



UNITED NATIONS
UNIVERSITY

UNU-CRIS

Institute on Comparative
Regional Integration Studies

UNU-CRIS Working Papers

W-2015/4

The EU Index of Integration Effort



Author:

Jörg König



www.cris.unu.edu



**UNITED NATIONS
UNIVERSITY**

UNU-CRIS

**Institute on Comparative
Regional Integration Studies**

UNU-CRIS Working Papers

The author

Dr. König can be reached at the Market Economy Foundation (Stiftung Marktwirtschaft) in Berlin and the Georg-August-University of Göttingen (Germany).

He can be contacted at Koenig (@) stiftung-marktwirtschaft.de

United Nations University
Institute on Comparative Regional Integration Studies
Potterierei 72, 8000 Brugge, BE-Belgium
Tel.: +32 50 47 11 00 / Fax.: +32 50 47 13 09

www.cris.unu.edu

Abstract

Regardless of the strides that have been made by the European Union (EU) in terms of economic integration, levels of heterogeneity of the economies have been growing. There appears to be divergence between hub/spoke core/peripheral countries. This increase chasm between the core and periphery should be of concern to policy makers especially those in Brussels. The growing rift between these countries is compromising the aspirations of the EU to forge an ever-closer union. The author suggests that to reduce the economic heterogeneity between the core and the periphery of European integration the European Commission should promote further liberalization of the EU single market.

Why Measuring European Economic Integration?

The European Union (EU) is a unique economic and political integration project. Often referred to as a system *sui generis*, the EU is unique in both the scope and depth of its integration efforts. What has begun as a peacekeeping endeavor among six European countries struggling from the aftermath of World War II has evolved into a complex network of 28 member states and numerous European institutions with supranational authority. For more than six decades, a continuously growing number of countries strive for progressive continental integration – and the pending negotiations with other candidate countries demonstrate that this process has not lost any of its attraction.

In addition to the ongoing widening of the EU, the uniqueness of the European experience lies in the continuous deepening of its integration process. Hereby, European integration has passed through nearly all of the so-called stages of economic integration. According to Balassa (1961), formal economic integration takes place in several stages that envisage successive market liberalization between the participating economies, accompanied by the formation of common rules and institutions. Whereas the first stages are concerned with lowering tariffs and non-tariff barriers to trade and factor movements to finally create a common market, the later stages are engaged in allocating necessary policy prerogatives to the supranational level, eventually culminating in the creation of a single economic and political entity. Beginning with the lowest stage, these are a preferential trade agreement (PTA), a free trade area (FTA), a customs union (CU), a common market (CM), an economic and fiscal union (EFU), an economic and monetary union (EMU) and a political union (PU).

Table 1 **Stages of European Economic Integration**

Stage	Characteristics	EU integration steps
Preferential trade agreement (PTA)	Preferential access to certain products from the participating countries	European Coal and Steel Community (1951)
Free trade area (FTA)	Reciprocal elimination of tariffs and quotas on all goods and services	European Economic Community (1957)
Customs union (CU)	Common external tariff	European Customs Union (1968)
Common market (CM)	Free movement of goods, services, capital and labor	European Union (1992)
Economic and fiscal union (EFU)	Harmonization and coordination of relevant national policies	Partially achieved; e.g., agricultural policy, competition policy, 'Fiscal Compact', etc.
Economic and monetary union (EMU)	Single currency and monetary policy	Stage three of EMU of the EU (1999)

Political union (PU)	Almost complete transfer of national sovereignty and prerogatives to a supranational authority	Not (yet) achieved
----------------------	--	--------------------

Source: Own presentation.

Notes: Balassa's original five stages of economic integration have been extended to fit European integration more closely. See Molle (2006) and Crowley (2006) for similar extensions.

Table 1 assigns the individual stages of economic integration to the respective steps of European integration. Since the pooling of coal and steel production in 1951, the EU and its predecessors have almost gradually developed from a mere PTA to EMU. This development is worth mentioning as only less than 5 percent of all the FTAs that have been notified to the World Trade Organization (WTO) have succeeded in further deepening their integration process.¹ The recent implementations of a European fiscal compact and a European banking union further show that the institutional design of the EU is still developing, leaving the potential completion of PU for the future.

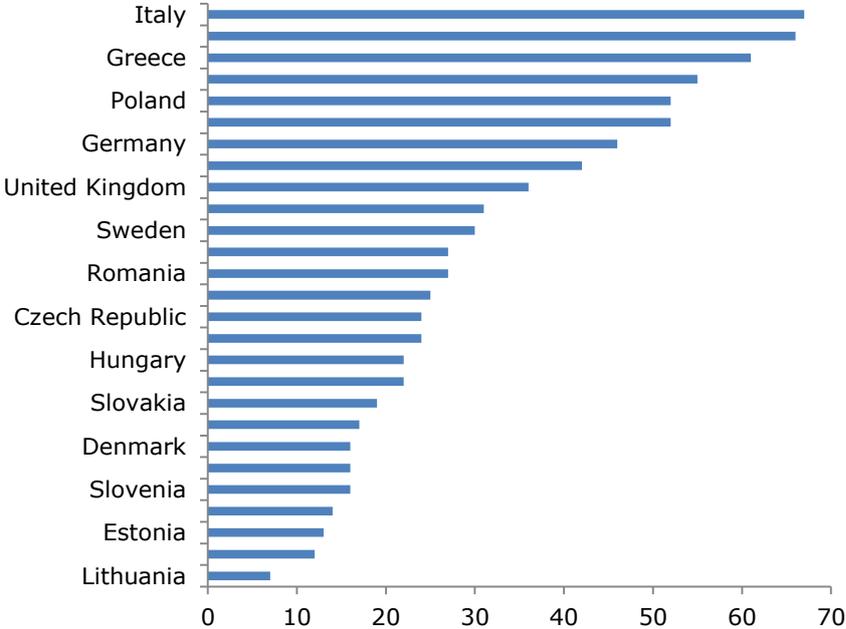
Tinbergen (1954) once defined that 'integration may be said to be the creation of the most desirable structure of international economy, removing artificial hindrances to the optimal operation and introducing deliberately all desirable elements of coordination or unification' (p. 95). Generally speaking, the past integration efforts of the EU have laid down the floor towards achieving this desirable structure of international economy: artificial hindrances to trade and factor movements are officially abolished in the EU's single market; the launch of EMU further reduced transaction costs and stabilized (so far) the price level within the union; and based on common rules and principles, the supranational institutions of the EU have the mandate and technical requirements to coordinate many sensitive policies.

By investigating the country level, however, Tinbergen's ideal of the international economy is put at risk. The EU member states show different efforts and capabilities in further deepening their individual degree of European economic integration. For instance, despite their commitment to the same *acquis communautaire*, the member states show tremendous differences in implementing and following EU law. As presented in Figure 1, the number of pending infringement cases against Italy is about ten times higher than in Lithuania. Moreover, the combined share of the three least complying member states (Italy, Spain and Greece) represents a quarter of the total number of cases of all

¹ According to the WTO website, <http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx>, there are currently 6 CUs (besides the EU) out of 211 FTAs notified under GATT Art. XXIV or GATS Art. V: the Caribbean Community and Common Market (CARICOM), the Southern African Customs Union (SACU), the Eurasian Economic Community (EAEC), the Central American Common Market (CACM), the East African Community (EAC) and the Southern Common Market (MERCOSUR).

member states. As most of these infringements concern the EU's internal trade relations, this may have a large impact on the members' reciprocal interactions, thereby hampering the final completion of the EU's single market.²

Figure 1 Pending Infringement Cases



Source: European Commission (2013), p. 21.

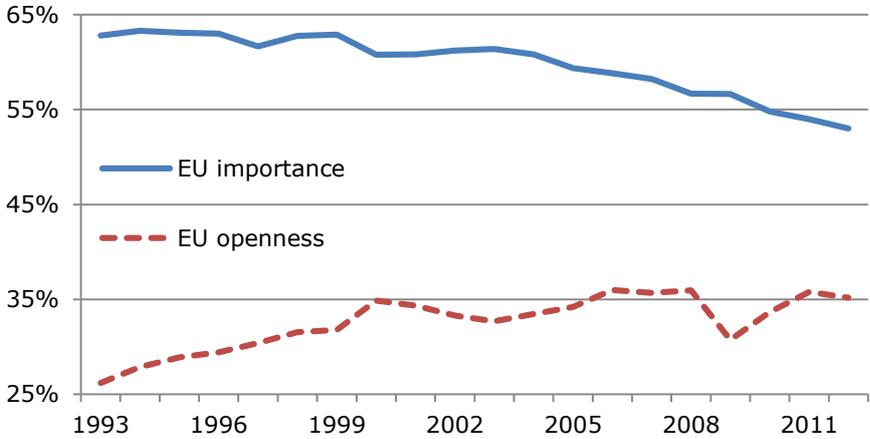
With its four fundamental freedoms – the free movement of goods, services, capital and persons – the EU's single market is often regarded as the core of the European integration architecture. The economic intuition behind the single market is that due to expected higher marginal revenues, the free movement of capital and labor allows for the optimal allocation of production factors, thus enhancing the productive efficiency of the firms. The rise in product specialization through a reduction in average costs (economies of scale), in combination with the elimination of tariffs and non-tariff barriers to trade, pave the way for larger trade flows between the member states. In turn, increasing trade is expected to have significant positive effects on the economic performance of the member states – such as greater market efficiency and product innovation due to increased competition – finally leading to a reduction in price levels, a rise in consumption and, hence, long-term economic growth.³

² See also Isbasoiu, Fernández and De Lombaerde (this volume) on the legal compliance of the EU member states.

³ See Cecchini et al. (1988) and Baldwin (1989) for rather optimistic ex ante analyses of the potential single market effects, and Ilzkovitz et al. (2007), Boltho and Eichengreen (2008) and Badinger and Breuss (2011) for ex post analyses of the European integration effects on trade and growth.

However, not all the member states were able to make use of such improvement in market efficiency. Even 20 years after the launch of the EU's single market, immense heterogeneities between the members' trade patterns exist. For example, whereas both Greece and Portugal show intra-EU trade balance deficits in relation to their gross domestic product (GDP) of 5 percent in 2012, Ireland and the Netherlands have surpluses of 12 and 28 percent, respectively. Furthermore, when examining the internal export volumes as a percentage of GDP, even larger disparities appear: Belgium and the Netherlands possess internal export ratios of nearly 65 percent in 2012, while Greece and the United Kingdom hold ratios of only 6 and 9 percent, respectively. As presented in Figure 2, the EU's internal trade in goods as a percentage of GDP ('EU openness') has increased by 10 percent since 1993. When considering the share of European trade over the total world trade ('EU importance') in goods, though, the ratio has steadily declined over the same period by roughly 10 percent. It seems that despite offering a large CM, the EU member states become more and more attracted by markets outside the union to a great and increasing extent.⁴ In the light of this development, the loss of market efficiency of some members does not only generate large macroeconomic imbalances between the member states but also challenges the external economic competitiveness of the EU.⁵

Figure 2 Share of Intra-EU Trade in Goods



Source: Own calculations based on Eurostat data.

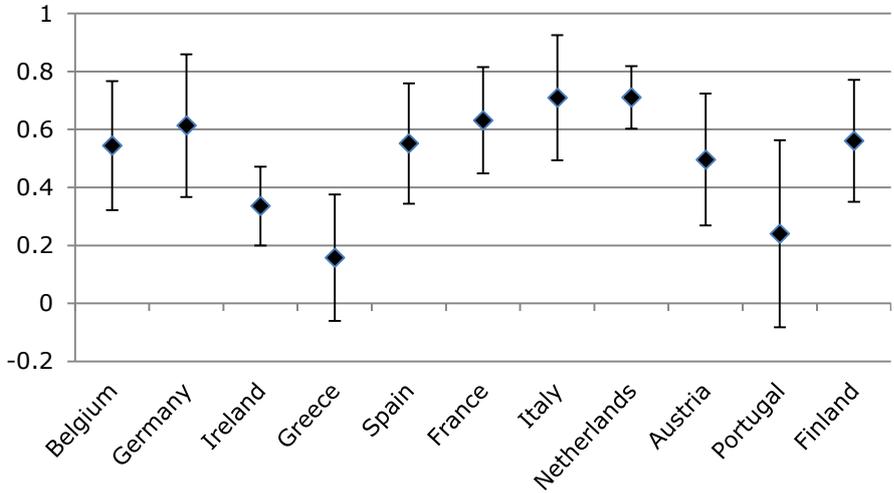
Notes: 'EU importance' refers to the sum of imports and exports of goods traded within the EU-15 as a share of total trade in goods. 'EU openness' refers to the sum of imports and exports of goods traded within the EU-15 as a share of GDP.

⁴ Such as the emerging markets of BRICS (Brazil, Russia, India, China and South Africa) and MIST (Mexico, Indonesia, South Korea and Turkey).

⁵ See also Caballero (this volume) on the measurement of macroeconomic imbalances within the EU.

The same is true for the specific case of EMU. The national loss of autonomous monetary and exchange rate policy demands for a certain degree of similarity in the development of important macroeconomic variables. If large macroeconomic imbalances appear, the member states become more prone to asymmetric shocks and the 'one-size-fits-all' monetary policy becomes less effective. Figure 3, which measures the symmetry of real GDP growth rates across the EMU-11 countries, reveals large heterogeneities over the period 1999–2012. The correlation coefficients are high in some countries but very low in others, such as Greece and Portugal. The respective standard deviations are also very different and even point to negative correlations in some years. Hence, a well-functioning EMU seems to be less likely if the member states do not increase their integration efforts in that regard.

Figure 3 Average Levels of Business Cycle Symmetry (1999–2012)



Source: Own calculations based on Eurostat data.
 Notes: The figure presents the average correlation coefficient (and the respective standard deviation) over five-year moving windows between the domestic real GDP growth rate and the average growth rates of the remaining EMU-11 countries. The growth rates refer to quarterly data, which have been adjusted to seasonal and trend effects using the Hodrick-Prescott filter.

Likewise, increasing economic heterogeneities between the member states may also pose a serious threat to the EU's primary aim of 'creating an ever closer union' (Preamble, TEU). The results of the 2014 elections to the European Parliament give cause for particular concern. Populist, radical and anti-European parties have been gaining ground in most of the European countries and the average voter turnout was again far below 50 percent; in some countries even below 20 percent. Whereas many of the radical parties in Northern Europe took advantage of the people's fear that the EU might be on the verge of becoming a one-sided fiscal transfer union and a union of mass migration, many parties of the Southern countries blamed the EU for imposing tough reforms and austerity policies on their economies. More and more, the EU is held responsible for mistakes that were originally made by national governments that contributed to the

increasing economic heterogeneity within the union. As a consequence, the EU now has to deal with parties such as the Front National (France), the UKIP (Britain), the Freedom Party (Netherlands), the Lega Nord, the Five Star (both Italy), the People's Party (Denmark), the Finns (Finland), the Jobbik (Hungary), the Golden Dawn, the Syriza (both Greece), the FPÖ (Austria) and the AfD (Germany) – all pursuing further disintegration of the EU.

These and other potential effects of the members' different integration efforts and capabilities underline the importance of measuring European economic integration. A separate investigation of these effects, however, does not allow for general statements on a country's overall level of integration efforts. Hence, the various effects of EU integration should be merged into one statistic. A composite indicator combining the most relevant aspects of European economic integration would be able to verify the degree of a country's overall level of integration and to highlight those dimensions that need further integration efforts. The countries' overall integration levels would become numerically tangible, making European economic integration operational for further empirical research. This also allows the identification of member states that tend to fall behind the general speed of European economic integration and of others that determine and accelerate the speed of integration as a 'core group'.

Recently, König and Ohr (2013) have developed such a composite indicator – the 'EU Index'.⁶ Their index covers various relevant aspects of EU integration that also go beyond the Internal Market Scoreboard and the Macroeconomic Imbalance Procedure of the European Commission. Appropriate statistical techniques combine the data to manageable indices which offer both general and very specific insights on a country's integration efforts. In the following sections, the composition of the EU Index is briefly presented and the statistical methods of aggregating its indicators are discussed. As the original index covers only the EU-15 countries until the year 2010, an extended and updated version of the EU Index is introduced and analyzed, capturing the EU-25 countries until 2012. Some recommendations for future integration policies are also derived from the results.

Composition and Methodology of the EU Index

Dimensions of the EU Index

The EU Index developed by König and Ohr (2013) consists of 25 indicators measuring the extent of economic integration for each EU member state individually on a yearly basis. The indicators are mainly macroeconomic in nature and represent the main achievements

⁶ For more information on the EU Index see www.eu-index.org.

of EU integration: the *acquis communautaire*, the single market, the economic and monetary union, and the level of economic homogeneity within the union to measure the EU's final aim of 'creating an ever closer union'.

The indicators measuring a country's compliance with the *acquis communautaire* are listed in the EU Index under the dimension 'EU conformity'. More specifically, the EU conformity dimension itself is composed of six indicators: one indicator captures the infringement cases that are newly opened against the particular country in each year; three indicators measure the cases in which litigation in the European Court of Justice (ECJ) ensues (subdivided into the categories 'single market cases', 'environmental and consumer protection cases' and 'other sector cases'); and two indicators measure whether a country has signed the Schengen Agreement and whether it is a member of EMU.

The indicators measuring a country's integration with the EU's single market are analyzed in two different ways: (1) the sum of a country's intra-European imports and exports as a share of its total world trade ('EU importance'); and (2) as a share of the country's GDP ('EU openness'). In both ways, the four fundamental freedoms of the EU's single market are represented by a country's intra-European trade in goods, services, stocks of foreign direct investment (FDI) and migration of EU workers, leading to a total number of eight indicators here.

The synchronization of business cycles represents the suitability of EMU and is captured by the dimension 'EU symmetry'. As mentioned above, the loss of autonomy in the members' monetary and exchange rate policy requires similarity in the co-movement of important macroeconomic variables.⁷ The advocates of an endogenous approach further believe that cyclical symmetry emerges *ex post* through increased intra-industry trade (Frankel and Rose 1998). The EU Index measures the symmetry of business cycles with the most common indicators: the real GDP growth rate, inflation, unemployment and a country's net borrowing. Quarterly data over five year moving windows are used to calculate pairwise correlations between one country and the average values of the remaining countries, weighted by the respective population size. The data are adjusted to seasonal effects and long-term trends.

The indicators measuring the degree of economic convergence between the member states are summarized in the dimension 'EU homogeneity'. Economic convergence is only

⁷ Other criteria referring to the *ex-ante* optimality of EMU include the flexibility of domestic prices and wages, the mobility of capital and labor, and the responsiveness of fiscal transfers (Mundell 1961). For an evaluation of the EMU's constitutional design see Ohr (2009) and De Grauwe (2013).

partly expected by economic theory⁸, but desired and financially supported by the EU (e.g., through the EU's cohesion policy). Important indicators in that regard are a country's real GDP per capita, purchasing power, hourly labor costs, long-term interest rates, public debt ratios and implicit tax rates on consumption and capital. Each indicator is compared to the average value of the remaining member states. The average values are again weighted by the respective population size.

The data used in the EU Index mainly stem from Eurostat and InfoCuria, which are the statistical databases of the European Commission and the European Court of Justice. If the data shows missing values these are complemented with data from secondary sources such as the OECD, the UNCTAD or the national statistical offices. Missing values account for less than 1 percent in the EU Index. More information on the data and its sources are illustrated in Table 2.

Table 2 **Description and Sources of Indicators Measuring a Country's European Integration Level**

Indicator	Description	Source
<i>EU Single Market</i>		
<i>EU openness</i>		
Trade in goods	Intra-European imports and exports of goods as a percentage of GDP.	Eurostat
Trade in services	Intra-European imports and exports of services as a percentage of GDP.	Eurostat
Capital movement	Intra-European stocks (inward and outward) of foreign direct investments as a percentage of GDP.	Eurostat, (UNCTAD)
Labor migration	Amount of European employees (ILO definition) as a percentage of the total number of employees (foreign and national).	Eurostat
<i>EU importance</i>		
Trade in goods	Intra-European imports and exports of goods as a percentage of total trade in goods.	Eurostat

⁸ See, for instance, Romer (1986), Lucas (1990) and Krugman (1991) on divergence effects and, on the other hand, the 'law of one price', the Lerner-Samuelson theorem and the traditional neoclassical growth theory by Solow (1956) and Swan (1956) to explain economic convergence.

Trade in services	Intra-European imports and exports of services as a percentage of total trade in services.	Eurostat
Capital movement	Intra-European stocks of foreign direct investments as a percentage of total FDI.	Eurostat, (UNCTAD, OECD)
Labor migration	Amount of European employees (ILO definition) as a percentage of the total number of foreign employees.	Eurostat

EU Homogeneity

Per capita income	Real GDP per capita at constant prices (2005=100, in PPP) in relation to the respective EU average.	Eurostat
Purchasing power standards	Purchasing power standards (EU-15=1) in relation to the respective EU average.	Eurostat
Labor cost	Labor costs (wage costs and payroll costs) per hour (in PPP, for the manufacturing sector and for companies with 10 or more employees) in relation to the respective EU average.	Eurostat
Long-term interest rate	Long-term interest rates according to the Maastricht criteria (10-year government bonds) in relation to the respective EU average.	Eurostat
Public debt ratio	Gross government debt as a percentage of GDP in relation to the respective EU average.	Eurostat
Consumer tax rate	Implicit tax rate on consumption (consumption tax revenues in relation to private consumption spending) in relation to the respective EU average.	Eurostat
Capital tax rate	Implicit tax rate on capital (taxes on property and corporate profits for private households and companies in relation to the global profit and investment income of the private households and companies) in relation to the respective EU average.	Eurostat

EU Symmetry

Economic growth	Real GDP at current prices (2005=100, percentage change to the previous period, seasonally and trend adjusted) in pairwise correlation to the respective EU average on the preceding 20 quarters.	Eurostat
Inflation	Harmonized Index of Consumer Prices (percentage change to the previous period, seasonally and trend adjusted) in pairwise correlation to the respective EU average on the preceding 20 quarters.	Eurostat, (national statistical offices)
Change in unemployment	Unemployment rate (ILO definition, percentage change to the previous period, seasonally and trend adjusted) in pairwise correlation to the respective EU average on the preceding 20 quarters.	Eurostat, (OECD)
Government net borrowing	Government net borrowing as a percentage of GDP (percentage change to the previous period, seasonally and trend adjusted) in pairwise correlation to the respective EU average on the preceding 20 quarters.	Eurostat, (national statistical offices)

EU Conformity

EU participation

EMU membership	Countries of the euro zone receive a value of 100; countries of the Exchange Rate Mechanism II receive a value of 50; and countries with flexible exchange rates towards the EU countries receive a value of 0.	ECFIN
Schengen participation	Countries of the Schengen area receive a value of 100; countries outside the Schengen area receive a	Ministries of Foreign Affairs

EU compliance

Infringement proceedings	Infringement proceedings (pre-litigation) of the European Commission against the EU member states.	European Commission (different volumes) ^a
--------------------------	--	--

ECJ verdict: single market	Completed EU infringement proceedings via ECJ conviction in the field of the EU single market: free movement of services, goods, capital and people; freedom of establishment; state aid; state trade monopolies; market competition; regulations for cartels, mergers and Union citizenship.	InfoCuria
ECJ verdict: environment and consumer protection	Completed EU infringement proceedings via ECJ conviction in the field of environment and consumer protection.	InfoCuria
ECJ verdict: other sectors	Completed EU infringement proceedings via ECJ conviction in the remaining sectors (e.g., social policy, fiscal law, company law, harmonization of legislation, transport, industrial policy, agriculture, fishing, energy).	InfoCuria

Source: Own presentation.

Notes: ^a 'Annual Report on Monitoring the Application of EU law – Annex II'. Sources in brackets are secondary sources in case of missing data of the primary source. Missing data accounts for less than 1 percent of the data.

Normalization Method

As the EU Index consists of a large scale of different indicators, appropriate normalization measures are needed. Panel normalization is used here to allow the comparison of index scores over time – that is, there is only one reference point per indicator over the entire sample and period. Additionally, the sensitivity to extreme values and year-to-year variations are sharply reduced. In the EU Index, panel normalization is converting the data to a scale from 0 to 100. An index score $I_{i,t} = 0$ refers to the least possible integration level per indicator of country i in year t , whereas an index score of 100 denotes the highest level of integration.

The single market indicators belonging to 'EU openness' are normalized by:

$$I_{i,t} = \frac{V_{i,t}}{V_{max(j,T)}} \times 100 \quad (1)$$

where a country's indicator value at a given year is measured in relation to the maximum value V_{max} of all the EU member states j over the entire period T . The closer the country comes to the identified maximum value, the more successful it is in terms of European economic integration.

Normalization of the 'EU importance' data is carried out by:

$$I_{i,t} = \frac{V_{i,t}}{V_{i,t}^{world}} \times 100 \quad (2)$$

where intra-European trade and factor movements are measured as a percentage of the country's total trade and factor movements. The more transactions take place with the European partners (opposed to transactions with countries outside the EU), the greater the country's level of European economic integration.

The indicators measuring 'EU homogeneity' are transformed to:

$$I_{i,t} = \left(1 - \frac{|V_{i,t} - \bar{V}_{j,t}|}{|\max(V_{j,T} - \bar{V}_{j,T})|} \right) \times 100 \quad (3)$$

where the difference between a country's value and the average value of the remaining EU countries $\bar{V}_{j,t}$ represents the degree of heterogeneity. If the difference between the two variables is 0, the maximum degree of homogeneity is achieved. Absolute values are considered in this equation as for homogeneity it is irrelevant whether a value deviates positively or negatively from the EU average.

The co-movement of business cycles between the member states in the dimension 'EU symmetry' is measured as:

$$I_{i,t} = \text{corr}(V_{i,\tau}, \bar{V}_{j,\tau}) \times 100 \quad (4)$$

where the correlation coefficient between a country's values and the average values of the remaining EU countries indicates the level of integration. The correlation takes into account period τ , covering the preceding five years (20 quartiles) for each value. A positive correlation of 1 represents the highest possible level of European economic integration in this field.⁹

⁹ Negative correlation values are tolerated here because a value of less than zero represents an anti-cyclical behavior of a country's figures and should therefore be treated as disintegration.

A country's participation in the Schengen Agreement and its EMU membership gives the following index scores:

$$I_{i,t} = \begin{cases} 0, & \text{if having flexible exchange rates} \\ 50, & \text{if participating in the Exchange Rate Mechanism II} \\ 100, & \text{if being a member of the European Monetary Union} \end{cases} \quad (5)$$

$$I_{i,t} = \begin{cases} 0, & \text{if staying out of the Schengen Agreement} \\ 100, & \text{if participating in the Schengen Agreement} \end{cases} \quad (6)$$

And finally, compliance with the law of the EU is rewarded by:

$$I_{i,t} = \left(1 - \frac{V_{i,t}}{V_{\max(j,T)}}\right) \times 100 \quad (7)$$

where the denominator contains the maximum amount of detected non-compliance cases (infringements and convictions) measured in any of the countries over the entire period and reflects the least possible level of European integration. Thus, committing no infringements yields the highest possible level of integration.

The EU Index measures in most cases the relative performance of the member states. The ranking order then does not only depend upon a country's own integration efforts and capabilities but also upon the economic success (and failure) of the other EU member states. This relative approach takes into account the EU's specific aim of creating an ever closer union and avoids the predetermination of external thresholds based on a subjective rationale.

Weighting Procedure

Weights can have a large effect on the outcome of the overall index and country rankings. Selecting an appropriate weighting procedure is therefore fundamental to the successful construction of a composite indicator. The a priori weighting procedure performed by some indices (e.g., the Kearney/Foreign Policy Globalization Index or the Human Development Index of the United Nations) is not considered accurate weighting due to the lack of objectivity in the assigned weights. Here, the importance of one indicator over others rests solely upon the subjective belief of the expert. This approach leads inevitably to a bias in the final results. The results of indices using a priori weighting are further criticized in terms of sensitivity to alternative weighting schemes (Lockwood 2004). Instead, the weights should be generated on statistical grounds.

Considering the statistical structure of the data set used in the index ensures the calculation of objective weights that are not influenced by the expert's opinion. A sound statistical procedure, therefore, respects the statistical relevance and informative value given by each indicator with regards to the relative contribution to the overall index (OECD 2008).

The EU Index uses such a statistical weighting scheme by computing the weights with the principal component analysis (PCA). Originally designed by Pearson (1901), Spearman (1904) and Hotelling (1933) to analyze and reduce the multicollinearity problem of a large set of interrelated variables, PCA has also gained popularity in creating indices.¹⁰ Here, orthogonal transformation of the various linear combinations between the variables produces a set of components that maximizes the amount of variance of the observed data. In each component, the computed factor loadings then determine the importance (i.e. the weight) of the individual indicators to the respective component. In this case, the indicators are weighted according to their statistical relevance with respect to overall European economic integration and with respect to the underlying dimensions of EU integration. Ideally, the number and structure of the extracted components coincides with the number and structure of the dimensions of the index. Prior standardization of the data using z-scores – with mean values of 0 and standard deviations of 1 – ensures the correct aggregation of the calculated weights.

The EU Index data is first analyzed by a number of tests confirming its eligibility to perform PCA. In short, the data passes all tests: the large average correlation coefficient of Cronbach's alpha (0.82) underlines the factorability of the data set; Bartlett's test of sphericity (χ^2 : 3525, p-value: 0.000) rejects the null hypothesis of an identity matrix; and the Kaiser-Meyer-Olkin measure of sampling adequacy indicates with a value greater than 0.5 (KMO: 0.62) that the variables share enough common factors.

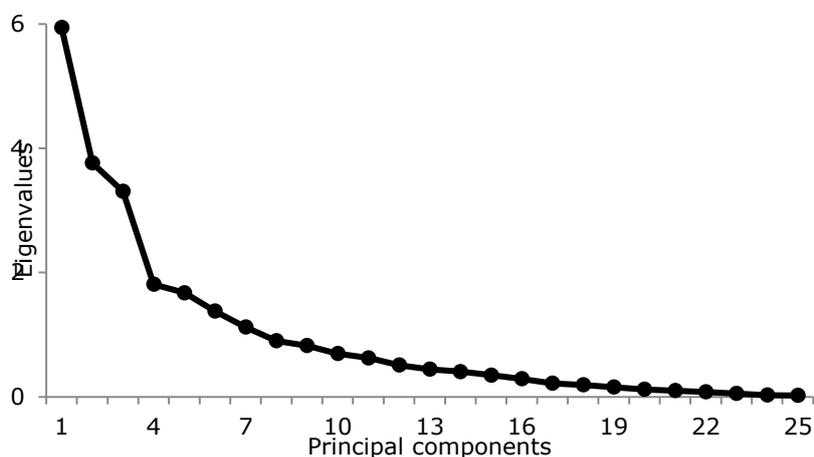
The scree test proposed by Cattell (1966) indicates the optimal number of components to be extracted from PCA. The smooth decrease in the size of eigenvalues after the fourth component suggests an extraction of three components (see Figure 4).¹¹ Although extracting three components does not perfectly match with the number of four dimensions of the EU Index, the structure of the index is still very well confirmed. As presented in Table 3, the indicators belonging to the three dimensions single market, business cycle symmetry and institutional conformity each have the highest explanatory

¹⁰ See, for instance, the index of Economic Freedom by the Fraser Institute, the CSGR Globalization Index or the KOF Index of Globalization.

¹¹ Other common measures such as the Kaiser-Guttman criterion or the Parallel Analysis do not lead to reasonable results here as there are too many components with eigenvalues close to 1.

power in their respective dimension. Hence, these dimensions are not arbitrarily designed but confirmed by statistics. Only the indicators representing the level of homogeneity do not show their highest values jointly in one component, mainly due to the lack of a fourth component.

Figure 4 Scree Test of the Principal Component Analysis



Notes: The obvious 'kink' at component 4 indicates that only three components should be extracted. The smooth decrease in eigenvalues after component 4 points at random correlations and can be neglected.

Table 3 Rotated Factor Loadings and Computed Weights of the EU Index

	<i>Rotated factor loading^a</i>			<i>Weight (%)^b</i>			<i>Overall weight (%)^c</i>
	<i>Comp 1</i>	<i>Comp 2</i>	<i>Comp 3</i>	<i>Comp 1</i>	<i>Comp 2</i>	<i>Comp 3</i>	
	<i>Single Market</i>						
EU-openness to goods	0.434	-0.039	-0.049	7.1	0.1	0.1	7.2
EU-openness to services	0.281	0.100	-0.093	3.0	0.4	0.2	3.6
EU-openness to capital	0.390	0.020	0.081	5.7	0.0	0.2	5.9
EU-openness to labor	0.366	-0.012	0.116	5.1	0.0	0.4	5.4
EU-importance of goods	0.262	-0.035	-0.310	2.6	0.0	2.5	5.2
EU-importance of services	0.244	-0.219	-0.246	2.2	1.7	1.6	5.5
EU-importance of capital	0.182	-0.138	0.019	1.2	0.7	0.0	1.9

	EU-importance of labor	0.341	0.121	0.053	4.4	0.5	0.1	5.0
Homogeneity	Per capita income	0.195	0.241	0.103	1.4	2.1	0.3	3.8
	Purchasing power standards	0.072	0.332	0.165	0.2	3.9	0.7	4.8
	Labor costs	0.206	0.041	0.294	1.6	0.1	2.3	3.9
	Long-term interest rates	-0.098	-0.052	-0.042	0.4	0.1	0.1	0.5
	Public debt ratios	0.000	-0.336	0.040	0.0	4.0	0.0	4.0
	Consumer tax rate	0.124	0.335	-0.008	0.6	3.9	0.0	4.5
	Capital tax rate	-0.102	0.097	0.063	0.4	0.3	0.1	0.8
Symmetry	Economic growth	0.062	-0.083	0.398	0.2	0.2	4.2	4.6
	Inflation	0.029	-0.119	0.411	0.0	0.5	4.5	5.0
	Change in unemployment	0.083	-0.036	0.252	0.3	0.1	1.7	2.0
	Government net borrowing	-0.064	0.074	0.374	0.2	0.2	3.7	4.0
Conformity	EMU membership	0.163	-0.323	-0.007	1.0	3.7	0.0	4.7
	Schengen participation	0.045	-0.255	0.109	0.1	2.3	0.3	2.7
	Infringement proceedings	0.071	0.259	0.131	0.2	2.4	0.5	3.0
	ECJ: single market	-0.015	0.326	-0.269	0.0	3.7	1.9	5.7
	ECJ: environment & cons.	0.035	0.262	-0.128	0.1	2.4	0.4	2.9
	ECJ: other sectors	0.037	0.260	-0.196	0.1	2.4	1.0	3.4
	<i>Explained variance</i>	4.963	4.652	3.492				

Share of total variance (%)	37.86	35.49	26.64
	0	5	5

Source: PCA calculations.

Notes: ^a Rotation method: (oblique) promax-rotation with Kaiser-normalization. ^b Squared factor loading multiplied by the share of total variance of the corresponding component (Comp 1 to 3). ^c Horizontal sum of the three factor weights of each indicator. The shaded areas highlight the highest numbers of each variable across the three components and indicate that the intuitively assigned dimensions single market, symmetry and conformity can be confirmed by statistics.

Prior to the calculation of the weights, the factor loadings are rotated in order to enhance the optimal allocation of indicators to the components. Oblique rotation hereby allows the components to correlate with each other. This accounts for the interdependent nature of the EU Index in a more realistic manner as the dimensions of EU integration are certainly not independent from each other. With the consideration of all three factor loadings per indicator, the explained variance of the index is increased. Otherwise, by relying on only one factor loading and component this would neglect important information of the other components. This would be especially inefficient in those cases where the optimal number of components is greater than 1 and where two or more factor loadings of an indicator reach similar sizes. Thus, the horizontal sum of all three factor loadings – each squared and multiplied by the respective share of total variance of the component – eventually assigns the overall weight to each indicator. These weights are presented in the last column of Table 3.

Multiplying the weights with the respective indicator finally leads to the individual index scores of each country. The country rankings are calculated for each dimension of EU integration as well as for a country's overall level of integration efforts. The latest results of the EU Index are presented in the next section. It is further briefly analyzed whether the EU countries are on the verge to become a more homogeneous or heterogeneous community.

Results of the EU Index

Table 4 presents the results of the EU Index for the EU-25 countries. As ten countries entered the union in 2004, the EU Index presented here is calculated for the years 2004 to 2012.¹²

¹² The original EU Index developed by König and Ohr (2013) was calculated for the EU-15 countries over the period 1999–2010. More recent versions of the EU Index can be downloaded here: http://www.eu-index.uni-goettingen.de/?page_id=195. As Luxembourg shows many extreme values (e.g. GDP per capita) it is not considered in either EU Index.

Table 4 Results of the EU-25 Index for 2004 and 2012

EU Index 2004			EU Index 2012		
Ran	Country	Score	Ran	Country	Score
1	Belgium	66.3	1	Belgium	75.3
2	Netherlands	59.9	2	Ireland	70.5
3	Ireland	58.3	3	Austria	69.6
4	Finland	57.8	4	Germany	66.1
5	Cyprus	56.1	5	France	66.0
6	Germany	56.1	6	Netherlands	65.5
7	Austria	56.0	7	Slovakia	65.5
8	Spain	55.3	8	Finland	65.1
9	France	52.9	9	Spain	64.3
	EU-25	51.9	10	Slovenia	63.3
10	Denmark	51.7	11	Malta	62.5
11	Portugal	51.5		EU-25	61.4
12	Sweden	50.9	12	Czech Republic	61.3
13	Italy	50.1	13	Cyprus	60.8
14	Malta	50.0	14	Italy	60.4
15	United Kingdom	48.2	15	Portugal	59.6
16	Slovenia	47.8	16	Denmark	57.3
17	Estonia	47.6	17	United Kingdom	56.8
18	Czech Republic	47.4	18	Estonia	56.3
19	Slovakia	46.9	19	Sweden	55.3
20	Greece	46.2	20	Lithuania	53.5
21	Poland	44.9	21	Hungary	51.9
22	Hungary	43.7	22	Latvia	51.7
23	Lithuania	39.9	23	Poland	50.7
24	Latvia	36.2	24	Greece	46.8

Source: Own calculations, www.eu-index.org.

Belgium is the top performing country with respect to overall European economic integration in 2012, accomplishing 75.3 of 100 possible index scores. At some distance, Ireland and Austria reach second and third places, followed by Germany, France and the Netherlands. Four of the six best performing countries belong to the founding members of the European Coal and Steel Community. Only the founding member Italy (ranked 14th in 2012) does not belong to the top group. With Slovakia and Slovenia, also two of the Central and Eastern European Countries (CEECs) that joined the EU in 2004 are among the ten best performing countries. Most of the CEECs, though, show very low integration efforts when compared to the EU-25 average. Lithuania, Hungary, Latvia and Poland show especially low levels of integration. The three EMU-outs (Denmark, UK and Sweden) also show fairly low levels of integration efforts. At the very end of the 2012 ranking is Greece, achieving less than 50 index scores.

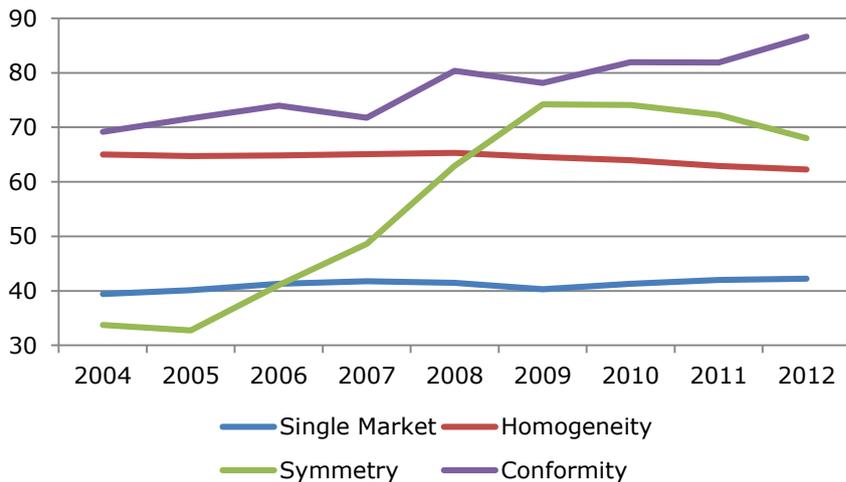
This large discrepancy between the most and least integrated countries was already present in 2004, yet at lower levels. Belgium achieved 66.3 index scores reaching first place again, and being followed (more or less) by the same countries as in 2012. The CEECs are skewed towards the very bottom of the index scale – together with Greece. When compared to 2012, the lack of integration efforts made by Greece since 2004

becomes considerably visible. More precisely, Greece still shows very low levels of single market integration (particularly in the goods and capital sections), high debt ratios and long-term interest rates, low symmetry in GDP growth and unemployment rates, and too many open infringement cases. With an overall of 46.2 and 46.8 index scores in 2004 and 2012, respectively, Greece has hardly made any additional efforts in EU integration.

The EU-average, on the other hand, has increased by roughly 20 percent since 2004. The largest boost in integration efforts was achieved in Slovakia and Slovenia, followed by Latvia, the Czech Republic, Austria and Lithuania. Hence, it seems that some of the CEECs are catching up to the top performing countries in terms of EU integration, even if most of the CEECs are still below the EU-average in 2012.¹³

So, does the increase in integration efforts of almost all member states also imply that the EU is becoming a more homogeneous community? Figure 5 raises some doubts in this regard. By illustrating the average development of each EU dimension over time, it becomes evident that the homogeneity dimension of the EU Index has not improved over the years. Whereas the symmetry and the conformity dimension have made substantial improvements in integration efforts, the homogeneity dimension even sees a slight decrease in integration efforts. These disintegration tendencies have occurred especially due to different labor costs, long-term interest rates, public debt ratios and capital tax rates.

Figure 5 Development of EU Integration Dimensions

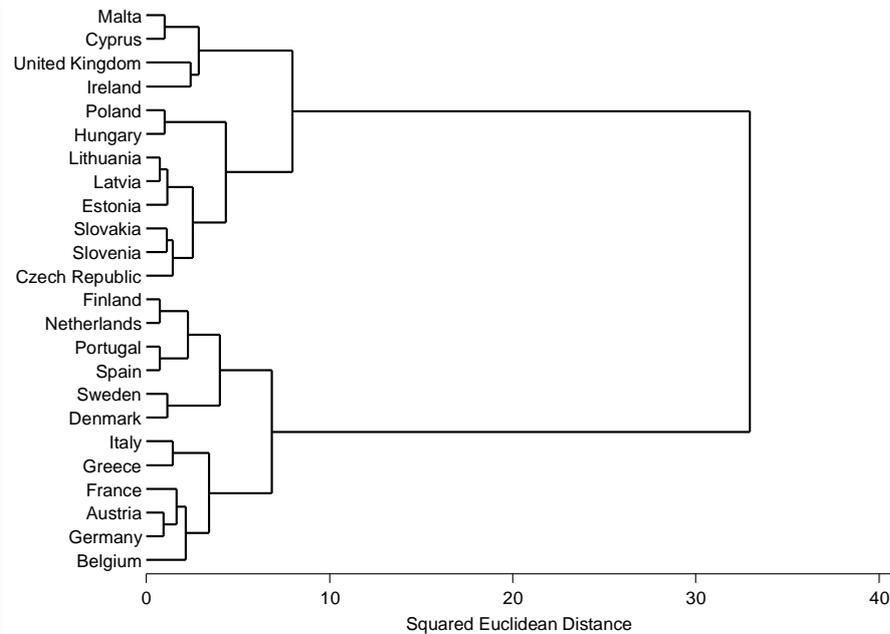


Notes: EU-25 average index scores on the vertical axis.

¹³ Among the CEECs, Hungary and Poland have made the lowest integration efforts since 2004. For a more elaborate view on the integration profiles for Hungary and the CEECs see Palankai and Miklos (this volume).

By performing cluster analysis it is further shown that the EU has not become more homogeneous but rather heterogeneous with several homogeneous country groups. Figure 6 presents the results of the cluster analysis using the 2004 data set. Squared Euclidean distances are used to measure the relative distances between the countries (and country groups): The lower the measured distance, the more homogeneous is the country pair, respectively the country group. It is very well shown that the EU-25 of 2004 was mainly divided into two parts: the EU-15 countries on one side and the ten new EU member states (plus UK and Ireland) on the other. The EU-15 group consisted of two subgroups each containing six EU countries, one led by Austria and Germany and the other by Finland and the Netherlands. The other (new EU member) group is also marked by two subgroups: one of the CEECs and another consisting of the island states of Malta, Cyprus, the UK and Ireland.

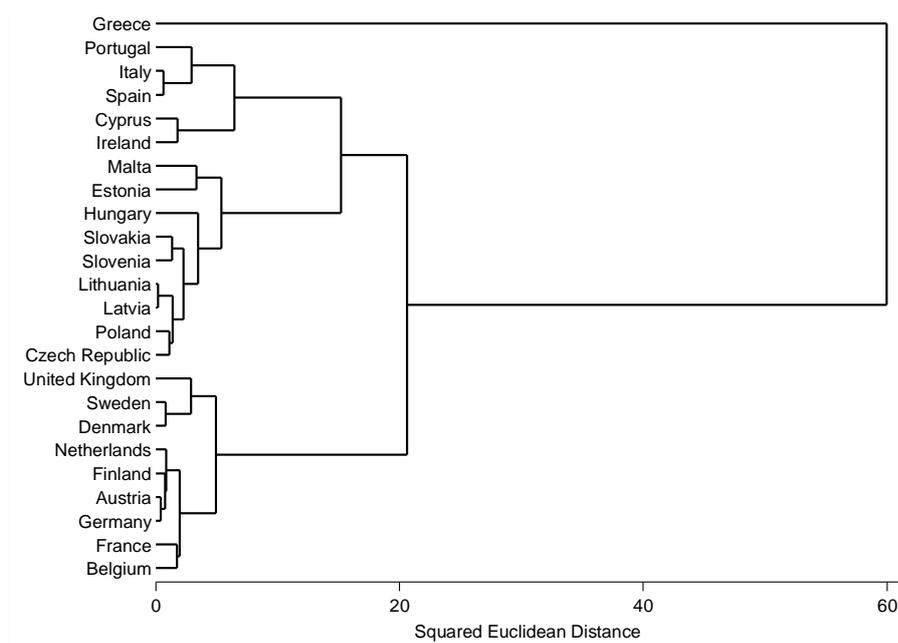
Figure 6 Dendrogram for 2004



Notes: Cluster analysis based on 25 indicators used to calculate the EU Index in 2004 (using Ward’s clustering).

When performing cluster analysis using the 2012 data set, as presented in Figure 7, the country groups are changing in terms of size and relative distance. The former EU-15 group has become much smaller. There is now one subgroup of six countries, again led by Austria and Germany, and another consisting of the three EMU-outs (Denmark, Sweden and the UK). The first subgroup may be regarded as the ‘core group’ of EU integration as here the relative distances between the countries are the lowest. Finland, the Netherlands, France and Belgium belong to this core group, in addition to Austria and Germany. This core group seems to be very homogeneous and also shows some homogeneity with the three EMU-outs.

Figure 7 Dendrogram for 2012



Notes: Cluster analysis based on 25 indicators used to calculate the EU Index in 2012 (using Ward's clustering).

The periphery of European economic integration, on the other hand, is again dominated by the CEECs, which form one large group of relatively homogeneous countries (with Malta). Among the CEECs, Lithuania and Latvia show again the most homogeneous integration pattern. With regards to 2004, however, the CEECs were not able to substantially decrease their relative distance to the core group.

At even larger distances to the core group, a new formation of countries has emerged in 2012: the GIIPS (plus Cyprus).¹⁴ This new formation (of which Greece is the ultimate outsider) interestingly consists of exactly those EMU members that needed financial assistance from the European Stability Mechanism (ESM) due to the eruption of the Global Financial Crisis in 2008. The GIIPS are still facing strong austerity policies delegated from the EU. Greece, Italy, Portugal and Spain belonged to the EU-15 group in 2004, but in 2012, the distance to the core group is very large and, especially in Greece, much integration efforts are needed to get back on track.

The cluster analysis of the 2012 data implies that the former 'two-speed Europe' – mainly characterized by the EU-15 and the new member states – has evolved to a 'multi-speed Europe'. This multi-speed Europe sees strong and increasing heterogeneity between a so-called core group of EU integration (consisting of Austria, Germany, Finland, the Netherlands, France and Belgium) and the EU periphery (consisting of the GIIPS and Cyprus). This tendency is of particular concern as the rising economic heterogeneity

¹⁴ GIIPS (Greece, Ireland, Italy, Portugal, Spain).

stokes certain fears among the EU citizens which in turn lead to more radical and nationalist attitudes. It should therefore stand at the forefront of European policy to reduce this heterogeneity.

Conclusions

The heterogeneous integration efforts of many EU member states underline the importance of measuring European economic integration. Despite the improvement in overall integration levels, the EU seems to have become less homogeneous today. The core group of countries, above all Austria and Germany, determines the pace of EU integration, whereas the other country groups seem to fall behind the core group.

Due to the fact that British, Danish and Swedish policy generally shows low integration intentions ever since their EU accession, this tendency might not cause any irritation in these countries. In the other two country groups, the CEECs and the GIIPS, however, the large distance to the core group should raise more concerns. By showing an increasing heterogeneous tendency among the GIIPS not only the functioning of EMU but also the EU's aim of becoming an ever closer union is put at risk. For most of these countries, especially the single market integration needs to be improved in the future. In 2012, Greece, Italy and Spain showed the least single market activities of all EU member states. Therefore, to reduce the economic heterogeneity between the core and the periphery of European integration, the CEECs and the GIIPS as well as the European Commission should promote further liberalization of the EU single market. Thereby, the development of other macroeconomic variables could be affected in a positive way, leading to more symmetric business cycles across the member states. This could improve the efficient functioning of EMU and lowers the risk of having inadequate monetary policies. The success of EU and EMU stands and falls with the economic integration of its member states – and the EU Index will further monitor its progress.

References

- Badinger, H. and Breuss, F. (2011). The Quantitative Effects of European Post-War Economic Integration. In: Jovanovic, M.N. (ed.) *International Handbook on the Economics of Integration* (pp. 285–315), vol. III (Cheltenham: Elgar).
- Balassa, B. (1961). *The Theory of Economic Integration* (Homewood, IL: Richard D. Irwin).
- Baldwin, R. (1989). The Growth Effects of 1992. *Economic Policy*, 9, 247–281.
- Boltho, A. and Eichengreen, B. (2008). The Economic Impact of European Integration. *CEPR Discussion Paper*, (6820).
- Cattell, R.B. (1966). The Scree Test for the Number of Factors. *Multivariate Behavioral Research*, 1, 245–276.
- Cecchini, P., Catinat, M. and Jacquemin, A. (1988). *The European Challenge, 1992: The Benefits of a Single Market* (Aldershot: Gower).
- Crowley, P.M. (2006). Is There a Logical Integration Sequence After EMU? *Journal of Economic Integration*, 21, 1–20.
- De Grauwe, P. (2013). The Political Economy of the Euro. *Annual Review of Political Science*, 16, 153–170.
- European Commission (2013). *Internal Market Scoreboard*, (26). Brussels.
- Frankel, J. and Rose, A. (1998). The Endogeneity of the Optimum Currency Area Criteria. *Economic Journal*, 108, 1009–1025.
- Hotelling, H. (1933). Analysis of a complex of statistical variables into principal components. *Journal of Educational Psychology*, 24, 417–441.
- Ilzkovitz, F., Dierx, A., Kovacs, V. and Sousa, N. (2007). Steps Towards a Deeper Economic Integration: The Internal Market in the 21st Century. *European Economy – Economic Papers*, (271).
- König, J. and Ohr, R. (2013). Different Efforts in European Economic Integration: Implications of the EU Index. *Journal of Common Market Studies*, 51, 1074–1090.
- Krugman, P. (1991). Increasing Returns and Economic Geography. *Journal of Political Economy*, 99, 483–499.
- Lockwood, B. (2004). How Robust is the Kearney/Foreign Policy Globalization Index? *World Economy*, 27, 507–523.
- Lucas, R. (1990). Why Doesn't Capital Flow from Rich to Poor Countries? *American Economic Review*, 80(2), 92–96.
- Molle, W. (2006). *The Economics of European Integration* (Aldershot: Ashgate).
- Mundell, R. (1961). A Theory of Optimum Currency Areas. *American Economic Review*, 51, 657–665.
- Organisation for Economic Co-operation and Development (OECD) (2008). *Handbook on Constructing Composite Indicators: Methodology and Users Guide* (Paris: OECD).
- Ohr, R. (2009). European Monetary Union at Ten: Had the German Maastricht Critics Been Wrong? *Cege-Discussion Paper*, (141).
- Pearson, K. (1901). On lines and places of closest fit to systems of points in space. *Philosophical Magazine*, 2(6), 559–575.
- Romer, P.M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy*, 94, 1002–1037.

- Solow, R.M. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, 70, 65–94.
- Spearman, C. (1904). 'General intelligence', objectively determined and measured. *American Journal of Psychology*, 15, 201–293.
- Swan, T.W. (1956). Economic Growth and Capital Accumulation. *Economic Record*, 32, 334–361.
- Tinbergen, J. (1954). *International Economic Integration* (Amsterdam: Elsevier).