Convergence in EU: from country level to regional level

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Abstract

Following other studies demonstrating empirically the complex road to convergence in EU, based on an updated analyse, we highlight as a quasi-general rule: a country starting at a relative small level of income per capita (far on the left side at that moment from the average of its group level) will strongly converge to the group average but in this way it will be registered a process of divergence among its component regions. A main problem is when the regional divergence will reverse in a regional convergence process. In our study we propose a methodology to explain this phenomenon of switching from regional divergence to regional convergence doubled by a simulation model. As application, we are using few levels of grouping (digitalisation). Thus, firstly, EU (27 countries after Brexit) is divided in three conventional groups of countries. Secondly, each country is divided in its component regions, according to the NUTS 2 Eurostat database. Thirdly, each region in a country is divided in its smaller territorial units (counties), according to the NUTS 3 Eurostat database. Finally, considering the period starting in 2000, we present a resulted typology of countries and respectively of regions and counties in EU by using two criteria (changes in position against the average income per capita in EU and respectively existence of a process of convergence/divergence among components).

Keywords: growth; regional convergence; clubs of convergence; behavioural regimes

JEL codes: C31; C82; E17; O47; O52

1. Introduction

In order to analyse real convergence in EU, as usually in literature we used GDP per capita as purchasing power standard (Purchasing Power Standard), data being from Eurostat. Because at the levels of regions and counties available data are only until 2017, in our study we are analysing the convergence process for the period 2000-2017. The variation coefficient (as cv) is the indicator used to evaluate the convergence/divergence process. Usually, convergence is when the variation coefficient is going down and reversely when it is going up a trend of divergence is manifesting.

The convergence at all levels is one of main goals of European Union. In this context, considering that a remaining problem for the future of EU is to concerns the low level of economic development in case of a significant number of regions or counties together with the general target of diminishing poverty, an analysis of their progress in converging to EU average level could be of interest. Therefore, we analyse the dynamics of real convergence to the EU average for three conventional groups of countries in EU. Starting from the estimated trajectories of convergence, we try to identify some so-called behavioural regimes of convergence.

The literature that deals with the convergence focuses on the relations between the main factors of economic growth and changing in heterogeneity. Studies exploring relations between dynamics of macroeconomic fundamentals (such labour force or fixed capital) and financial markets are rather scarce and we mention: Fama, 1990; Barro and Sala-i-Martin, 1992; Lee, 1992, Mankiw et al, 1992; King and Levine, 1993; Martin and Sanz, 2003; Canova, 2004; Levine, 2004; Kenourgios and Samitas, 2007; Crespo et al, 2008; Caporale et al, 2009; Fink et al, 2009; Ayadi et al, 2013; Monfort et al, 2013; Albu et al, 2014; Lupu and Calin, 2014; Raileanu-Szeles and Albu, 2015; Albu and Caraiani, 2016; Chapman and Meliciani, 2016, among others.

This paper contributes to the literature in several ways. On one hand we employ some specific ad-hoc metrics to study the existence and dynamics of convergece/divergence for all EU countries and on the other hand we produce evidence on the extent to which this phenomenon is manifesting in three main conventional groups of countries that are established by means of economic development. Moreover the analysis is extended to the levels of regions and respectively counties in EU.

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2. Real convergence at EU level and among groups of countries

In specialised literature, there are many classes in which countries in EU are grouped depending on the goal of studies. In our study, based on a detailed analysis of their economic structure and macroeconomic specificities, we classified countries in three major conventional groups: 1) EU10, North-Western states (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, Netherlands, and Sweden); 2) EU6, Southern countries (Cyprus, Greece, Italy, Malta, Portugal and Spain); and 3) EU11, Eastern states (Bulgaria, Czechia, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia).

Usually, to analyse the real convergence in EU, income per capita, as GDP per inhabitant in PPS (Purchasing Power Standard) is used and based on it the ratio (g) between this value for each country (y) and the average EU GDP per capita (yM). Distribution of countries in EU by g (as g%) in 2000-2017 period is shown in Figure 1. We can see a general process of convergence toward the average EU27 (represented by the horizontal line 100), excepting the highest trajectory (Luxembourg) and the second highest trajectory on the right side (three points for Ireland in 2015-2017).

Considering 2000 as base year, in 2017 a better position in EU, demonstrated by a higher proportion in EU average, obtained all Eastern countries (however they still being under 100%) and only three Western countries (Ireland +47.8 percentage points, Luxembourg +5.3 pp, and Germany +0.2 pp) and one from Southern group (Malta +15.7 pp). The distribution of countries in EU in mater of g dynamics in 2017 against 2000, as Δg, in EU countries is shown in Figure 2.

At the level of EU (comprising 27 countries after Brexit), the real convergence is demonstrated by dynamics of variation coefficient cv (as cv%) in Figure 3, where on horizontal axis time is from 0 to 17, corresponding to years from 2000 to 2017.

Moreover, in 2000-2017 it was a strong negative correlation between convergence (as cv% registered a decreasing trajectory) and average EU level of GDP per capita in thousands of euro PPS (yM), as it is shown in Figure 4 (where yM00_17 means the average value of yM for the whole period). Thus, the estimated value of correlation coefficient was -0.941.
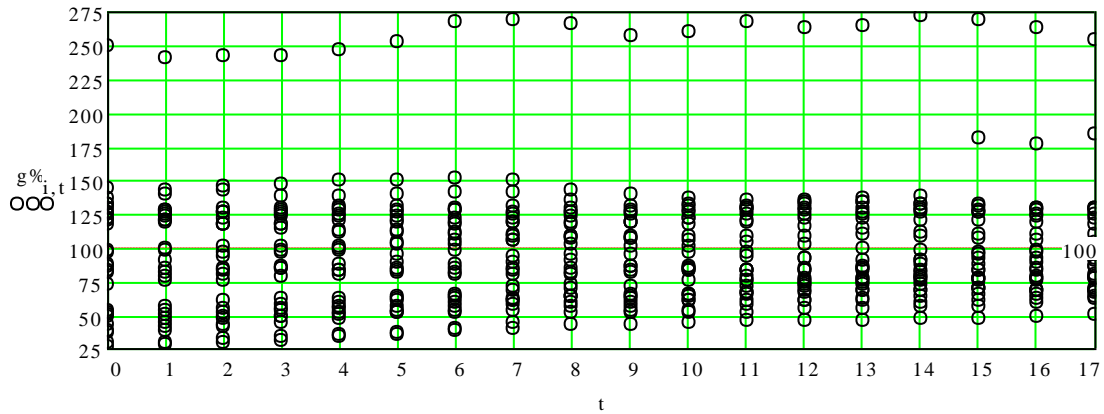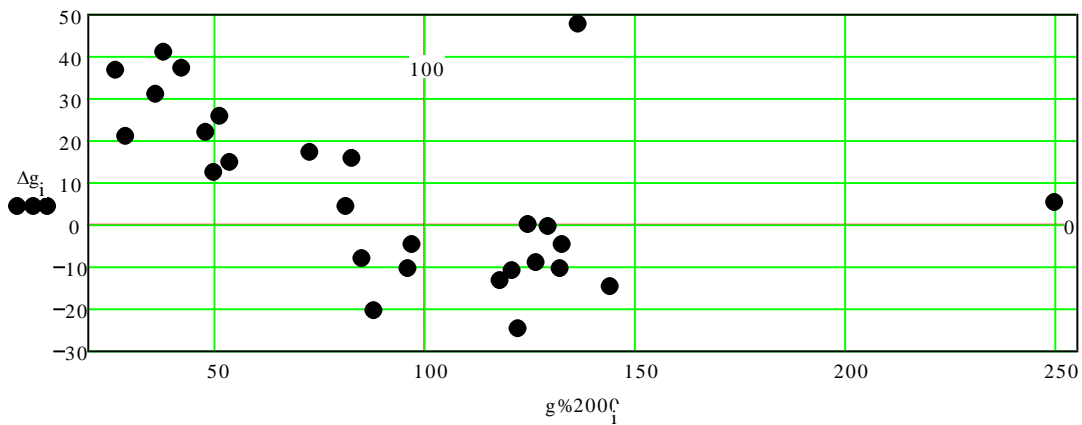
Figure 1.

Figure 2.

Regarding the analyse of convergence among the three conventional groups of countries, in Figure 5 is presented dynamics of GDP per capita (in thousands of euro PPS), y, during the period 2000-2017 and in Figure 6 their level against the average EU27, g%, where on horizontal axis time is from 0 to 17, corresponding to years from 2000 to 2017. Based on trajectories of GDP per capita (Figure 5), thus in absolute terms, only the convergence between EU11 and EU6 is evident, but in case of those related to EU27 average (Figure 6), thus in relative terms, a general process of convergence is clear. In Figures trajectories are black for EU10, blue for EU6, and red for EU11. Comparing among groups of countries, from Figure 6, it is clearer that global crisis (started in 2007-2008) especially affected the Southern group, by severe reduction in its level of g%.
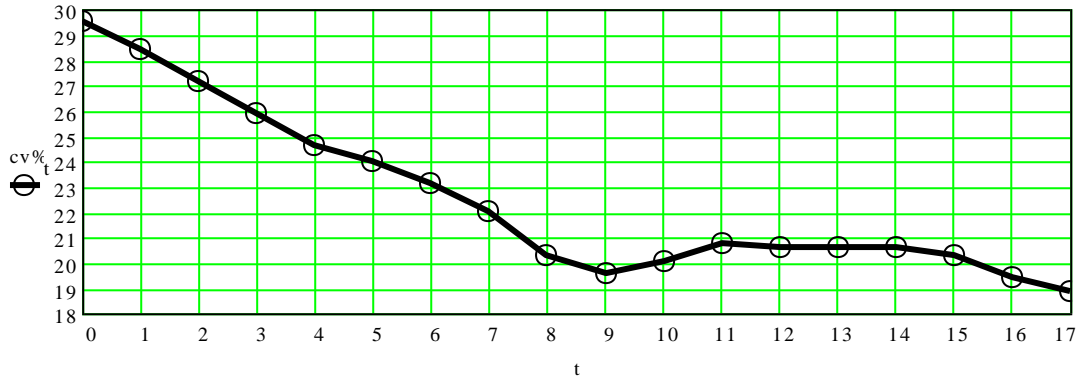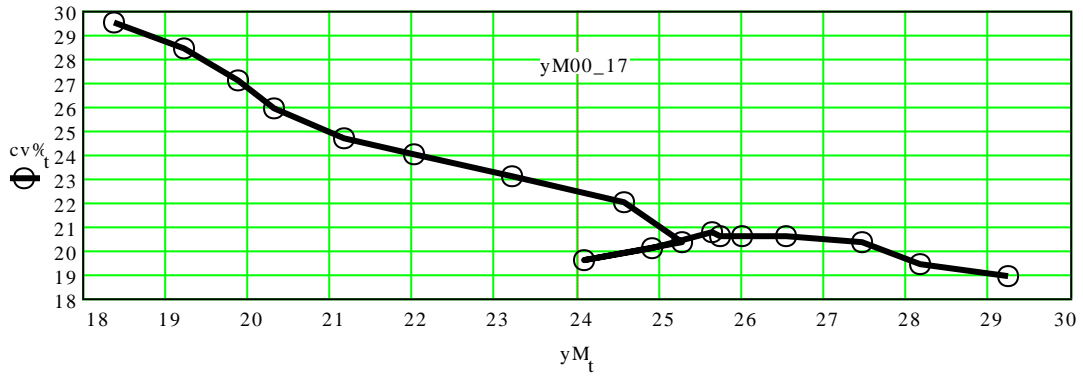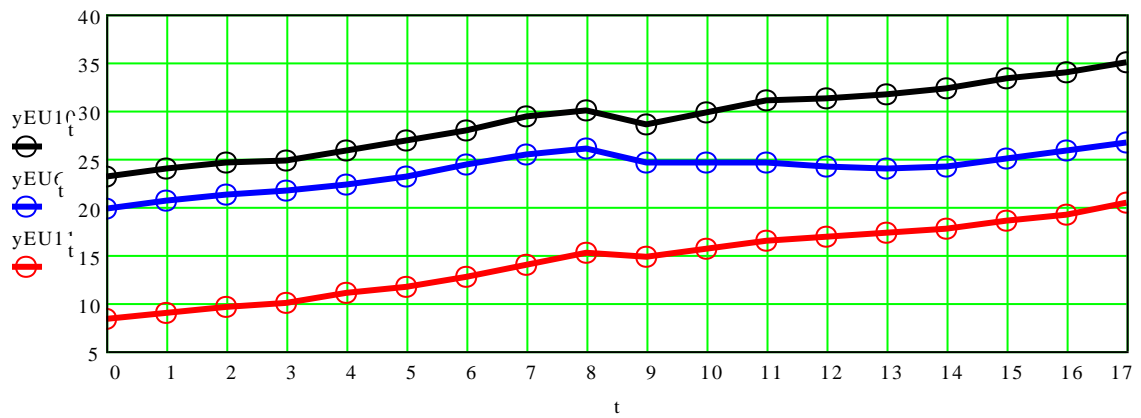
Figure 3.

Figure 4.
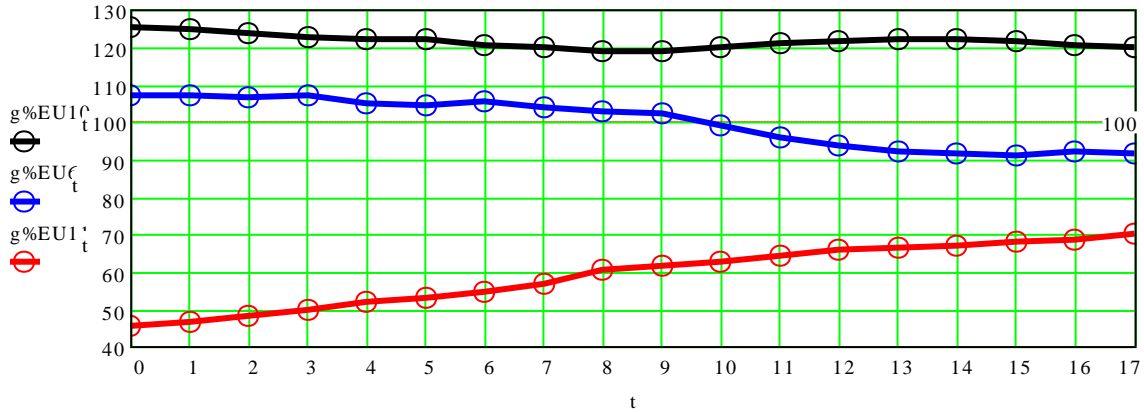

Figure 5.

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Figure 6.

Concretely, the convergence/divergence inside of each group of countries is expressed by the value of variation coefficient (cv%), its dynamics in considered period being presented in Figure 7. We can see that in case of groups starting at high heterogeneity in 2000 (Eastern group EU11 and Southern group EU6) it was a decreasing trend in variation coefficient. Contrary, in North-Western group, starting at a high homogeneity, it was a general slow increasing trend.
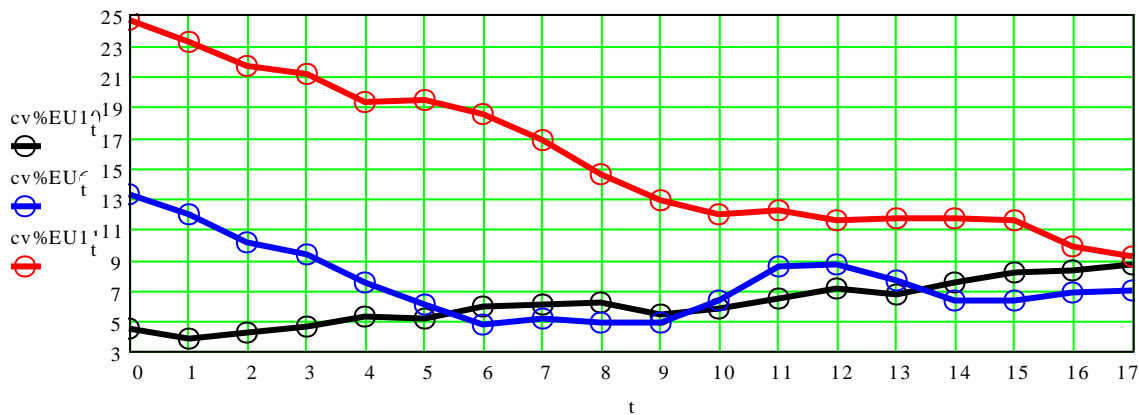

Figure 7.

Moreover, by replacing on horizontal axis time by GDP per capita, three distinctive patterns or so-called behavioural regimes can be highlighted, as it is shown in Figure 8. As GDP per capita is growing, they seem to evolve in a natural way from a first red regime (Eastern group EU11) on

the left side of the graphical representation to a second blue regime (Southern group EU6) on the middle side, and finally to a third black regime (North-Western group EU10) on the right side.
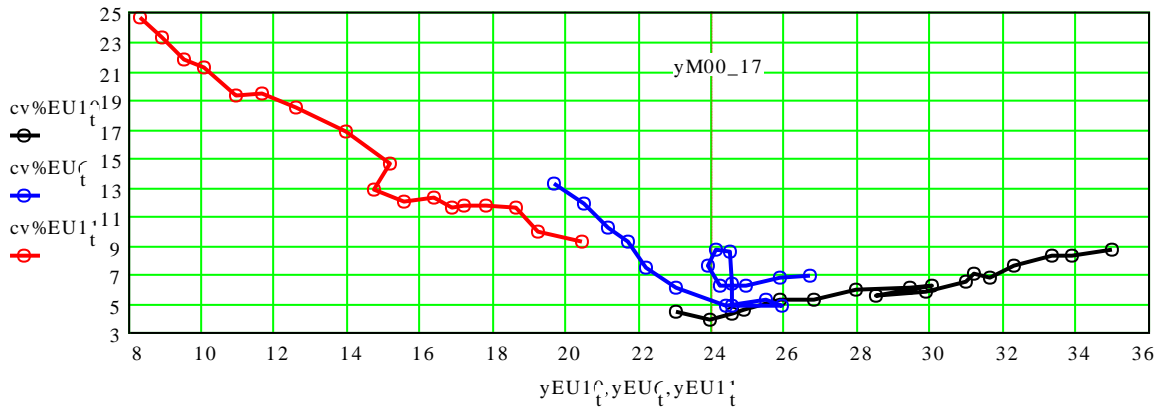

Figure 8.

Based on graphical representation in Figure 8, it can be estimated a significant point on the scale of income per capita, namely a turning point on a continuous trajectory unifying the three regimes, where the previous decreasing trajectory is changing in a new increasing trajectory. Thus, reversing convergence trend to one of divergence. As it can be seen on the graphical representation, this point is placed around 24 thousand of euro PPS per capita. For instance, in case of the whole period 2000-2017 the average level of GDP per capita (noted as yM00_17 in Figure 8) was 24044 of euro PPS.

A special problem related to real convergence is the converging in the ratio between GDP in PPS and that in current euro (as R). During 2000-2017 the distribution of this ratio in EU (as black small circles) is shown in Figure 9, compared with the blue theoretical trajectory (as Rt).

A key point on it is the intersection between the 100% vertical line for g% with the horizontal line of value 1 for R. Concretely, dynamics of the ratio R in 2000-2017 period is shown in Figure 10 and related to dynamics of g% in Figure 11, where we can see a still large gap between Eastern group and the other two conventional groups of countries.
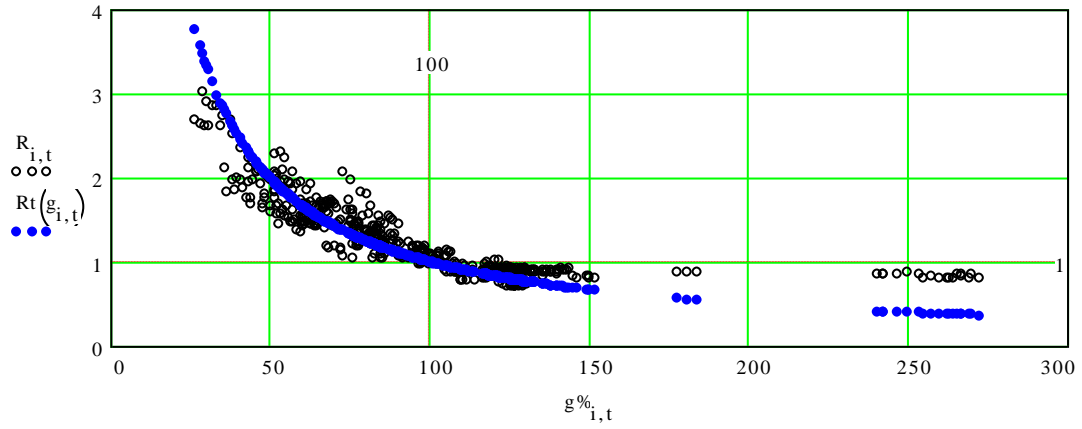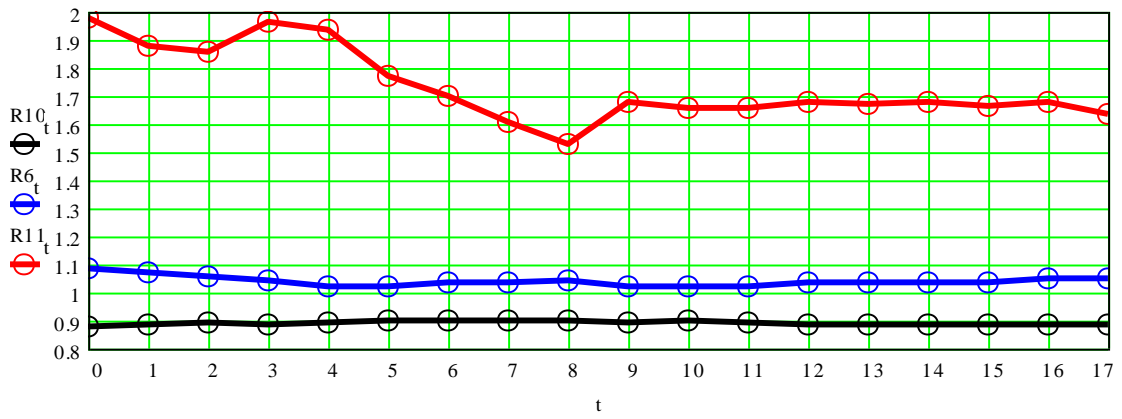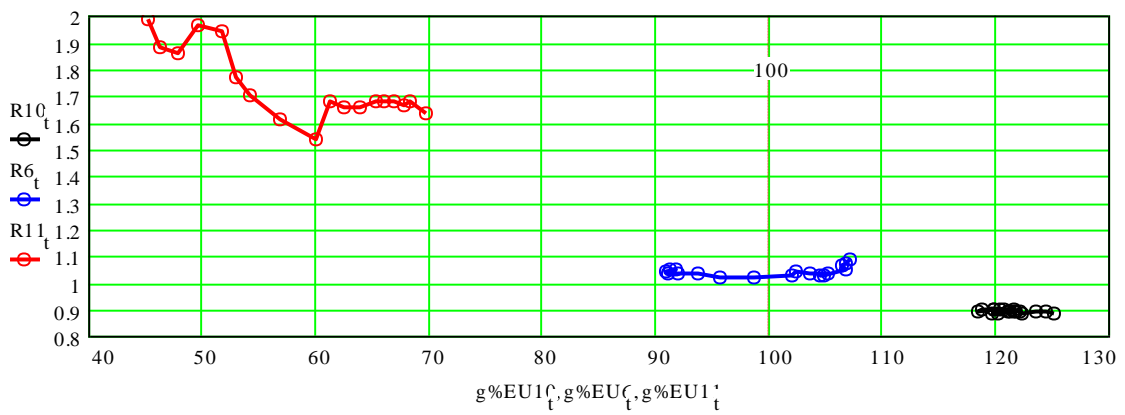
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Figure 9.

Figure 10.

Figure 11.

3. How is going convergence from countries to regions and counties levels

According to Eurostat published NUTS 2 database (by excluding extra regions) we separated 240 regions by the three groups of countries in EU (as they are in the NUTS 2 database). Thus, we grouped the 240 regions of as follows: 119 regions in EU10 (corresponding to North-Western countries), 62 regions in EU6 (corresponding to Southern countries), and 59 regions in EU11 (corresponding to Eastern countries). Also, based on NUTS 3 database we grouped the 1169 counties in EU27 as follows: 681 counties in EU10, 249 counties in EU6, and 239 counties in EU11.

In order to investigate, for the period 2000-2017, the convergence process in EU27 we estimated dynamics of variation coefficient for three levels (degree of data digitalisation), according to NUTS database published by Eurostat: 1) countries' level – EU27 (NUTS1); 2) regions' level – EU240 (NUTS2); 3) counties' level – EU1169 (NUTS3). The graphical representation of such dynamics is shown in Figure 12.
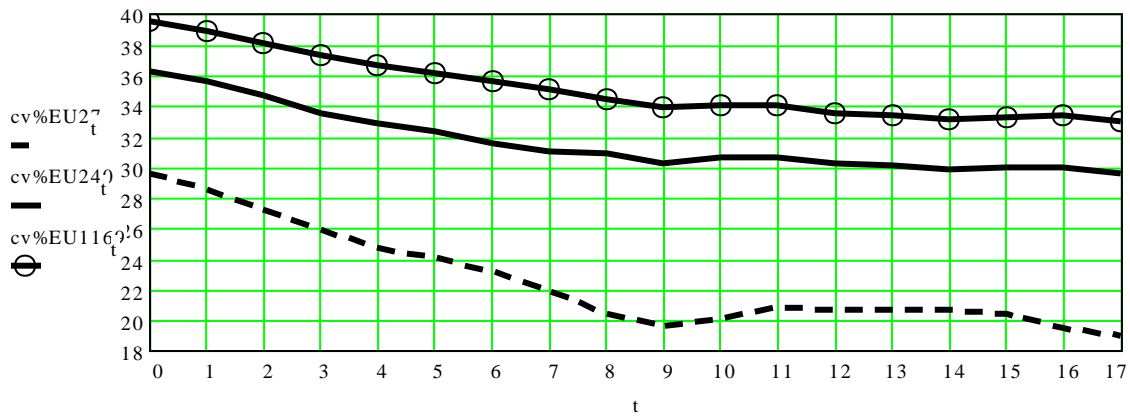

Figure 12.

We can see a general convergence at all three levels, but more accentuated at the level of countries. Moreover, as it is expected from General Theory of Systems, increasing degree of digitalisation (from countries' level to regional level and finally to counties' level) is conducting to a higher heterogeneity that means a higher value of the variation coefficient. Concretely, increasing degree of digitalisation will move the convergence trajectory (represented by the decreasing trends in

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variation coefficient) from bottom trajectory (27 countries in EU), as dashed line, to median trajectory (240 regions in EU), as solid line, and to top trajectory (1169 counties in EU), as solid line with circles on it.

In Figure 13 the same dynamics of variation coefficient are related to the average level of GDP per capita in EU27, expressed in PPS (as y on the horizontal axis). We can see a strong negative correlation between variation coefficient and income per capita (for all three levels the estimated value of correlation coefficient was less than 90%).
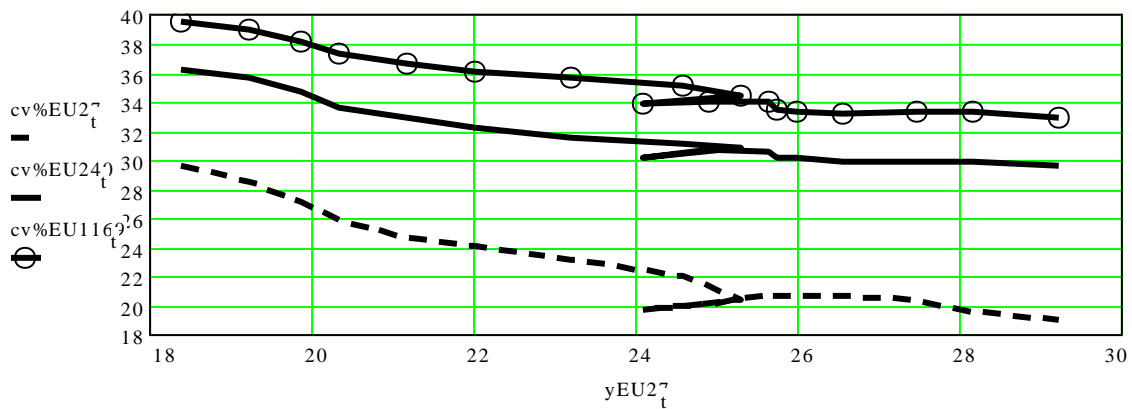

Figure 13.

For each country is important to increase homogeneity among component regions (meaning a diminished variation coefficient) simultaneously with improving their position as a country against EU average (meaning a positive trajectory of proportion in EU average). This ambitious goal must be supported by national efforts together with EU policies in the field.

In Figure 14 is presented dynamics of variation coefficient in EU, comprising 240 regions classified in 23 countries or groups of countries (as m), in 2000-2017 period, related to the proportion of their income per capita in average EU (as g%). This changing of EU27 in EU23 resulted by grouping Baltic countries in only one class, and considering Luxembourg together with Belgium, and Cyprus with Malta. This graphical representation suggests a relatively small negative correlation, at the level of all 240 regions in EU23, between the two variables (the value of

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correlation coefficient being of about -0.300). A detailed analysis of variation coefficient inside of each country or group of countries we shall report in other special dedicated study.
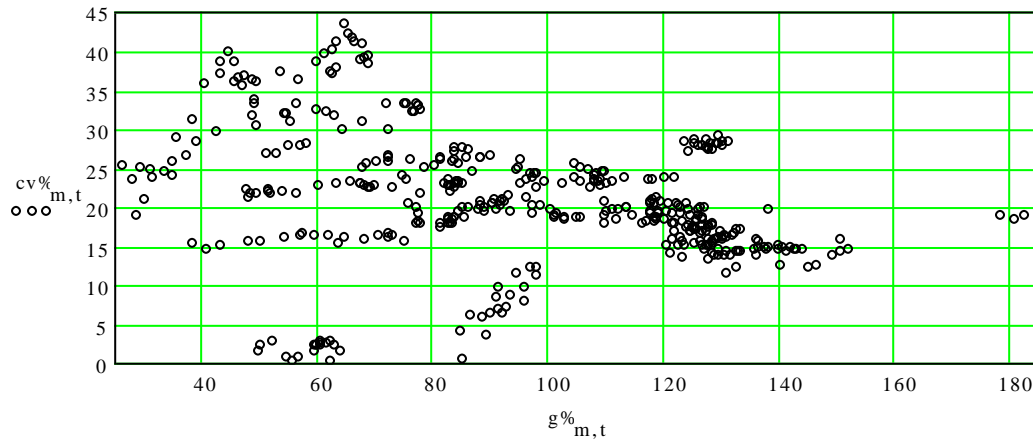

Figure 14.

On the other side, considering 2000 as base year, in 2017 the distribution of regions in EU (240 regions according to NUTS2) in mater of g dynamics, as Δg, is shown in Figure 15. In this graphical representation, regions located above zero line improved their position against EU average, and contrary those located below it depreciated their position. This time the correlation between the two variables Δg and g%2000 is stronger negative (the value of correlation coefficient being of about is -0.497). Comparing to former correlation, a conclusion could be that in a general process of convergence way the prevalent is to improve a country position in EU, comparing with convergence among its component regions.

Going to the counties level and applying a similar methodology, in Figure 16 is presented dynamics of variation coefficient in EU, comprising this time 1169 counties (classified in the same 23 countries or groups of countries, as m), in 2000-2017 period, related to the proportion of their income per capita in average EU (as g%).

The graphical representation shows a negative correlation, at the level of all 1169 counties in EU23, between the two variables (the value of correlation coefficient being of about -0.450). A detailed analysis of variation coefficient inside of each country or group of countries and inside of each region will be reported in a special study.
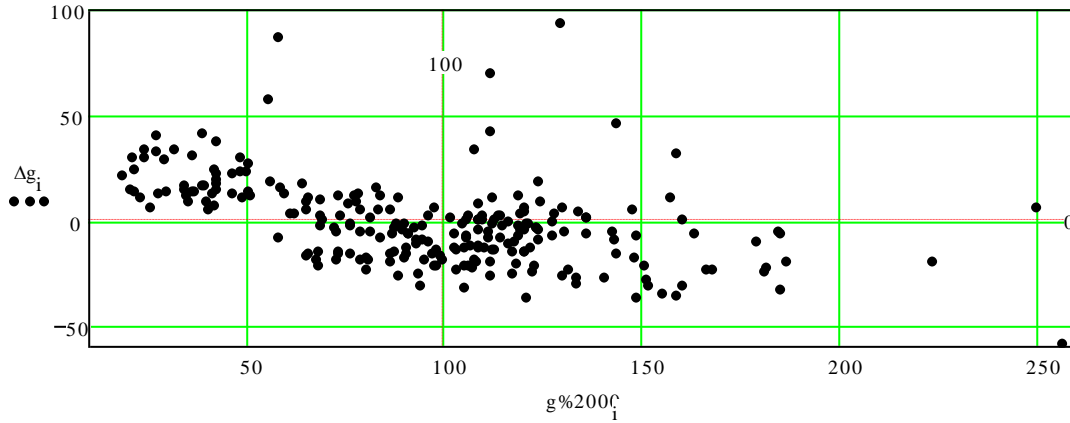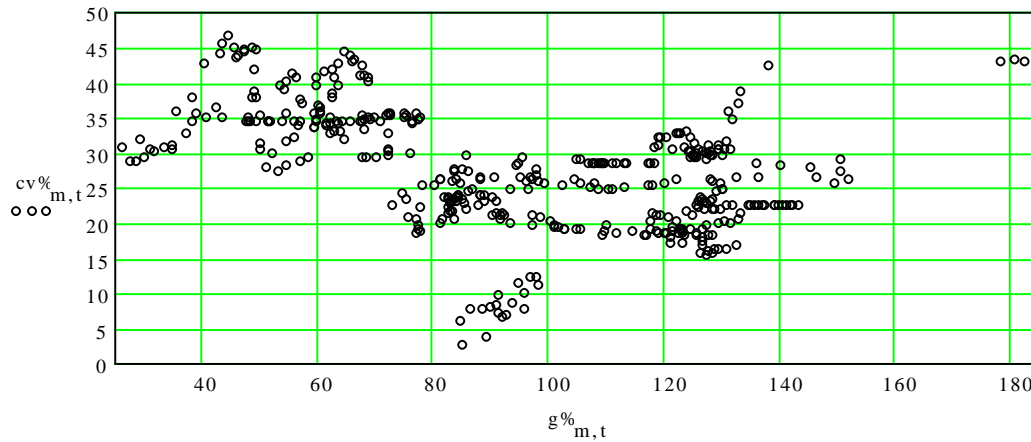
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Figure 15.

Figure 16.

Moreover, considering 2000 as base year, in 2017 the distribution of counties in EU (1169 counties according to NUTS3 database) in mater of g dynamics, as Δg, is shown in Figure 17.

Counties located above zero line improved after 2000 their position against EU average, and contrary those located below it depreciated their position. This time the correlation between the two variables Δg and $g\%2000$ is lower negative (the value of correlation coefficient being of about is -0.348). Comparing to former correlation, as conclusion could be that, in a general process of convergence way, the prevalent is to increase convergence inside of a country among its component counties, comparing with the improvement of a country position in EU.
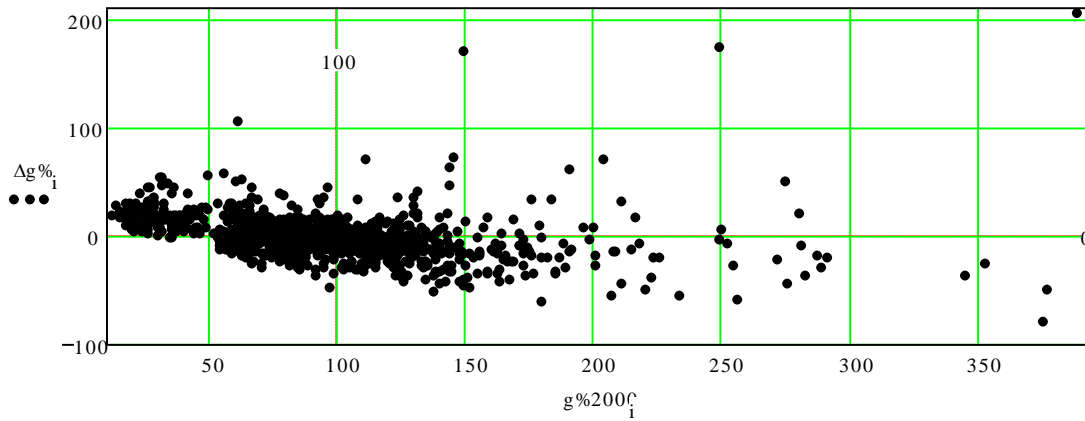
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Figure 17.

4. A typology to classify countries in EU

The values of aggregated indicators related to the regional convergence and respectively counties' convergence inside of each country or group of countries in EU23 are synthetically presented in the following Table, where g and cv are expressed as percentage (g% and cv%). Additionally, Δ means for g% and cv% changes in percentage points. Variation coefficient in case of regions is as cv%2 and in that of counties as cv%3.

Based on such data, we propose a typology for the regional and counties' convergence, as it is graphically expressed in Figure 18.

There are four main classes of countries or groups of countries that are corresponding to the four quadrants (numbered in a trigonometric sense) in which the dynamics between 2000 and 2017 can be accounted, as follows (countries ordered by increasing in g%):

Q1) Countries that improved their position (as proportion of the EU average GDP per capita) but in the same time registered a regional divergence (Ireland, all Eastern countries, and Denmark): Δg% > 0 and Δcv% > 0;

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Q2) Countries for which their position increased (as proportion of the EU average GDP per capita) and in the same time they registered a convergence among regions (only Germany): $\Delta g\% > 0$ and $\Delta cv\% < 0$;

Q3) Countries for which their position worsened (as proportion in EU average GDP per capita) but they registered both regional convergence and counties convergence (Austria, Belgia&Luxembourg, Portugal, Finland, and Netherlands, plus Cyprus&Malta only for regional convergence): $\Delta g\% < 0$ and $\Delta cv\% < 0$;

Q4) Countries for which their position decreased (as proportion of the EU average GDP per capita) and in the same time they registered a regional divergence (Spain, Sweden, France, Greece, and Italy, plus Cyprus&Malta only for counties convergence): $\Delta g\% < 0$ and $\Delta cv\% > 0$.

Based on the results of our study, in case of the European Union (EU27), at least for the period after 2000 there are the following two rules:

a) for a country or a group of countries placed in matter of GDP per capita far on the left side of the average level of GDP per capita in EU (100%), it is expected to grow faster but concomitantly with an internal divergence among its components; and

b) for a country or a group of countries placed on the right side of the average level of GDP per capita in EU, it is expected to grow slower concomitantly with a slow trend of internal divergence among its regions, eventually interrupted by temporal passages of convergence.

Important for less developed countries there are two facts: the initial level of discrepancy among its regions or counties (estimated by the value of the variation coefficient) and on the road of a faster economic development it must not ignore regional and counties convergence in order to fructify in certain periods (boom periods) the opportunity to attenuate such discrepancies.

|		g% :			cv% 2:			Quadrant	cv% 3:				Quadrant
		2000	2017	Δ	2000	2017	Δ		2000	2017	Δ		
1	Belgium&Lux	131.3	124.3	-7.0	28.5	27.2	-1.3	III	30.4	30.2	-0.2		III
2	Bulgaria	28.9	49.7	20.9	18.9	36.1	17.2	I	28.6	44.7	16.1		I
3	Czechia	73.1	90.3	17.2	22.4	26.6	4.1	I	22.4	26.5	4.1		I
4	Denmark	125.6	127.3	1.7	15.2	19.8	4.6	I	18.1	22.7	4.6		I
5	Germany	124.5	124.7	0.2	19.7	16.9	-2.8	II	32.1	29.2	-2.9		II
6	Baltics	38.4	75.2	36.8	15.3	15.6	0.3	I	34.2	34.9	0.7		I
7	Ireland	136.5	182.4	46.0	15.6	19.0	3.4	I	26.3	42.8	16.5		I
8	Greece	88.2	67.8	-20.4	20.8	25.2	4.4	IV	23.9	29.2	5.3		IV
9	Spain	97.4	92.7	-4.7	20.3	20.7	0.4	IV	21.1	21.2	0.1		IV
10	France	118.0	104.8	-13.2	20.8	25.6	4.8	IV	28.5	28.9	0.4		IV
11	Croatia	50.1	62.4	12.3	1.4	2.7	1.3	I	30.5	34.2	3.7		I
12	Italy	122.1	97.0	-25.1	23.8	24.2	0.4	IV	26.0	26.4	0.4		IV
13	Cyprus&Malta	91.4	90.0	-1.4	6.9	6.4	-0.4	III	7.0	8.0	1.0		IV
14	Hungary	53.7	68.4	14.6	37.2	39.0	1.8	I	39.4	40.8	1.4		I
15	Netherlands	144.0	128.8	-15.2	14.6	13.9	-0.7	III	22.3	21.9	-0.4		III
16	Austria	132.7	127.7	-4.9	17.1	13.3	-3.8	III	26.3	19.7	-6.6		III
17	Poland	48.2	70.2	22.0	21.2	22.8	1.6	I	34.4	35.0	0.6		I
18	Portugal	85.2	77.2	-8.0	22.9	17.8	-5.1	III	23.3	18.6	-4.7		III
19	Romania	26.5	63.0	36.5	25.4	31.7	6.3	I	30.6	40.8	10.2		I
20	Slovenia	81.5	85.7	4.2	17.5	18.7	1.2	I	19.9	21.8	1.9		I
21	Slovakia	51.3	76.9	25.5	26.8	32.1	5.3	I	27.9	34.0	6.1		I
22	Finland	120.8	109.9	-11.0	20.4	17.9	-2.6	III	20.6	18.2	-2.4		III
23	Sweden	132.5	121.9	-10.6	16.7	16.8	0.2	IV	16.7	17.9	1.2		IV
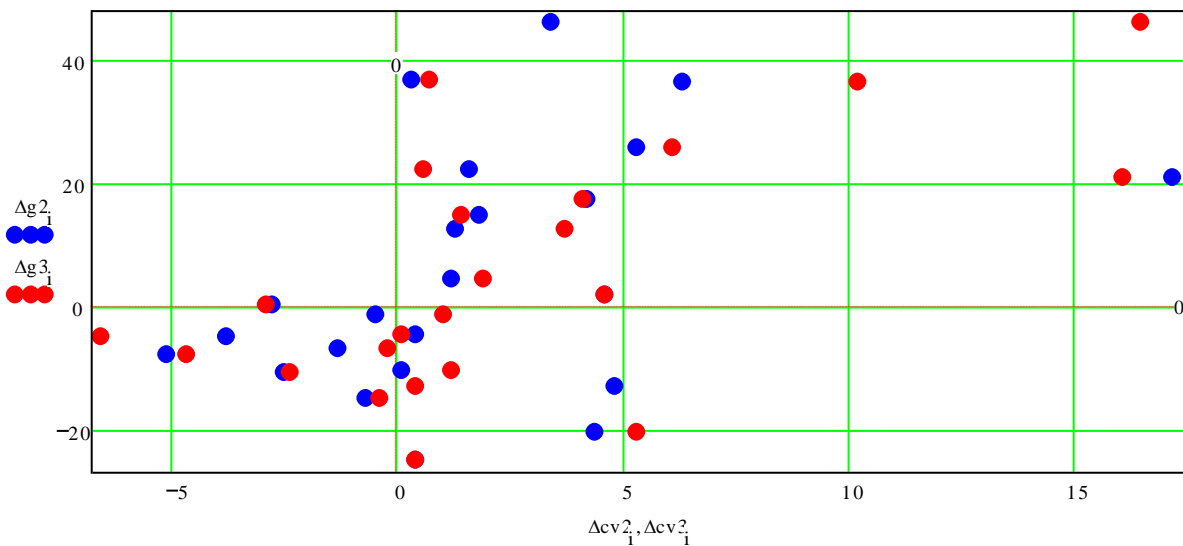
Figure 18.

5. Conclusion

There were after 2000 a strong convergence in EU, both at level of countries and at that of groups of countries. Moreover, starting from a higher heterogeneity, also at the level of regions and counties was registered a trend of convergence toward the average level of GDP per capita (in conditions of a general cquasi-continous growing). Thus, it is demonstrated that the general economic growth has a positive impact on convergence at all levels. This is more accentuate when a country, a region or a county is placed far under the average level of income per capita. When its level is more closed to the average level the speed of convergence is decreasing. For geographical or administrative entities registering high level of income per capita far on the right side of the average level the expected trend could be more probably of divergence. Only adequate policies can exploit the opportunities to continue convergence also in case of a high level of income per capita.