# CATCHING UP OR FALLING BEHIND? ECONOMIC CONVERGENCE AND REGIONAL DEVELOPMENT TRAJECTORIES IN ROMANIA

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**Abstract** – The main aim of the article is to analyse the economic convergence between the NUTS 3 level units (counties) in Romania during a period of intensive economic growth (1999-2011). The main added value of the paper consists in the measurement of the multi-dimensional convergence and in adding a spatial dimension to the convergence analysis by testing the spatial autocorrelation. We have found no economic convergence for the analysed period, the economic growth process being polarized by the capital region. But in contrast, we have evidenced a social convergence process, starting with 2008 for the education component of the HDI and starting even earlier, in 2004, for the life expectancy component. In addition, we have tested the convergence club hypothesis, which has evidenced the club convergence phenomena in Romania as well.

**Keywords:** multi-dimensional convergence, regional disparities, spatial autocorrelation, club convergence, Romania

## INTRODUCTION

Strengthening the territorial cohesion at regional level, especially in those Member States confronted with huge regional disparities (such as the new Member States in Central and Eastern Europe), is one of the main objectives of the Cohesion Policy (European Commission, 2007, 2009, 2011). Economic convergence should contribute to the achievement of these goals, generating an intensive academic debate about the role of this process in strengthening territorial cohesion.

This paper aims at exploring the economic convergence in Romania, covering a period which starts before the EU accession and spans until the latest available data (1999-2011). We will emphasise the role of spatial and national context for economic growth and convergence. The question is extremely sensitive in the case of Romania, a country experiencing the highest level of internal income inequalities among the EU members, after the United Kingdom. The added value of this paper comes from setting the analysis of the economic convergence at the NUTS 3 level, which has been largely ignored by previous scientific works, but which is very relevant in the specific CEE territorial context, where NUTS 2 regions are rather heterogeneous and the intra-regional gaps tend to be more significant than the inter-regional ones. The second main aim of the paper is to test whether the "convergence club" hypothesis can be validated at NUTS 3 level in Romania.

The paper is structured as follows: after the introduction, the second chapter offers a theoretical background of the previous research results on convergence, including the new concept of multi-dimensional convergence, and a synthesis of the economic convergence process in the EU. The third section will analyse the economic convergence (sigma and beta-convergence), and the multi-dimensional convergence process in the NUTS 3 regions (counties) in Romania. As proxies for the

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economic convergence, we use the Gross Domestic Product (GDP) per capita, and the Human Development Index (HDI) for the measurement of the multi-dimensional convergence at NUTS 3 level (42 counties). In the fourth section of the paper, we focus on testing the hypothesis of convergence clubs. Finally, the paper ends with a summary of key findings.

## ECONOMIC CONVERGENCE: THEORETICAL BACKGROUND

Most of the previous research outputs on convergence rely on the rich theoretical background of the neoclassical theory of absolute (unconditional) convergence, which satisfactory explains the evolution of regional disparities: regions with low capital/work ratios have a greater marginal productivity of capital and consequently grow faster than richer regions, given the same level of saving and investments. As a result, disparities tend to decrease on short-term, due to the lower costs of factors in poorer regions, which attract more investors. However, on long-term, the mobility of factors and free trade, together with the rapid dissemination of the progress and know-how, which is considered a public asset, encourage the regional income convergence (Solow, 1956).

Thus, most of the convergence studies are based on the beta-convergence concept, an exogenous growth model (Solow, 1956), stating that growth is generated by the exogenous offer of inputs, determining constant margins or scaled decreases, by using a linear regression approach, which compares the GDP per capita growth rates between poor and rich regions.

Barro and Sala-i-Martin (1991) have made a clear distinction between the beta-convergence, showing the rate of convergence between regions and, therefore, being used to predict conditional and absolute convergence, and sigma-convergence, which measures the dispersion of growth using standard deviation or the coefficient of variation of a certain sample. Sigma-convergence is also useful to observe the alternation of divergence and convergence intervals.

To sum-up, this model shows that after a region reaches its steady state, it will grow at the rate of technological progress and that the fastest economic growth (in terms of GDP) will be reported for those regions that are below this state (Stanisic, 2012).

The conditional convergence approach has been combined, in the latest years, with the theory of endogenous growth, by explaining the regional disparities through the accumulation of knowledge and physical capital (Romer, 1986), or by enlarging the range of convergence factors with human capital, innovation and knowledge transfer, or increased margins (Barro, 1991). This hypothesis is actually validated by most of the empirical studies showing that convergence is largely conditioned not only by the level of productivity and profit, but also by the accumulation of human capital and innovation. On the other hand, the absolute convergence can be observed only in the case of very heterogeneous regions – the so-called “convergence clubs” hypothesis (Chatterji, 1992).

Moreover, some scholars discuss about the convergence’s cyclicity: intervals of growing territorial disparities are usually followed by phases of convergence (Qash, 1996).

As concerns the Cohesion Policy, many researchers have stated that regional disparities in the European Union have not diminished in the last decades and, on the contrary, they increased, whereas the countries tend towards a certain convergence (Magrini, 1999).

Studies carried out in the Member States since the beginning of the 1990s (Armstrong, 1995; Tondl, 2001; Le Gallo et al., 2003; Arbia and Piras, 2004) emphasise the relationships between the regional income disparities and growth. Some of these empirical works also show that the speed of convergence over shorter periods may deviate significantly from the long run average (e.g. Barro and Sala-i-Martin, 1995). Overall, there is a relative consensus among all observers that a phenomenon of income convergence can be observed between countries (Barro, 1991; Barro and Sala-i-Martin 1992; Islam, 1995; Abreu et al., 2005; Matkowski and Prochniak, 2007; Czasonis and Quinn, 2012).

The analysis at NUTS 2 level offers a different perspective on the convergence process taking place in the European Union (Armstrong, 1995). These studies indicate a general trend to beta-convergence with varying intensity according to the time frame of the analysis, geographic area and methodology of convergence used. Certain explanations for this economic reality can be found in the models of Krugman (1987) and Lucas (1988), stating that specialization causes divergence in per capita income, because endogenous productivity improvements affect mainly the production of the high-tech sector and because after integration countries generally specialize in the sector in which they have a comparative advantage. Empiric studies show that the lack of convergence between regions hides a process of polarization across groups of regions, which is altered by the knowledge spillovers in the high-tech sector (Gianetti, 2002). The same can be stated for the NUTS 3 regions (Tóth and Nagy, 2013), but overall conclusion is hard to formulate due to the low number of empirical analyses carried out at this level. In this sense, our study fills a research gap for the Romanian context.

This approach assumes that convergence among certain clusters of regions called “convergence clubs” is deepening, whereas the disparities between these clubs are growing (Baumol, 1986). It accounts for the possibility of multiple equilibrium and steady states to which relative heterogeneous economies converge.

Therefore, our initial assumption is that inter-regional (NUTS 3) disparities have grown in the last decade and that different convergence clubs have been developed among the 42 counties in Romania, building the framework for the future development of the considered regions.

At the moment, the regional performance of the regions is measured in GDP per capita. However, GDP fails to give a clear image of a region’s welfare, as it ignores the issues of income distribution (Sen, 1976), the individual social-related welfare indicators, such as health, family status, freedom, employment, etc. (Easterlin, 2001; Oswald, 1997), as well as the environmental impact of the economic activity (Solow, 1993). Even more, at global scale, Becker et al. found that the income and health inequality trends have been different: while the income inequalities have a growing tendency, cross-country inequality in different dimensions of health was reduced (Becker et al., 2005).

In this context, the one-dimensional (economic) approach of development becomes insufficient and limitative. To overcome these gaps between economy and society, some researchers (Perrons, 2012; Royuela and García, 2015; Rodríguez-Pose and Tselios, 2015) have defined the concept of convergence as a multi-dimensional process, while the mainstream economics still operates with the one-dimensional economic convergence concept, proxied by GDP per capita based approach.

For this purpose a wide range of indicators can be used, such as the ones based on the Human Development Index (HDI), measuring the progress achieved by a territory (country) in three distinct dimensions: a long and healthy life, knowledge and a decent standard of living (UNDP, 2013). Sen’s index of social welfare (Sen, 1974) has also been the source of inspiration for different empiric studies on the multidimensional aspects of well-being and convergence (Rodríguez-Pose and Tselios, 2015). However, using the HDI components has the advantage of a good international comparability, taking into account this indicator is annually calculated by the United Nations Development Program (UNDP).

The European Union has also started developing more complex indicators for its political purposes that complement the classical GDP with social and environmental positive and negative externalities. The most relevant step in this direction has been the concept of the Sustainable Development Indicators (SDIs), comprising 10 themes of analysis with over 100 indicators. The Commission on the Measurement of Economic Performance and Social Progress (CMEPSP), led by Stiglitz, Sen and Fitoussi, has a very prolific activity and defines the concept of well-being with the following dimensions (Stiglitz et al., 2010): material living standards (income, consumption, wealth), health, education, political representation and governance, social and personal connections, environment, economic and physical insecurity.

At international level, efficiency and equity tend to go hand in hand; the analysis at NUTS 2 level indicates they are actually divergent objectives and not simultaneous (Royuela and García, 2015). All the above-mentioned approaches agree on the fact that measuring progress involves taking into account economic, environmental and social issues. Thus, this paper tries to clarify whether multi-dimensional convergence occurs at the level of Romanian NUTS 3 regions, in the framework of strong economic and spatial polarization.

## DATA AND VARIABLES. METHODOLOGY

In this analysis, to test the economic convergence of Romania, we examined on the one hand the GDP per capita and its yearly average growth rate, and on the other hand the HDI. The examined territorial level was the NUTS 3 regions of Romania, so the counties. The number of study units was 42 territories, because it is the lowest territorial level at which the examined indicators are available. The length of the test period was from 1999 to 2011 because the county level GDP data of Romania are calculated only from this period using the EU methodology.

The HDI was calculated by the authors for all counties using the methodology of the United Nations. Three sub-indicators were used, like the GDP per capita, the life expectancy at birth and the student's participation ratio at school (the enrolment levels). The source of data was Eurostat, the databank of the EU. For the GDP per capita, we used a logarithmic transformation. After calculating the three sub-indices, the HDI was computed by using the geometric mean of indicators.

The sigma-convergence of the data was tested by the CV indicator, which means the coefficient of variation. It was calculated by the division of the standard deviation and the mean of the data.

$$CV = \frac{standard\ deviation}{mean}$$

The CV indicator shows if the convergence is realized or not. If its value is decreasing in time, then the sigma-convergence is realized.

The beta-convergence was measured by the linear regression of the GDP per capita and its yearly average growth rate. In this case, the linear regression line shows the presence of the beta-convergence. If the beta-coefficient of the equation is negative, it is realized. The reliability of the model is measured by the R squared. The county incomes convergence to the average county values was tested by the beta-convergence analysis.

The spatial autocorrelation was tested using the GeoDa program, developed by Luc Anselin. This program serves especially the spatial analysis techniques. The program can help perform spatial analysis, spatial autocorrelation analysis, and spatial modelling. Beside the linear regression modelling (without any spatial effects), spatial lag and spatial error examination can be made as well. The Moran's I index was calculated by the k-nearest neighbours method with 5 neighbours and 999 permutations. These permutations are for testing the normality and significance of the model.

For the calculation of the convergence clubs, we used the relationship between the GDP or HDI at the beginning year, and the yearly average growth rate of the indicators in the analysed period. By the analysis in every clubs, the inner convergence was also tested by linear regression analysis. In order to form convergence clubs, the SPSS programs Ward method was used. This method is a hierarchical cluster technique and a variance model. The aim of the method is to form optimal number of clusters by minimizing the variance growth within the clusters.

Three indicators were used to calculate the HDI at county level. These are the GDP/capita, the life expectancy at birth, and the education component. A logarithmic transformation was used for the GDP/capita and the whole HDI indicator was calculated by using the geometric mean of the three sub-indices. The HDI was calculated according to the methodology of the United Nations.

## CASE STUDY: ECONOMIC AND MULTI-DIMENSIONAL CONVERGENCE IN ROMANIA

As indicated above, economic convergence is a long-term and nonlinear process. Moreover, the experience of the last two-three decades shows that there is a trend towards convergence reported among the EU State Members, while the disparities between NUTS 2 regions tend to grow, especially in times of crisis such as the one installed in 2008. However, the NUTS 2 regions are quite heterogeneous in Romania and there is little empirical proof on the existence of potential convergence clubs at NUTS 3 level.

### Sigma-convergence

The coefficient of variation shows if the sigma-convergence is realized or not. If the CV is decreasing in time, then the sigma-convergence is realized in that period. In the case of Romania (NUTS 3), the CV index of the GDP per capita shows a divergence processes from 1999 to 2011. The

CV index increased in that time from 0.27 to 0.44, which means that the regional disparities were growing.

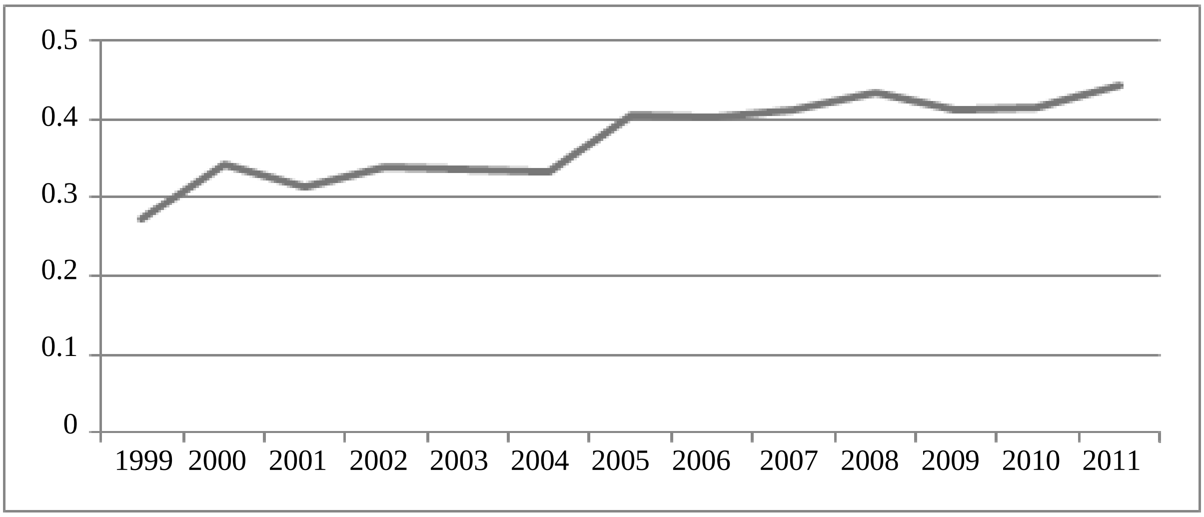


**Figure 1.** *The Coefficient of Variation of the GDP per capita in Romania, at NUTS 3 level (1999-2011)*
Source: Own calculations, based on the data series from the Romanian National Institute for Statistics, 1999-2011

In the case of the HDI, there was a small divergence process from 1999 to 2007; the CV index rose from 0.049 to 0.068. But, from 2008, the sigma-convergence of HDI was realized, although the data of 2011 is still higher than in 1999.

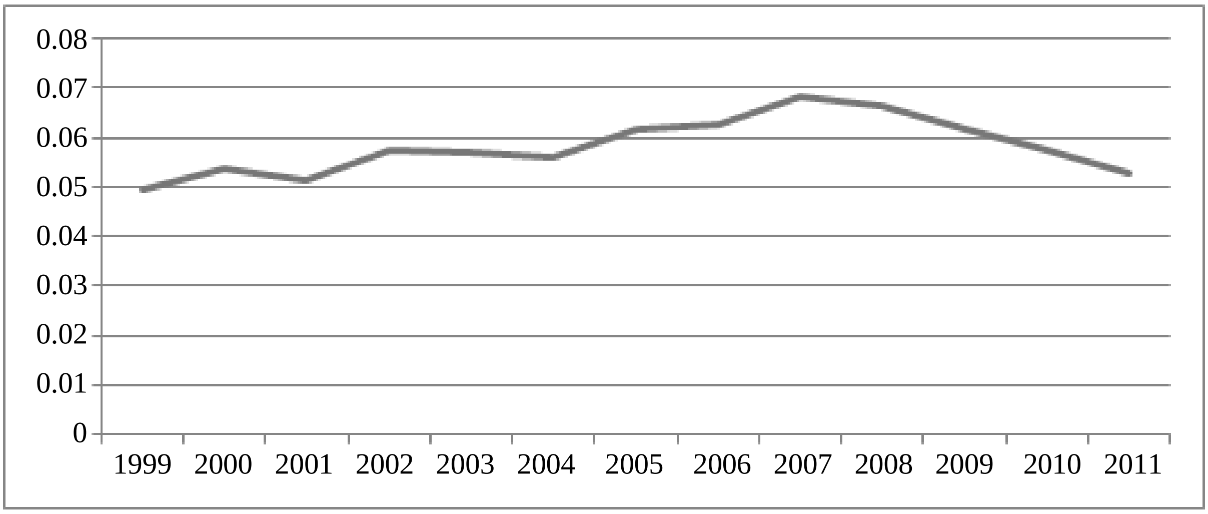


**Figure 2.** *The Coefficient of Variation of the HDI in Romania, at NUTS 3 level (1999-2011)*
Source: Own calculations, based on the data-series from the Romanian National Institute for Statistics and EUROSTAT, 1999-2011

A first conclusion that can be drawn by comparing the results: the divergence of the CV index of the HDI is much smaller than the one of the GDP per capita. Moreover, since 2007, NUTS 3 regions seem to follow a HDI convergence path although the economic disparities between them continue to grow.

**Beta-convergence**

In the case of beta-convergence, the relationship between the initial value (1999) and the yearly average growth rate of GDP per capita was analysed. If the beta coefficient of the equation (linear regression line) is negative, then the beta-convergence is realized.

**Table 1**. *Beta-convergence of Romania (based on NUTS 3 regions) – GDP and HDI*

| | GDP/capita | | | HDI | | |
|---|---|---|---|---|---|---|
| | **no spatial effects** | **spatial lag** | **spatial error** | **no spatial effects** | **spatial lag** | **spatial error** |
| ρ (Rho) | | 0.231886 | | | | |
| λ (Lambda) | | | | | | 0.411813 |
| $R^2$ | 0.8847 | 0.899 | | 0.901042 | | 0.912780 |
| F-statistic | 299.266 | | | 355.105 | | |
| AIC (Akaike information criteria) | 664.443 | 661.145 | | -244.492 | | -248.031 |
| number of observations | 41 | 41 | | 41 | | 41 |
| LM test (no spatial lag) | 5.7651072** | | | 3.4251443 | | |
| Robost LM test (no spatial lag) | 4.1674355 | | | 1.1744324 | | |
| LM test (no spatial error) | 1.6257123 | | | 3.6022600* | | |
| Robost LM test (no spatial error) | 0.0280407 | | | 1.3515481 | | |

**1% significance level
*5% significance level
Source: Own calculations, based on the data-series from the Romanian National Institute for Statistics, 1999-2011

The Moran I indices of the GDP/capita are at 10% significance level significant, while the HDI values at 1%.

The decision method of the spatial regression is the following. First, we have calculated the OLS regression of the analysed values, then we controlled the LM diagnostics. If both of the LM tests are non-significant, then the null hypothesis will be not rejected (so there is no spatial autocorrelation). In that case, the OLS results are valid. If one of the parameters is significant, then we run the relevant model, and either the spatial lag or the spatial error model will be valid.

The tests of the spatial regression table are the following:

– If there is no spatial effect, then the OLS regression is valid. ($y=\beta X+\varepsilon$)
– The spatial lag model contains a spatially lagged variable. In that case, the neighbouring values of the dependent variable have a direct effect to the dependent variable. ($y=\rho Wy+X\beta+\varepsilon$)
– In the spatial error model, the spatial dependence is observable by the error coefficient (for example by the missing values).

$$y=X\beta+u$$
$$u=\lambda Wu+\varepsilon$$

– $R^2$ shows the reliability of the model, how it fits to the values.
– AIC (Akaike Information Criteria): this criterion serves for the comparison of models. According to the AIC, the smaller value is better.
– LM test (Lagrange Multiplier): these LM tests are good for testing the spatial autocorrelation of the model. With the help of the LM test, the most relevant model can be chosen from OLS regression, spatial lag and spatial error models.
– Rho: the Rho measures the spatial dependence in the model. The main question is what kind of effects has the neighbouring territories on each other. The direction of the indicator shows

the direction of the effect (positive, negative). If the Rho is positive, then the counties (which have neighbours with high GDP/capita) will also have higher GDP/capita values.

– Lambda: the Lambda serves for the spatially autocorrelated error coefficient. If the Lambda is not zero, then there is a spatial dependence in the error coefficients of the neighbouring territories.

**The results of the beta-convergence test**

From the analysis of beta-convergence it results that, in the case of both the examined indicators (GDP/capita and HDI), the reliability of the regression models is high (it shows the R square of the data).

In the analysis of the beta-convergence, the GeoDa program used 41 observations because the counties of Bucharest and Ilfov are not separate regions in its map.

After testing the spatial regression with the Lagrange Multiplier tests, we can assert that in the case of the GDP/capita, the spatial lag model is significant at 1%, which shows that the model will contain a spatially lagged variable. Testing the spatial lag model shows that the Rho coefficient of the model is positive. It means that the counties (which have neighbours with high GDP/capita) will also have higher GDP/capita values. The AIC criteria of the models also verify the spatial lag model (it is lower in the spatial lag model). In this case, the R square is also higher.

In the case of the HDI, the LM test is significant by the spatial error model at 5%. It means that the spatial dependence is observable by the error coefficient. The lambda, the R square of the model and the AIC criteria also verify the existence of the spatial error model.

**SPSS test – GDP/capita**

**Table 2**. *Model summary of the GDP/capita*

| Model Summary | | |
|---|---|---|
| R Square | F statistic | Durbin-Watson |
| 0.888 | 317.778** | 1.381 |

**1% significance level
Source: Own calculations

$$Y= -1150.747 + 3.993x$$

By using this model, it can be seen that the beta-convergence is realized. The R square is very high, so the model's reliability is also high. This regression is significant at 1% level according to the F statistic.

**HDI**

**Table 3**. *Model summary of the HDI*

| Model Summary | | |
|---|---|---|
| R Square | F statistic | Durbin-Watson |
| 0.902 | 366.798** | 2.304 |

**1% significance level
Source: Own calculations

$$Y= 0.020 + 1.050x$$

When taking into consideration the HDI, it can be seen that the model's reliability is very high. This is also significant at 1%, but the regression equation shows small divergence of the model.

In the case of the GDP per capita, the beta-coefficient is positive, so it shows a little divergence process in the country. It means that if the initial GDP is increasing, then the growth rate will be increasing, too, so disparities are growing. However, the reliability of the model is relatively low because the linear regression fits in only 0.17%.

In the case of the HDI, the beta-convergence was realized in that time, so the initially underdeveloped territories could reach on the average higher HDI growth rates than the initially more developed. Therefore, there is an important catch up process in the HDI. The linear regression model fits in 0.34%.

The causes of this beta-convergence can be found in the education and the life expectancy values, because the indicator of GDP showed divergence. The beta-convergence (as well as the sigma one) was achieved in the life expectancy indicator, while the linear regression line fits in 23.81%. The most dynamic growing regions were Bihor, Vâlcea and Constanţa with over 0.8% growth per year, while the less dynamic was Vaslui with almost 0.4% per year. Satu Mare, Cluj and Maramureş had also high growth rates in the period under analysis. The convergence in health services can be generally explained by investments in the network of county emergency hospitals.

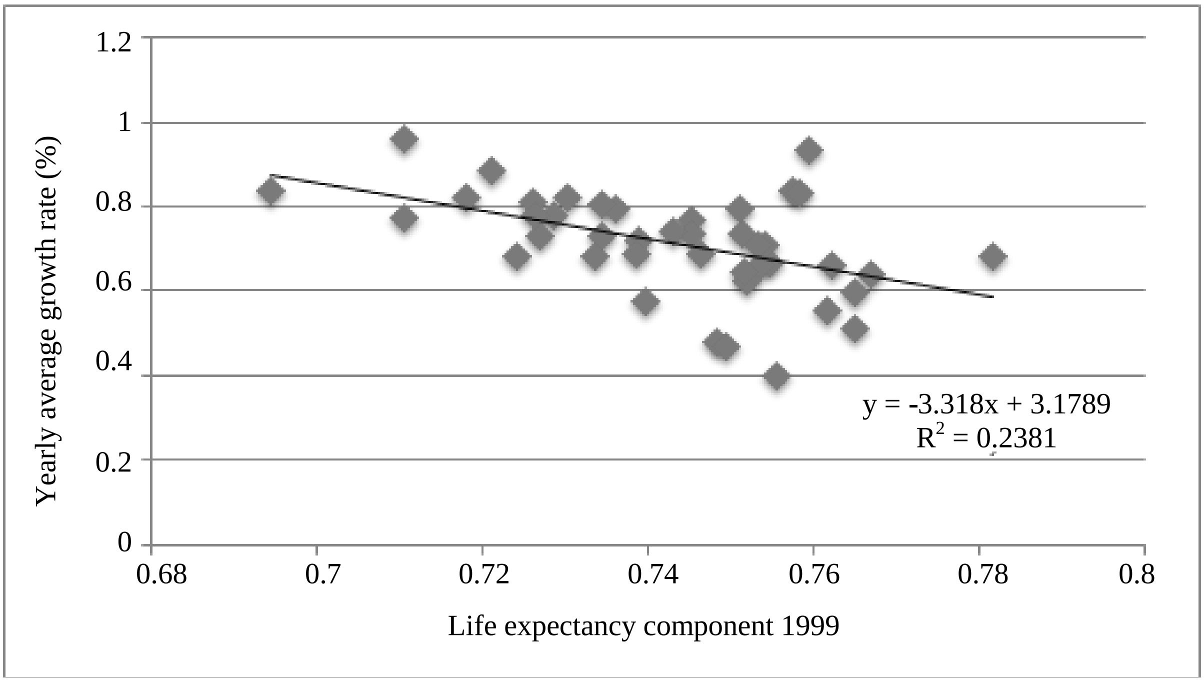


**Figure 3.** *The beta-convergence of the life expectancy component*
Source: compiled by the authors

The beta-convergence analysis shows divergence in the education component indicator. The linear regression has only 1,4% reliability. The NUTS 3 regions, except Arad, had negative yearly average growth rates, the highest in Tulcea. Beside Arad, only in the regions of Mureş and Constanţa was the value less than -0,5% yearly. The negative growth rates can be explained by the decreasing number of children and students, resulting from a low birth-rate, on one hand, but also by the concentration of student population in only a few university centers (Bucharest, Cluj-Napoca, Iaşi, Braşov, Timişoara, Constanţa).

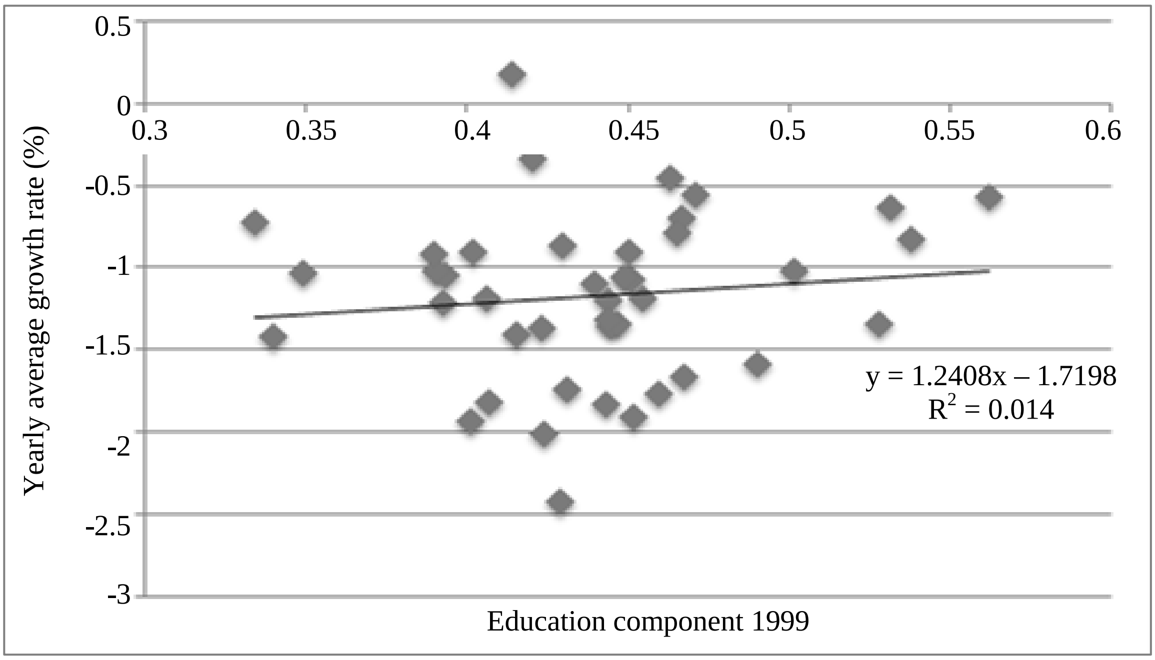


**Figure 4.** *The beta-convergence of the education component*
Source: compiled by the authors

**Convergence and spatial polarization: the Moran I Index**

The Moran I is an indicator of the spatial autocorrelation, which shows the relationship between the indicator values of the neighbouring territories. There is a so-called benchmark, to which the value of the Moran I index will be compared. If values tend to be clustered together in space, it means positive spatial autocorrelation, but if values are more dispersed, it means negative spatial autocorrelation. The data were calculated with queen contiguity, with row-standardized method.

In the case of the GDP per capita, the values of Moran I show strong positive spatial autocorrelation, which is increasing/ strengthening in time. It means that values tend to be clustered together.

**Table 4.** *Moran I statistic of Romania (based on NUTS 3 regions) – GDP*

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Moran I** | 0.6855 | 0.3284 | 0.358 | 0.3014 | 0.3673 | 0.4104 | 0.414 | 0.446 | 0.464 | 0.5104 | 0.4978 | 0.4942 | 0.506 |

Source: Own calculations, based on the data-series from the Romanian National Institute for Statistics (INS), 1999-2011

When analysing the HDI, the spatial autocorrelation is also positive, but relatively weak, although the intensity is increasing slowly.

**Table 5.** *Moran I statistic of Romania (based on NUTS 3 regions) – HDI*

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Moran I** | 0.0311 | 0.0187 | 0.0082 | 0.0224 | 0.0493 | 0.0389 | 0.053 | 0.0725 | 0.0592 | 0.056 | 0.0713 | 0.059 | 0.0645 |

Source: Own calculations, based on the data-series from the Romanian National Institute for Statistics (INS) and EUROSTAT, 1999-2011

The reason for the significant difference between the spatial autocorrelation of the GDP and the HDI is that the two other factors of the HDI (life expectancy at birth and education component) do not show spatial autocorrelation.

In other words, the economic divergence between the 42 NUTS 3 regions in Romania have increased after 1999, including the first three years of global economic and financial crisis, when the economic output dropped in all regions. Moreover, an evident process of spatial polarization can also be noted at this territorial level. On the other hand, a certain trend of multi-dimensional convergence has been reported after 2007-2008, most probably as result of national policies in education and health. These two divergent trends can also be explained by the process of public resources redistribution under the regional development objectives. Nevertheless, some statistical limitations in measuring the economic convergence based only on the GDP indicator should be considered, having in view that most of the companies with national coverage report their financial results only in the capital city and in some of the counties (Constanța, Cluj, Timiș, Ilfov, etc.). The surrounding area of Bucharest (Ilfov County), for example, records a high economic performance in the national context, in terms of GDP, but a low HDI level, resulting from the lack of medical and educational infrastructure, being dependent on the services provided by Bucharest.

This shows that equity does not always go together with growth, at least not at the micro-territorial level and on short and medium term.

**CONVERGENCE CLUBS AT NUTS 3 LEVEL**

Counties can be grouped in the so-called “convergence clubs”, clusters of regions whose steady state paths are close to each other, with minimal intra-group differences and maximal inter-group differences. We have determined such clubs for both indicators and have analysed the convergence within each club by considering the cluster means as benchmarks.

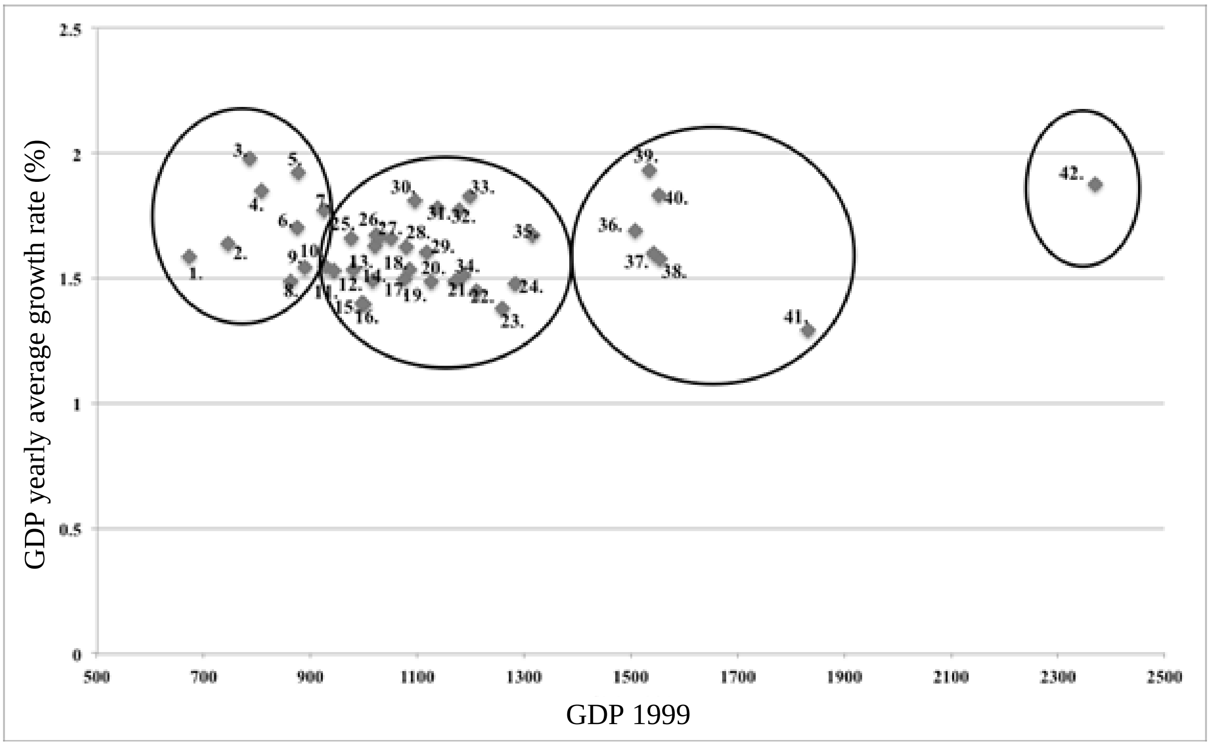


**Figure 5.** *The convergence clubs of NUTS 3 regions in Romania, by GDP per capita*
Source: Own calculations, based on the data series from the Romanian National Institute for Statistics, 1999-2011

The NUTS 3 regions of Romania can be grouped in four convergence clubs with respect to the GDP per capita indicator (see Appendix 1).

Nine counties, many of them situated on the eastern and southern peripheries (Vaslui, Botoșani, Giurgiu, Călăraşi, Tulcea, Maramureş, Suceava, Neamţ), belong to the first club, where the initial GDP was relatively low, but the GDP growth rate was high. The highest GDP growth rate was reported in Tulcea. The cluster mean is 825.88 Euro per capita and the average growth rate is 1.73%. The whole cluster alone shows divergence, but five of the counties converge to the cluster mean (Giurgiu, Călăraşi, Maramureş, Neamţ, Suceava) and seem to be trapped at a low development stage, showing clear signs of a peripheralization process. In this sense, on the longer term, we do not expect that some of these regions will be able to narrow the gap to the regions of the second club.

The second convergence club, where the cluster mean is 1094.7 Euros and the average growth rate is 1.59%, includes 26 counties, from which 12 show convergence to the cluster mean.

Six counties can be identified in the third club, especially the ones containing growth poles (Cluj, Constanţa, Timiş, Braşov, etc.), Arad County and the metropolitan area of Bucharest (Ilfov). In this case, the initial GDP and the growth rate are both relatively high. Moreover, this cluster is the only one convergent as a whole, thus confirming the theory stating that well-developed regions tend to converge in time, creating a very exclusive club. Because of the fact that the most developed city-regions show high growth rates, the whole national convergence could not be reached between 1999 and 2011. The region of Bucharest builds a unique club, like an outlier, because here the initial GDP and its growth rate are very high.

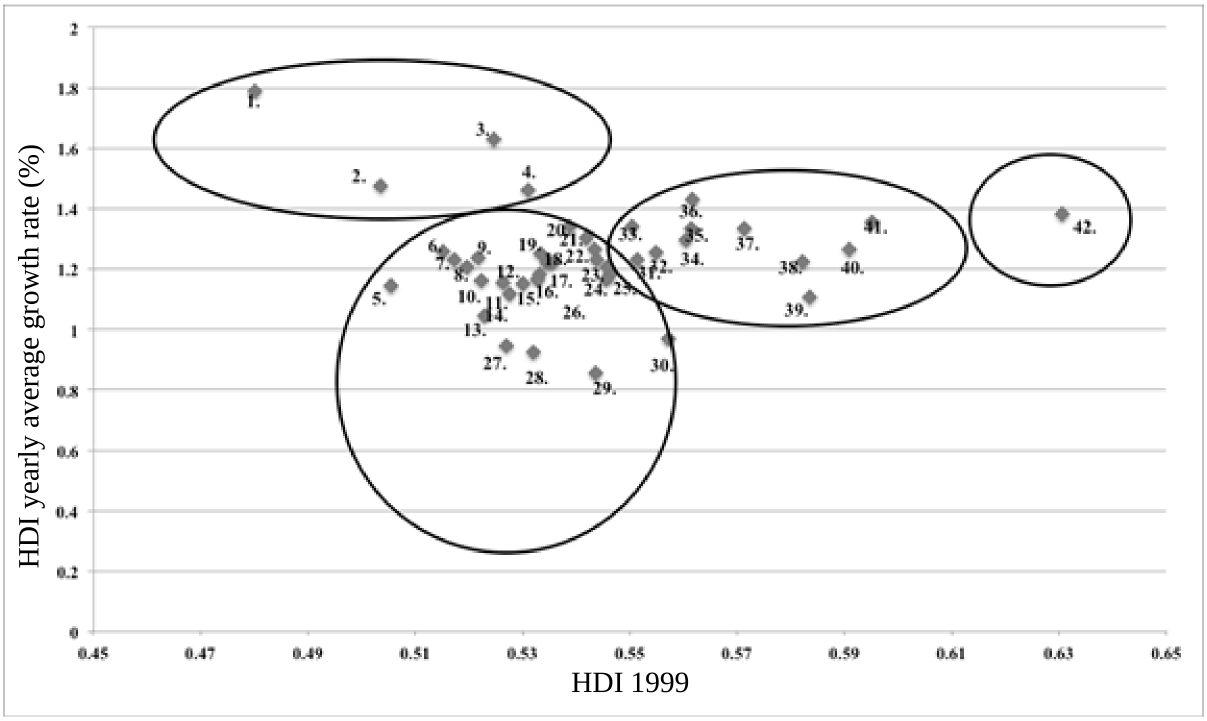


**Figure 6.** *The convergence clubs of NUTS 3 regions (counties) in Romania, by HDI*
Source: Own calculations, based on the data series from the Romanian National Institute for Statistics, 1999-2011

Four convergence clubs can also be created in the case of HDI (Figure 6). The first one contains four counties with low initial values and extremely high growth rates: Giurgiu, Călăraşi, Ilfov and Prahova. The mean value of HDI for this club was only 0.5097, but the growth rate was over 1.4% for each county.

The second convergence club contains 26 counties with relative high HDI values, but rather low growth rates.

The third club reunites 11 counties with both high values of HDI and growth rates. These counties are, in general, the most urbanized ones, with significant urban centres and an above-average GDP per capita (Cluj, Timiş, Braşov, Iaşi, Sibiu, Constanţa, Arad, Bihor, Argeş), but also two untypical ones – Alba and Gorj. The HDI values reported by the members of this club can be explained by the fact they host highly specialized educational, cultural, social and medical infrastructure, having a direct positive impact on the well-being. All three clusters show convergence to their cluster means, indicating a consolidation of the present club membership, with no significant transfers to be predicted in the future.

The capital city – Bucharest – builds again a separate cluster. In its case, the initial HDI was the highest (0.63056) and the growth rate is relatively high, the sixth among all counties.

## CONCLUSIONS

As indicated in the Introduction, the paper was focused on testing and analysing the economic and multi-dimensional convergence processes in Romania, at NUTS 3 level, but also on emphasizing the links between convergence and spatial polarization. This research work comes in the scientific and political debate on polarization/peripheralization and the territorial cohesion policy of the European Union and of the Member States.

Our results show that no economic convergence can been seen between the 42 counties in Romania. Moreover, the disparities between the capital city, a small group of urbanized and industrialized counties (such as Timiş, Cluj, Constanta, Braşov, Arad, etc.) and the rest of country are even deeper than in 1999, when the development regions were created with the scope to ensure a more territorial balanced development. In addition, there are peripheral counties that seem to be trapped in an underdevelopment stage, with no perspectives to promote to the more advantaged clubs. For example, in 1999 the GDP per capita ranged, at NUTS 3 level, from 12% of the EU average (Vaslui) and 33% (Brașov), while in 2008 the differences were more evident (22% in Vaslui and 64% in Timiş).

On the other hand, at NUTS 3 level, growth and welfare (quantified by the HDI) do not necessarily come hand in hand, that is despite the increasing economic disparities, since 2008, a clear trend of multi-dimensional convergence can be observed. Moreover, the special polarization in this respect is lower than the one determined with the pure economic indicators. Thus, the theory stating that economic growth is not the only source of welfare is confirmed. Regardless of this convergence interval, that was too short to allow final resolutions on the medium and long-term tendency, the highest values of the HDI components are still registered in the capital city and a short list of well-developed, urbanized counties.

The hypothesis of the convergence clubs can be clearly tested also at NUTS 3 level. In addition, the lack of sigma and beta-convergence has consolidated the convergence inside each club, especially from the HDI perspective. This strongly embedded hierarchy, with exclusive "islands of well-being" and deprived groups, leaves little space for future transfers of the low-developed counties to superior levels.

Getting back to a broader territorial and political context, we have to underline the fact that this lack of convergence, especially from the economic perspective, which has been observed also at NUTS 2 level all over the European Union, comes in the framework of the Economic, Social and Territorial Cohesion Policy objectives and financial allocations. Even if a proper impact evaluation of the 2007-2013 interventions will be possible only after 2016, it is predictable to say the Cohesion Policy has failed to properly address all aspects of convergence. One of the reasons is the allocation system of the EU funding in the 2007-2013 programming period: the funds for regional development have been allocated depending on the GDP per capita value at regional (NUTS 2) level. For example, the second most developed region in Romania, namely West Development Region, has received less ROP funds, considering its GDP per capita reached 51% of the EU average level. However, the region is made up of four counties (NUTS 3 region), among which two are relatively well developed (Timiș and Arad, with more than 50% of the EU average GDP per capita), whereas the other two (Caraş-Severin and Hunedoara) are underdeveloped (with less than 40%). Moreover, the lack of administrative and co-financing capacity resulted in a polarization of the EU funding absorption in the most developed counties. Out of the 56 projects financed in the West Region in the previous programming period, only four were located in Caraş-Severin, the poorest county, and over 70% of the allocation went the two most developed ones. Therefore, we can conclude that the underdeveloped counties in the developed regions were the most disadvantaged from the investment perspective.

In this context, our policy recommendations for the 2014-2020 programming period argue for a complementary cohesion approach of the national objectives and budget allocations to the one of the European Union. The national budget allocation of each Member State plays an essential role in ensuring a more balanced development, which is, in our opinion a pre-condition for achieving the goals of the country, as a whole. Additional national programmes to the EU funded ones (such as Community-Led Local Development initiatives) should target the upgrade of the transport and business infrastructure in the deprived rural areas and in small cities and help them catch up with the urbanized and industrialized regions. In 2013, the Romanian Government launched such a complementary financing instrument – the National Local Development Programme (PNDL), with an annual allocation of around 1 bn. Euro for transport, public utilities and social infrastructure. An option to reduce the disparities between NUTS 2 and 3 regions would be to develop a fund allocation system based on a set of specific indicators (life expectancy, time distance to TEN-T network, share of dwellings with water supply, etc.), at 3 territorial levels: region, county and settlement.

Moreover, there is need for a more place-oriented approach in public policies, considering that NUTS 2 regions proved to be too heterogeneous to be treated as the subject of an effective regional development policy. At least in the case of Romania, the impact evaluation of the 2007-2013 regional development initiatives should be conducted at NUTS 3 level. The existing debate on dividing the existing regions into smaller and more cohesive ones is in our view at least challenging, considering that creating new territorial structures involves resources, competencies, and know-how that are highly concentrated in the existing regional seats and growth poles. In this context, developing a mechanism for financial allocations at NUTS 3 (county) level, similar to the one already applied for NUTS 2 regions in the ROP, could be a much easier and effective way to fight against intra-regional disparities. The new Territorial Development Strategy of Romania for 2030, that has to be finalized in 2015, should foresee specific programmes and investments for each category of NUTS 3 regions: the most-developed ones should invest in consolidating their competitiveness (for example, by investing in the RDI infrastructure), whereas the poorly developed ones should target the access of all citizens to quality basic public services (health, education, public utilities, etc.). Moreover, investments in rural remote areas should be located in central places, by establishing a network of rural development poles, able to provide basic services for the surrounding area.

Nonetheless, the Bucharest-Ilfov region has already joined the “more developed regions” group (with GDP per capita over 90% of the EU average) and the West region may also leave to “less developed” group by 2020, meaning more financial resources to be reallocated to the remaining six regions in Romania. This calls also for a reconsideration of the current allocation mechanism between regions, by adding also the poverty and social inclusion or the accessibility indexes to the existing disparities controls (GDP per capita).

On the other, the fact that economic growth is not the only source of wellbeing should be an incentive for European and national authorities to revise the current regional development policies and invest more in assets such as education, health, social care, culture. This may not generate economic output on short and medium-term, but have a stronger impact on the quality of life.

The multi-dimensional convergence approach is also based on the idea that the regional policy instruments designated to support economic convergence are neglecting some basic interests of local, regional or even national communities. Building models of regional performance including a social well-being dimension could be a suitable solution.

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**APPENDIX 1.** *GDP/capita Convergence Clubs at NUTS 3 Level in Romania*

| | GDP 1999 | Yearly average change (%) | Number | Club membership |
|---|---|---|---|---|
| Vaslui | 671 | 1.587768 | 1 | 1 |
| Botoşani | 745 | 1.63971 | 2 | 1 |
| Giurgiu | 786 | 1.9791 | 3 | 1 |
| Călăraşi | 807 | 1.852715 | 4 | 1 |
| Tulcea | 875 | 1.925842 | 5 | 1 |
| Maramureş | 873 | 1.703399 | 6 | 1 |
| Dâmboviţa | 925 | 1.772877 | 7 | 1 |
| Neamţ | 863 | 1.487806 | 8 | 1 |
| Suceava | 888 | 1.544689 | 9 | 1 |
| Bistriţa-Năsăud | 976 | 1.662192 | 10 | 2 |
| Mehedinţi | 927 | 1.549281 | 11 | 2 |
| Olt | 942 | 1.529188 | 12 | 2 |
| Buzău | 978 | 1.536677 | 13 | 2 |
| Teleorman | 996 | 1.403286 | 14 | 2 |
| Vrancea | 999 | 1.399506 | 15 | 2 |
| Bacău | 1015 | 1.491535 | 16 | 2 |
| Satu Mare | 1075 | 1.49712 | 17 | 2 |
| Galaţi | 1084 | 1.534753 | 18 | 2 |
| Harghita | 1170 | 1.487394 | 19 | 2 |
| Vâlcea | 1186 | 1.513823 | 20 | 2 |
| Ialomiţa | 1125 | 1.489918 | 21 | 2 |
| Mureş | 1209 | 1.447861 | 22 | 2 |
| Covasna | 1257 | 1.379201 | 23 | 2 |
| Bihor | 1283 | 1.480369 | 24 | 2 |
| Sălaj | 1020 | 1.631238 | 25 | 2 |
| Brăila | 1022 | 1.672679 | 26 | 2 |
| Iaşi | 1027 | 1.666218 | 27 | 2 |
| Dolj | 1051 | 1.659451 | 28 | 2 |
| Caraş-Severin | 1078 | 1.628195 | 29 | 2 |
| Alba | 1095 | 1.813522 | 30 | 2 |
| Prahova | 1138 | 1.783577 | 31 | 2 |
| Argeş | 1178 | 1.77296 | 32 | 2 |
| Sibiu | 1199 | 1.827585 | 33 | 2 |
| Hunedoara | 1117 | 1.606071 | 34 | 2 |
| Gorj | 1316 | 1.672607 | 35 | 2 |
| Cluj | 1507 | 1.690673 | 36 | 3 |
| Braşov | 1555 | 1.577987 | 37 | 3 |
| Constanţa | 1542 | 1.600624 | 38 | 3 |
| Ilfov | 1533 | 1.933973 | 39 | 3 |
| Timiş | 1553 | 1.8335 | 40 | 3 |
| Arad | 1831 | 1.292124 | 41 | 3 |
| Bucureşti | 2369 | 1.875367 | 42 | 4 |

*Convergence to the Cluster Means in GDP/capita*

| **NUTS 3 region** | **Convergence to the cluster mean** |
|---|---|
| **1. Cluster** | |
| Vaslui | y=0.001x+0.9328 |
| Botoşani | y=0.0012x+0.7256 |
| Giurgiu | y=-0.006x+6.711 |
| Călăraşi | y=-0.006x+6.7128 |
| Tulcea | y=0.0038x-1.4038 |
| Maramureş | y=-0.0008x+2.3623 |
| Dâmboviţa | y=0.0003x+1.4563 |
| Neamţ | y=-0.0068x+7.3282 |
| Suceava | y=-0.0031x+4.3221 |
| *whole cluster convergence* | *y=0.0002x+1.5777* |
| **2. cluster** | |
| Bistriţa-Năsăud | y=-0.0006x+2.2268 |
| Mehedinţi | y=0.0003x+1.3049 |
| Olt | y=0.0004x+1.1325 |
| Buzău | y=0.0005x+1.0606 |
| Teleorman | y=0.0019x-0.5156 |
| Vrancea | y=0.002x-0.6249 |
| Bacău | y=0.0013x+0.1935 |
| Satu Mare | y=0.0049x-3.7541 |
| Galaţi | y=0.0055x-4.3999 |
| Harghita | y=-0.0014x+3.1367 |
| Vâlcea | y=-0.0009x+2.5492 |
| Ialomiţa | y=-0.0034x+5.3397 |
| Mureş | y=-0.0013x+2.9888 |
| Covasna | y=-0.0013x+3.0393 |
| Bihor | y=-0.0006x+2.2513 |
| Sălaj | y=-0.0005x+2.1463 |
| Brăila | y=-0.0011x+2.7853 |
| Iaşi | y=-0.0011x+2.7688 |
| Dolj | y=-0.0015x+3.2444 |
| Caraş-Severin | y=-0.0021x+3.8636 |
| Alba | y=0.8172x-893.04 |
| Prahova | y=0.0044x-3.2155 |
| Argeş | y=0.0022x-0.7658 |
| Sibiu | y=0.0022x-0.8642 |
| Hunedoara | y=0.0006x+0.9756 |
| Gorj | y=0.0004x+1.2021 |
| *whole cluster convergence* | y=0.0000005x+1.5006 |
| **3. cluster** | |
| Cluj | y=-0.0003x+2.1649 |
| Braşov | y=0.0028x-2.6992 |
| Constanţa | y=0.0014x-0.6324 |
| Ilfov | y=-0.005x+9.5778 |
| Timiş | y=-0.005x+9.5497 |
| Arad | y=-0.0015x+4.0924 |
| *whole cluster convergence* | y=-0.0015x+3.9939 |

| **4. cluster** | |
|---|---|
| Bucureşti | *not relevant* |
| *whole cluster convergence* | *not relevant* |

*Cluster Means*

| **Cluster** | **GDP/capita (1999)** | **GDP average growth rate (%)** |
|---|---|---|
| **1.** | 825.88 | 1.7389 |
| **2.** | 1094.7 | 1.5935 |
| **3.** | 1586.8 | 1.6655 |
| **4.** *(only one region – Bucureşti)* | 2369 | 1.8755 |

**APPENDIX 2.** *HDI Convergence Clubs at NUTS 3 Level in Romania*

| | **HDI 1999** | **Yearly average change (%)** | **Number** | **Club membership** |
|---|---|---|---|---|
| Giurgiu | 0.479959 | 1.788077 | 1 | 1 |
| Călăraşi | 0.5034 | 1.475235 | 2 | 1 |
| Ilfov | 0.524598 | 1.630182 | 3 | 1 |
| Prahova | 0.530989 | 1.463184 | 4 | 1 |
| Teleorman | 0.505317 | 1.144362 | 5 | 2 |
| Tulcea | 0.515 | 1.259171 | 6 | 2 |
| Botoşani | 0.517293 | 1.232907 | 7 | 2 |
| Olt | 0.519611 | 1.207277 | 8 | 2 |
| Ialomiţa | 0.521711 | 1.237119 | 9 | 2 |
| Mehedinţi | 0.522171 | 1.162343 | 10 | 2 |
| Vaslui | 0.522737 | 1.045182 | 11 | 2 |
| Satu Mare | 0.526369 | 1.155751 | 12 | 2 |
| Buzău | 0.527446 | 1.118343 | 13 | 2 |
| Brăila | 0.530066 | 1.154044 | 14 | 2 |
| Caraş-Severin | 0.53267 | 1.16473 | 15 | 2 |
| Maramureş | 0.533097 | 1.183239 | 16 | 2 |
| Dâmboviţa | 0.534515 | 1.219795 | 17 | 2 |
| Sălaj | 0.535469 | 1.222455 | 18 | 2 |
| Hunedoara | 0.533196 | 1.253308 | 19 | 2 |
| Mureş | 0.538629 | 1.340189 | 20 | 2 |
| Dolj | 0.541758 | 1.304754 | 21 | 2 |
| Bistriţa-Năsăud | 0.543314 | 1.265605 | 22 | 2 |
| Suceava | 0.545663 | 1.208951 | 23 | 2 |
| Harghita | 0.546197 | 1.184861 | 24 | 2 |
| Galaţi | 0.545524 | 1.165501 | 25 | 2 |
| Vâlcea | 0.543779 | 1.230552 | 26 | 2 |
| Neamţ | 0.526932 | 0.945257 | 27 | 2 |
| Vrancea | 0.53197 | 0.92575 | 28 | 2 |
| Bacău | 0.543566 | 0.856548 | 29 | 2 |
| Covasna | 0.557128 | 0.969899 | 30 | 2 |
| Alba | 0.551338 | 1.232603 | 31 | 3 |
| Argeş | 0.554712 | 1.25448 | 32 | 3 |

| | | | | |
|---|---|---|---|---|
| Bihor | 0.550416 | 1.342249 | 33 | 3 |
| Arad | 0.560471 | 1.297698 | 34 | 3 |
| Gorj | 0.561351 | 1.333849 | 35 | 3 |
| Constanţa | 0.561491 | 1.431149 | 36 | 3 |
| Sibiu | 0.571289 | 1.334653 | 37 | 3 |
| Iaşi | 0.582106 | 1.224532 | 38 | 3 |
| Braşov | 0.583441 | 1.106367 | 39 | 3 |
| Timiş | 0.590853 | 1.26678 | 40 | 3 |
| Cluj | 0.595055 | 1.355486 | 41 | 3 |
| Bucureşti | 0.63056 | 1.384686 | 42 | 4 |

*Convergence to the Cluster Means in HDI*

| NUTS 3 region | Convergence to the cluster mean |
|---|---|
| **1. cluster** | |
| Giurgiu | y=-6.7695x+5.0371 |
| Călăraşi | y=17.56x-7.3644 |
| Ilfov | y=2.9392x+0.0883 |
| Prahova | y=-5.8024x+4.5442 |
| *whole cluster convergence* | *y=-4.5449x+3.9053* |
| **2. cluster** | |
| Teleorman | y=0.5941x+0.8441 |
| Tulcea | y=-5.6911x+4.1901 |
| Botoşani | y=-4.8136x+3.7229 |
| Olt | y=-3.6776x+3.1182 |
| Ialomiţa | y=-7.2081x+4.9977 |
| Mehedinţi | y=-0.1886x+1.2608 |
| Vaslui | y=11.987x-5.2207 |
| Satu Mare | y=0.7811x+0.7446 |
| Buzău | y=8.5789x-3.4065 |
| Brăila | y=2.7917x-0.3257 |
| Caraş-Severin | y=13.506x-6.0295 |
| Maramureş | y=30.589x-15.124 |
| Dâmboviţa | y=27.438x-13.446 |
| Sălaj | y=19.896x-9.431 |
| Hunedoara | y=109.94x-57.366 |
| Mureş | y=28.635x-14.083 |
| Dolj | y=15.343x-7.0075 |
| Bistriţa-Năsăud | y=9.5944x-3.9471 |
| Suceava | y=3.6454x-0.7802 |
| Harghita | y=1.765x+0.2208 |
| Galaţi | y=0.3855x+0.9552 |
| Vâlcea | y=6.1366x-2.1064 |
| Neamţ | y=39.705x-19.977 |
| Vrancea | y=615.72x-326.62 |
| Bacău | y=-27.096x+15.585 |
| Covasna | y=-7.6896x+5.254 |
| *whole cluster convergence* | *y=-0.9735x+1.6782* |

| **3. cluster** | |
|---|---|
| Alba | y=3.1333x-0.4949 |
| Argeş | y=2.3594x-0.0543 |
| Bihor | y=-2.8196x+2.8942 |
| Arad | y=-0.9889x+1.8519 |
| Gorj | y=-5.6344x+4.4967 |
| Constanţa | y=-18.163x+11.629 |
| Sibiu | y=23.216x-11.928 |
| Iaşi | y=-5.038x+4.1572 |
| Braşov | y=-12.93x+8.6502 |
| Timiş | y=-1.0925x-1.875 |
| Cluj | y=2.5856x-0.1831 |
| *whole cluster convergence* | *y=-1.2032x+1.9741* |
| **4. cluster** | |
| Bucureşti | *not relevant* |
| *whole cluster convergence* | *not relevant* |

*Cluster Means*

| cluster | HDI (1999) | HDI average growth rate (%) |
|---|---|---|
| **1.** | 0.5097 | 1.5865 |
| **2.** | 0.5324 | 1.1604 |
| **3.** | 0.5693 | 1.2889 |
| **4.** *(only one region – Bucureşti)* | 0.6306 | 1.0138 |