

# The Impact of Convergence on Inequalities in the European Union since 2004

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## Summary

On the basis of a complex methodology, the study shows that territorial disparities in the European Union have been decreasing since 2004, and, at the same time, examines the claim that the intense development and convergence of countries go hand in hand with regional divergences within these countries (at NUTS2 level). The results show that convergence occurred mainly during the recovery phases between crises causing significant downturns, and the development and catching-up tendencies of convergence countries have also contributed to that. While inequalities have been reduced in the EU, there seem to be increasing gaps between countries and regions, with the top performing better and better, while other countries and regions are becoming poorer compared to the average. When examining regional disparities within countries, divergence was mainly found in convergence countries and above-average performers achieving outstanding development.

**KEYWORDS:** catching up, inequalities, EU, convergence

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## Introduction

The study of inequalities, growth and convergence has long been at the forefront of academic debate. *‘Everything develops and evolves through inequalities.’* (Farágó, 2016, p. 118) Convergence can be interpreted in nominal, real, economic policy, policy and institutional terms, as well as at the level of attitudes and opinions (Losoncz, 2016). The two areas that are analyzed most are nominal and real convergence. The former is about meeting the Maastricht criteria by EU countries, while the latter is about reducing the gap with developed countries. The research focuses on the latter, real

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convergence, and basically examines differences in development on the basis of the measure most widely accepted by the academic community, gross domestic product per capita at purchasing power parity. The pace of the convergence of individual countries and their euro area membership are not necessarily correlated. (For more on euro area membership and economic and monetary union, see Ferkel (2020).)

Economic growth is a prerequisite for convergence between territories, which is a measure of catching-up, i.e. covering a certain distance. (Halmai, 2019) Literature tends to use the term ‘catching up’ as a synonym for ‘convergence’, but convergence means getting closer, rather than catching up or surpassing. (Oblath, 2013)

The nature of inequalities has long been debated in international literature. Theories of convergence (such as: Solow, 1956, Barro-Sala-i-Martin, 1991, Ohlin, 1933, Romer, 1994, Lucas, 1988, Todaro, 1997), taking certain factors into account, proclaim that all regions are moving towards a state of equilibrium, but individual views differ about the issue whether development is uniform, or unique in each region. The spatial extension of the models gave rise to divergence theories (see: Myrdal, 1957, Prebisch, 1971), which outline the hierarchy of territories and argue that as territories develop, inequalities – by their very nature – will keep growing. The U-theory (Hirschman, 1958, Friedmann, 1966) is a combination of convergence and divergence theories, and says that the development of territories is fairly different, therefore inequalities tend to increase. However, after reaching a certain point, the innovations and resources that bring progress are spread out in space, thus convergence begins. The origins of the existence of inequalities are addressed by centre-periphery theories, such as the dependency theory (Furtado, 1971, Barant, 1957, Gilbert, 1985, Prebisch, 1971), the concept of unequal exchange (Emmanuel, 1972), the world-systems theory (Wallerstein 1974), the theory of base innovations (Schumpeter, 1934, Hall-Preston, 1988), the theory of regulation (Lipietz, 1986) or the growth pole theory (Paelinck, 1970).

When examining inequalities within countries, Williamson (1965) concluded that the path of development varies regionally, too, and growth initially brings regional divergence within countries, and when a certain level of development is achieved, growth is coupled with regional convergence within countries. International research has been confirmed by domestic research: Nemes Nagy (1987) associated this with a development process (four phases), while in Lackó's (1988) wave model, regional divergence and convergence appear in waning cycles under national growth. According to the trade-off convergence theory, the growth of the national economy is generally associated with an increase in regional income disparities within a country (EC, 2000; Kertész, 2022b).

The framework of cohesion policy in the European Union has so far set conditional convergence as a target (although there is a debate within the EU, too, on the nature of convergence, see for example Kertész (2022a)), as the regions are categorised on the basis of reaching 75 or 90 percent of the average development.<sup>2</sup> In the 2021-2027 budget cycle, the 90% limit has been raised to 100%, thus giving priority to absolute convergence.

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<sup>2</sup> For more on the categorisation of regions, see Kengyel (2020)

## Objective

Academic and EU cohesion research shows that territorial disparities in the European Union are decreasing. The study uses a complex methodology to examine this in the period since the largest ever enlargement of the EU, and, at the same time, analyses the catching-up trends of convergence countries in terms of NUTS2 regional inequalities within countries, which are particularly important in the field of cohesion policy. The basic assumption is that intense development and convergence lead to divergence between regions, as the most advanced regions achieve the most significant development.

## Method

The NUTS2 regional dataset is available in the Eurostat database until 2020<sup>3</sup>, so the time horizon of the research is 2004-2020.

Relative standard deviation compares the value of the standard deviation to the mean, which gives a dimensionless measure (usually represented as a percentage).

$$V = \sigma / \bar{x}$$

Sigma ( $\sigma$ ) convergence is a measure based on standard deviation, indicating that inequalities decrease over time if the standard deviation calculated from log GDP per capita data (which can significantly reduce the bias of outliers) shows a decreasing trend (Sala-i-Martin, 1996):

$$\sigma_t < \sigma_o$$

Beta ( $\beta$ ) convergence predicts the time of catching-up, which implies the assumption of absolute convergence as explained in Solow's theory (Halmai, 2014). It is calculated using logarithmic (log-log type) regression equation estimation (Barro-Sala-i-Martin, 1991, Sala-i-Martin, 1996).

$$\gamma_{i,o,t} = \alpha + \beta \ln y_{io} + \varepsilon_i$$

- ▶ where,  $\gamma_{i,o,t}$  is the change in average gross domestic product of the  $i$ -th economy over the period under consideration, calculated as  $\gamma_{i,o,t} = (\ln(y_{it}/y_{io}))/t = \Delta \ln y_i$
- ▶  $y$  denotes gross domestic product
- ▶  $a$  constant term
- ▶  $\beta$  regression coefficient
- ▶  $\varepsilon_i$  error term (with zero expected value)
- ▶  $o$  base period
- ▶  $i$  is the index for the country

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3 In December 2022, from the Eurostat database, the updates of 23 March 2022 were used for national data and the updates of 18 April 2022 for regional data as the basis of the analysis.

If  $\beta < 0$ , there is absolute convergence.

Sala-i-Martin (1996) points out that  $\beta$  convergence can be found without  $\sigma$  convergence, too, so  $\beta$  convergence is a necessary but not sufficient condition for  $\sigma$  convergence.

It should be noted here that  $\beta$  convergence has been widely criticised (see for example: Friedman, 1992, Quah, 1993, Bernard-Durlauf, 1996, Laurini, 2007). Dedák-Dombi (2009), however, point out that the post-socialist countries are now full members of the EU, which ensures the free flow of factors of production and technology, which means that the Solow model, which assumes the same rate of technological progress in the future, can play an important role in the analysis of growth processes.

As to growth, it should also be noted that some countries are experiencing «overheated» growth, i.e. the growth of the GDP exceeds potential output by far, which is not sustainable in the long run and could therefore affect future development paths.

A histogram is also produced to illustrate the convergence of countries and regions (5 divisions at Member State level and 13 at NUTS2 level, with the mean of the intervals shown in the graph). The histogram (and the image of the density function estimated from it) shows the convergence of territorial units when comparing functions produced at different points in time. The territorial development of an ideal economy follows a normal distribution. Plotting a histogram also helps us to understand that mean and standard deviation type measures can be highly affected by abnormally low or high values, so their use is appropriate when the data is close to a normal distribution (Sitthiyot-Holasut, 2020), otherwise other inequality indicators need to be involved in the examinations.

The 20/20 rate, also known as the income quintile rate, which compares the average of the richest 20% of the population with the average of the poorest 20% (5-5 countries and 48-48 NUTS2 regions).

The Palma ratio, based on the empirical observation of economist José Gabriel Palma, is the share of the top 10 percent relative to the bottom 40 percent (3-11 countries and 24-97 NUTS2 regions) (Cobham et al., 2015). Palma's observations were essentially based on the GNI indicator, but can nevertheless be applied to the GDP of the territories, too, when examining inequalities.

Of the indices that show the variation in regional distributions, the Gini index and the Hoover index are the most commonly used. Both indicators, together with the Lorenz curve, are different indices of the same method (see: Nemes Nagy, J. Of the three indicators, the Hoover index is worked out, it is also known as the Robin Hood index (hereafter referred to as the Robin Hood index) or the Pietra ratio when the GDP and the population are examined<sup>4</sup>. Calculation (Nemes Nagy, 2005):

$$h = \frac{\sum_{i=1}^n |x_i - f_i|}{2}$$

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4 Because of the weighting by population, the income data in the Robin Hood index (and the Theil index) are GDP figures at purchasing power parity, and not per capita values.

- ▶ where,  $x_i$  is the share of the income of a country/region within the total income (expressed as a percentage),
- ▶  $f_i$  is the share of the population of a country/region within the total population (expressed as a percentage),
- ▶  $n$  is the number of countries/regions.

The Robin Hood index can be interpreted as the proportion of income that needs to be transferred from above-average regions to below-average regions to achieve an equal distribution. Value set  $(0, 100 - \min f_i)$  (Costa-Pérez-Duarte, 2019; Nemes Nagy, 2005).

For the concentration of income shares, a concentration (Hirschman-Herfindahl) index can be calculated, which measures absolute concentration. The value set of the indicator is the  $[1/n, 1]$  interval, where the maximum is reached when all income is concentrated in a single hand (area) and the minimum is reached when it is completely evenly distributed. Calculation (Major-Nemes Nagy, 1999):

$$K = \sum \left( \frac{y_i}{\sum y_i} \right)^2$$

The main weakness of the Gini coefficient and the Hoover index is that they cannot distinguish between different types of inequality. The Lorenz curves may cross each other, reflecting different patterns of income distribution, but, in spite of that, they produce very similar values. (Sitthiyot-Holasut, 2020)

For the analysis of inequalities, a key advantage of the Theil-index, the entropic method taken from information theory, is that it allows us to break down inequalities within a sample into inequalities between and within groups. Calculation (based on Conceição-Ferreira (2000), with own notation):

$$T = \sum_{i=1}^m \left[ \frac{y_i}{Y} \ln \left( \frac{\frac{y_i}{Y}}{\frac{n_i}{N}} \right) \right]$$

- ▶ where  $y_i$  is the total income of the given country,
- ▶  $Y$  is the total income of the European Union,
- ▶  $n_i$  is the population of the given country,
- ▶  $N$  is the population of the European Union,
- ▶  $m$  is the number of countries.

Breakdown of the Theil index:

$$T = T^b + T^w$$

- ▶ where  $T^b$  is the inequality between countries,
- ▶  $T^w$  is the (regional) inequality within countries.

Its value set is the  $[0; \ln n]$  interval.

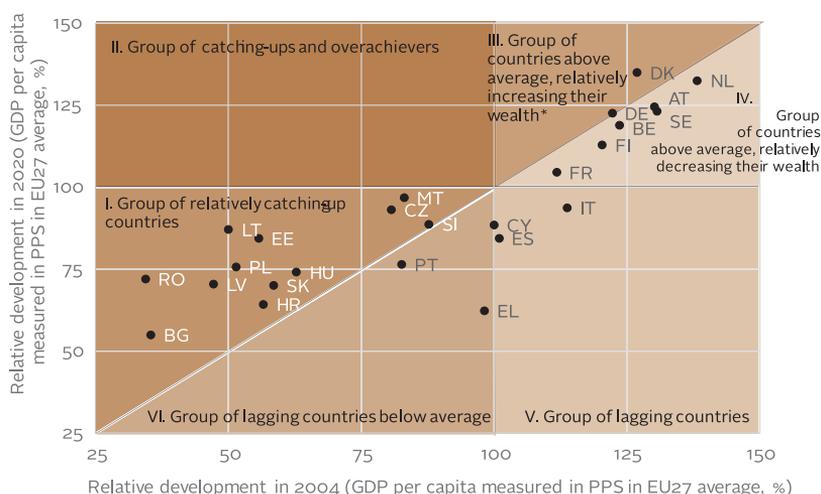
When testing whether the development of countries depends on their initial level of development, a regression equation estimation is used for the levels of development at the beginning and end of the examined period between countries. Based on the best-fitting lines plotted in the test, in addition to the linear trend line, the

exponential also explains the co-movement of the data under investigation to a similar extent, so both regression estimates are analysed.

## Results

In order to review the convergence path of each country, it is necessary to compare the relative development levels at the two end points<sup>5</sup> of the period under review.

**Figure 1: The development path of EU countries between 2004 and 2020 in terms of relative development (GDP per capita at PPS, measured in euro EU average, %)**



Source: Based on Eurostat database (2022a), own calculation and editing<sup>6</sup>

\* Ireland (150;209), Luxembourg (249;263) – not shown because of their outliers

Figure 1 shows where the Member States got by 2020 compared to their 2004 development levels. Countries not reaching 100% by 2020 are the catching-up or convergence countries. Above the diagonal are countries with above-average growth, and below the diagonal are countries with below-average growth. Based on this breakdown, the EU countries can be divided into groups (see map in Figure 2)<sup>7</sup>.

<sup>5</sup> Naturally, if other periods are taken into account, different results are obtained.

<sup>6</sup> Country abbreviations according to ISO 3166-1 alpha-2.

<sup>7</sup> Based on a presentation by Gábor Oblath on Macrostatistics in January 2011, in the framework of the TÁMOP-4.1.2-08/2/A/KMR-2009-0041 grant project. Content development at the Department of Economics of the Faculty of Social Sciences of ELTE University, in cooperation with the Institute of Economics of the Hungarian Academy of Sciences and the Balassi Publishing House.

Group I is the group of countries *achieving relative convergence*, they started from a below-average level of development and made above-average progress over the period, so they re now approaching the mean, but did not reach it by 2020 (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia).

Group II is the group of countries *catching-up with and outperforming* other countries, they started from a below-average level of development and reached an average or above-average level of development (no EU country is included in this group for the period under review).

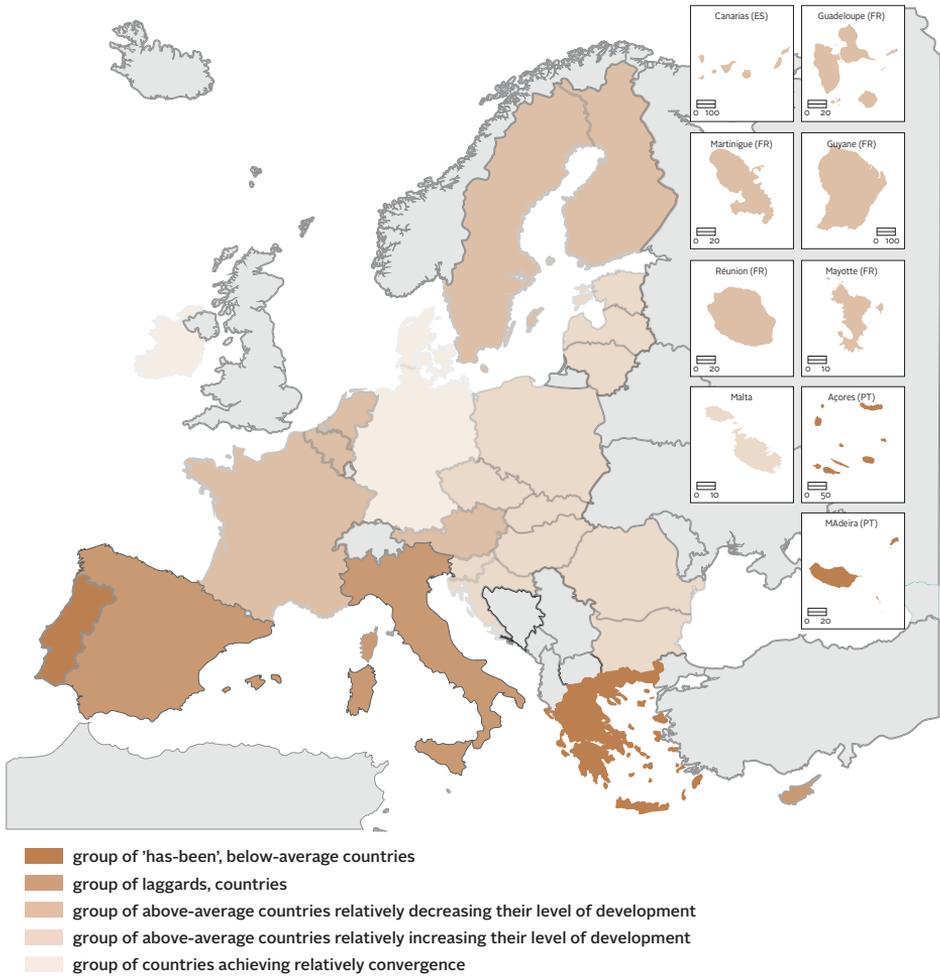
Group III is the group of *above-average* countries *relatively increasing their level of development*, starting from an above-average level of development and then improving above the average to an even higher level of development (Denmark, Ireland, Luxembourg, Germany).

Group IV is the group of *above-average* countries *relatively decreasing their level of development*, they started from an above-average level of development, grew slightly less than the average, but were still above the average at the end of the period (Austria, Belgium, Finland, France, the Netherlands, Sweden).

Group V is the group of *laggards*, countries that started from above-average levels of development, grew less than the average and thus slipped to below-average levels by the end of the period (Cyprus, Italy, Spain).

Group VI is the group of '*has-been*', *below-average* countries, which started from a below-average level of development and grew below the average, thus slipping to an even lower level of development by the end of the period (Greece, Portugal).

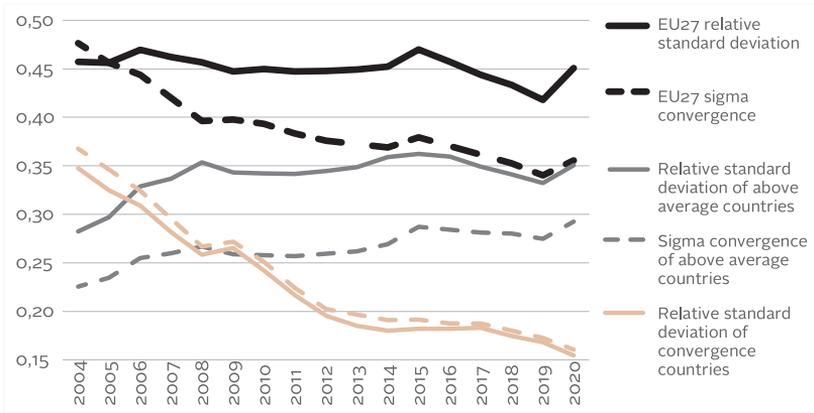
**Figure 2: EU Member States on the basis of the 2004-2020 convergence path**



Source: Based on Eurostat database (2022a), own calculations, own editing with Gisco

The map clearly shows the faster growth rates and convergence tendencies of the new Member States (that acceded in 2004 and after) and the lagging behind of the old southern countries (that acceded before 2004).

**Figure 3: Relative deviation and  $\sigma$  convergence of gross domestic product per capita at purchasing power parity of the European Union Member States, in euro, 2004-2020**

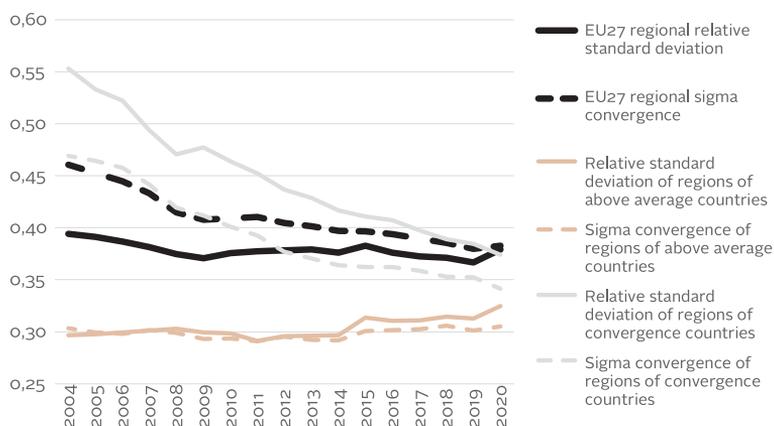


Source: Based on Eurostat database (2022a), own calculation and editing

Looking at the relative deviation across the EU27, it is clear that inequalities between countries declined slightly from 2004 to 2020, but this is due to improving trends in the years preceding the two crises that caused large downturns, i.e. the periods of 2006-2009 and 2015-2019. When analysing  $\sigma$  convergence, we can see that countries drew closer to one another, with the only periods of no convergence being 2008-2009, 2014-2015 and 2019-2020.

If we split the population into two groups, the above-average performers and the convergence countries, we can see an interesting difference in the trend of convergence and regarding global crises. For the above-average performing Member States, the values of the examined indicators increased significantly between 2004 and 2020, while in the group of convergence countries, the values decreased sharply (by more than half), actually dropping below the values of above-average performers. For convergence countries, the crisis of 2008-2009 broke the significant progress that had been achieved until then, so between 2008 and 2009, based on relative deviation and sigma convergence, the differences widened, while above-average performers witnessed a slight convergence instead of divergence. The 2012-2013 sovereign debt crisis and the 2020 coronavirus crisis had the opposite effects; while for convergence countries, deteriorating performance led to convergence, for above-average performers the decline caused significant divergence.

**Figure 4: Relative deviation and  $\sigma$  convergence of gross domestic product per capita at purchasing power parity for NUTS2 regions in the European Union, in euro, 2004-2020**



Source: Based on Eurostat database (2022a), own calculation and editing

For the NUTS2 regions, Figure 4 shows that relative deviation has decreased overall, but convergence occurred in stages, mostly until 2009 and between 2015 and 2019. Inter-regional  $\sigma$  convergence was strong until 2009, then not visible for two years, then – albeit at a slower pace – visible again, and disappeared in 2020, but considering the whole period,  $\sigma$  convergence is significant.

If we look at convergence in two groups in the case of NUTS2 regions, too, the regions of Member States with above-average performance and the regions of convergence countries show different results. Over the period under review, the regions of above-average performing Member States show divergence overall – similarly to the convergence between countries – while the regions of convergence countries show significant convergence. So, for the NUTS2 regions, it is also the development and convergence path of the convergence countries and their regions that causes convergence within the Union.

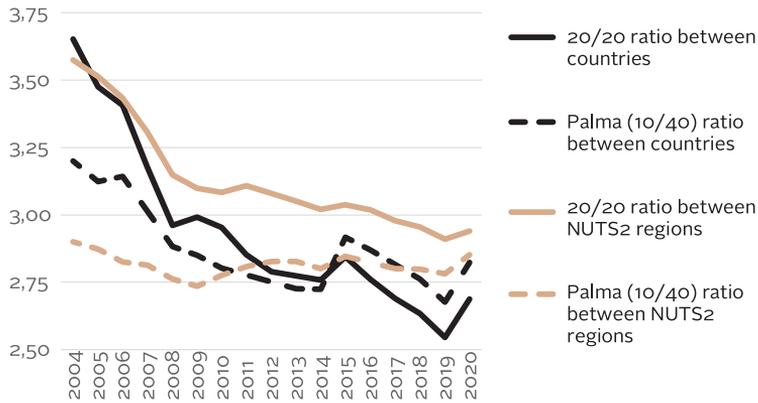
Beta convergence testing shows convergence between 2004 and 2020 for the 27 EU countries<sup>8</sup>. It should be noted, however, that the value of the coefficient of multiple determination ( $R^2$ ) is not too high, so the predictive ability of the model is limited. From the beta convergence, it is possible to estimate the catching-up time for each country, so, for example, based on the model obtained and the 2004-2020 period, *ceteris paribus*, Estonia will reach the EU average in 2024, Lithuania in 2025, Malta and Romania in 2026, the Czech Republic in 2030, Poland and Latvia in 2032, Slovenia in 2041, Bulgaria in 2042, Croatia in 2044, Hungary in 2049 and Slovakia

8 The equation of the resulting regression line is:  $y = -2.5412x + 28.1$ , where  $R^2 = 0.4679$

in 2056. Testing shows  $\beta$  convergence between NUTS2 regions, too<sup>9</sup>. However, the value of the coefficient of multiple determination ( $R^2$ ) is low, so the predictive ability of the model is limited.

When testing whether the development of countries and regions depends on the initial level of development, we used a regression equation estimation drawn for the values of the development levels at the beginning and at the end of the period under study for the countries and NUTS2 regions. Analysing the period 2004-2020, the coefficient of multiple determination ( $R^2$ ) of the linear regression line for the development of the Member States is high, while the explanatory power of the model is 81.0 percent, from which the coefficient of multiple correlation ( $R=0.9001$ ) is calculated, indicating a strong co-movement of the actual and the model-estimated GDP<sup>10</sup>. The relationship is even stronger when exponential equation estimation is used. The regression equations for the development of regions are similar.<sup>11</sup> This means that the development of EU countries and regions depends to a large extent on their starting position: the lower the starting point, the more difficult it is for a country/region to catch up, and the higher the starting point, the more capable it is of developing. This, at the same time, draws attention to the need to treat beta convergence with caution, as its underlying assumption is that economies starting from a lower level can grow faster.

**Figure 5: Changes in income quintile and the Palma rate for EU-27 and NUTS2 regions (based on GDP per capita at PPS, euro), 2004-2020**



Source: Based on Eurostat database (2022a), own calculation and editing

9 The equation of the resulting regression line is:  $y = -2.0613x + 22.708$ , where  $R^2 = 0.3183$

10 Estimates for 2004-2020: the equation of the regression line:  $y = 1.2518x + 5216.2$ , where  $R^2 = 0.8101$ , and the exponential equation is:  $y = 14637e3E-05x$  where  $R^2 = 0.8111$

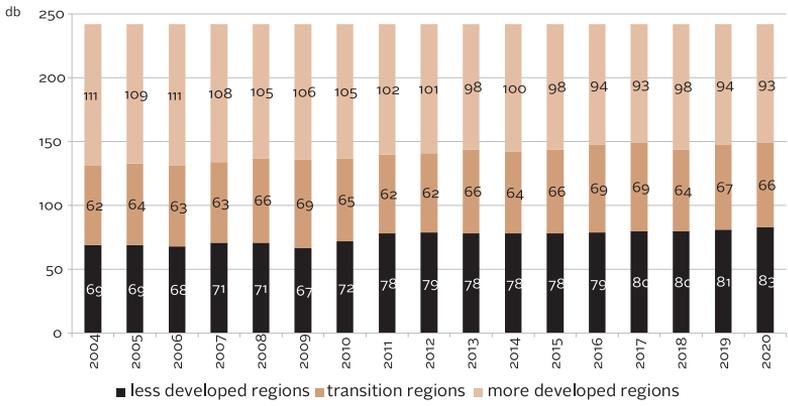
11 Equation of the regression line for regions of NUTS2 level:

$y = 1.1662x + 4471.6$ , where  $R^2 = 0.7382$ , and the exponential equation is:  $y = 11727e4E-05x$  where  $R^2 = 0.7435$

The income gap between the top and bottom 20 percent of the EU-27 decreased significantly overall over the period (from a 3.65-fold difference to a 2.68-fold difference), with much of this improvement coming from the 2004-2008 and 2015-2019 periods. In comparison, the income share of the top 10 percent and the bottom 40 percent decreased less over the period under review (from 3.20-fold to 2.89-fold differences), and has exceeded the 20/20 rate since 2015. At NUTS2 regional level, the trend is similar, with rates showing convergence between regions over the period. There was a significant convergence regarding the 20/20 rate between 2004 and 2008, followed by a gradual slow convergence, with some divergence in some years, but with values below threefold differences in the last 4 years under review. There was significant convergence in the share of the bottom 40 percent of the top 10 percent between 2004 and 2009, which was followed mostly by divergence. It is also worth noting that over the period, the values of the rates studied decreased more at national level than at regional level, with national values falling below regional values for both rates studied.

In 2022, the EU-27 has 242 NUTS2 regions. Of these, 230 regions had an increase in GDP per capita at purchasing power parity between 2004 and 2020, of which 108 regions had above-average growth (including all regions of the countries that acceded in 2004 and afterwards, except for the region of Cyprus and one Czech region (CZO4 Severozápad)).

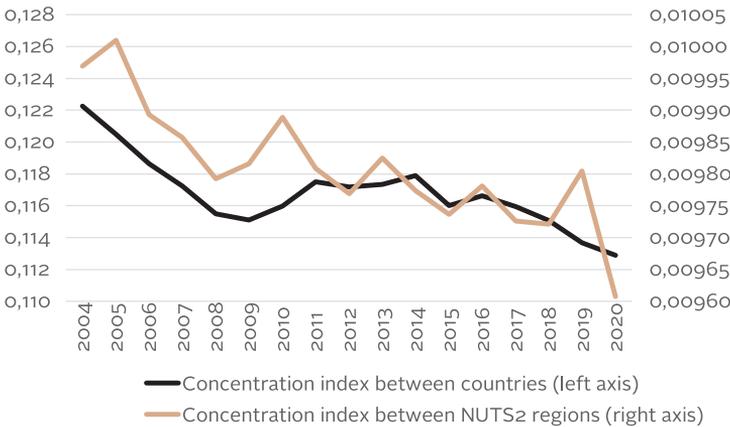
**Figure 6: Cohesion policy classification of the NUTS2 regions of the European Union in the rules for the 2021-2027 budget cycle and its evolution in terms of number of items (pieces) between 2004 and 2020**



Source: Based on Eurostat database (2022a), own calculation and editing  
 Note: To ensure comparability, the regions of the Member States that acceded in 2007 and 2013 have been included in the dataset since 2004.

Figure 6 shows that the number of developed regions is decreasing, while the number of transitional and developing (lowest level) regions is increasing. As a result of raising the threshold from 90 to 100 percent for developed regions, much more regions will fall into the category of transitional regions; for example, in 2020, there are one and a half times more transitional regions. In the 17 years under review, two regions with outstanding development (the Lithuanian and Romanian capital regions) have moved from being developing to developed regions, and the Bulgarian capital region has crossed the 90% threshold considered in the 2014-2020 budget cycle. Malta (as a single-region country) has moved from a transitional region to a developed region, although it remained below the 100 percent threshold in 2020, but it is expected to exceed it again from 2022. Eight regions; four Czech, four Estonian, one French and two Polish regions have managed to reach higher levels and have gone from less developed to transitional regions. Most of the regions that have slipped down are Greek, French and Spanish, with some Italian, Belgian, Portuguese, Cypriot and one Irish region(s). The growth of the EU average is mainly driven by the most developed regions (e.g. around capitals), leaving other regions «sliding down» compared to the average and some regions falling behind.

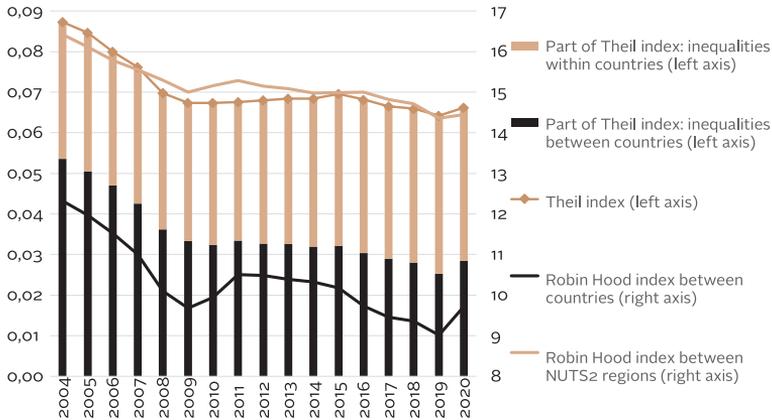
**Figure 7: Concentration index values for the inequality of performance (GDP in PPS terms, in euros) of the EU-27 (left axis) and NUTS2 regions (right axis) between 2004 and 2020**



Source: Based on Eurostat database (2022b), own calculation and editing

The territorial concentration of income has declined over the period, both nationally and regionally, so the concentration index shows an overall reduction in inequality. At the national level, the value set of the index is the [0.037;1) interval, while at the NUTS2 level it is the [0.004;1) interval.

**Figure 8: Theil index and its decomposition (left axis) and Robin Hood index (right axis) values for inequality in performance (GDP at PPS, euro weighted by population) of the EU-27 countries and NUTS2 regions between 2004 and 2020**



Source: Based on Eurostat database (2022b; 2022c) own calculation and editing

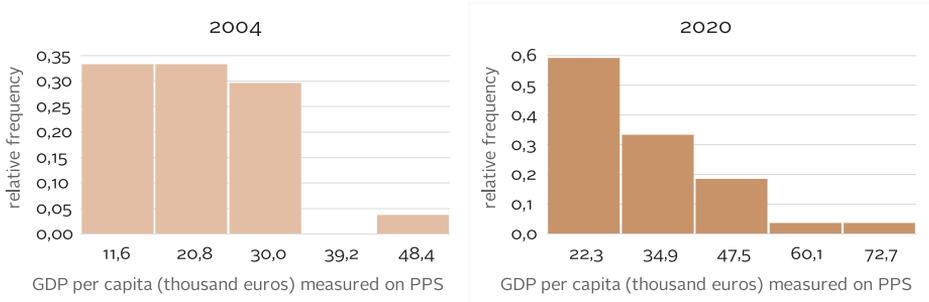
The Robin Hood Index<sup>12</sup> shows that inequalities fell both nationally and regionally from 2004 to 2020. At the national level, while in 2004 more than 12 percent of the income should have been transferred from above-average to below-average territories to achieve equal distribution, in 2020 this figure dropped below 10 percent. At NUTS2 level, in 2004, 16.5% of the income should have been redistributed to achieve equality, but in 2020 it should have been only 14.5%. The largest decline in inequalities was experienced between 2004 and 2009.

According to the Theil index<sup>13</sup>, between 2004 and 2020, territorial disparities at both national and regional level decreased, with the largest contribution coming from the high convergence between 2004 and 2009. Following accession in 2004, the then <new> Member States achieved significant convergence, which was interrupted by the crisis. Thereafter, there was a steady decline – albeit at a much slower pace than before – between 2015 and 2019. The decomposition of the Theil index indicates a shift: while at the beginning of the period under review, the bulk of inequalities in the European Union (over 60%) was caused by differences between countries, at the end of the period under review, the bulk (almost 60%) was caused by inequalities within countries. It also shows that regional convergence in the EU has been accompanied by an increase in inequalities within countries.

12 The index values at national level are [0;99,999], while at regional level they are [0;100,00]

13 Index values at national level are [0;3,296), at regional level they are [0;5,49)

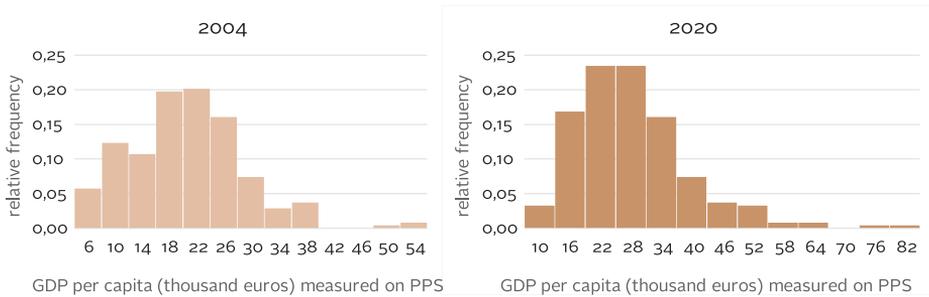
**Figure 9: Histogram of the 27 EU Member States in 2004 and 2020 based on GDP per capita at PPS (euro)**



Source: Based on Eurostat database (2022a), own calculation and editing

The histograms show that neither at the beginning, nor at the end of the period under review did the national values approach the normal distribution. However, while in 2004 the distribution was relatively balanced in the middle and lower categories, in 2020 nearly 60 percent of countries were in the poorest category, and the data actually show an exponentially decreasing function. Based on that, inequalities between countries have increased.

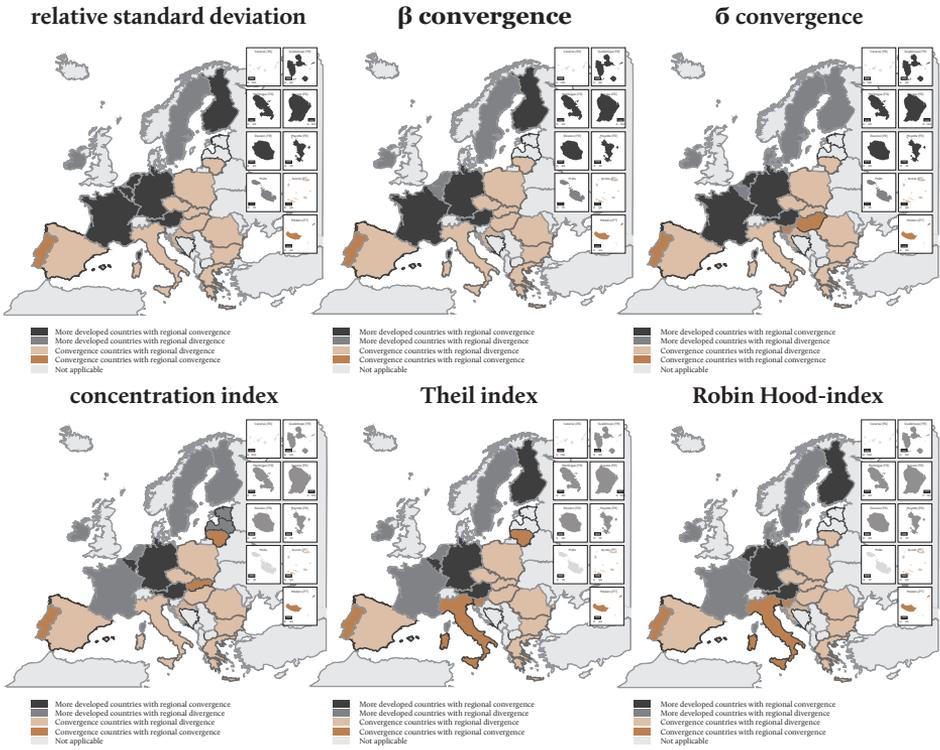
**Figure 10: Histograms of EU NUTS2 regions in 2004 and 2020 based on GDP per capita at PPS (euro)**



Source: Based on Eurostat database (2022a), own calculation and editing

At NUTS2 level, a comparison of the histograms shows that the top regions are leaving the other regions behind more and more, while the other regions are becoming poorer compared to the average, i.e. a kind of divergence can be observed between 2004 and 2020. A slightly positive feature is the reduction in the ratio of regions at the bottom of the range, with more of the poorest regions catching up.

**Figure 11: Existence of regional convergence/divergence (from 2004 to 2020) at NUTS2 level within the EU27 Member States,<sup>14</sup> based on the indicators examined**



Source: Based on Eurostat database (2022a,b,c), own calculations, edited with Gisco

In the below-average performing, i.e. convergence countries, the relative deviation between regions decreased only in Portugal and Slovenia between 2004 and 2020, and these countries had beta convergence with stronger explanatory power, too. In addition to these two countries, Hungary had sigma convergence. Regional disparities within countries decreased over the period under review for Portugal, Lithuania and Slovakia according to the Concentration Index, for Italy, Portugal, Lithuania and Slovenia according to the Theil Index, and for Italy, Portugal and Slovenia according to the Robin Hood Index. All in all, regional convergence within the country was observed for Portugal, which is gradually falling behind in terms of

<sup>14</sup> For the Theil index and the Robin Hood index, data missing from Eurostat database (DK 2004-2006, DED4 – Chemnitz, DED5 – Leipzig, IE 2004-2011, FRY1 – Guadeloupe, FRY5 – Mayotte, HR, PL 2004-2013, SI 2004-2007) are excluded.

GDP performance, and Slovenia, which is catching up, although only in two NUTS2 regions, for most of the indicators examined.

In six countries (Austria, Belgium, Finland, France, Germany, Germany, the Netherlands), the relative deviation between regions in countries with above-average performance shows a decrease between 2004 and 2020. Beta convergence (with a relatively stronger compliance) occurred in four countries (Austria, Finland, France, Germany). Sigma convergence occurred in five countries in total (Austria, Finland, France, Germany, and the Netherlands) over the examined period. Regional disparities within countries have decreased for Austria, Belgium and Germany according to the Concentration Index, for Austria, Belgium, Finland and Germany according to the Theil Index and for Austria, Finland, the Netherlands and Germany according to the Robin Hood Index. Overall, we can say that above-average performers experienced a proportionally higher degree of regional convergence between 2004 and 2020 than the convergence countries. Of the nine countries with above-average performance, based on the majority of indicators examined, regional convergence decreased in four countries (Austria, Finland, the Netherlands, Germany), and based on half of the indicators examined, it declined in Belgium and France, too. However, in the case of two of the three countries with above-average growth (Denmark and Ireland), where regional disparities within the country clearly increased, it should be noted that their performance over the period was above the EU average, i.e. they achieved relative development.

## Conclusions

Based on the examinations presented in the study, territorial disparities (based on GDP per capita at PPS) in the European Union decreased at both national and NUTS2 regional level between 2004 and 2020, but convergence mainly occurred during the recovery phases between crises causing major downturns, until the global financial and economic crisis of 2008-2009 and during the period 2015-2019. During the period under review, the development and catching-up trends in convergence countries and their regions (especially in the 4-5 years following accession) were the causes of convergence within the Union. It has been found that the development of EU countries and regions depends to a large extent on their starting position; the lower a country/region starts from, the more difficult it is to catch up, and the higher a country/region starts from, the more it is able to develop.

The analysis shows that although inequalities in the European Union have been reduced, there is a certain degree of divergence between countries and regions, with the top leaving the rest of the countries and regions behind and the rest of the countries becoming poorer than the average. The growth of the EU average is mainly driven by the most developed regions, leaving other regions <sliding down> compared to the average and some regions definitely falling behind. During the period under review, the number of less developed regions increased, while the number of developed regions decreased. The problem of lagging behind is illustrated by the fact

that the share of countries in the top 20 and bottom 20 percent has been exceeded by the share in the top 10 and bottom 40 percent since 2015. The decomposition of the Theil index also showed a shift, with a large share of inequalities in the European Union at the beginning of the period being caused by differences between countries, but by 2020 a large share was caused by inequalities within countries.

The second hypothesis of the study – that the high degree of development and convergence of countries is associated with regional divergence within countries (at NUTS2 level) – has been confirmed. Based on the indicators examined, the majority of the convergence countries showed a regional divergence within the country between 2004 and 2020. The above-average performers showed proportionally higher levels of regional convergence.

The extensive analysis of changes in inequalities has pointed out that in the course of spatial planning, support should be provided not only to the least developed regions, but rather to those in the bottom 40 percent, and that reliance on the development of central regions will only escalate territorial inequalities. Higher levels of development can only be achieved through territorially balanced growth, for which, in addition to convergence between Member States, it is of paramount importance to move towards convergence within Member States, so countries should put even more emphasis on the development of regions lagging behind. In addition, we should underline the importance of the EU cohesion policy (which is targeted at reducing regional disparities and the convergence of less developed regions), which will play a more important role in counterbalancing the divergence caused by economic and other difficulties resulting from current and future crises, as less attention is paid to catching up at Member State level in crisis situations. ■

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