Exploring regional economic convergence in Romania. A spatial modeling approach

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Abstract

This paper explores spatial economic convergence in Romania, from the perspective of real GDP/capita, and examines how the shock of the recent economic crisis has affected the convergence process. Given the presence of spatial autocorrelation in the values of GDP per capita, we address the question of convergence in terms of both classic and spatial regression models, thus filling a gap in the Romanian literature on this topic. The empirical results seem to provide support for both absolute and relative beta divergence in GDP/capita, as well as sigma divergence among Romanian counties on the long run. This is the consequence of the two-speed regional development, with the capital region and some large cities thriving by attracting human capital and FDIs, while the lagging regions are systematically left behind. Failing to validate the neoclassical approach on convergence, our results rather support the new divergence theory based on polarization and centre-periphery inequality.

Keywords: sigma and beta convergence, GDP per capita, county, economic crisis, Romania

Introduction

In Romania, the issues related to regional disparities are starting to be a matter of concern for policy-makers, given their steady increase since the early 1990s. First, the transition to the market economy generated huge changes at all spatial scales, including closure of many inefficient and oversized enterprises throughout the country (World Bank, 1991; Light and Phinnemore, 2001). This affected heavily the dependent local economies, leaving many small cities without their main economic sector and thus triggering their rapid decline. The increasing shadow economy added to these economic problems (Ianole *et al*., 2017).

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Spatial polarization of the Romanian economy further broadened during the rapid economic growth in the 2000s, as developed regions benefited more from the economic boom, attracting most of the human capital and also large Foreign Direct Investments that are key drivers of economic growth (Ruxanda and Stoian, 2008; Rădulescu *et al*., 2016). Inequalities continued to expand during the economic turmoil of the recent economic crisis (Lefter and Constantin, 2009; Grigore and Mitroi, 2009; Goschin and Constantin, 2010). Focusing mainly on EU integration and rapid economic growth, it seems that economic policies failed to address properly the issue of social and regional cohesion and territorial gaps swiftly deepened (Zaman and Goschin, 2015).

In the EU, disparities are regarded as a crucial economic issue for regional development because although inter-country economic inequalities tend to decrease, they continued to increase within countries (Matkowski and Próchniak, 2006; Monfort, 2008; Palan and Schmiedeberg, 2010; Bongardt *et al*., 2013). Consequently, in an attempt to deepen the understanding of the ongoing trends in economic inequalities, the analysis of the real convergence process has experienced a great expansion, generating vast theoretical and empirical literature (e.g. Williamson, 1996; Collins, 1999; Castro, 2004; Egger and Pfaffermayr, 2006; Villaverde, 2006; Dall'erba and Le Gallo, 2008; Checherita, 2009, etc.).

This issue has been studied in Romania as well, empirical research indicating the lack of absolute convergence of Romania to the EU (Iancu, 2007, 2008 and 2009) and divergence at the county level (Sîrghi *et al*., 2009; López-Rodríguez and Bolea, 2012; Török, 2013; Benedek *et al*., 2015).

In this context, we aim to examine the extent to which the recent economic shock of the global economic crisis has affected the real GDP/capita dynamics in different regions and to capture its impact on territorial convergence/divergence process. In line with the mainstream international literature, we will address the convergence process from the output perspective, using GDP per capita as the reference variable.

Our contribution to the previous literature on economic convergence in Romania is twofold. Firstly, considering the presence of spatial autocorrelation in the values of GDP per capita, this paper addresses the question of convergence in terms of both classic and spatial regression models, using the standard tests in spatial econometrics in order to choose the best fit. Secondly, our paper aims to capture the impact of economic shocks by estimating the regional convergence models not only for the overall period under consideration -1995 to 2013-, but also for smaller time spans, separating the phases of economic growth and decline.

The results might be of interest for regional decision-makers, as our findings contribute to highlighting the emerging changes in territorial economic behaviour due to the economic crisis, with potential long-lasting consequences on regional disparities.

The rest of the paper proceeds as follows. The next section briefly reviews the literature on regional convergence in Romania. Section 3 outlines the methodology to be employed in the convergence analysis, based on the international literature, and also presents the variables and the datasets. Section 4 reports the findings from our two main lines of research: the sigma convergence indicators and the beta convergence models, discussing the econometric results and their policy implications. Section 5 concludes by summarizing the main findings and tracing directions for future research.

1. Literature Review

As regional economic inequalities became increasingly visible in Romania, many studies addressed their causes, effects and magnitude (e.g., Lefter and Constantin, 2009; Sandu, 2011; Ianoș *et al*., 2013; Benedek, 2015; Hăisan, 2016), accompanied by empirical research aiming to assess the process of real convergence or divergence (Iancu, 2009; Sîrghi *et al*., 2009; López-Rodríguez and Bolea, 2012; Török, 2013; Benedek *et al*., 2015).

Among the first studies that approached this topic, Iancu (2007, 2009 and 2010) assessed the feasibility of real convergence of Romania to the EU and found no absolute convergence on the long-run, while Ailenei *et al*. (2015) reported absolute convergence among Central and Eastern European Countries (including Romania) between 1996 and 2007, but sigma divergence among Romanian regions.

Sîrghi *et al*. (2009) found unconditional divergence in Romania at the regional level, while López-Rodríguez and Bolea-Gabriel (2012) presented evidence of absolute divergence over 1995-2008 at the county level. In the same register, Bunea (2012) and Neagu (2013) reported regional sigma divergence in income in Romania over 1995-2008 and 2000-2011, respectively.

The latest empirical research also confirmed regional divergence based on different time spans. Thus, Moroianu *et al*. (2015) analysed σ-convergence of GDP in Romania, at various territorial levels, and found divergence over 1995-2011, except for a short subperiod of convergence 2002 – 2004. Munteanu (2015) and Moisescu (2015) found both sigma and beta divergence at NUTS 2 (regions) level over 1995-2011 and 2000-2010 respectively. Ailenei *et al.* (2015) revealed sigma divergence between 1996 and 2007. In sum, almost all empirical studies agree on regional divergence in Romania, except for Simionescu (2014) who found conditional convergence over 2000-2012 (but no absolute convergence or catching-up among Romanian counties) and Bunea (2012), who reported conditional beta convergence while controlling for net migration. Failing to validate the neoclassical convergence model, Munteanu (2015) proposes an endogenous growth model for future research, arguing that this might be more appropriate for Romania. In the same register, Iancu (2010) argues that real convergence should not be considered a natural process, governed solely by market forces, as stated by neoclassical growth

approach. Countries should focus instead on supporting new production factors, such as human capital and knowledge, able to trigger higher economic growth.

Research addressing economic convergence among Romanian counties is not limited to GDP. Indicators such as real wage (Zaman and Goschin, 2014) and exports (Zaman and Goschin, 2017) have also been used in assessing this phenomenon. Both studies revealed the disruptive impact of the recent economic and financial crisis on the ongoing convergence process. In the same register, Benedek *et al*. (2015) combined GDP/capita, life expectancy and education into a county level Human Development Index that was further used for analysis and reported no economic convergence. The authors also identified several convergence clubs at county level.

The international empirical literature on this topic currently uses a wide range of methodologies and different indicators for evaluating the convergence/divergence process, thus producing various results and frequently generating lack of consensus between different studies, even for the same country. Previous studies addressing the regional economic convergence in Romania also applied a variety of methods. Ailenei *et al*. (2015) calculated sigma convergence based on the average square deviation of the logarithm of income per capita and tested classic beta convergence, Moroianu *et al*. (2015) used a population-weighted coefficient of variation to assess sigma convergence, Simionescu (2014) employed the panel unit root test method to check for real GDP per capita convergence, Bunea (2012) used panel data models for conditional beta convergence, while Moisescu (2015) applied a convergence index (standard deviation) and the absolute beta convergence equation. Finally, Neagu (2013) used the coefficient of variation, as well as Gini coefficient, Atkinson, Theil, and Mean logarithmic deviation indexes as measures for inequality in the endeavour of testing for sigma convergence.

Since the past studies on regional convergence in Romania, except for Benedek *et al*. (2015), ignored the spatial autocorrelation of the variables, we aim to address the convergence issue in the framework of both classic and spatial regression. Moreover, we are going to assess the impact of the economic crisis on this process.

2. Research methodology, variables and data

Our analysis is focused on identifying and explaining the long-run convergence and/or divergence process among Romanian counties, while putting a spotlight on the recent economic crisis, as crises are acknowledged as likely disruptors of economic convergence (Sala-i-Martin, 1996). Following the main methodological trends in the literature, traditional sigma and beta convergence methods were applied using the two basic measures of convergence proposed by Barro and Sala-i-Martin (1995). The first one is "sigma convergence" (σ), which denotes the decrease in GDP dispersion across regions. The second one is "beta

convergence" (β), which means that underdeveloped regions grow faster and catch-up with the developed ones.

Sigma convergence is measured based on the coefficient of variation across regions, as follows:

$$\sigma = \frac{\sqrt{\frac{\sum_{i=1}^{n}(y_i - \bar{y})^2}{n}}}{\bar{y}} \qquad (1)$$

where y_i stands for the real GDP/capita in counties and $\bar{y}$ is the average (national) GDP/capita. This indicator is computed annually, for a longer period of time. If its values diminish over time, this means lower output dispersion across counties, indicating economic convergence. The opposite, i.e. an increasing trend in σ values, signals economic divergence.

Sigma and beta convergence are interrelated. Sigma convergence implies beta convergence, but the reverse does not necessarily hold, as beta convergence, although required, it is insufficient to produce sigma convergence (Bongardt *et al*., 2013). This is because beta convergence may occur without reducing the GDP dispersion (Wodon and Yitzhaki, 2005). It happens when economic shocks, affecting stronger certain regions, maintain or increase the initial dispersion (Barro and Sala-i-Martin, 1995).

The beta convergence concept derives from the neoclassical growth model (Barro and Sala-i-Martin, 2004) and denotes the negative correlation between the GDP growth and its initial level, in the framework of an economic growth equation:

$$\frac{1}{T}\log\left(\frac{y_{i;t_0+T}}{y_{i;t_0}}\right) = a + b\log(y_{it_0}) + \varepsilon_i, \qquad (2)$$

where:
$y_{i;to}$ and $y_{i;to+T}$ stand for initial and final level of GDP per capita;
T – distance between firstyear - t_0 and final one -t_o+T;
b – regression coefficient; a negative value signifies convergence;
ε – error term.

The beta convergence method is based on the decreasing efficiency of capital: if underdeveloped economies grow faster than developed ones, it means that there is a reverse relationship between the initial level and GDP growth.

Equation (2) depicts the absolute (unconditional) β convergence model, based on the assumption of structural homogeneity among the territorial units. Conditional β convergence (Galor, 1996) takes into account the technological or institutional differences between countries or regions by including additional variables in the model to capture local characteristics.

The classic conditional beta convergence model is as follows:

$$\frac{1}{T}\log\left(\frac{y_{i;t_0+T}}{y_{i;t_0}}\right) = a + b\log(y_{it_0}) + \sum_j \log(x_{jit_0}) + \varepsilon_i \qquad (3)$$

where x_{jito} represents the additional variables.

We are going to test a range of production factors as potential conditional variables (Table 1): trade openness and productivity capture the economic performance and competitiveness of the local economy, R&D employees and human capital reflect the creativity and innovation potential, the number of private entrepreneurs is used as proxy for business climate and opportunities, while the FDI stock indicates the economic attractiveness of the county. The selection of the additional variables for the conditional beta convergence models was guided by theoretical considerations, as well as by literature. Nevertheless, it should be noted that our choice was severely limited by data availability, as official statistics are quite scarce at county (NUTS3) level.

Table1. The variables included in the beta convergence models

Variable name	Description	Data source
GDP	Gross Domestic Product per inhabitant (Euro)	Eurostat database
Trade	Trade openness, computed as Export plus Import over GDP (%)	National Institute of Statistics and own computation
R&D	Number of R&D employees (full time equivalent)	Eurostat database
Productivity	Productivity, computed as GDP relative to employment (Euro/person)	National Institute of Statistics and own computation
Entrepreneurs	Number of private entrepreneurs	National Institute of Statistics
FDI	The foreign direct investments stock from 1991 to the year of reference (Euro)	The National Trade Register Office
Human capital	Number of tertiary education graduates.	National Institute of Statistics

In this paper, we will also use the spatial models of beta convergence because neighbouring regions often have similar economic patterns, generating spatial autocorrelation that is ignored by classic regression. The existence of spatial dependence will be tested using Moran's I statistic (Anselin and Rey, 1991):

$$MI = \frac{n\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{(\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij})\sum_{i=1}^{n}(x_i - \bar{x})^2} \quad (4)$$

where x_i and x_j represent the values of the variable x under investigation in the regions i and j respectively, and $\bar{x}$ stands for the average. The spatial weights w_{ij} capture the "spatial influence" between county j and county i. Given the relatively small number of territorial units in Romania at NUTS 3 level, we only will use a first-order queen contiguity matrix, where the neighbours are defined by common borders, more specifically $w_{ij} = 1$ if regions *i* and *j* are contiguous, and $w_{ij} = 0$ otherwise.

Moran's *I* ranges from −1 (perfect dissimilarity among neighbours) to +1 (perfect similarity), while the null value corresponds to random spatial distribution of values. The permutation test will be applied to validate the statistic significance of the Moran's *I* (Anselin and Rey, 1991).

If spatial dependence is confirmed, it should be corrected using the appropriate spatial model. In this paper we use two models that address the spatial autocorrelation issue by entering a spatial lag of the dependent variable y in the regression model, or by including it in the error term (Anselin, 2005; LeSage and Pace, 2009).

The first variant, the spatial autoregressive model (SAR) for conditional beta convergence, introduces the spatial lag of the dependent variable, as follows:

$$\frac{1}{T}\log\left(\frac{y_{t_0+T}}{y_{t_0}}\right) = a + b\log(y_{t_0}) + \rho \cdot W\frac{1}{T}\log\left(\frac{y_{t_0+T}}{y_{t_0}}\right) + \sum_j \log(x_{jit_0}) + \varepsilon \quad (5)$$

where W is the spatial weight matrix capturing the neighbours.

The second option is the spatial error model (SEM) that includes the spatial dependence in the error term $\varepsilon = \lambda W\varepsilon + \nu$, therefore the classic beta convergence model becomes:

$$\frac{1}{T}\log\left(\frac{y_{t_0+T}}{y_{t_0}}\right) = a + b\log(y_{t_0}) + \sum_j \log(x_{jit_0}) + (\lambda W\varepsilon + \nu) \quad (6)$$

The choice of the best model for our data is based mainly on Lagrange multiplier tests for spatial error and lag.

The results from the convergence models critically depend on the territorial level of analysis, usually less aggregated data providing better estimations, for instance counties rather than regions. Consequently, our empirical analysis focuses on the counties, as the lowest territorial level at which official statistical data are available. In order to highlight the different effects of the periods of growth and decline, we divided the overall interval under consideration into three smaller time intervals to be analysed separately: 1995-1999, 2000-2007 and 2008-2013.

Data for our analysis come from various sources: Eurostat database, Romanian Institute of National Statistics TEMPO database, The National Trade Register Office. Own computations were also required in order to prepare some variables for the models and to measure all annual values of the variables in constant 1995 prices.

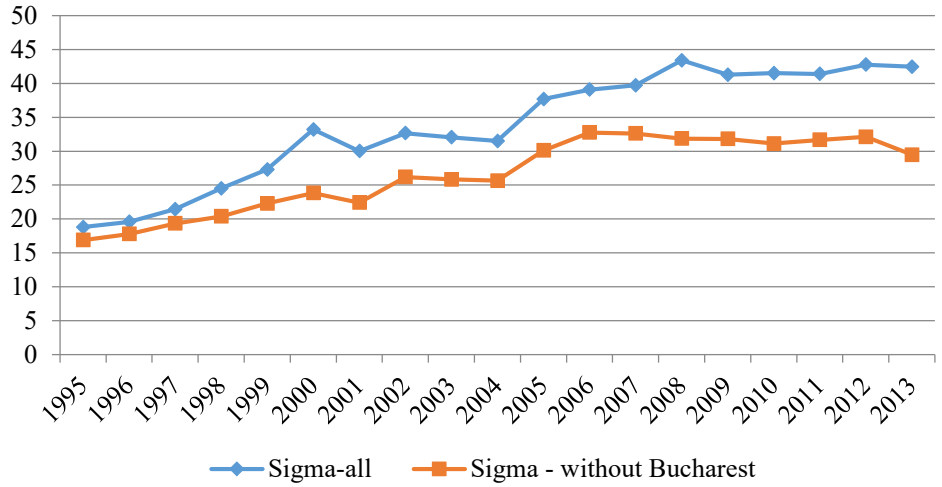
3. Results and discussion

We tested sigma and beta convergence among Romanian counties over the whole period of interest and on three sub-periods, using the spatial software developed at The Centre for Geospatial Analysis and Computation (GeoDa, 2015).

Sigma divergence. The annual calculations of the coefficient of variation (sigma) in GDP per capita among Romanian counties showed an ascending trend, despite some small temporary distortions (Figure 1). Among the main factors playing a role in this process are: highly unbalanced territorial distribution of economic resources, strong concentration of FDIs in the most developed regions (e.g., Bucharest-Ilfov Region currently owns over 60% of the FDI stock in Romania), uneven R&D potential distribution (over half of it is to be found in the Bucharest-Ilfov Region), systematic human capital migration from rural to urban zones and from underdeveloped to developed regions, etc. Even the structural and cohesion funds added to the spatial inequality, instead of helping to level it. The developed regions, more experienced in writing projects and accessing European funds, and having more capital to co-fund such projects, are the biggest recipients of these funds.

Surprisingly, during the recent economic crisis, spatial disparities dropped, even if by only a small amount. An explanation for this might be the initial stronger impact of the economic crisis on the developed regions that have large financial and real estate sectors where the crisis originated, while the lagging regions rely mainly on agriculture and low-technology activities, which are less affected by economic crises (Goschin and Constantin, 2010).

Figure 1. Sigma divergence among Romanian counties based on GDP per capita



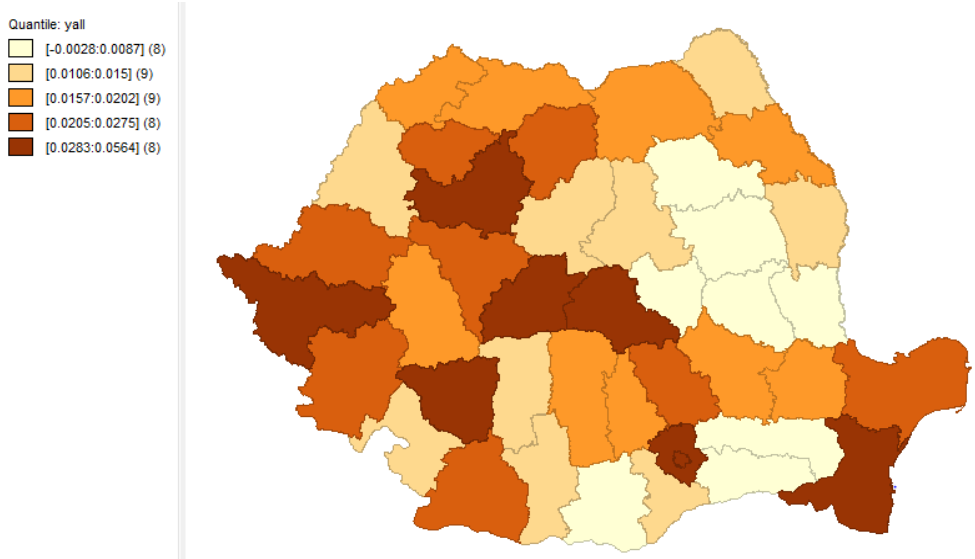
Source: own representation.

Since Bucharest municipality is a major source of disparities due to its dominant position in the Romanian economy, a clearer picture of the territorial inequalities can be drawn by excluding Bucharest from the sigma indicator calculations. The remaining inequalities are by 40% lower, but the trend remains nevertheless the same, indicating a quasi-permanent rise in disparities, as measured by GDP/capita (Figure 1).

In order to validate the statistic significance of this ascending trend in spatial dispersion of GDP per capita, we performed several standard unit root tests on sigma series: Augmented Dickey-Fuller, Elliott-Rothenberg-Stock DF-GLS and Phillips-Perron. All these tests failed to reject the null hypothesis of a unit root and the test equations indicated a positive trend in sigma values, suggesting a systematic increase in GDP/capita territorial dispersion, i.e. sigma divergence.

Beta divergence. In this paper, we use both classic and spatial beta convergence models, in absolute and conditional form, for the analysis of GDP per capita differences between Romanian counties, on three sub-periods established according to the growth and decline phases of the economic cycle. The average annual GDP/capita growth for the overall period varied strongly from one county to another, with the smallest growth rates clustering in Moldova, and a clear development divide between Eastern and Western Romania visible on the map (Figure 2). This clustered distribution of GDP/capita growth is characteristic for spatial autocorrelation. Indeed, the value of Moran's I indicates spatial dependence and the permutation test clearly rejects the null hypothesis of spatial randomness, therefore spatial models seem the appropriate choice for our data.

Figure 2. Average annual GDP per capita growth by county over 1995-2013



Source: own representation in Geoda 1.10

We first estimated the absolute and conditional beta convergence models, both in their classic and in spatial form, according to equations (3), (5) and (6), for the entire period under consideration. The results are presented in Table 2.

The estimated coefficient for logarithm of initial GDP/capita is highly significant and bears a positive sign in all absolute beta convergence models, indicating that Romania is far from achieving territorial convergence over the period 1995-2013. On the contrary, the results clearly point to an ongoing process of β divergence. This is in line with findings obtained from previous convergence research in Romania (e.g. Sîrghi *et al*., 2009; López-Rodríguez and Bolea, 2012; Török, 2013; Ailenei *et al*., 2015; Moroianu *et al*., 2015; Munteanu; 2015; Moisescu, 2015; Benedek *et al*., 2015). In this context, Iancu (2008) argues that "absolute convergence", so hard to find in the current economic environment, should be replaced by the more realistic concept of "group convergence".

Although all three models (classic, spatial lag, spatial error) seem to provide similar results, the Likelihood ratio test revealed low significance for the spatial lag model and insignificance for the spatial error model compared to the classic one, which is the best fit for the absolute convergence case.

When additional explanatory variables are introduced in the models with the aim to capture the regional characteristics and provide a more accurate picture of spatial differences, the Likelihood ratio test points to the spatial lag model as best suited for the data. This means there is interdependence among neighbours (Romanian counties) in the process of economic growth.

Table 2. Estimation results for absolute and conditional beta convergence models, 1995-2013 (dependent variable – real GDP per capita annual growth rate)

ABSOLUTE BETA CONVERGENCE MODELS						
Variables	**Classic model***		**Spatial lag model****		**Spatial error model****	
	Coeff.	**Prob.**	**Coeff.**	**Prob.**	**Coeff.**	**Prob.**
W_GDP Growth			0.36002	0.0501		
CONSTANT	-0.11426	0.02446	-0.10453	0.0219	-0.09511	0.0500
Ln_GDP_initial	0.02322	0.0092	0.02035	0.0108	0.01993	0.0181
LAMBDA					0.26760	0.1902
Statistics	**Value**	**Prob**	**Value**	**Prob**	**Value**	**Prob**
R-squared	0.15749		0.23134		0.1941	
Log likelihood			135.553		134.8764	
F-statistic	7.47715	0.0093				
Spatial dependence: Likelihood Ratio Test			2.5956	0.10716	1.1817	0.2770
CONDITIONAL BETA CONVERGENCE MODELS						
Variables	**Classic model***		**Spatial lag model****		**Spatial error model****	
	Coeff.	**Prob.**	**Coeff.**	**Prob.**	**Coeff.**	**Prob.**
W_GDP Growth			0.39538	0.0203		
CONSTANT	0.16806	0.6369	0.04971	0.8721	0.06485	0.8579
Ln_GDP_initial	0.03437	0.0766	0.02322	0.0564	0.02005	0.0915
Ln_R&D	0.0029	0.0010	0.00294	0.0000	0.00273	0.0002
Ln_Productivity	-0.02438	0.3051	-0.01824	0.3722	-0.01515	0.4964
Ln_Entrepreneurs	0.00090	0.7355	0.00089	0.7074	0.00196	0.4227
Ln_Human_capital	-0.04561	0.5976	-0.01743	0.8161	-0.0215	0.8048
LAMBDA					0.27994	0.1671
Statistics	**Value**	**Prob**	**Value**	**Prob**	**Value**	**Prob**
R-squared	0.4065		0.47428		0.42649	
Log likelihood			143.39		141.963	
F-statistic	4.9315	0.0015				
Breusch-Pagan test	6.3595	0.7571	5.2610	0.3848	6.6192	0.2505
Spatial dependence: Likelihood Ratio Test			3.5757	0.0506	0.7237	0.3949

**OLS estimation*

*** Maximum likelihood estimation*

In the case of conditional beta convergence, the coefficient b is still positive, although less significant, reinforcing the results obtained for the absolute beta convergence models, i.e. divergence (Table 2).

These findings reveal that the developed counties continue to draw on their higher economic potential and grow faster, making any catching-up process unlikely in the near future. This result is in accordance with the systematic upward trend in sigma values, as discussed earlier and supports previous findings in the literature

(Sîrghi *et al*., 2009; López-Rodríguez and Bolea, 2012; Török, 2013; Ailenei *et al*., 2015; Moroianu *et al*., 2015; Munteanu; 2015; Moisescu, 2015).

Table 3. Estimation results for conditional beta convergence models, by sub-periods (dependent variable – real GDP/cap annual growth rate)

Variables	1995-1999 Classic model*		2000-2007 Spatial error model**		2008-2013 Classic model*	
	Coeff.	**Prob.**	**Coeff.**	**Prob.**	**Coeff.**	**Prob.**
CONSTANT	0.0086	0.0959	0.13239	0.0227	-0.29202	0.0178
Ln_GDP_initial	0.1049	0.0490	0.04639	0.0868	-0.06735	0.0042
Ln_R&D			0.00544	0.0002		
Ln_FDI			-0.00284	0.2105	-000759	0.0092
Ln_Trade			0.00447	0.2744		
Ln_Productivity	-0.0960	0.0918	-0.05096	0.0827	0.0897	0.0091
Ln_Entrepreneurs					0.01970	0.0012
LAMBDA			0.47158	0.0061		
Statistics	**Value**	**Prob**	**Value**	**Prob**	**Value**	**Prob**
R-squared	0.3323		0.42716		0.34905	
Log likelihood			125.919			
F-statistic	6.3065	0.0014			4.96011	0.0026
Breusch-Pagan test	2.0941	0.1478	5.5972	0.3474	2.3333	0.6747
Spatial dependence: Likelihood Ratio Test			4.0035	0.0454		

*OLS estimation

** Maximum likelihood estimation

Of all the additional variables of the conditional beta convergence models, only R&D is statistically significant. Its sign indicates a positive influence on regional development, supporting the findings of previous studies on this topic. The number of private entrepreneurs has the expected positive sign, while productivity and human capital seem to indicate a negative impact on regional growth, but the results are not reliable due to statistic insignificance of these variables. Further research, using other control variables, might provide better results.

To sum up, the empirical results provide support for both absolute and conditional divergence in GDP per capita over 1995-2013.

We further checked for possible deviations from this beta divergence trend on the long-run by estimating the same beta convergence models for three relevant sub-periods. We found the same indication of territorial divergence for the intervals 1995-1999 and 2000-2007 (Table 3), which is surprising because the first sub-period was marked by the economic turmoil of the transition to market economy, as well as extensive economic restructuring and large periods of crises, while the second sub-period was characterized by continuous and relatively strong economic growth that should have supported real convergence among counties.

This means that the divergence process was strong and persistent and did not weaken even during significant economic boom, such as the one in the 2000s. This enduring process of spatial polarization of the Romanian economy started during the transition to the market economy. Although Romania had a relatively low level of territorial inequalities in the early 1990, the economic restructuring hit hard the oversized enterprises that were crucial for local economies. Often a large area depended economically on a single industry whose decline would bring about strong negative consequences. On the other hand, the capital region and some large cities benefited from and thrived by attracting human capital and big investments. The large gaps that developed among Romanian counties during transition could not be narrowed in the relatively short economic growth period. Moreover, the developed regions continued to be privileged by receiving steady inflows of human capital, FDIs and European funds.

The last sub-period, 2008-2013, bore the effects of the economic crisis that hit hard the developed regions in the first place. The breadth and depth of economic decline in each county was influenced by various local features, mainly the specific economic and social structures, regional specialisation degree, export orientation of economic activities, etc. The distinct reactions to the crisis manifested by the developed counties compared to the less developed ones should explain the negative coefficients for the natural logarithm of initial GDP/capita obtained for the period 2008-2013, which are suggesting a process of economic convergence. This period includes the economic crisis, as well as the long and still incomplete process of recovery that followed. The developed regions were more vulnerable to the crisis due to their closer links with the developed countries that generated the crisis. Moreover, these regions had larger financial and real estate sectors that were at the forefront of the crisis (Goschin and Constantin, 2010). In contrast, the less developed regions, mainly based on agriculture and low-technology activities, were shielded from the hardest shock of the crisis, at least in the first period. Their advantage was nevertheless only on the short-run, as the developed regions had the economic potential to recover more rapidly once the crisis was gone (Zaman and Goschin, 2015) and beta divergence will probably resume soon.

The severe policy of austerity during the crisis delayed the recovery of the crisis-led economic decline and many counties still need to get steady out of recession and engage on a sustainable path of growth (Zaman and Goschin, 2015). Therefore the results for this period should be considered temporary and likely to change on a longer run.

Conclusion and future directions of research

Real economic convergence, a key issue for regional development, is attracting growing interest in Romania, given the marked and steadily increasing regional economic inequalities, especially in the last two decades. In this context, we analysed the territorial GDP/capita convergence/divergence phenomenon in Romania, by addressing this issue from the economic cycle point of view. We tried to assess the negative impact that strong economic shocks, such as the recent crisis, may exert on the convergence/divergence process.

The empirical results from our analysis seem to provide support for divergence in GDP/capita on the long run, based on sigma and beta convergence traditional methods, in classic and in spatial approach. Our findings show that regional development in Romania is on a systematic long-run divergence path. A variety of factors played a role in this process, starting with the territorially unbalanced effects of transition, when the capital region and some large cities attracted more human capital and big Foreign Direct Investments and continuing with the EU accession which was more beneficial for rich regions, able to attract more European funds. Since conditions for regional catching-up have not been met, as the beta convergence models indicated, there is little hope for future reversal of this negative trend. Failing to validate the convergence theory grounded in the neoclassical economic growth approach, our results rather support the divergence theories based on polarization and centre - periphery inequality, in line with the arguments such as the ones in Prebisch (1981). Such core - periphery structures have been identified in Romania as well (e.g. Benedek, 2015).

A surprising result was to find evidence suggesting economic convergence among Romanian counties during a period of economic decline, such as the recent financial crisis, although this process is likely to be temporary because the residual effects of the recent economic crisis should fade on the long run. Our findings contribute to highlight the emerging changes in territorial economic behaviour due to the economic crisis, with potential long-lasting consequences on regional disparities.

The results indicated that, for our dataset, spatial models perform better than classical regression, at least for certain subintervals of analysis. Further research will need to introduce new and better control variables in the conditional convergence models, since many variables that we tested were statistically insignificant. Also, extending the time span of the analysis, as new data will become available, should shed more light on the unbalances of territorial economic development in Romania. It will be useful to confirm the robustness of these results or assess the new trends in regional convergence when the effects of economic crisis will be outrun and complete recovery achieved for all counties.

The variety of problems and challenges faced by the regional economies require specific policy measures and tools to promote economic growth and reduce

disparities on short and long term and efficient governance is essential in this process. Wide-raging actions and measures need to be taken at both national and regional level to avoid unequal and unstable recovery. Balanced territorial development requires a correct understanding and firm countering of the specific local weaknesses responsible for deeper downfall and slower recovery of some regions. Inequality decline and reversal of the current divergence process depend on identifying new local resources of the economy, removing imbalances, countering negative factors, and improving economic resilience.

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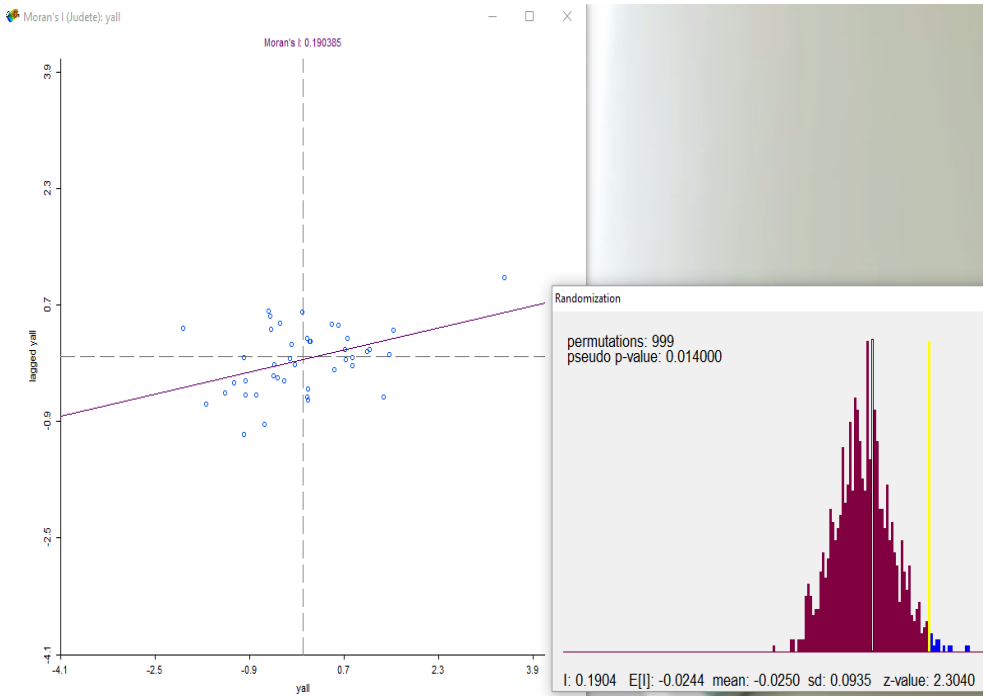
Appendix. Testing for spatial dependence (Moran I and permutations test): spatial dependence in GDP/cap growth



Source: own representation in Geoda 1.10