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REGIONAL DISPARITIES AND CONVERGENCES IN THE EUROPEAN UNION

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Abstract

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This paper analyses the disparities and convergences between 97 regions of the European Union in the period 2000 to 2008. The methodology is based on the Gini coefficient, Disparity Range Coefficient, Average Disparity Range Coefficient, and σ- and β-convergence.
The study tests the hypothesis that the EU regions are converging economically. The subject is relevant as the welfare disparities among the EU regions and their possible convergence represents an economically and politically important issue for the EU. The EU is aiming at decreasing regional welfare disparities through the cohesion policy. The study analyses the convergence within the time span where there was substantial EU enlargement with a disparity effect on the whole EU.
The study concludes that the level of disparities among the EU regions is relatively low. The convergence analysis provided mixed results, depending on the methodology used. The tested hypothesis was not confirmed fully.

disparity, convergence, regions, European Union

1 INTRODUCTION

The objective of the paper is to study the regional welfare disparities in the European Union. At the same time, the purpose is to evaluate the convergence or divergence trends.

The paper looks at approving or not the research hypothesis that states that the regional disparities across the EU macro-region are decreasing and thus there is convergence inside the macro-region. The hypothesis is linked to the regional welfare parameters, in terms of nominal Gross Domestic Product (GDP), individual GDP per capita and individual GDP per capita in purchasing power standard (PPS). The study will aim at confirming this hypothesis.

The study contributes to the literature on the EU cohesion policy. As a policy tool to narrow down regional disparities, the European Union has the regional policy. This policy is based on the EU treaties and constitutes a key pillar of EU construction. It also creates a precondition for other EU policies such as the internal market and the Economic and Monetary Union of the EU. It is a shared policy, meaning that the competences of the EU and Member States are shared. This EU regional policy is well documented (EUROPEAN COMMISSION, 2008; GODET, M., DURANCE, P., MOUSLI, M., 2010). This literature demonstrates the economic effect of the regional policy on decreasing the regional disparities. At the same time, it shows the limits of this effort.

The supplementary objective of the paper is the development of new analytical tools to capture disparities and convergences.

There is extensive literature concerning the link between economic growth and regional disparity and convergence. However, the interpretation of the final effects of the underlying parameters for disparity and convergence among regions

1 The opinions expressed in this article are those of the author alone.

varies across economic schools, EDERVEEN, S., GORTER, J., DE MOOIJ, R. and NAHUIS, R. (2002).

Firstly, the neoclassical growth theory (exogenous growth theory) is based on the work of SOLOW, R. M. (1956). It predicts that the higher the investment rate in both human and physical capital and the lower the population growth, the higher the steady level of per capita income will be. As long as economies are similar in terms of technological levels, investment and population growth rates, they will converge at the same steady rate. Then, differences in per capita income can temporarily exist, but the poor, capital-scarce regions tend to catch up with richer ones. In summary, the neoclassical model predicts convergence of welfare among countries.

Secondly, the endogenous growth theory (new growth theory) seeks to explain the economic forces that drive technological progress. It is based on the work of ROMER, P. M. (1986). The new growth theory suggests that regional growth depends on the level of technology. According to this theory, differences in economic development across countries can be explained by the differences in the accumulation of endogenous knowledge within borders which are largely national. As technology requires investments, a poor economy will stay poor, because it lacks the ability to invent and adapt new technologies. In contrast, rich economies innovate all the time and grow richer and richer. The endogenous growth theory predicts that technological progress causes divergence between economies.

Thirdly, the technology gap theory is based on the work of FAGERBERG, J. (1987). It arrives at the opposite conclusion compared to the exogenous growth theory. The public good properties of technical knowledge can have an international dimension that favours less advanced countries. The basic idea is that the followers can imitate the inventions of the technological leader, provided they have the capability to absorb. This theory arrives at a similar conclusion as the neoclassical theory; however its theoretical fundament is different.

Fourthly, there is the economic geography theory (new economic geography theory). The starting point of this theory is the empirical evidence that economic activity is often concentrated in a few geographic clusters. This theory was developed by WILLIAMSON, J. G. (1965), FUJITA, M. (1988), KRUGMAN, P. (1991, 2008) and VENABLES, A. J. (1996). They equipped this approach with an analytic framework to study how gains from agglomerations interact with other forces that shape economic geography. This can lead to the following effects: balanced regional development will result if most regions are able to exploit their local comparative advantages; geographic concentration, in case the gains from the agglomeration are very strong. In conclusion, the new economic geography theory foresees both economic convergence and divergence.

As explained above, the economic theories are based on different assumptions of the role of key factors. As a consequence, they arrived at differentiated conclusions in terms of regional convergence and economic disparities.

The disparities are the subject of extensive literature. Several aspects are studied: the trend of income inequality (SUMMERS, R. (1995), IMF (2007), SALA-I-MARTIN, X. (2006), UNDP (2008)), the relation between inequality and growth rate IRADIAN, G. (2005) and specific developments in the individual countries or smaller regions. However, most of the literature looks at individual disparities and not at the disparities among regions.

The competitiveness divergences of the euro-area Member States demonstrate the level of differentiation even within the single currency zone (EUROPEAN COMMISSION, 2009) which has contributed to the recent euro-area economic crisis. According to EUROPEAN UNION (2010), the disparities in GDP per head are still considerable.

The economic convergence of countries on a macro-regional scale or of regions inside one country has been at the centre of scholars' attention. There is no conclusive answer to the above questions. Two divergent scenarios emerged from the analysis: one advocating evidence of convergence and another suggesting divergence trends. Much depends on the methodology used. Country-specific characteristics play their role via public policy options and the competitiveness models of the countries.

At the level of countries, BARRO, J., SALA-I-MARTIN, X. (1992), SALA-I-MARTIN, X. (2002, 2006) made important contributions. One of the conclusions is that, for the OECD countries between 1950 and 1990, σ-convergence occurred for GDP development. Its trend was however not a linear one, as, $\sigma = 0.60$ in 1950 then decreased to $\sigma = 0.51$ in 1960, and came to $\sigma = 0.36$ in 1985 SALA-I-MARTIN (1995). At the same time, β-convergence was confirmed together with σ-convergence. An interesting fact is that both σ and β-convergences were interrupted in 1970s. On the other hand, at the global level, for the wide sample of 110 countries, there was no σ-convergence in the given period, as σ grew from 0.8 % to around 1.1 % in this period.

At the regional level, in general, convergence can be noticed in the US, EU and Japan (UNEL, B., ZEBREGS, H. (2006)). In Spain, according to VILLAVERDE, J., MAZA, A. (2009), between years 1995 and 2005 the β-convergence for the regional GDP level was calculated at an annual speed of 1.48%. Regional convergence of the regions of the Czech Republic for the total employment rate was confirmed by DUFEK, J., MINAŘÍK, B. (2009) for the time span between 2000 and 2002. In this case the σ-convergence dropped from 0.05 to 0.03 and the trend was confirmed by the β-convergence.

There are however other studies which demonstrate the opposite or mixed development, namely divergent developments. The mixed results

come from the variable measured (income, GDP levels) and from the character of the country or its regions, such as starting development levels, economic structure, policy development and redistribution policies. Methodological modalities, such as regional price differences (ATEN, B., HESTON, A., 2003), play their role as well. There is no conclusive evidence that average GDP per capita has converged among OECD regions, as reported by the OECD (2009b). Its analysis carried out for the period 1980 and 2005 revealed that, in approximately one-third of the OECD countries, regional disparities of GDP per capita increased, in another third of countries the disparities decreased, and in the rest of the regions there was no clear trend. This study also stated that there was no overall convergence of the OECD regions.

2 METHODOLOGY

The 97 micro-regions in the study are represented by 97 Nomenclature of Territorial Units for Statistics, NUTS 1 (EUROPEAN UNION, 2003). The meso-regions are 27 Member States of the EU and the macro-region means the whole EU. The data are based on the European Commission (Eurostat) source. The database was established for the time period of 2000–2008. The GDP per capita PPS is the GDP per individual under the Purchasing Power Standard (PPS). Finally, the GDP growth rate is the real growth rate at market prices, expressed as a percentage change on the previous year. Due to the non-availability of full and comparable data, the GDP per capita are missing for the years 2001 and 2002.

To evaluate the regional disparities, the Gini coefficient was calculated using a free online software (http://wessa.net/co.wasp). The Gini coefficient was calculated on nominal GDP, GDP per capita and GDP per capita PPS.

To analyse convergence, four methods were used. Firstly, we used two instruments developed specifically for the purpose of this study. The objective was to capture better the link between disparity and convergence together. On top of that, two classical convergence methods were used.

a) Disparity Range Coefficient (DRC) and Average Disparity Range Coefficient (ADRC)

This measure is a convergence instrument; however it builds on disparity elements to understand better regional convergences based on disparities.

It is built upon a regression analysis. The regression was constructed in such a way as to capture to what extent the distribution of income at the micro-regional level is affected by changes in the macro-regional GDP over a sample period. Specifically we want to know whether the income distribution in the regions (meso or micro) is being more equally distributed as macro-regional GDP grows over time or not.

We make an assumption that the data are linear and that we have just one independent variable x and one dependent variable y which are related by the simple linear equation:

$$y = c_1 + c_2 x,$$

where the coefficient c_1 represents the constant which takes its value as if the independent variable were zero, while the coefficient c_2 indicates the slope of the regression line.

The relationship between the two variables is expressed in the linear regression which depicts how the dependent variable evolves when the independent one changes. We were looking for the results for the coefficient c_2 as it describes the relationship between the independent and dependent variables. Both DRC and the ADRC are based on GDP per capita only.

The DRC is defined, for a particular year, as the difference between the maximum and minimum values of GDP per capita of the micro-region data for the year in question. It could be expressed as:

$$DRC_y = GDP_{i\text{-}max} - GDP_{n\text{-}min},$$

where

DRC_y ..... is the Disparity Range Coefficient of the macro-region (EU) in the given year,

$GDP_{i\text{-}max}$ .... is the GDP of micro-region i, which has the highest GDP in the macro-region and

$GDP_{n\text{-}min}$ .... is the GDP of micro-region y, which has the lowest GDP in the macro-region.

The ADRC for a particular year is calculated analogically but, instead of the difference between the maximum and minimum values, we calculate the arithmetic mean of the sum of all distances (in absolute terms) between the GDP per capita of the macro-region and all the values for the corresponding micro-regional GDP per capita for the year:

$$\overline{ADRC}_y = \frac{1}{n}\sum_{i=1}^{n} \left| GDP_{macro} - GDP_n \right|,$$

where:

$\overline{ADRC}_y$ ..... is the Average Disparity Range Coefficient of the EU macro-region in the given year,

GDP_{macro} ... is GDP per capita of the macro-region (EU),

GDP_n ..... is a GDP per capita of the micro-region,

n ..... is the total number of micro-regions.

Regarding the ADRC for the national level, it is derived as the arithmetic mean of the sum of all distances between the national GDP per capita of the country under scrutiny and all the corresponding micro-regional GDP per capita of the same state.

b) σ and β-convergence

The σ-convergence and β-convergence are standard tools of convergence analysis. They were applied to evaluate the convergence between

micro-regions inside the EU macro-region, possibly between micro-regions and meso-regions or meso-regions and macro-regions.

The methodology used is described in detail by ŽIVĚLOVÁ, I., PALÁT, M. (2008) and DUFEK, J., MINAŘÍK, B. (2009).

In the cases where individual the micro-regional GDP reached excessively high or low values, they were eliminated in order not to disrupt the overall trends. These cases are indicated in the individual result descriptions.

3 RESULTS AND DISCUSSION

3.1 Disparity results

The disparity results are provided in the following three ways.

a) Gini coefficient on the basis of nominal GDP

For the period 2000–2008, the Gini coefficient varies in the range of 0.4 and 0.5 (Tab. I). This indicates overall a considerable inequality of income distribution among the EU micro-regions. It has increased relatively significantly as a whole from 0.4299 to 0.4734. This trend shows an increase of the micro-regional welfare disparities in the EU.

However, the biggest one-off increase is attributed to EU enlargement, with an increase of 0.4311 to 0.4827 in one year between 2001 and 2002 (the 2002 data already cover the EU-25). The disparity further increased as of 2005 due to the calculations of the EU-27. Then, we observe a slight but stable decrease in the Gini coefficient. After that moment there is a slow but continuous trend towards more equal outcome distribution. This tells us that the gap between the size of the micro-regions within the macro-region decreases slightly. Altogether, there was a one-peak development of the disparity pattern.

b) Gini coefficient on the basis of GDP per capita

The Gini coefficient based on GDP per capita is much smaller than in the case of the nominal GDP-

I: *Regional Gini coefficient results for nominal GDP in the European Union*

	Gini Index (GDP in Mio. EUR)								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
	EU-15	EU-15	EU-25	EU-25	EU-27	EU-27	EU-27	EU-27	EU-27
EU	0.429906	0.431124	0.482637	0.480072	0.500184	0.490991	0.487497	0.480871	0.473361
Austria	0.181847	0.175289	0.181351	0.180766	0.180424	0.178046	0.174759	0.175238	0.175721
Belgium	0.254987	0.253555	0.254686	0.253124	0.253862	0.254380	0.256098	0.262413	0.261063
Bulgaria	–	–	–	–	0.057869	0.058633	0.084159	0.099557	0.103782
Cyprus	–	–	–	–	–	–	–	–	–
Czech Republic	–	–	–	–	–	–	–	–	–
Denmark	–	–	–	–	–	–	–	–	–
Estonia	–	–	–	–	–	–	–	–	–
Finland	0.493343	0.493197	0.493157	0.493100	0.493596	0.493841	0.493497	0.493805	0.493739
France	0.327847	0.327403	0.324072	0.323525	0.324027	0.322420	0.322523	0.322321	0.324271
Germany	0.498316	0.496979	0.496059	0.493810	0.494531	0.493839	0.495491	0.494405	0.495377
Greece	0.226913	0.230118	0.226279	0.227521	0.299924	0.319504	0.321386	0.324692	0.267905
Hungary	–	–	0.123393	0.115206	0.112569	0.128071	0.138657	0.138819	0.149198
Ireland	–	–	–	–	–	–	–	–	–
Italy	0.238937	0.221258	0.219473	0.214143	0.224621	0.222084	0.223033	0.225389	0.225197
Latvia	–	–	–	–	–	–	–	–	–
Lithuania	–	–	–	–	–	–	–	–	–
Luxembourg	–	–	–	–	–	–	–	–	–
Malta	–	–	–	–	–	–	–	–	–
Netherlands	0.324460	0.322259	0.323471	0.321320	0.320276	0.318696	0.315082	0.313679	0.307486
Poland	–	–	0.180848	0.185455	0.184102	0.190313	0.189981	0.188758	0.188085
Portugal	0.625488	0.624864	0.623400	0.621864	0.620964	0.620191	0.619405	0.619589	0.617460
Slovakia	–	–	–	–	–	–	–	–	–
Slovenia	–	–	–	–	–	–	–	–	–
Spain	0.292436	0.292758	0.292435	0.301522	0.301134	0.300536	0.301701	0.301535	0.300555
Sweden	0.172631	0.171504	0.176162	0.170970	0.172337	0.176159	0.174605	0.173809	0.177669
UK	0.281017	0.291806	0.296213	0.284213	0.285066	0.287011	0.297831	0.303136	0.306532

II: *Regional Gini coefficient results for GDP per capita in the European Union*

	Gini Index (GDP per capita in EUR)								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
	EU-15	EU-15	EU-25	EU-25	EU-27	EU-27	EU-27	EU-27	EU-27
EU	0.194028	–	–	0.266524	0.298832	0.290175	0.288173	0.279315	0.267136
Austria	0.054284	–	–	0.052235	0.049981	0.046249	0.041667	0.041885	0.042169
Belgium	0.231227	–	–	0.231472	0.228663	0.227707	0.226223	0.218923	0.212668
Bulgaria	–	–	–	–	0.083350	0.082327	0.106061	0.118421	0.127660
Cyprus	–	–	–	–	–	–	–	–	–
Czech Republic	–	–	–	–	–	–	–	–	–
Denmark	–	–	–	–	–	–	–	–	–
Estonia	–	–	–	–	–	–	–	–	–
Finland	0.072888	–	–	0.077964	0.059197	0.048245	0.060942	0.048602	0.052258
France	0.126904	–	–	0.120183	0.120651	0.118496	0.120363	0.115369	0.118091
Germany	0.161567	–	–	0.150285	0.148292	0.153465	0.151562	0.145027	0.141796
Greece	0.055020	–	–	0.029796	0.117914	0.119005	0.127060	0.131323	0.078743
Hungary	–	–	–	0.197355	0.193510	0.205270	0.212014	0.210305	0.217565
Ireland	–	–	–	–	–	–	–	–	–
Italy	0.137803	–	–	0.127481	0.137203	0.133186	0.133442	0.134597	0.133438
Latvia	–	–	–	–	–	–	–	–	–
Lithuania	–	–	–	–	–	–	–	–	–
Luxembourg	–	–	–	–	–	–	–	–	–
Malta	–	–	–	–	–	–	–	–	–
Netherlands	0.053963	–	–	0.054300	0.051815	0.051790	0.049375	0.046654	0.050916
Poland	–	–	–	0.094307	0.094506	0.101852	0.104265	0.104124	0.102473
Portugal	0.078057	–	–	0.087312	0.071781	0.079464	0.080114	0.080933	0.078431
Romania	–	–	–	–	0.089336	0.108843	0.118852	0.127682	0.143130
Slovakia	–	–	–	–	–	–	–	–	–
Slovenia	–	–	–	–	–	–	–	–	–
Spain	0.111845	–	–	0.108455	0.104417	0.100939	0.102290	0.101692	0.102090
Sweden	0.046894	–	–	0.052997	0.051897	0.058013	0.054848	0.052288	0.053108
UK	0.093918	–	–	0.089622	0.092148	0.093007	0.103410	0.110416	0.112689

based one, indicating that the regional disparities in the EU based on the GDP per capita are relatively small (Tab. II). The Gini coefficient of the micro-regional GDP per capita distribution varied between 0.2 and 0.3. In terms of its trend, there is a clear tendency in the widening of the disparities as it rose substantially between 2000 and 2008 from 0.194 to 0.267 and thus the individual income distribution has become more uneven.

Similar to the case of the nominal GDP disparity analysis, the widening of regional disparities in the EU was caused essentially by the inclusion of the 12 new Member States in the data set. On the other hand, for the last four years (2004–2008) of the sample period, during which there is no inclusion of any new state, a marginal trend of convergence to more even distribution of individual income was observed from the value of 0.298 towards 0.267.

c) Gini coefficient on the basis of GDP per capita in the PPS

The Gini coefficient based on the GDP per capita in PPS reached the smallest values out of all three Gini coefficient analyses (Tab. III). It is much smaller than in the case of nominal GDP, reaching values below 50% of the latter, and marginally below the GDP per capita values. The Gini coefficient of the micro-regional GDP per capita in PPS distribution varies between 0.04 and 0.21. In terms of its trend, there is once again a clear trend in the widening of disparities as they rose substantially for the whole EU between 2000 and 2006 from 0.163 to 0.199 and thus the individual income distribution in the PPS has become more uneven.

The following remarks can be made. Firstly, on methodology. The Gini coefficient was used here in an atypical way. Normally, it is used for measuring individual disparity within a country or region. We substituted the individual country/region for 97 micro-regions. The results obtained

III: *Regional Gini coefficient results for GDP per capita in PPS in the European Union*

	Gini Index (GDP per capita, PPS)								
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
	EU-15	**EU-15**	**EU-25**	**EU-25**	**EU-27**	**EU-27**	**EU-27**	**EU-27**	**EU-27**
EU	0.163059	0.160067	0.202156	0.198315	0.222189	0.215727	0.213358	0.208150	0.199492
Austria	0.054283	0.046351	0.054793	0.052241	0.049976	0.046251	0.042537	0.042316	0.041621
Belgium	0.231232	0.233157	0.230544	0.231465	0.228663	0.227715	0.226317	0.218402	0.212384
Bulgaria	–	–	–	–	0.083380	0.082309	0.105714	0.121053	0.122727
Cyprus	–	–	–	–	–	–	–	–	–
Czech Republic	–	–	–	–	–	–	–	–	–
Denmark	–	–	–	–	–	–	–	–	–
Estonia	–	–	–	–	–	–	–	–	–
Finland	0.072877	0.077096	0.076960	0.077972	0.059187	0.048244	0.061489	0.048387	0.051672
France	0.126904	0.127417	0.121609	0.120179	0.120647	0.118493	0.120349	0.115646	0.117553
Germany	0.161568	0.159982	0.161174	0.150286	0.148287	0.153466	0.151802	0.145184	0.141589
Greece	0.055015	0.022817	0.026536	0.029792	0.117897	0.119015	0.126769	0.131385	0.078310
Hungary	–	–	0.205936	0.197341	0.193527	0.205294	0.212885	0.210027	0.216110
Ireland	–	–	–	–	–	–	–	–	–
Italy	0.134561	0.137107	0.133628	0.127484	0.137198	0.133188	0.132886	0.135036	0.133862
Latvia	–	–	–	–	–	–	–	–	–
Lithuania	–	–	–	–	–	–	–	–	–
Luxembourg	–	–	–	–	–	–	–	–	–
Malta	–	–	–	–	–	–	–	–	–
Netherlands	0.053957	0.052978	0.054240	0.054303	0.051810	0.051780	0.049416	0.046078	0.050915
Poland	–	–	0.091200	0.094325	0.094489	0.101854	0.103996	0.104218	0.103992
Portugal	0.078053	0.073381	0.076884	0.087313	0.071778	0.079464	0.080279	0.080672	0.078740
Romania	–	–	–	–	0.089339	0.108848	0.121585	0.127381	0.143843
Slovakia	–	–	–	–	–	–	–	–	–
Slovenia	–	–	–	–	–	–	–	–	–
Spain	0.111844	0.111713	0.110676	0.108451	0.104418	0.100935	0.101958	0.101706	0.101872
Sweden	–	–	–	–	–	0.058004	0.054967	0.052302	0.052805
UK	0.093920	0.098127	0.100615	0.089618	0.092149	0.093008	0.102981	0.110866	0.112983

provide for a relatively coherent picture. However, the weakness is that they suggest only a marginal value differentiation as the results are quite similar for several countries. So the conclusion could be that the Gini coefficient could be used for the regional disparity analysis but with limitations. Secondly, on regional disparities in the EU. The Gini coefficient results, in all three ways, proved relatively small disparities in the EU micro-regions, with values below 0.5 and in most cases around 0.2–0.3. The trend embodies a slight tendency of slow convergence to more equal income distribution in the EU macro-region. The recent EU enlargement represents a one-off disparity shock.

3.2 Convergence results

a) Convergence analysis based on regression of Disparity Range Coefficient

Firstly, the Disparity Range Coefficient with GDP per capita of the EU was tested. This refers to the trend of the evolution of the gap between the richest and poorest micro-regions vis-à-vis macro-regional GDP evolution. The results show a divergence trend (Tab. IV). For the EU as a whole and for the period 2000–2008, we obtained $c_2 = 6.9969$. This means that the DRC, with a disparity between the EU micro-region with the highest GDP per capita and the EU micro-region with the lowest GDP per capita, rises 7 times faster than the rate at which EU macro-regional GDP per capita grows. The results obtained are statistically significant.

Concerning micro-regional convergence within the meso-regions (countries), we can observe two trends.

In the majority of Member States, the micro-region GDP per capita DRC tends to diverge with the values of the country GDP per capita increasing. In the smaller group of countries, there was a convergence trend.

The diverging group of meso-regions consists of Belgium, France, Germany, Greece, Italy, the

IV: *Disparity range coefficient and GDP in the European Union, years 2000–2008 (EUR)*

Region	coefficient	t-statistic	p-value
EU	6.996877	2.723324	0.0416
Austria	–0.058540	–0.828371	0.4452
Belgium	0.910339	1.575768	0.1759
Bulgaria	0.387439	4.851524	0.0167
Finland	–0.214757	–0.577570	0.5886
France	1.000735	2.748554	0.0404
Germany	0.354168	1.020444	0.3543
Greece	1.404317	1.279316	0.2569
Hungary	0.926180	6.393033	0.0031
Italy	0.502381	1.685052	0.1528
Netherlands	0.266053	1.509641	0.1915
Poland	0.754581	8.763289	0.0009
Portugal	0.396288	2.137947	0.0855
Romania	0.901659	6.933450	0.0062
Spain	0.664407	2.806021	0.0377
Sweden	0.403085	1.781007	0.1350
UK	3.068609	3.616320	0.0153

V: *Average disparity range coefficient for the European Union, years 2000–2008 (EUR)*

Region	coefficient	t-statistic	p-value
EU	0.368439	1.006567	0.3603
Austria	0.079346	3.532060	0.0167
Belgium	0.284655	1.493795	0.1955
Bulgaria	0.193719	4.851524	0.0167
Finland	–0.107379	–0.577570	0.5886
France	0.250290	3.028836	0.0291
Germany	0.152239	4.103045	0.0093
Greece	0.535967	1.208592	0.2809
Hungary	0.379699	6.571899	0.0028
Italy	0.138562	0.892449	0.4130
Netherlands	0.008596	0.247944	0.8140
Poland	0.171188	8.375813	0.0011
Portugal	0.139491	2.242119	0.0750
Romania	0.270589	5.042245	0.0150
Spain	0.223602	2.460481	0.5727
Sweden	0.163831	1.755440	0.1395
UK	0.510198	3.866667	0.0118

Netherlands, Portugal, Spain, Sweden, the United Kingdom and all tested Member States which entered the EU after 2004 (Bulgaria, Hungary, Poland, Romania). The speed of divergence varies significantly from c_2 values of 3.069 in the case of the United Kingdom to 0.266 in the case of the Netherlands.

The converging group of meso-regions consists of Austria and Finland only. The speed of convergence was rather marginal here, with c_2 values of –0.0559 to –0.248 respectively.

b) Convergence analysis based on regression of Average Disparity Range Coefficient

As in the previous analysis, the convergence of the 97 micro-regions within the EU was also tested by the regression of the Average Disparity Range Coefficient with the macro-regional GDP per capita of the EU.

The regression results show once again a divergence trend (Tab. V). For the EU as a whole for the period 2000–2008, the value $c_2 = 0.3685$. This means that, for the ADRC, the average disparity between the EU micro-regions in GDP per capita increased at approximately 1/3 of the speed at which EU macro-regional GDP per capita grew. In other words, an increase of the macro-regional (EU) GDP per capita leads to greater disparities in the distribution of individual income in the EU micro-regions. As the EU macro-regional GDP per capita rises, the average micro-regional disparities increase.

The divergence trend of the average income gap between the micro-regions of the EU as a whole was however much smaller than in the case of the extreme micro-regional case of the DRC. The speed of divergence based on the ADRC was almost 20 times smaller compared to the divergence based on the DRC. Similarly to the previous regression analysis, the results obtained for the EU as a whole are statistically significant.

Concerning the convergence within the meso-regions (countries), two trends can be observed. The average gap of the micro-regional GDP per capita tends to increase in the vast majority of Member States, such as Austria, Belgium, France, Germany, Greece, Italy, the Netherlands, Portugal, Spain, Sweden, the United Kingdom and all tested Member States which entered the EU after 2004 (Bulgaria, Hungary, Poland, Romania). The speed of divergence varied only marginally. The only converging meso-region is Finland.

c) Analysis based on σ-convergence

The results for the EU-25 suggest a marginal convergence trend and increasing homogeneity of regional GDP per capita in PPS (Fig. 1). The annual rate of convergence between the 97 micro-regions of the EU Member States without Bulgaria and Romania was 1.3%.

The results obtained for the EU-15 are surprising (Fig. 2). Actually, they suggest an annual divergence trend among the 82 micro-regions of 0.53%. The regression function however only marginally explains the trend.

Thirdly, the convergence analysis inside the selected EU meso-regions showed three separate patterns.

A group of meso-regions, all countries from the EU-15, demonstrated a convergence trend (Austria, Belgium, Finland, France, Germany and Spain). A group of countries manifested a divergence trend

(Bulgaria, Hungary, Poland, Romania and Greece). Finally, there was a third group of countries with an unclear trend (Italy, the Netherlands and Portugal).

In conclusion there is an overall marginal convergence trend for the micro-regions of the EU-25 driven by the convergence hub of the majority of wealthier Member States. A convergence trend on the other hand occurred in the relatively poorer countries.

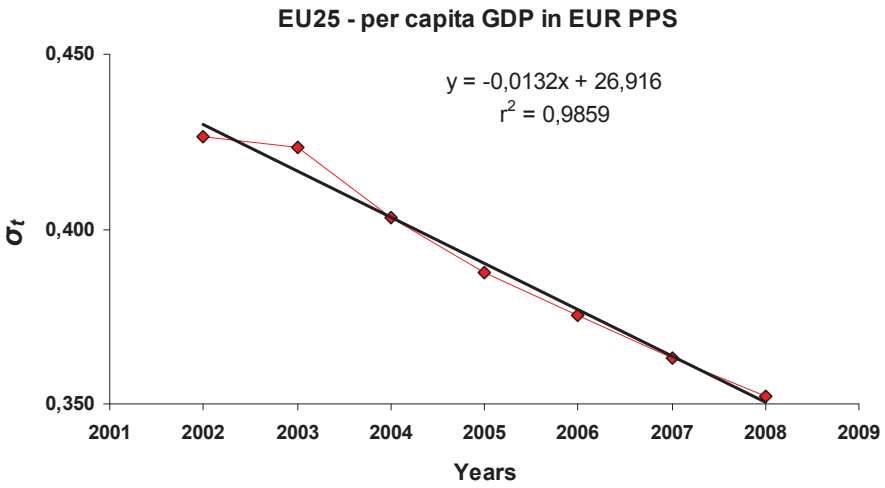
d) Analysis based on β-convergence

The evidence obtained by using the β-convergence broadly confirms the results of the σ-convergence.

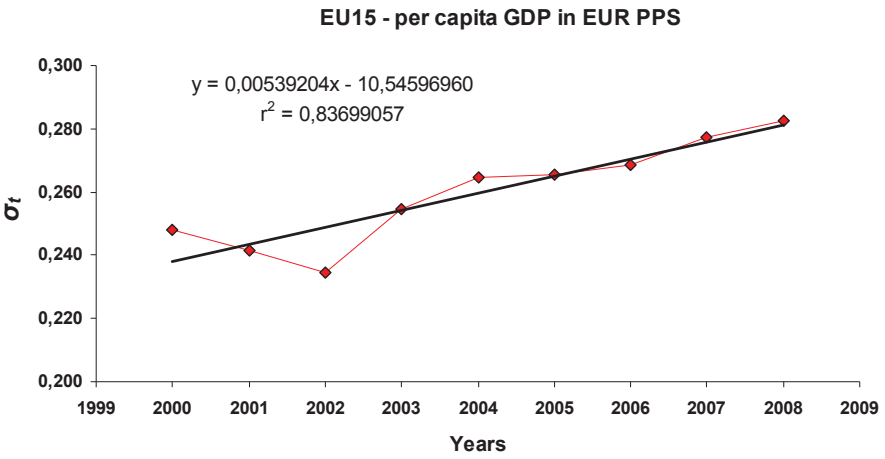
Firstly, the result for the EU-25 proves a convergence trend of 3.35% annually (Fig. 3). Secondly, the results obtained for the EU-15 (Fig. 4) confirm the outcome of the σ-convergence. This also offers an annual divergence trend among its micro-regions. The speed of divergence is 0.36% in this case. The regression function however does not explain the trend as the coefficient of determination $100r^2$ is below 1%. Thirdly, the convergence analysis between the selected EU countries showed, as in the case of σ-convergence, three separate patterns. Overall, the convergence trend was stronger here however with a less pronounced confirmation by the coefficient of determination.

The biggest group of meso-regions (countries), demonstrates a convergence trend. This was the case of Austria, Belgium, Italy, France, Germany, the Netherlands, Portugal and Spain. Another group of countries confirmed a trend towards divergence (Hungary, Bulgaria and Romania). In Finland there was no clear trend.

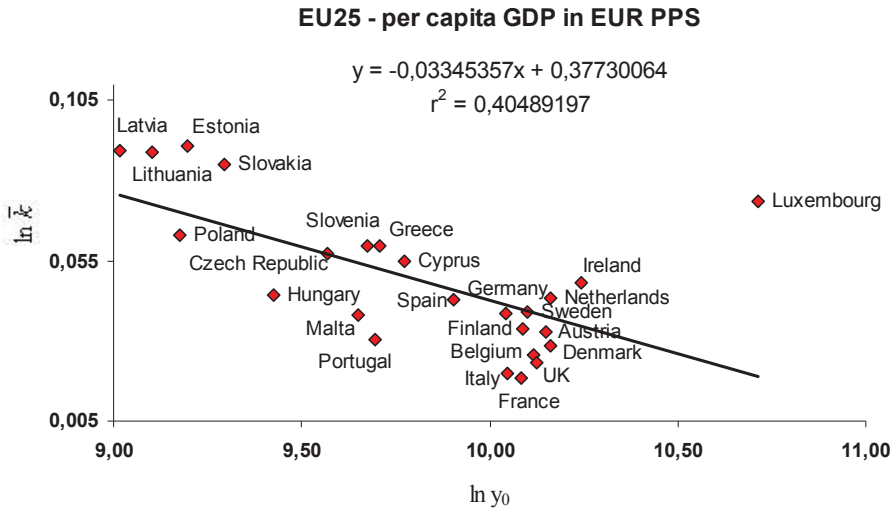
In conclusion, the results demonstrate that there is an overall convergence trend for the micro-regions of the EU-25 driven by the developments in the richer EU-15 Member States. In the Member Stares which entered the EU recently plus in the convergent countries, such as Greece, a diverging



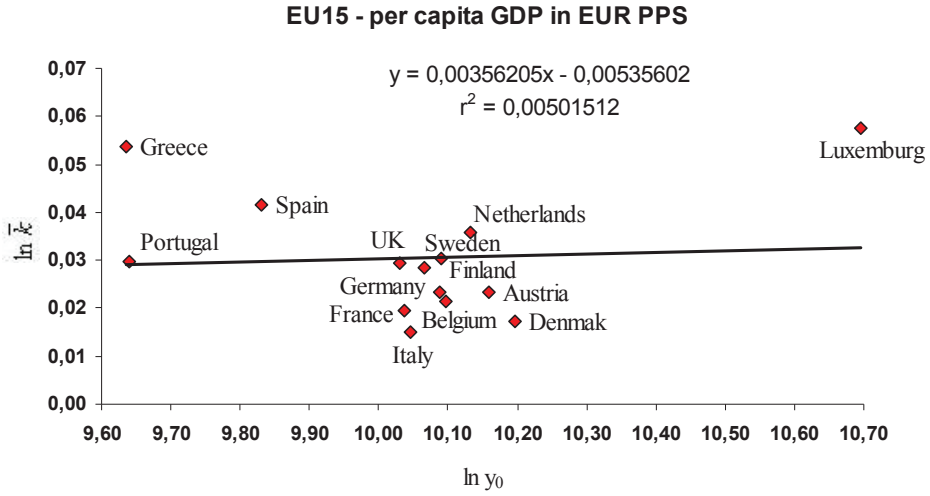
1: *The evolution of σ-convergence for 25 European Union Member States (GDP per capita in Purchasing Power Standards in EUR)*



2: *The evolution of σ-convergence for the 15 European Union Member States (GDP per capita in Purchasing Power Standards in EUR)*



3: *The evolution of β-convergence for the 25 European Union Member States (GDP per capita in Purchasing Power Standards in EUR)*



4: *The evolution of β-convergence for 15 European Union Member States (GDP per capita in Purchasing Power Standards in EUR)*

trend was identified. The poorest Member States diverged at the micro-regional level at a considerable speed. This represents a challenge for EU regional policy.

By way of discussion, there is the issue of the differentiation of the convergence results. The classical methods of the β- and σ-convergence suggest convergent results. On the other hand, results obtained by the DRC and ADRC regressions confirm divergence. Based on the methodology, one is more convergence-oriented, the other more divergence-oriented.

Interestingly, these two divergent results can also be found in the literature outcomes. Different theoretical approaches suggest either a convergence, divergence or mixed trend concerning the convergence of regions. Therefore, our analysis of the β- and σ-convergence corresponds to the findings of several studies, such as BARRO, J, SALA-I-MARTIN, X. (1992), DUFEK, J., MINAŘÍK, B. (2009), SALA-I-MARTIN, X. (1995, 2002, 2006) and VILLAVERDE, J., SERRA, M. I., PAZIMO, M. F., LINDOW, G., SUTTON, B., RAMIREZ, G. (2006).

On the other hand, our divergence and mixed scenarios, based on DRC and ADRC regressions, concord with the outcome of BANERJEE, B., JARMUZEK, M. (2009), BELL, M. W., HOE EE KHOR, KALPANA, K. (1993), OECD (2009) and UNEL, B., ZEBREGS, H. (2006).

A final comment on the DRC and ADRC regression method. This methodology can offer value added in that it combines the disparity analysis with the convergence analysis, it is easily interpretable and it offers different perspectives of convergence developments as it challenges

the more convergence-type results of the β- and σ-convergence analysis.

In terms of policy input, the study confirms that the level of disparities among the EU regions is relatively low and that the convergence happens in some areas but not others. The study shows the fact that the EU enlargement increased significantly disparities within the EU. The study does not permit to show to what extent the EU regional policy has an effect on decreasing disparities or increasing convergence between the EU regions. Politically speaking, it is not clear from this study whether the low level of regional disparity is a precondition for macro-regional cooperation or an outcome of such coordination.

4 CONCLUSIONS

The results show low disparity levels between the EU regions. In terms of nominal GD, the Gini coefficient was below 0.5 based on a GDP per capita below 0.3, and if calculated on GDP per capita in PPS it was 0.15 to 0.22. An increasing disparity trend with fluctuations was recorded, mainly due to EU enlargement. The disparity trends increased in the countries which entered the EU after 2004 plus in Greece, Portugal and Spain. The convergence based on the Disparity Range Coefficient analysis showed a divergence trend (coefficient value of 6.99). Similarly, the EU regions diverged based on the Average Disparity Range Coefficient, even though at a lower speed (coefficient value of 0.37). The convergence analysis based on the σ-convergence resulted in converge in the EU (1.32%). Similarly, the β-convergence proved a convergence speed of 3.35%. A more detailed convergence analysis was done at country level.

In conclusion, the study confirmed that the level of disparity between EU regions is relatively low. The convergence analysis provided more mixed results. It strengthened the argument of the appropriate methodological tools. The approach combining analytical instruments of both disparity and convergence characteristics, developed in the study, represents a possible way forward in this respect.

We return to the main hypothesis of the study, which foresaw that the EU macro-region converges in terms of GDP per capita. This hypothesis was not fully confirmed. Actually, the results depend on the methodology used.

The paper developed a new analytical tool for convergence analysis, the DRC and ADRC. The motivation for this was the fact that the convergence analysis based on the classical σ and β-convergence method resulted in general and less pronounced trends. On top of it, we looked at a method which would combine both disparity and convergence aspects. That is why we constructed first the disparity measurement tool, based on the extreme and average micro-regional gaps, and then used it as a convergence measurement instrument by constructing a regression function to the macro-regional average.

This approach can bring forward a new understanding of the processes of convergence.

Regarding the regional policy of the EU, the results point to the fact that there are both a low level of regional disparities and convergence among some regions. It is however impossible to conclude to what extent this is due to the EU regional policy.

SUMMARY

The objective of the study was to analyse the level and trend of regional disparity and convergence in the European Union.

The regional disparity levels and trends were analysed with the Gini coefficient between the regions based on nominal GDP, GDP per capita and GDP per capita in PPS. The convergence analysis was evaluated through the Disparity Range Coefficient and Average Disparity Range Coefficient. These tools capture both disparity and convergence aspects. On top of it, σ- and β-convergence was used. The analysis was made at the micro regional (91 regions) and meso-regional (27 countries) levels. The time period is 2000–2008.

The results show low disparity levels between the EU regions. In terms of nominal GDP, the Gini coefficient was below 0.5 based on a GDP per capita below 0.3, and if calculated on GDP per capita in PPS it was 0.15 to 0.22. An increasing disparity trend with fluctuations was recorded, mainly due to EU enlargement. The disparity trends increased in the countries which entered the EU after 2004 plus in Greece, Portugal and Spain. The convergence based on the Disparity Range Coefficient analysis showed a divergence trend (coefficient value of 6.99). Similarly, the EU regions diverged based on the Average Disparity Range Coefficient, even though at a lower speed (coefficient value of 0.37). The convergence analysis based on the σ-convergence resulted in converge in the EU (1.32%). Similarly, the β-convergence proved a convergence speed of 3.35%. A more detailed convergence analysis was done at country level.

In conclusion, the study confirmed that the level of disparities between the EU regions is relatively low. The convergence analysis provided more mixed results. It strengthened the argument of the appropriate methodological tools. The approach combining analytical instruments of both disparity and convergence characteristics, developed in the study, represents a possible way forward in this respect.

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