REGIONAL DISPARITIES IN ROMANIA AFTER THE EUROPEAN UNION ACCESSION

Mihai ANTONIA
Bucharest University of Economic Studies
6 Piața Romană St., 010374, Romania
antoniamihai20@stud.ase.ro

Elena-Maria PRADA
Bucharest University of Economic Studies
6 Piața Romană St., 010374, Romania
elena.prada@csie.ase.ro

Luciana SIMION
Bucharest University of Economic Studies
6 Piața Romană St., 010374, Romania
luciana.simion6@gmail.com

Abstract. *One of the most expected benefits after the integration of Romania into the European Union was the improvement of living standards in the country's poorer regions. In 2007, regional disparities in Romania were at a high level, and the expectation was that economic performance due to accession to the union and the European funds would reduce these inequalities. This paper investigates the evolution of regional disparities in Romania at the county and regional levels between 2007 and 2019. The investigation tool used to analyze inequalities variation is sigma convergence, based on the catch-up effect hypothesis, that poorer regions have higher growth rates than richer regions. Excepting Bucharest Municipality, the results suggest overall regional divergence in GDP/capita in Romania in the studied period and territorial convergence in the same period if.*

Keywords: *catch-up effect; European Union; regional disparities; sigma convergence.*

Introduction

European Union even since its formal establishment, has adopted a cohesion policy that plays an important role in promoting the 'overall harmonious development of its member states and regions. Cohesion policy is clearly visible and offers benefits that could not be implemented only on a national, regional, or local level. The expectations were high in 2007 after Romanian accession to the European Union, especially on economic development and reducing the gaps that we had behind senior EU members.
In the first year after the integration of Romania into the European Union, our country had all the NUTS2 regions below the EU-27 average in terms of GDP/capita, with the NE region as the poorest region in the EU. Things were not too bright inside the country; there were old gaps between the East and the West, and about 45% of the population lived in rural areas. Regional disparities in Romania, increased shortly after the transition to the market economy; in 1990 there were low territorial inequalities, the result of an active policy of the precursory communist regime, that followed evenly economic development inside the country (Goschin, 2014).

In 2010, the European Union launched a document entitled Europe2020, which is the European strategy for smart, sustainable and socio-economic growth. Regional policy is the EU's main investment policy. In 2014-2020, € 355.1 billion, about a third of the EU total budget, was allocated to cohesion policy to reduce disparities and meet the various needs of all EU regions (ec.europa.eu). Romania was allocated 30, 882 billion euros in structural and investment EU funds.

Literature review

Socioeconomic inequalities are a major concern and attracted the attention of both specialized studies conducted by different institutions in Romania and Europe, as well as researchers affiliated with universities and research institutes, aiming for social and policy measures. National economic studies offer an explanation for territorial inequalities, based on the dissimilarity between regions in terms of endowments with infrastructure, natural resources, factors of production, and technological development (Ailenei & Dachin, 2007; Goschin, et al., 2008; Constantinescu & Constantin, 2010; Boboc et al., 2012).

Considering the analysis of the factors that affect economic evolution and regional inequalities in Romania, we have recognized several articles that use different research methodologies: using the SSA methodology studied regional growth in Romania after the EU ascension (Goschin, 2014). Territorial disparities in the Romanian counties regarding the urban population's access to waste collection services and to examine environmental issues were highlighted by Mihai, F.C. et. al. (2012); the endogenous determinants and processes of underlying economic evolution at the national and county level, were the subject of a 2015 study (Zaman et al., 2015); the determinants of GDP (Anghelache et al., 2015); a study on international trade was presented in 2012 Anghelache and Manole (2012); Anghelache et al. (2014), Bardsen et. al. (2005), Dobrescu (2013) presents a macro model for the Romanian economy; Davies, Waddell, and Naughton (2007) perform a spatial analysis of FDI on GDP; Ludoșean (Stoiciu) (2012) also studied the correlation between FDI and economic development; a similar topic is found in the studies of Stancu and Constantin (2011) and Pecican (2007).

Several other relevant studies that treat the topic of regional inequalities in Romania and Europe are mentioned below: providing a classification of countries by the degree of convergence, Shankar, R., Shah, A. (2001) find also Romania among the countries experiencing regional income divergence: Vietnam, China, Indonesia, Russia, Philippines, Brazil, Sri Lanka, and India. Herz, B. and Vogel, L. (2003) investigate the regional development in Central and Eastern Europe, by analyzing a sample of 31 Central and East European regions. They conclude that structural variables like the labor participation rate and the economy's sectoral structure matter for regional growth. Meliciani, V., Peracchi F. (2004) study convergence in per-capita GDP across European regions over the period 1980—2000 and find significant evidence of correlation of growth rates across neighbor regions and regions belonging to the same country by estimating convergence equations. Paas, T. and Vahi, T. (2012) notice that regional innovations tend to increase inter-regional differences, at least during the short-run period. Covering the period between 1985 and 2000, Niebuhr, A. (2006) investigates the significance of market access for regional wages and the geographic extent of demand linkages for a cross-section of European regions, also taking into account the effects of national borders. LópezBazo, E. (2021) brings evidence of regional

disparities in public attitudes toward the EU and finds that the impact of regional growth on attitudes towards the EU is not the same in all regions. The effect of support and trust is more intense in regions with per capita income above the EU average. Hadjinikolov, D. (2020) finds that intra-regional differences in Bulgaria have increased in the post-accession period and intra-regional disparities have resulted in the depopulation of the lagging regions.

Major events also attracted the interest of authors in this field, the evolution of regional inequalities in the context of the great economic crisis of 2008 (Chirila & Chirila, 2014) was studied using a series of indices that defines the difference between the territorial structure and its evolution in time (Zaman et al., 2013). The more recent context of the global pandemic caused by the COVID-19 virus also may change the course of regional disparities evolution due to region resilience, a topic studied in European countries by Roberta Capello and Andrea Caragliu (2021).

Methodology

Economic conditional convergence or the "catch-up" effect is the hypothesis that countries with lower GDP/capita tend to have a higher growth rate than more developed countries. This theory first appeared in the economic literature in 1956 when Solow as Swan, independently developed a long-run economic growth model. In their models, these two new classical economists estimate that different economic development levels would look stable, considering the capital marginal production decrease. In my paper, I will measure regional disparities, with a standard method proposed by Barro, R. and Sala- i-Martin in 1995, σ-convergence, which measures the decreases or increases of disparities between regions over time. The mathematical notation of the sigma convergence is as follows:

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

where:

- $\sqrt{\sum_{i=1}^{n} (y_i - \underline{y})^2/n}$, represents the standard deviation, the measure of the dispersion where ***n*** is an indicator of the number of observations (counties or regions) within the sample,
- $\boldsymbol{\sigma}$ represents the ratio between the weighted standard deviation of regional or counties GDP per capita (y_i) and national GDP per capita ($\underline{y}$).

$$\sigma_{t_0+T} < \sigma_{t_0} \quad (2)$$

If the coefficient of variation decreases over time, we have the "catch-up" effect or economic conditional convergence or sigma convergence meaning that regional disparities decreased over time.

$$\sigma_{t_0+T} > \sigma_{t_0} \quad (3)$$

In the case that the coefficient of variation increases over time, we have sigma divergence. In this case, the regional disparities increased over the period studied.

Tendencies of the sigma variation over time are calculated using the trend equation below:

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

where:

- $\sigma_t$is the time series of sigma annual values
- bt is the corresponding trend line. If the trend variable t holds a positive significant coefficient, indicates a divergence process, if it is negative then we have a convergence process.

In the above regression equation, may be inserted an autoregressive process AR (1), resulting following:

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

AR (1) can be used to test non-stationarity (autoregressive process AR (1) with ρ = 1 indicating unit root) of σ time series based on Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981). A more powerful variant of the ADF test is Dickey-Fuller Generalized Least Squares (DF-GLS) test (Elliott et al., 1996), which will reinforce the results. ADF test involves estimating the following equation that results by subtracting $\sigma_{t-1}$from both parts of the previous relation:

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

Where:

- $\Delta\sigma_t$ is the first-order difference in sigma time series,
- bt stands the corresponding trend line,
- c = ρ-1 represents unit root

Null hypothesis in ADF tests is the presence of unit root (Drennan, 2004):
H_0: c = 0 => ρ = 1, sigma convergence
H_A: c < 0 , indicates sigma divergence

Cohesion funds from European Union are a powerful tool for territorial convergence, and Romania has benefited since its accession to the union. The evolution of regional disparities in Romania between 2007 and 2019 also influenced other factors like the Great Recession from 2008-2010 (Goschin, 2014), the supply and demand generated by mass migration, technological evolution, or preferences of household consumers. I will put this hypothesis and the 'catch-up' effect for the Romanian counties and regions in the 2007-2019 period to investigate the evolution of regional disparities in Romania since its accession to the European Union.

Results and discussion

To test the degree of economic convergence or divergence in Romania, I used data from the National Institute of Statistics (TEMPO online database). To ensure comparability of data in the time series, the statistics on GDP were transformed in 2008 by constant prices using GDP deflator formula. Territorial inequalities and sigma convergence/divergence of GDP/capita have been measured inside the region, between the regions and counties.

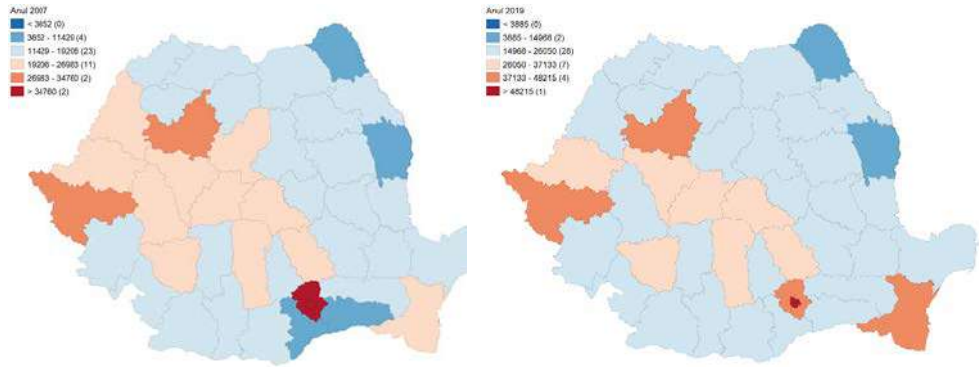

Figure 1. Standard deviation of GDP per capita in 2007 and 2019

Figure 1 represents the standard deviation map in 2007, at the beginning of the period studied and in 2019, the end of the period studied, and shows us how dispersed the county's GDP per capita in relation to national GDP per capita. The regression results are divided into 6 parts: with the blue pallet of colors we have the counties with annual GDP per capita lower than the annual national GDP per capita, and with the red pallet of colors we have the counties with higher GDP per capita than the national average. We can visualize how disparities evolved in this period the figure 2.

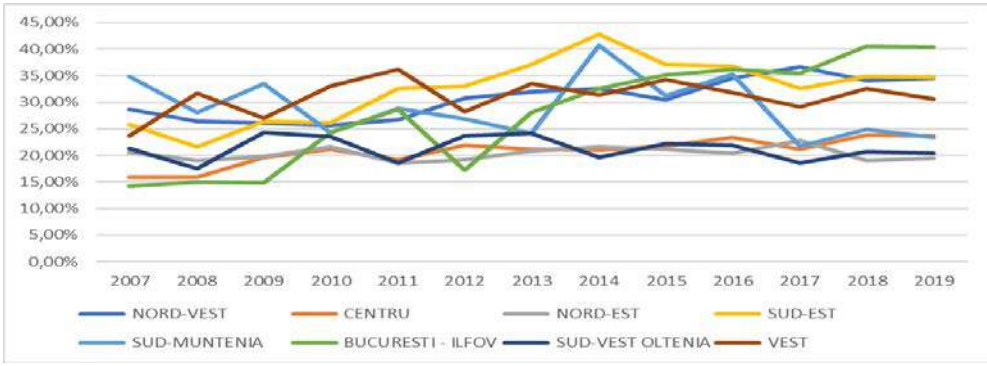

Figure 2. The convergence coefficient (sigma) for GDP/capita within each development region, 2007-2019 (%).

Table 1. The Sigma convergence for GDP/capita within each development region, 2007-2019 (%).

YEAR	NORD VEST	CENTRU	NORD-EST	SUD-EST	SUD-MUNTENIA	BUCURESTI - ILFOV	SUD-VEST OLTENIA	VEST
2007	28,73%	15,81%	20,47%	25,75%	34,83%	14,24%	21,22%	23,66%
2008	26,34%	15,94%	19,06%	21,63%	28,08%	14,94%	17,60%	31,70%
2009	26,15%	19,58%	19,85%	26,47%	33,52%	14,86%	24,30%	26,96%
2010	25,72%	21,21%	21,59%	26,09%	24,33%	24,27%	23,56%	32,98%

2011	26,75%	19,21%	18,53%	32,55%	28,83%	28,73%	18,54%	36,14%
2012	30,77%	21,85%	19,14%	32,98%	26,79%	17,25%	23,72%	28,15%
2013	31,96%	21,09%	20,86%	37,12%	24,21%	28,01%	24,16%	33,41%
2014	32,61%	21,03%	21,64%	42,83%	40,77%	32,56%	19,56%	31,37%
2015	30,42%	21,74%	21,09%	37,15%	31,21%	35,19%	22,15%	34,25%
2016	34,51%	23,35%	20,37%	36,73%	35,28%	36,26%	21,94%	31,82%
2017	36,59%	21,15%	22,77%	32,61%	21,73%	35,47%	18,53%	29,06%
2018	34,05%	23,88%	19,09%	34,76%	24,87%	40,59%	20,69%	32,59%
2019	34,58%	23,73%	19,51%	34,62%	23,43%	40,47%	20,36%	30,56%

These results suggest that we have more than one situation: extreme divergence, divergence, stable/unstable and even convergence among country development regions. We identify extreme divergence in Bucuresti – Ilfov region. This extreme divergence came from the uneven economic growth between Bucharest the national capital and the surrounding county Ilfov.

Divergence is present in the next regions: North West, Centre, South-Est, and West.
In North East and South West Oltenia, the evolution of economic convergence is unstable, indicating that regional disparities within these regions are constant. We can see that the trend is convergent meaning a is a slight trend in reducing inequalities.
South Muntenia is the only region in the country where disparities are, meaning that since its accession to the EU, this region manage to deal with inequalities. The economic convergence came from the spill-over effect due to the vicinity of Bucharest Municipality, the core of economic development in Romania.

Table 2. Sigma divergence in GDP/capita across counties and across regions, 2007-2019

Year	Counties	Counties except for Bucharest Municipality	Regions	Regions except for Bucharest Municipalities
2007	40,49%	33,46%	47,96%	17,89%
2008	43,49%	34,20%	54,57%	17,83%
2009	41,10%	33,62%	49,11%	17,20%
2010	40,74%	31,78%	50,36%	18,03%
2011	43,18%	32,92%	53,75%	18,53%
2012	44,86%	35,63%	54,44%	17,61%
2013	44,66%	33,91%	55,08%	17,06%
2014	46,19%	35,83%	54,17%	17,18%
2015	46,93%	34,40%	57,87%	18,18%
2016	46,47%	35,16%	55,54%	19,30%
2017	44,23%	32,51%	54,97%	18,35%

2018	43,45%	32,30%	52,48%	18,70%
2019	42,54%	31,73%	51,26%	18,37%

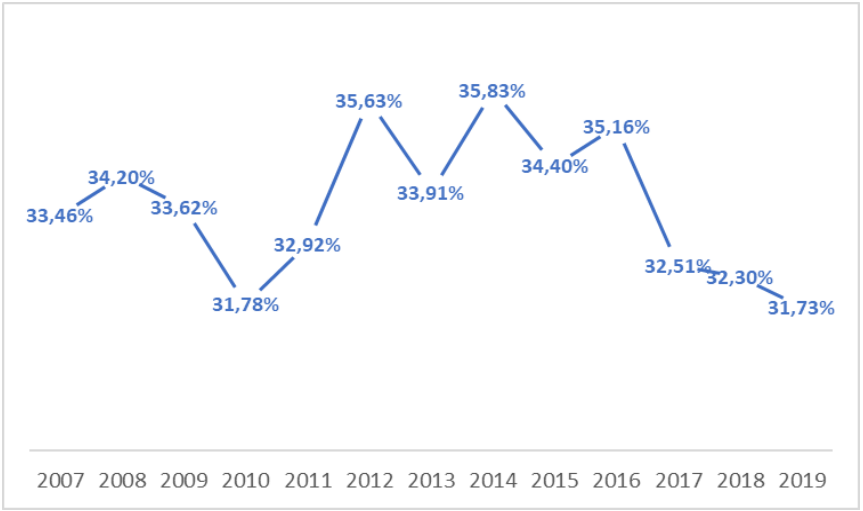

Figure 3. Sigma divergence in GDP/capita across counties, except Bucharest Municipality

If we except the Bucharest Municipality coefficient of variation decreases over time, and we have the "catch-up" effect or economic conditional convergence or sigma convergence meaning that regional disparities decreased over time.
In figure 4 case, the coefficient of variation increases over time and we have sigma divergence. In this case, the regional disparities increased over the period studied.

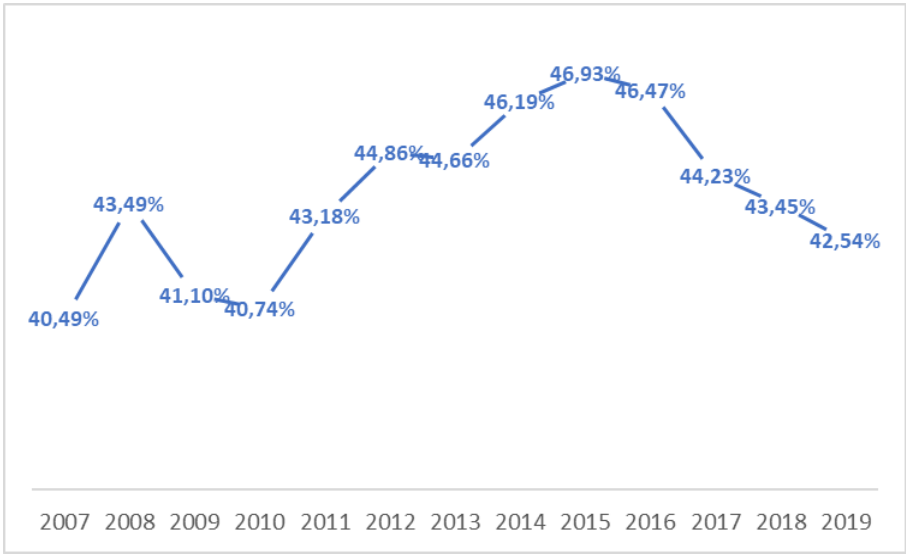

Figure 4. Sigma convergence in GDP/capita across counties

Table 3. Trend estimation results for sigma series, 2007–2019 (Author's Own Source)

Counties			
Variable/statistic	Coefficient	Std. Error	Probability
Constant	41.7665	1.1263	0.000***
trend	0.2786	0.1419	0.07533
R-squared		0.2595	
F statistic		3.8563	0.075331
Regions			
Variable/statistic	Coefficient	Std. Error	Probability
Constant	51,0293	1,56313	0.000***
trend	0,3097	0,196936	0,14404
R-squared		0,183616	
F statistic		2,47406	0,14404

In Table 3 are the results from sigma trend estimation in accordance with equation (5) that take into consideration an autoregressive process AR (1) for both, county and regional level. The results for sigma trend estimation at the county level is not statistically significant, the probability is 0.07533, below the benchmark of 0.05, meaning that the null hypothesis cannot be rejected (Drennan, 2004). The results for sigma convergence at the regional level are also not statistically significant, with p value 0.14404.

Table 4. Results for the ADF test equation (dependent variable Δσ) (Author's Own Source)

Counties			
Variable/statistic	Coefficient	Std. Error	Probability
Sigma -1	-.3310474	.3021734	0.302
Trend	-.0006492	.0018388	0.732
Constant	.1509778	.1247871	0.257
Regions			
Variable/statistic	Coefficient	Std. Error	Probability
Sigma -1	-.822245	.3398513	0.039*
Trend	.0007065	.002712	0.800
Constant	.4368975	1714301	0.031*

For both estimations, the sigma variable with unit lag is negative, which indicates a divergent process, but not a statistically significant coefficient for trend. At the county level, the result suggests that disparities had a steady evolution. At a regional level, results indicate that disparities had divergent evolution since the accession of Romania to the European Union.

Table 5. Results for the ADF and DF-GLS tests (Author's Own Source)

Test critical values		t-statistic (Prob.)	
		Counties	Regions
Augmented Dickey-Fuller Test		p-value for Z(t) = 0.9298	p-value for Z(t) = 0.3693
		-1.096	-2.419
1% level	-4.380		
5%level	-3.600		
10%level	-3.240		
Elliott-Rothenberg-Stock DF-GLS Test		-1.377	-1.180
1% level	-3.770		
5%level	-3.190		
10%level	-2.890		

In Table 4 are presented the results from the Augmented Dickey-Fuller and DF-GLS unit root tests for sigma series from 2007 to 2019, and shows that we cannot reject the unit root hypothesis.

Conclusions

In our study, we employed different methods for estimating the economic divergence/convergence process in Romania's regions and counties after the accession to the European Union. Our results indicate that both at the county and regional levels had a weak increase in economic disparities in the long run, but with some important deviation in the sub-periods.

Immediately after the accession of Romania to the European Union, in the first two years, regional inequalities were widening, influenced by previous trends (Goschin, 2010) and the accommodation process to the norms and rigors of the EU, which, the wealthier region was more prepared. The trend overlaps in 2009 in the global economy influenced by the Great Recession. The financial crisis created a non-desired convergence process in Romania, economic differences between regions and counties were reduced, not because of the catch-up effect but because more developed, yet more integrated counties and regions were more affected by crises than less developed ones. The period after the Great Recession was followed again by a divergent process of regional inequality mostly caused by the more rapidly recover of more developed yet resilient counties and regions in Romania.

The expected benefit of economic growth and reducing economic disparities are visible in Romania eight years after its integration into the European Union. In the sub-period 2015-2019, the "catch-up effect" occurs at every level, county, and region, and the economic gap is on a steady descendent trend. We can attribute this favorable evolution to the benefits of EU integration – technological spill-over, FDI funds, EU funds, and regional EU investment policy in the sustainable development of all regions.

To our knowledge, this paper is the first to investigate the evolution of regional disparities in Romania after the EU accession and offers a deeper understanding of the socio-economic evolution in the context of European Union membership. Our results provide valuable information for policymakers regarding Euroscepticism and withdrawal parties. In the end, our study also has limitations. We focus on the evolution of regional disparities measured as GDP/capita; therefore, future research should focus on other indicators of regional inequalities.

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