

INTER-REGIONAL DISPARITIES IN THE EUROPEAN UNION

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ABSTRACT – One of the European Union's major goals is to reduce disparities between countries and regions. We compute sigma-convergence at national and regional level (NUTS2) on GDP per capita and employment rates to analyze the evolution of convergence in the EU. Results show growing disparities both at regional and national levels. Quartiles are used to separate the best and the worst performing regions. Comparing the average performance of the 25% most developed regions with the one of the 25% least developed regions reveals that the widening gaps are due to the increasing performance of the former and the worsening situation of the latter. In terms of both GDP and employment, after 2009 the leading regions enjoy high growth rates, while the regions lagging behind show small or negative growth. According to the results, the divergence in regional employment rates is currently at the highest level since 2000. Choropleth maps are used to illustrate the levels and the evolution of the two indicators at regional level.

Keywords: regional development, regional economic disparities, sigma-convergence

INTRODUCTION

The Cohesion Policy is the main financial instrument available to EU institutions in order to fulfil the targets of the Europe 2020 and the objective of reducing disparities between countries and regions of the European Union. Economic disparity is not just about income, but also about an overlapping of features that contribute to the quality of life for EU citizens: transport infrastructure (highways, bridges, airports, etc.), the education system and training of human capital, environment infrastructure, research and development facilities, etc. This policy expresses the solidarity of the UE for less developed countries and regions by concentrating funds to those areas and sectors that can promote economic competitiveness.³

Cohesion Policy is one of the basic principles of the European construction and dates back to its founding Treaty (Treaty of Rome, 1957). According to the 1957 Treaty, one of the main objectives of the European Community was to promote "the harmonious development of economic activities" (Art. 2). In addition, with the first enlargement of the European Community (Ireland, Denmark and the UK in 1972) and the shaping of the Economic and Monetary Union, the Regional Development Fund was created in December 1974. The need for this fund came as result of the fact that with progressive enlargements there were recorded increasingly higher economic disparities between member states, amid gradual accession of new, less developed countries.

In the new multi-annual programming period, 2014-2020, the Cohesion Policy represents approximately 32.5% of the total budget of the European Union. In nominal terms, 351.8 billion euros are allocated for promoting competitiveness, creating new jobs and supporting regional economic growth.

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³ European Commission, http://ec.europa.eu/regional_policy/what/index_en.cfm.

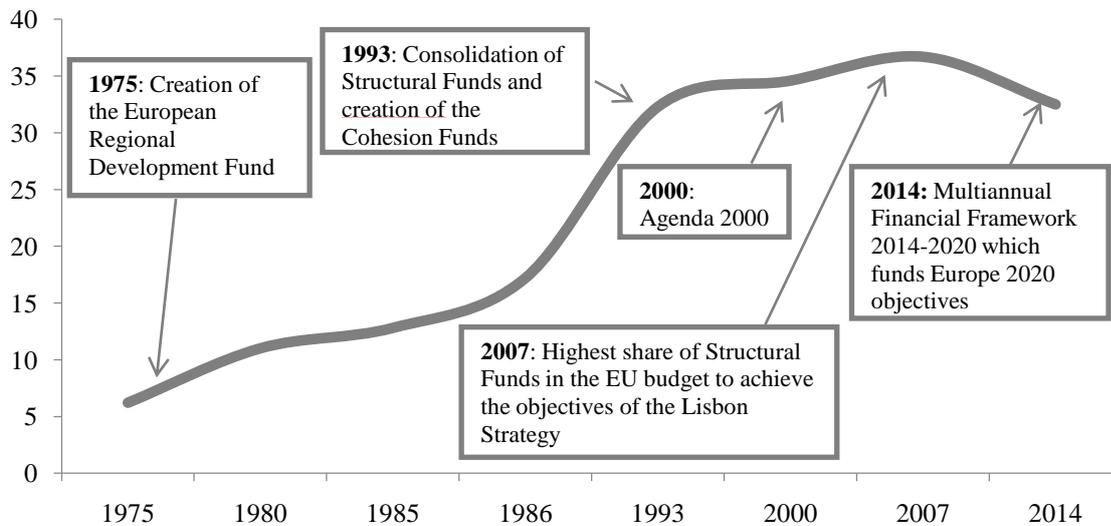


Figure 1. *Timeline of the percentage allocated to regional policy of the EU budget (% of total UE budget)*

In the context of the EU's Cohesion Policy, this paper analyzes the evolution of disparities in the European Union regions in terms of economic performance to assess the current state and evolution. We use GDP per inhabitant in real terms (PPS per capita) as it is the most commonly used indicator to reflect the level of economic performance. Another indicator analyzed, more opened to the social aspects, is the employment rate. The data covers all 272 NUTS 2 regions of EU-28, for the period 2000-2011 for GDP and 2000-2013 for the employment rate. Choropleth maps are used to illustrate the territorial distribution of regions depending on the level of development.

THE STUDY OF DISPARITIES

In addition to the obvious policy implications, economic convergence attracted considerable research literature and debates. On the one hand, Solow's neoclassical paradigm (1956) states that disparities tend to decrease as result of faster economic growth recorded by the poorer countries. On the other hand, there are other schools of thought which argue that inequalities are more likely to grow: Romer's (1986) and Lucas's (1988) endogenous growth theories, Krugman's (1991) new geographical economics, or Myrdal's theory (1957) that suggests that economic growth is leveraged by a cumulative causation effect.

Quah's analysis (1996, p.13) argues that economic disparities arise because poor countries do not have the same ability to implement new technologies as developed countries. That will lead to more development gaps, dividing countries into "convergence clubs". Empirical research at global level conducted by Quah concludes that there is now a sense of bipolarity of income: poor countries tend to stay underdeveloped, rich countries will remain rich, and those at a medium level of development will follow a path towards one of these two "clubs".

Dinu et al. (2005, p.28) argue that this phenomenon of polarization is rather explained by the divergent approaches initiated by the theory of divergence / polarization, based on „multiplier-accelerator mechanism” that produces higher income rates in developed regions, given the modern infrastructure, physical and technological flows and other high quality factors of production.

According to the neoclassical theory of localization, the market economy tends to balance the spatial disparities, in contrast with the new geographical economy (regarded as a theory of polarization) which assumes the strengthening of economic concentration in a territory through a circular cumulative process, which leads to further imbalances in levels of development (Clipa et al., 2012, p. 6).

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Combining endogenous growth theories and new geographical economy allows the study of the links between the concentration of economic activities (as a manifestation of economic divergence) and the economic growth process. Under the new approach, neoclassical theory lacks two fundamental processes: agglomeration and complementary factors (flows of labour and capital). The "center-periphery" model introduced by Krugman (1991) provides the basic framework for addressing economy geographically, showing how the costs of transport or mobility of production factors can cause changes in the spatial economy.

The new theories also support the idea of lack of convergence between regions, in opposition to the neoclassical view that capital moves in the opposite direction of labour (the capital moves from the developed regions, and the labour from the less developed regions, which causes an equalization of the capital per labour units). A set of centrifugal and centripetal forces act towards increasing dispersion, explaining the disparities between regions and how the economic poles affect national economic growth rate.

At European level, a series of empirical studies were conducted on the dynamics of economic disparities at national and regional level. Puigcerver-Peñalver (2007, p. 181) estimated the impact of structural funds on growth rate, in the period 1989 to 2000, regions eligible under Objective 1 ('Convergence') using a hybrid model that partly endogenizes the rate of technological progress. Results suggest that structural funds had a positive impact in these regions, actively supporting a process of catching-up in the European regions. A similar approach had Crespo-Cuaresma et al. (2003, p. 55). They assessed the impact of European integration on income disparities in the member states. The empirical results show that EU membership had a positive effect on the long-term growth but also showed some degree of asymmetry at the national level between member states. Petrakos et al. (2003, p. 41) also proposed a dynamic model for analyzing regional disparities (SURE model) using time series across the eight member states of the European Union. Their results indicate a process of divergence in the short term, but long-term convergence.

METHODOLOGY

Sigma-convergence is traditionally assessed using indicators of divergence. We argue that the coefficient of variation is more appropriate for this study than the standard deviation. The formula used to compute dispersion in regional GDP per capita is:

$$c_v = \frac{\sigma_t}{\bar{x}} \text{ where } \sigma_t = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n}}$$

where c_v is the coefficient of variation; σ_t is the standard deviation for all the 272 NUTS 2 regions in year t ; x_i is the regional GDP per inhabitant of region i ; \bar{x} is the average GDP per inhabitant; n is the total number of regions (272).

Sigma convergence was computed also at national level applying the same formula for the 28 member states of the European Union. The same methodology was used in case of employment rates.

Divergence is further analysed by comparing the evolutions of the best and the worst regional performances. Quartiles were used to identify the best performing 25% of the EU-28 regions and the worst performing 25%. For each of these two groups, the average performance is computed as a simple arithmetic average.

Growth rates of the group averages are calculated using the standard formula for growth rates. For GDP per inhabitant the formula used is:

$$r_{GDP} = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}$$

where r_{GDP} is the growth rate of GDP per inhabitant; GDP_t is the GDP per inhabitant value in the current year and GDP_{t-1} is the value from the previous year. Again, the same methodology was used in case of employment rates.

DISPARITIES IN THE EUROPEAN UNION

Currently, the European Union is a very heterogeneous space not only in terms of social and cultural differences, but also in terms of economic development, measured by two of the most commonly used indicators: employment rate and GDP per capita expressed in purchasing power standard (PPS).

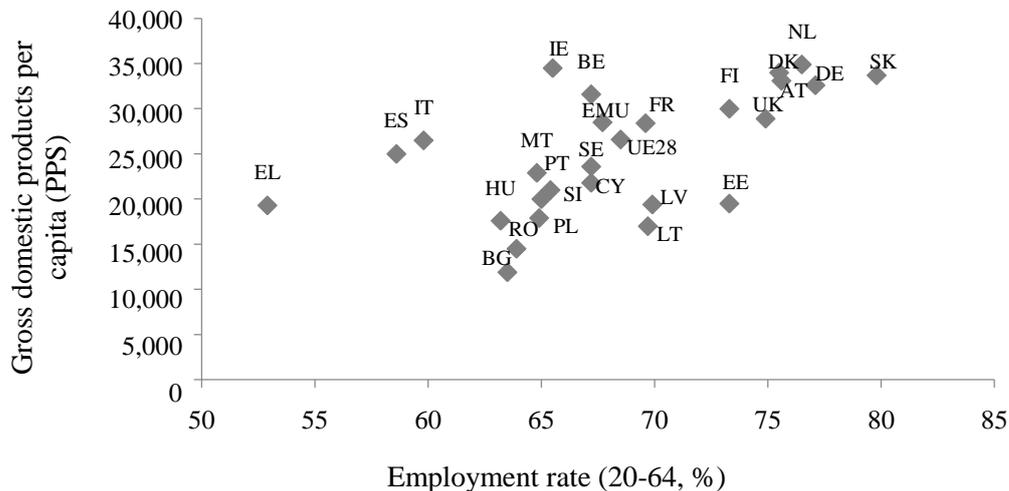


Figure 2. GDP (PPS) and employment rate (20-64; %) in 2013

Source: Eurostat

Figure 2 shows that in 2013 there were important differences between national economic performances in the European Union. Territorial characteristics can be seen in the national performances: there is a group of developed countries located in the north and centre part of Europe (Netherlands, Denmark, Finland, Germany, Austria, etc.), countries that have big structural problems with the labour market in southern Europe (Greece, Italy, Spain). Having both GDP values and employment rates well below the European average, the less developed member states are located in the eastern part of Europe (Lithuania, Latvia, Estonia, Romania, Bulgaria, Hungary, and Poland).

Figure 5 illustrates that the European GDP per inhabitant (EU-28 average) increased almost constantly between 2000 and 2008. The 2009 recession is shown by an important reduction in GDP per inhabitant: the EU-28 average economic performance fell below 2006 levels. In the next two years Europe recovered, the GDP grew reaching a new maximum value in 2011, higher than the one in 2008.

Disparities are even greater at regional level than at national level. The most developed NUTS 2 region is Inner London (UK) with a score of 80,000 PPS per inhabitant. 12 regions recorded more than 40,000 PPS per inhabitant, while the other 10 regions have a GDP of over 4 times lower. The negative performance in GDP is 7,200 PPS per inhabitant, belonging to two regions: North-East (Romania) and Severozapaden (Bulgaria).

When ranking regions in terms of wealth, it can be seen that the best performers are not in the same country. The top ten regions in terms of GDP belong to nine countries: UK, Luxembourg, Belgium, Germany, Slovakia, France, Netherlands, Sweden, and the Czech Republic. In contrast, the poorest 10 regions belong to only two countries: Bulgaria and Romania.

Extending the selection to more and more regions, a pattern of development becomes obvious: richer regions are around large cities (Hamburg, Brussels, Luxembourg, Paris, Milan) from the "Centre-North" part of the European Union, where there is a high concentration of economic activities. The "triangle" defined by North Yorkshire (UK), Franche-Comté (France), Hamburg (Germany) generates about 47% of the income of the European Union, although it covers only 15% of the European territory (Marinaș, 2008, p. 60).

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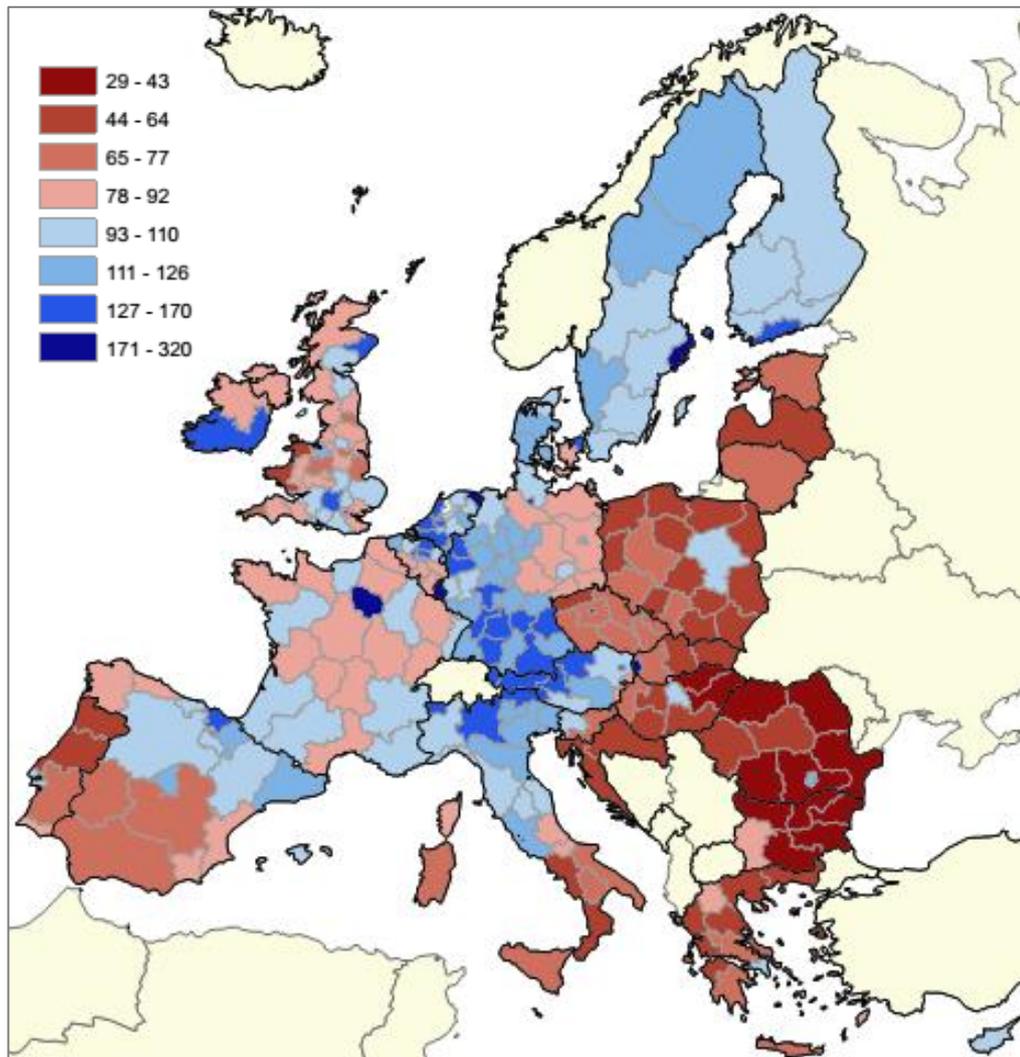


Figure 3. *Regional gross domestic product (PPS per inhabitant) by NUTS 2 regions in 2011, index EU-28 = 100*
Source: Eurostat

Figure 3 shows the situation of GDP per inhabitant according to the latest available data. The regions lagging behind are located in periphery of the European Union, mostly in the Eastern, Southern and Western part. The majority of the regions located in the former communist countries have a GDP significantly lower than the EU average. Almost all Greek regions, Southern part of Italy and the South-Western part of Spain are also included in the low performance group.

There are two concepts of convergence that emerge when analyzing convergence across countries or regions. According to the first one, poor countries have a GDP per capita growth rate higher than the developed countries (Barro, Sala-i-Martin, 2004, p. 462). This type of convergence is called beta-convergence and is based on the fact that, due to the low level of development, there are more business opportunities. In these countries, investments tend to bring a higher rate of return. The other concept – sigma-convergence – refers to the cross-sectional dispersion of values that illustrates the degree of spread in regional or national data in a given moment. Beta-convergence exists if undeveloped regions grow faster than the developed ones, while sigma-convergence takes place if the dispersion of income or GDP per inhabitant income decreases with time.

Thus, sigma-convergence is determined using a dispersion indicator which actually measures the opposite of convergence, that is divergence. This indicator shows how far the individual values are from the average. Dispersion is measured either as the standard deviation (Barro, Sala-i-Martin, 2004, p. 473) or as coefficient of variation. The latter is actually standard deviation relative to the mean. Standard deviation in itself does not convey useful information about the evolution in time, except when related to the average sample studied (Monfort, 2008, p. 5). Standard deviation shows the same evolution as the coefficient of variation if the average does not change over time. Between 2004 and 2007, Europe had a high economic growth rate reaching a maximum in 2008. Due to the crisis, the GDP dropped very fast in 2009. If the standard deviation approach is used, the variations of average GDP would make the results unrealistic. This is why the coefficient of variation seemed a more appropriate instrument in calculating convergence across the European regions.

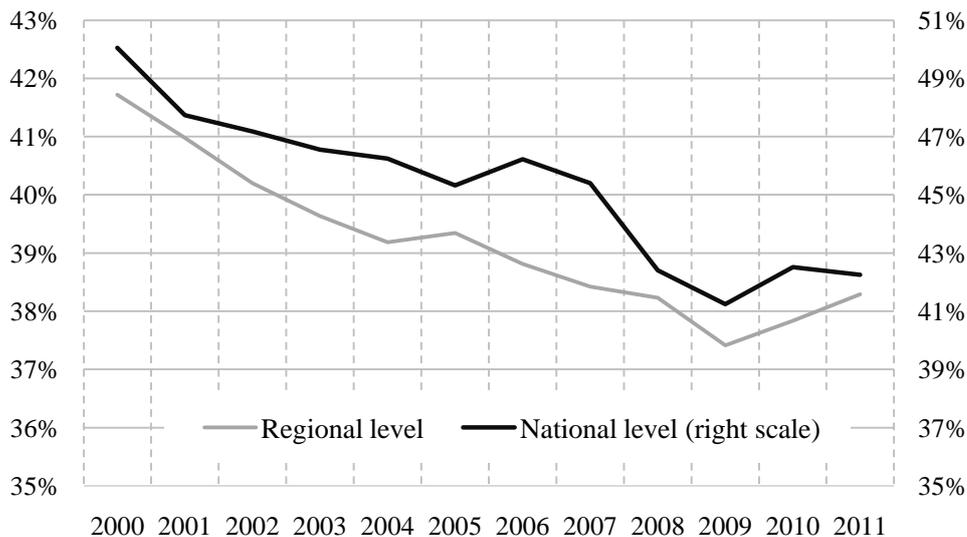


Figure 4. *Coefficient of variation for GDP per inhabitant in PPS*
Source: Eurostat

Figure 4 illustrates a decrease of dispersion in GDP per capita, which demonstrates the existence of sigma-convergence in the period 2000-2008. The indicator reaches the lowest value, meaning the highest level of convergence, in 2009, after which it starts to grow signalling an increase in divergence.

Examining the reason why the convergence evolved this way, regions were ranked depending on the GDP per inhabitant values and then divided into groups based on performance. After ranking, all 272 regions were divided into four equal groups (68 regions in each one) out of which only the first and the last group were used further in the analysis. The three points needed to equally divide the data set into four groups are called quartiles. The second quartile is the value from the middle, the one that divides all the regions into two equal groups. Half of regions have a performance under this value, while the other half above it. The first quartile illustrates the value under which a quarter of the regions can be found. These are the least performing 25% of regions, the least developed regions in EU-28. The third quartile is the point above which the richest 25% of regions are found, that is the best performers.

One group brings together the lowest performing 68 regions in the EU-28, while the other group contains the most developed 25% of regions (also 68). We then compute the average value of the first group (shown in figure 5 by the grey line) and the average value of the second group (black line in figure 5). The evolutions of these two groups were similar between 2000 and 2008 as they both had an almost constant upper trend. The difference is that, in accordance with the convergence theory,

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the poorest regions grew at a higher rate (5.4%) than the developed ones (3.15%). This led to decrease in dispersion among regional performance. In other terms, it narrowed the gap between regions, demonstrating the occurrence of sigma-convergence.

In 2009, gaps further reduced and the reason is that although both groups experienced a sharp decrease in GDP, the developed regions were more affected. This strong decline of developed regions (-6.7% compared to -4.5%) reduced the gaps between developed and the poor regions to a minimum in the entire analyzed period. Thus, in 2009 the highest degree of sigma-convergence was attained.

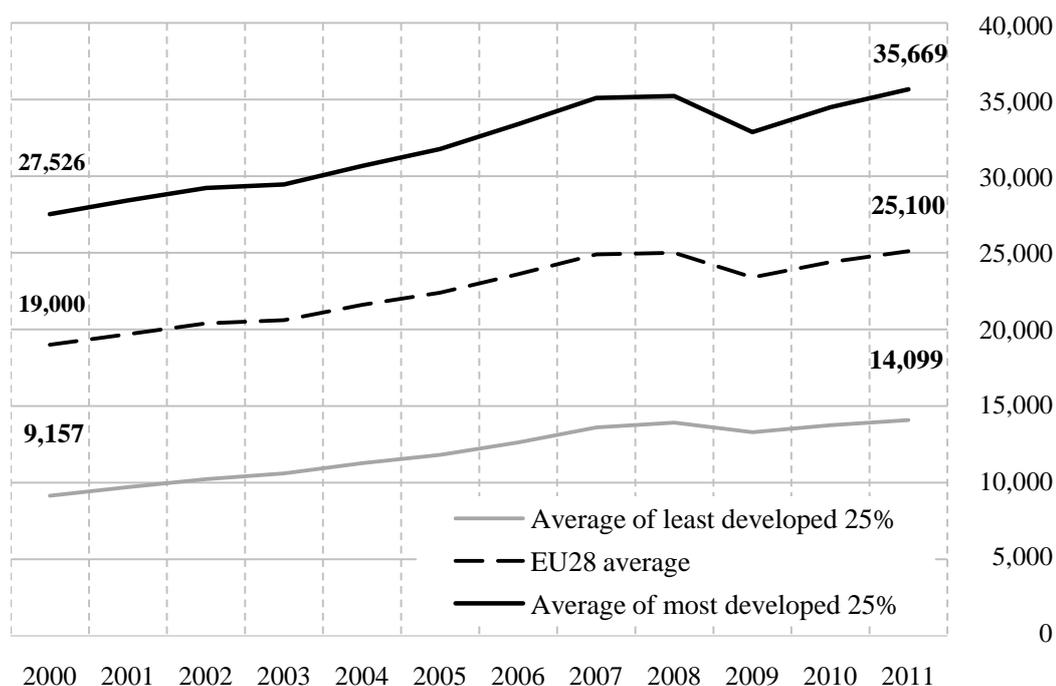


Figure 5. Regional GDP per inhabitant in PPS

Source: Eurostat, Gross domestic product (GDP) at current market prices by NUTS 2 regions [nama_r_e2gdp]

The evolution in the last two years is surprising: the developed regions recovered more quickly. Between 2009 and 2011, the top 25% most developed regions increased by 8.5%, while the 25% least developed regions increased by only 6%. In absolute terms, the economic performance of the former increased by 2,800 PPS/ inhabitant, while of the latter by 800 PPS/ inhabitant. In contradiction with the previous years and with the converge theory, the growth rates in the two analyzed groups reversed after 2009. In 2010 and 2011, the growth rates of the most developed regions were 4.9% and 3.4%, while the least performing regions experienced growth rates of 3.5% and 2.5%.

This evolution made the gap between European regions grow. In 2011, the sigma-convergence level in the 272 European regions returned to the 2008 score. Figures 7 and 8 illustrate that the regions that had the highest growth rates between 2001 and 2008 are almost the same as the ones that declined the most after 2008.

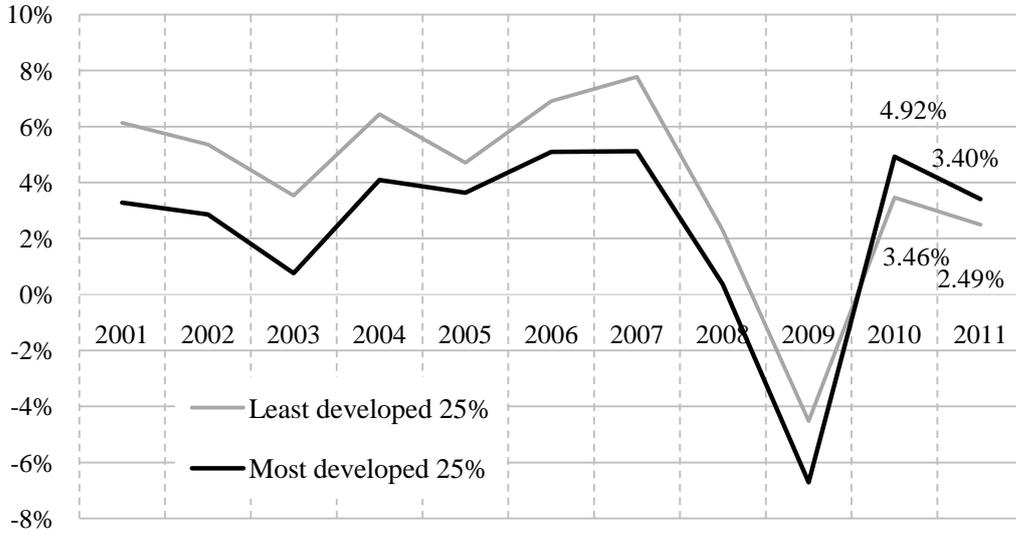


Figure 6. GDP per inhabitant growth rates

Source: Eurostat, Gross domestic product (GDP) at current market prices by NUTS 2 regions [nama_r_e2gdp]

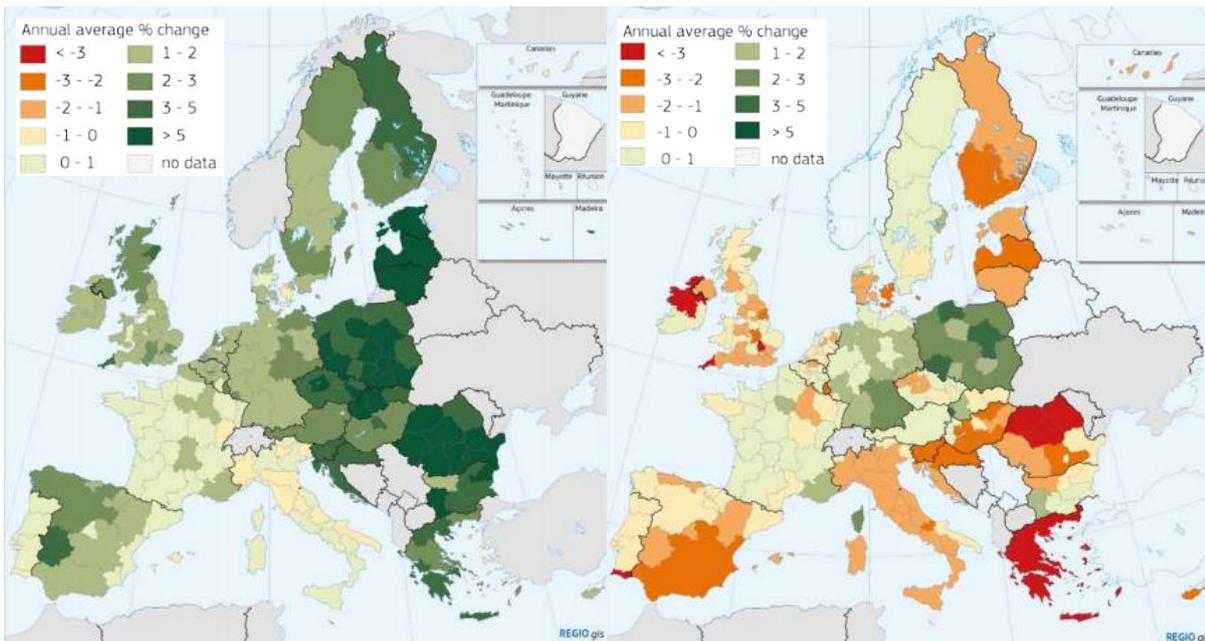


Figure 7. Growth of GDP per capita, 2001-2008 **Figure 8.** Growth of GDP per capita, 2008-2011

Source: European Commission, 2014

Overall, between 2001 and 2011, the average annual growth rate was 2.4% for the less developed regions and of 4% for the most developed ones. At these growth rates, convergence will be attained in 60 years.

The same method was used to compute the coefficient of variation at national level. The results are very similar to the one at regional level (Figure 4). Between 2000 and 2009, the national performance converged, except 2005, reaching the highest level of convergence in 2009. In 2010, dispersion increased fast, and remained constant in 2011 when it scored the same as in 2008.

DIVERGENCE IN REGIONAL EMPLOYMENT RATES

Another widely used indicator for socio-economic development is the employment rate, computed as the percentage of employed people in total population. For this analysis, we used employment rates as a percentage of population aged 20-64 years. The territorial pattern of employment rate greatly resembles the GDP per inhabitant pattern. The centre and the northern part of Europe has high employment levels, while the lowest rates are located in the periphery, more precise in the East, South and West of the European Union. In 2013, the average employment rate in EU-28 was 68%. In 10 regions, less than half of population (<50%) was employed, whereas 13 regions had an employment rate above 80%.

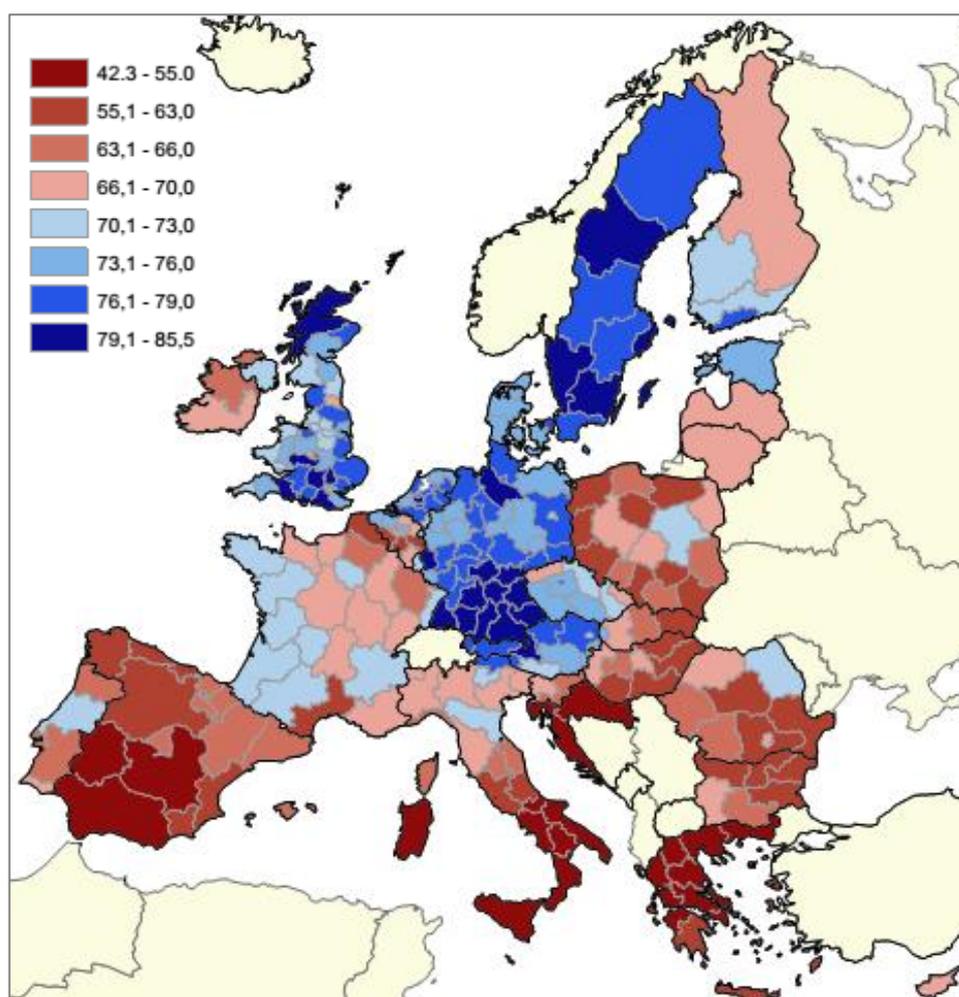


Figure 9. *Employment rate in 2013 (% of population aged 20-64)*

Source: Eurostat

The calculated coefficient of variation of regional employment rates shows how disparities decreased between 2001 and 2007. Starting 2008, gaps increased very fast, exceeding the 2001 value in 2012. It continued to grow and, in 2013, the standard deviation reached 9 percentage points, while the average EU-28 performance was of 63.3%.

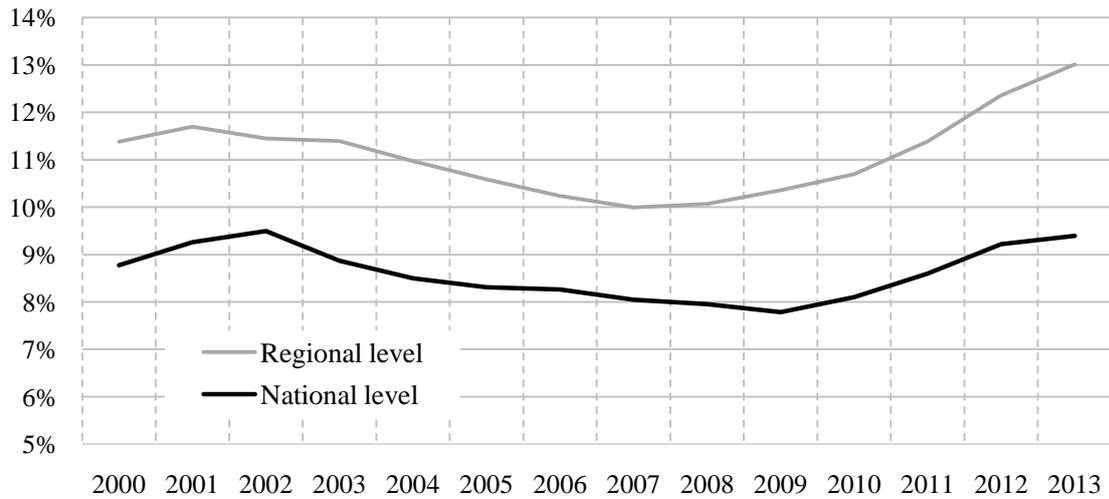


Figure 10. Coefficient of variation for employment rates

Source: Eurostat, Employment rates by sex, age and NUTS 2 regions (%) [lfst_r_lfe2emprr]

Similar to the case of GDP per inhabitant, the employment rate should increase more in regions where it is lower due to the influx of investors, and it should grow less or even decline in areas with high levels of employment (usually developed regions). The evolution of the best 25% of regions compared to those 25% least developed regions illustrates a convergence between 2001 and 2007 due to a faster growth of employment in poorly performing regions. This led to a reduction of disparities between regions. 2008 is the first year in which gaps increased because the speed in which the employment growth in the two groups reversed.

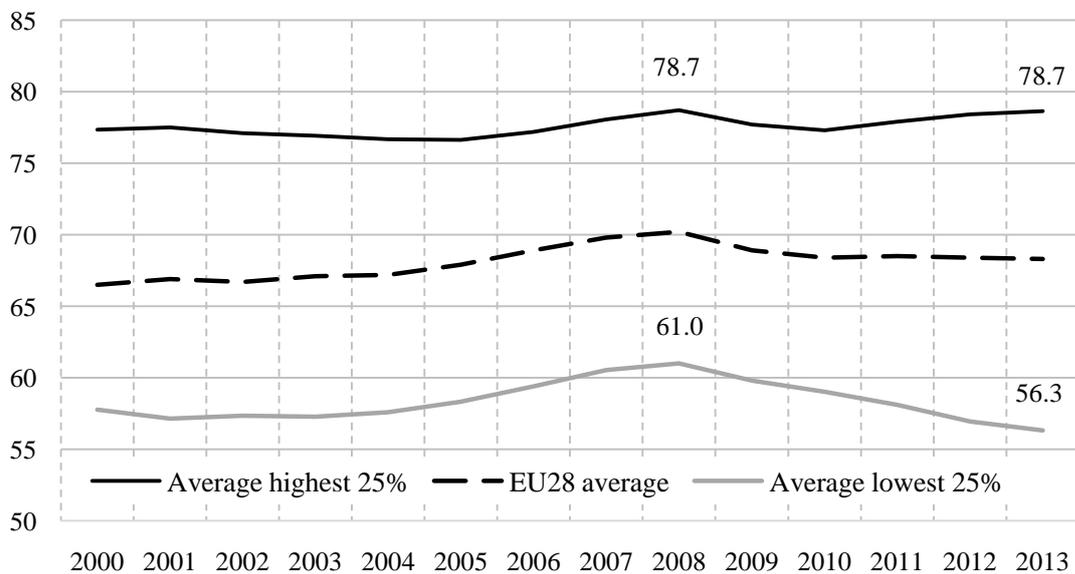


Figure 11. Regional employment rates (% of population aged 20-64)

Source: Eurostat, Employment rates by sex, age and NUTS 2 regions (%) [lfst_r_lfe2emprr]

Figure 12 illustrates an index of employment rate computed as simple growth index: value in t1 divided by the value in t0. It is similar to the GDP growth rate in Figure 6, with the difference that in this case it is a growth rate of the employment rate.

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Between 2000 and 2007, the employment rate in the least performing 25% of regions grew by 4.8%, while in the 25% best performers it grew only by 1%. Between 2008 and 2013, the figures switched; the best performing regions experienced a faster recovery and, in 2013, they managed to regain the maximum level of employment reached in 2008 that is 78.7%. In the worst performing regions, the employment rate continuously deteriorated experiencing the lowest levels in 2012 and in 2013: 56.9% and 56.3%, respectively. Just before the economic crisis hit Europe, in 2007, the gap between the worst and best 25% performing regions had been the smallest, 17.5 percentage points. This explains the highest level of convergence attained in that year. After 2008, the gap widened, amounting to 22.3% in 2013.

At national level, the coefficient of variation followed almost exactly the same line as the one at regional level with the exception that in 2013 the divergence grew at a slightly smaller scale than at the regional level.

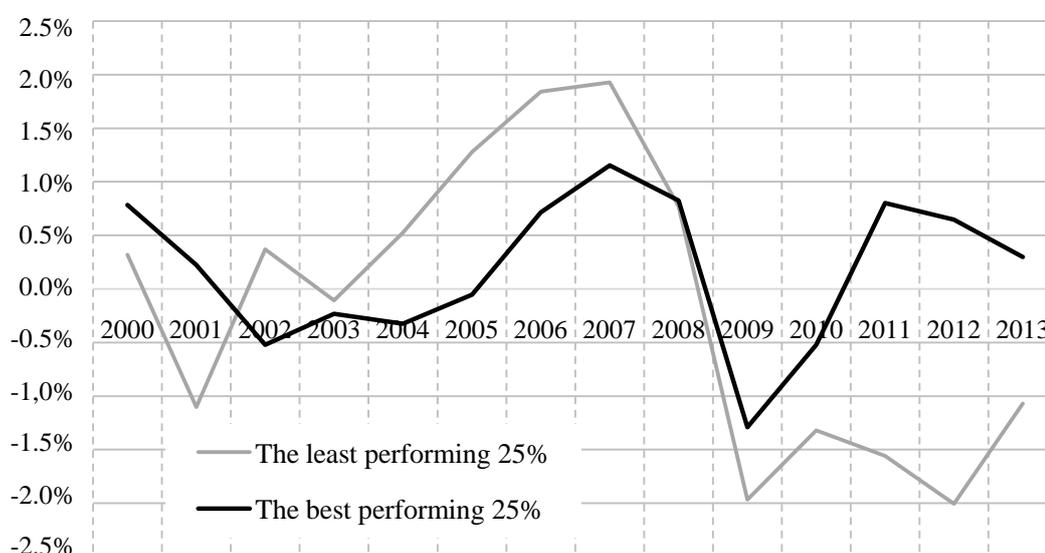


Figure 12. *Employment rate index (t/t-1)*

Source: Eurostat, Employment rates by sex, age and NUTS 2 regions (%) [lfst_r_lfe2emprr]

CONCLUSIONS

The level of development in the European regions is very heterogeneous but tends to follow a territorial pattern. Both in terms of GDP per capita and of employment rates, performing regions are around large cities (Hamburg, Brussels, Luxembourg, Paris, Milan) from the "Centre-North" part of the European Union, where there is a high concentration of economic activities. The regions lagging behind are located in the periphery of the European Union, mostly in the Eastern, Southern and Western part. The majority of the regions are in the former communist countries. In the same low performance group there are almost all Greek regions, the Southern Italy and the South-Western part of Spain.

This paper has analyzed the sigma-convergence that illustrates the degree of spread in regional or national data in a given moment. Dispersion is measured as coefficient of variation of regional GDP per inhabitant or employment rate. For both indicators results show a decrease of dispersion, hence the presence of convergence, until the onset of the financial crisis, when undeveloped regions had a higher growth rate than the developed ones. In terms of GDP per capita, the highest level of convergence was reached in 2009, when the top 25% performing regions were at the smallest distance from the bottom 25% performing regions. In the following two years, divergence increased as the growth rates switched sides: the most developed regions had a higher growth rate than the least performing ones. The same evolution pattern was followed in terms of employment rates with the difference that the

maximum level of convergence was reached in 2007, after which the divergence increased very fast due to positive performance of top regions and the negative performance of lagging regions. At national levels, the results are similar.

According to the latest available data, the European regions are currently on a diverging trend. This aspect is highly important as it could pose problems in terms of socio-economic stability in the European Union.

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