

A Multi-Level β Convergence Analysis for Romania in a European Framework

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Abstract

Romania belongs to the countries less developed in the European Union and the main desire is to reach the performance of the most developed countries. The β convergence is measured by the time needed to reach the desired level, in our case highest development level. The present study is calculating the β convergence for Romania at the NUTS0, NUTS1 and NUTS2 level with the most developed countries in European Union considering the annual average GDP/capita, considering as target value maximal and median values. The first issue we are looking for is the convergence existence among the European countries. The contribution of the study reveals the time needed to overcome the gap as a starting point for the strategies and the public policies design. In our opinion, a reasonable convergence time is a base for adjusting and speeding the existing policies, since a high period could be perceived as a need for disruptive measures. At the same time the study offers a perspective at the EU level about the time skyline of reaching the homogeneous regional development.

Keywords

Beta-convergence, disparities, regional development, economic growth, public policies, strategies

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Introduction

The desire of the European Union is to create approximately the same life conditions in all regions, for all citizens, this objective being mentioned by the EU Treaty. Unfortunately, the EU countries know different development in time and they are characterized by significant differences in natural resources and cultural behavior. This mandate of reducing disparities was developed in Cohesion Policies strongly implemented by the EU. Monfort (2008) in his analysis, about the convergence of EU regions, concluded that the disparities were significantly reduced and the convergence gets a contour. Any strategy or policy could be strongly disrupted by the crises, phenomenon recorded for the economic crisis from 2008-2010. Monfort (2020) evaluates the post crisis state and the evolutions of the regional disparities. His main conclusions are that the crisis stopped the convergence process; the disparities trend to increase in some countries; the crisis impact is on long-lasting for convergence despite the economic recovery process.

Nowadays the convergence issue is more current than ever considering the fact that we were hit by the health crisis of pandemic COVID-19, 2020-2022 being a period of tremendous restrictions and changes (lockdowns, slowdowns). The energy crisis started in 2022 and the potential food crisis are new challenges for European countries, but not only, forced to focus on specific resilience, minimization the effects and recovery, than on a broad, generous objective as convergence. Even so, to be able to create the best framework to face the challenges and to blueprint out the policies we should have a view about the regional disparities in EU and especially the Romania's position. The existence of the disparities and the

increasing trend could be a reason to question the cohesion policies and their success. The EU cohesion policy for the new strategic programming period has to be adjusted in accordance with the resilience and recovery policies. The present study aims to find an answer to the question if Romania is connected to the convergence process in Europe, are we in the mainstream of reducing disparities. The research hypothesis is that the Romanian regions at the level of NUTS0, NUTS1, NUTS2 are belonging to a specific pattern of convergence, based on the time needed to reach the maximal or medium level of development.

1. Literature review

Club convergence was considered by Apergis, Panopoulou and Tsoumas (2010), they consider that the EU countries are split in two Clubs: old and new members (EU 14 and EU 27-14), it was the time of the “two speed Europe”. Another convergence analysis (Monfort, Cuestas and Ordóñez, 2013) drives to a similar conclusion of 4 Clubs, this time the EU-14 seems to belong to 2 clubs and the new Eastern European countries to 2 other clubs. Definitely the disparities between the old and the new EU countries represent a concern after the EU enlargement, but there are also differences between South-East and North-West countries (Borsi and Metiu, 2015). GDP/capita structured the EU countries in two clusters and the GDP deflator in three in Fritsche and Kuzin study (2011). Cutrini (2019) using a clustering approach combined with a logit regression structured the EU regions in 4 clubs: Club 1 - Metropolitan areas and capital regions; Club 2- Central European Manufacturing Core; Club 3- De-industrializing regions with intermediate average per capita income levels; Club 4- Mediterranean lagging-behind regions. She placed Romania’s regions in Club 2 and Club 3 and concluded that the structural changes are the root of growing the regional disparities. Club convergence was studied by the Barrios et al. (2021) for Serbia at the NUTS3 and the findings highlights 2 distinctive clubs. Mazzola and Pizzuto (2020) analyzed the club convergence after the great recession and highlighted the evidences supporting the „multi speed Europe”. The clustering of the EU countries are pronounced geographically, the disparities between north and south being considerable, also at NUTS2 income and GDP differences are pleading for multi-speed Europe (von Lyncker and Thoennesen, 2017). Butkus at al. (2018) find out that the convergence at the EU countries still persists, but the speed is slowing down after the economic crisis, conclusion reconfirmed by Monfort (2020). From the perspective of Euro zone convergence there was a convergence among the countries that join the euro. β convergence analysis of the EU regions reveals a discrepancy between three club countries: EU-28, EU-15 and EU-13, the spacial effect come to the conclusion that, despite the efforts of cohesion policy, there are disparities between the new and old EU countries (Pietrzykowski, 2019). Employing Phillips and Sul’s (2007) nonlinear dynamic factor model Cavallaro and Villani (2021) found out that EU countries do not converge to a unique path; the Central and Eastern European (CEE) countries are willing to catch up the Western countries; the asymmetries were increased after the economic crisis; there is a clustered pattern; the heterogeneity economic states in specializations.

The enlargement of EU in 2004 and 2007 generated the existence of EU-15 (the old members), CEE-8 and EU-12 (Malta and Cyprus being closer to the old than the new) determined also the interest of analyzing the catching up process. Cieřlik and Wciřlik (2020) studied the CEE-8 convergence to the EU-15 and among them and find out that inside CEE-8 there is convergence since between CEE-8 and EU-15 there is no convergence, except convergence to France and Germany. The cohesion policies are having a wide positive result in terms of growth and employment, not only on the disadvantaged regions or less developed, but the impact is not the same, there are consistent differences (Crescenzi and Giua, 2020; López-Bazo, 2021). The positive effect is visible on the CEE countries as new EU members (Dyba et al., 2018).

Žuk and Savelin (2018) studied the Central, Eastern and South Eastern European countries (CESEE) including 3 categories: new EU member state + euro zone, new EU state and candidate states, the common characteristics is the former centralized economy. One of the conclusions was that the CESEE countries succeeded in diminished the gap in terms of GDP/capita towards E-15. A club convergence was analyzed from the perspective of innovation activities and the findings are confirming the existence of seven clubs (Barrios, Flores and Martínez, 2019) as a potential leverage of growth and employment tool.

2. Research methodology

The method used to calculate the time needed to reach the convergence is the intersection of the development curves (Iancu, 2007). The development equations for Romania and European countries are:

$$Y_{tR} = Y_{0R}(1 + r_R)^t \tag{1}$$

Where: Y_{tR} is the Romanian GDP at the time ‘t’

Y_{0R} is the Romanian GDP at the time '0'

r_R is average region rate of growth for GDP

The same equation is used for the European countries:

$$Y_{tE} = Y_{0E}(1 + r_E)^t \quad (2)$$

Where: r_E is elevation rate

The convergence is reached when:

$$Y_{tR} = Y_{tE} \quad (3)$$

$$Y_{0R}(1 + r_R)^t = Y_{0E}(1 + r_E)^t \quad (3')$$

't' being the time of the equilibrium, that can be calculated with the equation:

$$t = \frac{\log Y_{0E} - \log Y_{0R}}{\log(1+r_R) - \log(1+r_E)} \quad (4)$$

The data used are for 2000 and 2018, offered by Eurostat for EU26+UK+IS.

3. Results and discussions

3.1. β Convergence for NUTS 0

Assessment of the time needed for convergence between Romania and the richest EU countries, EU average in relation to annual averages of GDP / capita at NUTS level 0 represents the convergence at the country level.

Table no 1. Romanian β Convergence for NUTS 0

Year		2010	2018
Y Maximum UE (26+UK-IS) NUTS0, (\$PPP 2015)		101148	106675
name NUTS0		LU Luxembourg	LU Luxembourg
Elevation rate rE_{max} NUTS0 (%):		5.46	
Y Medium UE (26+UK-IS) NUTS0, (\$PPP 2015)		36314	41447
name NUTS0		calculated	calculated
Elevation rate rE_{medium} NUTS0 (%):		14.13	
<i>Convergence time NUTS0</i>		t_{max} level Y NUTS0 (LU00 Luxembourg)	t_{medium} UE (26+UK-IS) NUTS0
Ro	Romania	5.1	2.8

Based on the convergence time Y_{max} we can see from the Map 1 that:

- Romania time is 5.1 years, placing us in the Baltics countries cluster: Lithuania, Estonia and Latvia with times between 0.1-5.5 years. This cluster has the highest rates of growth of GDP/capita for 2010-2018, higher than 42%;
- Italy and Greece are having negative growth rates for 2010-2018, of -1.46%, respectively -13.64%. Keeping this trend there are less chances to reach the convergence GDP/capita;
- Finland has a high GDP/capita of 43,236 \$PPP for 2015, but has a low rate of growth for PIB/capita 2010-2018 of about 4.88% driving to a large period of time to reach the convergence;
- France, Spain, Austria, Portugal and Belgium are having a similar pattern with Finland. The GDP/capita is lower, but the growth rates are higher of about 7-8%, figures that are driving to a convergence time of about 29 years.

The convergence time to the Y_{medium} (Map 2) highlights:

- The time for is Romania 2.8 years, including it in the same cluster with Poland, Czech Republic, Belgium and Lithuania with values between 2.4-3.3 years;
- Italy and Greece with the mentioned above negative growth rates are having a low expectation to reach the convergence;

- Spain, Portugal and Slovenia (in blue color) are close to the medium level, even if the elevation rate is under the median;
- Ireland reached the target 3.5 years ago;
- For France, UK, Italy, Estonia, Finland and Latvia the GDP/capita in 2010 is about 36 mii de \$PPP 2015, and the growth rates are positive, they reach the convergence from the beginning;
- Germany, Denmark, Slovakia, Austria, Netherland, Luxemburg are having growth rates above the elevation rates, but they already have high GDP/capita. Bulgaria could be included in this cluster even if it has a lower GDP/capita but a very high rate of growth.

Map 1 – Convergence time at the NUTS0 level, 2010-2018, Maximum elevation rate

Map 2 – Convergence time at the NUTS0 level, 2010-2018, Medium elevation rate

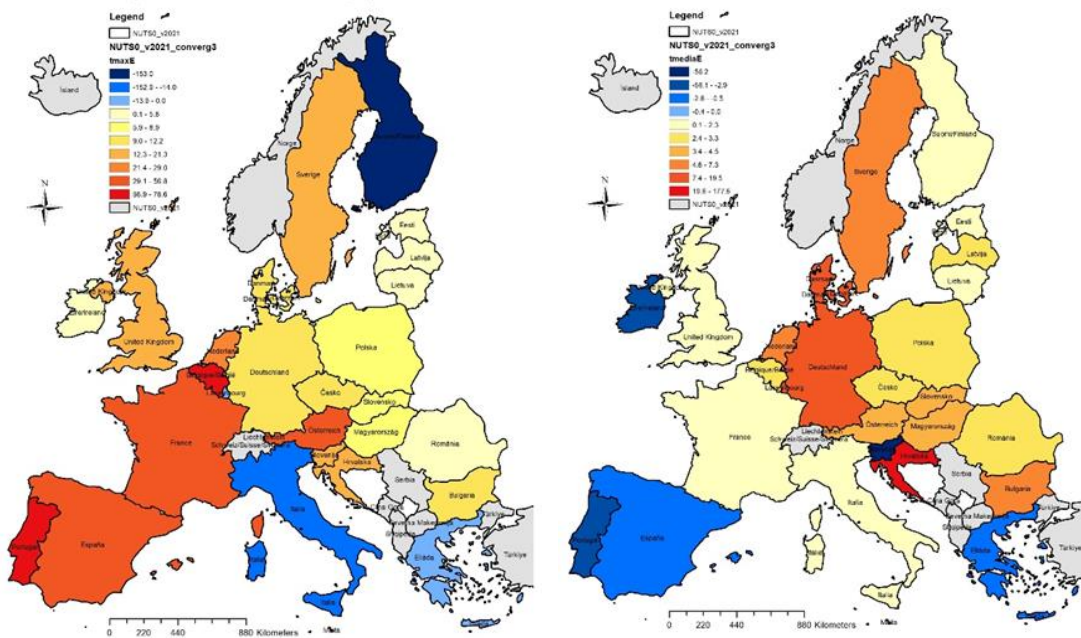


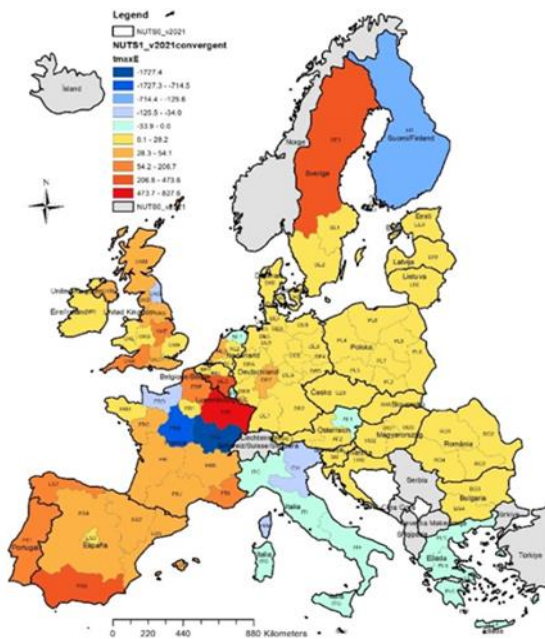
Figure no. 1 Convergence time for EU 26 + UK + IS, at the NUTS0

3.2. β Convergence for NUTS 1

Table no 2. Romanian β Convergence for NUTS 1

Year		2010	2018
Y Maximum UE (26+UK-IS) NUTS1, (\$PPP 2015)		101148	106675
name NUTS1		LU0 Luxembourg	Mainland Finland
Elevation rate rE_{max} NUTS1(%):		5.46	
Y Medium UE (26+UK-IS) NUTS1, (\$PPP 2015)		36205	39969
name NUTS1		calculated	calculated
Elevation rate rE_{medium} NUTS1 (%):		10.40	
<i>Convergence time NUTS1</i>		t_{max} level Y NUTS1 (LU00 Luxembourg)	t_{medium} UE (26+UK-IS) NUTS1
RO1	Macroregion one	5.3	2.7
RO2	Macroregion two	5.9	3.5
RO3	Macroregion three	4.2	1.3
RO4	Macroregion four	6.1	3.1

Map 3 – Convergence time at the NUTS1 level, 2010-2018, Maximum elevation rate



Map 4 – Convergence time at the NUTS1 level, 2010-2018, Medium elevation rate

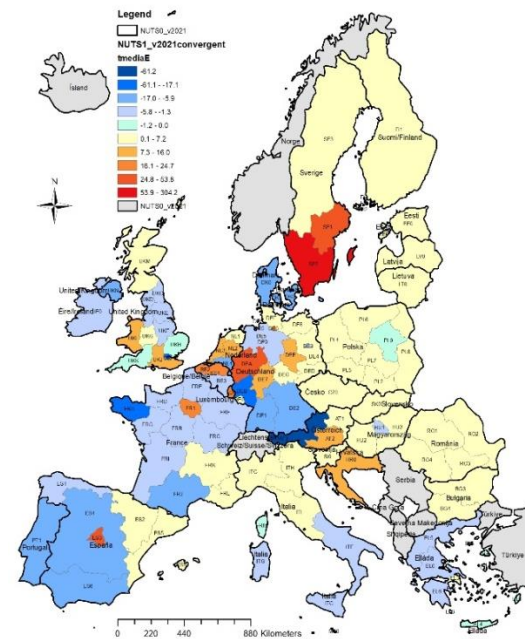


Figure no. 2 Convergence time for EU 26 + UK + IS, at the NUTS1

The spatial pattern at the level of NUTS1 with convergence objective Y_{\max} NUTS1 for EU countries is structured in 4 clusters:

- Central and Eastern Europe, including South regions of Sweden, is homogeneous, with a low time to reach the convergence target and a high rate of GDP/capita growth;
- Mediterranean zone, Italy and Greece are characterized by negative initial rate of growth for GDP/capita;
- France partially, Spain, Portugal and UK are in the area with large convergence time based on the relatively small growth rates of GDP/capita between 5.046% to 7.6%, with an elevation rate of 5.46%;
- Regions France B, C, D, Y, M, Finland 1, Portugal 2, UK C, Italy H, Spain 7 are having growth rates of GDP/capita between 1.76%-5.46%

If we consider the convergence with Y_{medium} NUTS1 the pattern for EU countries are simpler:

- One cluster with relatively short time to convergence 0.1-7.2 years, including Central and Eastern Europe, North of the Mediterranean Basin (yellow). *Romania belongs to this cluster;*
- Second cluster (in blue) including the regions that looks like already reached the convergence including West and North Europe, partially South Italy and Greece. This cluster has to be deeply analyzed to confirm the finding.
- The Outlier cluster including regions with extreme values:
 - Minimal values with $t < -17.1$, including Austria 3, Germany B, UK I, France H (dark blue)
 - Maximal values with $t > 7.3$, including UK J, L, Germany 5, 6, 7, A, E, Netherland 2, 3, Hungary 0, Austria 2, Belgium 2, Luxemburg 0, France 1, Spain 3, Slovenia 1, 2.

3.3. β Convergence for NUTS 2

The spatial pattern for NUTS2 level having as objective of convergence Y_{\max} NUTS2 is structured in 4 clusters for EU countries:

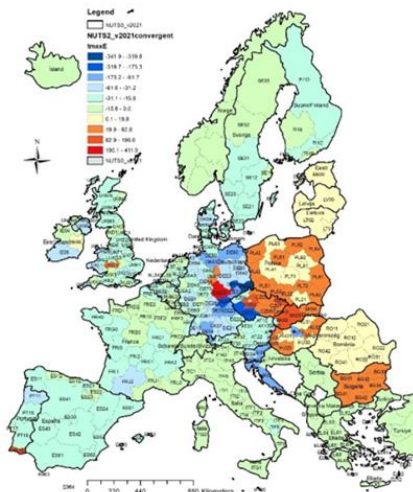
- Cluster with problematic time of convergence from – 4264 to -31 years. It is a cluster characterized by small rates of GDP/capita growth between 2.72% to 5.5%, including east Germany (dark blue);

Cluster with negative/problematic time of convergence from -31 to 0 years, cluster characterized by small rates of GDP/capita growth between -24.95% to 1.2%, including Scandinavian Peninsula, Iberian Peninsula, Italy, Greece and UK (light blue and green);

Table no 3. Romanian β Convergence for NUTS 2

Year		2010	2018
Y Maximum UE (26+UK-IS) NUTS2, (\$PPP 2015)		101148	106675
name NUTS2		LU00 Luxembourg	LU00 Luxembourg
Elevation rate rE_{max} NUTS2 (%):			5.46
Y Medium UE (26+UK-IS) NUTS2, (\$PPP 2015)		35817	39357
name NUTS2		calculated	calculated
Elevation rate rE_{medium} NUTS2 (%):			9.88
<i>Convergence time NUTS2</i>		t_{max} level Y NUTS2 (LU00 Luxembourg)	t_{median} UE (26+UK-IS) NUTS2
RO11	North-West	5.2	2.6
RO12	Centrum	5.5	2.6
RO21	North-East	6.2	3.8
RO22	South-East	5.4	2.9
RO31	South - Muntenia	6.7	3.7
RO32	Bucharest - Ilfov	3.0	-0.5
RO41	South-West Oltenia	5.7	3.1
RO42	West	6.7	2.9

Map 5 – Convergence time at the NUTS2 level, 2010-2018, Maximum elevation rate



Map 6 – Convergence time at the NUTS2 level, 2010-2018, Medium elevation rate

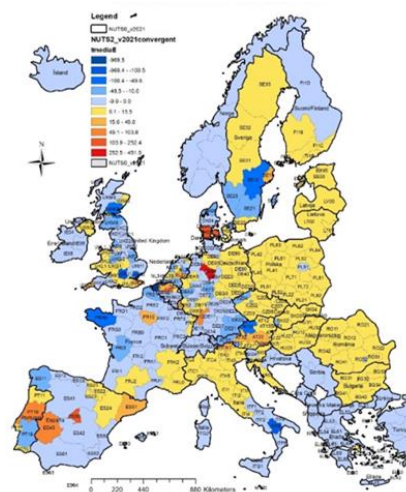


Figure no. 3. Convergence time for EU 26 + UK + IS, at the NUTS2

- Cluster with time of convergence relatively short, between 0.1-19 years, characterized by high rate of DGP/capita growth from 8.2% to 52% (higher than the elevation rate), including Eastern Europe, especially Central Poland and Hungary, and Baltics (Lithuania, Latvia, Estonia), a region of Ireland (yellow). *Romania belongs to this cluster;*

- Cluster with the time of convergence long, between 19-82 years, cluster characterized by high rates of GDP/capita growth from 5.53% to 13.37%, including Eastern Europe, especially borders regions of Poland, Hungary and Bulgaria, and Outliers Spain 61, UK E3, UK J2, UK K1.

The convergence objective pattern Y_{medium} NUTS2 is structuring the EU countries also in 4 clusters:

- Cluster with problematic convergence > -969 years (dark blue), characterized by small rates of GDP/capita growth, represented by the Eastern Germany;

- Cluster with negative/problematic convergence time from -969 to 0 years, cluster including Scandinavian Peninsula, Iberian Peninsula, Italy, Greece and UK (light blue);

- Cluster with relatively short time of convergence from 0.1 to 15.5 years (yellow), cluster grouping the Eastern Europe, especially Central Poland, Hungary and (Lithuania, Latvia, Estonia), a region of Ireland. **Romania belongs to this cluster;**

- Outliers with a convergence time very long over 165 years (red, light red), characterized by high rates of growth, between 9.7% and 9.9%. Among the outliers are Spain 30, Belgium 24, Denmark 03 and Germany 92.

Conclusions

The evolution of Romania in the studied period 2010-2018 was to convergence at all NUTS levels, based on a high and continues GDP/capita growth. Romania comply with the cohesion policies and there are particular findings are the convergence with the maximal and median values. The spatial patterns of β convergence are having a high grade of similarity for all studied levels.

For the convergence with the median values, in the studied period of time 2010-2018, all Romanian regions are convergent with the EU, regardless the disaggregation level (NUTS1, NUTS2). The national average at NUTS 0 is close to the EU NUTS 0 minimum.

The situation is different for the convergence of the Romanian territories from the EU maximal, depending on the level of territorial disaggregation. The convergence trend is manifested only for the most aggregated level (NUTS1), for the NUTS 2 level there are situations of opposite directions (divergence).

Romania is in the cluster with high convergence rate, the short duration of convergence is supported by the hypothesis of maintaining high rates of GDP/capita growth at all 3 levels of disaggregation. The pattern of β convergence given by the duration estimate for reaching the objective is different between average and maximum:

- Pattern for maximum, regardless of level, indicates the move of the Performance Center to the geographic center of the continental shelf. The parent is strongly influenced by the ability to achieve high GDP / capita growth rates. With the increase in the level of granularity, the transition to NUTS3 level, the trend of increasing regional disparities at this level becomes visible, especially in Western Europe, especially in France, Spain, Portugal and the United Kingdom;

- The average pattern, regardless of level, indicates the presence of the Performance Center in Baden-Wittenberg and Bavaria.

We can appreciate that Romania followed a “catching up” process with the EU countries at all levels of regional disaggregation, with different speeds. Being a CEE country (new member), Romania had the target of reaching the convergence with the Western countries (old members). At first site, it looks that the cohesion policies were at least partially successful and the process should continue.

Also, the studied literature highlighted that better results are obtained using different tools of measuring the convergence process. This is one of the limits of the study and further developments have to be done.

A second limit is related to the crisis, as Monfort (2020) demonstrated the convergence is affected, slowdown or jeopardize the results. The nowadays are at a presumptive end of health crisis COVID-19 and there rate consistent signals of an energetic crisis, a food crisis and a large scale military conflict. They are affecting the economic growth and probably the convergence, but not necessarily in the way it does before, there are, in our opinion plenty chances to have at the end of this disruptions period a new economic framework ant the EU level.

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