Real economic convergence in the European Union from 1995 to 2013

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Abstract
The aim of the paper is to analyze the economic convergence of real per capita GDP in the EU-28 Member States with two types of measurement methodology. The first is sigma convergence, based on coefficient of variation of real per capita GDP. The second is beta convergence, absolute/unconditional and conditional, including economic and socio-political variables, based on the neoclassical growth theory. The hypothesis of the paper is that there has been real economic convergence in the Member States of the European Union in at least one analyzed sub-period. The relationships between selected macroeconomic variables and the rate of economic growth are econometrically tested. Both sigma and beta convergence are estimated for the period 1995-2013 and four sub-periods: pre-enlargement sub-period 1995-2003, post-enlargement sub-period 2004-2013, pre-crisis sub-period 2004-2008 and the crisis sub-period 2009-2013. The empirical findings support the hypothesis of economic convergence, i.e. that the poor countries tend to grow faster than the rich ones in per capita terms. Sigma convergence is consistent with beta convergence. According to the results, half-life of real convergence in the EU-28 may take from 18 to 111 years. It can be concluded that the EU-28 countries have been successful in integrating their economies. However, the negative effects of the crisis on per capita GDP growth are confirmed, having as a result the slower convergence process. Significant dissimilarities between the growth patterns among individual countries show the considerable heterogeneity of growth, i.e. the convergence clubs.

1. Introduction
Convergence, defined as equalization of levels of development, is a necessary condition for efficient and successful integration. According to the Balassa classification, the European Union is at the highest degree of integration, economic union, with a single currency used by 19 Member States. How has it come there? Successful economic and monetary union requires similarities in economic structures without disparities. This has been a focus of the European Union since the inception of the European Community and the Treaty of Rome (1957) when the common policies to promote "harmonious economic development and balanced expansions" were adopted. Has the European Union been successful in this matter? If we look at the period before the crisis, the answer could be yes. First, in order to join the Union, countries have to fulfill so called Copenhagen criteria (1993) which include democracy, active market economy and obligations for the purposes of the EU. Second, once they join the EU, countries eventually have to join the Eurozone. The criteria they have to fulfill, the Maastricht criteria, include price development stability, fiscal stability, financial market stability and exchange rate stability. Before the biggest enlargement in 2004, the members of the EU were developed countries. Austria, Finland and Sweden did not join until 1995, after the collapse of the Soviet Union, since they wanted to stay neutral. So if we look at them, they had a similar level of development and should have converged. However, in 2004 ten CEE countries joined the Union, and that was the first real test. It was expected that these countries would not perform well, that there would be trade diversion. In the pre-crisis period, these countries proved that they could cope with the

challenges of being in the Union. For example, there was trade creation, the rate of trade with the old Member States and the world increased. They benefited from the SAPARD program and the development programs of the CAP. The new Member States had to improve productivity of agricultural and food sector. The quality of their food had not fulfilled the EU standards, so they had to adjust to them. As a result, technological standards have increased, as well as animal hygiene, welfare regulations, environmental requirements; employment opportunities and professional skills have improved, there were new business opportunities in rural areas and the development of the infrastructure. All of these examples prove that the process of joining the EU is justified, and that the countries need to assimilate before joining. However, problems in the EU started with the crisis in 2008. The problem is that in the time of crisis countries will not focus on integration, but on their own economies. The problem specific for the EU is that the countries have to maintain a certain level of debt or deficit. But the levels of both government debt and deficit were determined in 1991 and were based on the data of that period (60% was the average debt-to-GDP ratio at the time). The world economy experienced an enormous shock in 2008 that affected the Eurozone. Since the time has changed, the EU should adjust their rules to the current situation.

The main purpose of this research is to have an overview of the real convergence process in the European Union, i.e. to determine real convergence rates in order to reject or not reject the convergence hypothesis. Other purposes are to analyze the convergence process between different time periods, since it could show what might affect the convergence process and to determine whether there are convergence "clubs" within the EU-28.The main research hypothesis of this analysis is that there is real economic convergence in the Member States of the European Union. There are several sub-hypotheses formulated to support answering research questions: there is sigma convergence in the European Union in at least one period; there is absolute/unconditional beta convergence in the European Union in at least one period; there is conditional beta convergence in the European Union in at least one period; there is club convergence in the European Union; the EU countries have been successful in integrating their economies; the crisis has impacted the economic convergence process in the European Union.

2.   A Brief Survey of Literature

Different empirical studies have used time series and cross section data to measure and analyze the convergence process among countries and regions in the world. Convergence was popularized by Barro and Sala-i-Martin (1992). They analyzed the U.S. states over various periods from 1840 to 1988. The empirical results showed the existence of convergence, with the speed of convergence of 2 percent per year, regardless the time period. Sala-i-Martin (1994) proved that there was ample evidence of conditional beta convergence, and that the speed of convergence was remarkably similar across data sets, 2 percent per year, with the lesson that transitions were important and quite slow. Barro (1991) analyzed the impacts of independent variablesinitial GDP per capita, primary and secondary school enrollments, number of political assassinations, investment rates and measures of distortions in capital markets on the GDP per capita growth. From the analysis four lessons emerged: education was an important determinant of the growth rate of the economy; investment rate was strongly positively correlated to growth; coefficient of the initial level of income was significantly negative once other variables were held constant; different measures of political instability and market distortions seemed to matter in varying degrees. Mankiw, Romer and Weil (1992) suggested that international differences in income per capita were best understood using an augmented Solow growth model, where the output was produced from physical capital, human capital and labor. The augmented Solow model says that differences in saving, education and population growth

should explain cross-country differences in income per capita. The results indicated that these three variables explained most international variations. Ben-David (1993) examined the impact of trade liberalization on income convergence. His results supported the convergence hypothesis. The most of convergence in the EEC occurred in the post-World War 2 era, during a period of increased trade liberalization. Only after the new Member States, the United Kingdom, Ireland and Denmark, started removing the trade barriers, the income differences among the six original Member States and them began to fall. Marques and Souikiazus (1998) analyzed sigma and absolute beta convergence process in the EU-12 from 1975 to 1995. The results of the analysis were that the EU-12 Member States were converging at the rate of 1.18%. Using ten year sub-periods, they concluded that the convergence rate from 1975 to 1984 was 1.55% and from 1985 to 1995 1.61%. The results for the sigma convergence were different. The countries were converging from 1975 to 1982 and from 1986 to 1991. The discrepancy in the results of the two approaches showed that the rate of beta convergence was not sufficient to ensure the approximation of the levels of per capita income in absolute terms. Yin, Zestos and Michelis (2003) analyzed sigma and beta convergence in the EU form 1960 to 1995. For sigma convergence, the results showed that the cross sectional standard deviation of the real GDP per capita for the EU-15, the EU-9 and the EU-12 had declined over the period 1960-1995. For the EU-6, the standard deviation declined in the first two decades, but increased in the last 15 years, even though it remained the lowest one.

The results for the absolute and conditional beta convergence showed that the EU-15 countries were converging, other than from 1980 to 1985. It was shown that convergence in the EU-15 had been going strong and uninterrupted. Rapacki and Prochaniak (2009) analyzed the effects of the EU enlargement on economic growth of ten new Member States from Central and Eastern Europe (CEE-10), from 1996 to 2007. They tested sigma convergence and absolute beta convergence hypotheses of the EU-25, CEE-10 and EU-15, from 1996 to 2007 and in two sub-periods, 1996-2001 and 2001-2007. The results indicated that the EU enlargement had significantly contributed to economic growth of the CEE-10 countries and that the convergence process had accelerated after 2000 as the enlargement had been approaching. Mathur (2005) examined the convergence process in the four regions, including the European Union, from 1961 to 2001.

The EU showed the evidence of absolute convergence, the convergence rates in the periods 1980-2001 and 1990-2001 were not statistically significant, which could be caused by a challenge for designing the EU regional policies and coping with then-new entrants. Low growth was linked to high unemployment, the failure of the labor market and the unsolved problems in the systems of social security, which might require good governance and institutional changes. Szeles and Marinescu (2010) studied the absolute and conditional convergence in the Central and Eastern European countries. They found both unconditional and conditional convergence. For conditional convergence, the labor productivity and trade openness had a positive and important role in fostering regional economic convergence. The exchange rate had a weaker significance and was in a negative relationship with growth. Government debt also had a weakly significant, but positive impact on growth. Cavenaile and Dubois (2011) investigated the convergence process within the EU-27 from 1990 to 2007. They found a significant rate of convergence, as well as the existence of two heterogeneous groups; the EU-15 and the CEE countries. The presence of heterogeneity could have implications on the functioning of the EU and the Eurozone, as the recent sovereign debt crisis in the Greece highlighted. Halmai and Vàsàry (2012) analyzed four groups of the EU countries: "developed", "Mediterranean", "catch-up" and "vulnerable" countries. They showed how convergence and potential growth rates

were disrupted by the 2008 crisis through three different channels: capital accumulation, labor input and total force productivity. They concluded that the potential growth rate in the Eurozone would fall in the period 2009-2010 by 0.8%. They estimated a longer period of divergence might ensue in Europe. Kaitila (2013) analyzed only the sigma convergence of purchasing power adjusted GDP per capita in four groups of countries: the EU-15 (the old Member States, or the countries that were Member States before the 2004 enlargement), the EU-27, the EU-17 (the Eurozone) and the EU-33 (the EU Member States and the candidate countries at the end of 2012; Croatia, Iceland, Macedonia, Montenegro, Serbia and Turkey). The countries were converging from 1960 to 1973 and from 1986 to 2001.

The speed of convergence was different among the groups and it depended on time period. The Great Recession was a considerable shock to the development, resulting in divergence in the EU-15 in 2012. In the EU-27, there was little convergence from 1993 to 2000, but slowed by the Great Recession, which caused at least levelling off. The new Member States were converging rapidly by 2007, and then again affected by the crisis, there was levelling off until 2011, when they started to catch up again. In 2000, the simple average of the new Member States' GDP per capita was only 41% of the EU-15 simple average GDP per capita, but it was 60% in 2012. Dobrinsky and Halvik (2014) provided evidence of differentiated patterns in the new Member States and the EU as a whole, in the pre-accession and the post-accession periods. The results again indicated heterogeneity of growth, pointing more generally to uneven economic convergence within the EU. Also, the evidence of dissimilarities within the subgroups existed (for example Hungary and the Baltics in the new Member States), indicating the considerable within-group variation.

3. Methodology and Data

In this study, the convergence hypothesis that poorer countries, in per capita terms, tend to grow faster than the rich ones is tested through two measures of convergence. The first is sigma convergence, a simple way of measuring convergence using standard deviation or coefficient of variation. In this study will be used coefficient of variation of purchasing power adjusted GDP per capita, and the minimums and maximums of GDP per capita relative to the simple average, introduced by Ville Kaitila (2013), from 1995 to 2013, with sub-periods 1995-2003, 2004-2013, 2004-2008 and 2009-2013.Coefficient of variation is calculated as standard deviation divided by mean.

If the coefficient of variation is declining, it indicates convergence. On the other hand, an increase in this measure indicates divergence in the GDP per capita in the group. In the spirit of convergence, it will be used only simple averages, not weighted, since it is equally unwanted for any country to lag behind, despite the size of its population.

Analyzing convergence through the lowest and highest GDP per capita level relative to the average in the group is an important addition, since sigma convergence can show convergence even if one country is for some reason left behind. The minimum value does not overlook this possibility. The narrowing spread shows that the poorest countries are catching up with the average.

Another well-known measure of convergence is beta-convergence, based on the neo-classical growth model. It was introduced by Barro and Sala-i-Martin (1992). There are two types of beta convergence; absolute/unconditional and conditional. When it is assumed that the countries converge to the same terminal point or the steady states point the convergence is absolute. It is simple regression analysis, where dependent variable is the growth rate of per capita GDP, and independent variable is the initial level of per capita GDP in purchasing power terms:

log(yi,t) = α + betalog(yi,t-1) + εi,t
α – the constant term
beta – the convergence coefficient
beta<0
log(yi,t) – the growth rate of per capita GDP in period t for country i
yi,t-1 – initial per capita GDP for country i
εi,t – the stochastic error of the equation.

The beta coefficient is obtained without any other variable, since it is assumed that the economies do not differ significantly in their levels of technology, investment ration, industrial structure, human capital qualifications and other factors. When the economies have different structures, they converge to a different steady state point, and the convergence is conditional. (Marques and Soukiazis, 1998) Conditional convergence is analyzed through the multiple regression with the same dependent variable, but includes various economic, social and political variables as independent, next to the initial level of per capita GDP. In this analysis, included economic variables are inflation rate (measured by the consumer price index), economic openness and gross capital fixed formation and socio-political variables are unemployment rate, population growth rate and government debt. The expected sign of economic openness and gross capital fixed formation is positive, while the expected sign for inflation rate, unemployment rate, population growth rate and government debt is negative.

log(yi,t) = α + betalog(yi,t-1) + γXit + εi,t
Xit – a set of structural exogenous variables which can influence the growth of per capita GDP

Beta coefficient captures the rate at which a country's real GDP per capita approaches the steady state rate of growth, i.e. it is a speed of convergence. Even though it can be more than one independent variable, only the beta coefficient of real GDP per capita is taken into consideration, and it has to be negative. A positive rate indicates divergence.

Another way of analyzing the speed of convergence is through the half-life of the convergence. The half-life of the convergence process is defined as the number of years that it takes for the income gap to be cut in half. It is calculated as h= -ln(2)/ln(1+beta).

Sigma and beta convergence are closely related. Beta convergence measures the speed at which poor countries approach the rich countries in real GDP per capita terms, in a specified time interval. Sigma convergence indicates whether the cross sectional variation of the real GDP per capita among a group of countries decreases over time. Beta convergence is a necessary but not a sufficient condition for sigma convergence.
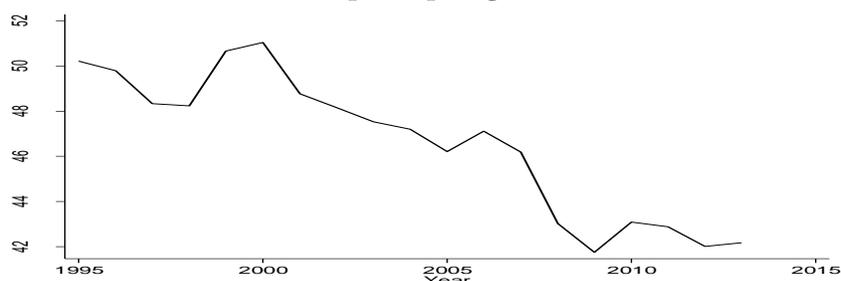
4. Sigma Convergence

Sigma convergence measures the dispersion of real per capita GDP among the countries. Table 1 and graph 1 present coefficients of variation of the real GDP per capita in the European Union Member States.

Year	Coefficient of Variation	Minimum to Average ratio	Maximum to Average Ratio
1995	50.22	0.3460	2.5059
1996	49.79	0.2874	2.4914
1997	48.34	0.2861	2.4048
1998	48.24	0.2990	2.4222
1999	50.66	0.2850	2.6182
2000	51.05	0.2825	2.6565
2001	48.77	0.3071	2.5537
2002	48.16	0.3173	2.5850

2003	47.53	0.3362	2.6385
2004	47.20	0.3638	2.6660
2005	46.21	0.3723	2.6691
2006	47.12	0.3934	2.7979
2007	46.19	0.4168	2.8107
2008	43.02	0.4511	2.6892
2009	41.75	0.4608	2.6024
2010	43.09	0.4624	2.6981
2011	42.88	0.4753	2.7209
2012	42.01	0.4842	2.6842
2013	42.17	0.4761	2.7117

Table 1: Coefficients of variation and the minimums and maximums of GDP per capita relative to the simple average in the EU-28

It can be seen that the countries in the EU-28 mostly converged. The first period of lower growth was 1999-2000. In 2000, the coefficient of variation was the highest for the analyzed period, 51.05. The countries were converging until 2006, when the index was 47.12, only slightly higher than in 2005, when it was 46.21. Next divergence happened in 2010, which is not a surprise, since the growth was affected by the Great Recession and the national governments focus mainly on combating domestic unemployment rather than pursuing common programs aiming at further integration (Yin, Zestos and Michelis: 199, 2003) In 2013 the index increased to 42.17, comparing to the previous year when it was 42.01. The EU countries are still recovering from the crises and they are experiencing increased unemployment, budget deficits, general government debt and a decline of the GDP per capita growth rate.

Graph 1: Sigma convergence in the EU-28, 1995-2013

Even though the coefficient of variation is the most commonly used measure of sigma convergence, another way of analyzing it is to compare the ratio of the minimums and maximums of GDP per capita in the EU-28 relative to the average GDP per capita (table 1, graph 2). In the EU-28, the minimum declined relative to the average up until 2000, with the exception of 1998. In 2001 it started to catch up, and this trend continued until 2013, when it declined again. Maximum to average of GDP per capita ratio increased from 1995. The lowest ratio for the EU-28 was in 1997, 2.4 which increased to 2.71 in 2013.
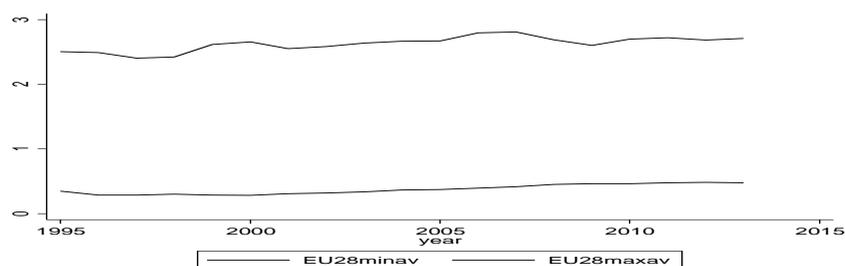
Graph 2: The minimums and maximums of GDP per capita relative to the simple average

5. Beta Convergence

Economic convergence requires a negative relationship between the initial year per capita income or GDP and the average rate of growth of the countries' real per capita GDP within a specified time period. In the table 2 are presented the results of the regression for the entire period and four sub-periods. The dependent variable in all regressions is the average rate of growth of the GDP for all EU-28 countries. Economic variables are: inflation rate, economic openness and gross capital fixed formation, and socio-political variables are general government debt, population growth and unemployment rate.

Period/Model	Basic Equation (1)			Equation with other Economic Variables (2)			Equation with Economic and Socio-Political Variables (3)		
	beta (t)	R^2	Half-life	beta (t)	R^2	Half-life	beta (t)	R^2	Half-life
1995-2013	-2.08 (-6.07)	0.63	33	-2.34 (-5.66)	0.76	30	-1.91 (-1.8)	0.83	36
1995-2003	-1.71 (-3.51)	0.32	41	-2.44 (-4.1)	0.54	29	-1.24 (-1.17)	0.61	58
2004-2013	-2.52 (-6.48)	0.62	28	-2.34 (-3.27)	0.69	30	-0.62 (-0.72)	0.81	111
2004-2008	-3.91 (-8.35)	0.73	18	-3.38 (-4.2)	0.8	20	-1.62 (-1.57)	0.87	43
2009-2013	-1.15 (-2.28)	0.17	60	-1.05 (-1.65)	0.22	63	0.61 (0.56)	0.38	-

Table 2: Absolute and Conditional Convergence in the EU-28

For the absolute or unconditional convergence, the beta coefficient for log of level of GDP per capita is negative and significant for the EU Member States. The estimated value of beta for the period 1995-2013 is 2.08, which means that, assuming that the EU Member States are similar in terms of steady state characteristics; they were converging to a common GDP per capita at the rate of 2.08%. This is consistent to Barro and Sala-i-Martin (1992) findings. Statistically, beta coefficient explains for each one-point increase in initial income, how much the rate of GDP per capita would decrease. In this case, for one-unit increase in initial income level, we would expect a 2.08 unit decrease in GDP per capita. The half-life of the convergence process is defined as the number of years that it takes for the income gap to be cut in half. (Ben-David, 1996) Half-life of the convergence from 1995 to 2013 was 33 years. Convergence was a slow process because it took about 33 years to close half of the gap between initial income and the steady state income level. Graph 3 plots the GDP per capita in 1995 (X-axis) against the average annual growth rate of the GDP per capita from 1995 to 2013 (Y-axis). The graph supports the hypothesis of absolute convergence, since there is a negative relation between the variables. It shows that countries with lower levels of GDP per capita in 1995 achieved higher growth rates in per capita terms. In 1995, Baltic countries Estonia, Latvia and Lithuania had GDP per capita of 4929.4, 4204.2 and 4837.8 euros, and they achieved average growth rate of 5.31%, 5.58% and 5.15% from 1995 to 2013. In 1995, Luxembourg had the highest GDP per capita of 30338.8 euros, and the average growth rate of GDP per capita was 1.68% from 1995 to 2013. Italy had the lowest GDP per capita growth rate of only 0.39%, and the GDP per capita of 16532.9 euros in 1995, the seventh highest GDP per capita in the European Union.

In this period, an average growth rate of GDP per capita was 2.37%, with the highest rate of 5.58% in Latvia, and the lowest rate of 0.39% in Italy. Analyzing the EU as two groups, the old and the new Member States, it can be seen that the new Member States were growing in per capita terms at the rate of 3.38% in this period. The lowest rate of GDP per capita growth

was in Cyprus, 0.81%. The average growth rate in the old Member States was 1.5%, with the highest rate in Ireland, 3.32%. From the graph 3 can be seen that the Baltic countries were acting as a club, with an average growth rate of 5.35%. Their GDP per capita in 1995 was only 14.83% of an average GDP per capita in the EU-28 and 4.59% of the highest GDP per capita in the EU-28, Luxembourg. Portugal, Spain, Greece and Cyprus formed the worst performing club, with an average growth rate in per capita terms of 1.11%. Their average GDP per capita in 1995 was 83% of the EU-28 average and 26% of Luxembourg's GDP per capita. In 1995, the Baltic countries' GDP per capita was 17.9% of this club's GDP per capita. Absolute convergence from 1995 to 2013 is consistent to the sigma convergence for the same period. Economic variables impacted the convergence process differently, depending on the period. From 1995 to 2013, the rate of conditional convergence with economic variables was 2.34%, faster than unconditional convergence. With the lower speed, the half-life of convergence was shorter by 3 years. With socio-political variable, the rate of convergence is 1.91%. Half-life of the convergence was 36 years, 3 years longer than conditional convergence with only economic variables and 6 years longer than unconditional convergence.
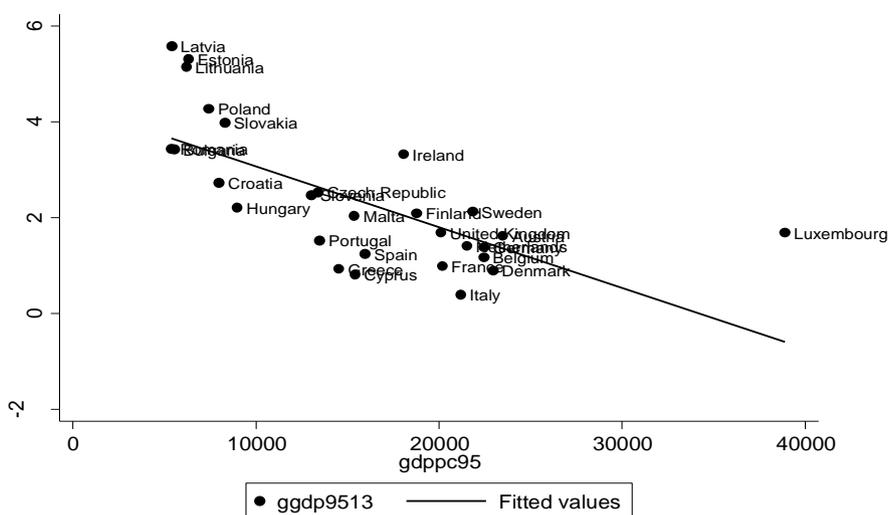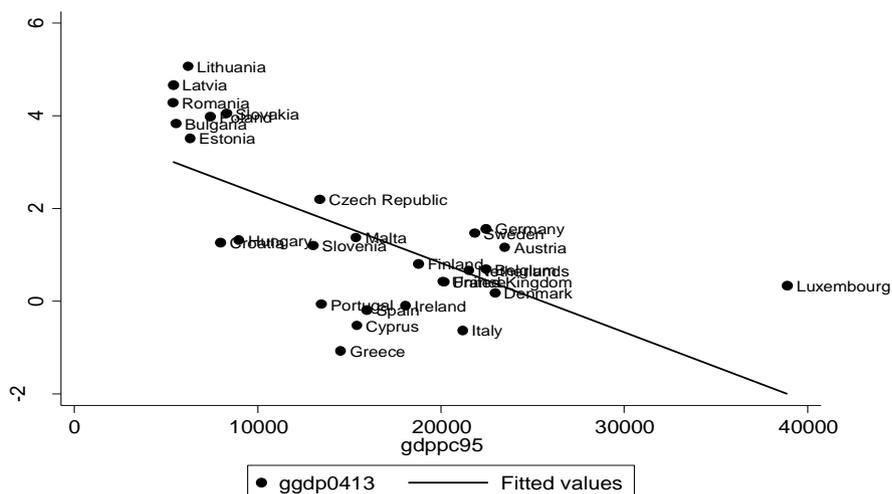

Graph 3: Absolute convergence in the EU-28, 1995-2013

The regression results also confirm the convergence hypothesis for the pre-enlargement, 1995-2003 period, with the beta coefficient for log of level of GDP per capita of 1.71, lower than for the entire period. It took about 41 years to close half of the gap between initial income and the steady state income level. In this period, the Baltic countries Estonia, Latvia and Lithuania achieved average growth rate in per capita terms of 6.74%, while Luxembourg's growth rate of GDP per capita was 3.18%. Irish growth rate was 7.1%, second largest in the EU, after Estonia, and its initial GDP per capita was 14097.3 euros. EU-28 average growth rate was 3.4%. The beta coefficient is lower, consistent to higher coefficient of variation, which showed divergence in 1999 and 2000.From 1995 to 2003, the rate of conditional convergence with economic variables was 2.44%, again faster than unconditional convergence. The half-life of conditional convergence with economic variables was shorter by 12 years. With socio-political variable, the convergence process is the slowest from 1995 to 2003. The rate of convergence is 1.24%. Half-life of the convergence was 58 years, 29 years longer than conditional convergence with only economic variables and 17 years longer than unconditional convergence. It is longer than the conditional convergence with economic and socio-political variable for the period 1995-2013 by 22 years.
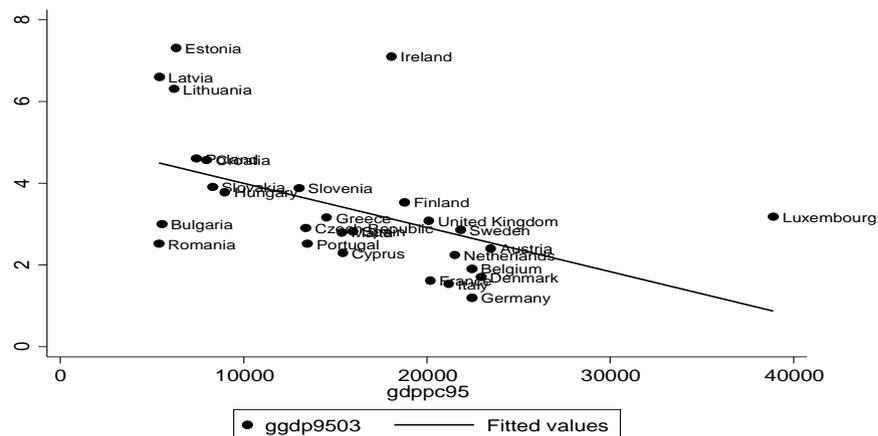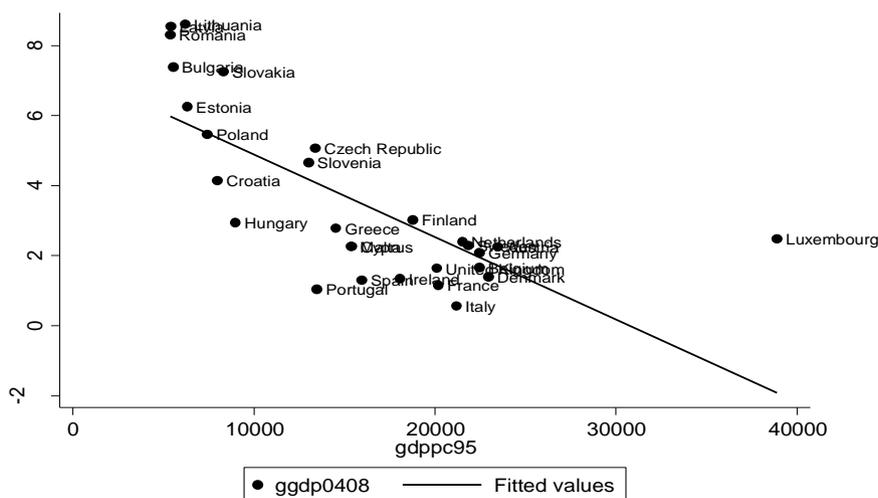
Graph 4: Absolute convergence in the EU-28, 1995-2003

For the period 2004-2013, beta coefficient is negative and statistically significant, with the estimated value of 2.52, higher than for the entire period. The convergence process was a little faster than in the previous period. It took 28 years for the income gap to be cut in half. From 2004 to 2013, Latvia and Lithuania had the highest average GDP per capita growth rates of 4.66% and 5.06%, followed by Romania (4.28%), Slovakia (4.05%), Poland (3.98%), Bulgaria (3.83%) and Estonia (3.51%), and they were forming a club, with an average growth rate in per capita terms of 4.2%, comparing to an average growth rate in the EU-28, 1.49%. Luxembourg's growth rate of GDP per capita was 0.33% in this period. Affected by the crisis, Greece had the lowest growth rate of GDP per capita in the EU, -1.08%. Cyprus, Greece, Ireland, Italy, Portugal and Spain formed the worst performing club, with an average growth rate of -1.98%. From 2004 to 2013, the rate of conditional convergence with economic variables was 2.34%, the same as for the entire period and only by 0.1% faster than for the pre-enlargement period. Conditional convergence with socio-political variables was the slowest in the period 2004-2013. The rate of convergence is 0.62%. Half-life of the convergence was 111 years, 81 years longer than conditional convergence with only economic variables and 83 years longer than unconditional convergence. It is longer than the conditional convergence with economic and socio-political variables for the period 1995-2013 by 75 years and by 55 years for the period 1995-2003.

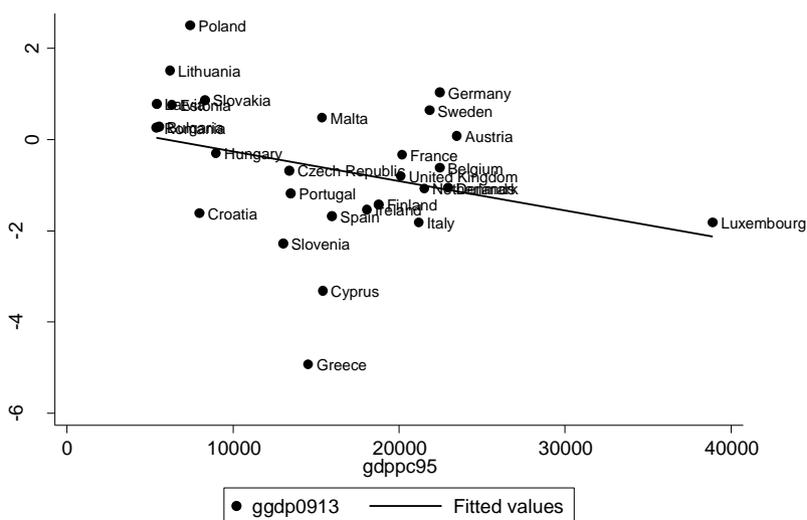**Graph 5: Absolute convergence in the EU-28, 2004-2013**

Analyzing unconditional convergence from 2004 to 2008, it can be seen that the beta coefficient for log of level of GDP per capita is negative and statistically significant, and the highest comparing to the other analyzed periods. The estimated value of beta coefficient is 3.91. In the pre-crisis period, the half-time of convergence was 18; it took about 18 years to close half of the gap between initial income and the steady state income level. From 2004 to 2008, Estonia, Latvia and Lithuania were among countries with the highest average GDP per capita growth rates of (6.26%, 8.54% and 8.6%) together with Romania (8.3%), Slovakia (7.24%) and Bulgaria (7.38%), the country with the lowest initial GDP per capita after Latvia and Romania, 4315.5 euros. And together with Poland, they formed a club with an average growth rate of 7.4%, comparing to the EU-28 average of 3.59%. Luxembourg's growth rate of GDP per capita was 2.48% from 2004 to 2008. Again, Italy had the lowest growth rate of GDP per capita in the EU, 0.56%. France, Ireland, Italy, Portugal, Spain and the United Kingdom formed a club with an average growth rate of 1.17%. In 1995, their average GDP per capita was 116.92% of the EU-28 average. The high rate of beta convergence from 2004 to 2008 is in accord with the strong performance of sigma convergence for the same period. From 2004 to 2008, the rate of conditional convergence with economic variables was 3.38%, the highest among the analyzed periods, just like the absolute convergence rate. The half-life of conditional convergence with economic variables was 20 years, which is the fastest time to close half of the gap between initial income and the steady state income level in the group. With socio-political variables, the convergence process is again the fastest from 2004 to 2008. The rate of convergence is 1.62%. Half-life of the convergence was 43 years, 25 years longer than conditional convergence with only economic variables and 23 years longer than unconditional convergence.

Graph 6: Absolute convergence in the EU-28, 2004-2008

Even though the regression results confirm the convergence hypothesis for the second five years sub-period, 2009-2013, it can be seen that the Member States were hit hard by the crisis. The EU Member States were converging to a common GDP per capita rate of 1.15%. With half-life of 60 years, it took about 60 years to close half of the gap between initial income and the steady state income level, which indicates a very slow convergence process. Graph 7 shows the GDP per capita in 1995 against the average annual growth rate of the GDP per capita from 2008 to 2013. The graph supports the hypothesis of absolute convergence, because beta convergence, even at a minimum rate, is always sufficient to ensure approximation in the levels of per capita income in relative terms (Marques and Soukiazis, 1998: 8). In this period, the country with the

highest average growth rate of GDP per capita was Poland, 2.5%. 17 out of 28 countries had negative average growth rates in per capita terms. 7 out of 13 new member States had low, but positive growth rates: Romania (0.26%), Bulgaria (0.28%), Estonia(0.76%), Latvia (0.78%), Slovakia (0.86%), Lithuania (1.52%) and previously mentioned Poland, and they formed a club with an average growth rate in per capita terms of 0.99%, comparing to the EU-28 average of -0.62%.From 2009 to 2013, the rate of conditional convergence with economic variables was 1.05%, the lowest among the analyzed periods, again consistent to the absolute convergence rate. The half-life of conditional convergence with economic variables was 63 years, close to 60 years for the unconditional convergence in the same period. Including socio-political variable in the analysis, it can be seen that the convergence hypothesis for the period of crisis is rejected, or that the countries were diverging. Lower rate of beta convergence is consistent to sigma convergence, which showed small divergence in 2010 and 2013.

Graph 7: Absolute convergence in the EU-28, 2009-2013

6. Conclusion

The paper examines the real convergence process in the EU-28 from 1995 to 2013, with four sub-periods, 1995-2003, 2004-2013, 2004-2008 and 2009-2013. Two measures of convergence were used; sigma convergence, which measures the dispersion of the real GDP per capita through coefficient of variation, and beta convergence, based on the neoclassical growth theory. The empirical results suggest that the EU-28 Member States were converging in the analyzed periods. The only exception was conditional convergence from 2009 to 2013, when economic and socio-political variables were included. Sigma convergence was consistent to beta convergence for all the analyzed periods. The highest rate of convergence was in the sub-period 2004-2008, when the countries had just joined the European Union. The results suggest that the new Member States benefited from joining the EU. The rate of absolute beta convergence in the first post-enlargement period, 2004-2008, was 3.91% comparing to 1.71% in the pre-enlargement period 1995-2003. Including economic variables, the rate of convergence from 2004 to 2008 was 3.38%, comparing to 2.44% in the pre-enlargement period. One of the included economic variables in the analysis is economic openness, which impacted the convergence process positively. The average share of exports and imports increased in both the old and the new Member States after the enlargement. Trade volumes expanded by 11.3% in the new Member States in the first decade in the EU, while it only expanded by 5.3% in the old Member States.

How high the level of trade integration is shows the fact that almost 80% of the export of the new and 60% of the exports of the old Member States goes to the EU. The new Member States export more to the old Member States after 2004. 19% of the old Member States import comes from these countries, and in 1999 it was 13%. The export from the old to the new Member States increased from less than 5% in 1999 to 7.5%. This is the consequence of a quality upgrading of their products and productivity gains which compensated for the sharp drop in cost competitiveness caused by the rise in wages in these countries.

Including socio-political variables, the convergence process was slower in the first post-enlargement period, 1.62%, while in the period of crisis the countries were diverging at the rate of 0.61%. In the pre-enlargement period, an average general government debt rate in the EU-28 was 50.04%, 35% in the new and 63.07% in the old Member States. In the period 2009-2013, the rates increased to 64.08% in the EU-28, 46.04% in the new and 79.71% in the old Member States. Unemployment rate increased from 9.13% in the pre-enlargement period to 10.17% in the period 2009-2013 in the EU-28. The lowest rate was in the period 2004-2008, 7.39%. In the new Member States, an average rate of unemployment before joining the EU was 10.5%. The lowest rate was in the period 2004-2008, 8.15% and the highest in the period of crisis, 10.67%. The highest increase in unemployment rate was in the old Member States. Before the enlargement, the unemployment rate was 7.94%. It decreased to 6.77% in the period 2004-2008 and was the highest in the period 2009-2013, 9.74%. These variables have theoretically negative sign, i.e. they impact growth negatively. Since the convergence rate was lower with the presence of different socio-economic conditions among the Member States, it can be concluded that the EU Member States could converge at a faster rate if they reduce socio-political differences, which has been the aim the EU countries tried to conduct through the Maastricht and Copenhagen criteria.

All of the graphs illustrate a characteristic that the new Member States, other than Cyprus and Malta, have been a club of their own. Including Cyprus and Malta, in 1995 these countries lagged behind the old Member States average in terms of GDP per capita. In 1995, the average GDP per capita in the new Member States was 7120.6 euros, or 43.34% of the old Member States average, 16429.8 euros. In 2013, the average GDP per capita of the new Member States reached 58.82% of the old Member States average, while Czech Republic, Cyprus, Malta, Slovakia and Slovenia have higher GDP per capita levels than Portugal and Greece.

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