

Chilian, Mihaela-Nona; Iordan, Marioara; Pauna, Carmen Beatrice

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# **Real and Structural Convergence in the Romanian Counties in the Pre-accession and Post-accession Periods<sup>1</sup>**

*Mihaela-Nona CHILIAN,*

*Institute of Economic Forecasting, Bucharest, Romania*

*Marioara IORDAN,*

*Institute of Economic Forecasting, Bucharest, Romania*

*Carmen Beatrice PAUNA*

*Institute of Economic Forecasting, Bucharest, Romania*

## **Introduction**

In the European Union, the issue of economic convergence among the Member States and among their regions is linked with the main objective of the Union. Article 2 of the Treaty of Rome, amended by subsequent treaties, lists “a high degree of convergence of economic performance” and “economic and social cohesion” among the objectives of the European Union (EU). The Maastricht Treaty includes three economic objectives concerning convergence: the harmonious and sustainable development of economic activities; the high performance level of economic activities and the economic and social cohesion and solidarity of the Member States. In literature, convergence at both national and regional and sub-regional levels is studied in connection with the economic development on medium and long term and with the dynamics of economic sectors and correlated with the economic mechanisms and institutions with supportive roles in the process of European integration (Ghizdeanu *et al.*, 2015 Iancu, 2008).

*Real convergence* is a process endogenous to each national entity, and the convergence of regions within the Member States is very important for improving European cohesion and the competitiveness and efficiency of the Single Market. Currently, the Europe 2020 Strategy that aims at achieving smart, sustainable and inclusive growth stresses the need for reducing regional disparities, stating that “Regional development and investment also support inclusive growth by helping disparities among regions diminish and making sure that the benefits of growth reach all corners of the EU” (European Commission, 2012). Real convergence was one of the major objectives of the EU cohesion policy in the period 2007-2013 and it has covered the poorest EU

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<sup>1</sup> Paper dedicated to the 150th anniversary of the Romanian Academy.

regions, defined as convergence regions. The key objective in these regions, eligible for the cohesion policy, involved the stimulation of growth potential to maintain and achieve high growth rates in such regions (Jozwik and Ponikowski, 2014).

The overall objective of the EU regarding real convergence also overlaps with and requires the *territorial convergence*. Sustainability of economic growth and closing the development gaps among the EU countries involve both structural reforms and, especially, a balanced contribution to the national development of regions and sub-regions, according to their potential, and the cohesion policy reform aims to ensure maximization of regional contribution to growth by adapting the Community assistance to the development of each region and by channeling resources to the key sectors for growth.

To all these developments add up the effects of the global financial and economic crisis, which has disrupted the growth mechanisms, by affecting countries and regions differently depending on their responsiveness and reaction. In Romania, the different impact of the economic crisis has reduced the concentration of economic growth during the years of direct manifestation (decline), namely 2009 and 2010, but in the post-crisis period (2011-2012) the concentration of economic growth in certain areas (usually more developed) was resumed and even emphasized (Ghizdeanu *et al.*, 2015; Iordan, Ghizdeanu and Tapu, 2014; Chilian, 2013; Iordan and Chilian, 2015).

### **Real and Structural Convergence Assessment Methods**

*Economic convergence* refers usually to the process of diminishing the economic, development or socio-economic gaps of the less developed/emerging countries/regions/territories towards the developed countries, regions or territories. Economic growth theories (neoclassical - exogenous growth - and endogenous growth) and economic integration theories are often associated with the processes of convergence or divergence (Barro and Sala-i-Martin, 1992; Capello, 2007; Quineti *et al.*, 2011). Two broad types of convergence were identified in the neoclassical growth theories: 1) *absolute convergence* (the *beta convergence*), which implies that poorer countries or regions tend to grow faster per capita than the rich ones and 2) *conditional convergence* (the *sigma convergence*), which implies that an economy grows faster the further it is from its steady state value, regardless if it is poor or rich (Quineti *et al.*, 2011). The beta convergence appears to be a necessary, but not sufficient prerequisite for the sigma convergence, because random shocks can disrupt the convergence of countries/regions, they evolving towards different stable states

(Neagu, 2013). Also, the literature on economic growth identified and analyzed the groups of economies (countries or regions) with homogeneous economic growth patterns and which converge towards a common steady state, called the *convergence clubs* (Quah, 1996; Lopez-Bazo *et al.*, 1999; Ertur *et al.*, 2006; Mora, 2008). Finally, the integration theories with neoclassical or endogenous growth bases may argue both a tendency towards regional convergence and towards regional divergence in the EU (Quineti *et al.*, 2011).

For the analysis of *real convergence*, particularly at national level, the literature highlights several indicators that may be used, starting from *broader indicators* (GDP growth rate, GDP per capita, the ratio of exports to GDP, the intensity of foreign investment, stock market capitalization, unemployment rates, labor costs and R&D expenditures, etc.) and going to *specific indicators and modeling methods* (coefficient of variation, Lorenz curve, Gini index, Atkinson index, Theil index, average logarithmic deviation, Robin Hood index, Markov chains, panel regressions, non-parametric methods, etc. - see Albu, 2013; Iancu, 2009; Răileanu Szeles and Marinescu, 2010; Miron, Tatomir and Alexe, 2013; Neagu, 2013; Simionescu, 2014; Iordan, Ghizdeanu and Tapu, 2014).

In the EU, the process of real convergence of the Member States and their regions has been extensively studied, either in a macroeconomic context and considering its relationship with the nominal convergence, or in connection with the concept of *cohesion* (economic, social and territorial - see, for instance, Sala-i -Martin, 1996; Monfort, 2008; European Commission, 2010a; Halmai and Vásáry, 2011; Quineti *et al.*, 2011; Albu, 2012). The results of existing empirical studies on the EU provide mixed evidence. Some studies have generally revealed the presence of absolute convergence between the EU member states and/or their regions, but the pattern and speed of convergence were found to vary sharply across different sub-periods and regional subsets (including periods of divergence), with peculiarities for the EU15 countries and the New Member States, and also within these groups of countries (Landesmann and Romisch, 2006; Carrington, 2006; Ezcurra *et al.*, 2007a; Melchior, 2008; Enflo, 2010, Jozwik and Ponikowski, 2014; Dobrinsky and Havlik, 2014). Especially important was the uneven impact of the crisis upon particular countries when examining convergence, with the convergence tendencies of the NMS continuing even after the crisis years of 2008 and 2009, while the periphery countries of the EU15 diverging remarkably in that period (Rozmahel *et al.*, 2013). Also, a more detailed study of convergence of the regions of the EMU countries revealed that even in a currency union

the convergence of regions to the country mean was far from automatic, highly discontinuous and strongly concentrated on a rather limited number of time periods (Firgo and Huber, 2013).

At the same time, across the EU the conditional convergence was less pronounced, signaling increasing disparities among the regions, selective tendencies, convergence clubs, and asymmetric shocks, especially in the EU15 countries but also in the NMS (Landesmann and Romisch, 2006; Quineti *et al.*, 2011; Petrakos and Artelaris, 2009, 2014). Moreover, the European Commission's successive Periodic Reports show that real economic convergence is a long way off and in some countries regional economic disparities have even worsened (European Commission 2004, 2007, 2010b; Rodriguez-Pose and Tselios, 2015).

For the Romanian economy, most studies have addressed the convergence towards an "average" level of the entire European Union economy or groups of Member States (Albu, 2012; Miron, Dima and Păun, 2009; Răileanu Szeles and Marinescu, 2010; Simionescu, 2014). As regards the economic convergence of the regions/counties of Romania, we may find studies based both on specific indicators and approaches in the broader context of the cohesion process (Antonescu, 2012; Neagu, 2013, Iordan, Ghizdeanu and Tapu, 2014; Iordan *et al.*, 2014; Chilian, 2013; Ghizdeanu *et al.*, 2015; Iordan and Chilian, 2015, Iordan *et al.*, 2015), as well as studies that address specific issues, but which deal with the process of cohesion, such as those related to economic resilience and the impact of the 2008 global economic crisis (Iordan and Chilian, 2014; Zaman and Goschin, 2015) and to the modeling of spatial structures in Europe (Koczisky *et al.*, 2015). The key findings of such studies were that, generally, in the pre-accession period Romania registered a process of economic convergence, while in the post-accession period it was noticed a divergence/economic differentiation process, and growth in the inter and intra-regional disparities, deepened by the economic and financial crisis. However, during crisis Romania was among the few countries which have improved the real convergence as compared to the EU average (Iordan, Ghizdeanu and Tapu, 2014). Such developments are not specific only to Romania, but they are also found in other newer or older EU Member States (Antonescu, 2012; Chilian, 2013; Ghizdeanu *et al.*, 2015).

A concept associated to real convergence is the *structural convergence/convergence of economic structures*, developed by Wacziarg, who established that structural convergence occurs if convergence in per capita income is accompanied by sectoral convergence. Different dedicated indices may be used to study it - the Krugman specialization index, the location quotient,

structural coefficients, other disproportionality measures (Longhi and Musolesi, 2007; Bickenbach and Bode, 2008; Dobrescu, 2011). Different trends in the European industries were revealed by empirical studies, such as the increase in regional industrial concentration of both declining traditional industries and the growing advanced sectors, or the increase in regional specialization in manufacturing, a split performance between the Capital regions of NMS and the regions bordering the EU, very much differentiated patterns of structural change in the NMS, large shifts in productivity performance (Kallioras and Petrakos, 2010; Havlik, 2014).

The literature on economic convergence in Romania has addressed it especially in connection with the influence on the timing of business cycles, as well as benchmarking exercise for assessing the state of economic development (Albu, 2013; Miron, Tatomir and Alexe, 2013; Iordan, Ghizdeanu and Tapu, 2014; Iordan and Chilian, 2014). There are several studies addressing nationally and regionally the relationship between the real and structural convergence, through *indexes of real convergence* and of *structural convergence/divergence* and their combination, which reveal a relative alignment of sector similarity and convergence in terms of per capita income (Miron, Tatomir and Alexe, 2013; Ghizdeanu *et al.*, 2015; Iordan *et al.*, 2015; Iordan and Chilian, 2015).

In what follows, this paper presents a brief analysis of real convergence in the counties of Romania over a longer time span (2000-2012), which includes both the pre-accession period and part of the post-accession to the EU period. Also, it presents an estimate of the relationship between real and the structural convergence in the Romanian counties, based on an *index of real convergence* and a *structural coefficient*.

### **Peculiarities of Real Convergence in the Counties of Romania**

In order to analyze the process of *real convergence* in the counties of Romania, the following indicators were used:

- *GDP per capita at PPP*, as compared to EU28 average;
- “*gross*” *speed of convergence/economic growth process*, computed as the ratio of the difference between the absolute levels of GDP per capita at PPP (percentage of the EU28 average) at the beginning and the end of period to the length in years of the analyzed period (see Zaman and Goschin, 2015), for the entire analyzed period, namely 2000-2012 and for *sub-*

periods, namely pre-accession, 2000-2006, post-accession, 2007-2012, economic crisis, 2008-2010 and start of economic recovery, 2011-2012;

- the *coefficient of variation*, defined as the ratio of standard deviation to the mean, according to the following formula:

$$CV = \frac{\sigma}{\mu} \quad (1)$$

where:  $n$  is the number of NUTS-3 territorial units in EU28,  $Y$  is the EU28 average GDP per capita and  $y$  is the GDP per capita of the  $i$  county.

- an *overall labor productivity indicator*, computed as total GVA per total employees, percentage as against the EU28 average, and the *convergence speed of labor productivity* towards the EU average, for the entire analyzed period and for sub-periods, computed similarly to gross speed of real convergence.

The GDP per capita at PPP as compared to the EU28 average has continuously increased in all the Romanian counties during the pre-accession period, from 11.7% in 2000 in Vaslui County (the lowest level) and 58.7% in Bucharest Municipality in the same year (the highest level), up to 17.2% in 2006 in Vaslui County and 88.5% in Bucharest Municipality. Growth has continued during the post-accession period, but at a lower or fluctuating pace over the period of economic crisis, and the gaps between the counties have increased, varying in 2012 from 25.3% of the EU28 average (in Botoșani County) to 135.8% of the EU28 average (in Bucharest Municipality – the single administrative-territorial unit of Romania with a GDP per capita exceeding, since 2007, the EU average).

Correlated with such developments, the *speed of convergence* has also recorded significant inter-county differences during all the analyzed periods (Appendix 1). Thus, if over the entire period an advance of convergence/economic growth process is noticed in all the counties, by sub-periods the situations differ, especially in the case of post-accession and economic crisis periods, when both more and less developed counties recorded slowdown of economic growth and increasing development gaps, in some cases continued in the post-crisis and debut of economic recovery period. In all the regions we may find counties with slow economic growth and/or increasing gaps over the crisis and even post-crisis periods, with peculiarities as follows:

- decline in convergence over the entire post-accession period and increasing gaps as against the EU average over the crisis and post-crisis periods, signaling either a delay in starting

the economic recovery, peculiar unfavorable economic circumstances during the analyzed interval or continuation of specific county circumstances;

- very slow convergence over the analyzed periods, and increasing gaps during the economic return period, which reveals a diverging evolution as compared both to the European average, and the national one;
- other counties from almost all the Romanian regions have also recorded slow convergence during certain sub-periods, especially the post-accession and crisis ones. One may also notice that the entire Sud Muntenia and București-Ilfov regions have recorded unfavorable developments during the short post-crisis analyzed period when - theoretically - the economic growth should have returned.

Analysis of real convergence with the help of *coefficient of variation* highlights the advance of the process in all regions during the pre-accession period, but also fluctuations and adverse developments in times of economic crisis and in the post-crisis period (Appendix 2). Increasing divergence is manifested both in the counties of less developed regions (Sud Muntenia, Sud-Est), but also in the more developed regions (Vest and București-Ilfov). In the case of Bucharest Municipality the growth in divergence is positive, because it has exceeded since 2008 the EU average in terms of GDP per capita, already entering another group of regions/sub-regions in Europe, namely the Capital cities with much higher levels of development in relation to the average level of the country they belong to, for which the catching-up process has a different connotation and other forms. In the case of counties with a higher level of development (Timiș and Arad in the Vest Region, Ilfov in the București-Ilfov Region, Bihor in the Nord-Vest Region, Sibiu in the Centru Region), the increasing divergence during the post-crisis period is an unfavorable aspect, revealing a slower economic recovery and a relative slowdown of economic growth, which in the case of a continued trend may have negative and broader, lasting impacts, at least in the medium term.

The diverging and/or oscillating trends of economic growth are also revealed by the dynamics of *labor productivity*, and especially by the *speed of its convergence* towards the EU28 average (Appendix 1). As documented in the literature, the variations in regional productivity over time are the result of changes in output and/or employment across the different regions. Also, the productivity growth may be the outcome of various types of adjustment processes; its distribution may, therefore, be spatially uneven (Ezcurra *et al.*, 2007b). Considering that labor



productivity is deemed as the key factor of increasing competitiveness and of social and economic development of any territory (Gardiner and Martin, 2005; Fagerberg *et al.*, 2004; Garelli, 2014; Delgado *et al.*, 2012), the diminishing of labor productivity gap towards the more developed economies is vital for the economy of any emerging or developing country, region or sub-region. In the case of the Romanian counties, one may notice very contradictorily dynamics, which call for further more detailed analysis:

- Faster convergence of labor productivity as compared to the GDP per capita over the entire analyzed period in the less developed counties or in counties with medium development level at best, which started from a very low basis as compared to the EU average. Moreover, these counties as well as others from among all the Romanian regions have recorded a faster increase in productivity during the pre-accession period, while the trend has reversed during the post-accession period, some counties recording even increases in the productivity gaps as against the EU average. Under such circumstances, only very few counties saw a more significant advance in the productivity convergence towards the EU average. Paradoxically, the Bucharest Municipality has recorded a slower convergence of productivity towards the EU average (however, starting from a higher basis as compared to all the other counties), while in the case of Ilfov County one may notice a balanced convergence of both GDP per capita and labor productivity.
- Increasing total productivity gap as against the EU average during the period of economic crisis in almost all of the Romanian counties, as well as faster return of productivity convergence as compared to GDP per capita convergence in both less and more advanced counties in almost all the regions of Romania, which signals favorable development opportunities, at least for the nearest periods. Such developments are, however, accompanied by increasing productivity gaps during the post-crisis period in some counties and even entire regions (Sud Muntenia), which reveal less favorable immediate perspectives regarding the economic development. Although the analyzed post-crisis period was short, it is however worrisome that some of the national and regional economic engines may be found in the group of counties with slower economic recovery, and possible structural rigidities - results in line with those of other authors (Zaman and Goschin, 2015). On another hand, it is a good thing that some of the counties and regions with lower development levels seem to have faster returned to the path of diminishing their development gaps, but we must also mention that the levels for comparison are low not only

against the EU average, but also against the national average. Also, further data update and analysis may confirm or not such very short time dynamics.

### **The Relationship between the Real and Structural Convergence in the Romanian Counties**

Finally, as mentioned in the beginning, we tried to make a first estimate of the *relationship between the real convergence and the structural convergence* in the counties of Romania. For this, a matrix with four quadrants of performance was used (see Miron, Tatomir and Alexe, 2013), based on an *index of real convergence* and a *structural coefficient*. The former was computed as an aggregate index of GDP per capita coefficient of variation and of GVA per employee, while the latter was determined as *standard Euclidean norm of employed population by sector* (see Dobrescu, 2011; Iordan and Chilian, 2014; Iordan *et al.*, 2015), as according to the relationship:

$$SCE = 1 - (\sum l w_i - W_i) / 2 \quad (2)$$

where:  $W_i$  and  $w_i$  are the weight of the  $i$  sector in the total employment of the economy considered as reference and in the analyzed economy, respectively  $w_i > 0$ ,  $W_i > 0$ ,  $\sum w_i = \sum W_i = 1$ . In our analysis, the reference sectoral structure was considered that of the EU28 "average", and six main sectors were taken into account: agriculture, forestry and fisheries; industry; constructions; trade, transport, hotels and restaurants, information and communication; finance and insurance, real estate, professional, scientific and technical activities, services for businesses; public administration and defense, social security, education, health, artistic and recreational activities, services for the population. The indexes were determined for all the counties of Romania in the years 2000, 2007, 2010 and 2011, and the results were normalized on a scale of 0 to 100. The significance of the four quadrants is as follows:

*Quadrant 1 - Low performance* - includes counties with RCI and SCE lower than 50 points out of 100;

*Quadrant 2 - Average performance of real convergence* - counties with RCI higher than 50 points, but with SCE lower than 50;

*Quadrant 3 - High performance* - includes the counties with both SCE and RCI higher than 50 points out of 100;

*Quadrant 4 - Average structural performance* - includes counties with SCE higher than 50 points, but with RCI lower than 50.

The results generally show a relative alignment of real convergence and structural convergence over the analyzed period in the national economy, but also important differences between counties due to the composition of sectoral structure<sup>2</sup>. With very few exceptions, only the counties with higher levels of development recorded progresses in the post-accession period, both in terms of real convergence and the structural convergence. Also, the counties with higher development levels recorded during the same period a faster reduction of disparities in terms of real convergence, but slower in terms of structural convergence, which could indicate either specific geographic-economic peculiarities or the presence of sectoral structural rigidities, issues that require further thorough analysis.

Conversely, we find counties that during the post-accession period recorded a faster advance in terms of structural convergence, which cannot be found but in the evolution of economic performance and also counties, generally with a lower level of development, which during the post-accession period either recorded lower progresses in terms of one or the other or both types of convergence, or even some relative regresses. Again in this case, a further more detailed analysis of the determinants of both types of convergence and of the geographical-economic and sectoral peculiarities is required.

Finally, during the post-crisis period stand out some counties where the gaps against the EU average have widened in terms of both real and structural convergence, while in the case of others it has especially widened the gap regarding the structure of employment. Deepening disparities in terms of economic growth in the short post-crisis analyzed period are noticed only in very few cases, signaling both positive developments (Bucharest Municipality) and disadvantages (Bihor and Argeş counties).

## **Conclusions**

Similar to the other NMS, a process of real convergence is noticeable also in the Romanian economy and in the economies of its regions and counties. If in the EU accession year (2007) only two regions except for the Bucureşti-Ilfov Region, namely Vest and Centru regions, recorded a GDP per capita higher than 40% of the EU average, in 2013 six regions were found in such a situation, and the Bucureşti-Ilfov Region recorded a GDP per capita by 30% higher than the EU average in the same year.

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<sup>2</sup> Due to space limitations, the results were not included in the paper and are available upon request.

Analysis of real convergence of Romania's counties reveals that the favorable results recorded nationally during the 2000-2012 period were mainly due to the accelerated growth in the București -Ilfov region and in some county growth poles within the regions, and that the convergence process itself takes place at different speeds. The results highlight the advance of the process in all regions during the pre-accession period, as well as fluctuations and adverse developments in times of economic crisis and during the post-crisis period, when both more developed and less developed counties recorded reduced growth and increased development gaps, in some cases continued in the early post-crisis recovery period.

Increasing divergence was noticeable both in the counties of less developed regions (Sud Muntenia, Sud-Est), but also in the more developed regions (Vest and București-Ilfov). In the case of Bucharest Municipality, the growth in divergence is positive, because it has exceeded since 2008 the EU average in terms of GDP per capita, already entering another group of regions/sub-regions in Europe, namely the Capital cities with much higher levels of development, while in the case of counties with a higher level of development the increasing divergence during the post-crisis period is an unfavorable aspect, revealing a slower economic recovery and a relative slowdown of economic growth, which may induce negative and broader, lasting impacts, possibly in the medium term. Nevertheless, further data update and analysis is needed to confirm or not such trends.

The diverging trends and/or the fluctuations of the economic growth process are also revealed by the labor productivity dynamics, and especially by the speed of its convergence towards the EU28 average. On the one hand, we may find a faster convergence of labor productivity than of the GDP per capita over the entire analyzed period in the less developed counties or in the counties with a development level medium at best, especially during the pre-accession period, while during the post-accession period the trend has reversed, even towards increasing the productivity gaps as against the EU average. On the another hand, we may see deepening productivity gaps during the economic crisis nearly in all the Romanian counties, but also a faster return to the productivity convergence than to the GDP convergence both in less or more developed counties in nearly all the regions. However, some of the national and regional economic growth engines were still maintaining in the group of the counties with slower economic recovery, and possibly with structural rigidities.

Regarding the estimate of relationship between the real convergence and the structural convergence in the counties of Romania, the results generally show a relative alignment of real convergence and structural convergence processes during the analyzed period in the national economy, but also important differences between counties, mainly due to the composition of sectoral structure. With very few exceptions, only the counties with higher levels of development have progressed during the post-accession period both in terms of real and structural convergence, while in most of the cases gaps in the evolution of the two processes, but also relative stagnation or even regress may be noticed.

Since this paper is only an opening of a research avenue, a more detailed analysis has to be performed in the future, based on more indicators and updated data, as well as on econometric relationships, to highlight the causes of stagnation and poor economic performance in certain counties and even regions, as well as the effects of the geographical-economic framework and of the sectoral structures, because in certain areas industry or even agriculture can still be important factors of economic growth. Also, considering the fact that the most developed counties have benefited the most from the EU accession, being also more able to better absorb the shock of the economic crisis and resume the growth processes, an important problem for Romania is the effectiveness of the support policies directed at specific growth poles or cities in the less developed areas, and their (in)ability to irradiate growth in the adjacent areas, due to poor infrastructure and services for business and lack of perspective of stable and well paid jobs.

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## Appendix 1

### Dynamics of Real Convergence Process in the Romanian Counties (Percentage Points per Year)

Regions/Counties	2000-2012		2000-2006		2007-2012		2008-2011		2011-2012	
	PIB	W	PIB	W	PIB	W	PIB	W	PIB	W
<b>Nord Vest</b>										
Bihor	1.3	0.9	2.2	1.8	-0.2	-0.9	-0.7	-1.8	-0.6	0.1
Bistrita-Nasaud	1.5	1.1	1.4	1.8	1.1	-0.8	-0.3	-2.1	1.7	-0.4
Cluj	2.9	1.9	2.5	2.1	1.8	0.0	1.3	-0.9	1.1	1.4
Maramures	1.4	1.2	1.3	1.7	1.2	-0.3	0.4	-1.7	1.6	0.8
Satu Mare	1.3	1.0	1.4	1.5	0.9	-0.4	0.1	-1.4	0.8	-0.1
Salaj	1.7	1.4	1.7	2.0	1.2	-0.2	0.2	-0.9	1.9	-0.4
<b>Centru</b>										
Alba	2.3	1.9	2.0	1.7	1.4	0.7	0.6	0.7	1.8	0.6
Brasov	2.7	1.8	1.8	1.5	2.7	1.0	1.2	0.2	3.2	1.6
Covasna	0.7	0.9	0.4	0.8	0.6	0.1	0.4	0.3	-0.4	-0.6
Harghita	1.0	1.1	1.1	1.4	0.6	-0.1	0.3	-0.4	-0.4	-0.3
Mures	1.3	1.3	1.2	1.4	1.1	0.4	-0.1	-0.7	1.7	1.8
Sibiu	2.4	1.5	2.5	1.8	1.7	0.3	0.4	-0.5	0.8	0.2
<b>Nord Est</b>										
Bacau	1.3	1.3	1.1	1.5	1.3	0.3	-0.3	-1.1	2.3	1.6
Botosani	0.8	1.2	0.6	1.2	0.7	0.0	0.3	-0.8	-0.1	0.3
Iasi	1.5	1.6	1.2	1.4	1.4	1.0	0.5	-0.2	0.8	1.9
Neamt	1.1	1.1	1.0	1.4	1.1	0.1	-0.1	-1.1	2.6	1.8
Suceava	1.0	1.3	0.8	1.4	0.7	0.0	0.4	-0.7	0.9	1.3
Vaslui	1.1	1.4	0.8	1.3	1.4	1.0	-0.1	-0.7	2.2	1.9
<b>Sud Est</b>										
Braila	1.6	1.4	1.4	1.5	1.0	0.3	0.5	-0.5	0.4	0.7
Buzau	1.2	1.4	1.1	1.5	1.1	0.6	0.2	-0.8	0.8	1.7
Constanta	2.4	2.1	2.3	2.0	2.7	1.7	1.5	0.3	2.8	4.0
Galati	1.3	1.4	0.9	1.1	1.4	0.9	0.4	0.1	1.0	1.2

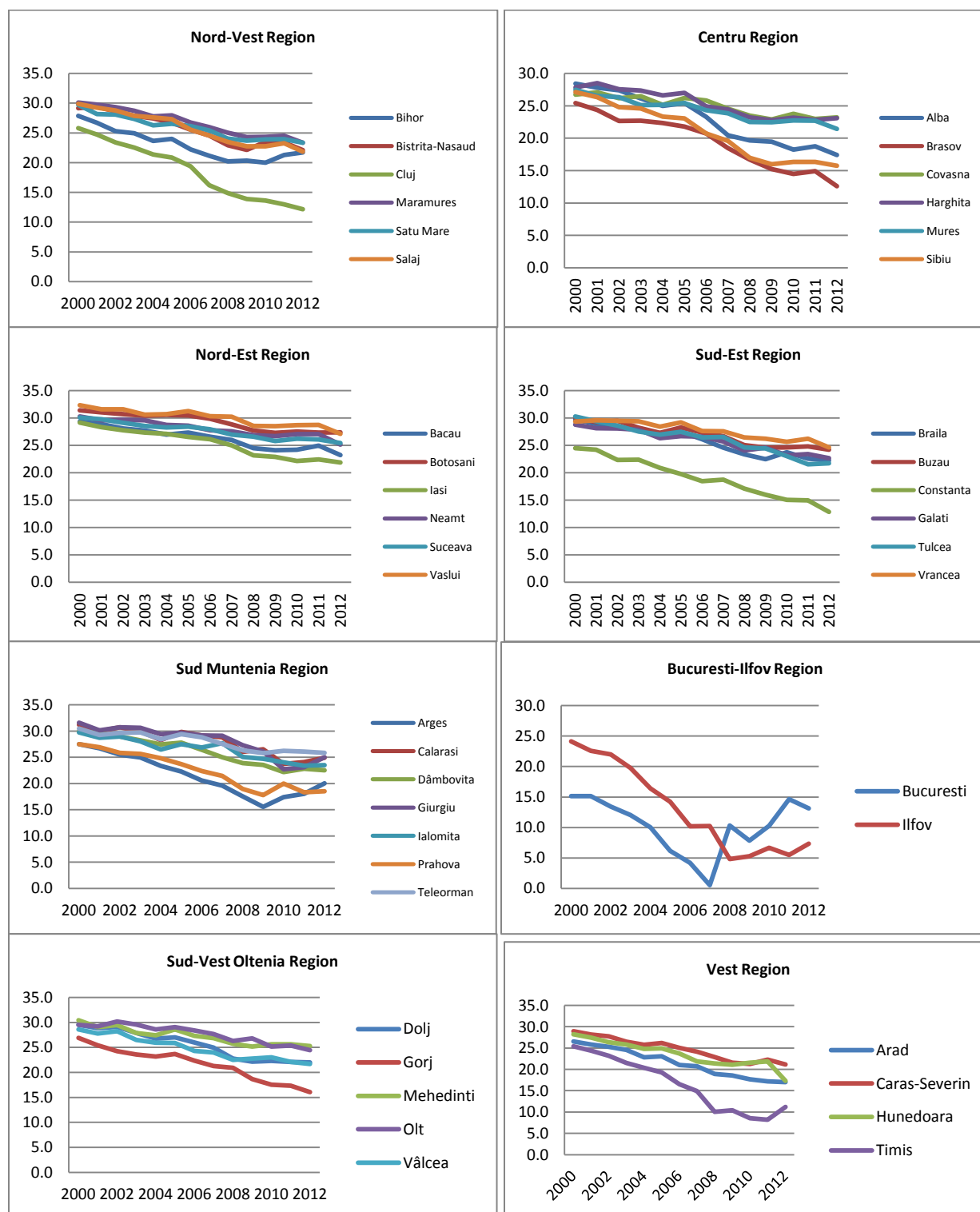
Tulcea	1.8	1.4	1.5	1.7	2.2	0.7	2.1	0.8	-0.2	-1.4
Vrancea	1.0	1.4	0.7	1.4	1.3	0.9	0.2	-0.1	2.2	1.6
<b>Sud Muntenia</b>										
Arges	1.6	1.3	2.7	2.2	-0.2	-0.7	-0.3	-0.8	-2.7	-2.5
Calarasi	1.3	1.4	0.8	1.2	1.8	1.2	1.3	0.9	-1.1	-2.4
Dâmbovita	1.5	1.9	1.4	1.8	1.1	0.8	0.7	0.4	0.4	0.4
Giurgiu	1.4	1.9	1.0	1.7	1.9	1.7	2.9	2.5	-2.6	-3.0
Ialomita	1.3	1.2	1.1	1.4	1.9	1.0	1.1	1.0	-0.2	-2.3
Prahova	1.9	1.5	2.0	1.8	1.3	0.4	0.4	-0.2	-0.3	-0.8
Teleorman	1.0	1.0	0.6	1.1	0.8	-0.2	0.2	-0.4	0.3	-1.5
<b>Bucuresti-Ilfov</b>										
Bucuresti	5.9	2.5	4.3	2.4	5.7	0.9	3.0	-1.0	-2.1	-1.6
Ilfov	3.5	3.0	5.4	3.7	1.3	1.3	-0.5	-2.5	-2.5	2.2
<b>Sud-Vest Oltenia</b>										
Dolj	1.6	1.8	1.4	1.7	1.4	1.1	0.4	-0.5	0.2	1.3
Gorj	2.3	2.1	1.8	2.2	2.4	0.8	2.5	0.4	1.8	1.4
Mehedinti	1.1	1.2	1.2	1.7	0.7	-0.1	0.1	-0.9	0.5	0.0
Olt	1.1	1.6	0.5	1.0	1.5	1.4	0.6	0.3	1.2	1.8
Vâlcea	1.4	1.5	1.7	1.8	1.0	0.4	0.3	-0.9	0.6	1.2
<b>Vest</b>										
Arad	2.0	1.4	2.2	1.9	1.7	0.1	1.2	-0.6	0.3	-0.1
Caras-Severin	1.6	1.7	1.5	1.8	1.4	0.6	0.4	0.0	1.5	0.0
Hunedoara	2.3	1.5	1.8	1.5	2.1	0.4	-0.3	-1.2	6.2	3.2
Timis	3.0	1.9	3.5	2.3	1.7	0.4	1.3	-0.8	-4.1	-1.2

Note: W refers to total labor productivity.

Source: Authors' computations based on Eurostat data.

## Appendix 2

### Real Convergence Dynamics in the Romanian Counties, 2000 – 2012 (Coefficient of Variation)



Source: Authors' computations, based on Eurostat data.