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CONTRADICTIONS IN REGIONAL DEVELOPMENT ASSESSMENT: IN WHAT MEAN WE COULD SPEAK ABOUT ECONOMIC CONVERGENCE IN EUROPEAN UNION?

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CONTRADICTIONS IN REGIONAL DEVELOPMENT ASSESSMENT: IN WHAT SENSE WE COULD SPEAK ABOUT CONVERGENCE OF REGIONAL ECONOMIC DEVELOPMENT IN EUROPEAN UNION?¹

Janno Reiljan²

Introduction

Regions derive different relative levels of economic development potential (steady state) from their geographic location and other specific conditions (historical, cultural, political, economical, social, demographic, climatic, ecologic and others.) Development potential determines “normal” differences in the level of economic development (GDP or value added creation per capita) of regions in the presence of free market economy conditions. Excessive variations in inter-regional levels of economic development within a country create problems for the country as a whole, which in turn reduces its ability to compete globally. That is why governments of developed countries try to unify economic development levels of regions through the use of public sector politics and programs. The objective (scientific) justification and evaluation of such programs require an adequate methodology for the quantitative assessment of regional development disparities and their change.

Insufficient attention has thus far been focused on the quantitative assessment problems of regional economic development disparities. Within the framework of empirical verification of neoclassical growth theories Barro and Sala-i-Martin have demonstrated the properties of two indicators – the so called β -convergence and δ -convergence (Barro, Sala-i-Martin 1991; 1995). Those indicators have been widely used in empirical analyses, but the use of β -convergence and δ -convergence indicators have find a lot of critics too. Markov chain technique is proposed for modelling spatial disparities dynamics (Quah 1996; Fingleton 1997; Magrini 1999; Le Gallo 2004; Bosker 2009) to overcome the restrictions of neoclassical growth theory and problems of regression analysis. The imbalance of regional economic

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development is a phenomenon which has high socioeconomic importance and needs complex qualitative analysis and quantitative assessment.

The Eurostat database (see Dispersion of regional GDP per inhabitant) presents an official statistical assessment of regional imbalance in economic development in different countries, one which is based on different methodology compared with the aforementioned Barro and Sala-i-Martini approach. A number of additional regional economic steadiness indicators can be used. (Ezcurra, Rodriguez-Pose 2009: 329-334) The author of this article studied variations in regional GDP distribution based on the regional location of companies and their subsidiaries, and regional value added creation based on employees' place of residence. (Reiljan 2009a, 2009b)

Every indicator has its specific properties when assessing regional development disparities and often different initial information is needed to calculate their values. So the use of a single indicator to assess regional economic development imbalance produces a unilateral idea about regional development, and isolated usage of indicators can result in an incorrect understanding of regional development processes. When justifying regional politics and regional development programs, but also assessing their implementation results, the complete range of regional imbalance indicators should be used.

The objective of this article is to assess regional economic development imbalances within the EU and their changes during the last decade, using a comprehensive indicator system for quantitative measurement of economic development regional disparities on the base of GDP per capita in EU member states. Derived from the objective, the following research tasks have been set:

- creating a comprehensive indicator system for the quantitative assessment of regional disparities in economic development;
- a complex assessment of economic development (GDP per capita) disparities between EU countries and their change.

The objective of this article is not to create policy recommendations. The problems of regional economic development imbalances are considered in order to demonstrate the necessity and possibilities for improvements in the quantitative assessment methodology of economic development regional disparities.

1. A comprehensive system for the empirical analysis of regional imbalances in economic development

The level of economic development in a region, as well as the ability to change living conditions of people and solve social problems are in the most common sense reflected by GDP per capita or value added per capita in the region. (Lange 2002; Zischek 2006: 100-114) This does not take into account however that regional comparison of GDP per capita produce valuable, but analytically different results depending on whether GDP is calculated in market prices or where GDP price level differences are removed (using PPP prices). Using GDP in market prices makes it possible to analyse the position of countries from a viewpoint of global economic competition, as interstate economic co-operation is taking place in market prices. Per capita GDP levels calculated using PPP prices helps to assess comparatively the capability of countries in guaranteeing the welfare of their populations, eliminating income purchasing power differences on welfare assessment. Per capita GDP in PPP prices gives a sense of regional differences in production costs.

Of course it is possible to take a wider approach when assessing the regional levels of development. In addition to GDP per capita it is also possible to consider the ability of the economy to solve the problems of society in other specific fields. Lange as well as Zischek gave the most importance to the ability of an economy to offer employment to the population (unemployment rate, underemployment rate) when assessing regional economic development. That approach is reflecting the priority of employment compared to other properties of the economy in highly developed European countries. These authors add to GDP per capita and employment indicators the indicator of infrastructure investments per capita, which reflects development perspectives of a region. So the economic development of each region would be described by an indicator system composed of three indicators. This approach can be widened with more novel socio-economic indicators describing other important aspects of regional development.

The usage of other socio-economic indicators beside GDP or levels of value added creation means going from an economic development level approach to a socio-economic development level approach. Adding more novel indicators widens and/or deepens a regions' socio-economic development level approach considering new aspects. One should not define the social development of society as economic development, but instead as a political function or as a result of economic development. In this article only the economic aspect of regional

development is considered, which is reflected by levels and dynamics of created GDP per capita. This research approach was emphasised when developing traditional neoclassical as well as new growth theories. (see overview by Stimson et al. 2009)

The assessment of imbalances in regional development is based on different methods (Ezcurra, Rodriguez-Pose 2009: 329-334). The most widespread are indicators describing average amplitude of deviations in levels of regional development. When interpreting the nature of average deviation indicators, the regional polarisation of an economy must be taken into account – especially whether the region has one or several development centres. In cases where a sufficiently large number of regions of approximately the same size exist, the Gini coefficient can be used to describe regional economic development homogeneity. Then this measures the difference between the GDP per capita curve for regions and a GDP per capita curve describing equal regional development.

Barro and Sala-i-Martin (Barro, Sala-i-Martin 1995) present a framework for the verification of neoclassical growth theories using two approaches to empirical assessment of imbalances between levels of regional development: β -convergence and δ -convergence measurements. In the first case the growth rates of the economy (GDP per capita creation) in different regions are compared -- β -convergence is said to be present when regions with a lower initial level of GDP per capita have faster real growth rates compared to regions with higher initial level of GDP per capita. Such an approach does not allow for the measurement of regional development stability directly, but it allows for the assessment of the probability that regional development imbalances will increase or decrease over a certain period. β -convergence has a negative correlation to initial levels of regional development and GDP growth rate variables.

The second approach measures directly regional imbalances in economic development and is based on a comparison of the level of dispersion of GDP per capita across regions – δ -convergence exists when the dispersion of GDP per capita for a selected group of regions decreases during a period. δ -convergence is defined as follows: A decrease in the cross-sectional average deviation of regional level gets compared to the mean value for a selected set of regions. When assessing imbalances in regional development by squaring values for regional deviations relatively more weight is given to larger deviations.

To assess regional economic development imbalances of countries, Eurostat uses the weighted average of absolute nominal deviations in regional GDP per capita from the average

country GDP per capita. (See Dispersion of regional GDP per inhabitant) Weighting is determined by a region's share of the country's population as a whole. Eurostat not only considers the difference between levels of economic development from region to region, but also takes into account the share of population which is affected by these levels of development.

According to Eurostat indicator, intense migration from low to high developed regions causes, a decrease in regional imbalances even when the territorial differences in the level of development across regions do not actually decrease (or even in some cases increases). In contrast to Barro and Sala-i-Martini's δ -convergence indicator, the Eurostat regional dispersion indicator does not square regional deviations in GDP per capita from the average, which means that a quantitatively similar change in GDP per capita creation in regions with different levels of development are considered to be qualitatively equally important for regional convergence/divergence of development.

This presumption is not plausible. In one set of regions the contradictions (economic, social, political) are caused by regions with extremely low (or high) levels of economic development, and for the harmonization of the socioeconomic situation it is more important to decrease the extreme disparities within levels of economic development between regions.

The mean value of the differences between regional GDP per capita from the average country GDP per capita (dispersion or D), weighted according to the number of inhabitants in the regions, is calculated using the following formula:

$$D = \sum a_i * D_i \quad \text{and} \quad a_i = R_i / R$$

where

a_i – share of i region's population in the total population of the selected set of regions;

D_i – The deviation in GDP per capita created in region i from the average GDP per capita of the selected set of regions;

R_i – number of inhabitants in region i ;

R – total population of the set of selected regions.

In the case of unweighted GDP per capita regional dispersion the variable R_i equals 1 for each index i value and R is equal to the number of selected regions. In the case of a spatial uneven economic development, we can use for the weights R_i the area of i -th region, then R would equal the total area of the selected set of regions. The variable D_i describing regional

deviations in GDP per capita from the average can be substituted by the square of the deviations. In that case the regional imbalance would be reflected by GDP per capita standard deviation in the selected set of regions.

To elaborate a dynamic assessment of regional imbalance D is calculated for different comparable periods. Instead of nominal indicators, relative ones are used. In the Eurostat dataset average nominal deviations of GDP per capita in relation to the average GDP per capita level are calculated within the selected set of regions (country). GDP per capita growth shows on one hand the real growth of an economy and on the other hand price level growth caused by inflation. An increase in the GDP per capita differences during the selected period caused by price level increases does not necessarily mean an increase in real development differences. Therefore, the impact of the change in price levels should be eliminated from the assessment of average regional development disparities across different time periods. At the same time calculating the relationship between nominal development difference indicators and average GDP per capita in the selected set of regions eliminates the impact of real economic growth from the assessment of relative development disparities indicators. This is not reasonable.

Changes in GDP per capita which stem from real economic growth show effects on nominal regional development disparities, i.e. economic potential or welfare differences, between regions. In market exchange processes (consumption, investments and other activities) a region still has to act irrespective of their different level of GDP per capita. In real economic processes (in competition, in the formation of welfare) there will be a comparison of the nominal, rather than the relative, values. Therefore, the elimination of the impact of real economic growth from the assessment of regional dispersion of GDP per capita gives a distorted picture about the disparities in competitiveness or welfare position of regions. For this reason it is better not to calculate the relationship between the nominal dispersion of regional GDP per capita to average GDP per capita across the selected set of regions.

Therefore, the indicator used by Eurostat, as well as other indicators do not give an adequate assessment to the economic convergence of selected set of regions, but rather one which is overly “positive” or “optimistic”. The price change impact should be eliminated from the values of the indicator in the time series in order to get an adequate assessment of economic convergence /divergence in terms of a measurement scale of nominal dispersion indicators. To obtain comparable convergence or divergence indicators the nominal values of regional

development disparities should be divided by the constructed average of GDP per capita. One expresses only the price level change impact on this indicator during a period in the selected set of regions.

Different indicators provide completely different and often contradictory assessments as to the level of regional imbalances of GDP per capita and dynamics. Therefore, a comprehensive indicator system should be used to assess imbalances in GDP per capita. Using a single indicator in isolation would reflect a unilateral outlook of the development process.

In this research we use the following indicators in order to develop an empirical description of regional imbalances in economic development within the selected regions for the period 1999-2008:

- Maximal nominal difference of GDP per capita between regions;
- Maximal real difference of GDP per capita between regions in prices of 1999;
- Relative maximal difference of GDP per capita between regions (in relation to the average in the selected set of regions);
- Arithmetical mean nominal difference of GDP per capita;
- Arithmetical mean real difference of GDP per capita;
- Relative arithmetical mean difference of GDP per capita (in relation to the average in the selected set of regions);
- Mean nominal difference of GDP per capita weighted by the population share;
- Mean real difference of GDP per capita, weighted by the population share;
- Mean relative difference of GDP per capita in relation to the average of the selected set of regions, weighted by population share – this is the indicator used in Eurostat;
- Standard deviation of nominal GDP per capita -- – indicator used in logarithmic form by Barroso and Sala-i-Martin;
- Standard deviation of real GDP per capita;
- Relative standard deviation of GDP per capita in relation to the average of the regions;
- Standard deviation of nominal GDP per capita, weighted by the population share;
- Standard deviation of real GDP per capita, weighted by the population share;
- Relative standard deviation of GDP per capita in relation to average of the selected regions, weighted by the population share.

Any empirical assessment of disparities in economic development between EU member states set will vary depending on whether or not we take into account price level differences between countries. The measurement by Eurostat of regional disparities in economic development amongst EU member states through the use of a relative dispersion indicator based on nominal differences relies on GDP at market prices. Such an assessment can be suitable for comparing regional development tendencies of regions, which are passing through reasonably similar phases of development, e.g. regions in one country. To make comparisons about the levels of regional economic development in transformation countries and the so called “Old” EU members, assessing GDP in current market prices is not suitable. Using GDP per capita in PPP prices, which eliminates price level differences between countries, opens new possibilities for assessing and comparing regional economic development.

Accordingly, the EU regional economic development imbalance and its change is assessed below, using all the indicators for regional development disparities of GDP per capita in market prices and PPP prices.

2. Comprehensive analysis of levels of disparity in regional economic development within the EU and their dynamics

Regional policy tries to reduce regional disparities and strengthen social, economic and territorial cohesion (Stierle-von Schütz et al. 2008:4). But the question arises how to measure the extent and dynamics of those disparities. Methodologies differing in just one aspect -- the regional economic development level and dynamics on the basis of GDP per capita -- cause controversial results as shown in the following analysis. Therefore, regional disparities in GDP per capita between regions (countries) itself is a qualitative, multidimensional phenomenon and its adequate quantitative measurement needs a comprehensive system of indicators. In the following analysis we use the indicator system explored in first part of this article.

Firstly, development differences between EU member states are assessed in terms of total (maximal) nominal and relative differences of GDP per capita in three groups of countries: in the EU as a whole (EU-27), then in the pre-1995 enlargement “Old EU” member states (EU-15) and then in the so-called new member states which have joined the EU since 1995 (EU-12). Indicators have been given in current market prices in table 1 and in PPP prices in table 2.

Table 1. Total difference of GDP per capita in current market prices between EU member states 1996-2008

	1996	2002	2008	Relation 2008 / 1996	Relation 2008 / 2002
EU-27: total nominal difference in Euro	38100	51700	76000	1.99	1.47
EL-27: total relative difference in % to EU-27 average	247.4	252.2	302.8	1.22	1.20
EU-15: total nominal difference in Euro	29800	40700	64800	2.17	1.59
EL-15: total relative difference in % to EU-27 average	193.5	198.5	258.2	1.33	1.30
EU-12: total nominal difference in Euro	10200	13600	17200	1.69	1.26
EL-12: total relative difference in % to EU-27 average	66.2	66.3	68.5	1.03	1.03

Source: Eurostat on-line database 2009, calculated and compiled by author.

Table 1 describes the maximum differences in GDP per capita in current market prices. In all EU countries the maximum disparity is presented by the difference between Luxemburg and Bulgaria³, in old EU member states between Luxemburg and Portugal, and in new EU member states between Cyprus and Bulgaria. When considering the largest differences, we cannot talk about convergence in either nominal nor relative terms. In nominal terms the maximum difference between countries with extreme indicator values has risen twofold – from 38.1 thousand EUR per capita in 1996 to 76 thousand EUR per capita in 2008. At the same time the nominal difference has grown faster during last six years (24.3 thousand EUR) than during the preceding six years (13.6 thousand EUR). In relation to the EU-27 average level, the maximum difference in GDP per capita between countries has risen by 22%, mostly during the last six years. Nominal as well as relative economic divergence in EU must be acknowledged.

Divergence from the aspect of maximum disparity in GDP per capita among countries has risen the most in the group of old EU member states, where it is represented by the difference between Luxembourg and Portugal – in nominal terms an increase of 2.17 times and in

³ There is accentuated the growth of the economic development regional imbalance in EU caused by enlargement (s Stürle-von Schütz et al. 2008: 3), but as result of the following analysis we see that this phenomenon is characterizing the group of so called old member states of the EU as well.

relative terms by a third. In the group of new EU member states the maximum disparity is represented by the difference between the levels for Cyprus and Bulgaria, which has risen 1.69 times in 12 years in nominal terms, but only by 3% when assessed relatively to EU-27 average GDP level.

From the data in table 2, illustrating the maximum interstate differences of GDP per capita measured in PPP prices, we see that when eliminating purchasing power differences between countries, the maximum difference in the EU as a whole and in old member states is about one fifth, and in new member states about 10-20% less compared to the assessment in market prices. The growth rates of nominal and relative maximum differences are about the same when calculated using PPP or market prices, although slightly larger in the EU-15 group and slightly smaller in the EU-12 group. In the EU-12 group the maximum difference calculated using PPP prices in relation to the EU-27 average GDP actually shows a 5% decrease. In contrast to assessment in current market prices, the growth rate of differences assessed using PPP has been smaller in last six years when compared with the rate six years before that, especially in the EU-12 group.

Table 2. Total difference of GDP per capita in PPP-prices between EU member states 1996-2008

	1996	2002	2008	Relation 2008 / 1996	Relation 2008 / 2002
EU-27: total nominal difference in Euros	29600	42900	58000	1.96	1.35
EL-27: total relative difference in % to EU-27 average	192.2	209.3	231.1	1.20	1.10
EU-15: total nominal difference in Euros	22400	33400	49200	2.20	1.47
EL-15: total relative difference in % to EU-27 average	145.5	162.9	196.0	1.35	1.20
EU-12: total nominal difference in Euros	9000	12000	14000	1.56	1.17
EL-12: total relative difference in % to EU-27 average	58.4	58.5	55.8	0.95	0.95

Source: Eurostat on-line database 2009, calculated and compiled by author.

Maximum differences are a common feature to countries with extreme values within the groups and thus enables characterisation of convergence or divergence. Members with extreme properties cause problems in every union, and therefore the obvious divergence of countries with extreme levels of development is a significant research object within the EU. The whole

set is better described by the difference of GDP per capita for each country from the the EU average GDP. Such assessments are given in market prices in table 3 and in PPP prices in table 4.

Table 3. Mean difference of GDP per capita in current market prices of EU member states from the EU-27 average 1999-2008

	1999	2003	2008	Relation 2008 / 1999	Relation 2008 / 2003
EU-27: nominal mean difference in Euros	9904	11137	12019	1.21	1.08
EL-27: relative mean difference in % to EU-27 average	56	54	48	0.86	0.89
EU-15: nominal mean difference in Euros	7820	9233	11073	1.42	1.20
EL-15: relative mean difference in % to EU-27 average	44	45	44	1.00	0.99
EU-12: nominal mean difference in Euros	12508	13517	13200	1.06	0.98
EL-12: relative mean difference in % to EU-27 average	70	65	53	0.75	0.81

Source: Eurostat on-line database 2009, calculated and compiled by author.

Table 3 shows that the arithmetic average of deviations assessed in market prices has risen in the EU as a whole more than 2.1 thousand EUR (that is by 21%) in 9 years. This rise was faster during first four years than in last five (EU enlargement) years. The relation between the arithmetic average of deviations and average GDP per capita in the EU-27 has decreased by 14% in 9 years, mainly in the years 2004 – 2008. Considering this indicator the groups of “old” and “new” EU member states also present remarkably different level and dynamics of regional imbalance in economic development. The average nominal deviation in GDP per capita of the EU-15 member states’ has increased by 42% for the years 1999 – 2008 and in relation to the EU-27 average has remained stable. In the EU-12 countries the average dispersion of economic development levels has increased by just 6% in the last 9 years, whereby the dispersion grew until the year 2003 and was then followed by a small decrease. As a result the relation of the mean nominal deviation of GDP per capita to the EU average GDP decreased by 25%. According to nominal indicator, the disparity of levels of economic development has grown significantly for EU15 countries, while there has been stabilization

within EU12 countries. The relative level of disparities seems to be stabilized within the EU-15 group of countries and decreased by quarter in the EU-12 group of countries.

Table 4. Mean difference of GDP per capita in PPP-prices in EU member states from EU-27 average 1999-2008

	1999	2003	2008	Relation 2008 / 1999	Relation 2008 / 2003
EU-27: nominal mean difference in Euros	6537	7048	7485	1.15	1.06
EU-27: relative mean difference in % to EU-27 average	37	34	30	0.81	0.88
EU-15: nominal mean difference in Euros	5167	5820	6853	1.33	1.18
EU-15: relative mean difference in % to EU-27 average	29	28	27	0.94	0.97
EU-12: nominal mean difference in Euros	8250	8583	8275	1.00	0.96
EU-12: relative mean difference in % to EU-27 average	46	41	33	0.71	0.80

Source: Eurostat on-line database 2009, calculated and compiled by author.

From table 4 we find that average deviation assessed using PPP prices has in nominal terms grown by less than a thousand EUR (that is by 15%) in the EU as a whole over nine years. Nominal dispersion related to EU-27 average GDP has decreased by 19%. In nominal terms the average disparity in economic development has grown by a third in the EU-15 group, but decreased by 6% in relative terms. In the EU-12 group the average nominal dispersion grew slightly in the years 1999-2003 and decreased about the same amount in the years 2003 – 2008, which meant stabilization. Nominal dispersion related to the EU-27 average GDP decreased by as much as approximately 29%.

Drawing from tables 3 and 4 we can conclude that, when using the mean deviation of GDP per capita from the EU-27 average GDP, nominal divergence and relative convergence have occurred in EU economic development. GDP per capita disparities in the EU have nominally grown not only in market prices, but also in PPP prices. The assessment in market prices reflects a growth of disparities in the economic competitiveness of EU countries in terms of world trade on the import side and attracting foreign investments in the service sector (involvement in the internal market). GDP per capita calculated using PPP prices reflects a growth of disparities in the welfare level of countries and a growth in the differences in

competitiveness in world trade on the export side, and derived from that also in the ability to attract export oriented investments.

In order to assess imbalances in regional economic development for different countries Eurostat uses the indicator of the deviation between the GDP per capita levels for the regions and the average GDP per capita for whole set of regions (country), weighted by shares of regions population in the population of the whole country. Using the same methodology in the analysis of regional disparities in economic development of the whole EU (member states occur in the role of regions), we get the assessments of GDP per capita regional disparities measured in current market prices in table 5 and the assessments of GDP per capita regional disparities measured in PPP prices in table 6. From those tables we learn that using population shares to weight the interstate deviations of GDP per capita remarkably changes the assessment of regional economic development disparity level and dynamics:

- regional disparity measured through average nominal GDP per capita weighted by the countries population shares in the EU as a whole will be assessed 25-40% lower than the regional disparity measured through arithmetical mean nominal deviation and the difference between these two assessments has permanently grown during viewed period;
- when looking at the arithmetic mean deviation of GDP per capita it becomes clear that there has been an increase in the nominal imbalance across the EU as a whole. Over the 9 year period the increase has been 15% in PPP prices (table 4) and 21% in current market prices (table 3). When the deviations are weighted by population shares of the EU member states, average regional disparity appears to be stable in market prices (table 5), and even decrease by 6% in PPP prices (table 6);
- when the deviations of nominal GDP per capita are weighted by population shares of EU member states, as opposed to the arithmetical mean dispersion indicator, we get a contradictory assessment as to the level and dynamics of disparities in regional economic development in the old member states (EU-15) and new member states (EU-12). The regional imbalance appears to be remarkably lower and decreasing in the EU-15 group, and remarkably larger and increasing in the EU-12 group.
- Regional dispersion of GDP per capita in relation to the EU 27 average GDP, weighted by population share, decreased by 30% in the given period across the EU as a whole. At the same time dispersion decreased by one third within the EU-15 group and by a fifth in the EU-12 group.

- an assessment of regional economic development dispersion derived through the weighting by population shares pushes into the background the problems of smaller and less populated countries. Migration from poorer to richer countries appears to lessen imbalances in regional economic development, however such an approach to regional development is problematic. The relationship between weighted regional dispersion and average EU-27 GDP per capita creates an impression of a considerable overall decrease in the level of imbalance in EU regional development, while at the same time people have a different experience due to increases in nominal disparities in GDP per capita within EU member states. Using disparities in economic development weighted for population share as an indicator of regional economic development does not fit with the central ideas of such development, that of guaranteeing increasingly equal living and employment conditions across all regions. People should not be required to relocate from one region to another in the search for improving their living environment or higher paying work.

Table 5. Mean difference of country's GDP per capita from the EU-27 average GDP, weighted by population shares of EU member states, in current market prices 1999-2008

	1999	2003	2008	Relation 2008 / 1999	Relation 2008 / 2003
EU-27: nominal mean difference in Euros	7294	7604	7221	0.99	0.95
EL-27: relative mean difference in % to EU-27 average	40.97%	36.73%	29.00%	0.71	0.79
EU-15: nominal mean difference in Euros	5363	5427	5034	0.94	0.93
EL-15: relative mean difference in % to EU-27 average	30.13%	26.22%	20.22%	0.67	0.77
EU-12: nominal mean difference in Euros	14179	15663	15576	1.10	0.99
EL-12: relative mean difference in % to EU-27 average	79.65%	75.66%	62.56%	0.79	0.83

Source: Eurostat on-line database 2009, calculated and compiled by author.

Table 6. Mean difference of country's GDP per capita from the EU-27 average GDP, weighted by population shares of EU member states, in PPP prices 1999-2008

	1999	2003	2008	Relation 2008 / 1999	Relation 2008 / 2003
EU-27: nominal mean difference in Euros	4686.02	4784.32	4607	0.98	0.96
EL-27: relative mean difference in % to EU-27 average	26.33%	23.11%	18.50%	0.70	0.80
EU-15: nominal mean difference in Euros	3270	3230	3086	0.94	0.96
EL-15: relative mean difference in % to EU-27 average	18.37%	15.60%	12.39%	0.67	0.79
EU-12: nominal mean difference in Euros	9736	10539	10421	1.07	0.99
EL-12: relative mean difference in % to EU-27 average	54.70%	50.91%	41.85%	0.77	0.82

Source: Eurostat on-line database 2009, calculated and compiled by author.

Based on the pattern of empirical experiments of Barro and Sala-i-Martin (1991; 1995), the levels of dispersion in EU regional economic development and the assessment of dynamics are formulated using the standard deviation in GDP per capita (from the average EU-27 GDP level), implementing current market price GDP in table 7 and GDP in PPP prices in table 8. Standard deviation places more importance on extremes compared to arithmetic mean deviation. When assessing the level of convergence using such methods, changes in the value of GDP per capita of a country which is closer to the EU average carries less significance than changes in a country which is further from the EU average. So in an assessment of regional economic development disparities and dynamics, standard deviation synthesises the best properties of a GDP per capita interstate maximum span assessment and a GDP per capita arithmetic mean nominal deviation assessment. On the one hand, standard deviation emphasises the fact that EU economic homogeneity is distorted more by countries which have GDP per capita creation further from the average EU level. On the other hand, standard deviation takes into consideration deviations in GDP per capita from the EU average GDP of all countries, rather than just the differences between countries with extreme levels of GDP per capita.

When comparing the standard deviation of regional GDP per capita in current market prices and its dynamics, as shown in table 7 with arithmetic mean deviation in regional GDP per capita and its dynamics, as shown in table 3, we see some regularities:

- The standard deviation of regions GDP per capita from the EU average GDP is larger than the arithmetic average deviation of regional GDP from the EU average GDP in both the EU-15 and EU-12 group of countries. A more pronounced assessment is present for the group of so called old member states.
- Nominal economic divergence (an increase in regional dispersion of GDP per capita) seems to be larger when assessed using the standard deviation in regions GDP per capita than when assessed using the arithmetic average deviation of regional GDP level in the whole EU as and in the EU-15 group. At the same time, in the case of assessments of new member states (EU-12) the divergence will be assessed about the same for either indicator.
- When assessed using the relative indicator (the relation of arithmetic average regional GDP per capita deviation to the EU average GDP level) dynamics, it seems that there is (relative) economic convergence in the EU. The same can not be said when an assessment is made using the relative indicator based on relation of standard deviation in regional GDP per capita to the EU averages GDP.
- According to the dynamics of the relative indicator (the relation of regional GDP per capita standard deviation to the EU average GDP) prevails in the EU-15 group (relative) economic divergence. However, when the relation of arithmetic average of regional GDP per capita deviation to the EU average GDP) is used, regional economic dispersion in the group of old EU member states seems to be stable;
- The same assessment shows for the EU-12 group an approximately small degree of nominal economic divergence as well as large relative economic convergence on the basis of both calculations -- standard deviation of regional GDP per capita and arithmetic mean deviation of regional GDP per capita.

Table 7. Arithmetic mean standard deviation of GDP per capita in current market prices in EU member states from the EU-27 average GDP 1999-2008

	1999	2003	2008	Relation 2008 / 1999	Relation 2008 / 2003
EU-27: nominal mean standard deviation in Euros	11350	13112	15621	1.38	1.19
EL-27: relative mean standard deviation in % to EU-27 average	63.77%	63.34%	62.24%	0.98	0.98
EU-15: nominal mean standard deviation in Euros	9821	12245	16832	1.71	1.37
EL-15: relative mean standard deviation in % to EU-27 average	55.17%	59.15%	67.06%	1.22	1.13
EU-12: nominal mean standard deviation in Euros	13590	14749	14582	1.07	0.99
EL-12: relative mean standard deviation in % to EU-27 average	73.10%	68.22%	55.62%	0.76	0.82

Source: Eurostat on-line database 2009, calculated and compiled by author.

In table 8 economic regional development imbalance assessments calculated using standard deviations in interstate GDP per capita in PPP prices are from the level as well as the dynamics aspect lower than the assessment results in table 7, which were calculated using GDP per capita in current market prices. When assessed using nominal standard deviation in GDP per capita in PPP prices, the regional dispersion of economic development in the EU-12 group seems stable. Accordingly, the whole EU (EU-27) nominal economic divergence is caused only by the remarkable increase of disparities in the EU-15 group's level of regional economic development. According to the relationship of standard deviation GDP per capita in PPP prices to the EU27 average GDP there has occurred some economic convergence in the EU as a whole, because the remarkable (relative) economic convergence in the EU-12 group more than compensates for the (relative) divergence in the EU-15 group.

When comparing in table 8 the standard deviations in GDP per capita in PPP prices and its dynamics with the arithmetic average regional GDP per capita deviation level and its dynamics given in table 4, we essentially see the same regularities as when we compare the results in tables 7 and 3.

Table 8. Arithmetic mean standard deviation of GDP per capita in PPP-prices in EU member states from the EU-27 average GDP 1999-2008

	1999	2003	2008	Relation 2008 / 1999	Relation 2008 / 2003
EU-27: nominal mean standard deviation in Euros	8169	9192	10915	1.34	1.19
EL-27: relative mean standard deviation in % to EU-27 average	45.89%	44.41%	43.49%	0.95	0.98
EU-15: nominal mean standard deviation in Euros	7418	9035	12110	1.63	1.34
EL-15: relative mean standard deviation in % to EU-27 average	41.67%	43.65%	48.25%	1.16	1.11
EU-12: nominal mean standard deviation in Euros	9020	9384	9204	1.02	0.98
EL-12: relative mean standard deviation in % to EU-27 average	50.68%	45.33%	36.67%	0.72	0.81

Source: Eurostat on-line database 2009, calculated and compiled by author.

In tables 9 and 10 the EU countries' economic development disparity level and dynamics assessments are presented using regional GDP per capita deviations weighted by population shares of the EU member states in the population of the whole EU. In table 9 they are presented in current market prices and in table 10 using PPP prices.

When weighting by the population share of regions the same regularities appear, both when using standard deviation or average deviation. Because small countries are pushed into the background the nominal regional dispersion of economic development is assessed to be smaller in comparison to arithmetical average dispersion. That is why in the EU as a whole seems to be economic convergence when measurements are made using nominal as well as relative indicators. Only in the nominal deviation weighted by population shares of the regions indicator for the EU-12 group we can see any economic divergence – using GDP per capita measured in market prices as well as in PPP prices. When applying the standard deviation in GDP per capita weighted by regions population shares, the assessment on EU regional economic development imbalances delivers the same results for the EU-15 as well as for the EU-12 when using different prices – in the years 1999-2008. A 10% nominal GDP per capita divergence and a 10-30% relative (to EU-27 average level) regional economic convergence there was found.

Table 9. Standard deviation of GDP per capita in current market prices, weighted by population shares of EU member states from the EU-27 average GDP 1999-2008

	1999	2003	2008	Relation 2008 / 1999	Relation 2008 / 2003
EU-27: nominal weighed standard deviation in Euros	8419	9065	9133	1.08	1.01
EL-27: relative weighed standard deviation in % to EU-27 average	47.30%	43.79%	36.38%	0.77	0.83
EU-15: nominal weighed standard deviation in Euros	5781	6049	6269	1.08	1.04
EL-15: relative weighed standard deviation in % to EU-27 average	32.48%	29.22%	24.97%	0.77	0.85
EU-12: nominal weighed standard deviation in Euros	14299	15840	15874	1.11	1.00
EL-12: relative weighed standard deviation in % to EU-27 average	80.33%	76.52%	63.24%	0.79	0.83

Source: Eurostat on-line database 2009, calculated and compiled by author.

Table 10. Standard deviation of GDP per capita in PPP-prices. weighted by population shares of EU member states from the EU-27 average GDP 1999-2008

	1999	2003	2008	Relation 2008 / 1999	Relation 2008 / 2003
EU-27: nominal weighed standard deviation in Euro	5669	6036	6130	1.08	1.02
EL-27: relative weighed standard deviation in % to EU-27 average	31.85%	29.16%	24.42%	0.77	0.84
EU-15: nominal weighed standard deviation in Euro	3555	3730	4065	1.14	1.09
EL-15: relative weighed standard deviation in % to EU-27 average	19.97%	18.02%	16.20%	0.81	0.90
EU-12: nominal weighed standard deviation in Euro	10084	10946	10864	1.08	0.99
EL-12: relative weighed standard deviation in % to EU-27 average	56.65%	52.88%	43.28%	0.76	0.82

Source: Eurostat on-line database 2009, calculated and compiled by author.

In figure 1 we compare four regional imbalance indicators based on GDP per capita in market prices. They describe interstate nominal dispersion of regional GDP per capita in total EU (EU-27) in market prices. When using only the Eurostat indicator – average deviation (from EU-27 average GDP level) weighted by population shares of regions, the regional dispersion

of economic development in the EU seems to be quite stable over time – neither converging nor diverging. All other nominal indicators of regional imbalance point to growing divergence of regional economic development in the EU. The largest is the assessment of the level of divergence in EU interstate economic development based on the indicator of GDP per capita standard deviation (used in logarithm form by Barro and Sala-i-Martin). In international market relations the differences in EU countries' capabilities are therefore perpetually growing.

The regional imbalance assessments obtained when weighting deviations by country's population shares bring out the aspect that nominal differences between EU citizens are in general smaller than the differences between countries as territorial units. As interstate differences (unweighted by population shares of countries) in GDP per capita level seem to increase. The lower value of indicators weighted by population shares of countries compared to values of unweighted indicators shows an obvious movement of the population from lower developed countries to more developed ones.

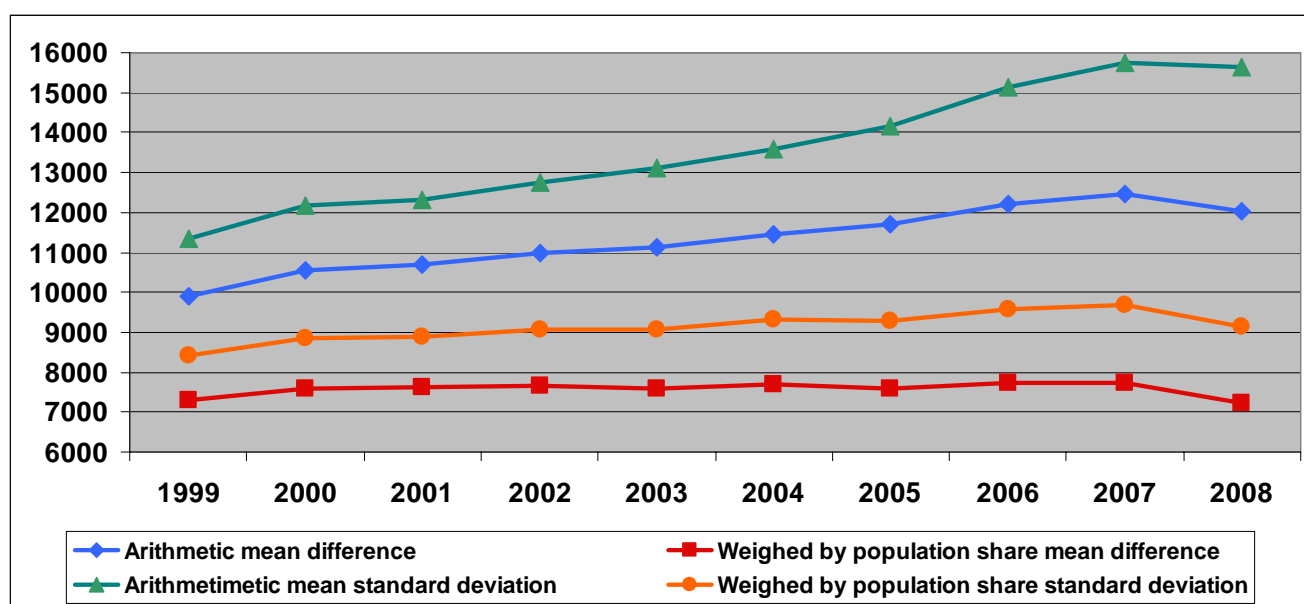


Figure 1. Nominal mean difference of GDP per capita in current market prices of EU-27 member states from EU-27 average GDP (years 1999 - 2008), in Euro.

Source: Eurostat on-line database 2009, calculated, compiled and drafted by author.

Figure 2 informs that the indicators of GDP per capita (in PPP prices) variation between EU countries offers an analogical picture of economic divergence to the indicators of regional dispersion in current market price GDP per capita. At the same time, for all indicators based on GDP per capita in PPP prices dispersion is remarkably lower compared with indicators

based on GDP in current market price per capita. That means that the divergence of EU member state citizens' welfare and a firm's production costs in the EU show the same tendency as the development of disparities in competitiveness of EU countries. In PPP prices assessments of imbalance of nominal levels of regional economic development are smaller when compared to assessments in current market prices.

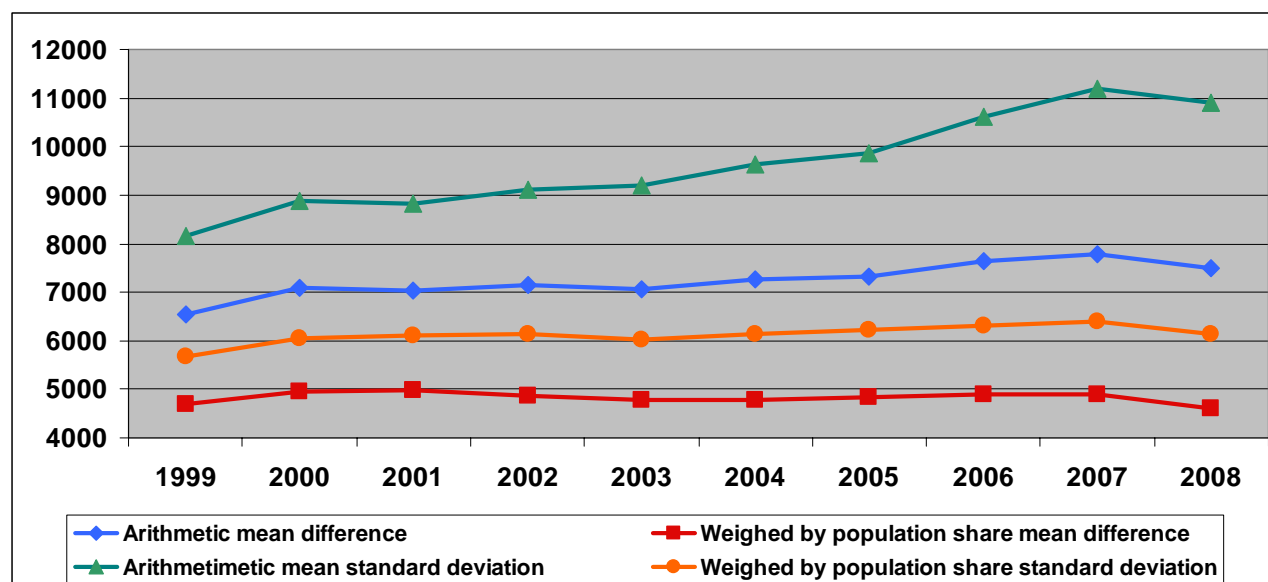


Figure 2. Nominal mean difference of GDP per capita in PPP-prices of EU-27 member states from EU-27 average GDP (years 1999 - 2008), in Euro.

Source: Eurostat on-line database 2009, calculated, compiled and drafted by author.

Figure 3 illustrates different indicators of relative regional economic disparity in the EU derived from GDP per capita in current market prices in relation to the EU-27 average GDP. From this graph we learn that only the standard deviation of GDP per capita changes as quickly as the GDP per capita average level in the EU-27 country group. Such relative indicator values are quite stable over time, varying between 62-64%. According to the other EU-27 indicators describing relative interstate differences in economic development it seems that there is a prevailing permanent (relative) convergence in the EU as a whole. The relative assessments of imbalance are constantly decreasing. With the smallest relative regional economic development dispersion and the fastest decrease in that dispersion is characterised by Eurostat's population weighed indicator. What justifies the usage of the most "optimistic" indicator of regional imbalance as the official Eurostat assessment? An indicator is welcomed to support decisions on how to divide EU regional development support funds and their effectiveness.

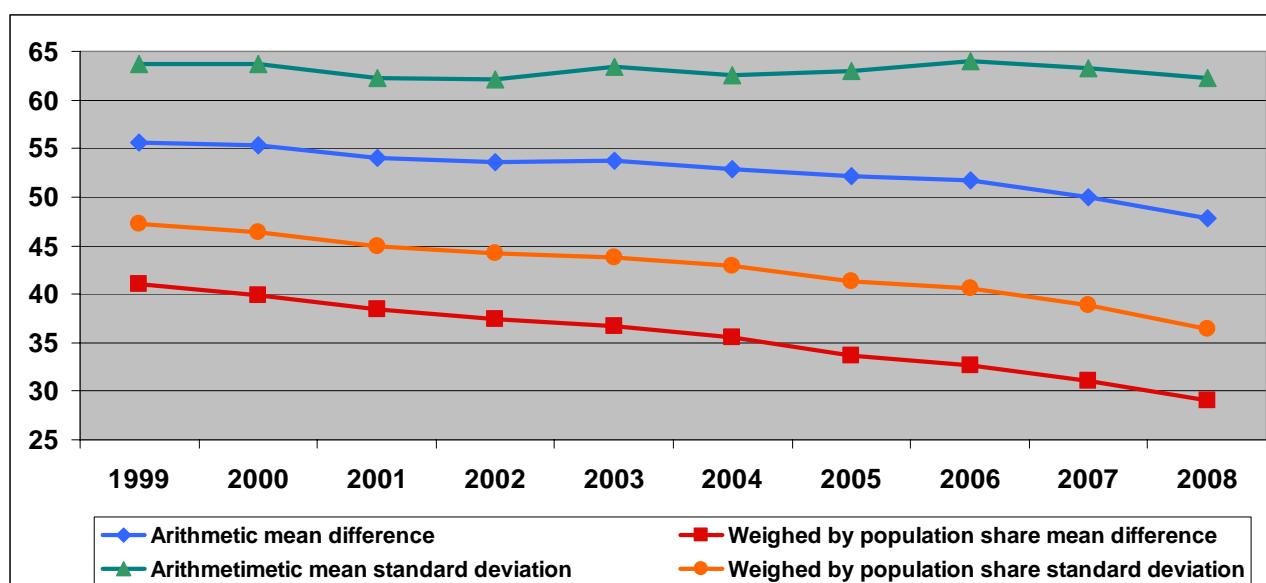


Figure 3. Nominal mean difference of GDP per capita in current market prices of EU-27 member states from EU-27 average in relation to EU-27 average GDP (years 1999 - 2008), in %.

Source: Eurostat on-line database 2009, calculated, compiled and drafted by author.

Figure 4 provides an assessment of EU economic convergence/divergence using regional economic dispersion indicators based on nominal GDP per capita in PPP prices in relation to the EU-27 average GDP. From the dynamics of these relative regional imbalance indicators we see that the EU-27 country set seems to be economically converging in 1999-2008. Those results mean that the relative difference in EU-27 countries' welfare and production costs are decreasing. Imbalance indicators derived from the dispersion in GDP per capita, weighted by population shares of countries, show a lower level of imbalance in relative regional economic development between EU-27 countries. However, a more rapid decrease of imbalance indicator values compared to relative indicators derived from the variation of GDP per capita arithmetic average results. That means that the population share of less developed countries is decreasing as a proportion of the EU total population.

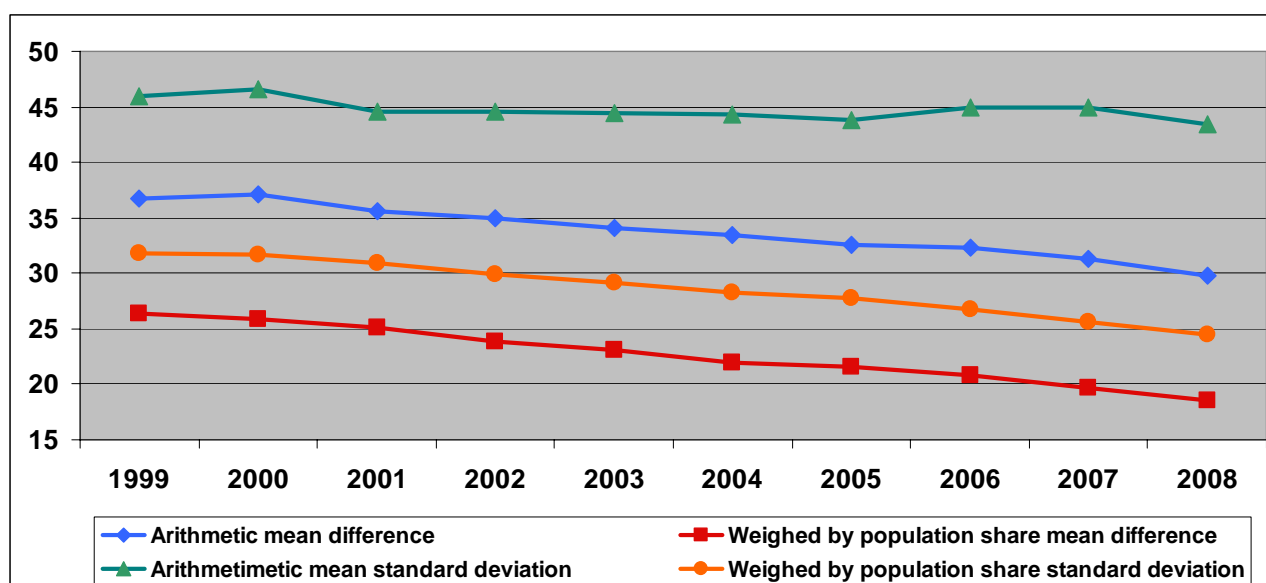


Figure 4. Nominal mean difference of GDP per capita in PPP-prices in EU-27 member states from EU-27 average in relation to the EU-27 average (years 1999 - 2008), in %.

Source: Eurostat on-line database 2009, calculated, compiled and drafted by author.

Besides real growth of the economy, GDP per capita increases also reflect the level of price growth (inflation) impact. Growth in interstate GDP per capita disparities (dispersion) caused by price level growth does not necessarily mean an increase in real economic development differences between countries. Dividing a nominal economic development dispersion indicator with EU-27 average GDP level eliminates the economic growth impact from relative economic development disparities indicators. Essentially, this is not justified, because differences in economic competitiveness are determined through dispersion indicators' nominal (not relative) real differences. So the indicator used by Eurostat "regional dispersion of GDP per capita" and other analogical indicators present an inadequately "positive" or "optimistic" assessment of economic convergence in the EU.

Below, the price level change impact is eliminated from GDP per capita nominal dispersion assessments for different periods. To achieve that, firstly we constructed an EU-27 average GDP level indicator, describing only the price level increase (inflation) impact for the years 1999-2008 based on real GDP per capita in 1999. This was achieved through the division of nominal values of GDP per capita by GDP real growth rates (see table 11).

Table 11. EU-27 average nominal GDP per capita and inflation determined level in 1999-2008

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
GDP per capita average nominal level in market prices	17800	19100	19800	20500	20700	21700	22500	23600	24900	25100
GDP real growth rate in relation to year 1999	1	1.04	1.06	1.07	1.09	1.11	1.14	1.17	1.21	1.22
GDP per capita inflation determined level (base year – 1999)	17800	18383	18683	19114	19053	19486	19809	20133	20643	20644

Source: Eurostat 2009, calculated and composed by author.

The indicator describing comparable relative convergence/divergence is obtained by dividing nominal regional economic development dispersion assessments by EU-27 average GDP per capita values, reflecting only the price growth impact.

From figure 5 we see that after neutralizing the price growth impact, (but remaining real economic growth impact) relative indicators of regional imbalance give a completely different picture of regional dispersion dynamics in EU-27 interstate economic development when compared to indicators calculated from the relation to EU-27 average GDP per capita in current market prices:

- the interstate GDP per capita relative dispersion dynamics on the base of nominal arithmetic mean deviation shows stability of regional economic development, but indicators without inflation impact reflect a clear growth tendency (divergence);
- dynamics of relative indicator weighted by population shares of countries, based on standard deviation and elimination cleaned from the price growth impact must be considered as stable in the selected years (a small decrease has occurred only in the year 2008);
- only the population weighted average deviation indicator dynamics show a tendency to decrease after removing the impact of inflation.

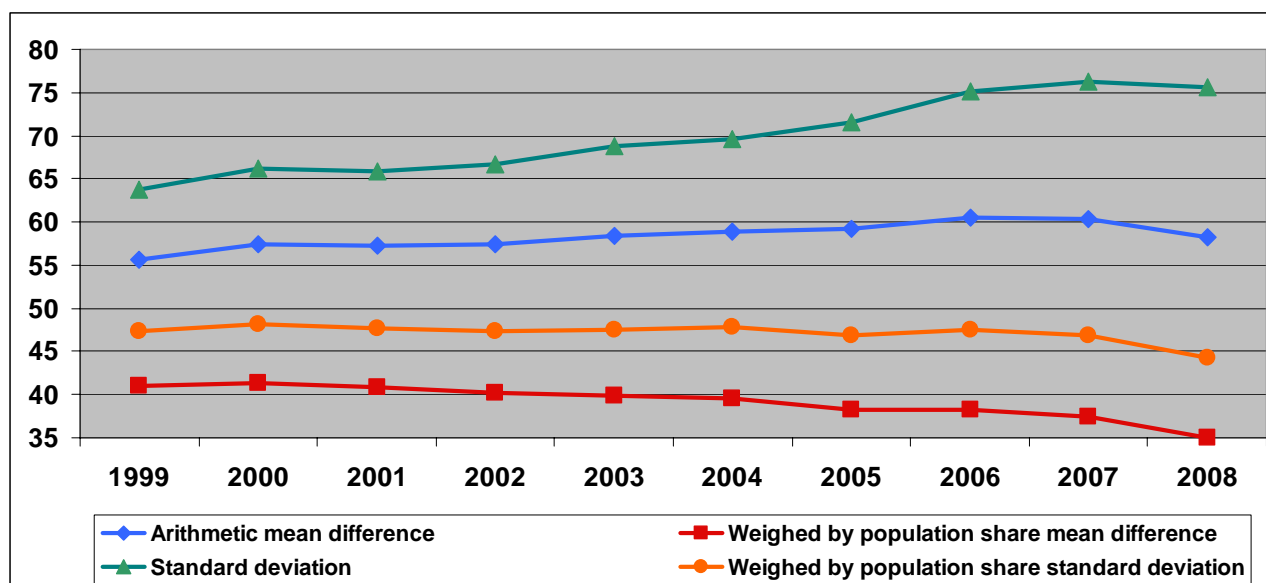


Figure 5. Nominal mean difference of GDP per capita in current market prices in EU-27 member states from the EU-27 average in relation to the EU-27 average without price level impact (years 1999 - 2008), in %.

The results presented above do not correspond with the statement of the European Commission that “real convergence between countries has been achieved in Europe” (Stierle-von Schütz et al. 2008: 11). The dynamics of different indicators of regional disparities in GDP per capita present a controversial picture. This complex empirical assessment provokes talks about territorial economic divergence between member states of the EU, however, the differences between the inhabitants’ economic environment have been decreased over the last decade.

Summary

The assessment of the level and dynamics of regional disparity in economic development is a complicated task, even when we use only GDP per capita as base for this purpose:

- Different GDP per capita measuring possibilities must be taken into account: in current market prices and using PPP prices.
- For measuring nominal differences in interstate GDP per capita there are several possibilities: absolute differences between countries with extreme values; arithmetic average deviation or standard deviation from the average level in a selected set of regions; arithmetic average deviation or standard deviation weighted by population shares of the regions in a selected set of regions.

- In order to get comparable economic development assessments for different countries the nominal imbalance indicator in relation to a specific country's average GDP per capita level can be used. Commonly (in Eurostat official statistics) the average level of GDP per capita in current market prices is used to calculate ratios. Such a relative indicator of regional imbalance in economic development does not suit the description of dynamics in regional dispersion of economic development, as the elimination of real growth of the economy from dispersion dynamics in economic development of regions is not justified. In this research relative indicators are suggested for describing the regional imbalance dynamics in economic development, whereby the EU average GDP per capita dynamics were used as base for calculating relative indicators, from which the price growth (inflation) impact was then removed so that they reflect only the real economic growth impact.

The assessments of EU-27 countries' economic convergence/divergence are contradictory in cases where different indicators are used for describing economic regional development imbalances. The results of empirical analysis highlight the multidimensional character of the phenomenon of regional economic convergence/divergence, especially if only GDP per capita serves as base for assessment. Some rare cases signal economic convergence in the EU, but in others divergence is still occurring. It is not justified to use a single specific indicator (for instance official Eurostat indicator) for making decisions concerning regional policy or programs and assessing their results. Eurostat uses as a regional imbalance indicator base. An assessment results, which measures the dynamics of regional disparities in regional economic development too "optimistically" (convergence friendly). In order to identify regional economic development dynamics, a complex of nominal and relative regional imbalance indicators should be applied.

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