particular economic reality, which is what Principal Component Analysis (PCA) does, has been traditionally a privileged heuristic way of carry out descriptive studies of the regionalization technique. These methods allow us firstly to identify homogeneous and functional areas and, secondly, to establish a ranking of territories because of their varying socio-economic dynamism (Paelinck and Nijkamp, 1975).

The Principal Component Analysis, as well as other techniques for data reduction (factorial analysis in its various forms), are based on the idea of the existence of underlying dimensions that help explain a phenomenon as complex and multidimensional as is the local development[11]. At the same time the clusters technique (cluster analysis) is a fitting complement to the PCA that allows us to classify cases instead of variables. To be more accurate we use a clustering technique based on the inter-counties similarities which are translated in terms of variables as "proximity-difference" between the observations of each county, grouping the cases according to the minimization of the distances between variables. Therefore, what we are doing with these type of techniques is to study correlations between a large number of variables and group them into explanatory factors and characterize the reality of the Romanian socio-economic development between 1995-2008 based on the factors that can be interpreted and supporting our interpretation with local development theories (Aluja Banet, 1999).

Our factor analysis is based on the study of three different points in time; 1995 which is the first year in our sample and also the first year in our analysis, then the year 2000 which is the initial year of the Romanian recovery after the recession

[11] PCA – Principal Component Analysis presents similarities with the Factor Analysis, however, there are important differences, being the most important the fact that the PCA assumed that there is no variance of the variables themselves but the whole variance is common or shared

of the second half of the nineties and 2008 which is the last year of our sample and also the last year of the economic boom in Romania. The factor analysis is carried out using information on 19 socio-economic indicators at county level: number of internal migration flows from and out of each county (migrji,year,In and migrji,year,Out), real per capita GDP figures (Real GDP, year), unemployment rate (u, year), employment rate (Ocup Rate), labor force participation rate (Active Rate), number of inhabitants (Hab, year), population density (Hab Density), share of workers in agriculture (%Agriculture), industry (%Industry) and services sector (%Services), percentage of population with primary (% Ed P, year), secondary (% Ed S, year) and tertiary educational attainment levels (% Ed T, year), wages in agriculture (wia, tyear), industry (win, year) and services sector (wis, year) total wages (wi, tyear) and R&D investments as percentage of GDP (r&d, year).

Table 4. Total Variance Explained, 1995

Comp	Initial Elgenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Var	Cumulat %	Total	% of Var	Cumulat %	Total	% of Var	Cumulat %
1	7.090	37.316	37.316	7.090	37.316	37.316	6.622	34.854	34.854
2	4.393	23.119	60.435	4.393	23.119	60.435	3.996	21.032	55.886
3	1.918	10.094	70.529	1.918	10.094	70.529	1.845	9.709	65.595
4	1.306	6.873	77.402	1.306	6.873	77.402	1.694	8.916	74.511
5	1.127	5.93	83.331	1.127	5.93	83.331	1.676	8.82	83.331
6	0.824	4.339	87.67						
7	0.686	3.613	91.283						
8	0.543	2.859	94.142						
9	0.385	2.026	96.168						
10	0.222	1.166	97.334						
11	0.209	1.098	98.432						
12	0.116	0.612	99.044						
13	0.086	0.454	99.498						
14	0.047	0.248	99.746						
15	0.033	0.173	99.919						
16	0.010	0.051	99.97						
17	0.004	0.018	99.988						
18	0.002	0.012	100.000						
19	0.000	0	100.000						

Note: Extraction Method: Principal Component Analysis

Source: Own elaboration based on INSSE and Eurostat data

Table 4 shows the results for the first year 1995 and it can be seen that the program creates five factors or components extracted from our 19 indicators which jointly explain around 83.3% of total variance, although the first four already explain 77% of the total variance. We have to mention that these five factors are orthogonal and therefore problems such as multicollinearity do not exist. In order to interpret the mentioned factors we have to take a look at table 5 which contains the loadings of the variables (indicators) in the factors which have been extracted.

Table 5. Rotated component Matrix, 1995

	Component				
	1	2	3	4	5
migrji,1995,In	.975				
migrji,1995,Out	.974				
Real GDP, 1995	.958				
Hab, 1995	.945				
Hab.Density	.932				
r&d,1995	.930				
% Ed S, 1995	.702				
%Industry		-.958			
% Ed T, 1995		.889			
% Ed P, 1995		.888			
%Agriculture		.769			
%Services	.440	.687			
Ocup Rate		-.483		.452	.452
win,1995			.969		
wi,t1995			.815		
Active Rate				.809	-.882
wis,1995				.803	.613
u, 1995					
wia,t1995					

Note: Rotation Method: Varimax with Kaiser Normalization

Source: Own elaboration based on INSSE figures

Table 5 shows that the first factor (component) is made up of eight indicators: migration into the county, migration out of the county, Real GDP, number of habitants, density, R&D expenditure, percentage of population with secondary education attainment levels and percentage of workers in the tertiary sector. This information reveals that this factor could be termed as *agglomeration*. The second factor (component) is made up of the following indicators; share of workers in the agriculture, industry and tertiary sectors, percentage of population with primary education attainment levels and employment rate. This factor could be termed as *sectorial structure*.

The next set of indicators which made up the third factor (component) are the following: total wages and wages in the industrial sector and therefore this factor could be named as *relative labour costs*. As a conclusion for the analysis carried out for the year 1995 we have a map of total economic chaos, linked to the economy inheritance of the previous year and a complete fail in the implementation of economic reforms towards a well-functioning market economy.

Table 6. Total Variance Explained, 2000

Comp	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Var	Cumul %	Total	% of Var	Cumul %
1	7.357	38.721	38.721	6.803	35.806	35.806
2	3.211	16.899	55.620	2.863	15.070	50.875
3	1.763	9.278	64.898	2.149	11.311	62.186
4	1.502	7.904	72.802	1.735	9.130	71.316
5	1.400	7.366	80.168	1.682	8.852	80.168
6	.813	4.281	84.450			
7	.745	3.921	88.370			
8	.610	3.210	91.580			
9	.483	2.544	94.123			
10	.363	1.909	96.033			
11	.316	1.665	97.698			
12	.202	1.064	98.762			
13	.137	.724	99.486			
14	.036	.190	99.676			
15	.025	.130	99.806			
16	.019	.101	99.907			
17	.011	.058	99.965			
18	.007	.035	100.000			
19	.000	.000	100.000			

Source: Own elaboration based on INSSE figures

Table 6 contains the results for the year 2000. In this case the first four factors (components) explain more than 72% of the total variance.

Table 7. Rotated component Matrix, 2000

	Component				
	1	**2**	**3**	**4**	**5**
Real GDP, 2000	.950				
Hab, 2000	.948				
migrji,2000,Out	.935				
migrji,2000,In	.907				
r&d,2000	.903				
Hab.Density	.902				
% Ed T, 2000	.780				
wis,2000	.452		.437	.301	
%Industry		.943			
%Services	.465	-.697			
%Agriculture	-.369	-.688			
% Ed S, 2000	.400	.684		.404	
wia,t2000		-.571			
win,2000			.963		
wi,t2000	.421		.849		
u, 2000				.829	
% Ed P, 2000				.796	
Ocup Rate					.928
Active Rate					-.877

Source: Own elaboration based on INSSE figures

Although we have found that there are three indicators which load in two factors the weights are higher in the second factor, that is, they are more correlated with the second factor which we have termed before as sectorial structure. These results are coherent with the interpretation we have given to these factors in the previous analysis (year 1995). Therefore, the first factor (component) is made up of 8 indicators: Real GDP, number of habitants, migration into the county, migration out of the county, R&D expenditure, population density, and wages in the tertiary sector. In this case, the factor can be named in a similar way than before (*agglomeration*). The second factor includes the next indicators: % Industry, %services, %agriculture, %Ed S, 2000 and wia, t2000. This factor could be named as sectorial structure but it is important to highlight that apart from the standard variables which help us to understand the structure of the economy, the variables wages in agriculture and the share of agriculture in total GDP seem to be highly correlated. This result reveals, on the one hand, the important weight assigned to agriculture in this economy and the corresponding labour costs associated to these activities.

The third factor (component) which includes wages in the secondary sector and total wages can be named as *industrial development*. The four factor (component) which includes total unemployment and % of population with primary education can be named as school enrollment and *labour hiring*. Finally the last factor includes occupation and active rates and can be labeled as *economic activity*.

So the landscape depicted for 2000 points out to the fact that the economic development in Romania could be mainly explained by two big factors. On the one hand, agglomeration explains to a largest extend the economic development across Romanian regions. On the other hand, the second factor, which explains an important part of the variance of the economic development, is the sectorial structure. Indeed, we highlight the important weight associated to agriculture which is counteracting the economic progress. Therefore, although recognizing the importance of the agriculture sector in Romania, we emphasize the challenge faced by this sector to create more value added which will lead to a better factor remuneration in this sector (farmers, small producers, etc) and to a better competitive position in European market.

Finally, the analysis for the year 2008 is shown in tables 8 and 9. After more than eight years in a row of economic growth in Romania, the results in table 8 show that the first factor (component) is again agglomeration. As it can be seen in table 9, this factor includes not only the same variables which we have identified previously but also the share of services over GDP. Although, the addition of the latter variable to the first factor could seem to be counterintuitive, the inclusion is meaningful. The explanation behind this result lies on the fact that the economic activity in Romania is highly concentrated in the capital of the country (Bucharest). In fact, there is a huge bias of concentration in services activities in the capital.

Table 8. Total Variance Explained, 2008

Comp	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Var	Cum %	Total	% of Var	Cum%
1	9.259	48.733	48.733	7.694	40.497	40.497
2	2.767	14.564	63.297	2.779	14.628	55.125
3	1.615	8.502	71.799	2.335	12.292	67.417
4	1.306	6.876	78.675	2.139	11.258	78.675
5	.941	4.952	83.627			
6	.771	4.060	87.686			
7	.679	3.572	91.258			
8	.509	2.678	93.937			
9	.460	2.423	96.360			
10	.274	1.443	97.803			
11	.198	1.040	98.843			
12	.089	.471	99.313			
13	.079	.418	99.732			
14	.021	.111	99.842			
15	.014	.075	99.917			
16	.012	.061	99.978			
17	.003	.015	99.993			
18	.001	.007	100.000			
19	.000	.000	100.000			

Source: Own elaboration based on INSSE figures

Now the results depict a totally different socioeconomic landscape. The new (components) variables make more "economic" sense to explain the situation of the Romanian economy in 2008 than the results for the previous years.

Table 9. Rotated component Matrix, 2008

	Component			
	1	**2**	**3**	**4**
migrji,2008,Out	.946			
migrji,2008,In	.920			
Hab, 2008	.917			
Real GDP, 2008	.906		.306	
Hab.Density	.872			
r&d,2008	.871		.318	
% Ed T, 2008	.741		.378	
wi,t2008	.733			.499
%Services	.721	-.540		
%Industry	-.591	.734		
%Agriculture		-.726		
% Ed S, 2008		.697		-.580
win,2008	.488	.505	-.308	.435
wis,2008	.362	.434		
u, 2008			-.694	
Active Rate		.327	.688	
Ocup Rate	.461	.410	.682	
wia,t2008				.824
% Ed P, 2008			-.477	-.642

Source: Own elaboration based on INSSE figures

The second factor can also be named as *sectorial structure*. This factor includes the same range of indicators than in the previous analysis additionally the remuneration of the factors associated to these activities (agriculture, industry…..). The third factor can be again labeled as *economic activity*.

Finally the last factor can be name as *school enrollment and labor hiring*.

We can wrap up this analysis by establishing three main conclusions: firstly agglomeration is playing the most important role in explaining the economic development in Romania in the period from 1995 to 2008. This effect is more and more important over the course of the years. In fact, a striking fact about economic activity in Romania is that it is highly concentrated around the capital, being this concentration much more pronounced in the service sector (the 2008 PCA have clearly shown this). Secondly, the sectorial structure is the second factor in explaining the economic development. At this point the agriculture sector arises as a key sector. Nevertheless, it is necessary to mention that an improvement of the competitiveness and remuneration of labor force within this sector is still needed. Finally, the economy of Romania strongly needs not only get higher human capital levels but also match in a better way school education with labour demand, i.e higher education targeted to managerial duties, marketing, innovation, management

for instance in the agriculture sector and to create technological platforms to support the agriculture activities.

6. Conclusions

In this paper the growth dynamics of the Romanian economic over the period 1995-2008 have been studied and them a link between the geographical economics of Romania and the observed patterns of growth has been established. Additionally we have also performed a principal component analysis in order to take into consideration other set of relevant socio-macroeconomic indicators and disentangle the main factors behind the growth dynamics of the Romanian economy. The results of growth regressions carried out for the different periods show that the coefficient of the initial level of GDP per capita in each period is always positive and significant, signaling a process of regional divergence and therefore giving support to the fact that disparities across Romanian counties, regardless of the time period under analysis, have not been narrowing away. Moreover our results also point out to the fact that regional changes in market potentials positively affect Romanian cross-regional growth rates and therefore the economic geography of Romania emerges as one of the key factors behind this divergence phenomenon. The attenuation of this divergence phenomenon within Romanian regions will need the right policy measures. The recent Romanian EU membership and the flow of EU structural funds towards Romanian regions will give a very good opportunity to overcome many of the structural problems the economy is facing.

Finally, the Principal Component Analysis performed in the last part of the chapter allowed us to establish three main conclusions: firstly agglomeration is playing the most important role in explaining the economic development in Romania in the period from 1995 to 2008. This effect is more and more important over the course of the years. In fact, a striking fact about economic activity in Romania is that it is highly concentrated around the capital, being this concentration much more pronounced in the service sector (the 2008 PCA have clearly shown this). Secondly, the sectorial structure is the second factor in explaining the economic development. At this point the agriculture sector arises as a key sector. Nevertheless, it is necessary to mention that an improvement of the competitiveness and remuneration of labor force within this sector is still needed. Finally, the economy of Romania strongly needs not only get higher human capital levels but also match in a better way school education with labour demand, i.e higher education targeted to managerial duties, marketing, innovation, management for instance in the agriculture sector and to create technological platforms to support the agriculture activities.

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