

Some Evidence on Continuing Integration in the European Union from the Perspective of Trade and Factor Mobility Measures: a Cluster Analysis Approach

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Abstract: *The paper aims at providing some evidence at current level of homogeneity and convergence among the EU states from the perspective of trade and factor mobility measures. In particular, the paper examines whether the EU countries make internally homogenous clusters and to what extent they differ. Also the convergence or divergence tendencies among pre-determined clusters of the EU core, periphery and new EU countries comprising of the CEE countries are analysed and assessed. Finally, the paper intends to shed some light on contribution of the periphery and CEE countries to rising or decreasing heterogeneity in the European Union from the perspective of selected trade and factor mobility measures comprised in the dimension of Single market and openness. The cluster analysis, particularly the agglomerative Ward method with squared Euklidean distance, is the main research method. The results show that the EU countries differ to a small extent and disparities among them have been diminishing from the perspective of trade and factor mobility over the integration period.*

Key words: European Integration · Convergence · Cluster Analysis · Foreign Direct Investment Intra-Industry Trade · Labour Mobility

JEL Classification: F14 · F15 · F22

1 Introduction

Despite ongoing discussion on benefits of the EU and Euro area membership due to current overall economic stagnation and debt crisis, the process of European integration is still continuing. In 2013 Croatia joined the European Union. In 2014 and 2015 Latvia and Lithuania enlarged the Euro area respectively. Poland has declared adopting Euro as its current macroeconomic priority, which makes this country a next potential candidate for the Euro area membership. Other new member states including mainly the Central and Eastern European (CEE) countries still consider the costs of Euro adoption to exceed the benefits regarding current economic circumstances in Europe and the worldwide. Considering further enlargement of the Euro area, the insufficient level of macroeconomic policy harmonisation and economic synchronisation are the main arguments for postponing the monetary unification process as repeatedly claimed by the euro area candidate countries' officials.

Apart from efficiency of common monetary union, the similarity of countries' economic performance as well as inner similarity of the member economies are considered as important factors for effective functioning of the European Union.

Alesina et al. (2005) state that countries of the European Union should be homogenous to exploit the economies of scale or externality internalisation as a positive outcome of integration. Cappelen (2003) reminds that greater equality across Europe in income and productivity has become one of the central objectives of the European Community since the early days of European economic integration. Trichet (2013) considers the recently adopted legislations on the macroeconomic Imbalance Procedure (MIP), the Fiscal Compact introduced in the Treaty on Stability Coordination and Governance (TSCG) or the Europlus Pact to lead to a remarkable progress in coordination of the EU governance. All the procedures and treaties mentioned above support the convergence of individual economies and should prevent form asymmetric shocks within the EU and Euro area in particular. Regarding similarity and homogeneity within Europe, one should mention that the major part of the EU budget consolidated in the structural funds is aimed at reducing inter-regional disparities across the EU.

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Regarding the call for homogeneity and similarity of states by the EU officials as well as the literature our paper aims at providing some evidence at current level of homogeneity and convergence among the EU states from the perspective of trade and factor mobility measures. The selected indices of trade and factor mobility are comprised within the dimension labelled as Single market and openness. The paper examines whether the EU countries make internally homogenous clusters and to what extent they differ. Also the convergence or divergence tendencies among pre-determined clusters of the EU core, periphery and new EU countries comprising of the CEE countries is analysed and assessed. Finally, the paper intends to shed some light on contribution of the periphery and CEE countries to rising or decreasing heterogeneity in the European Union from the perspective of selected trade and factor mobility measures comprised in the dimension of Single market and openness. The central idea and methodology of the paper follows a large research by Rozmahel et al. (2013).

The paper is structured as follows. After the introductory part explaining motivation of research the main methods and data are explained in the second section. The third section presents the results of the static and dynamics analysis, which were applied to identify the clustering structures in the EU in selected years and also to identify the convergence or divergence tendencies among the country clusters. The third part includes also the sensitivity analysis. The fourth section concludes.

2 Methods

Aiming at identifying internally homogenous clusters of countries and their changing structures over time we employ the cluster analysis as the main research method. In particular, following the study by Sorrensen and Gutierrez (2006) we apply the agglomerative Ward method with squared Eukclidean distance in other take into account the internal homogeneity as well as the outliers. There are also many other studies applying the cluster analysis in slightly different modification when examining various aspects of European integration process such as Artis & Zhang (2001), Boreiko (2003), Camacho et al. (2006, 2008), Song & Wang (2008) and Quah & Crowley (2010).

The clustering structures were identified in years 2000, 2004, 2008 and 2011 to capture changes in the pre- and after-accession periods including the crisis year 2011. In addition, the evolution of the average distances in dendrograms and their variances are measured and compared to examine dynamics of clustering development in the EU. For the dynamic analysis the EU country clusters were pre-determined to study the convergence among clusters and contribution to the overall heterogeneity development from the perspective of Single market and openness dimension. The country-clusters were divided as follows: the EU core countries consists of Austria, Belgium, Germany, Finland, France and the Netherlands. The EU periphery includes Greece, Ireland, Italy, Portugal and Spain. Finally, the new EU countries involve the Czech Republic, Hungary, Poland, Slovenia, Slovakia and the Baltic countries Estonia, Latvia and Lithuania. Regarding the focus on dimension of Single market and openness, the measures of trade and factor mobility were selected for the analysis. Highly correlated variables, as suggested, e.g., by Dormann (2012), were excluded from the final list of variables to avoid the multicollinearity problem. The final list of indicators of the Single Market and Openness dimension is reported in the Table 1.

Table 1 Indicators of the Single Market and Openness Dimension

Variable	Abbreviation	Unit	Source
Intra-European trade	IET	%	Eurostat
Grubel-Lloyd index	GL	%	Eurostat, own calculations
Market integration - Foreign Direct Investment intensity	FDI	%	Eurostat
Labour migration	LM	%	Eurostat

Source: Authors

The idea of European integration to create a common market is addressed by the Single market and openness dimension. In particular, the Intra-European trade (imports and exports of goods and services as a percentage of total trade of goods and services) and Intra-Industry trade are used to tackle the issue. While the first is a classical measure of total trade intensity between a studied EU country and the rest of the EU, the latter is suggested by Fidrmuc (2004), Kandogan (2006) or Gabrish (2009) who claim that synchronizing of business cycles is primarily determined by the trade linkages measured by the Grubel Lloyd index (*GL*) rather than their intensity.

$$GL_{it} = 1 - \frac{\sum_i \sum_k |X_{it}^k - M_{it}^k|}{\sum_i \sum_k |X_{it}^k + M_{it}^k|} \quad (1)$$

GL_{it} represents a ratio of the absolute value of intra-industry trade to total foreign trade. X_{it}^k and M_{it}^k are the values of exports and imports of the k^{th} commodity produced in the i^{th} country in the time period t .

Besides the trade within the EU, the general openness of the EU countries represented by Foreign Direct Investments (as a percentage of GDP) and Labour Migration (a percentage of foreigners working in a particular EU country)² are used.

Consequently, all variables (see Table 1) were transformed into an index I which represents the i^{th} country's position relative to the rest of the EU countries using the following formula:

$$I_{i,t} = \frac{v_{i,t}}{\frac{\sum_{j=1}^n w_j v_j}{\sum_{j=1}^n w_j}} \quad (2)$$

where v represents the transformed variable, i stands for the i^{th} country in the time period t , denominator is the weighted average of the variable v_j for $i \neq j$, weights w_j being the j^{th} country's GDP. Index I can be used to describe the contribution of the i^{th} country to the level of heterogeneity within the EU. It then provides the information on a country's distance to the average of the remaining EU countries which reflects the degree of heterogeneity in the integration process.

As the indices can range from zero to theoretical infinity, all indices were normalized applying the formula:

$$N_{it} = \frac{I_{it} - \text{MIN}(I_T)}{\text{MAX}(I_T) - \text{MIN}(I_T)} \quad (3)$$

to preserve the equal impact of all indices. Where I is the value of the index for the i^{th} country in time period t . $\text{MAX}(I_T)$ and $\text{MIN}(I_T)$ represent maximum and minimum value of the index during the whole time span T , respectively.

Once the variables are transformed cluster analysis based on agglomerative Ward method with squared Eukclidean distance is performed. The principles of the Common European Market have led since their adoption to elimination of many barriers to free trade. Therefore, we expect a remarkable openness of the EU countries and highly integrated trade within the EU and so low average distance and variance of clusters estimated.

3 Research results

The empirical part is divided into two parts – the cluster analysis showing the dis/similarity of the EU countries and convergence/divergence issue based on the clusters' average distance. The results of the study are supported by sensitivity analysis.

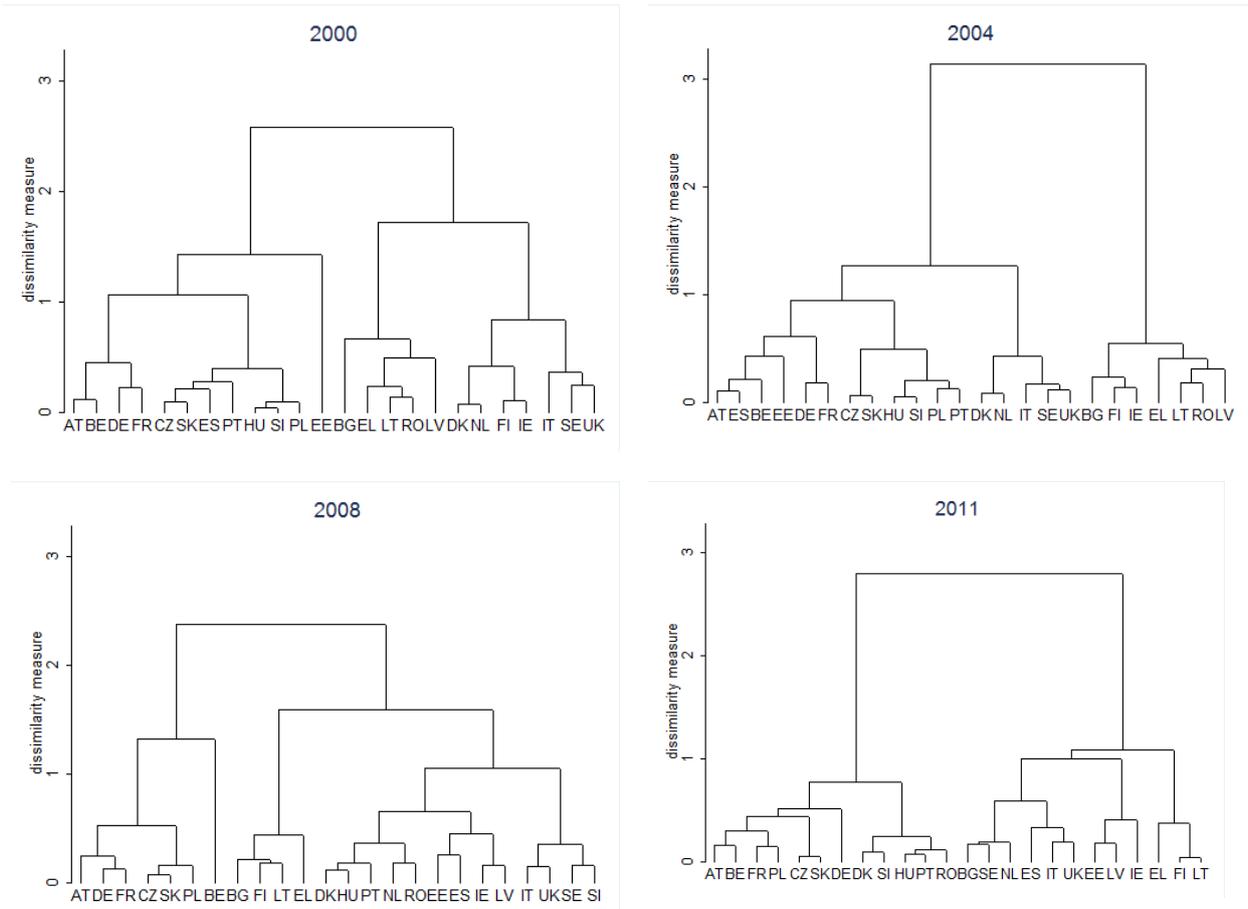
3.1 Identification of the EU country-clusters from the perspective of Single market and openness measures

Figure 1 shows the estimated clusters of the EU countries with respect to the dimension of Single market and openness. The years examined are those that represent pre- and post-accession period, economic crisis and post-crisis period. Low heterogeneity is expected as the Principles of the Common European Market came to existence in 1992.

As anticipated the differences in distances among the EU countries are small, especially in the pre-enlargement and pre-crisis period. Moreover, no clear identification of commonly named groups of countries as core, periphery or the CEE countries cannot be unambiguously identified. Nevertheless some common patterns can be observed. While Finland, Ireland and the Netherlands are characterized by relatively low intra-industry and intra-EU trade their opposite counterparts among the CEE countries are Poland and Slovakia which shifts them towards the core countries. Regarding the CEECs, even if they do not create a homogenous cluster their average distance decreases over the period analysed which is the evidence of integration in trade linkages among the core and CEECs. As there are small differences among countries, the clusters are sensible to even small changes in variables which makes them unstable over time.

² The measure capturing all foreigners in the EU countries was finally used due to low data availability of intra-EU labour mobility indicators.

Figure 1 Clustering in the dimension of Single Market and Openness

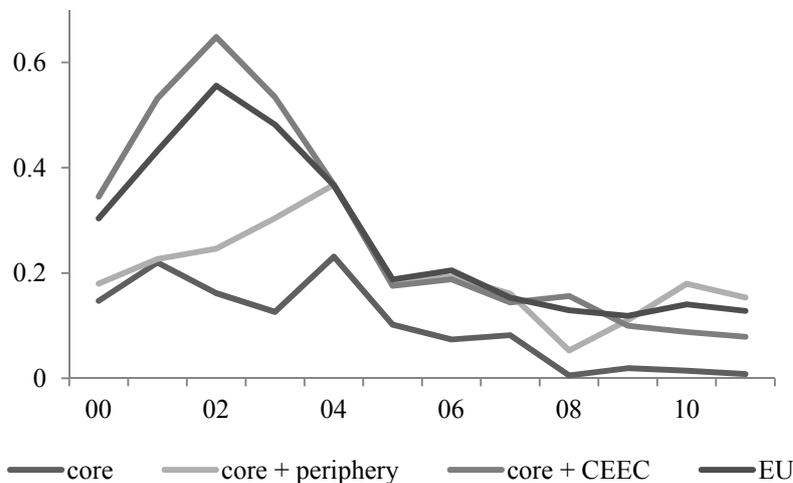


Source: Authors' calculations

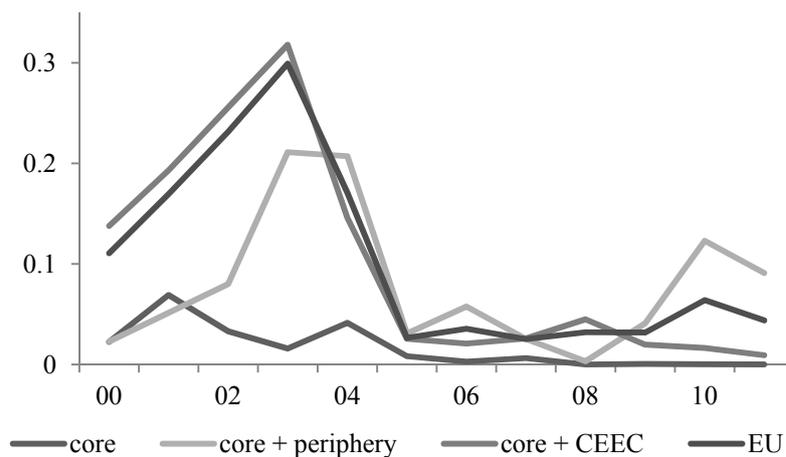
3.2 Dynamic analysis. Convergence of pre-determined EU country-clusters

The second part of the empirical analysis aims at assessing the evolution of the homogeneity level over time. The estimated averages of distances within pre-determined clusters can be regarded as a measure of homogeneity where low distance means low differences among Single Market and Openness features and so higher level of homogeneity, and *vice versa*.

Figure 2 Average distances in clusters



Source: Authors' calculations

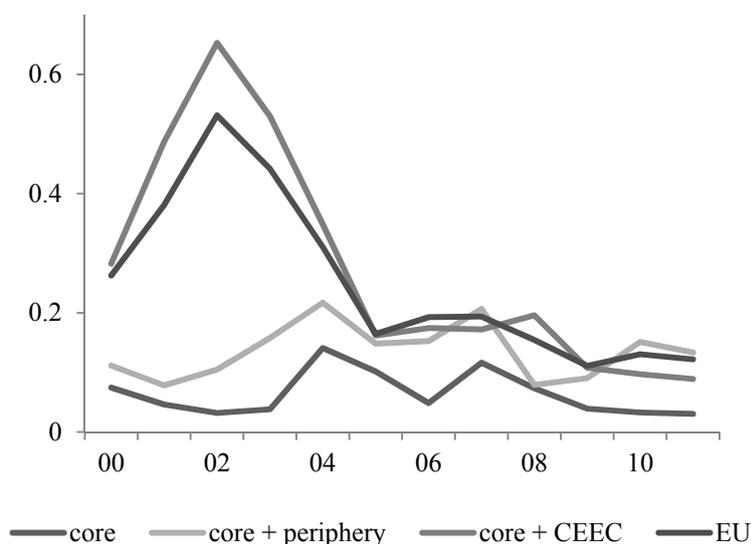
Figure 3 Variances of distances in clusters

Source: Authors' calculations

As shown in the Figure 2 and 3, average distances among the clusters diminish. Starting from the core countries, they are estimated as highly homogenous during the whole period of time. Regarding the CEECs, they arise the average distance of the core+CEECE group so we can claim that the enlargement increased heterogeneity mainly till the 2005. Since then the whole EU is very homogenous till the end of 2007. The dispersion is caused by Belgium and Austria in which we can observe a sharp increase in FDI. Another resource of the EU heterogeneous movement came from periphery countries mainly due to the FDI intensity and Labour migration issues. On the contrary, the CEECs since 2009 have contributed to heterogeneity reduction as they adjusted the trend of the core countries.

3.3 Sensitivity analysis

The sensitivity analysis is used to check the robustness of results. In particular, we examine how the results of clustering and their evolution are stable.

Figure 4 Sensitivity Analysis: Average distance in clusters in adjusted dimensions

Source: Authors' calculations

Excluding the Labour Migration measure from our set of variables, no significant change in results compared to the original ones can be observed in cluster and dynamic analysis. The clustering structure remains almost unchanged. Even the role of the CEECs and periphery countries in the convergence process within the EU is quasi identical to the original one.

4 Conclusions

The results of the research did not confirm the traditional division among core, periphery and new EU countries from the perspective of trade and factor mobility measures. The clustering structure is unstable over analysed years. Only slight shift of Finland, Netherland and Ireland out of group of the old EU countries and convergence of Poland and Slovakia towards this group is observable in the dendrograms. Also the overall heterogeneity level seems to be declining since as the distances among countries and clusters seem to decline. This is actually confirmed in the following dynamics analysis. The average distances among clusters diminish and tend to the minimum of zero. Since 2007 divergence of the EU periphery from the core countries is apparent. Contrary to the EU periphery, the CEE countries have contributed to heterogeneity reduction as they adjusted the trend of the core countries since 2009. The sensitivity analysis confirmed the stability of results. In general, the EU countries differ to a small extent and disparities among them have been diminishing from the perspective of trade and factor mobility over the integration period. Further research testing for heterogeneity of countries from other socio-economic dimensions might contribute for providing a broader picture of the internal EU heterogeneity and its development over time.

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