

Territorial patterns of development in the European Union

Mădălina AVRAM

Bucharest University of Economic Studies, Romania
avram.madalinaa@yahoo.ro

Constantin POSTOIU

Bucharest University of Economic Studies, Romania
postoiu.constantin@gmail.com

Abstract. *Although the European Union is considered the largest integration project, disparities at national and regional level existed since the advent of the European model and grew with the new waves of enlargement of the countries from Central and Eastern Europe in 2004 and 2007. This paper is aimed at studying the problematic disparities between NUTS 2 regions of the EU. These imbalances are highlighted through a cluster analysis which aims to identify clusters of regions with similar characteristics in terms of various socio-economic indicators. Results are illustrated using GIS software.*

Keywords: regional development, cluster analysis, convergence, regional inequalities, spatial growth patterns.

JEL Classification: R11, C49.

The dichotomy between rich and poor economies represents the source of economic research that analyzes the capacity of emerging countries to intensify the catching-up process. Given that economic reality has always highlighted the existence of developed and emerging countries on the world map, reducing disparities among member states represent an essential goal for the European Union. Therefore, it aims to reduce disparities among regions and social categories.

Although the development exercise makes its presence felt in the European model, both in developed countries, and especially in the emerging ones, a large segment of population is still characterized by poverty and unmet basic needs.

Stiglitz (2012) draws attention to the perpetuation of inequalities and its increased value. If the cake would be apportioned equally, everyone would get a slice of the same size, so the top 1% of people would receive a percentage of the cake. In reality, the upper 1 percent takes a slice much bigger, about a fifth of the whole cake, which means that the rest of the population has to be “satisfied” with an insignificant slice.

In his last book “Capital in the Twenty-First Century”, Thomas Piketty has made a detailed analysis of inequalities since the eighteenth century. The French author highlighted that the main mechanism for convergence between countries / regions is dissemination of knowledge, both internationally and internally. In other words, the poorest countries will catch up the rich ones if they will achieve the same level of technological knowledge, qualifications and education. This pleading for education is reinforced by Jean-Claude Berthelemy (2006), who mentioned the importance of a quality education system, described as a key factor for growth in the case of developing countries.

However, in 2011, only 29 of the 272 European regions have reached or exceeded the level of 3% of GDP for research and development, threshold set by Europe 2020 Strategy. Statistics show that regions which invest 3% or more of their GDP in R&D are the most developed regions in the EU, in particular regions from Germany, United Kingdom, Sweden, Finland, Austria and Belgium⁽¹⁾. Some of these regions are positively impacted by capital cities such as Brussels, Vienna, Helsinki, Stockholm and London. At the opposite pole are regions of Central and Eastern Europe, especially in Romania and Bulgaria which invest below 1% (exception: Bucharest – Ilfov region -1.05%) in research and development.

According to Piketty, another conclusion is looming already as clearly as possible: the economists would be naive to believe that in the structure of modern economic growth or in the market economy laws there are strong convergence influences that naturally lead to a reduction of inequalities or to a harmonious stabilization. Thus, complex analysis on the distribution of wealth and the gaps between countries/regions return in the spotlight of researchers (Morris, 2012, Stiglitz, 2012, Landes, 2013, Piketty, 2014).

The European economic model aims to solve difficulties in the development process by eliminating the compromise between equity and efficiency. The European model proposes a win-win game between economic and social side, in order to ensure the stability of the construction (Dinu et al., 2005).

To give the European model the chance to generate smart, sustainable and inclusive growth, the European Union should disseminate prosperity from its hard core - Western Europe - to emerging areas which will exceed the peripheral condition. This requires maintaining an extensive process of convergence, including allocation of non-refundable European funds that generate economic, social and territorial cohesion.

Borsi and Metiu (2013) have demonstrated that there is no overall real income per capita convergence in the European Union, however they have identified groups of countries that converge to different steady states. The authors accentuate the importance of regional linkages in determining these clusters.

The issue of discrepancies between the member regions existed since the advent of the European model and grew with the new waves of enlargement of the countries from Central and Eastern Europe in 2004 and 2007 (Marinas, 2008). These two waves have added new countries considered peripheral. With the increasing number of Member States the convergence and the cohesion process based on common policies have become decisive. Therefore, the main purpose for the new countries is to adapt to the model performing core standards.

Cohesion, sustained by convergence is a process of European construction to approach the nations and regions in terms of welfare and living conditions. These processes sustain the European project stake: development felt at the individual level, society, region.

The current economic situation of the European Union can be described by multiple equilibria theory sketched by Young's contributions (1928) and Rosenstein-Rodan (1943). Subsequently, Abramovitz (1986) and Baumol (1986) associated the idea of multiple equilibria with the notion of "convergence club". Baumol split the states according to the political regime and he identified three clusters: developed market economies – OECD members, planned economies and middle income countries, a group imprecisely defined.

The analysis of convergence clubs is very important for the European Union taking into consideration the attention given to the objective of reducing regional disparities at NUTS2 level. For this purpose, EU allocates for the period 2014-2020 a percentage of 32.5%⁽²⁾ of total cohesion policy budget. Jean Claude Barthelemy (2006) draw special attention to the importance of policies adopted. Regarding the efficiency of these policies, Azomahou et al. (2011) highlight that in the period 1950-1990, the European Union has been characterized by an economic convergence process. In general, regions with low initial level of income per capita experienced a higher growth rate than developed regions. However, in the past two decades researchers talk about divergence for poor regions and convergence for middle-income regions.

Bartkowska and Riedl (2009) tested the convergence of per capita income at regional level in 17 countries of Western Europe between 1992 and 2002. The authors identified six separate groups and showed that initial conditions play a crucial role in determining clusters (initial level of human capital, initial level of income per capita, etc.), while the structural characteristics of the economy have only a minor role. However, the regions belonging to the same state tend to be part of the same cluster - country effect (see Quah,

1996). In addition, it is emphasized that the capital regions generally belong to a club more developed compared with neighboring regions.

According to Quah (1995), the welfare of a region depends on the level of development of neighboring regions and the performance of the entire state. Based on this assumption, the regions of Europe are not isolated islands. Thus, independent regions cannot be studied in isolation. The author highlights the importance of geographic position and spillovers in understanding income distribution. Quah gives great importance to geographical factors, but does not deny any impact of national factors.

Baldwin and Wyplosz (2006) point out that technological progress - regarded as the accumulation of knowledge (knowledge capital) - is essential to generate and sustain economic growth in the long term because it may move production function in maintaining the capital stock.

Drawing inspiration from the literature and studies carried out by the European Regional Development Fund, we can talk about the existence of regional patterns of development in the European Union. There is a clear distinction between the regions of Western and Eastern Europe in terms of economic performance. As exceptions to this rule are the poorest regions of Spain, southern Italy and Portugal. In Eastern Europe, positive exceptions are capital regions (Bratislava, Central Hungary and Bucharest-Ilfov). However, this territorial pattern is less pronounced compared to a decade ago, when 12 states joined the European Union⁽³⁾. This can be explained by two scenarios:

- Beta Convergence: poor regions tend to grow faster than rich ones
- The economic and financial crisis had an increased impact on the economic performance of many developed European regions.

Even if the effects of the two scenarios made their presence felt in reducing regional disparities, in 2013, all nineteen European regions with a GDP per capita level lower than 50% of UE28 average were located in Eastern Europe. Therefore, about a quarter (19) of the 80 low-income regions⁽⁴⁾ fails to reach even half of the average GDP per inhabitant in the European Union. These regions were spread across five Eastern Europe countries: five regions in Bulgaria, Poland and Romania and 4 regions in Hungary. The most difficult situation is in Bulgaria, which reported a per capita GDP equivalent to one third of the European average for the regions Severozapaden, Severen tsentralen and Yuzhen tsentralen. Also in Greece, Slovenia and Croatia all regions have a GDP below the European average.

According to Eurostat statistics, in 2013 GDP per capita in Inner London (325% of the UE28 average) was at least 11 times higher than the level recorded in the region Severozapaden (Bulgaria)⁽⁵⁾ and 10 times compared to the Nord-Est region of Romania⁽⁶⁾. Although the ratio between the richest European region (Inner London) and the poorest (Severozapaden) seems exaggerated, it has declined in recent years (in 2008 the London region was 13 times richer). It should be specified, however, that flows of cross-border workers in regions such as Inner London, Vienna or Ile de France boosts economic activity well above potential level of the resident population.

Another territorial pattern splits Europe into two parts. The northern European regions are characterized by higher economic performance compared with southern ones. Positive exceptions in this case are the regions of the Alps in southern Germany and from Western Europe.

It is also important to note that the capital regions recorded higher economic performance compared to other regions within the same state. In 2013, the Bucharest - Ilfov region had a GDP per capita of 34,900 euros compared to 9,000 euros in the North East (yielding a ratio of 3.9). Large gaps exist also in Slovakia (a ratio of 3.6 between capital region and the eastern regions of the country – Východné Slovensko), France (a ratio of 3.3 between Ile de France and Guyane region) and the UK where GDP per capita in Inner London was almost five times higher than in the West Wales and The Valleys region.

Reviewing patterns of territorial development in the European economic model, we intend to highlight imbalances in European construction through a cluster analysis in SPSS which aims to identify clubs regions with similar characteristics based on five socio-economic indicators.

The methodology and data used

The research aims to identify regions with similar characteristics, grouping them into clusters based on several economic and social indicators. Withal, we are trying to identify the evolution of regions by analyzing the changes in the structure of clusters between 2007 and 2012. Cluster analysis is a tool that allows grouping of cases or variables based on several criteria. This analysis seeks to identify a number of homogeneous groups in order to minimize the variation within a group and maximize the variation between groups.

There are two types of cluster analysis: hierarchical and non-hierarchical. The first type involves setting up clusters by successive mergers of closest regions and/or clusters (agglomerative clustering), or by dividing all regions (divisive algorithm – opposite of agglomerative). The second type (k means clustering) starts from an ex-ante choice concerning the number of clusters. The algorithm estimates the cluster means and assigns each region to the group for which its distance to the cluster mean is the smallest (iterative action).

SPSS enables the use of a different type of cluster analysis, a combination between hierarchical methods and non-hierarchical. This method was preferred for various associated tools: the assessment of the quality of formed clusters, the importance of each indicator for the clustering operation, comparative illustration of the clusters characteristics.

We opted to group the European regions into four or five clusters. Three or less clusters could not reflect the high heterogeneity of the indicators included in the analysis. In the opposite case, a bigger number of clusters would represent a too high reduction of the variance between groups. If the number of clusters increases, the variation within groups decreases, but decreases also the variation among groups. Between these two

possibilities, we consider that the option with five clusters is more opportune because, even if the groups are quite similar in the two divisions, the option with four clusters has a higher variability within clusters.

By using this technique of multivariate analysis, we intend to group the 272 European regions such that the similarities between the regions that are part of the same cluster have to be as large as possible, but between the members of two distinct clusters, the similarities have to be insignificant.

In performing the analysis five economic indicators at regional level were used. Data source is Eurostat:

1. GDP per capita (in PPS per inhabitant),
2. GDP growth rate (this indicator illustrates the economic growth),
3. Population aged 25-64 with tertiary educational attainment (Bachelor degree or equivalent),
4. Employment rates (men and women) of the population aged 15-64 years,
5. Total research and development expenditure (% of GDP or percentage of people employed in R&D in the total active population).

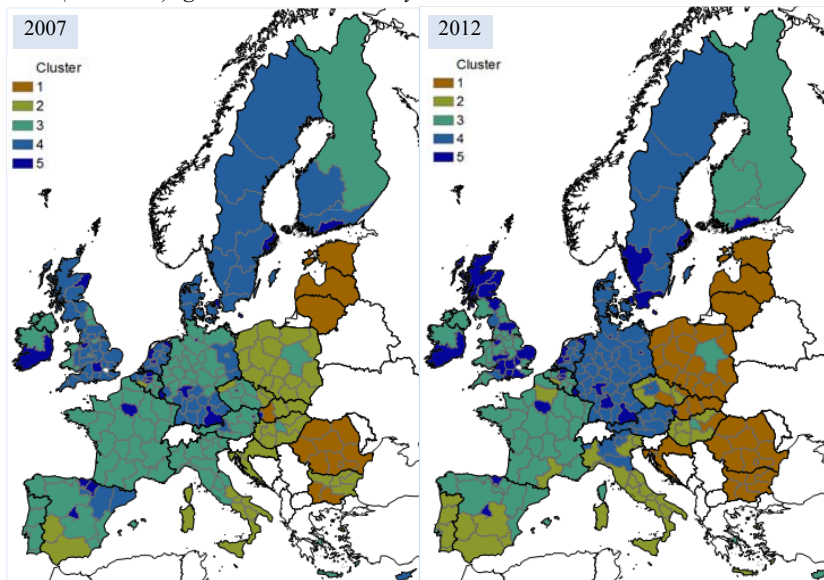
GDP is the most widely used indicator for measuring macroeconomic activity. This indicator gives an overview regarding the competitiveness and productivity of a region and becomes an indirect indicator of social development and progress in general. The population with tertiary education reflects the level of professional attainment of human capital and R&D sector size is an indicator of innovation. Knowledge and innovation are considered to be the engine of progress by several authors.

We opted for clustering based on data from 2007 and 2012. The main criterion was the availability of data: the year 2007 was chosen because it is the first year with complete data, and 2012 is the last year with complete data concerning GDP per capita at regional level.

Results

Figure 1 illustrates the NUTS 2 regions of the European Union divided in 5 clusters according to values from 2007 and 2012 of GDP per capita level and growth rate, employment rate, the percentage of people with tertiary education.

Figure 1. Clusters of NUTS2 regions in the European Union grouped according to the employment rate, GDP (PPS / loc.), growth rate and tertiary education



Cluster analysis in 2007

Cluster 1 contains only 14 regions, including all Romania, the Baltic countries and some of Bulgaria and Slovakia. Here are the regions with the lowest level of GDP per capita and tertiary education. The major difference in contrast with the other clusters is the very high GDP growth rate.

The second cluster includes regions with higher values of GDP per capita and tertiary education. The growth rate is higher than the following three clusters but significantly less than the cluster 1. Another important characteristic for these regions is the lowest employment rate of all EU regions. As illustrated above, clusters 1 and 2 gather regions of eastern and southern Europe. These regions have the lowest values of per capita GDP, tertiary education and employment rate.

Cluster 3 is composed of regions characterized by average performances in terms of employment rate, GDP per capita and tertiary education. These regions are situated in particular in Latin speaking countries (France, Italy, Spain and Portugal) plus Austria, Czech Republic and Germany. The economic growth rate has the lowest value because this cluster contains regions that have had the worst economic evolution between 2000 and 2007 (located especially in Italy and France).

Cluster 4 includes regions with the highest employment rate and with a level of GDP / capita and rate of tertiary education above European average. Most of these regions are located in the United Kingdom, Netherlands, Sweden, Denmark, Belgium and in the south of Germany.

The most developed regions are grouped in cluster 5. They have a significantly higher GDP per capita than the other clusters and the highest percentage of tertiary education. These include the European capitals: London, Paris, Brussels, Stockholm, Helsinki, Madrid, Amsterdam, Prague, Vienna and Bratislava.

Cluster analysis in 2012

Cluster analysis based on data from 2012 shows that the cluster 1 summarized all the poorest regions in Europe but with the highest rates of economic growth. The number of members of the group has expanded from 14 to 40 regions, now including all Bulgaria, Croatia and a big part of Poland and Slovakia. Both in 2007 and 2012 capital regions of Poland, Hungary, Slovakia and the Czech Republic are part of a cluster more developed (4 or 5). Despite the fact that the development gap between the capital region Bucharest-Ilfov and others Romanian regions is significantly higher than in other countries, the capital region belongs to the same cluster with all the Romanian regions.

This enlargement of cluster 1 reduced the growth rate and increased median proportion of people with tertiary education (Chart 1). The explanation is that new entrant regions have a lower growth rate and more people with higher education.

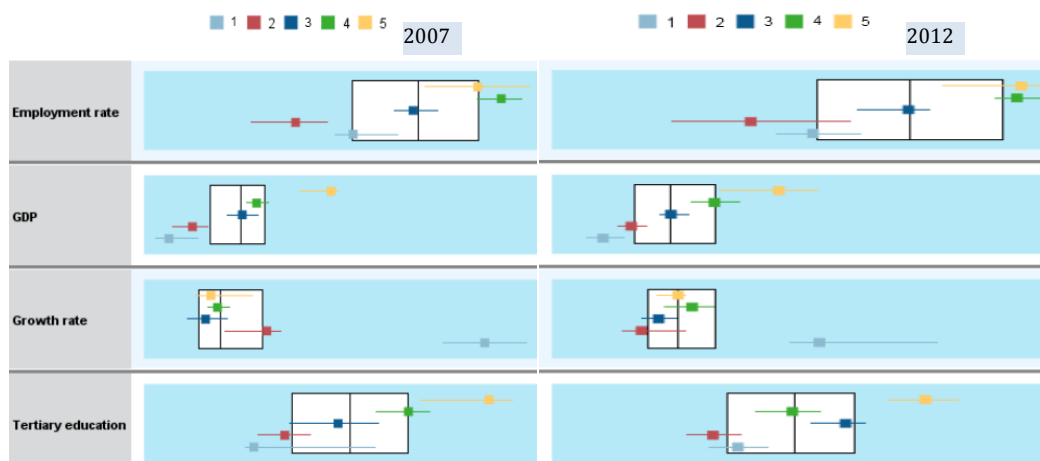
The second cluster has the same number of regions as in 2007 because the number of regions leaving cluster 1 was covered by the regions that have migrated from cluster 3 in 2. Most of them are from Italy, Greece and Portugal, but also some regions from Spain, Czech Republic and even France. Note that in 2007 the cluster 2 has the second highest growth rate, while in 2012 has the worst performance in this regard. This fact is due to the inclusion of Greek and Italian regions, which had the lowest economic growth rates of the whole European Union.

Cluster 3 is significantly reduced in size, from 104 in 2007 to 66 in 2012 as a result of the moving of aforementioned regions or the fact that the regions of Germany and Austria moved into cluster 4. These changes have increased the percentage of people with tertiary studies in cluster number 3, inasmuch as regions in Italy, Portugal and Spain who have left the group have the lowest scores on this indicator.

Important changes occur also inside the fourth cluster who gains four regions in Germany and Austria, but loses parts of Spain and United Kingdom. In fact, the British areas represent an interesting case. In 2007 the majority of them were part of cluster 4. Meanwhile some of them have reduced the economic performance, migrating in cluster 3, while others have migrated to cluster 5. These developments highlight a significant increase of disparities among the UK regions. Overall, cluster 5 gathers many members mostly from the United Kingdom, Germany, Sweden, Finland and the Netherlands.

Figure 2 shows a comparative analysis of characteristics of each cluster for 2007 and 2012. The situation in the two years is quite similar except for the changes described above.

Figure 2. The median values and quartiles of indicators for each of five clusters (squares and lines of different colors) and for all 272 regions (white rectangles)



Note: Different colors are used for each cluster: the small colored square illustrates the median value, while the horizontal line of the same color connects the 25% and 75% quartiles. The big, white rectangles show the median value (middle vertical line), the 25% and 75% quartiles (left and right side of the rectangle) for all the 272 regions.

For example, regarding the tertiary education, the median for the cluster 4 (green small square) in 2007 is equal to the 75% quartile of the whole population (all EU28 NUTS 2 regions) (right side of the white rectangle). In 2012 the two medians coincide.

Chart 1 gives an overview on the relative position concerning the performance of each group in 2007 and 2012. Table 1 points out the performance in absolute terms. It is preferable to use the median instead of the arithmetic mean because the last one has a major disadvantage: it is notably influenced by outliers (an observation point that is distant from other observations; a value that is notably smaller or larger than the rest of the values). Outliers are found in the data for GDP, population with tertiary educational attainment and growth rate. Thus, because the median is less affected by outliers, it is preferable to use it in our analysis.

Table 1. Clusters performance in 2007 and 2012 (median values)

	Cluster 1		Cluster 2		Cluster 3		Cluster 4		Cluster 5	
	2007	2012	2007	2012	2007	2012	2007	2012	2007	2012
Regions	14	40	58	59	104	66	70	65	26	42
Employment	61,8%	58,9%	55,2%	54,4%	65,7%	64,2%	73,1%	72,7%	70,5%	71,2%
GDP	12471	14655	14926	19025	24338	24045	26986	29592	41464	38812
Growth rate	105%	107%	40%	26%	28%	31%	30%	40%	33%	37%
Tertiary	17,5%	21%	14,7%	17,3%	20,9%	31,3%	28,5%	25,5%	36%	40,2%

The enlargement of cluster 1 and 5 highlights an increase regional cohesion in the European Union. The analysis of 2007 draws attention to the extreme values and socio-economic disparities inside the EU. A cluster included the 14 most underdeveloped regions situated far away from the European average, and another cluster comprised the 26 highly developed regions.

In 2012 clusters have a more balanced structure in terms of number of regions. Cluster 1 has increased at 40 regions and cluster 5 at 42. This is a positive thing given that these two clusters approached to the European average in terms of GDP / capita. The median rates of growth in cluster 1 were, in both 2007 and 2012, three times higher than the median of all European regions. Thus, we can notice a catching-up process in terms of GDP per capita (from 52% in 2007 to 62% in 2012) but also a slowdown of economic growth inside cluster number 5 (from 113% in 2007 to 103% in 2012).

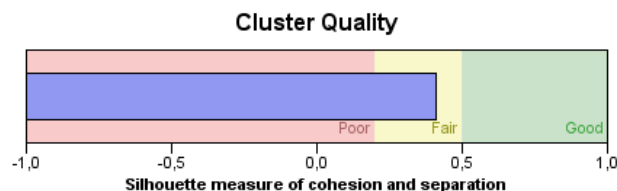
Disparities among regions have increased in terms of employment rate because the values recorded for this indicator have decreased in underdeveloped regions and increased within the cluster 5. This evolution is highlighted in Table 2 which illustrates the position of clusters compared to the EU median.

Table 2. Relative performance of clusters in 2007 and 2012

	Cluster 1		Cluster 2		Cluster 3		Cluster 4		Cluster 5	
	2007	2012	2007	2012	2007	2012	2007	2012	2007	2012
Regions	14	40	58	59	104	66	70	65	26	42
Employment	93%	90%	83%	83%	99%	98%	110%	111%	106%	109%
GDP	52%	62%	62%	81%	102%	102%	113%	125%	173%	164%
Growth rate	355%	297%	135%	73%	95%	86%	101%	112%	113%	103%
Tertiary	77%	80%	65%	66%	93%	119%	126%	96%	159%	152%

Note: The table shows the median of each cluster divided by the median of all EU regions

SPSS has a specific tool that allows assessing the quality of a cluster analysis solution. A common measure is the **silhouette coefficient**, a measure of both cohesion and separation. In a fair cluster solution there is less variability within the group, but high variability among groups. The result shows that the rule is respected at a reasonable level for both clusters analysis (2007 and 2012).



In case of introducing the R&D personnel indicator in our analysis, the results are quite similar, for both 2007 and 2012. Due to the fact that the data for R&D sector is missing for more regions, we gave less attention to this indicator.

Concluding remarks

The research aims to identify regions with similar characteristics, grouping them into clusters based on several economic and social indicators: GDP per capita, GDP growth rate, population aged 25-64 with tertiary educational attainment, employment rates (men and women) of the population aged 15-64 years and total R&D expenditure.

Our main findings can be summarized as follow. Firstly, the results show that the regions with low economic performance for all indicators used in analysis (except for GDP growth rate) were all located in Eastern Europe, in former communist countries.

Secondly, the third cluster consists of regions from France, Spain, United Kingdom and Finland. The last two clusters contain the most developed regions in the European Union, covering all Germany, Austria, Netherlands and Sweden, a part of UK and several capital regions. Research results outline an array of socio-economic development in which the most powerful regions are located in Central and Northern Europe and, at the opposite side, the underdeveloped at periphery, particularly in the Eastern and Southern Europe.

Last but not least, the changes in the structure of clusters draw attention to an increased cohesion between European regions. Except for employment rate, the economic characteristics of both performing regions and less performing region converge to European average. A phenomenon of relatively rapid growth among less developed regions while the developed ones slowdown their grow rate is normally. Regarding the evolution of employment rate, it is notable an increase of disparities among regions (the best performance was recorded in Germany). The Greek regions were strongly affected by the financial and economic crisis and these regions recorded the worst performances of the whole European Union. This situation is also applicable for some Spanish regions.

Notes

- (1) Eleven regions of Germany exceeded the threshold of 3% of GDP (Braunschweig, Stuttgart, Tübingen, Upper Bavaria, Karlsruhe, Dresden, Franconia, Darmstadt, Berlin, Rheinhessen-Pfalz, Cologne), followed by Sweden and the United Kingdom with four regions:
 - UK (Cheshire, East Anglia, Kent and Berkshire region, Buckinghamshire and Oxfordshire).
 - Sweden (Stockholm, Sydsverige, Östra Mellansverige and Västsverige).Finland has three regions that exceed this percentage (Helsinki-Uusimaa, Itä-Suomi ja Pohjois-, launched Suomi), followed by Belgium and Austria with two regions.
- (2) For the 2014-2020 period 351.8 billion euros of the total EU budget are allocated for the cohesion policy. This provides the framework and the necessary investment for the fulfillment of five specific objectives contained in the Europe 2020 Strategy.
- (3) The wave of accession from 2004 included: Cyprus, Estonia, Latvia, Lithuania, Malta, Poland, Czech Republic, Slovakia, Slovenia and Hungary. In 2007, Romania and Bulgaria joined the European construction (action considered an extension of the wave from 2004).
- (4) To define the development degree of regions we took into consideration the methodology provided by the European Commission. Therefore:
 - Regions with low incomes (GDP <75% of the European average)
 - transition regions (GDP ranging between 75% -90% of the European average)
 - developed regions (GDP > 90% of the European average).
- (5) Severozapaden Region (Bulgaria) is the region with the lowest GDP per capita of the whole European Union (only 30% of the average UE28).
- (6) GDP per capita in North East region was 9,000 euro compared to 86.400 euro in Inner London region

References

- Abramovitz, M. (1986). Catching up, forging ahead, and falling behind. *The Journal of Economic History*. Vol. 47. No. 2. pp. 385-406.
- Artelaris, P., Kallioras, D. and Petrakos, G. (2010). Regional inequalities and convergence in the European Union new-members states. *Eastern Journal of European Studies*. Vol. 1. Issue 1.
- Azomahou, T., El Ouardighi, J., Nguyen-Van, J. and Pham, T., (2011). Testing convergence of European regions: A semiparametric approach. *Elsevier – Economic Modelling* (28). pp. 1202-1210.
- Baldwin, R. and Wyplosz, C. (2006). *The economics of European integration*. McGraw Hill Education, second edition.
- Barro, R. and Sala-i-Martin, X. (1991). Convergence across States and Regions. *Brooking Paper on Economic Activity*. pp. 107-182.
- Barthelemy, J.-C. (2006). Clubs de convergence et equilibres multiples: comment les economies emergentes ont-elles reussi a echapper au piege du sous-developpement. *Revue d'economie du developpement*, 14(1), pp. 5-44.
- Bartkowska, M. and Riedl, A. (2009). Regional convergence clubs in Europe. Identification and conditioning factors. *Elsevier – Economic Modelling*. 29. pp. 22-31.
- Baumol, W. (1986). Productivity growth, convergence and welfare: what the long – run data show. *The American Economic Review*, Vol. 76, No. 5, pp. 1072-1085.
- Borsi, M. and Metiu, N. (2013). The evolution of economic convergence in the European Union. *Discussion Paper – Deutsche Bundesbank*. No. 28/2013.
- Canova, F. (2001). Testing for Convergence Clubs in Income per-capita: A predictive Density Approach. *Hambourg Institute of International Economics*.
- Dinu, M., Socol, C. and Marinaş, M. (2005). *Mecanisme de convergență și coeziune*. Ed. Economică.
- Fischer, M. and LeSage, J. (2014). A Bayesian space-time approach to identifying and interpreting regional convergence clubs in Europe.
- Fuss, C. (1999). Mesures et tests de la convergence: une revue de la literature. *Revue de l'OFCE*, No. 69. pp. 221-249.
- Kolasa, M. (2014). Real convergece and its ilusion. *Elsevier – Economic Modelling*. 37. pp. 79-88.
- Landes, D. (2013). *Avuția și sărăcia națiunilor. De ce unele țări sunt atât de bogate și altele atât de sărace*. Ed. Polirom.
- Marinaş, M. (2008). *Convergența economică*. Ed. Economică.
- Monfort, M. (2008). Convergence of EU regions. Measures and evolution. *Working papers – Directorate General for Regional Policy*. No. 01.
- Monfort, M., Custeas, J. and Ordonez, J. (2013). Real convergence in Europe: A cluster analysis. *Elsevier – Economic Modelling*. 33. pp. 689-694.
- Morris, I. (2012). *De ce vestul deține încă supremația și ce ne spune istoria despre viitor*. Ed. Polirom.
- Piketty, T. (2014). *Capital in the Twenty-First Century*. Harvard University Press.
- Quah, D. (1995). Empirics for Economic Growth and Convergence. *Centre for economic performance discussion paper*. No. 253.
- Quah, D. (1996). Twin peaks: Growth and Convergence in Models of Distribution Dynamics. *The Economic Journal*, Vol. 106, No. 437, pp. 1045-1055.
- Rosenstein, R. (1943). Problems of industrialisation of Eastern and South-Eastern Europe. *The Economic Journal*, Vol. 53, Issue 210/211, pp. 202-211.
- Simuț, R. (2015). Real Convergence in EU countries. A cluster analysis. *Management Intercultural*. Vol. XVII. No. 1 (33).
- Stiglitz, J. (2012). *Prețul inegalității*. Ed. Publica.
- Young, A. (1928). Increasing returns and the big push. *Economic Journal*. 38. pp. 527-542.