

**PROCESSES
OF CONVERGENCE
AND DIVERGENCE
IN THE REGIONS
OF THE EUROPEAN
UNION:
FEATURES
AND QUALIMETRY**

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A higher level of unity and cohesion across the European Union member states is an important aspect of European integration though it has a rather ambiguous nature. The Law on the Common Market, which aims to increase the economic efficiency of the EU, became a subject of extensive discussions among researchers suggesting that its viability at the political and socio-economic levels depends on a fair distribution of gains among the countries and regions of the Community. These discussions resulted in a considerable increase in funding allocated for the development of the EU regions from the EU Structural Funds and the Cohesion Fund aiming to reduce regional disparities. The present analysis and the assessment of convergence processes (GDP per capita at purchasing power parity) in the EU regions of NUTS-1, -2, -3 levels in 1995 -2009/2010 help demonstrate the efficiency of these efforts.

Key words: alignment, development, convergence, divergence, region, European Union

An increase in the stability and coherence of the member states of the European Union (EU) is an important aspect of the process of European integration and consolidation. At the same time, the question as to what degree this policy is efficient for regions of different levels remains relevant. Is regional convergence taking place at all levels in the EU or is it of selective nature? Do regions of different levels have their distinctive features?

This study aims to assess the process of convergence of regions of NUTS 1—3¹ levels from 1995 to 2010. To reach this aim the following objectives are set: to

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¹ The Nomenclature of Territorial Units for Statistics (French nomenclature des unités territoriales statistiques — NUTS) is a geocode standard for referencing the subdivisions of EU countries for statistical purposes. The standard defines three levels of NUTS that can coincide with the national administrative division; however, in some cases, there is no correspondence.

propose methods for assessing the considered types of convergence through analysing the key principles of the theory of convergence; to carry out an empirical analysis of the process of convergence of EU regions taking place at three levels — NUTS 1, NUTS 2, and NUTS 3 — on the basis of the accumulated results of empirical studies.

First of all, it is worth noting that by ‘regions’ we understand the statistical territorial units identified on the basis of the 2003 European Parliament regulation [1]. In the EU, the key criterion for distinguishing regional levels is population. So the following regional division was adopted: NUTS 1—2—7 million people (then national territorial level for all EU member states), NUTS 2—800,000—3 million people (the level of subregions comprising each EU state except for Lithuania, Latvia, and Estonia, where NUTS 1 and NUTS 2 levels coincide), NUTS 3—150,000—800,000 people (it is the level of small regions comprising subregions). The current NUTS classification, valid from 1 January 2008 until 31 December 2011, lists 97 regions at NUTS 1, 271 regions at NUTS 2, and 1303 regions at NUTS 3 level.

The Key Principles of the Theory of Convergence

The methods of analysing the dynamics of interregional differences are viewed in the light of the theory of convergence. Economic literature does not offer a single approach to the notion of ‘convergence’. Here, we propose to understand *convergence* as the process of approximation of regional economic parameters towards a certain level.

The following types of convergence can thus be distinguished: interregional and international; convergence from the perspective of growth rates (or income levels); absolute and conditional; club-convergence; β -convergence and σ -convergence [2]. The international convergence is based on the indices characterising the differences between countries, whereas regional convergence considers this process within one country. Convergence from the perspective of growth rates is defined as the approximation of different economies towards a single growth rate trajectory. This approach rests on the postulates of the neoclassical growth theory [3]. Conditional convergence suggests that there are fundamental differences and insuperable heterogeneity intrinsic to the objects studied, which results in different trajectories of economic growth. Absolute convergence implies the homogeneity of objects and a single growth trajectory for all economies. Club-convergence — unlike absolute convergence — suggests that the economies of countries/regions are characterised not by a universal growth trajectory but by one that is common for a group of economies similar in the initial level of development and other parameters. β -convergence implies a negative correlation between the growth rates and the initial level of economic development. It is conceptualised as a process of ‘supplementation’, when poor countries or regions exhibit higher economic growth rates. σ -convergence is a more common phenomenon and suggests reduction in the dispersion of the objects’ characteristics within a sample of countries or regions. Research literature mostly focuses on β - and σ -convergence [4, p. 50—51]. In the term

' β -convergence', the first letter stands for the coefficient at the initial GDP per capita in the analysed equation [5; p. 6]. The β - and σ -convergence hypothesis are interrelated but not equivalent. Absolute β -convergence does not result in σ -convergence [4, p. 50—51]. Researchers have proposed an interpretation of the connection between absolute β - and σ -convergence [7]. The former indicates that there are trends towards a reduction in the per capita GDP. At the same time, random shocks affecting regional economies can counteract these trends and increase per capita GDP dispersion.

More than 40 years ago, the English economist J. Williamson established that, at early stages, national development contributed to an increase in regional difference. Later, however, economic growth stimulates the approximation of regional levels, i.e. regional convergence, which is depicted by an upside-down U-curve [8]. Williamson's key argument is that, at first stages, the region has several growth poles that concentrate capital and qualified workers. As a result of a more rapid increase in labour productivity, the economic growth accelerates at these poles even more, which leads to greater regional disparities (divergence). At later development stages, costs start to increase at growth poles, thus capital is likely to move to other regions with a lower cost of labour. Alongside the effects of even knowledge dissemination, it can contribute to the redistribution of production factors through sectors and regions, which leads to the approximation of their regional development. The starting point for analysing the equation is the β -convergence model based on R. Solow's neoclassical growth theory [9]. In accordance with this theory, economic growth rates are positively correlated with the gap between the per capita GRP of the given region and the per capita GRP of a region with a stable growth trajectory characterised by constant growth rates. Therefore, weaker regions have to develop more rapidly than strong ones; in a long-term perspective, regional levels of economic development will approximate [10]. Thus, β -convergence theory shows that relatively weak regions are characterised by higher growth rates at the initial stage. β -convergence is assessed with the help of the model of growth/initial level regressions, where the dependent variable is growth rates, and the independent variable is the initial level. The simplest regression of this type looks as follows:

$$y_i = a + \beta \ln(x_{it-T}) + e,$$

where x_{it-T} is the rate at the moment preceding the current one (t) by T periods (as a rule, the initial period of integration or another significant moment for the development of the integration group); β is the coefficient to be assessed; y_i stands for average growth rates in the i^{th} country over T periods calculated as $\ln(y_{it})/\ln(y_{it-T})$; e stands for a random deviate [11].

The indicator of convergence is the sign of the β coefficient. If $\beta < 0$, the high level of the index at the initial moment correlates with a relatively low growth rate.

Unlike β -convergence, σ -convergence is indicative of a reduction in indices characterising the smoothing divergence between the regions. β -convergence is not always a precursor of σ -convergence. In a situation when a

group of stronger and weaker regions constantly changes (as a result of the deterioration of the economic situation in the stronger and the improvement thereof in the weaker ones) but the gap between the stronger and the weaker once is stable, σ -convergence does not take place [4; 12; 13].

To identify σ -convergence in case of a pronounced trend in a time series, one can use such indicator as dispersion or relative variation indicators: the coefficient of range (K_R) and the coefficient of variation (V_σ). An increase in the coefficients of range and variation are indicative of a greater variation of the parameter in the analysed objects. Thus, when analysing the dynamics of the above coefficients in relation to key parameters, one can give a quantitative and qualitative description of the growing differences according to the per capita GRP criterion.

Another indicator used in σ -convergence identification is the normalised Theil index:

$$T = \sum_{i=1}^n y_i \ln(y_i / p_i),$$

where y stands for the share of the country's GDP in that of the EU; p is the share of the country's population in that of the EU in general.

The index gives 0 in case of absolute equality and increases with inequality. Thus, a decrease in this index over time is indicative of convergence and an increase of divergence, i. e. growing differences.

A Review of Studies into the EU Convergence Process

The EU territory was divided into a 'periphery' and a 'core' according to a study of 12 countries (EU-15 with the exception of Austria, France, and the UK) carried out in 1980—1999 by S. Dall'erba and J. Le Gallo. The 'core' brings together most developed countries of the EU. Significant convergence is registered for the 'periphery' countries; however, they do not achieve the same development results as the 'core'. According to the researchers, the benefits of investment projects of the EU structural funds are indisputable for the regions they were aimed at, but the uniform effect of the EU structural funds is pronounced only in the key regions (the 'core'). A possible reason behind it is that the 'core' regions have smaller territories and are better connected through transport networks and trade. The researchers divided the countries into two groups: Greece, Portugal, Spain, and Ireland as less and Germany, the UK, and Italy as more developed. It is established that the latter have several growth poles, whereas the other regions lag behind in terms of this parameter, which results in increasing disparities [14].

The Italian scholars studied 15 EU countries comprising 140 NUTS 2 regions in 1980—1999 and detected significant convergence: a distribution analysis showed that the per capita income levels of poorer countries tend to approximate, i. e. the process of convergence is more intensive among regions with lower incomes [15].

The Luxembourg income study carried out in the Czech Republic (1992, 1996), Hungary (1991, 1994), Poland (1992, 1995, 1999), and Russia (1992,

1996) showed that the regional income disparities within the CEE region were increasing; the capitals and large urban territories occupied the leading positions. It is possible that, in the future, the interregional disparities within certain EU countries will increase, especially between urban agglomerations and the economic periphery with 'old' economic specialisations. At the same time, even favourable economic dynamics of certain large periphery regions will be ensured mainly through local growth points [16].

The results of a study of the EU-25 countries and their 1214 NUTS 3 regions carried out in 1995—2002 showed that regions with a lower per capita GDP developed more rapidly in these years. The convergence rate was higher for NUTS 3 regions of the EU-15 than for NUTS 3 regions of the new EU states. Convergence was registered within the EU-15 and was not in the group of new EU member states [17]. These conclusions point out a more serious problem: against the background of reduction in interregional disparities at the level of large regions, in smaller regions, disproportions remain untouched by the mechanisms of territorial development regulation. Even in well-off countries, there emerge poor regions that have nothing to hope for. NUTS 3 regions can become targets of a regional policy aimed to increase competitiveness and employment rate one if a number of criteria are met. Local administrative units are left beyond the scope of regional EU programmes.

On the basis of an analysis of 19 of 27 EU member states in 1995—2004 (both at the national and NUTS 2 level), B. Szörfi established that the date of accession to the EU affects the degree of regional disparities: they are more significant in new EU member states [18]. A study of 10 new EU countries in 1995—2005 aimed to identify convergence of economic systems in terms of GDP (according to the quarterly dynamics of the real per capita GDP over the period) showed a certain trend of the GDP of this countries shifting towards the EU average [19]. Over the last 15 years, there has been a significant increase in the interest in studying differences in the development of EU region through econometric methods. Most researchers focused on analysing β - and σ -convergence (spatial convergence).

Despite the fact that the authors of these studies used different methods of assessing convergence, the results they obtained are comparable which makes it possible to make the following conclusions. Over 25 years, the levels of development of relatively poor and rich countries of the EU approximated. Such approximation took place in the periods when the poorest EU countries were represented by those of Southern Europe and Ireland (1980—1999) and those of CEE (1995—2005). At the same time, the convergence process at the level of certain regions (NUTS 2 and NUTS 3) was rather complicated. If the Scandinavian countries and Italy showed convergence and a reduction in regional disparities, in other EU states, convergence periods interchanged with those of divergence. The new EU countries of CEE show a higher level of regional differences in comparison to the 'old' member states. At the same time, the disparity between larger and smaller regions is increasing in many 'new' member states due to the rapid development of capital regions and cities in comparison to smaller regions. Let us consider it in more detail.

An Assessment of Regional Convergence Processes at NUTS 1 Level

In the empirical analysis, we used the 1995—2009 Eurostat data. In the EU countries, the 2009 per capita GDP level (PPP) for NUTS 1 regions ranged from 44% of the EU-27 average (USD 10,300 per capita (PPP)) in Bulgaria to 266% (USD 62,500) in Luxembourg. The disproportion between NUTS 2 regions is even greater: in 2009, per capita GDP (PPP) varied from 27% of the EU-27 average (USD 6,400 (PPP)) in the north-western region of Bulgaria to 332% (USD 78,000) in the capital region (Greater London) of the UK. Among the new countries, the leader is Prague (Czech Republic) with 175% (USD 41,200 per capita (PPP)) and the region of Bratislava (Slovakia) with 178% (USD 41,800) of the EU-27 average. However, these two regions are exceptions among the new states that acceded in 2004. They are followed by the most prosperous regions of new countries: the Bucharest region in Romania (111%, USD 26,100 (PPP)), Central Hungary in Hungary (109%, USD 25,500), Western Slovenia in Slovenia (105%, USD 24,600), and Cyprus (100%, USD 23 500). Except for the Masovian Voivodeship in Poland (97%) and Malta (82%), all other regional of new EU member states have a per capita GDP (PPP) of 75% and less of the EU-27 average.

An increase in the per capita GDP of poor territories is the key objective of the major area of the EU regional policy, i. e. convergence. Assistance is provided to regions with economic development of less than 75% (PPP) of the EU average. The accession of CEE countries to the EU automatically reduced the EU average, thus the less developed regions of 'old' countries (East Germany and the medium-developed regions of Greece) cannot seek such assistance. An increase in per capita GDP in the poor NUTS 1 regions of the EU results in the reduction in GDP disparities [20]. G. Petrakos, A. Rodríguez-Pose, and A. Rovolis, when analysing this process in France, the UK, Italy, Portugal, Spain, Belgium, Greece, and the Netherlands in 1981—1997 established that long-term development processes exhibited a trend towards more even resource distribution, although a more rapid GDP growth leads to a more significant increase in regional disparities. In the EU, regional differences at the national level are of cyclic nature: they increase in the periods of rapid GDP growth and decrease in the periods of slow growth [21].

An analysis of the per capita GDP shows that the level of corresponding differentiation at NUTS 1 level was decreasing throughout the observation period. A slow reduction in the differentiation characteristic of 1995—1999 was replaced by the rapid of convergence of 2000—2009. The accession of ten new countries to the EU in 2004 and that of two more (Bulgaria and Romania) in 2007, seems to have had a positive effect on the convergence process; however, this effect was quite limited, the convergence rate hardly changed over the first decade of the 21st century. Even the economic crisis of 2008—2009 did not affect the convergence processes across the EU. Its rate slightly decreased, however the general trend persisted, despite the fact t the scope of GDP decrease varied substantially (table 1). Such rapid convergence process in 1995—2009 is explained, first of all, by a reduction in the differentiation between the 'old' (EU-15) and 'new' countries, which resulted from a high GDP increase rates and a slower population growth in the new countries.

Table 1

**Changes in the Theil index in the European Union
(EU-27) in 1995—2009**

Year	Theil index
1995	6.44
1996	6.21
1997	6.18
1998	6.16
1999	6.12
2000	6.05
2001	5.68
2002	5.31
2003	4.97
2004	4.64
2005	4.41
2006	4.09
2007	3.65
2008	3.21
2009	2.96

Note: The data on Slovenia, the Czech Republic, Slovakia, Hungary, Poland, Lithuania, Latvia, Estonia, Bulgaria, Romania, Cyprus, and Malta were taken into account throughout the period regardless of the countries' status of a EU member state.

The GDP growth and convergence process have the following structure in the EU. The GDP growth rates in the poorer 'new' countries of the EU outstripped the economic growth rates in the EU-15 until 2008. In some 'new' countries (for example, Latvia in 2005—2007), the GDP growth rate exceeded 20%, whereas it reached only 2—3% in most of the EU-15 states (table 2).

Such significant differences in the economic growth rates inevitably resulted in the reduction in differentiation between the 'rich' and 'poor' EU member states.

Let us consider the hypothesis about the σ -convergence of the studied EU regions at NUTS 1 level in terms of per capita GDP (PPP). β -convergence is considered to be a necessary condition for σ -approximation [12; 13; 22]. The calculations the coefficients of variation and range showed that, in 1995—2009, the 'polarisation' of NUTS 1 EU region in terms of per capita GDP decreased which is indicated by a reduction in the coefficient of variation by 9%. Over this period, the increase in the standard deviate (σ) did not exceed the growth in the EU average per capita GDP. Therefore GDP differences decreased and the per capita GDP rates approximated, which was indicative of the σ -convergence of EU regions in terms of per capita GDP. The identified spatial convergence should lead to proving the hypothesis about the β -convergence of the regions under investigation in terms of per capita GDP (PPP) (σ -convergence entails β -approximation) [4, p. 50—51]. Through constructing a 1995—2004 GDP growth rate regression for the initial 1995 level, where the dependent variable is the growth rate and the independent one the initial level ($y = a + \beta x$, where $y = \ln(\text{GDP } 2004 / \text{GDP } 1995)$, $x = \ln(\text{GDP } 1995)$), it was established that the coefficient at the initial per capita GDP level is negative ($\beta = -0.588 < 0$) and statistically significant ($p = 0.001$). Therefore, the assumption about β -convergence in terms of GDP (PPP) in 1995—2004 is true.

Table 2

The Real GDP Growth Rates in the EU Member States in 1996—2010

Country	1996	2000	2004	2008	2009	2010
<i>EU-27</i>	1.8	3.9	2.5	0.5	-4.2	1.8
<i>EU-15</i>	1.7	3.9	2.3	0.2	-4.3	1.8
Bulgaria	-9.4	5.7	6.7	6.2	-5.5	0.2
Czech Republic	4.0	3.6	4.5	2.5	-4.1	2.4
Estonia	5.7	10.0	7.2	-5.1	-13.9	3.1
Cyprus	1.8	5.0	4.2	3.6	-1.7	1.0
Latvia	3.6	6.9	8.7	-4.2	-18.0	-0.3
Lithuania	5.2	3.3	7.4	2.9	-14.7	1.3
Hungary	0.7	4.9	4.5	0.8	-6.7	1.2
Malta	—	—	1.1	5.3	-3.4	3.7
Poland	6.2	4.3	5.3	5.1	1.7	3.8
Romania	3.2	2.4	8.5	7.3	-7.1	-1.3
Slovenia	3.6	4.4	4.3	3.7	-8.1	1.2
Slovakia	6.9	1.4	5.1	5.8	-4.8	4.0

Source: Eurostat.

Through constructing the 2004—2009 GDP growth rate regression for the 2004 initial level: ($y = a + \beta x$, where $y = \ln(\text{GDP 2009} / \text{GDP 2004})$, $x = \ln(\text{GDP 2004})$), we establish that the coefficient is negative ($\beta = -0.627 < 0$) and statistically significant ($p = 0,000$). Therefore, the assumption about β -convergence in terms of GDP (PPP) in 2004—2009 is also true. So, in 1995—2009, σ - and β -convergence took place in the EU at NUTS 1 level. Thus, one can speak of spatial approximation, when EU regions with lower economic development indices raise them more rapidly than those with stronger ones.

From our point of view, an important issue is that of the role of the EU structural funds (the Social Fund, the Regional Development Fund, etc.) in the process of convergence. Scholars tend to agree that there is a need to increase the income level in poorer regions where this level is lower than 75% of the EU average. In accordance with the endogenous theory, public policy has a considerable effect on long-term growth rates: the social infrastructure is a factor of the production function and its growth results in an increase in the marginal product of private capital, which leads to capital accumulation and economic growth. To take into account the role of the EU funds, one can include an additional factor — the share of EU structural fund investment and the states' co-financing in GDP — on the right side of the equation (table 3).

The coefficient at the initial per capita GDP level is negative and statistically significant (-0.027). However, if we include the variable characterising the effect of social investment, we obtain a positive but statistically insignificant coefficient. These results can be interpreted as an indication of that the processes of convergence did take place in the EU in 2000—2010; however, the effect of financial assistance of the European structural funds on the integration process cannot be given an unambiguous assessment. The volume of social investment increased in the less developed countries and regions of the EU, which, according to the theoretical assumptions, should have a positive effect on the convergence process. However, the model applied does not confirm it.

Table 3

**An Assessment of the β -convergence of EU Countries and Regions
in View of the Share of Social Investment in GDP in 2000—2010**

Variable	Coefficient	Standard error	t-statistic	p-value
β_0 constant	0.129	0.016	7.809	0.000
Initial per capita GDP, 2000, logarithm	- 0.027	0.003	- 8.394	0.000
Social investment, share in GDP	0.002	0.001	1.253	0.222
<i>Coefficient of determination, R²</i>				0.82
<i>Standard error</i>				0.006

Source: [25, p. 289—290].

**An Assessment of Convergence Processes
at NUTS 2 and NUTS 3 Levels**

Let us consider the problem of disparities between the ‘old’ and ‘new’ EU member states at NUTS 3 level in comparison to NUTS 2 (fig.).

The disproportion between EU regions at NUTS 3 level in terms of per capita GDP (PPP) reached its maximum in 2009 and ranged from 22% in the regions of Silistra and Sliven (Bulgaria) and Vaslui (Romania) (USD 664 and 1087 (PPP) respectively) to 596% in the City of London in the UK (USD 156 661 (PPP)). In the ‘new’ EU countries, the significant disparity in the development of NUTS 3 regions often does not have a political element and is connected to the overly rapid development of capitals, especially, in the smaller Baltic states.

Within the regions of the ‘new’ EU countries, the differences are even more pronounced at NUTS 3 level. For example in Bulgaria, the per capita GDP in the capital is five times as high as in Silistra and Sliven (105 against 22%). In 2009, in Latvia, the per capita GDP in Riga was three times as high as that in Latgale (86 against 28% of the EU average); in Hungary, there is a fivefold difference between Budapest and Nógrád (147 against 30%). In such states as Romania and Poland, the differentiation is also significant. In the Ilfov County (the region surrounding Bucharest), the per capita GDP rate reached 115% of the EU-27 average, whereas in the Romanian Vaslui Country situated at the border with Moldavia only 22% (a more than 5.2 times difference); in the city of Poznan, it reached 121 against 35% in the Biała Podlaska County bordering Belarus (an almost four-fold difference). Significant historical-economic differences are to be taken into account when choosing targets for the assistance of the EU structural funds. In this case, one has to face the thorny dilemma of efficiency vs. fairness. For example, in Latvia, it is more reasonable to allocate EU funds to Latgale, but, in this case, the return will be only 100 lats per a unit of the introduced resources, thus it is more efficient to allocate them to the central Riga region, where the return will equal 200—300 lats per unit, i. e. will be 2—3 times as high. In the market conditions, the priority is efficiency rather than fairness. At the same time, the differentiation

within large regions (NUTS 1 and NUTS 2 levels) of the ‘new’ EU countries is not that striking: in terms of per capita GDP, the most developed Polish Masovian Voivodeship outstrips the Lublin Voivodeship only 2.4 times (97 against 41%), whereas the capital region of Romania outstrips the Northwestern region only 3.8 times (111 against 29%). In Bulgaria, the difference between the Southwestern and Northwestern regions is 75 against 27% (2.7 times). In some Western European countries this difference turned out to be greater.

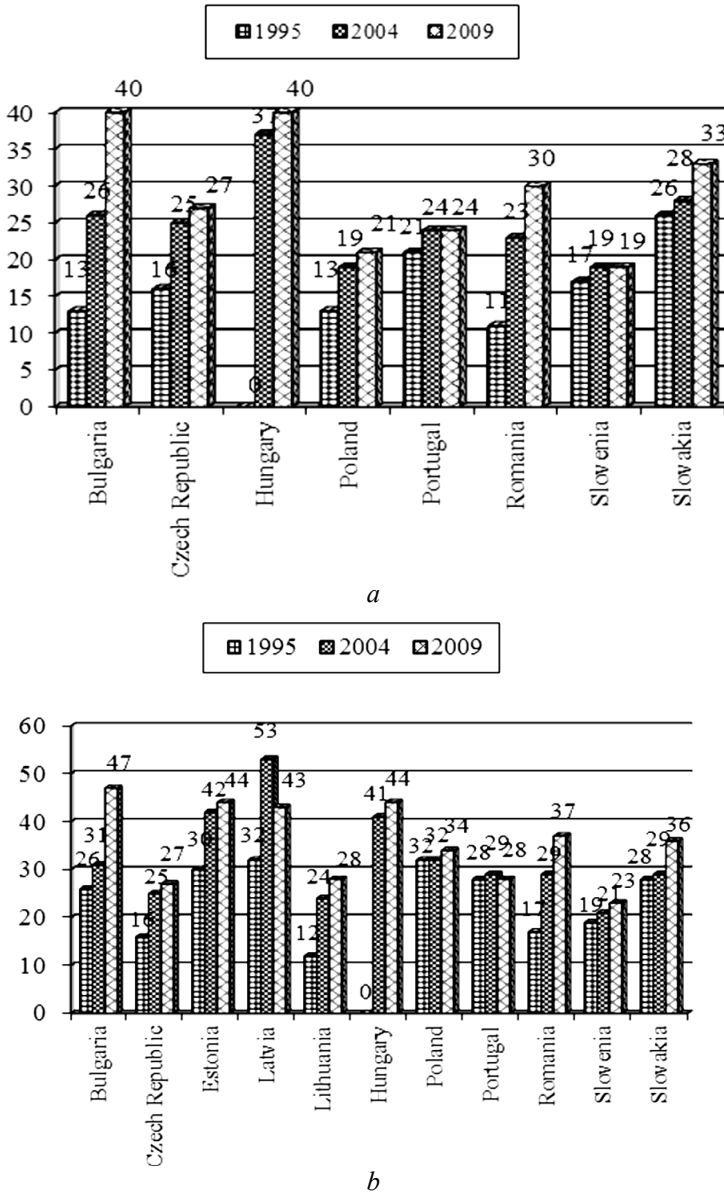


Fig. Dispersion in the new EU member states at NUTS 2 (a) and NUTS 3 (b) levels in 1995—2009,%

Source: Eurostat data for 1995—2009.

Conclusion

The study helped detect β - and σ -convergence processes in EU regions in terms of per capita GDP (PPP) at NUTS 1 level. At the same time, over the last 15 years the convergence process in the EU countries was rather rapid, especially, at the level of individual countries. It was a result of both a rapid GDP increase rate and a lower population growth rate in the ‘new’ EU countries. In the ‘new’ EU countries, the difference between the development of individual regions at NUTS 2 and NUTS 3 levels relates to overly rapid development of capitals, especially in the case of smaller states. The accession to the EU stimulated β - and σ -convergence in these countries. Therefore, the identified reduction in disparities in terms of the per capita GDP (PPP) criterion serves the interests of both ‘new’ and ‘old’ EU countries, which is indicative of a rather efficient EU policy aimed at the development of NUTS regions.

The processes of convergence taking place in the EU regions at NUTS 1, NUTS 2 and NUTS 3 are of ambiguous nature and stress that the objectives of regional approximation, parity (‘equality’), and the maximisation of output aggregate (‘efficiency’) are not always compatible in the market conditions. In such situation, the negative effect of lower growth rates in the regions of the EU ‘core’ will surpass the positive effect of the growth rate in the ‘periphery’, thus the GDP growth in the EU regions of NUTS 1 and NUTS 2 levels can be ensured, for instance, at the cost of an increase in regional disparities (divergence) at NUTS 3 level.

The analysis shows that the larger the EU region is (NUTS 1 and NUTS 2 levels), the shorter is the period required for levelling the differences. Vice versa, the smaller the region is (NUTS 3 level), the longer period it requires for achieving the same goal. Thus, when selecting a target for such levelling, the priority should be given to NUTS 3 level. Another reasonable solution is a balanced policy of region enlargement. The latter is relevant for many regions of the European part of Russia, which require production diversification and economy clusterisation for approximating their development levels.

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