

THE CONVERGENCE PROCESS IN EU COUNTRIES IN 2001-2010

Filip Ježek

*Silesian University, School of Business Administration,
Univerzitní náměstí 1934/3, 733 40 Karviná, Czech Republic
Email: jezek@opf.slu.cz*

Abstract. Joining the European Union and the commitment of the Maastricht criteria for adopting the euro increases the interest and the need for analysis of the convergence process. Many studies are connected with the economic growth which is commonly measured by GDP. The paper describes a framework of the theory related to the convergence process with the respect to the advantages and disadvantages of various theoretical approaches. Especially two methods how to measure a convergence are mentioned in the literature and empirical studies: β – convergence and σ – convergence. However, the problem of convergence is related not only to the GDP. In the paper, the convergence process through the prism of a comparative economics is discussed. The comparative economics is relatively a new discipline which analyses and compares the economic systems and processes within these systems; usually within a group of selected countries. The aim is to find common or different characteristics in their development. The article contains the analysis and evaluation of the convergence process of EU-27 countries in 2001-2010 by the technique for ordering a preference using the similarity to the ideal solution. This method enables taking into account not only the GDP, but other indicators as well. In the article, it is shown that the convergence process can be analysed through the comparative economics in the wider context.

Keywords: convergence, comparative economics, technique for order preference by similarity to ideal solution.

Jel classification: D63, F15, O11.

1. Introduction

Joining the EU was largely discussed in the framework of the theory of optimum currency areas (OCA). The object of this theory is the examination of the conditions that allow a group of countries the elaboration theory of optimum currency areas related to the convergence conditions that states should fulfil before joining the monetary union. By the theory, the countries which create optimal currency area should have constant prices and wages, labour mobility, homogeneity of preferences etc. However, various empirical analysis of convergence focuses mainly on GDP growth. It is obvious, that this problem needs an interdisciplinary solution. It can be provided by the comparative economics. Although it is relatively new discipline, it can make it easier to answer the question concerning the measuring and evaluating the convergence process based on more than one single indicator. In the

principle, the comparison method is based on the classical statistical apparatus. In the empirical part of the article, the method known as a technique for order preference by the similarity to the ideal solution is used. Various economic actions in different countries can lead to the same results, but on the other hand, identical economic actions in the different countries could cause different impacts. This requires a deep knowledge of the context, and it is a reason why the comparative research should be done by the international team (Smelster 2003). The main characteristics of the comparative research are the existence of units that are considered to be original entities and the fact that the cases are mutually related to each other. It is not just a description of the different cases. Therefore, comparison may contain generalizations or explanation or interpretation of the differences. The aim of the paper is to highlight a potential and possibilities of the comparative economics and to update the analysis of the convergence in the EU as well.

2. The theoretical background

Robert A. Mundell is considered as a founder of the optimum currency areas. In his work concerning optimal currency areas (1961), he focused on asymmetric shocks and labour market flexibility. Assuming constant prices and wages, he examined the macroeconomic adjustment mechanisms and changes in a demand between the two regions. Mundell claims that asymmetric shocks are the most easily absorbed by means of monetary policy, which changes in exchange rates. Wage flexibility and labour mobility could compensate the lack of the independence in the implementation of the monetary policy.

Friedman (1953) enriched the theory by the knowledge that into the monetary union should enter a country with flexible prices and wages. McKinnon developed the condition of the size and openness of the economy. Other conditions are e.g. the similar rate of inflation (Fleming 1971), integration and fiscal sustainability of public finances, homogeneity of preferences of members of the monetary union solidarity and political integration. An important condition is also a cyclical adjustment.

When entering the European monetary union, the countries are exposed to the risk of asymmetric shocks, which can be reduced by the convergence with other states forming a monetary union. The introduction of the euro (European currency) was in fact a quite controversial, with many economists questioning whether Europe is anywhere near suited as single money in the United States. Now, the major European economies are rather similar to each other and very closely linked (Krugman 2009).

Generally, two basic types of the convergence can be distinguished - real and nominal.

The nominal convergence expresses a convergence of nominal variables, especially price levels, but sometimes it is also used for the analysis of wages, pensions, and the development of nominal GDP (Siklos 2010). The nominal convergence

mainly deals with the convergence of absolute values and growth rates, in accordance with the criteria in the Maastricht treaty (Nagayasu 2011). It covers interest rates, inflation, deficit and debt and exchange rates. Nominal convergence also examines the development of price levels and their dependence, as well as the development of relative prices of the main expenditure components of GDP and household expenditure on basic consumption (Komárek *et al.* 2010). Inflation rates and their convergence within the Euro area have been a major concern since well before the advent of the single currency. Inflation is the norm in a world of paper currencies (Mauldin, Tepper 2011). The recent financial crisis and its strong impact on several Euro area countries with higher inflation rates have strengthened this interest, especially in the light of the European Central Bank's (ECB) objective of price stability (Lopez, Papell 2012).

The real convergence reflects the economic level of convergence in the least-developed countries to the country or countries more advanced. It can be defined as the process of convergence of GDP per capita and price levels comparable to the long-term equilibrium condition (Žďárek 2006), or as a synchronization of economic cycles of the country to the reference countries or regions of cohesion within the integration group (Begu *et al.* 2010). Real convergence parallel proceeds with the nominal convergence and it affects each other (Marelli, Signorelli 2010). Countries with a low economic level also usually have a lower price level and if a country has a lower price level than usually the wages are at a lower level than in the countries with higher price levels, too. Therefore, it will increase the inflation when catching up with the developed countries.

The both types of convergence may be delayed or may have a different intensity. The real convergence is based on the neoclassical growth theory, which deals with the approximation of continuous state variables, is perceived as approaching economic level to the level of other countries. It can be also understood as a structural approximation of economies or used technologies (Slavík 2007). The process of convergence can be written as in formula 1:

$$\left| Y_{1,t-1} - Y_{2,t-1} \right| > \left| Y_{1,t} - Y_{2,t} \right| \quad (1)$$

where y_1 is income of the first country at time t , y_2 is income of the country at time t , respectively $t-1$. The opposite sign indicates a case of divergence. The real convergence process can be seen in the case that GDP growth per capita is faster than GDP growth per capita in the country where the particular state tries to catch up (De Grauwe 2008). Unfortunately, the economic theory does not provide the unambiguous predictions regarding the convergence or divergence of per capita, but sets certain rules and mechanisms that can affect the convergence.

It is also possible to distinguish the two basic types of the real convergence - absolute and conditional. The process of real convergence assumes that the growth of GDP per capita growth precedes GDP per capita of the country to which the state seeks to be close.

1) Absolute convergence

Absolute convergence is based on the assumption that poorer countries grow faster than richer countries, regardless of other conditions (Barro 1995). The roots of absolute convergence can be seen in the neoclassical growth model and its disadvantage is the inability to explain the trends in the current economy, such as catching-up effect, where poorer countries achieve growth relatively easier than developed countries.

2) Conditional convergence

Conditional convergence predicts the convergence of countries with the same steady state in the countries which have similar structural characteristics. The convergence is conditional on controlling the variables that cause different stable states. This steady state is reflected for example in the same population growth, the same level of technology, the level of investment, production function and the savings in the economy. Of course, only one steady state cannot occur in practice, since the economies are differently equipped. Economies which are rather similar in their structural characteristics (e.g., production technology, preferences, government policies, etc.) may nevertheless converge to different steady state equilibrium if they differ in terms of initial conditions (Bartkowska, Riedl 2012).

There are two types of convergences: β – convergence and σ – convergence.

1) β - convergence

The concept of β - convergence is based on the assumption that countries with lower initial levels of output per capita achieve higher growth rates of output per capita than countries with its higher initial levels (Nevima, Melecký 2010). Originally poorer countries are more dynamic. These countries are catching up the others. Neoclassical model understands this convergence as a convergence to the steady state (Vu 2012). Steady state occurs when is the income per capita constant over time. This process can be quantified using the following regression equation:

$$y_{i,t} - y_{i,0} = \alpha_1 - \beta_1 * y_{i,0} + \varepsilon_i \quad (2)$$

where $y_{i,t} - y_{i,0}$ means the difference of product per capita in different times, regression coefficient β_1 represents how much of the difference between the steady state countries is managed to eliminate, - i.e. the reduced percentage gap compared to the steady state, α is a constant, ε is a residual component.

If the coefficient β_1 in formula 2 was positive, it would mean that richer countries have tended to grow faster. If a country had a stable steady state and time- α_1 than the time would be sufficiently long and country can converge to this state. In that situation β_1 is 1.

2) σ - convergence

σ - convergence indicates a reduction in the variance of GDP per capita between the economies in time. Accordingly, σ - convergence economies converge to the same economic level (GDP / inhab.) or to the same economic output and coef-

ficient of variation economic levels of countries in this case decreases over time (Galí 2006). The following definition expresses σ - convergence:

$$\delta_t^2 > E[\delta_{t+1}^2] \quad (3)$$

The formula 3 tells us, that the concept of σ - convergence is defined as a reduction of variance of logarithm of GDP per capita between the compared economies. During the process of growth, the income levels of countries will become more equal and the variation between their per capita GDP levels will gradually lessen (Varblane, Vahter 2005).

The problem of convergence can be also seen through the prism of comparative economics. The comparative economics as a discipline came into being in 30's in 20th century. The deepening of the differentiation of various parts of the world was the most important incentive. Even today, there are differences in economic level of countries. Therefore, comparative method is still commonly used. For example, the impacts of Keynesian revolution can be analysed (Prybyla 1969).

The comparison can also serve as a method of learning from others, or seeking the alternative problem solution. The comparative research also plays a different role in relation to the theory – it can be useful to validate the theory or to build a new theory (Mills *et al.* 2006).

The comparison focuses not only on comparing the results which are connected to the functioning of economic systems, but also to compare the structure of economic systems and to compare the mechanisms – how these systems work. It is obvious, that mathematical methods are often used just for comparison of results associated with the functioning of economic systems, because the results are easily measurable (Geißler, Mouralová 2012).

On the other hand, there are used qualitative rather than quantitative methods when comparing the structure and mechanism of functioning of economic systems.

An inadequate depth of knowledge of various phenomena and their causes and the lack of knowledge of the overall context can be a limitation for the application of the comparative method based on a qualitative comparison. In that case a contextual analysis should be done (Smelster 2003).

Therefore, in the next part of the article, we pay attention to the analysis of the nominal convergence. Another reason is that "...The variance of the logarithm often used to test for σ -convergence does not respect the properties expected for an inequality measure and it has problematic implications for world growth. And empirical tests for β -convergence are so weak that β -convergence can be observed whether one moves forward or backward in time." (Wodon, Yitzhaki 2001).

3. The convergence process in the EU countries in 2001-2010

When applying the comparative method to the convergence process problem, it will be convenient to use the TOPSIS method (Technique for Order Preference by

Similarity to Ideal Solution). This method can be used to resolve the multicriteria problems (Ramík 1999).

The method is based on the geometrical measurement of a distance between two points. Alternatives are ordered from the shortest distance between an ideal state and a particular alternative. It means that the shortest distance represents the better evaluation of the particular alternative.

Let's assume that $f_i \in C$ is a cardinal criterion, $f_i : A \rightarrow S_i$, and $S_i \in R$ is cardinal scale.

We can use the standardization method for the transformation scale S_i to scale $S = [0,1]$ (which should be the same for all the criteria).

After the transformation, all the criteria have non-negative values. It comes to this, that $f_i(a_j) \geq 0$ for all $i = 1, 2, \dots, m, j = 1, 2, \dots, n$, and $f_i \max > f_i \min$.

Then it is defined the transform $\varphi_i: S_i \rightarrow [0,1]$, $i = 1, 2, \dots, m$: for criteria which should be maximized (the higher value of criterion is better) as follows:

$$\varphi_i(x) = \frac{x - f_i^{\min}}{f_i^{\max} - f_i^{\min}} \quad (4)$$

The transform $\varphi_i : S_i \rightarrow [0,1]$ in the case of criteria which should be minimized:

$$\varphi_i(x) = \frac{f_i^{\max} - x}{f_i^{\max} - f_i^{\min}} \quad (5)$$

Through the φ_i a new criterion $F_i(a) = \varphi_i(f_i(a))$, $a \in A$ can be defined instead of a f_i criterion.

If $F_i(a)$ criterion had a value equal to zero, it would mean that the particular alternative is the worst. If $F_i(a)$ criterion had a value equal to 1, it would mean that the particular alternative is the best. These statements concern to all criteria.

Now, the standardised values can be easily compared. For ordering the alternatives, following formula is used:

$$D(A, B) = \left\{ \left[(x_1)_A - (x_1)_B \right]^2 + \left[(x_2)_A - (x_2)_B \right]^2 + \dots + \left[(x_n)_A - (x_n)_B \right]^2 \right\}^{1/2} \quad (6)$$

The formula represents the Euclidean distance $D(A, B)$ between the two objects (A and B) in a n -dimensional space. Values x_1, x_2 exactly represent the coordinates of the objects.

In our analysis of convergence EU-27 countries, we take into account four criteria: GDP growth (in %), unemployment rate (% of total labour force), exports of goods and services (% of GDP) and inflation (consumer prices, annual %). The time series begins in 2001 and ends in 2010. This is due to the limitation of the data availability. The results are as follows:

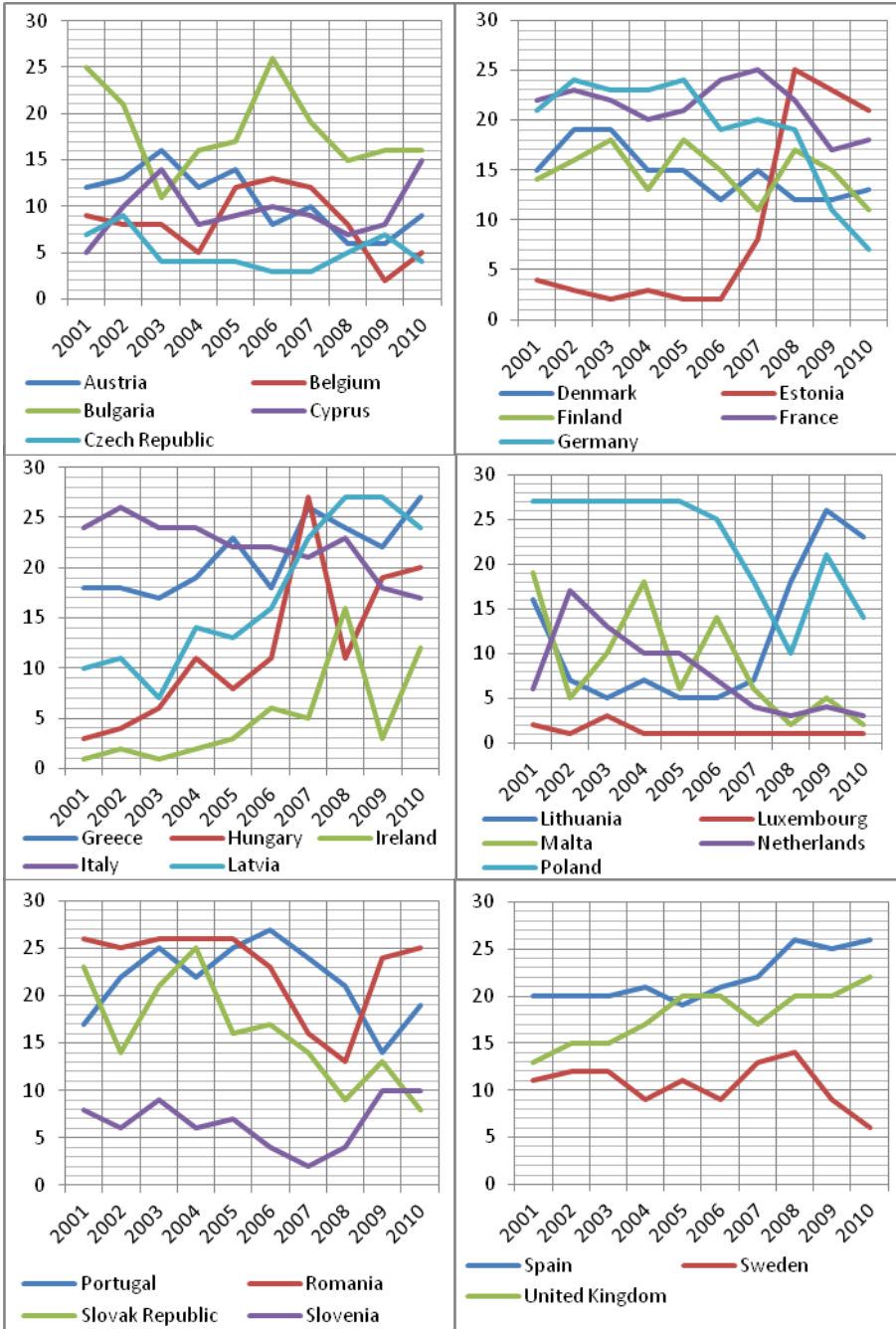


Fig. 1. Convergence process in EU in 2001-2010 (Source: own)

The figure 1 shows the convergence process in EU countries in 2001-2010. On the Y-axis, we can see the ranking of countries in particular years. The lower value means the better position – it is sorted by the economic level, 1 = the country with the best economic level, 27 = country with the worst economic level in EU-27. The analysis shows that there exist 3 types of countries – a group of countries, where the decreasing trend in ranking can be seen, a group of countries, where the ranking was increased between 2001 and 2010, and finally, countries, which have the steady economic level. The first mentioned group of countries represent Cyprus, Estonia, Greece, Hungary, Ireland, Latvia, Lithuania, Portugal, Romania, Slovenia, Spain and United Kingdom. In the Cyprus, the situation was especially caused by the decreasing exports since 2001, while in average in EU there was the increasing trend of the international trade. In Estonia, the situation was caused by the decreasing GDP growth since 2007, which was much more considerable when we compare it with the average GDP growth in EU. Contrary, the unemployment rate increased in Estonia much more than in EU. The situation of Greece is specific, of course. We can see the deterioration of values in all the four indicators – in comparison with EU average GDP growth, GDP growth in Greece is lower since 2004. The unemployment rate is also worse in Greece than EU average which last all the time period. Exports of goods and services are much lower than in EU, which can be noticed also since 2001-2010. And the fourth monitored indicator - the inflation rate was in Greece for a long time lower than the average inflation in EU countries, but in 2010 the inflation rate was in Greece 4.7% while EU average is 2.0%. In the case of Hungary, there is the deterioration in ranking of the economic level caused especially by the higher inflation rate in comparison with the EU average values and by the increasing unemployment rate which was lower than EU average till 2006. Then the unemployment rate was in Hungary higher than in EU. In the Ireland, we could see the higher unemployment rate than its average in EU countries. This occurs since 2009. Low ranking in Latvia was caused especially by the insufficient GDP growth, very high unemployment rate in 2009 and 2010 and very high inflation rate (especially in 2008 – 15.4%). In Lithuania, GDP growth was above the EU average in 2001-2010, but with the exception of 2008. The values of the export of good and services (as % of GDP) were similar to the EU average values in 2001-2010. The ranking of this country was decreased by the higher inflation rate, which occurred since 2006, and higher unemployment rate since 2009 (unemployment rate in Lithuania in 2009 was 13.7%, while the average unemployment rate in EU was 8.8%). In 2010, the unemployment rate in Lithuania was 17.8% and EU average value was 10%. Situation in Portugal was affected especially by the increasing unemployment rate (which constantly increased from 4% in 2001 to 10% in 2010) and much lower exports (related to GDP it was in Portugal about 26%) than was in EU (about 53%). In Romania there was considerable decreasing of inflation rate (in 2001 it was 34% while in 2010 it was 6% only) but the inflation rate is in Romania still higher than is EU average value (2% in 2010). This could be seen as a convergence in this area, but in fact there is another indicator – export

which shows that Romania has much lower export (20 – 30% of GDP) than is EU average (about 53 % as mentioned before). In Slovenia there are values of all four analysed indicators similar to the EU average values. When we look at the figure 1 we can see that ranking of Slovenia decreased from 8th best country in 2001 to the 10th in 2009 and 2010 which is not so much distinct deterioration. It was caused especially by the GDP growth decline which was in Slovenia -8% in 2009 while average decline of GDP growth in EU in 2009 was -5.8%. In Spain there we can see that the unemployment rate is higher in the whole time period and since 2008 it is even worse. While in 2001 was unemployment rate in Spain 10.5% and average unemployment rate in EU was 8.4%, in 2010 was unemployment rate in Spain 20.1% and average value of unemployment rate in EU was 10%. In Spain we can see also the decline in export activity (from 28% of GDP in 2001 to 23% of GDP in 2009) while in EU there was increasing trend. In the United Kingdom was the situation affected especially by the constant increasing inflation rate between 2004-2010 and approaching unemployment rate to the EU average values (while in UK was unemployment rate 4.7% in 2001 and average value in EU was 8,4%, in e.g. 2008 was the unemployment rate in UK 5.3% and average value in EU was 6.2%).

In 2001, the Ireland was evaluated as a country nr. 1 in the list of countries sorted by the economic level (measured by GDP growth, unemployment rate, export of goods and services and inflation rate).

Contrary, in 2001 was the worst economic level in Poland. In fact, we can observe that in time was the Poland evaluated better. In 2010, it reached the 14th position. We can also see that the Greece is in 2010 the last country in the list of countries sorted by the economic level. This country reached the similar evaluation even several years before. And the Spain, which is nowadays also often discussed as a country with serious economic problems, has a similar ranking in our model. Generally, we can confirm that countries really do not move only forward or only backward in time as mentioned by criticism of β -convergence concept. As we can see, e.g. Belgium had in 2001-2004 very good ranking, in 2005-2008 there was the deterioration and in 2009 it was even the second best country in the list of countries sorted by the economic level. Naturally, there are a lot of EU countries where an unsteady progress can be observed.

In fact, there is no country where the constant progress could be seen (except of Luxembourg).

4. Conclusions

The paper describes and analyses the framework of the theory related to convergence process in the context of the comparative economics. There were referred the disadvantages of the theoretical concept of σ -convergence or β -convergence (it has problematic implications for world growth and assumes that the country moves only forward or only backward in time). Therefore, taking into account the weaknesses in convergence theory, we suggest using a piece of knowledge which is a

part of a discipline known as the comparative economics. The main advantage of such approach is that it provides the deeper analysis of the convergence process based on much more indicators than GDP only. Another advantage is that the comparative economics is based on the classical statistical apparatus which means that the methods are usually known. The disadvantage is, that in case of qualitative research the international team and contextual analysis is needed. In case of the quantitative research, it depends on the number of cases (units, entities, countries), because if we selected a higher number of cases, any conclusions and arguments would be more reliable. But it is not possible to go in depth and analysis that contain only a few explanatory variables. In the article, it was analysed the convergence process in all 27 EU countries during the years 2001-2010 using the TOPSIS method. The time series were limited by the data availability (it was difficult to collect the complete data set for all the countries), but in fact, the period is long enough to examine the trend in the convergence process. The analysis shows that nothing is finite. In the EU countries, we can observe the unsteady progress which means that the convergence process will probably take more time than assumed. The analysed indicators were GDP growth (in %), unemployment rate (% of total labour force), exports of goods and services (% of GDP) and inflation (consumer prices, annual %). The analysis shows that when we try to create the list of countries sorted by their economic level (measured by the four mentioned indicators) we can obtain the results which are not much surprising. This is a confirmation of the fact that methods which are used in comparative economics work. This way we can divide the EU countries into the three groups: the countries with a decreasing economic level, the countries with an increasing economic level and the countries with a steady economic level. In the second mentioned group of countries, it should be such countries as are e.g. Romania, Portugal, Spain, Greece etc., because the convergence was the essential objective of the integration process. In fact, the mentioned countries belong to the group of the countries with the decreasing economic level. The analysis shows that it is affected by the various reasons. In Romania, the convergence process is decelerated by the low exports and higher inflation, in Portugal and Spain by the low exports and by the increasing unemployment rate, and in Greece it concerns all the analysed indicators. We can conclude that reaching the convergence is very complicated and in future it will be probably a big challenge for the policy makers.

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Filip JEŽEK graduated Silesian University Opava, Business school Karviná, master study programme – Economy of Enterprise in Trade and Services (2002-2007). In 2011 graduated Silesian University Opava - Business school, Karviná, Ph.D. study programme – Business Economics and Management. “The Impact of Direct Taxes on the Cultivation of the Business Environment” was the title of thesis. Since 2011 works as a lecturer in department of economy at Silesian University, Opava and teaches microeconomics, macroeconomics and comparative economics. In 2010-2011 participated on granted project “Fiscal policy in the context of global crisis and its impact on business”.