HUMAN DEVELOPMENT EQUALIZATION ISSUES WITHIN THE EUROPEAN UNION

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Abstract The establishment and enlargement of the European Union have been partly motivated by catching up on higher living standards of living. This study examines whether developmental convergence can be demonstrated among the NUTS 2 regions of the Union. The existence of convergence among the EU is generally approached from an economic perspective by using macroeconomic indicators. Although these metrics are suitable for comparing the performance of Member States, they are less reflective of each country's social well-being. Several analyses, usually based on mortality indicators, have been conducted in an attempt to characterize convergence from a social point of view. However, these calculations are usually limited to country-level convergence analyses with diseases and causes of death in their focus. Thus, this study applies a complex measure, the Human Development Index (HDI), to examine convergence at a regional level. For this purpose, the regional HDI is calculated and the existence of absolute and conditional beta convergence is assessed. Our calculations confirm convergence among EU regions over the period between 2006 and 2017, but the analysis also reveals divergent trends and various national characteristics that will call into question the long-term sustainability of equalization.

Keywords: equalization, beta-convergence, European Union, Human Development Index, regional level

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1 Introduction

The presence or lack of convergence between the Member States of the European Union is generally approached from an economic point of view with the indicators used in the analyzes being predominantly macroeconomic ones, such as gross domestic income, unemployment, government budget balance, government debt, inflation, and other characterizing economic indicators.

These metrics are evidently suitable for comparing the performance of EU Member States, but they are less reflective of each country's social well-being and standard of living. Over the past twenty years, several analyzes have attempted to characterize catching up processes from a social point of view, typically using mortality indicators. Life expectancy at birth is per se realistically indicative of the standard of living of a nation or region, so it can be a fitting indicator for convergence analyses. However, the use of mortality indicators is generally typical of studies that examine convergence comparing national regions or in a global context whereas the number of studies analyzing convergence within the EU is negligible and mostly focus on diseases and causes of death (e.g., Frenk, et al., 1991; Gächter & Theurl, 2011; Janssen, et al., 2016). Thus, there is a great amount of research examining convergence between EU Member States but only from an economic point of view (e.g. Busch, 2014; Goecke, 2013; Kaitila, 2013; Raiser & Gill, 2012) and there are publications examining convergence from a social welfare perspective, but not between EU Member States. My research topic is built on the resulting research gap.

In order to be able to assess the convergence process between the Member States of the Union from both an economic and a social point of view, my calculations are based on the Human Development Index (HDI). I furthermore examine the development of HDI within the EU at the NUTS 2 (Nomenclature of Territorial Units for Statistics – basic regions for the application of regional policies) level rather than the Member State level. This deeper territorial analysis is justified not only by the fact that huge differences in inequality can be found within countries, but also by the EU's support policy being applied to NUTS 2 levels, i.e. our regional analysis makes it possible for us to examine the EU's effectiveness in its redistribution activities.

The central question of the paper is whether convergence between the various levels of development of the respective EU regions can be demonstrated, i.e., whether the lagging regions can develop faster than their more developed peers.

2 Methods and data

2.1 Beta convergence

The calculations in the paper are based on Barro and Sala-i-Martin's convergence theory, which is derived from Solow's long-term exogenous growth theory. Based on their model, we distinguish between absolute and conditional beta convergence: in the case of absolute beta convergence, convergence analyzes are based on cross-sectional data and the calculation refers to the regression between the annual average GDP growth rate for a given time interval and the GDP at baseline:

$$\frac{1}{T} log \frac{y_{i,T}}{y_{i,0}} = \alpha_0 + \alpha_1 log y_{i,0} + \varepsilon_i \quad (1)$$

where $logy_{i,T}$ and $logy_{i,0}$ are the natural logarithms of GDP per capita in PPS at the initial and T^{th} time, α_0 is the constant and ε_i is the error term.

Convergence can be detected if $\alpha_1<0$, so if this is the case, the rate of convergence (β) can be determined as follows:

$$\beta = -\frac{1}{T} ln(1 + \alpha_1 T) \quad (2)$$

Beta shows the average percentages of distance from steady state over a year (Vojinović, et al., 2009).

In this study, I examine the convergence of regional HDI rather than GDP by writing the following regression equation using the cross-sectional data series of regional HDI for 2006 and 2017 for several regions:

$$\frac{\ln\left(\frac{RHDI_{2017}}{RHDI_{2006}}\right)}{T-1} = \alpha_0 + \alpha_1 \ln(RHDI_{2006}) \quad (3)$$

where the dependent variable is the logarithm of the change in the average annual HDI of the regions between 2006 and 2017, and the independent variable is the logarithm of the human development index for the initial year (2006). If $\alpha_1 < 0$, convergence can be detected in the data series.

2.2 Data

HDI is a composite indicator that includes three dimensions of human development: long and healthy life (HEALTH), education (EDU) and an acceptable standard of living (INCOME), and the composite index is the geometric mean of the normalized indices of these three dimensions. HDI has been established by the UN to determine and compare countries' levels of development, but our analysis focuses on NUTS2 regions, the territorial classification of the EU's cohesion and rural development policy, on which the level and scope of support is based. Time series HDI data are not available at a regional level therefore they need to be created.

To calculate the development index of NUTS 2 regions, I used the methodological description presented by Hardeman and Dijkstra in their 2014 study, however, due to incomplete or incompatible data sets, I had to deviate from their method at some point.

The authors compiled the human development index by incorporating six indicators:

1. Infant mortality (IM): the number of child deaths under the age of 1 per 1,000 live births per year.
2. Healthy life expectancy: an indicator that combines mortality and perceived health status; the number of years the individual is expected to have good perceived health.
3. NEET: the part of the population aged 18 to 24 that is not employed and does not participate in any education or training.
4. Higher education (TE): the proportion of people aged 25 to 64 with a tertiary education.
5. Net adjusted disposable household income: the net per capita household disposable income of a given region, weighted by the quotient of the country's gross and net adjusted per capita disposable income.

6. Employment (EMP): The proportion of employees over the age of 15 in the total population over the age of 15 (Hardeman & Dijkstra, 2014)

When applying the indicators defined by Hardeman and Dijkstra, I had to change two metrics due to the lack or incompleteness of the available data in my research:

1. Instead of life expectancy in health, I used life expectancy at birth (LE).
2. No weighting was derived when considering the disposable income of households (NDI).

To filter out the different units and magnitudes of the indicators, we transform the data using the following formulas:

$$x_t = \frac{x_i - Min(x_n)}{Max(x_n) - Min(x_n)} \quad (4)$$

and

$$x_t = \frac{x_i - Max(x_n)}{Min(x_n) - Max(x_n)} \quad (5)$$

where:

x_t: the transformed value of the given variable in a given region, each year,
x_i: the initial value of the given variable in a given region, each year,
$Min(x_n)$: the minimum value of the variable for all the years and all the regions, and
$Min(x_n)$: the maximum value of the variable for all the years and all the regions.

Formula (4) is applicable to indicators that have a positive effect on human development, that is, the value of the human development index also increases as regards life expectancy at birth, the proportion of people with tertiary education, the employment rate, and the increase in the net disposable income of households per capita.

Formula (5) refers to the transformation of the infant mortality and NEET indicators, as an increase in the value of these two indicators impairs human development. In both cases, the values of the transformed variables will be between 0 and 1.

After transforming the data, the value of each dimension – HEALTH, EDU and INCOME – is determined by a simple arithmetic average:

$$HEALTH = \frac{IM_t + LE_t}{2} \quad (6)$$

$$EDU = \frac{TE_t + NEET_t}{2} \quad (7)$$

$$INCOME = \frac{EMP_t + NDI_t}{2} \quad (8)$$

The value of the regional HDI index (RHDI) can be defined as the geometric mean of the three dimensions:

$$RHDI = \sqrt[3]{HEALTH \times EDU \times INCOME} \quad (9)$$

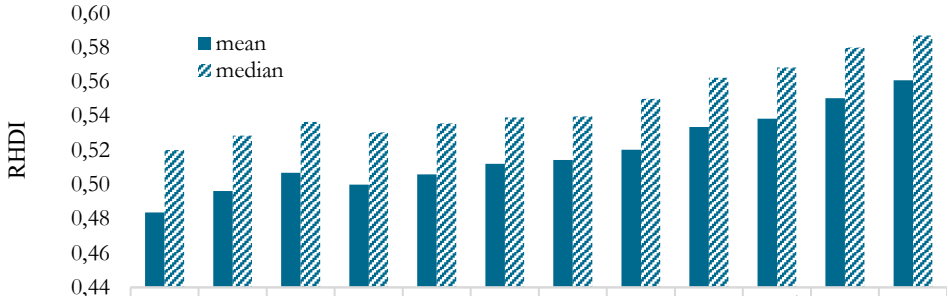
(Hardeman & Dijkstra, 2014)[1]

The territorial classifications of NUTS 2 have changed several times: between 2003 and 2007 NUTS2003, between 2008 and 2011 NUTS2006, between 2012 and 2014 NUTS2010, between 2015 and 2017 NUTS2013, between 2018 and 2020 NUTS2016, after 2021 NUTS2021 is applicable. Due to regular changes, I narrowed down the time horizon of the analysis to the period between 2006 and 2017[2], however, 33 regions were excluded from the examined sample partly due to incomplete data and partly due to changes in classifications. Ad hoc data gaps, accounting for 1.8% of all data, caused additional difficulties in data management and were imputed using a linear trend to avoid further data loss.

[1] Prior to transforming the variables, the authors smoothed out the variables considered volatile using a three-year moving average, which I omitted to do in order to avoid further data loss.
[2] The data included in the analysis could not be extended until 2018 since the respective data are still rather incomplete.

3 Results

The following figure shows the estimated HDI for the analyzed regions:



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
mean	0,484	0,496	0,507	0,500	0,506	0,512	0,514	0,520	0,533	0,538	0,550	0,561
median	0,520	0,528	0,536	0,530	0,536	0,539	0,540	0,550	0,562	0,568	0,580	0,587

Figure 1: Mean and median of the regional RHDI between 2006 and 2017
Source: own calculation based on Eurostat data

Over the period under review, both the average and median human development indices increased overall. While the economic crisis caused a decline in HDI in 2009, the average value of the index had already exceeded the 2008 value by 2011. The figure illustrates that the median value followed a similar trend and consistently exceeded the average HDI, indicating that half of the EU regions are more developed than average.

As described at the beginning of the study, the existence of absolute beta convergence is examined using regression estimation where the independent variable is the initial logarithmic value of the regional HDI in 2006 and the dependent variable is the logarithm of the average change in HDI between 2006 and 2017. The results of the calculation are presented in the following figures:

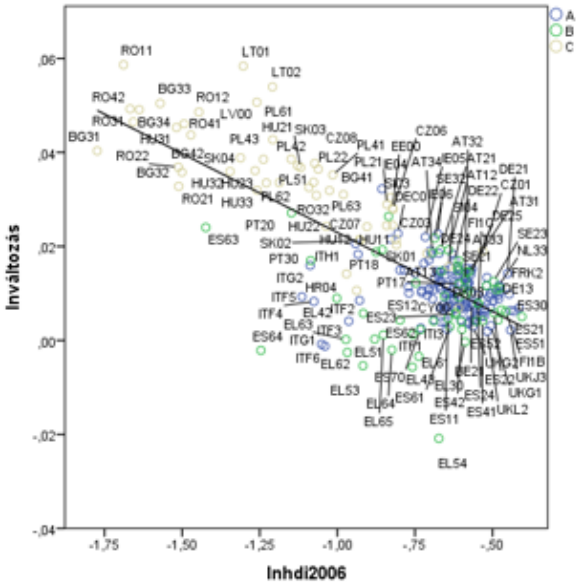


Figure 2: Beta convergence between 2006 and 2017 (a)
Source: own calculation based on Eurostat data

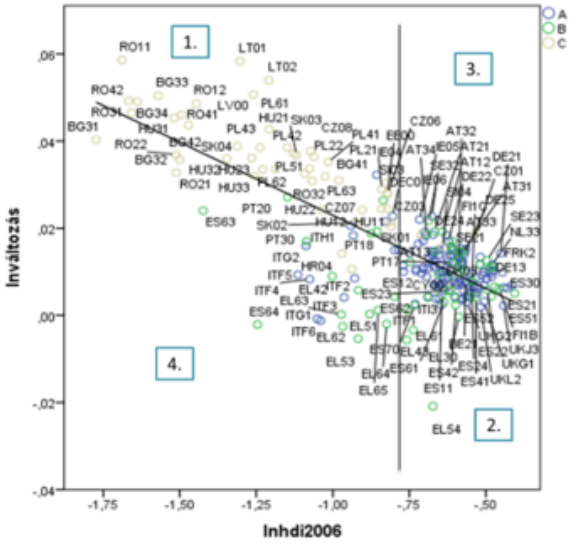


Figure 3: Beta convergence between 2006 and 2017 (b)
Source: own calculation based on Eurostat data

In Figure 2, the coordinates for each region are marked in different colors: blue (A) indicates regions that belong to countries already members of the EU before 1981 (BENELUX, France, Italy, Germany, the United Kingdom, Denmark, and Ireland). Green (B) marks the regions that became part of the Union after 1981 but before the major enlargement (regions of Greece, Spain, Portugal, Austria, Finland, and Sweden). Finally, the gray coordinates highlight the regions of countries that joined the EU in 2004 or later (Estonia, Latvia, Lithuania, the Czech Republic, Slovakia, Slovenia, Poland, Hungary, Cyprus, Romania, Bulgaria, and Croatia). It can be seen that the regions marked in green and blue had a predominantly higher level of development, whereas the regions of the countries that joined in 2004 or later are typically shown on the left side of the figure, i.e., their initial HDI was lower.

For a more nuanced picture, let us divide the graph showing the results of the regression estimation into four parts, along the regression line (regions above and below the line) and along the 2006 HDI average. Thus, the regions can be classified into four groups:

1. The first quarter includes regions whose HDI was relatively low in the initial year, but the average increase in HDI exceeds the value estimated by the regression. These regions are the ones that can catch up.
2. In the second quarter the regions that performed a low growth between 2006 and 2017 with a relatively high initial HDI can be found that are practically lagging behind their peers.

The first and second categories include the regions that strengthen the process of equalization: less developed regions with high growth potentials and regions already with a high level of development but demonstrating slow growth.

3. The third category includes countries with relatively high incomes that have shown higher growth compared to the regression estimate (developing regions).
4. Finally, in the fourth quarter, there are regions that have achieved a small average growth with a low level of initial development (these are regions that are expected to be marginalized).

The third and fourth groups include the regions that work against convergence: regions that are already lagging behind and have low growth potentials, and those that are more developed and capable of further development.

For the sake of transparency, it is worth grouping the regions according to the above categories. The results are shown in the following table:

Table 1: Groups of regions based on deviation from regression estimate and initial mean

Convergence		Divergence	
Catching up	**Lagging**	**Catching up**	**Lagging**
Belgium, 1 region	Belgium, 3 regions	Austria, 8 regions	Belgium, 3 regions
Bulgaria, 4 regions	Cyprus	Belgium, 4 regions	Bulgaria, 2 regions
The Czech Republic, 7 regions	Germany, 2 regions	The Czech Republic, 1 region	Germany, 1 region
Germany, 1 region	Denmark, 4 regions	Germany, 30 regions	Greece, 11 regions
Estonia	Greece, 2 regions	Dania, 1 region	Spain, 4 regions
Hungary	Spain, 12 regions	Spain, 3 regions	France, 2 regions
Ireland, 1 region	Finland, 1 region	Finland, 3 regions	Croatia
Latvia	France, 13 regions	France, 6 regions	Italy, 9 regions
Lithuania	Italy, 10 regions	Ireland, 2 regions	Portugal, 3 regions
Poland, 10 regions	The Netherlands, 2 regions	Italy, 1 region	Romania, 2 regions
Portugal, 3 regions	The United Kingdom, 21 regions	Luxemburg	The United Kingdom, 1 region
Romania, 6 regions		Netherlands, 9 regions	
Slovenia, 1 region		Portugal, 1 region	
Slovakia, 3 regions		Sweden	
		Slovenia, 1 region	
		Slovakia, 1 region	
		The United Kingdom, 8 regions	

Source: own calculation based on Eurostat data

The table shows that all the regions of Hungary, the Czech Republic and Slovakia, the vast majority of the regions of Slovenia, and all the regions of Poland and the three Baltic States belong to the catching-up category. Two-thirds of Bulgaria's regions and three-quarters of Romania's regions are also catching up. Based on the Human Development Index this confirms that catching up is not impossible in the long run. Croatian regions are an exception, with both of them lagging behind.

Belgium is another interesting item in the table with Belgian regions appearing in all the four categories, which raises further questions about inequalities within the country. In the case of Italy we see that, except for one region, its regions are in the categories of those lagging behind, while in Spain a similar composition prevails. A large proportion of the UK regions are also lagging behind, with only a quarter of them qualifying for the 'developing' group, and the French regions are only in a marginally better position than the UK ones. Most of the regions of Germany and the Netherlands, and all the regions of Austria and Sweden comprise an already highly developed and relatively fast-growing category.

4 Conclusion

In this study, I examined the process of equalization within the European Union between 2006 and 2017 with the help of a regional – NUTS 2 level – human development index. To determine the regional HDI, I used the methodology proposed by Hardeman and Dijkstra, and the theory of beta convergence of Barro and Sala-i Martin was applied to examine equalization. The findings confirm convergence between the regions of the Union in the examined time interval: the less developed regions demonstrated faster HDI growths than the more developed ones did. However, by deepening the analysis, we were also able to gain insights into the risks some regions are faced with of permanently lagging behind and eventually getting marginalized, while there are regions that despite their initial level of development demonstrate above-average growth rates. Although the main trend is convergence, we can also see signs of divergence.

The outbreak of the Sars-Cov-2 virus in 2020 and the resulting economic and social losses are likely to reshape the current convergence situation, therefore the question remains for the future whether COVID-19 will strengthen either divergent or convergent processes.

References

Busch, B., 2014. Zehn Jahre Osterweiterung der Europäischen Union. *IW-Trends – Vierteljahresschrift zur empirischen Wirtschaftsforschung,* Issue Vol. 41(1), pp. 99-116.

Frenk, J. és mtsai., 1991. Elements for a theory of the health transition. *Health Transition Review,* Issue Vol. 1 No. 1, pp. 21-38.

Gächter, M. & Theurl, E., 2011. Health Status Convergence at the Local Level: Empirical Evidence from Austria. *International Journal for Equity in Health,* Issue 10:34.

Goecke, H., 2013. Europa driftet auseinander. Ist dies das Ende der realwirtschaftlichen Konvergenz?. *IW-Trends - Vierteljahresschrift zur empirischen Wirtschaftsforschung, Institut der deutschen Wirtschaft (IW),* Issue Vol. 40(4), pp. 67-79.

Hardeman, S. & Dijkstra, L., 2014. *The EU Regional Human Development Index,* Luxembourg:: Publications Office of the European Union.

Janssen, F., Hende, v. d. A., Beer, J. d. & Wissen, L. J. G. v., 2016. Sigma and Beta Convergence in Regional Mortality: A Case Study of the Netherlands. *Demographic Research,* Issue Vol. 35(4), pp. 81-116.

Kaitila, V., 2013. Convergence, Income Distribution, and the Economic Crisis in Europe. *ETLA Working Papers,* Issue No. 14.

Raiser, M. & Gill, I. S., 2012. *Golden Growth : Restoring the Lustre of the European Economic Model,* Washington: World Bank Washington.

Vojinović, B., Sanjaya, A. & Próchniak, M., 2009. Convergence Analyses among the Ten European Transition Economies. *Hitotsubashi Journal of Economics,* Issue Vol. 50 No. 2, pp. 123-141.