REAL CONVERGENCE IN THE EUROPEAN UNION

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Abstract

The aim of the paper is to analyze real convergence process in the European Union. Economic convergence or divergence process is an inevitable part of economic development. An entrance into the European Union is linked to the fulfillment of Copenhagen economic criteria that are associated with real convergence. Therefore, fulfillment of these criteria results into real convergence process in the EU. In this paper, the process of convergence is observed not only for the whole EU, but also separately for the old member and the new member states. Gross domestic product per capita in purchasing power standards is used for researching process of convergence.

Introduction

An inevitable part of economic development is the process of economic convergence or divergence. "*Convergence is a process defined as approaching a certain level or decreasing a difference between two values over time (the difference between the two reduces over time towards a zero value).*" [9, p. 2] In general, convergence means a tendency to diminish differences among economies during time. We can observe two types of convergence – nominal and real convergence.

Nominal convergence concerns to nominal variables such as inflation, interest rates, government deficit and government debt, exchange rate etc. Very often, nominal convergence is analyzed through price level. The indicator for price level is comparative price level (CPL). Real convergence expresses the process when economic performances of different economies, measured by gross domestic product per capita, converge to the same level. According to Slavík, "*By real convergence we can understand for example structural approximation of economies or convergence of used technologies.*" [6, p. 24] While nominal convergence is being connected with Maastricht criteria, real convergence is being connected with Copenhagen economic criteria. Theoretical foundation of real convergence lies in the neoclassical growth theory [9]. This theory assumes the convergence towards a steady status that is identical for all economies and is influenced by a variety of characteristics and parameters such as savings, population growth, degree of depreciation of the capital assets used etc. There are new approaches adding other factors. The endogenous growth theory (new theory of growth) emphasizes for example education and institutional quality, and abandons the assumption of the same steady status. When a country reaches its steady status, the GDP per capita is constant over time.

Real and nominal convergence influence and determine each other. Economies with a lower economic level usually have lower price and wage level. [9] Price level growth has to be accompanied by productivity growth and therefore wage level grows. Otherwise, the decrease of real wage level could result in deterioration of the standard of living.

Economists have been interested in convergence for many decades and this economic and econometric topic has become a researched question of mainstream macroeconomic theorists and econometricians. It was caused by the fact that convergence across economies was suggested to be the main way to test the validity of modern theories of economic growth.

1 Materials and methods

There are more concepts of convergence. Sala-i-Martin defined β-convergence (absolute and conditional) and σ-convergence [5]. Both concepts emerge from the neoclassical theory of economic growth.

The absolute β-convergence presents a situation, where the economic growth in poorer countries (countries with a lower real product per capita) is higher than in richer ones no matter any other factors. The formula of the absolute β-convergence can be written as:

$$\gamma_{i,t,t+T} = \alpha - \beta.\log(y_{i,t}) + \epsilon_{i,t} \quad (1)$$

where i are economies 1, …, N, $\gamma_{i,t,t+T} = \log(y_{i,t+T} / y_{i,t}) / T$, that is economy's growth rate between t and t + T (total number of years under examination) period and log ($y_{i,t}$) is the logarithm of economy's GDP per capita in the year t. α is an constant. The absolute convergence appears when β > 0. In case of β = 0, there is no convergence, and if β < 0, there is a divergence. The formula implies that there must be a negative relationship between growth and the initial level of GDP. The disadvantage seems to be in fact that it is taking into account only the first (t) and last year (t+T) of the given period. The economic development between these years is not taken into account. Sala-i-Martin calls β-convergence the speed of convergence. The higher the speed of convergence, the nearer is β to 1. The absolute β-convergence assumes that all economies tend to grow is the same steady state. In fact, it is not true and there are differences between steady states. If a poor country is already in its steady state, there is no tendency to grow and the growth rate can be zero. In contrary, a rich country can be under its steady state and thus, the growth rate is higher than zero. The economic growth is thus conditioned by variables (e.g. capital stock, propensities to save) that cause different steady states. This is the concept of conditional β-convergence.

The σ-convergence is defined as a situation where countries converge to the same level of economic performance. The σ-convergence appears, when

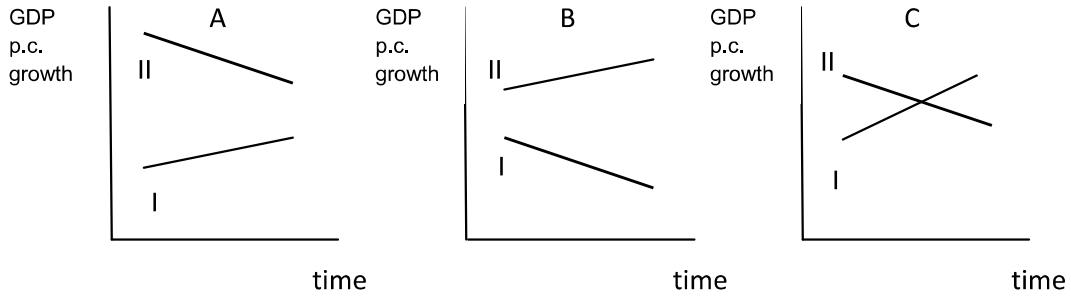
$$\sigma_{t+T} < \sigma_t \quad (2)$$

where σ_t is the time t standard deviation of log ($y_{i,t}$) across i. σ-convergence can be expressed via correlation coefficient (when countries converge to the same level of economic performance, correlation coefficient is decreasing).

The β-convergence is a necessary condition for the existence of σ-convergence, because for decreasing the dispersion of real per capita GDP levels, it is necessary for economies with lower real per capita GDP to have faster growth than richer ones to catch up. Although the β-convergence is a necessary condition, it is not a sufficient condition for the σ-convergence. In case poorer countries grow and rich countries decline, their levels can meet in time and at the end of the process, with divergence as result.

The following graphs capture different situations of the GDP per capita evaluation in time. In the situation A, economy I has lower GDP per capita, but faster growth than economy II. This leads to β-convergence (the catching-up process) and to σ-convergence (the correlation coefficient is decreasing). The situation B presents a divergence. In economy I, GDP per capita grows meanwhile it decreases in economy II. The situation C can be divided into two periods. First, as economy II grows faster than economy I, there is a β-convergence and a σ-

convergence too. Second, GDP per capita in the economy II exceeds economy I that leads into divergence.



Source: Own

Fig. 1: *Convergence and divergence process*

The convergence process of the Central and Eastern European transition economies is taken under the attention of researchers due to characteristic macroeconomic fundamentals. A test for convergence supports answering a question whether these countries successfully achieved a certain degree of natural economic integration. Kočanda noted two principal reasons to expect the convergence of macroeconomic variables of Central and Eastern European transition economies – an international trade and fulfilling the Copenhagen criteria necessary for EU entrance. [3] These and other factors encourage the process of convergence and diminishing differences among economies.

Real convergence can be measured by more indicators. Usually, GDP per capita in the purchasing power standard (PPS) is used. PPS remove the impact of different price levels and express the actual volume of goods and services. GDP is not able to intercept values of non market activities, leisure time, the quality of products and the shadow economy. Due to this and other disadvantages of GDP, there are discussions concerning to use other indicators such as national income or disposable income. Despite all drawbacks, GDP remains the most frequent indicator for analyzing convergence.

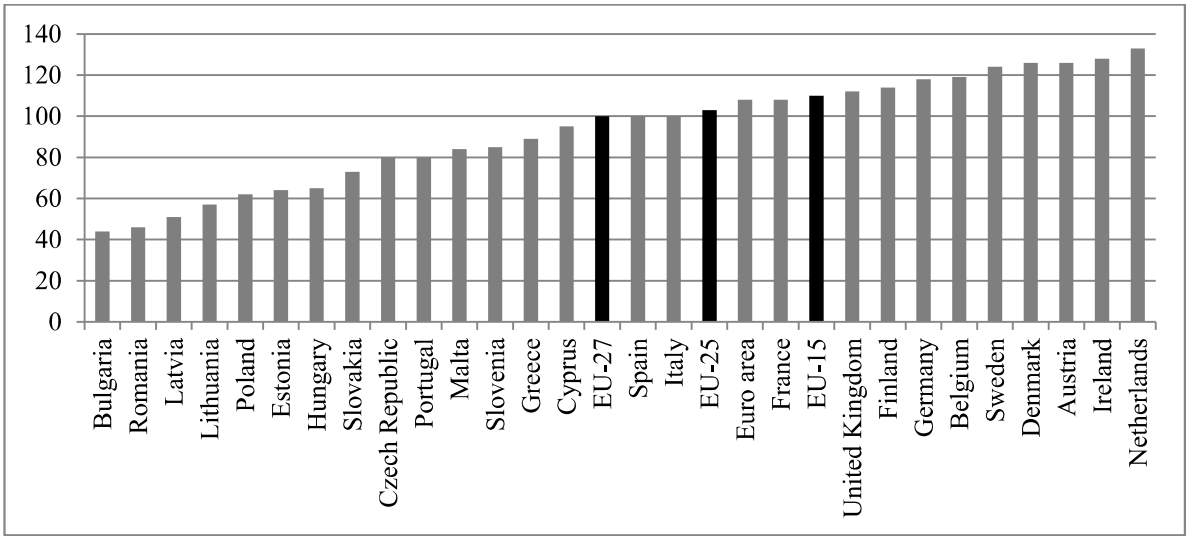
The data used in this paper are obtained from EU´s statistical office Eurostat. The observed period is from 1995 to 2010.

2 Results and discussion

Processes of convergence can be researched not only on state level but also on various regional levels. An evidence of convergence on state level cannot be identified with an evidence of a uniform development of all regions. "*A view on regional structure of any state shows that it is possible to find prosperous regions characterized by high standard of living, but also many regions with below-average economic performance, high unemployment and other social problems.*" [4, p. 8] These regions are mutually influenced in a positive and negative way, i.e. convergence and divergence processes occur. In this paper, the attention is devoted to state level.

The so called old member states, i.e. EU-15, are considered to have a higher economic level and this is proved in Figure 2. This figure contains gross domestic product in power purchasing standard where EU-27 is average. Therefore, the position of states expresses relative economic level to the EU-27 average. The highest relative economic level has Luxembourg (not captured in Figure 2). It reaches 271%. This is the reason why Luxembourg is very often extracted from analysis. All old member states are above EU-27 average. Only Greece and Portugal are under EU-27 average. New member states are under EU-27 average. The Czech Republic (80%) was on the 19th position in the EU in the year 2010 which is the

second best result from all post-communistic states (after Slovenia). Malta and Cyprus, other new member states, are also above the Czech Republic.



Note: Luxembourg = 271

Source: Eurostat

Fig. 2: *Gross domestic product of EU states in PPS per capita (EU-27 = 100, 2010)*

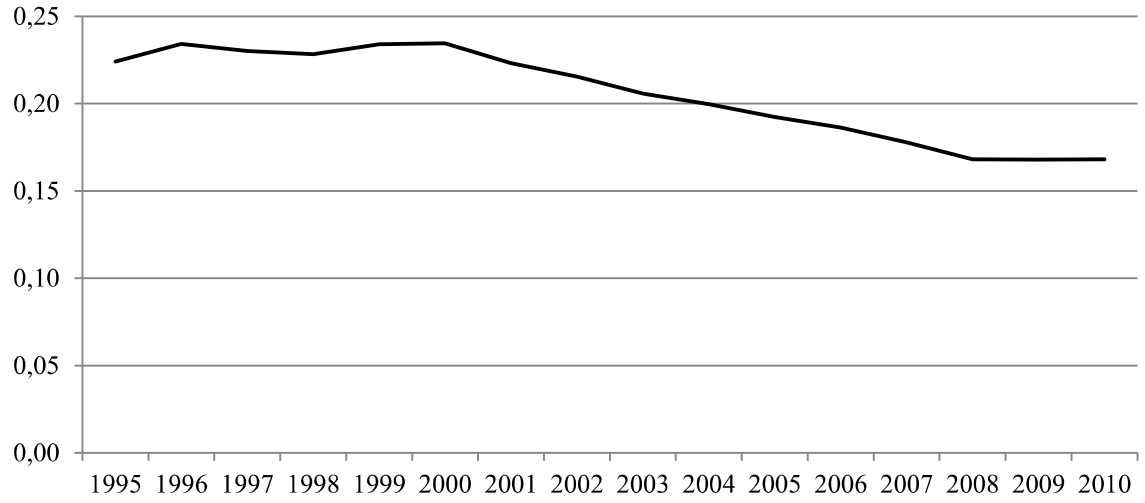
Focusing on new member states (EU-12) in the observed period 1995 – 2010, the greatest real convergence dynamics reported Estonia (from 36% to 64%, that is annual average change 1.87 p.p.), Slovakia (from 47% to 73%, that is annual average change 1.73 p.p.) and Lithuania (from 35% to 57%, that is 1.47 p.p.), see Table 1. In the Czech Republic, there was a divergence process between the years 1995 and 2000, caused by an economic recession. Unequal rate of real convergence of new member states is caused by differences in initial economic level, facilities in key growth factors and realized economic policy. [8]

Tab. 1: *GDP per capita in EU-12 (EU-27 = 100)*

	1995	2000	2005	2010	Annual average change 1995 – 2010
Bulgaria	32	28	37	44	0.80
Czech Republic	76	71	79	80	0.27
Estonia	36	45	61	64	1.87
Cyprus	87	88	92	95	0.53
Latvia	31	36	48	51	1.33
Lithuania	35	40	53	57	1.47
Hungary	51	54	63	65	0.93
Malta	86	85	78	84	-0.13
Poland	43	48	51	62	1.27
Romania	33	26	35	46	0.87
Slovenia	74	80	87	85	0.73
Slovakia	47	50	60	73	1.73

Source: Eurostat, own calculations

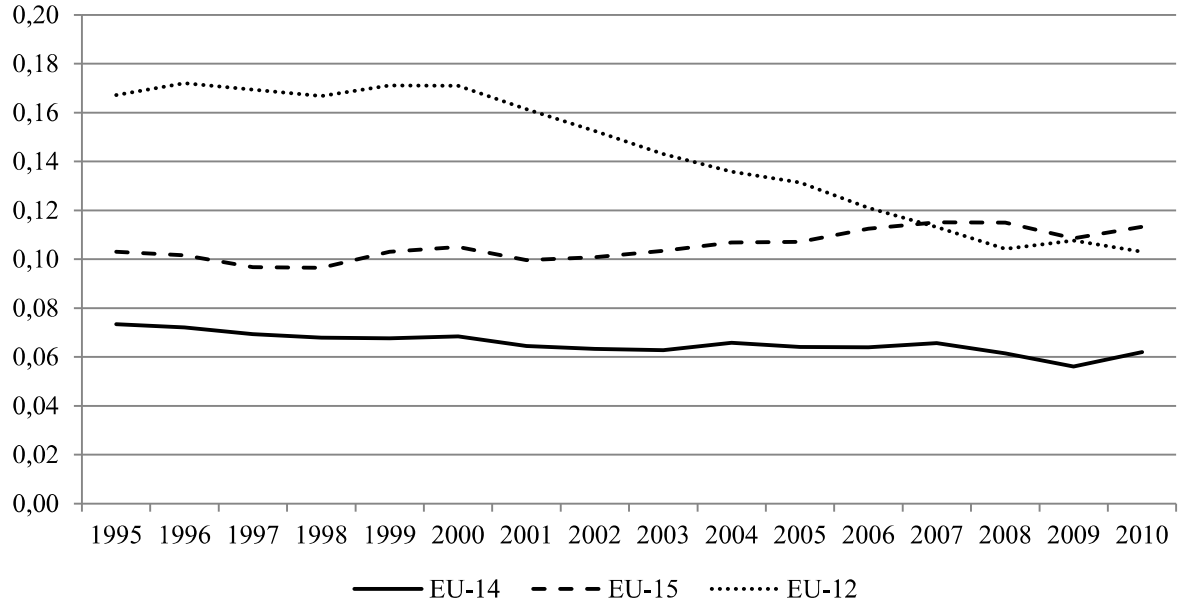
Figure 3 describes the evaluation of a standard deviation of the logarithm of GDP per capita in PPS in the EU-27 in the years 1995-2010. As we can see, there is σ-convergence from the year 2000, thus differences between economies are diminishing. Between the years 2008 and 2010, there is visible stagnation connected to the economic crisis.



Source: Eurostat, own calculation

Fig. 3: *σ-convergence in EU-27*

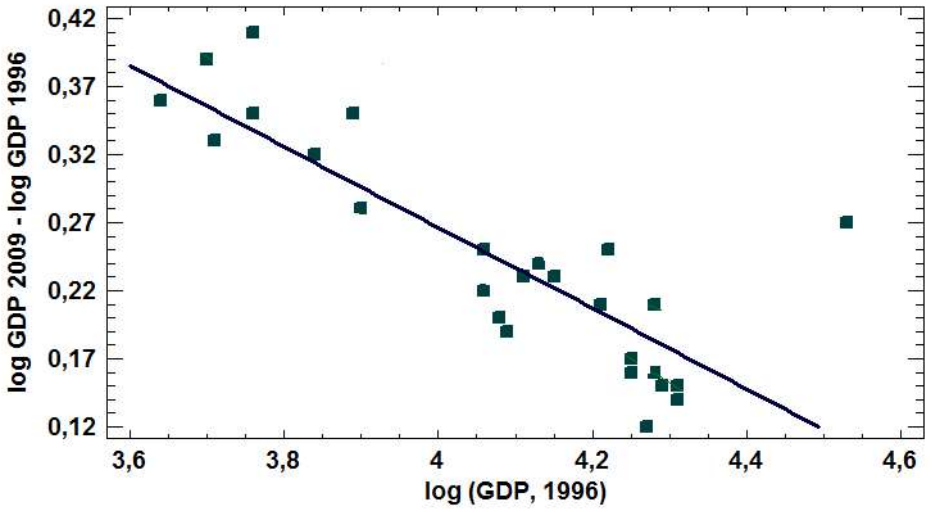
The σ-convergence can be measured for the whole EU, nowadays EU-27, or it can be observed in two main groups, old (EU-14, EU-15) and new (EU-12) member states. Luxembourg was extracted because its economy is highly above other countries and disfigures results, as is visible in the Figure 4, where EU-14 is a standard deviation of old member countries without Luxembourg. It is obvious that for new member states, the process of σ-convergence is more significant than for old member states.



Source: Eurostat, own calculation

Fig. 4: *σ-convergence in EU-15 and EU-12*

The following Figure 5 shows the β-convergence in EU-27. As mentioned above, the β-convergence means higher growth in poorer economies. This negative relationship between initial level of GDP in PPS (the axis x) and its growth rate (the axis y) is visible in the chart 4. Countries with the lowest initial level of GDP (Bulgaria, Latvia, Romania, Lithuania and Estonia) have a higher growth rate of GPD. These states undergo the catching up process more significantly than states with a higher initial level of GDP.



Source: Eurostat, own calculation

Fig. 5: *β-convergence in EU-27*

Conclusion

Real convergence is a process of diminishing differences among economies. The most preferable indicator used for measuring is GDP per capita in purchasing power standard. The so called old member states have a higher economic level. Apart from Greece and Portugal, their GDP per capita in PPS are above EU-27 average. On contrary, all new member states are under the EU-27 average. The Czech Republic has the second highest GDP per capita from all post-communistic states, after Slovenia. In the observed period 1995-2010, the greatest real convergence dynamics reported Estonia, Slovakia and Lithuania. Researching the evaluation of a standard deviation of the logarithm of GDP per capita in PPS in the EU-27 in the years 1995-2010, the σ-convergence was proved. Between the years 2008 and 2010, there was stagnation of this process connected to the economic crisis. Focusing on different groups of EU member states and comparing their economic development, it was proved that process of σ-convergence is more significant for new member states than for old member states. This phenomenon is in accordance with the goal of the European Union and the Copenhagen economic criteria. The β-convergence in EU-27 was also proved. States with lower initial economic level grow faster.

The economic crisis has influenced not only the economies of the EU member states, but also the processes of real and nominal convergence. Due to globalization, that allows shift of capital, labor force, technologies and other factors important for economic development, we can assume continuation of real convergence process and diminishing differences among economies.

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Reálná konvergence v Evropské unii

Cílem příspěvku je analyzovat proces reálné konvergence v Evropské unii. Proces ekonomické konvergence či divergence je nevyhnutelnou součástí ekonomického vývoje. Vstup do Evropské unie je podmíněn splněním Kodaňských ekonomických kritérií, která jsou ztotožňována s reálnou konvergencí. Plněním těchto kritérií tedy dochází k procesu konvergence v EU. Proces konvergence je v tomto příspěvku sledován nejenom v rámci celé EU, ale také odděleně pro staré a nové členské státy. Pro zkoumání procesu konvergence je využit ukazatel hrubý domácí produkt v paritě kupní síly.

Reale Konvergenz in der Europäischen Union

Ziel dieses Beitrags ist es, den Prozess der realen Konvergenz in der Europäischen Union zu analysieren. Der Prozess der wirtschaftlichen Konvergenz oder Divergenz ist ein unvermeidlicher Bestandteil der wirtschaftlichen Entwicklung. Der Beitritt zur Europäischen Union ist durch die Erfüllung der wirtschaftlichen Kriterien von Kopenhagen bedingt, die mit realer Konvergenz gleichgesetzt werden. Der Konvergenzprozess in der EU erfolgt also unter Einhaltung dieser Kriterien. Der Konvergenzprozess wird in dieser Arbeit nicht nur im Rahmen der ganzen EU betrachtet, sondern auch getrennt für alte und neue Mitgliedstaaten. Um den Konvergenzprozess zu untersuchen, wird als Maßstab das Bruttoinlandsprodukt pro Kopf nach Kaufkraftparität benutzt.

Realna konwergencja w Unii Europejskiej

Celem niniejszego artykułu jest analiza procesu realnej konwergencji w Unii Europejskiej. Proces konwergencji czy dywergencji ekonomicznej stanowi nieodłączny element rozwoju gospodarczego. Przystąpienie do Unii Europejskiej uzależnione jest od spełnienia ekonomicznych kryteriów kopenhaskich, które są utożsamiane z realną konwergencją. Spełnienie tych kryteriów stanowi podstawę procesu konwergencji w UE. W niniejszym opracowaniu proces konwergencji badano nie tylko w ramach całej UE, ale także oddzielnie dla starych i nowych państw członkowskich. Do celów badania procesu konwergencji użyto wskaźnika PKB wyrażonego według parytetu siły nabywczej.