Structural Convergence of the Central and Eastern European Countries: Achivements in the Last Decade

Tatomir, Cristina F.

Bucharest Academy of Economic Studies, Bucharest, Romania

22. September 2011

Structural Convergence of the Central and Eastern European Countries: Achivements in the Last Decade

Cristina TATOMIR[1]

Ph.D. candidate, Bucharest Academy of Economic Studies

Abstract

The paper studies the structural convergence of the Central and Eastern European countries (CEECs) with the Euro area, in order to determine whether the last decade led an increase or a decrease of the gaps between these two regions. The main findings of the paper indicate that only three CEECs out of ten reached a higher level of structural convergence with the Euro area in the last decade, namely Latvia, Bulgaria and Slovenia. Romania remains by far the country with the highest level of structural divergence. The analysis is based on cluster methodology and the structural divergence index developed by Krugman (2001).

Keywords: structural convergence, Central and Eastern Europe, Euro area, clusters

JEL classification: F15, F44, E01

Introduction

Economic integration as experienced by European Union (EU) countries since the 1980s is thought to have a great impact on the economic structure and the macroeconomic dynamics of member states. The aim of this paper is to review the structural divergence between the ten CEECs included in the EU enlargement process in 2004 and 2007 and Euro area and the changes that have occurred in the past decade, considering the fact that all these countries have to adopt the single currency in the next future. To date, only three of CEECs joined the Euro area, namely Estonia, Slovenia and Slovakia. The adoption of the Euro remains the greatest challenge that Bulgaria, Czech Republic, Latvia, Lithuania, Poland, Romania and Hungary are facing.

The paper assesses these developments from the point of view of their impact on the economy and their relevance for business cycles synchronization in the EU. Differences in the economic structure across member states have the potential to affect both the volatility and synchronization of business cycles. Sectoral composition may have consequences for the transmission of the macroeconomic shocks. Sectors may follow different patterns over the aggregate business cycle depending on their position in the value-added chain and their integration in the European single market. Thereby, economies are exposed to different kinds of exogenous shocks and the way in which they respond to similar shocks may also differ. This is directly related to the

---

[1] E-mail address: cris_tatomir@yahoo.com, mobile phone: +40 723 178 178

fluctuation and amplitude of the business cycles of member states and to the synchronization of business cycles across EU countries.

The remainder of the paper is organized as follows. Section two provides a brief review of related literature. Section three explains the empirical methodology used to compute the structural divergence index and the clusters. Section four reports the results obtained and section five summarizes the paper's main findings.

Related literature

The analysis of the economic structure convergence and its components dynamics has been developing in the last years in the light of its influence on the business cycle synchronization. This is significant for the way national economies respond to the common monetary policy and other economic shocks.

Convergence analysis of the Gross Domestic Product (GDP) structures are quite numerous. According to the Monetary Policy Committee task force of the European Central Bank (2004), the composition of the GDP by economic sectors is relevant to the monetary policy, due to its influence on the transmission mechanisms. Angeloni *et al*. (2005) consider that the output composition is an important indicator for structural convergence and a benchmark for assessing the stage of economic development. Following Krugman's methodology (1991), the above authors compute the divergence index of output structure towards the Euro area and estimate it for the new member states. Von Hagen and Traistaru (2005) calculate the dissimilarity index and analyze its dynamics, for the same purposes.

Darvas and Szapary (2004) conducted an empirical analysis of the behavior of production structure components in Hungary, Poland and Slovenia and observed a high correlation to the Euro area in industrial production.

Bojesteanu and Bobeica (2008) found that there is a common business cycle in the Euro area, by analyzing the degree of business cycle synchronization between the newest member states and the Euro area. In addition, most of the candidate countries to the Euro area record convergence with this group, with the remarkable exception of Estonia, Lithuania, Slovakia and Romania.

Research methodology

This paper uses a quantitative analysis based on a divergence index, but also an exploratory cluster analysis in order to emphasize the differences between the economic structures of the CEECs and Euro area.

The analysis developed in this paper covers the ten CEECs included in the EU enlargement process in 2004 and 2007. The years analyzed in this study are 2000 and 2010. Using six different sectors, the production structure of each country is compared to the Euro area as a whole (the relevant benchmark for any country wishing to adopt the euro).

In order to compute the structural divergence index, the gross value added is chose as unit of analysis of the activity level because it captures the overall importance of economic activity of a country. The output divergence index is based on six main sectors, corresponding to the NACE-A6 standard: agriculture, industry, construction, wholesale and retail trade, financial services and other service activities.

We use the index of structural divergence proposed by Krugman in 1991 and previously used in many other studies (Clark and van Wincoop, 2001; Imbs, 2004; Traistaru, 2005 etc.) for computing the sectoral divergence index. The output divergence index was developed in order to measure the degree of specialization in any given country compared to another country or group of countries. The index is the sum of the absolute differences in share between the given country and the

benchmark in six economic sectors. The index construction mode shows that a country is more similar to the Euro area as its value is close to 0. Structural Divergence Index (SDI) is computed as follows:

$$SDI_{i,EA} = \sum_{k=1}^{K} abs\,(S_{k,i} - S_{k,EA})\text{ , where}$$

$SDI_{i,EA}$ – index of structural divergence;
K – number of sectors taken into account;
$S_{k,i}$ – the share of the gross value added of the k sector in the total gross value added of country i;
$S_{k,EA}$ – the share of the gross value added of the k sector in the total gross value added of Euro area.

    The approach for the testing of convergence between the ten countries is based on cluster analysis. The cluster analysis classifies the countries in groups called clusters, in such a manner as to find closer countries from the perspective of structural divergence within the cluster, as compared to countries included in another cluster.

    In order to group the countries from the perspective of structural divergence, we use the k-means algorithm, based on the model suggested by MacQueen (1967). The first step of the procedure requires to initially set a number k of centroids, one for each cluster. The centroids should be placed as far from each other as possible. The second step is to place every country to the nearest centroid. After this preliminary grouping, the centroids are computed again, the clusters are rearranged and the countries are re-located in relation to the new centroids. These steps are repeated until the centroids no longer move. The objective function is the following:

$$J = \sum_{j=1}^{k}\sum_{i=1}^{n}\left\|x_i - c_j\right\|^2 \qquad\text{, where}$$

$\left\|x_i - c_j\right\|^2$ – distance between a country x_i and the cluster center;
c_j – indicator of the distance of the n countries from their respective cluster centers.

    The cluster method is computed in the Statistical Package for the Social Sciences soft (SPSS).

Data analysis

    Data concerning the gross value added (at constant prices) for every economic sector, as percentage of all branches, are taken from Eurostat. The Euro area average is computed by Eurostat.

Table no.1 Structural Divergence Index

Year / Country	2000	2010
Bulgaria	**27.9**	**26.9**
Czech Republic	33.5	34.8
Estonia	19.8	21.2
Latvia	**28.1**	**24.3**
Lithuania	30.5	36.7
Poland	25.8	31.9
Romania	38.8	47
Slovenia	**17.9**	**17.5**
Slovakia	29.6	32.3
Hungary	14.7	19.9

Source: Eurostat, author's work

The structure of the economy is a very important and relevant element from the perspective of business cycle synchronization. More similar the structures of production are, less likely is that countries will face asymmetric shocks.

The results from computing the structural divergence index indicate important differences between the economic structures of the countries considered in this study. All CEECs display a high index reported to the average of the Euro area, both in 2000 and 2010. Only Hungary and Slovenia have a lower index, while Estonia and Latvia are catching up with them. Romania is clearly the country with the most divergent sectoral structure. This lack of convergence implies that most CEECs still have a long way to go before they have the same type of economy with the countries of the Euro area.

Moreover, the structural divergence index has higher values in 2010 than in 2000 in seven out of ten countries analyzed. Only Bulgaria, Latvia and Slovenia have reached a higher degree of convergence with the Euro area in the last decade.

The dissimilarities between CEECs and the Euro area are a result of the high share of industry, trade and, to a lesser extend, agriculture in the CEECs, while the service sectors (other than trade) have a much smaller share.

Results

The cluster analysis used in this paper distinguish three homogenous groups of countries, both in 2000 and 2010:

Tabel no.2 Clusters by Structural Divergence Index, 2000

Cluster 1	Cluster 2	Cluster 3
Romania	Bulgaria Czech Republic **Latvia** Lithuania Poland Slovakia	Estonia Slovenia Hungary
Cluster Center 38.8	Cluster Center 29.2	Cluster Center 17.5

Source: author's work

Tabel no.3 Clusters by Structural Divergence Index, 2010

Cluster 1	Cluster 2	Cluster 3
Romania	Bulgaria Czech Republic Lithuania Poland Slovakia	Estonia **Latvia** Slovenia Hungary
Cluster Center 47.0	Cluster Center 32.5	Cluster Center 20.7

Source: author's work

As it can be seen in Tabel no.2, in 2000 we can roughly distinguish three clusters. A group of three countries has a divergence index of around 17.5. More than half of the countries (six out of ten) form a middle group, where the center of the cluster is 29.2. The third group has only one

country, namely Romania, with a very high level of divergence. Being single in its cluster, Romania was exactly the centroid of the cluster, with a divergence index of no less than 38.8.

Tabel no.3 displays a clear increase of the values representing the centers of the clusters. Therefore, Romania remains isolated from the rest of the countries, being the centroid of its cluster, with a significant level of structure divergence index of 47, much higher than 10 years ago. The second cluster has now five countries instead of six in 2000, Latvia being the only country that progressed from one cluster to another. As it can be seen in Table no.1, three countries reached higher levels of convergence with the Euro area in 2010 compared to 2000: Latvia, Bulgaria and Slovenia, but only Latvia had the necessary increase to progress in the third cluster. The three countries that diminished their structural divergence with the Euro area followed the same pattern: a decrease in the share of agriculture and industry and an increase in the share of financial services and other services.

The cluster methodology allows us to analyze the level of convergence between the clusters in the last decade. In this respect we are looking at the distances between the cluster centers:

Table no.4 Distances between Final Cluster Centers

Year	2000			2010		
Cluster	1	2	3	1	2	3
1	-	9.6	21.3	-	14.5	26.3
2	9.6	-	11.7	14.5	-	11.8
3	21.3	11.7	-	26.3	11.8	-

Table no.4 displays the changes in the level of convergence between the three clusters in 2010 compared to 2000. On the one hand, the results show us a higher level of divergence between the first cluster and the two other clusters in 2010. This means that Romania, the center of the first cluster, by being the only country in this cluster, has reached a higher level of structural divergence with the Euro area in the last decade and is now more far away from the rest of the CEECs. On the other hand, in 2010 the distance between the second and the third cluster centers remains at the level reached in 2000. These two cluster centers followed the same path in the last 10 years, attaining a higher level of structural divergence with the Euro area.

Conclusions

The main findings of this paper are showing us that the last decade had different impact on the CEECs regarding the structural convergence with the Euro area. Only three countries (Latvia, Bulgaria, Slovenia) registered an increase in the level of structural convergence, while the rest of them registered a decrease in this respect. The closest countries toward Euro area in 2010 are Slovenia, Hungary and Estonia, while Latvia is catching up with them. The countries that remain far away from Euro area regarding the structural convergence are Romania, Lithuania and Czech Republic. Romania is by far the most divergent country and it doesn't seem to make any step forward in order to achieve a higher level of structural convergence with the Euro area.

The dissimilarities between the CEECs and the Euro area economic structure are having a negative impacts on the business cycles synchronization in the EU countries. In this respect, it is very likely for the outsiders of the Euro area to face asymmetric shocks when joining the European Monetary Union.

Bibliography

1. Angeloni, I., Flad, M., Mongelli, F., (2005), "Economic and Monetary Integration of the New Member States. Helping to Chart the Route", European Central Bank Occasional Paper, No. 36
2. Bojesteanu E., Bobeica G., (2008), "Where Do the Newest EU Member States Stand on the Road to Monetary Integration?", International Trade and Finance Association Working Papers, 4
3. Clark, T. E., van Wincoop, E., (2001), "Borders and business cycles", Journal of International Economics, 55(1), 59-85
4. Darvas, Z., Szapáry, G., (2004), "Business Cycle Synchronisation in the Enlarged EU: Co-movements in the New and Old Members", Magyar Nemzeti Bank Working Paper, No. 2004/1
5. Dumitru, I., (2009), "Adoptarea euro in Romania", MPRA Working Paper, No. 18612
6. Imbs, J., (2004), "Trade, Finance, Specialization, and Synchronization", Review of Economics and Statistics, 86 (3), 723–34
7. Krugman, P., (1991), "Geography and trade", MIT Press, Cambridge
8. MacQueen J.B., (1967), "Some Methods for Classification and Analysis of Multivariate Observations", Proceedings of 5-th Berkeley Symposium on Mathematical Statistics and Probability, Berkeley, University of California Press, 281-297
9. Miron, D., Dima, A.,Păun, C., (2009), "A model for assessing Romania's real convergence based on distances and clusters method", Munich Personal RePEc Archive MPRA, Paper No. 31410
10. MPC Task Force of the ECB, (2004), "Sectoral Specialization in the EU: A Macroeconomic Perspective", European Central Bank Occasional Paper, No.19
11. Trăistaru-Siedschlag, I., (2005), "Transmission Channels of Business Cycle Synchronization in an Enlarged EMU", WHU Paper
12. Von Hagen, J., Traistaru, J., (2005), "Macroeconomic Adjustment in the New EU Member States", ZEI Working Paper, B 01