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Regional inequalities and sigma divergence in Romania

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Abstract

Starting from the need to understand the economic context that fuels increased regional inequality, this paper addresses the question of long-term regional divergence in Romania focusing on the effects of the recent economic crisis. The study uses a standard regional investigation tool, measuring variation in inequalities from the perspective of sigma convergence. It also addresses the impact of economic growth and crises on inequality. The results indicate territorial divergence in Romania on the long-run and narrowing regional inequality in the last few years, in the context of the economic and financial crisis. The main explanation for this new trend is higher resilience to the crisis of less developed counties/regions, due to the specific sectorial structure of their economies.

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Keywords: inequalities, sigma divergence, regional growth, crisis, Romania.

Introduction

At the beginning of the transition to market economy, Romania had low territorial inequalities, result of active policy of the former communist regime that targeted balanced economic development throughout the country. During the transition period the capital region and a few large cities developed at a more rapid pace, while other regions lagged behind. Accession to EU was expected to support the decrease of territorial gaps due to structural and cohesion funds supporting the more rapid development of the poorer regions. On the contrary, EU membership seems to have contributed to the rise in inequalities because of the low and unbalanced absorption of the structural

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and cohesion funds. The traditional divide between East and West and the sizeable gap that separates the capital region from the rest of Romania persisted and even increased. The discrepancy between urban and rural zones (the latter account for 45% of Romanian population) is also wide.

Starting from the need to understand the economic context that fuels increased regional inequalities, this paper addresses the question of long-term regional divergence in Romania focusing on the impact of the current economic crisis. In the current context of regionalization, administrative decentralization and building up of the Regional Operational Programme it is useful to assess the main territorial disparities in Romania, both at region and county level. In particular, knowledge on the size and dynamics of regional inequalities in Romania is important for the prioritization of regional development strategies as a basis for shaping policies in the field of economic, social and territorial cohesion. The main novelty of this research is the appraisal of the trend in territorial disparities over a long interval of time, including the recent economic crisis, based on statistical analysis of the time series of sigma convergence indicator.

The remainder of the paper proceeds as follows. The next section briefly reviews the relevant literature and section 3 describes the methodology employed for the analysis of inequalities and territorial convergence. Section 4 moves on to present and discuss the empirical results and section 5 concludes.

Literature review

The issue of regional inequalities is systematically addressed by many political and scientific bodies, aiming to provide decision-makers relevant data and information on specific processes and factors that influence the magnitude and evolution of disparities. Although European regional policies explicitly target the decrease in regional inequalities, empirical research shows that there are still deep income disparities, which have widened in the past two decades (Villaverde, 2006; Kallioras, 2010; Nahtigal, 2013).

The growing concern about reducing these regional disparities made the Structural Funds and the Cohesion Fund the fastest growing components of the EU budget. Over the last fifteen years, the income gap between the EU-15 countries has fallen, but inequalities between regions in each Member State have increased.

Enlargements of European Union have contributed to widening regional disparities and stronger financial instruments alone are ineffective in the absence of adequate policies for regional development (Huffschmid, 2005; Horváth, 2009). Studies examining the convergence in Central and Eastern Europe (CEE), from multidimensional perspectives and at different regional levels, indicate that this EU area is relatively homogeneous and the disparities in CEE are lower than those in Western Europe, even in the context of the recent economic crisis (Goschin and Constantin, 2010; Szendi, 2013). A special emphasis has been put in the literature on the influence of regional development on the evolution of inequalities and the resulting convergence/divergence process (Benabou, 1996; Quah, 2002; Hull, 2009).

Empirical heterogeneity across regions and counties has also been investigated in several Romanian studies (Dachin, 2008; Goschin et al, 2008; Patache and Grama, 2011; Antonescu, 2010 and 2012; Boldea et al, 2012) that indicated deeper regional disparities in Romania in the post-accession period.

Traditionally, economic analyses of international and national inequalities explained the differences between regions in terms of endowment with natural resources, inputs, infrastructure and technology (Ailenei et al, 2007; Goschin et al., 2008 and 2009; Constantinescu and Constantin, 2010; Boboc et al, 2012). Removing obstacles to mobility of goods and/or factors of production would therefore automatically eliminate the cause of disparities and would stimulate convergence. However, empirical evidence shows that there are relevant factors of influence missing from traditional analyses, factors that have been highlighted by recent theories on location. The main contribution of theories referred to as the "new economic geography" is to bring together in a common analytical framework convergence and divergence forces, helping to better understand the mechanism of regional disparities. In this framework should be encompassed the studies on economic, social and territorial cohesion in Romania (Constantin et al., 2010; Ailenei et al, 2009; Dobre et al, 2011).

An expected benefit following EU accession was the reduction of regional disparities, mainly as a result of using the structural and cohesion funds that should give support to faster development of poor regions. Joining the European Union not only didn't narrow the gaps between regions, but may actually have contributed to greater inequality, as developed regions having prior expertise in accessing funds profited the most (Zaman and Georgescu,

2009; Goschin and Constantin, 2010). High concentration of foreign direct investments in Bucharest-Ilfov region, that owns about 60% of total stock of FDIs in Romania, added to the large development gap separating the capital region from the rest of the country (Zaman et al., 2011).

The recent economic and financial crisis was characterized by uneven regional effects, depending on the specific economic and social structures, the degree of regional specialization and other local factors. The effects of the crisis have added to the pre-existing regional problems, thus aggravating them (Goschin and Constantin, 2010; Ailenei et al, 2012).

Method

Spatial inequality, one of the major topics in regional research, is usually analyzed using classical methods of convergence. We are going to apply in this paper a standard measure of convergence introduced Barro and Sala-i-Martin (1995), namely "sigma convergence". Sigma convergence means there is a downward trend in spatial dispersion of some relevant economic variable such as GDP per capita, revenues, labor productivity, wage, etc. The sigma convergence indicator is a coefficient of territorial variation, measured as the standard deviation of the variable y under consideration divided by its mean:

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

There is said to be sigma convergence if this coefficient of variation decreases over time:

$$\sigma_{to+T} < \sigma_{to} . \quad (2)$$

When the opposite occurs, i.e. the coefficient of variation increases over a period T:

$$\sigma_{to+T} > \sigma_{to} , \quad (3)$$

the process is called “sigma divergence”.

In order to check for the existence of a systematic trend of convergence or divergence we are going to use the following equation:

$$\sigma_t = a + bt + \varepsilon_t , \quad (4)$$

where σ_t is the time series of sigma annual values and bt is the corresponding trendline. A statistically significant coefficient for the trend variable t indicates either a convergence process if it is negative or divergence if positive. An autoregressive process AR (1) may be introduced in the previous regression equation, resulting:

$$\sigma_t = a + bt + \rho\sigma_{t-1} + \varepsilon_t \quad (5)$$

which can be used to test non-stationarity† of σ time series based on Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981). Alternatively we are going to use DF-GLS test (Elliott et al., 1996) which is a more powerful variant of ADF, based on Generalized Least Squares (GLS). ADF test involves estimating the following equation that results by subtracting σ_{t-1} from both parts of relation (5):

† non-stationary series follow the autoregressive process AR (1) with ρ = 1 indicating unit root.

$$\Delta\sigma_t = a + bt + c\sigma_{t-1} + \varepsilon_t, \quad (6)$$

where $\Delta\sigma_t$ stands for the first-order difference in sigma series, bt is the trend, $c = \rho - 1$ and the null hypothesis of ADF test is the presence unit root (H_0: $c = 0 \Rightarrow \rho = 1$) against the alternative H_A: $c < 0$. Rejection of the null supports the convergence assumption, while failing to reject it indicates divergence (Drennan, 2004).

One source of territorial convergence or divergence is the constant adjustment of the economy to shocks, such as the recent economic crisis. The supply and demand within an area can be radically influenced by technological changes or changes in consumer preferences. Although households and businesses are mobile, delays in adjustment may lead to temporary periods of divergence (Barro and Sala-i-Martin, 1995). We are going to test this hypothesis for Romanian counties and regions, over a relatively long period, including the 2008-2010 period of crisis.

Results

In Romania, the development regions and counties are the main territorial units relevant for the analysis of convergence/divergence in the national context. Consequently, we are going to analyze the magnitude and the long-run trend in territorial inequalities based on both county and regional time series. We used two main sources of data. The county and regional data on GDP and population, necessary for GDP/capita computation, were provided by the National Institute of Statistics (TEMPO online database), while the data on FDI stock come from the National Trade Register Office. In order to ensure comparability of data from different years we transformed the statistics on GDP and FDI in constant prices.

The indicators measuring territorial inequalities and convergence in GDP per capita in Romania have been calculated annually for the period 1995-2010 in three versions:

- inside the regions: we measured disparities between the counties within each development region;
- between the regions;
- between the counties.

Intra-regional convergence, measured by the coefficient of variation calculated within each region, provided the results displayed in Table 1. The indicator is less relevant for Bucharest-Ilfov region, as it includes only two territorial units.

Table 1. The convergence coefficient (sigma) for GDP/capita within each development region, 1995-2010 (%).

	North - West	Center	North - East	South - East	South - Muntenia	Bucharest - Ilfov	South - West Oltenia	West
1995	12.12	8.69	15.46	18.12	19.59	13.15	14.57	15.57
1996	12.08	9.73	16.52	18.29	20.66	12.51	20.39	14.71
1997	15.4	10.82	13.47	23.2	16.14	25.45	18.16	19.45
1998	17.63	14.19	16.26	23.55	15.86	22.72	16.25	17.43
1999	19.76	12.56	15.88	20.52	15.59	26.08	15.37	25.43
2000	22.1	12.33	18.79	22.27	20.41	30.05	18.49	16.86
2001	21.17	13.02	18.97	21.09	12.91	23.76	17.34	17.75
2002	22.33	15.99	20.57	26.06	20.8	24.61	29.13	18.8
2003	21.44	13.88	18.54	24.93	22.78	21.51	23.3	20.38
2004	22.03	11.84	21.02	23.05	16.71	16.28	18.15	20.7
2005	21.15	14.54	20.95	28.75	27.22	18.06	20.47	23.46
2006	20.48	16.17	19.06	27.82	29.37	11.25	20.14	26.59
2007	24.6	17.68	18.39	25.48	29.98	16.52	21.86	23.28
2008	23.19	17.65	18.03	23.17	25.95	22.53	17	27.42
2009	23.04	19.08	18.09	25.97	28.13	20.46	22.1	25.03
2010	24.69	22.61	21.94	25.94	19.35	25.61	23.77	28.66

Source: own computations based on NIS data.

These results are indicating constant divergence in terms of GDP/capita within each development region over 1995-2010. This trend is opposite to the Convergence objective of reduced intra-regional disparities promoted

by the European Union under the Cohesion and Social Inclusion Policy.

The factors that determined this trend are numerous, stating from the turmoil of economic restructuring in view of transition to market economy during the 1990s, up to the more recent efforts to accommodate to the rigors and commitments enforced by EU accession. These processes involved significant efforts and high economic and social costs that put to test the capacity of counties/regions to accommodate to the new economic environment. The counties/regions that failed to adapt rapidly and effectively have been left lagging behind.

Poor absorption of structural funds, representing only 11.42% of the total funds allocated by EU for the period 2007-2013, also played a pro-divergence role in Romania in the period under consideration.

The Bucharest-Ilfov region, with considerably higher economic and social development level compared to other regions, was another important factor in this divergence process.

Table 2. Sigma divergence in GDP/capita accross counties and across regions, 1995-2010

	Sigma across counties (%)	Sigma across regions (%)	Sigma across counties except for Bucharest Municipality (%)	Sigma across regions except for Bucharest-Ilfov region (%)
0	*1*	*2*	*3*	*4*
1995	19.02	19.78	16.00	8.72
1996	19.82	19.85	16.87	8.72
1997	21.70	21.69	18.21	12.03
1998	24.80	29.11	18.72	11.33
1999	27.64	33.22	20.20	13.75
2000	33.62	44.77	20.69	12.42
2001	30.39	40.20	19.87	11.97
2002	33.07	40.20	23.14	14.08
2003	32.44	39.43	22.94	14.01
2004	31.88	39.40	22.97	14.61
2005	38.16	46.72	26.06	14.93
2006	39.56	46.32	28.51	16.56
2007	40.21	47.73	28.09	17.23
2008	43.93	56.95	26.48	15.26
2009	41.79	52.34	26.84	15.16
2010	42.01	53.14	26.13	16.11

Source: own computations based on NIS data.

Calculations on the inter-regional variation in GDP/capita during the period 1995-2010 (Table 2, column 2) indicates a tendency for much stronger divergence than intra-regional. Inter-county divergence is also high and on an upward trend (Table 2, column 1) but since the start of the economic and financial crisis the coefficient sigma slightly decreased.

As Bucharest Municipality and the whole Bucharest-Ilfov region are dominating the Romanian economy and weight heavily in all inequality indicators, we recalculated the sigma coefficient for GDP/capita between counties and between regions excluding Bucharest Municipality and Bucharest-Ilfov region, respectivelly. As expected, the new values of the variation coefficient are markedly lower (tabelul 2, columns 3 and 4) confirming the high impact of the capital region on the economic divide in Romania. The upward trend in new sigma series is slightly curbed compared to previous results.

To check the sigma divergence trend indicated by these results we further estimated regression equation (4). The results that are presented in Table 3 show a positive and highly significant coefficient in the trend variable, which again confirms the hypothesis of divergence (increased dispersion of GDP/capita) between regions and counties, respectively.

Table 3. Trend estimation results for sigma series, 1995-2010.

Counties

Variable/statistic	Coeficient	Std. Error
Constant	18,4580***	1,1620
Trend	1,6523***	0,1201
R-Squared	0. 9310	
F statistic	189,04***	

Significance: *** p<0.01

Regions

Variable/statistic	Coeficient	Std. Error
Constant	19,7242***	2,2717
Trend	2,3181***	0,2349
R-Squared	0. 8742	
F statistic	97,357***	

Significance: *** p<0.01.

Results from sigma trend estimation according to equation (6), which includes an autoregressive process AR (1), also confirm the divergence based on the positive and statistically significant coefficient for the trend variable. The regression coefficient on sigma variable with unit lag is negative and statistically significant.

In sum, all results verify the divergence trend in GDP/capita, both at region and at county level.

Table 4. The results of the ADF test equation (dependent variable $\Delta\sigma$).

Counties

Variable/statistic	Coeficient	Std. Error
Sigma (-1)	-2.237818***	0.503537
Constant	41.20716***	8.401287
Trend	3.513325***	0.862103
R-Squared	0.821736	
F statistic	0.029993**	

Significance: *** p<0.01

Regions

Variable/statistic	Coeficient	Std. Error
Sigma (-1)	-0.611351**	0.272861
Constant	15.27540**	5.712505
Trend	1.311761*	0.708798
R-Squared	0.312776	
F statistic	2.730773*	

Significance: ** p<0.05; * p<0.1

Results from Augmented Dickey-Fuller and DF-GLS unit root tests for sigma series (Table 5) show that we cannot reject the unit root hypothesis. This contradicts sigma convergence between counties and also between regions, providing additional support to our previous conclusions.

Table 5. ADF and DF-GLS tests on sigma convergence in GDP/capita

Test critical values		t-Statistic (Prob.[1])	
		Counties	Regions
Augmented Dickey-Fuller test		-1.256096	-2.240522
		(0.6205)	(0.4367)
1% level	-4.728363		
5% level	-3.759743		
10% level	-3.324976		
Elliott-Rothenberg-Stock DF-GLS test		-0.904210	-2.469306
1% level	-3.770000		
5% level	-3.190000		
10% level	-2.890000		

[1] MacKinnon (1996) one-sided p-values.

In conclusion, empirical data points without reservation to sigma divergence in GDP/capita over 1995-2010. This can be explained by the combined influence of several factors, among which the most important might be

the impact of the recent economic and financial crisis, overlaid on effects of the first post-accession years. As seen from the past experience of other EU member states, accession brings about certain costs in order to accommodate to the new European single Market and to Community rigors. The new position of Romania as EU member state might have contributed to the rising disparities because territorial units adapt differently to the changed economic environment. Usually, the more developed regions and counties have an increased capacity to accommodate to the costs of integration and to external shocks such as the economic crisis.

Another influence factor for territorial inequalities and economic divergence is the Foreign Direct Investment (FDI). In Romania FDI can be considered as a double impact factor.

On the one hand, it contributes to the economic and social development, in particular in the territorial units where is carried out, through effects such as increased productivity and wages, greater spillover effects, both extensive and intensive, higher technology transfers, additions to the formation of gross fixed capital, superior management expertise, etc.

On the other hand, FDI also has a number of adverse effects: great concentration (about 60%) in Bucharest, massive labor layoffs when state enterprises have been bought by foreign investors, competitive pressure on domestic products and services, increased income divide between "elitist" highly-skilled minorities, and those with low qualifications.

Table 6. The convergence coefficient (sigma) for FDI/capita within each development region, 2001-2011 (%).

	Sigma across counties (%)	Sigma across regions (%)	Sigma across counties except for Bucharest Municipality (%)	Sigma across regions except for Bucharest-Ilfov region (%)
2001	99.57	159.94	50.56	27.40
2002	104.90	165.31	44.71	26.40
2003	104.04	156.96	50.73	27.16
2004	131.37	178.94	46.22	24.01
2005	123.55	191.68	41.77	23.22
2006	115.67	189.33	38.72	21.63
2007	119.87	214.16	30.29	20.63
2008	125.38	185.66	34.22	15.73
2009	128.89	175.33	32.07	17.55
2010	106.15	167.95	32.33	17.26
2011	98.33	165.72	29.73	16.21

Source: Author's calculations based on data from the National Trade Register Office.

There is high unbalance between Bucharest-Ilfov and the other regions in terms of FDI stock. The gap has accentuated notably during the large privatizations of banks, manufacturing enterprises, utilities, etc. with strategic investors. Consequently the coefficient of variation (sigma) in FDI is considerably higher compared to the same indicator computed for GDP/capita. The trend however is similar for the two sigma series. Like sigma for GDP/capita, sigma for FDI stock decreased following the crisis (Table 6), when FDI inflows in Romania steeply declined, compared to 2001-2008.

Conclusion

The results provided by different methods applied for analyzing the process of economic convergence/divergence of Romanian counties and regions indicate the same trend of rising inequalities on the long-run, with some deviations in the sub-periods, depending on the development of the national economy as a whole.

During the association period (1995-2000) and also during pre-accession to EU (2001-2006) the territorial inequalities followed a relatively slow but continuously upward trend. The first two years of the post-accession period were marked by a more rapid widening of regional differences, as the previous divergence trend was exacerbated by overlapping impact of the efforts to accommodate to the rigors and commitments towards EU

integration, which involved significant costs.

This trend was reversed since 2009. The factors supporting convergence surpassed the divergence forces in the context of the global economic and financial crisis that induced recession phenomena both in EU member states - the main trade partner of Romania and in Romania, where the impact was stronger and longer. One main explanation for this new trend is the higher resilience to the first stages of the crisis demonstrated by the less developed counties/regions, due to the specific sectorial structure of their economies. Prevalence of sectors with low technological level, but constant demand (such as agriculture) shielded the relatively undeveloped regions from the external shocks of the crisis.

In the post-crisis environment, developed regions should recover easier, given their superior economic potential, and rising inequalities should resume. Therefore, active policy measures, adapted to specific needs of different regions/counties should be designed to tackle not only the immediate effects of the crisis, but also to prevent further widening of territorial inequalities.

Further research should explore more in-depth the socio-economic factors linked to the observed territorial discrepancies.

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