

EVALUATION OF REGIONAL β CONVERGENCE IN EU COUNTRIES AT NUTS3 LEVEL

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Abstract. *The paper deals with regional economic differences: theoretical aspects of their causes, evaluation methods, and presents in empirical analysis of the EU countries. The β convergence methods were applied for empirical research. The results suggest that in most of the EU countries, regions were diverging during 1995–2008. The recent territorial differences in the EU are determined not by the factors of countries or their groups, but by economic differences inside the countries.*

Keywords: *regional convergence, divergence, territorial differences of economy*

Introduction

Many countries face the problem how to ensure the same possibilities for all citizens no matter where exactly they live. This problem cannot be solved without assessing regional social and economic differences. It is also very important to understand the causes and character of this process, because even very small differences in economic growth, accumulated for a long time, may cause great differences in the living standards of citizens in different geographical areas of the country. These differences have a negative impact on economic growth and increases economic, social, and political tensions among regions, leading to an ineffective distribution of resources and their employment.

This explains why the European economic integration, which started in the sixties, has always been accompanied by the idea of social cohesion. The Treaty of Rome already underlines the need of a sustainable economic growth to diminish the existing differences among regions. As various cohesion programs were introduced and developed, the estimation of economic differences among regions and their causes became very relevant, and the economic convergence of regions was the main principle of regional policy. The analysis of regional convergence in the EU is relevant also for political and financial reasons. The EU regional policy could be considered as successful if the differences among regions decrease. However, the results of empirical research on convergence or divergence are mixed.

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Aiming to evaluate the process of the economic convergence of regions, the first problem we meet is the definition of region. The meaning of this concept depends on the context where it is applied. The criteria applied for defining a region in the literature list inbetween two extremes: normative and functional. Research on the regions in the EU countries usually addresses administrative regions which are defined by the nomenclature of territorial units for statistics. The survey of research on regional convergence in the EU countries suggests that, despite several exceptions (Geppert, Stephan, 2008; Carrington, 2003; Pass, Schlitte, 2007; Heidenreich, Wunder, 2008), NUTS2 (or NUTS1) regions are analyzed. Denmark, Estonia, Latvia, Lithuania, Malta, Slovenia are the countries that are not divided into larger than NUTS3 regions. This means that the analysis of NUTS2 regions does not address the economic differences inside the mentioned countries.

Research object – economic convergence of NUTS3 regions in the EU countries.

The main aim of the research – to reason the causes of territorial differences in economy and their evaluation methods based on theoretical concepts and empirical research, to evaluate and to compare regional differences in the EU countries and their groups.

The **tasks of the research** were to:

- analyze the theories and factors of the economic convergence (divergence) among regions;
- structure the theoretical and empirical research on regional convergence, aiming to highlight the main methods for convergence evaluation;
- evaluate the differences among NUTS3 regions and their convergence in the EU countries and their groups.

Research methods. Literature analysis, structuration and generalization of empirical research were used to examine territorial differences in the EU national economies. The empirical research integrates the quantitative methods of descriptive statistics. Research data were processed by using SPSS software.

Theoretical aspects of regional differences

The territorial aspect of economic growth analysis is based on two opposite approaches regarding regional convergence in a long run. The first is derived from neoclassical equilibrium models and states that in the market economy there exist mechanisms for promotion of regional convergence, and they arise in integrated national or international economic areas. Regional differences are just a short-term phenomenon. These differences stimulate self-regulating changes in prices, labour and capital, which bring back the convergence tendencies. The two main theoretical concepts of regional convergence are presented in Table 1.

The latter theories were often criticized. Part of the criticism was based on empirical research. The rest was concentrated on non-realistic assumptions of neoclassical growth models. These critics encouraged the development of alternative theories – theories of

TABLE 1. Theories of convergence of economic regions

Name of the theory <i>(date of formation)</i>	Main representatives	Causes of convergence
Export based theory <i>(20th century 60s)</i>	D.C. North Ch.M. Tiebaut	Export diversification and increasing mobility of factors distributes the production in all regions and promotes their convergence.
Neoclassical (exogenous) theory <i>(20th century 70s)</i>	G.H. Borts, J.L. Stein	Decreasing productivity and mobility of factors redirects capital investments towards developing regions and encourages their growth

Source: compiled by authors.

regional divergence. They suggest that there are no factors, even in a long run, that could decrease territorial differences inside a national economy. Even more, the divergence of regions is more likely because unregulated market forces lead to a theoretical non-equilibrium. Economies of scale and agglomeration foster the cumulative concentration of capital, labour, and value added in some regions at the expense of others. That is why unsustainable regional growth is rather a self-encouraging than a self-correcting process. Table 2 presents the main theories of regional divergence.

TABLE 2. Theories of regional divergence

Name of the theory <i>(date of formation)</i>	Main representatives	Causes of divergence
Cumulative causation theory <i>(20th century, 60s–70s)</i>	G. Myrdal N. Kaldor	Economies of scale and agglomeration lead to the concentration of capital, labour, and production in some regions at the expense of others
Growth pole theory <i>(20th century 60s–70s)</i>	F. Perroux A.O. Hirschman J. Friedmann	Close relations among companies and sectors create better conditions for some regions at the expense of others by using economies of scale, competitive and trade barriers

Source: made by authors.

Most of the research on the regional convergence till the mid of the 90s were based on the concept of neoclassical (exogenous) theory. Based on it, the analysis of production factors has showed that they can explain only part of economy growth (Boltho, Holtham, 1992). The theory predicted the convergence of regions, but there was a shortage of empirical facts that could confirm this (Abramovitz, 1986). Empirical research (Molle et al., 1980; Smith, 1984) encouraged to revise economic growth theory in order to avoid its typical limitations and directly include into the model the former exogenous variables such as technology development (entire process “invention→innovation→dispersion”) and human capital. These variables started to be considered as endogenous.

R. Benabou (1993, 1994), G. Bertola (1993), P. Cheshire and G. Carbonaro (1995), and X. Sala-i-Martin (1994) were the first who aimed to adapt the endogenous growth theory for the explanation of regional convergence factors. Two different models were formed the regarding factors important for growth. These models, their economic growth factors and prediction of convergence are presented in Table 3.

TABLE 3. Typology of endogenous economic growth models

Name of the model <i>(date of formation)</i>	Main representatives	Growth factors	Convergence prediction
Endogenous broad capital model (1991–1995)	B. De Long L. Summers P. Romer N. Crafts G. Toniolo	Capital investment, constant return to scale caused by knowledge externalities	Cumulative process of divergence, which can be regulated by government by targeted finance and tax policy
Augmented Solow neoclassical model (1992–1996)	J. Rauch S. Bradley J. Taylor	Physical and human capital, externally determined technological progress available for everyone	Slow or only conditional convergence among regions with a similar socio-political structure
Endogenous human capital model (1988–1991)	R.E. Lucas N Stokey	Externalities caused by individual investments in education and training	Depends on return on investment, public policies, industrial and trade specialization
Endogenous innovation model (1990–1995)	P. Romer, G. Grossman E. Helpman, R. Barro X. Sala-i-Martin	Technological oligopoly innovations, their dispersion, transmission and imitation	Constant divergence. Available only in separate groups of regions

Source: compiled by authors.

Endogenous models explain regional economic growth through the interaction among increasing return to scale, human capital and technology. It also explains a two-way relation between economy functioning in the region and the growth of national economy. However, endogenous growth theories were mostly developed on the theoretical level and were not able to explain the instability of the convergence rate over time and why previously converging regions move to a divergence direction. These theories analyse regional growth and their convergence by applying static and dynamic equilibrium models. They do not pay attention to possible stages of the national economic development and its fundamental changes caused by resources, production structure and the development of the economic system. The further summarized group of theories models the regional economic growth as a process of structural changes in the region, national economy and beyond.

Structural theories treat economic growth in regions not as factors causing movement towards or from the equilibrium, but as an evolution through various stages of economic

development. Theoretical trends based on the structural position include several different *theories of region economic growth and development*. As many of these theories analyze also changes in economic industries, some of them are called *industrial theories*. According to theories of *product / profit cycle*, regional convergence is more likely in later stages of the national economic development when product standardization encourages production relocation towards lagging regions and the introduction of a new firm in the market reduces the monopolistic profit of innovators. However, new products that are created and developed in industrialized territories increase the differences among regions during the next economy growth cycle. At the same time, the theories that aim to explain these processes in the context of industrial organization changes have emerged.

Changes in national economies during the 80s – 90s: (decline of the production sector and the growth of services in industrialized countries, increasing international mobility of labour and capital, larger regional differences in labour quality) caused the emergence of a new *industrial restructuring theory* which analyses the influence of structural changes in an industrial organization on regional labour and capital markets. The representatives of this theory suggest that economic integration, and therefore increasing FDI flows, broke the traditional structure of labour force. In industrialized countries, the internationalization of capital flows caused disinvestment in many traditional industries and increased territorial differences of production possibilities. The movement from production to services fostered the centralization of corporative activities on the regional level, which was accompanied by the decentralization of low qualification employment. One of the possible outcomes of these processes was the accumulation of profit in several regions, fostering the economy divergence.

The other response to above-mentioned changes in economies was theories that concentrated on types and formation of links among companies in the new industrial districts. This trend analyzes the influence of market repletion with industrial production and diversification of consumer demand on the form of new product creation, allowing a constant reaction to changes through innovations. This new “flexible specialization” is based on flexible labour and capital employment which have to be easily adjusted as market needs change. According to this theory, regional divergence is most likely during the growth of national economy because of territorially uneven industry structure which causes different abilities of a flexible reaction to the possibilities created by economic growth.

The Marxian theory of regional economic growth gives a different approach to structural changes in economy and especially to the constant lagging of some regions in some countries. In this theory, the main cause of regional economic divergence is the nature of capitalism. Changes and development in society are analyzed as a classical conflict between labour and capital. The theory suggests that, despite the sustainable growth trend which is determined by competition for profit, this state cannot be achieved

without balance in the social relation structure. This instability is caused by periodical crises in capital accumulation, followed by a controlled wave of investment and disinvestment. Unsustainable growth can be understood as a spatial expression of capital contradictions. Table 4 summarizes the theoretical reasons for the possible results of national economy growth – convergence or divergence of regions.

TABLE 4. Summary of structural theories

Name of the theory <i>(date of formation)</i>	Main representatives	Convergence/ divergence prediction	Causes
Growth stage/sectorial theories <i>(20th century 60s)</i>	W.R. Thompson	Divergence/ convergence	Different abilities of reaction to externalities and transition to another development stage at different times because of different innovation absorption cause divergence. Economy of scale and overloaded cities may foster convergence
<i>Theories of product/ profit cycle</i> <i>(20 century 80s)</i>	A. Markusen M. Taylor	Divergence/ convergence	Urbanized territories are more attractive at initial product life-cycle stages because of firms R&D activities. Undeveloped regions are attractive because of economies of scale when the product is more standardized
<i>Industrial restructuring theory</i> <i>(XX century 80's)</i>	S. Sassen D. Massey R. Meegan T.J. Noyelle T.M. Stanback	Divergence	Disinvestment in specific regions caused by economic integration, internationalization of capital flows and centralization of corporative activities
<i>Flexible specialization theory</i> <i>(20th century 90s)</i>	A.L. Saxenian A.J. Scott P.Cooke K. Morgan	Divergence	Territorially uneven industrial structure that causes different abilities for flexible reaction to the possibilities created by economic growth
<i>Marxian theory of regional economic growth</i> <i>(20th century 70's)</i>	A.J. Watkins D.C. Perry D.M. Gordon M. Castells	Divergence/ convergence	Unbalanced structure of social relations, periodical crises of capital accumulation, followed by controlled waves of investment and disinvestment

Source: compiled by authors.

All the mentioned structural theories suggest that the regional economic divergence is caused by increasing differences between new and old industrialized territories. This means that these theories aim to explain the accidental circumstances that caused a rapid development in some regions first of all, and they do not analyze the development of the economic system of the entire region in the long run. These circumstances confirm the need for a more detailed analysis of the interaction between economic growth and regional convergence. One of the possible trends of theoretical research is to integrate endogenous growth models and economic development theory because a transition

to another development wave may provoke periods of a slower regional economic convergence or even divergence.

Methods of regional β convergence evaluation

Usually two methods are applied for evaluating regional economy convergence: β convergence, which means that real GDP in lagging regions is growing faster as compared with leading ones, and it approaches the real GDP level of leading regions; σ convergence which means that the dispersion of real GDP among regions is decreasing. Formally, β convergence is an essential but not sufficient condition for σ convergence: if differences in real GDP between two regions are diminishing (σ convergence), this is caused by a faster growth of the lagging region (β convergence).

β convergence takes place if there is an inverse relationship between the real GDP growth rate and the initial level of real GDP. There are three models of β convergence: absolute, conditional, and club.

The *model of absolute β convergence* is based on the assumption that all regions converge towards a single steady state, and the *model of conditional β convergence* suggests that the steady state of regions is determined by the initial level of controlled variables. In this case, all regions have different structural characteristics, and this it leads to the opposite assumption than the absolute β convergence: all regions converge towards different steady states. Such a dualism of β convergence models is criticized (Baumont et al., 2003). The club convergence, or the so-called convergence club model, is a compromise model of the previously mentioned extremes. Convergence clubs are regions that have similar initial structural characteristics and converge towards the same steady state (Canova, 2004; Quah, 1996). In this case, it is possible for developed economies to form one convergence club and for developing economies another club, and these clubs do not converge. The differences among convergence clubs may increase and lead to the polarization of the territorial distribution of real GDP (RGDP). Figure 1 presents graphical interpretations of the above-mentioned models of β convergence.

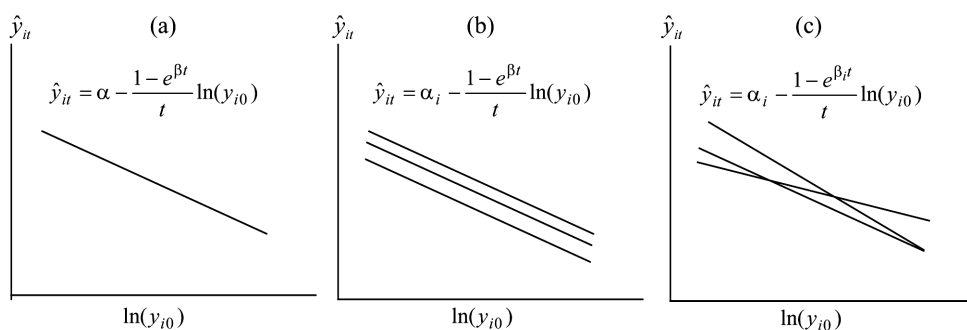


FIG. 1. Graphical interpretation of absolute (a), club (b) and conditional (c) convergence

Source: compiled by authors.

If regional economies are homogenous, an absolute convergence should take place (regional economies will converge towards the same level of RGDP). Empirically, absolute β convergence is identified applying the growth regression model:

$$\left(\frac{1}{T}\right) \ln\left(\frac{y_{it+T}^s}{y_{it}^s}\right) = \alpha + \beta \ln(y_{it}^s) + \varepsilon_{it}, \text{ where } y_{it}^s = \frac{RGDP_{g,it}}{RGDP_{g,t}}$$

is the ratio of RGDP per inhabitant in the region i and the average RGDP per inhabitant in the group of regions

analyzed during the year t . $\left(\frac{1}{T}\right) \ln\left(\frac{y_{it+T}^s}{y_{it}^s}\right)$ shows the average annual (from the initial

period t till the last $t + T$ period) growth rate of RGDP per inhabitant in the region i . If $-1 < \beta < 0$ and the coefficient is statistically significant, we may assume that there is a β convergence between the regions. The coefficient $|\beta|$ measures the rate of the process,

and $\tau = \frac{-\ln(2)}{\ln(1-|\beta|)}$ helps to estimate the time needed for the regional differences to be halved.

The model of conditional β convergence assumes that all regions should converge not towards a common equilibrium, but towards specific long-run equilibriums (Sala-i-Martin, 1994; Barro, Sala-i-Martin, 1995; Mankiw et al., 1992). Different fundamental structural characteristics (preferences, technology, population growth rate, economic policy, etc.) suppose that regions of different countries will also have different equilibrium RGDP levels. This model supposes that the economic growth rate of a region will be a function of the gap from its equilibrium level. So, aiming to test the hypothesis of conditional convergence, the equilibrium level of every country should be controlled.

One of the means to do this is to use structural variables which would present the

economy equilibrium level in a model: $\left(\frac{1}{T}\right) \ln\left(\frac{y_{it+T}^s}{y_{it}^s}\right) = \alpha + \beta \ln(y_{it}^s) + \sum_{j=1}^n \gamma_j d_{ji} + \varepsilon_{it}$,

where $\sum_{j=1}^n \gamma_j d_{ji}$ are all the factors that influence the economic growth rate. $d_{ji} = 1$ if the

region i is from the country j , otherwise $d_{ji} = 0$. If in case of regression with additional variables $-1 < \beta < 0$ and the coefficient is statistically significant, we may assume that a conditional β convergence took place.

The alternative mean to estimate conditional β convergence is to divide regions into groups in a way that we cannot reject the assumption about identical technology, institutional environment, industrial structure, etc., and to apply the model of absolute β convergence separately to each country.

One of the groups of economy growth theories (Azariadis, Drazen, 1990; Galor, 1996) states that regions with similar structural characteristics (production technology, priorities, economic policy, etc.) may converge towards different equilibriums, anyway, if they have different initial economy growth conditions. The process of convergence of similar regions with uniform growth conditions within a group is called club convergence.

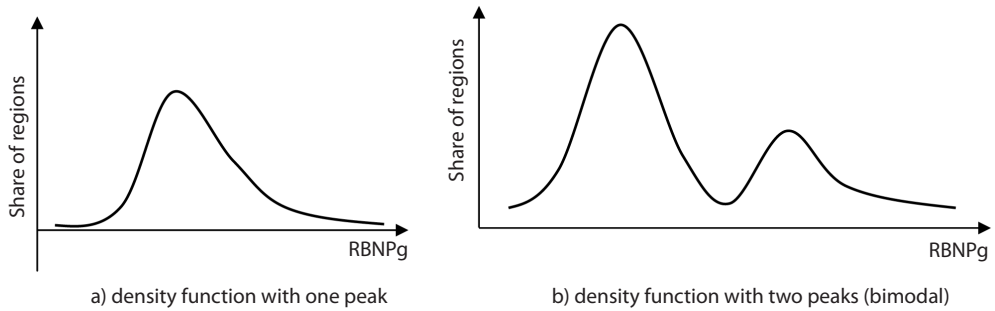


FIG. 2. Examples of density functions of RGDPg distribution in regions

Source: compiled by authors.

Convergence clubs consist of regions that converge towards the same equilibrium level. For identification of convergence clubs, first of all the factors of their formation should be set. Then we should determine the critical differences of these factors that form regional convergence clubs. Recently, methods of endogenous grouping are becoming more popular for the identification of convergence clubs. When applying these methods, it is not necessary to set the factors that are responsible for the formation of convergence clubs (Bernard, Durlauf, 1995; Hobijn, Franses, 2000; Phillips, Sul, 2007). However, these methods are more applicable for the territorial distribution analysis (σ convergence) than for β convergence.

The density function of the RGDP territorial distribution is most often used for the identification of convergence clubs. If the function is multimodal (has more than one peak), the hypothesis of a convergence club existence cannot be rejected. Figure 2 shows an example of such density functions.

The drawback of this method is the fact that it is impossible to estimate the factors that cause formation of convergence clubs. If they are caused only by differences in structural characteristics, there is a risk that the estimated groups of regions could be incorrectly considered as convergence clubs in case of conditional convergence.

The presented evaluation methods of β convergence have several serious drawbacks. One of them is the fact that the model of absolute β convergence, based on neoclassical economic theory, pays no attention to economic cycles. It gives no possibilities to evaluate the impact of a business cycle on economic growth in a short term. So, the estimated trend of convergence or divergence may be depended on the period under analyzed (Petraikos et al., 2005).

The other drawback is related to variables included in the model. Usually, the model of conditional convergence takes economic, structural or demographical characteristics of the regions analyzed as independent variables, and estimates their impact on economic growth. In this way, the impact of all these important structural factors is eliminated, and

we estimate the regional convergence that does not exist. These models do not measure the rate of convergence among regions, but just the convergence towards equilibrium level. Therefore, the model is not suitable to obtain information about regional economy convergence, because different regions may have different equilibrium levels. The estimation of club convergence is based on very different methods, and it is difficult to compare the results as they are very much dependent on the method.

The estimation of the convergence does not take into account the relative size of a region or its importance in the national economy, and all the regions are considered to be equal; so, changes in a relatively small region may change the convergence or divergence trend estimated by the model.

Assessment of regional convergence in EU countries at NUTS3 level

In the EU-27 NUTS3 regions, there are great differences in income per inhabitant. In 1995, the difference between the biggest and the smallest real GDP per inhabitant (RGDP_g) was 35.6 times. The RGDP_g in euros was biggest in Great Britain Inner London–West region (89656 EUR), and the smallest was in the Vaslui region in Romania (2517 EUR). In 2008, the RGDP_g of the richest region was 32 times larger than in the poorest region. In 2008, the biggest RGDP_g remained in the Inner London–West region (140773 EUR), and the smallest was in the Sliven region in Bulgaria (4406 EUR). The fact that the gap between the minimal and maximal RGDP_g has decreased by 10% during 13 years is not sufficient to prove convergence among the regions, because it is still unclear what the distribution of RGDP among the rest 1301 regions of the EU-27 was.

An empirical assessment of the economic convergence of EU-27 regions (if the territorial differences have decreased) is possible by testing the statistical significance of the β coefficient in the absolute convergence model. Figure 3 presents the panel data on regression of the EU-27 regions' economic growth.

The constructed model of absolute β convergence, which includes all EU-27 regions (Fig. 3, part a) is not statistically significant. The analysis of errors shows that they do not have a normal distribution ($K-S = 0.000$), are multi-correlated ($d = 0.745$), and their dispersion is not constant ($LM = 113.361$). In this case, the statistical significance of the model does not meet the Fisher and Student criteria. One of the possible explanations of these results can be the existence of exceptions in the data sample. The initial development level of the EU-27 regions was very different, as was also their average growth during 1995–2008. There were 113 exceptions found in the data sample, which make 8.7% of the total sample. Part of the exceptions were due to the unequal economy development level in the regions in 1995 (maximum-to-minimum ratio was 35.6). Another part was due to differences in economy growth rate during 1995–2008 (from -49% to 331%). We count almost all regions in Bulgaria, Romania, Hungary and Lithuania (87 out of 100 regions) and a few regions from Slovenia, Slovakia, Finland, Sweden, and Greece as exceptions.

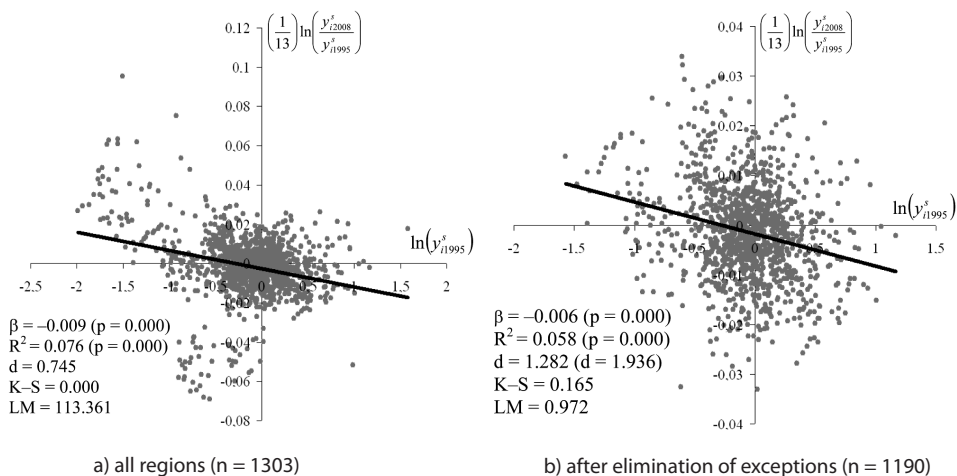


FIG. 3. The model of absolute β convergence of EU-27 regions and its parameters

Source: compiled by authors.

The constructed model of absolute β convergence includes 1190 EU-27 regions (Fig. 3, part b). Its statistical significance is only partial, because the autocorrelation of errors ($d = 1.282$) skews the results of significance tests. Autocorrelation may be determined by the fact that the initial development level and economy growth are similar among of regions from the same country. The spatial autocorrelation hypothesis (assumption that the economic growth of the region has a positive impact on the economic growth of neighboring regions) may be tested by changes in the Durbin–Watson criterion as we change the data sequence in the regression analysis. The value in brackets in Fig. 3 shows that autocorrelation does not exist if we list the regions by their initial economy development level. Other model parameters remain unchanged and prove the hypothesis of spatial autocorrelation. According to the constructed model of absolute β convergence, about 5.8% of variations of the average economic growth rate in the regions during 1995–2008 can be explained by the initial level of their development. A negative and statistically significant β coefficient proves the hypothesis of neoclassical economic theory that the lagging economies are growing faster than the leading ones and so the development gap between them diminishes. The estimated convergence is very slow: it is about 0.6% per year, and it would take 115 years for the economic differences among the regions to reduce by half.

The model of absolute β convergence is not able to evaluate the size of territorial differences of the economies. It just shows whether the regions were converging during the period under study and whether the territorial differences of economy were increasing or decreasing. This model is also unable to detail the changes that took place in a specific year.

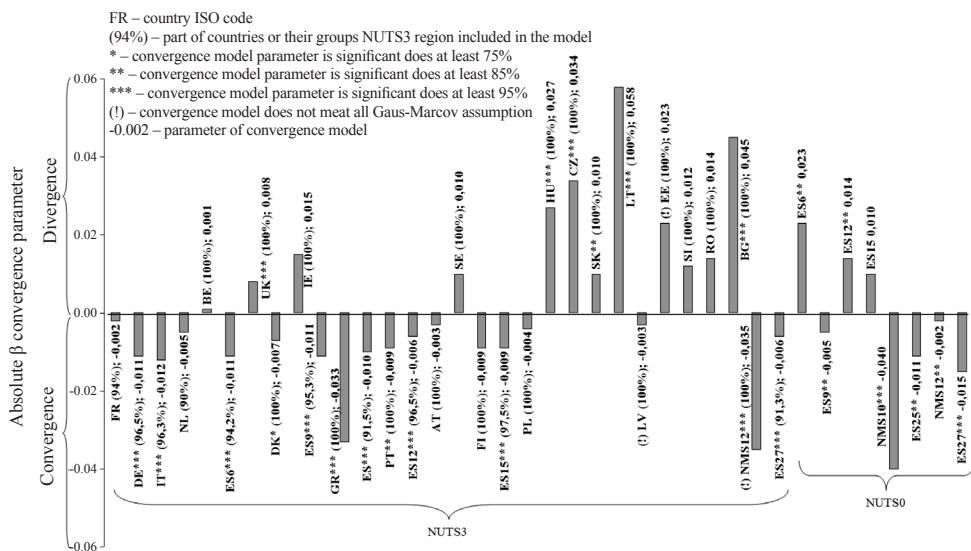


FIG. 4. Parameters of the absolute β convergence models of NUTS3 and NUTS0 territorial levels in EU countries and their groups in 1995–2008

Source: compiled by authors.

The next step of the research analyses regional convergence inside the EU-27 countries. We do not analyze Luxembourg and Cyprus because these countries do not have at least two NUTS3 regions. Figure 4 presents the constructed models of absolute β convergence in the study countries and their groups at NUTS3 and NUTS0 territorial levels.

Figure 4 presents the parameters of the absolute β convergence model which includes all the regions of a country or their group if the model meets the Gauss–Markov assumptions. If the model did not meet the assumptions, an alternative model was constructed. It did not include the exceptional regions and had the indicated percentage of excluded regions. If the constructed model does not meet the assumptions, anyway, the picture presents the basic model parameter with an indication that the model is not correct. Malta was not included in the research of separate countries because it has only two NUTS3 regions. But Malta was included when analyzing regional convergence in a group of countries.

Two out of 24 absolute β convergence models for separate countries did not meet the Gauss–Markov assumptions because of a too small data sample: there were only 6 regions in Latvia and 5 regions in Estonia. Regional economic convergence was estimated in 10 out of 14 old EU members. The regional convergence in Greece was estimated with a higher than 95% probability. There, the average convergence rate was 3.3% per year, and it would take about 21 years to reduce by half the regional differences in Greece. An at least 95% probability of regional convergence was estimated in Germany, Italy, and

Spain when we took not all the regions for the research. The convergence rate in these countries was slow: 1% per year in Spain and 1.2% in Italy. A statistically insignificant regional convergence was estimated in France, the Netherlands, Austria, and Finland. The estimated territorial convergence in Denmark and Portugal was respectively 0.7% (75% probability) and 0.9% (85% probability).

When we took all the regions for the research, the regional divergence was estimated in Great Britain, Belgium, Ireland, and Sweden. A statistically significant divergence rate was estimated only in Great Britain, and it was 0.8% (95% probability). A statistically significant economic convergence of regions was estimated in the EU-6 (1.1% per year), EU-9 (1.1%), EU-12 (0.6%), and EU-15 (0.9%) in case of excluding some regions.

Constructed models of absolute β convergence in the new EU members included all the regions. There was no country with a statistically significant convergence. An at least 95% probability of regional divergence was estimated in Hungary (2.7% per year), Czech Republic (3.4%), Lithuania (5.8%), and Bulgaria (4.5%). There is a 85% probability that the regional divergence rate in Slovakia is 1% per year. In Slovenia and Romania, the estimated regional absolute β divergence rate is statistically insignificant.

To sum up all the estimated results, we may say that regions in the EU countries were more often diverging than converging. The assessment of territorial differences in the EU economies and their factors suggests that the importance of a country or their group is decreasing while territorial economic differences inside a specific country are becoming more important. This suggestion is confirmed by the diminishing differences between the groups of new and old EU members and among all EU members, and by the fact that a relatively bigger share of regional economic differences can be explained by differentiation inside a country.

Conclusions

Traditionally, theoretical analysis of territorial differences of economies is based on two opposite approaches. The first one is derived from neoclassical equilibrium models and says that in the free market there are the mechanisms that foster regional economic convergence. The other approach suggests that economies of scale and agglomeration cause a cumulative concentration of capital, labour, and value added in some regions. Thus, the economic divergence is more probable, because, from the theoretical point of view, unregulated market forces lead to no equilibrium. The endogenous growth theory, formed in the beginning of the 90s, models the economic growth of regions as a result of increasing return to scale, human capital and technology. The economic differences of regions are explained in two ways: (1) the main growth factors are different in separate regions; or (2) the economic growth of national economy is territorially uneven. The representatives of structural theories suggest that the main cause of regional economic divergence is increasing differences between new and old industrialized territories.

In empirical literature, there are two methods proposed for evaluation of regional economic convergence. Research on β convergence analyzes whether the growth rate of the lagging regions is higher than of the leading ones. The main aim of σ convergence analysis is to estimate the differences among regions and whether they are diminishing over time. There are three models of β convergence: absolute, conditional, and club. The model of *absolute β convergence* assumes that all the regions converge towards a single equilibrium. The model of *conditional β convergence* assumes that equilibria in regions are determined by the initial values of controlled variables and all the regions converge towards different equilibria. The model of *club β convergence* is a compromised approach of the previously mentioned model.

There a great difference in income per habitant in the EU-27 NUTS3 regions. The fact that the gap between the maximum and minimum RGDP decreased by 10% during 1995–2008 is not sufficient to prove the economic convergence among the regions. The constructed model of absolute β convergence of all EU-27 regions is statistically insignificant. The error analysis suggests that the errors have no normal distribution, they are multi-correlated, and their dispersion is not constant. The great differences in initial economy development in the EU-27 regions and in their average growth rate during 1995–2008 resulted in 113 exceptions in the research data sample. Upon eliminating the exceptions, a new model of absolute β convergence was constructed. It included 1190 regions of the EU-27. The estimated convergence rate was very slow (about 0.6% per year), and it would take 115 years for the regional differences to decrease by half. Absolute β convergence models for Latvian and Lithuanian economies did not meet the model assumptions, because the data sample was too small. Regional economic convergence was estimated in 10 out of 14 old EU members, and there was no country from the new EU members with a statistically significant regional convergence.

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