Measuring European Economic Integration

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„Glück ist einerseits das Ziel allen menschlichen Strebens und Sehnens,
andererseits der Zufall, das Geschick, das jenem Ziel den Inhalt gibt.“
Aristoteles (384 – 322 v. Chr.)

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Table of Contents

List of Figures

List of Tables

List of Abbreviations

ATK/FP	A.T. Kearney / Foreign Policy
BMA	Bayesian Model Averaging
BRICS	Brazil, Russia, India, China, South Africa
CEE	Central and Eastern Europe
CM	Common Market
CU	Customs Union
CSGR	Centre for the Study of Globalisation and Regionalisation
EaP	Eastern Partnership
EC	European Community
ECB	European Central Bank
ECFIN	Economic and Financial Affairs
ECJ	European Court of Justice
EEC	European Economic Community
EU	European Union
EU-15	EU member states until 2004
EU-27	EU member states after 2004
EUI	EU Index
EMU	Economic and Monetary Union
ESM	European Stability Mechanism
FDI	Foreign Direct Investment
FE	Fixed Effects
FTA	Free Trade Area
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GIPS	Greece, Italy, Portugal, Spain
ILO	International Labour Organization
IV	Instrumental Variable
KMO	Kaiser-Meyer-Olkin

KOF	Swiss Economic Institute at ETH Zurich
MGI	Modified Globalization Index
MIPEX	Migrant Integration Policy Index
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
PTA	Preferential Trade Agreement
PU	Political Union
SWB	Subjective Well-Being
TEC	Treaty establishing the European Community
TEU	Treaty on European Union
UNCTAD	United Nations Conference on Trade and Development
VIF	Variance Inflation Factor
WTO	World Trade Organization

1 Introduction

> *'The pooling of coal and steel production should immediately provide for the setting up of common foundations for economic development as a first step in the federation of Europe, and will change the destinies of those regions which have long been devoted to the manufacture of munitions of war, of which they have been the most constant victims.'*
>
> *Robert Schuman, Declaration of 9 May 1950*

The European Union (EU) is a unique economic and political integration project. What has begun primarily as a peacekeeping endeavour among six European countries struggling from the aftermath of World War II has evolved into a complex economic and political network of meanwhile 28 member states and various 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.[1]

The academic roots behind the concept of economic integration can be traced back to Tinbergen (1954) and Balassa (1961). Tinbergen defines economic integration as '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). According to Balassa, this process can be divided into several *stages of economic integration*. Table 1.1 assigns the individual stages of economic integration to the respective steps of European integration over the past 60 years. The uniqueness of the European experience certainly lies in the progressive deepening of its integration process. The EU and its predecessors have almost gradually developed from a mere preferential trade agreement (PTA) in 1951 to an economic and monetary union (EMU) in 1999.[2]

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[1] The current EU candidate countries are Iceland, Macedonia, Montenegro, Serbia and Turkey.

[2] See, for instance, Ohr and Theurl (2001) and Baldwin and Wyplosz (2012, chap. 1) for a detailed discussion of the European integration process, and Rübel (2002, chap. 6) for an analysis of the successive development of the European Monetary System.

Table 1.1 Extended and Modified Balassa Stages of Economic Integration

Stage	Characteristics	EU integration steps
Preferential trade agreement (PTA)	Preferential access to certain products from 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 labour	European Union (1992)
Economic/fiscal union	Harmonization and coordination of relevant national policies	Partially fulfilled; e.g., agricultural policy, competition policy, 'Fiscal Compact'
Economic and monetary union (EMU)	Single currency and monetary policy	Stage three of EMU (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 and modified to fit European integration more closely. See Molle (2006, chap. 2) and Crowley (2006) for other EU-oriented versions of the Balassa stages.

This is worth mentioning because 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.[3] The European integration process, on the other hand, has passed through nearly all (extended) Balassa stages of economic integration, leaving the potential completion of fiscal union and political union for the future.

When looking at the country level, however, it appears that the EU member states show different efforts and capabilities in 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. Figure 1.1 underlines this point. Whereas the EU-15 countries were, on average, able to substantially reduce their violations against EU law over the last 20 years, there still exists a large discrepancy between the least (Italy) and most (Sweden) complying countries. Depending on the policy area in which the infringement has been taken place, these differences may have an impact on the member states' interaction in other areas, such as the common market.

[3] According to the WTO website, http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx, there exist 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).

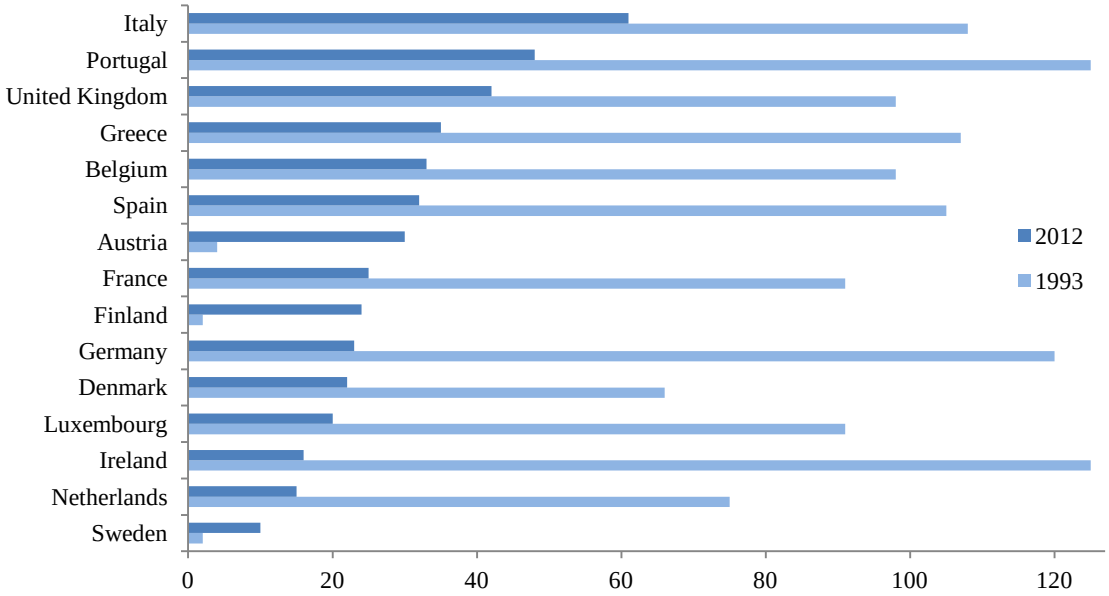

Figure 1.1 Infringement Proceedings against EU Member States

Source: Own presentation based on the 'Annual Report on Monitoring the Application of EU Law', Annex II, released by the European Commission in 1996 and 2012. A former version of this figure has been published in Ohr and König (2012).
Notes: Only newly opened infringement proceedings by the European Commission against member states are reported here. The early numbers of Austria, Finland and Sweden refer to the year 1995 due to their later accession to the EU.

The European single market with its four fundamental freedoms – the free movement of goods, services, capital and persons – is one of the most striking European economic integration steps and may be seen as the core of its integration architecture. Due to expected higher marginal revenues, the free movement of capital and labour enables the optimal allocation of production factors. Enhanced productive efficiency and product specialization (economies of scale) in combination with the elimination of tariffs and non-tariff barriers to trade eventually paves 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.[4] Further benefits arising from the common market include greater market efficiency and product innovation due to increased competition, leading to a reduction in price levels and a rise in economic growth rates.[5]

However, not all the member states were able to make use of such improvement in market efficiency. After 20 years of the EU single market there are still immense

[4] 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.

[5] For an elaborate overview of the potential benefits of the common market see Ohr and Gruber (2001).

heterogeneities in the members' trade patterns. For example, whereas Greece and Portugal both show intra-EU trade balance deficits of 5 percent in relation to their gross domestic product (GDP), Ireland and the Netherlands show surpluses of their intra-EU trade balance ratios of 12 and 28 percent, respectively, according to Eurostat data for 2012. Moreover, when examining the internal export volumes as a percentage of GDP, even larger disparities between the member states 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 1.2, overall internal trade in goods as a percentage of GDP ('EU openness') has increased in the EU-15 countries by 10 percent since the creation of the EU single market in 1993. When considering the share of internal trade over total world trade ('EU importance'), though, the ratio steadily declines over the same period. On average, the relative importance of the EU single market has diminished with respect to trade in goods by roughly 10 percent; from 63 percent in 1993 to 53 percent in 2012. Hence, despite offering a large common market the EU member states are also attracted by markets outside the union to a great and increasing extent.[6]

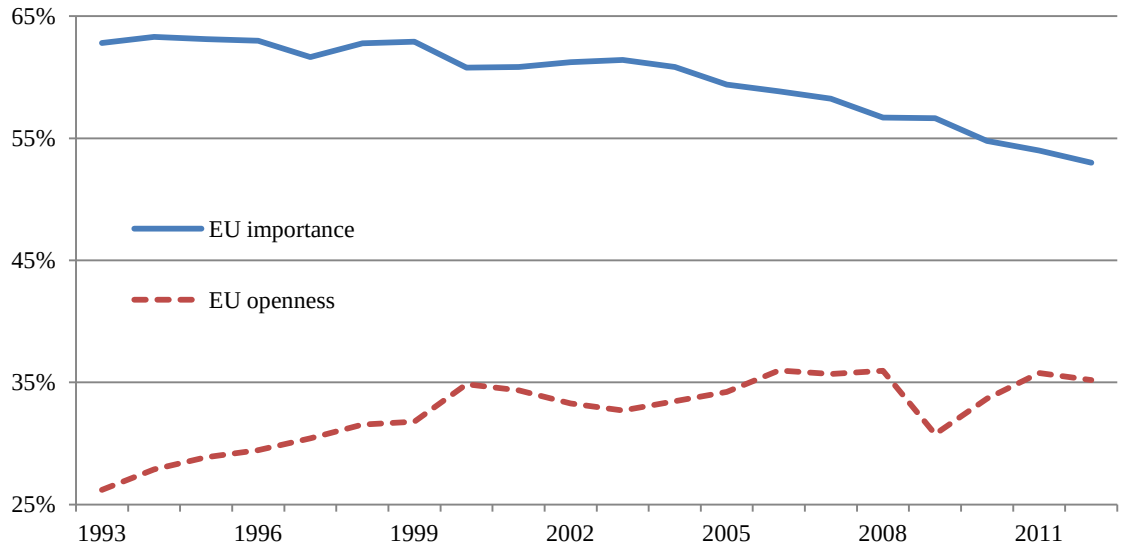

Figure 1.2 Intra-EU-15 Trade in Goods

Source: Own calculations based on Eurostat data.
Notes: 'EU importance' refers to the sum of imports and exports in goods within the EU-15 as a share of their total world trade in goods. 'EU openness' refers to the sum of imports and exports in goods within the EU-15 as a share of GDP.

[6] Such as the emerging markets of the BRICS (Brazil, Russia, India, China and South Africa), with China being a serious challenge to the EU's industrial competitiveness (see Havlik *et al.*, 2009).

Likewise, the countries may differ in terms of economic homogeneity and in the co-movements of their business cycles. The national loss of autonomous monetary and exchange rate policy in the EMU demands for a certain degree of similarity in the development of important macroeconomic variables.[7] Otherwise, the countries become more prone to asymmetric shocks and the common monetary policy 'one size fits all' becomes less effective. Visual inspection of Figure 1.3 suggests that the economic disparities between the member states might be too large in that respect. The member states show very different levels in average real GDP growth rate correlations over the period 1995–2012. Additionally, the respective standard deviations are very large in some countries and even point to negative correlations.

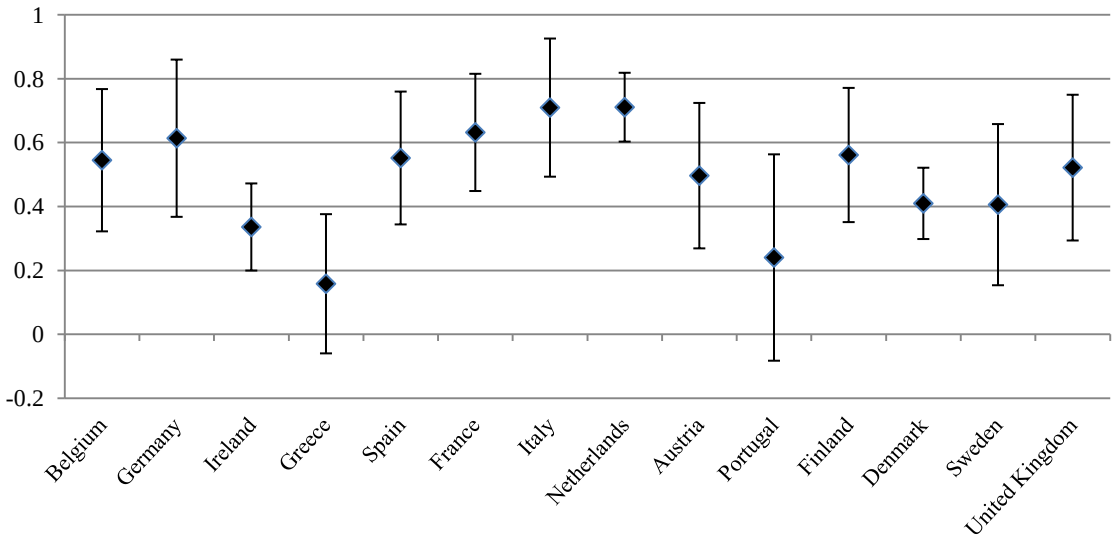

Figure 1.3 Average Levels of Business Cycle Symmetry (1995–2012)

Source: Own calculations based on Eurostat data.
Notes: The figure presents the average correlation value (and the respective standard deviation) between the domestic real GDP growth rate and the average growth rates of the remaining EU-15 countries over five-year moving windows. The growth rates refer to quarterly data, which have been adjusted to seasonal and trend effects using the Hodrick-Prescott filter.

In assessing the European economic integration level of the various member states, these developments and other indicators certainly have to be taken into consideration. In general, measuring economic integration has gained increasing interest in recent years. Prior contributions to this strand of literature have provided a substantial number of indices measuring integration. Nevertheless, the previous efforts were taken

[7] Other criteria referring to the *ex ante* optimality of a common currency area include the flexibility of domestic prices and wages, the mobility of capital and the labour force, and the responsiveness of fiscal transfers (see Mundell, 1961; Feldstein, 1997). See Ohr (2009 and 2011) and De Grauwe (2013) for a recent evaluation of the suitability of the EMU's constitutional design.

in either quantifying the scope and scale of worldwide integration through globalization indices (e.g., Dreher, 2006; Martens and Zywietz, 2006) – thereby ignoring the special dimensions of European integration – or in measuring only special parts of the European integration, such as the Migrant Integration Policy Index (MIPEX).

Motivated to fill this gap in the literature, the first part of this dissertation develops an index measuring the level of European economic integration for the various member states.[8] The **'EU Index'** developed in **chapter 2** incorporates those European-specific dimensions that were largely neglected by the globalization indices – that is, the member state's level of conformity with EU law (disaggregated by sectors and infringement phases), the level of participation in the EU single market across the four fundamental freedoms, the level of economic homogeneity and the symmetry of the member's business cycles. Moreover, using 25 different indicators to measure the main dimensions of European integration allows for a wider scope of integration analysis in opposition to, for instance, the MIPEX.

As the EU Index consists of a large scale of different indicators, much attention is devoted to an accurate weighting of the indicators and dimensions. As discussed below, the use of statistical procedures (i.e., principal component analysis) is regarded as the optimal choice in producing objective weights. Relying on statistical grounds, the derived index scores eventually reveal the depth of European economic integration for each EU-15 country (without Luxembourg) and each year from 1999 to 2010. The EU Index is thus able to present a rank order according to the most integrated countries with respect to overall integration and with respect to single indicators and dimensions.

Furthermore, a cluster analysis is used to group the countries according to their reciprocal distances in indicator values. The analysis is thus able to disclose those countries that are most likely to lead and determine the current and future European integration process as a 'core group'.

One major additional benefit of the EU Index is that it grasps a phenomenon as vast as European economic integration by one statistical measure. The member states' individual integration level becomes numerically tangible, thereby making European economic integration operational for further empirical research activities.

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[8] A similar version of this chapter has been published in *JCMS – Journal of Common Market Studies*; see König and Ohr (2013).

In **chapter 3**, the EU Index is employed in such an empirical assessment. In particular, it is analyzed whether the different national levels of European economic integration have a sizeable **impact on the European citizen's quality of life**. To put it differently, the EU's intrinsic aim of raising the standards of living and improving the well-being of its people is investigated in this section.[9]

The last decade has witnessed a rapidly growing literature on the economic determinants of subjective well-being (SWB) and the relevance of happiness studies in economics.[10] Following this stream of literature, life satisfaction data are used as the dependent variable instead of rather traditional indicators of welfare such as the real GDP per capita. For this reason, survey responses of 180,453 individuals are intensively exploited and further regressed on the EU Index data, on the macroeconomic conditions of the respective country and on the personal socio-demographic characteristics of the respondents. The regressions also control for country fixed effects, year effects and country-specific time trends.

The estimated regression coefficients are then surveyed due to their statistical significance and due to their marginal effects on reported life satisfaction. In order to derive further policy implications for future EU integration efforts, the regression estimations are repeated using disaggregated EU Index data. Specifically, the additional benefit of this study is the identification of those dimensions of European economic integration that enhance individual life satisfaction levels most likely. Several hypotheses are derived from economic and psychology literature and are then verified by several regressions.

For this purpose, different estimation strategies identified by the happiness literature are used to reveal efficient and robust results. The baseline econometric approach is adopted from Di Tella *et al*. (2003) using an ordered logit procedure due to the ordinal structure of the life satisfaction data. The detected correlations are further tested and confirmed in a robustness analysis applying linear ordinary least squares (OLS) as well as a two-stage OLS procedure, as suggested by Di Tella *et al*. (2001). The estimated coefficients, the robust empirical results and the derived policy implications are interpreted and summarized at the end of the study.

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[9] A similar version of this chapter is currently under review in an international journal.

[10] For an extensive overview see Frey and Stutzer (2002), Di Tella and MacCulloch (2006), Frey (2008), Dolan *et al*. (2008), Graham (2011) and Layard (2011).

In **chapter 4**, the effects of European economic integration on the member states' economic performance are further analyzed. Specifically, this chapter investigates whether small or large countries benefit more from their membership in the EU.[11] Conversely to the previous chapter, the more traditional indicator of well-being – real GDP per capita – is used as the dependent variable. More precisely, the **effects of country size on the economic growth rates** are investigated empirically for the EU-27 member states over the period 1993–2012.

According to a series of economic literature (e.g., Robinson, 1960; Kuznets, 1960; Scitovsky, 1960), small countries are expected to overcome their impediments of smallness (i.e., small domestic markets, vulnerability to idiosyncratic shocks, low potential labour force, limited access to capital, etc.) once their markets become internationally more integrated. Empirical evidence on this assumption, however, is rather limited or reveals mixed results.

The aim of this chapter is to fill this gap with a European integration focus. The correlation between economic growth and country size is verified with respect to statistical significance, direction and magnitude of the coefficients. Cross-country as well as panel data growth regressions are estimated for this purpose. The estimation strategy is successively extended on the basis of neoclassical growth theory. As a first step, the existence of (conditional and unconditional) economic convergence among the member states is analyzed, as predicted by traditional trade and growth theories.[12] Building on this information, the analysis goes on in estimating the effects of country size on economic growth. The variables of the human capital augmented growth model along with other variables derived from the literature serve as additional indicators in explaining economic growth.

Differences in estimation procedures using fixed effects estimations and instrumental variable estimations are further employed. At a later stage, the sample is subdivided into 'old' and 'new' member states in order to unleash the correct effects of country size on economic growth and in order to display the long-term convergence path across the EU member states. Possible explanations of the findings as well as policy implications are provided at the end of the study.

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[11] A similar version of this chapter is currently under review in an international journal.

[12] See Ohr (2003a) for an analysis of the theoretical concepts of economic convergence and for a theoretical discussion of the likeliness of convergence or divergence in the EU.

In **chapter 5**, the main findings and conclusions of the previous chapters are summarized. Moreover, **concluding remarks** on the derived policy implications of each chapter are presented. In the end, a brief outlook on **future research** possibilities with regards to European economic integration is provided.

2 Different Efforts in European Economic Integration: Implications of the EU Index

Abstract

European integration is a multilayer process consisting of significant differences in efforts and capabilities of the member state's individual EU participation. Hence, general statements about the national level of European economic integration are very vague. In order to fill this gap, this article presents a composite indicator measuring the extent of economic integration within the European Union – the EU Index. Existing composite indicators concerned with economic integration (such as globalization indices) were not designed to capture the specific European dimensions. The EU Index offers a unique basis, as now the national differences can be illustrated by one statistical measure. Large heterogeneities are found between the member states with respect to overall European economic integration and to various sub-indices. By using cluster analysis, it is also shown that the prevailing economic heterogeneities in the EU are combined with a strong and even growing clustering of its members, thereby challenging present and future steps of European integration.

Note: A similar version of this chapter has been published in *JCMS – Journal of Common Market Studies*, Vol. 51(6), 1074–1090. DOI: 10.1111/jcms.12058. Joint work with Prof. Dr. Renate Ohr, Georg-August-Universität Göttingen.

Joint work with the co-author was done in developing the main idea of the index, in deriving most of its indicators and dimensions and in discussing the results. Reclaiming the state of the literature, data handling, the development and performance of the statistical approach (data normalization, principal component analysis and cluster analysis) and of the robustness analysis as well as the wording of the text was done solely on my own.

There are two former discussion paper versions: König and Ohr (2012a) (in German) and König and Ohr (2012b). More information on the EU Index and the possibility of downloading the data set is given at www.eu-index.org.

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2.1 Introduction

The European Union (EU) is a unique community of 27 sovereign countries, which are politically connected and economically tied through various steps of European integration. Fostering economic ties between its member states is one of the main objectives of the EU's policy of 'creating an ever closer union' (Preamble, TEU). Moreover, the EU seeks to promote economic, social and territorial cohesion by 'reducing disparities between the levels of development of the various regions' (Art. 174, TFEU).

Despite this integration policy, the EU member states demonstrate large heterogeneities with respect to their economic performance. The existence of different efforts or capabilities in participating in the European economic integration process could be a reasonable explanation for this phenomenon. Although committing to the same *acquis communautaire*, economic research has found heterogeneous outcomes for the investigated member states through analyzing specific fields of integration, such as trade integration (e.g., Badinger, 2005; Baldwin, 2006), monetary integration (e.g., De Grauwe, 2006; Gregoriou *et al*., 2011), capital market integration (e.g., Baele *et al*., 2004), labour market integration (e.g., Nowotny *et al*., 2009) or institutional integration (e.g., Mongelli *et al*., 2007). However, in order to make a judgement on the overall degree of country-specific efforts and capabilities to participate in the European integration process, current research still lacks a combined investigation that captures the members' heterogeneity across the various fields of economic integration within the EU with one aggregate statistic.

In order to fill this gap, we have developed a composite indicator measuring the extent of European economic integration in the individual EU member states. This 'EU Index' is able to determine the degree of European integration of each country on an annual basis and can be used to evaluate a country's level of integration for certain years or to analyze whether a member state has fallen behind the general speed of integration. The ranking order between the EU members gives a first impression of the extent of economic heterogeneity related to the members' efforts and capabilities in implementing European integration.

We further contribute to the literature by measuring the specific effects of European economic integration in comparison to existing globalization indices. Whereas

globalization indices primarily focus on the degree of liberalization and internationalization of the economies, the EU Index addresses these issues in a more regional context and with respect to the EU's aim of an 'ever closer union'. Thereby, more EU-specific aspects are taken into consideration, including the European single market, the degree of economic convergence, the alignment of cyclical fluctuations and compliance with the EU institutions. Moreover, we investigate whether heterogeneity differences have led to the formation of country groups within the EU pursuing their own speed of integration.

The article is structured as follows: The next section explains the reasons for creating the EU Index. The article then goes on to define and justify the indicators forming the Index, and describes the statistical approach. The findings of the EU Index and its sub-indices are presented and the results are tested for robustness. The final section summarizes the main implications.

2.2 Why Another Index?

Measuring economic integration has gained interest in recent years. Particular efforts were taken in quantifying the elusive idea of globalization.[13] The ATK/FP Globalization Index developed by A.T. Kearney/Foreign Policy (2002) is generally considered to be the first attempt to construct a composite measure of globalization. Several others followed, including the G-Index (Randolph, 2001), the CSGR Globalization Index (Lockwood and Redoano, 2005), the MGI Modified Globalization Index (Martens and Zywietz, 2006), and the KOF Index of Globalization (Dreher, 2006). Whereas these indices differ in the amount of countries, years, indicators and weighting schemes, each of them combines data on a country-by-country basis into one aggregate statistic. As most of these globalization indices cover a much larger number of countries and years than the EU Index, it is legitimate to question the benefit of adding another economic index over existing globalization indices.

We see at least three reasons. First, *European economic integration is of interest in its own right.* In general, economic integration can be interpreted as a process that 'encompasses measures designed to abolish discrimination between economic units

[13] Extensive information on economic globalization indicators can be found in OECD (2005, 2010), yet without being weighted into ready-for-use indices.

belonging to different national states' (Balassa, 1961, p. 1). The globalization indices try to measure these worldwide internationalization effects. With respect to European integration, however, one has to take into account the special dimensions and specific aims of EU economic integration. Here, a distinction is usually made between positive and negative integration (Tinbergen, 1954). Whereas negative integration denotes the removal of discrimination in national economic rules (e.g., barriers to trade) and policies under joint surveillance within the economic region, positive integration refers to the allocation of competences to common supranational institutions. Globalization indices, however, are not designed to distinguish between a country's level of integration with the global economy and its degree of integration with a regional economic area, where other rules are in effect. Within the EU, the introduction of the single market with its four fundamental freedoms is one major example of negative integration that goes far beyond current globalization efforts. Participation in the Schengen agreement and in economic and monetary union (EMU), as well as the monitoring of EU law by the European Commission and the European Court of Justice (ECJ), are prominent examples of positive integration that cannot be captured by globalization indices.

Second, *current composite measures with respect to European (economic) integration discuss merely a special part of the integration process*. While it is ambitious to fully capture a phenomenon as vast as European economic integration in one statistical measure, it is an important first step in setting the European integration debate on a more solid scientific base. To our best knowledge, no such composite indicator exists. There are only some indices concerned with individual elements of the European integration process as the Migrant Integration Policy Index (MIPEX) produced by the British Council and the Migration Policy Group to evaluate migrants' opportunities to participate in society, the Eastern Partnership (EaP) Index developed by the International Renaissance Foundation and the Open Society Institute to track the economic progress of six countries in Eastern Europe, and the Regional Innovation Scoreboard by the European Commission to assess the innovative performance across NUTS-1 and NUTS-2 regions of the EU.[14]

[14] The NUTS classification system (Nomenclature of Territorial Units for Statistics) divides the economic territory of the EU into small (NUTS-3), basic (NUTS-2) and major (NUTS-1) regions.

Third, *we see potential improvement in the weighting schemes of the mentioned globalization indices.* Aggregation and weighting procedures have a direct effect on the overall composite. Therefore, appropriate procedures should be selected that respect both the theoretical framework and the data properties (OECD, 2008). Nonetheless, the globalization indices use either subjective *a priori* weightings or they use statistical aggregation procedures without making use of all the necessary information received. Refinement in the weighting scheme is therefore inevitable for the construction of future composite indices.

Overall, a comprehensive European economic integration measure should not just be a more complicated measure of economic internationalization. Economic integration within the EU is characterized by very specific dimensions of positive and negative as well as *de jure* and *de facto* integration, which are captured in our index.

2.3 Indicators of European Economic Integration

In congruence with the theory of positive and negative integration, the indicators of the EU Index are chosen to reflect the single market dimension of the EU, on the one hand, and the conformity dimension with EU law and European institutions, on the other. Furthermore, two other effects are usually derived from economic theory and European policy in connection with the just mentioned dimensions of EU integration: economic convergence and homogeneity among the member states (e.g., De la Fuente, 2002; Badinger, 2005; Cuaresma *et al.*, 2008) and the symmetric developments of their business cycles (e.g., Frankel and Rose, 1998; De Haan *et al.*, 2002; Aguiar-Conraria *et al.*, 2013). Indicators measuring these two phenomena therefore capture the degree of European integration as well and should therefore be considered in our Index, particularly with respect to the ideal of ‘an ever closer union’.

Against this background, we define four dimensions of European economic integration covering a total of 25 indicators: *EU single market* (for goods, services, capital and labour); *EU homogeneity* (degree of economic convergence); *EU symmetry* (of business cycles); and *EU conformity* (institutional participation and compliance with the *acquis communautaire*).

2.3.1 Indicators of EU Single Market

The single market with its four fundamental freedoms ensures the free movement of goods and services within the EU (intra-European trade). It also attempts to ensure efficient intra-European movements of capital and labour, thereby improving factor allocation within the EU. The degree of these market relations and transactions will be analyzed in two different ways: the sum of a country's intra-European imports and exports as a percentage of its gross domestic product (GDP) (so-called '*EU openness*') and as a percentage of its total (global) sum of imports and exports (so-called '*EU importance*').[15] Capital movements are reflected by a country's stocks (intra-EU, inward and outward) of foreign direct investment (FDI). Limited data availability unfortunately does not allow us to consider portfolio investments and other intra-European cross-border holdings in addition to FDI in order to measure financial integration more closely.[16] Labour mobility is measured by foreign European workers as a percentage of all domestic workers (EU openness) and as a percentage of all foreign workers within that country (EU importance). Outgoing workers cannot be considered due to limited data availability.[17]

2.3.2 Indicators of EU Homogeneity

Homogeneity is only partly expected by economic theory but is nevertheless desired by politicians and the EU itself (for example, through the EU's cohesion policy). Increasing intra-European trade and optimizing intra-European factor movements is expected to eventually equalize the prices of goods and services ('law of one price') and the factor prices (Lerner-Samuelson theorem) in the integration area. Per capita income is supposed to converge through the equalization of factor prices as well, meaning that

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[15] The two mentioned alternatives may lead to different results in certain situations: A country may be defined as 'closed' because of showing a very low export ratio, but from these very few exports most of it is traded within the EU. This country would show a low level of integration according to the first alternative, but a relatively high level of integration according to the second alternative. For this reason, it makes sense to include both versions in the Index (see Dorrucci *et al*., 2004).

[16] The European Commission and the European Central Bank provide informative annual reports on financial integration, yet without aggregating the indicators into manageable indices.

[17] These indicators do not evaluate the main reasons why market integration has increased or decreased between the EU countries. There are certainly other driving factors apart from European integration policy such as geographic or cultural proximity. If we were to incorporate these factors, we would have to weigh the data according to their bilateral regional distances. The EU Index, however, is primarily interested in detecting the level of European integration, independent from driving factors.

the per capita income levels of less developed countries will tend to catch up with the per capita income levels of advanced economies. Traditional trade and growth theory therefore expects that integrated economies will converge over time (Samuelson, 1948; Giannetti, 2002). New trade and growth theory, however, implies that increasing economies of scale, spill-over and agglomeration effects, and endogenous technological progress will favour advanced economies at the expense of less advanced economies (Lucas, 1990; Krugman, 1991), leading to diverging effects within the integrated area.

The idea of endogeneity of the optimum currency area (Frankel and Rose, 1998) proposes that the intensity of transnational capital and goods mobility will increase even more in a monetary union (mainly through reduced transaction costs, the loss of currency risks and enhanced price transparency). The former weak-currency countries in particular are then more likely to attract foreign capital through the decreased long-term interest rates as the currency risk runs off. If this capital is invested in an efficient and productive manner and not solely spent for consumptive purposes, economies that share a common currency are expected to converge.

Despite the somewhat ambiguous relationship between integration and convergence, greater homogeneity between the countries will be considered to be an indirect measure of higher integration. The indicators we use for analyzing EU homogeneity (or the degree of convergence) are the most important macroeconomic determinants in that regard: real GDP per capita, purchasing power standards, labour costs per hour, harmonized long-term interest rates (government bonds with maturities of close to ten years), public debt ratios (in percentage of GDP) and implicit tax rates on capital and consumption. Each indicator is measured in relation to the arithmetic mean of the remaining EU member states. The population size of each country is accounted for in calculating the arithmetic mean.

2.3.3 Indicators of EU Symmetry

Another indirect standard for integration is a high degree of synchronization of business cycles across the countries. The more goods and factor markets are integrated, the more similar the production structures and the patterns of trade (intra-industry trade).[18] In this

[18] If trade integration leads to more specialization, asymmetric co-movements of business cycles may result (Kalemli-Ozcan *et al.*, 2001).

way, the countries are similarly affected by exogenous shocks. Moreover a common monetary or fiscal policy could give symmetric economic stimulus. Symmetry of business cycles therefore indicates that the economies are driven largely by common external shocks and that they are highly interdependent (Artis and Zhang, 2001). Market integration through increased intra-European trade, as well as institutional integration – for example within a monetary union – should lower the risk of asymmetric shocks, implying enhanced symmetry of business cycles between the member states (Furceri and Karrass, 2008).

EU symmetry is measured by using the most common indicators when analyzing the co-movement of business cycles: GDP growth rate, inflation rate, change in unemployment, and government net borrowing. Pairwise correlations between the country's value and the average value of the remaining member states are considered over a period of five years, since this is widely regarded as an appropriate length for detecting business cycles (Buch *et al.*, 2005). Five-year moving averages are calculated. The average value of the remaining EU members is again weighted by the respective population size. Quarterly data are seasonally and trend adjusted using the Hodrick-Prescott filter (lambda = 1600).

2.3.4 Indicators of EU Conformity

Conformity is captured through the member states' participation in important steps of European institutional integration and through their compliance with EU law. Since most institutional steps were ratified uniformly across the member states, the major remaining disagreement relates to participation in the Schengen area and to membership of European monetary union. Moreover, *de jure* agreement on the regulatory framework provided by the EU does not necessarily mean *de facto* compliance. In these cases, the European Commission is able to start infringement proceedings against countries violating EU law. The proceedings start with the pre-litigation phase, where countries are urged through a so-called 'reminder' to correct their violating behaviour. The amount of new reminders per year is incorporated into our index. If member states do not act on the reminder, litigation in the ECJ ensues. For the EU Index, convictions were gathered and assigned according to the following groups: 'single market', 'environment and consumer protection' and 'other sectors'.

2.4 Statistical Approach

In this section, the statistical approach in developing the EU Index is described. Before turning to the presentation of the weighting procedure used in this article to aggregate the explanatory indicators in one statistical measure, information on the data and its normalization is provided.

2.4.1 Data and Normalization

Due to limited data availability for the Central and Eastern European (CEE) countries (especially until 2004), the EU Index only covers those member states that entered the EU no later than 1995 (the EU-15). Since Luxembourg contains many extreme values, it is not considered in the index. In these 14 remaining member states, 25 different indicators over the period 1999–2010 are investigated. As many promises towards a deeper and more intensified economic integration were linked with the launch of EMU in 1999, we have chosen that year as the starting point of our investigation. The data mainly stem from Eurostat, complemented by the statistical databases from the Organisation for Economic Co-operation and Development (OECD), the United Nations Conference in Trade and Development (UNCTAD) and the ECJ (InfoCuria).

For a proper aggregation of indicators with different measurement units, the data need to be normalized. To ensure data comparability not only for a given year, but over time, we use panel normalization – that is, the identification of one reference point per indicator over the entire period and across all sample countries. In doing so, the sensitivity to extreme values and year-to-year variations are sharply reduced.[19] Here, the panel normalization procedure is converting the data to a scale ranging from 0 to 100, the latter referring to the maximum level of European economic integration.[20]

In general, normalization of our data takes the form that $I_{i,t}$ represents one indicator of European integration for country i in year t. Hence, the *single market* data belonging to 'EU openness' will be normalized to:

[19] An alternative approach for treating extreme values is the application of percentiles in the normalization process, as done, for instance, by Dreher *et al.* (2008). However, then the index values will be distributed too smoothly within the designed scale, which leads to another distortion of the original data structure.

[20] More information on the data and its sources is illustrated in Table 2.4 in the Appendix.

$$I_{i,t} = \frac{V_{i,t}}{V_{max\ (j,T)}} \times 100 \tag{2.1}$$

where the value of variable V belonging to country i in year t is put in relation to the maximum value V_{max} measured across all EU member states j in period T from 1999 to 2010. The maximum value is identified only once in this period and not for every single year in order to increase the quality of comparability over time. The closer a value comes to the maximum value, the more successful the investigated country is in terms of European integration.

The *single market* data measuring 'EU importance' are normalized as follows:

$$I_{i,t} = \frac{V_{i,t}}{V_{i,t}^{world}} \times 100 \tag{2.2}$$

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

The normalization of the data measuring *EU homogeneity* is carried out by:

$$I_{i,t} = \left(1 - \frac{\left|V_{i,t} - \bar{V}_{j,t}\right|}{\left|max\ (V_{j,T} - \bar{V}_{j,T})\right|}\right) \times 100 \tag{2.3}$$

where the difference in a country's own value and the average value of the remaining EU countries $\bar{V}_{j,t}$ reflects the degree of heterogeneity between that particular country and the rest of the sample countries. Average values are weighted by the respective population size of each country. If the difference matches the maximum difference being measured over the entire sample period, the maximum degree of heterogeneity is achieved. Accordingly, smaller differences reflect greater levels of European integration. 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 subtraction of the (relative) degree of heterogeneity from 1 leads to the respective level of homogeneity.

The *EU symmetry* of the members' business cycles is measured as follows:

$$I_{i,t} = corr\ (V_{i,\tau}, \bar{V}_{j,\tau}) \times 100 \tag{2.4}$$

Here, a pairwise correlation is carried out for a country's values and the average values of the remaining EU sample countries. The correlation takes into account period τ, covering the preceding five years (20 quartiles) for each value, leading to five-year moving averages. A positive correlation of 1 represents the highest possible level of European integration in this field.[21]

Gauging the member states' *institutional conformity*, the data belonging to 'EU participation' are treated as follows:

$$I_{i,t} = \begin{cases} 0, & \text{if } having\ flexible\ exchange\ rates \\ 50, & \text{if } participating\ in\ the\ Exchange\ Rate\ Mechanism\ II \\ 100, & \text{if } being\ a\ member\ of\ the\ European\ Monetary\ Union \end{cases} \tag{2.5}$$

$$I_{i,t} = \begin{cases} 0, & \text{if } staying\ out\ of\ the\ Schengen\ Agreement \\ 100, & \text{if } participating\ in\ the\ Schengen\ Agreement \end{cases} \tag{2.6}$$

The member states' 'compliance with EU law' as part of their *institutional conformity* is normalized by:

$$I_{i,t} = \left(1 - \frac{V_{i,t}}{V_{max\ (j,T)}}\right) \times 100 \tag{2.7}$$

Value $V_{i,t}$ represents the amount of newly introduced infringement proceedings by the European Commission and the number of convictions by the ECJ per year and country. The denominator contains the maximum amount of infringements measured in any of the countries over the entire period and therefore reflects the least possible level of European integration. Subtracting the (relative) number of infringements from 1 leads to the respective level of EU compliance. Committing no infringements thus yields the highest possible level of European integration in this field.

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

2.4.2 Weighting Procedure

The selection of an appropriate aggregation and weighting procedure is crucial to the construction of multidimensional indices, as it may have a direct effect on the outcome of the overall index and country rankings. *A priori* weighting, as done by the globalization index of ATK/FP, the G-Index and the MGI, solely reflects the subjective belief of the researcher about the importance of each variable. In such cases, a subjective bias is inevitable and could bring major distortions in the final results. *A priori* weighting results are also heavily criticized in terms of sensitivity to alternative weighting schemes (Lockwood, 2004). Instead, the indicators should be weighted according to their statistical relevance and to maximize the informative value of the overall index (OECD, 2008).

In constructing the EU Index, the principal component analysis (PCA) is used to calculate the weights. With the help of PCA, it is possible to simultaneously analyze multiple indicators to uncover the patterns of their inter-item correlations and explain them in terms of common components. Linear combinations of the original data are computed that maximize the variation of the resulting composite indicator. Additionally, with PCA it can be tested whether the statistical results coincide with the theoretical dimensions of the index. The advantage of PCA over *a priori* weighting, therefore, lies in its objectivity as the calculated weights are solely determined on statistical grounds.

PCA has gained increasing popularity in the context of creating indices in recent years. However, there are fundamental differences between the various studies on how to handle the results delivered by PCA. Gwartney and Lawson (2001), Lockwood and Redoano (2005) and Dreher (2006) simply use the first component of PCA to derive the weights. Thus, these studies do not take into account the size of the eigenvalues in general and the factor loadings of the remaining components in particular. Moreover, they neglect to test for the overall suitability of the data set to perform PCA. Important information from PCA is disregarded in these studies. Furthermore, as Dreher (2006) first performs PCA separately for each sub-index and then uses these results to calculate the weights for the higher dimensions of the index, two additional problems are induced: the chain-linking of latent PCA results may not correspond to the original characteristics of the underlying data; and performing PCA with only two positively

correlated variables (or sub-indices) automatically reveals equal weights between them, which becomes apparent, for instance, in the 50 percent weights for both sub-indices of the KOF index – the 'actual flows' and the 'restrictions'.

Our study, in contrast, uses PCA in a way similar to Noorbakhsh (1998) and Nicoletti *et al*. (2000), where the information received from the data is gathered and employed as much as possible. Before applying the results of PCA, the correlation structure of our data set is considered in order to assess the suitability of the indicators that will perform the PCA. In order to test for the internal consistency of composite scores inherent in the EU Index, Cronbach's (1951) alpha coefficient is estimated. In our sample, the high alpha coefficient of 0.82 underpins the factorability of our data set. Bartlett's test of sphericity (Chi^2 = 3525.038, p-value = 0.000) and Kaiser-Meyer-Olkin's measure of sampling adequacy (KMO = 0.62) further support the overall suitability of our data set.[22] The computed eigenvalues are then analyzed to derive the optimum amount of components. For the EU Index, the scree test, proposed by Cattell (1966), suggests an extraction of three components for our data. The smooth decrease of eigenvalues after the fourth component should be interpreted as random correlations and can therefore be neglected.[23]

Rotation of the factor loadings reassesses the intended structure of the index and finally assigns adequate weights to the individual indicators. In Table 2.1, the rotated factors with the highest loadings are highlighted, showing that most of the indicators perfectly coincide with the theoretical dimensions. The indicators representing the single market, symmetry and conformity dimensions hold their highest value in the same respective component; only the indicators representing homogeneity do not show their highest numbers in one component due to the limitation to three components.

Our final weighting procedure differs from that of Noorbakhsh (1998) and Nicoletti *et al*. (2000) as the horizontal sum of all three squared factor loadings (each multiplied by its share of total variance) eventually assigns the weight to each indicator.

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[22] Cronbach's alpha is a positive function of the average inter-item correlation in a scale: the higher the average correlation, the lower the number of unique (improper) indicators. Bartlett's test checks whether the correlation matrix is an identity matrix, indicating that the factor model is inappropriate. The KMO tests whether the partial correlations among the indicators are small, relative to the original (zero-order) correlations. Small partial correlations (KMO of greater than 0.5) indicate that the variables share common factors.

[23] Supplementary information on the correlation structure of the data set (Table 2.5) and PCA results with regards to the scree test (Figure 2.4) and eigenvalues (Table 2.6) is given in the Appendix.

Table 2.1 Rotated Factor Loadings and Computed Weights

		Rotated factor loading [a]			*Weight (%)* [b]			*Overall weight (%)* [c]
		Comp 1	*Comp 2*	*Comp 3*	*Comp 1*	*Comp 2*	*Comp 3*	
Single Market	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 labour	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 labour	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**
	Labour 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**
	Explained variance	*4.963*	*4.652*	*3.492*				
	Share of total variance (%)	*37.860*	*35.495*	*26.645*				***100***

Source: Own PCA calculations based on data explained in the Appendix (Table 2.4).
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.

With the consideration of three and not only one factor loading per indicator, the potential effects on the other two components can be incorporated. In order to dissolve for the orthogonal transformation initially conducted by the PCA, we use oblique rotation of the factor loadings, thereby allowing for intercorrelations among the components. This takes into account the interdependent nature of the index variables in a more realistic manner. An uncorrelated and thus isolated consideration of the previously developed dimensions would not reflect the real pattern of European economic integration.[24]

[24] It should be noted that for the weighting procedure the indicators measuring EU homogeneity take the form $V_{i,t}/\bar{V}_{j,T}$. Thus, the quotient may be greater than 1, which takes into account the true structure of the data. Overall comparability of the indicators is still assured as our weighting procedure transforms the data to standardized z-scores with expectancy values of 0 and variances of 1.

2.5 Results of the EU Index

The results of the EU Index and its sub-indices presented in Table 2.2 reveal country rankings and index points for the EU-15 (without Luxembourg) for the two boundary years 1999 and 2010. Belgium with 77.33 index points shows the highest level of European integration in 2010, whereas Greece with only 43.65 index points is at the very bottom of the ranking. The figures demonstrate a large discrepancy between the most and least integrated countries in the EU. This discrepancy was already present in 1999, yet with lower index points. To be more concrete on these two countries, Belgium has achieved its top values in all openness indicators, in the homogeneity of long-term yields and capital tax rates, and in the symmetry of inflation rates. Greece, on the other hand, performs worst across all EU members in the openness indicators (except for trade in services), in the homogeneity of long-term yields and public debts, in the symmetry of GDP growth and government net borrowing, and in the compliance with EU law captured by the number of infringement proceedings. However, all of the investigated EU member states were able to increase their levels of European integration, apart from Spain.

Table 2.2 Results of the EU Index for 1999 and 2010

EU Index 1999			EU Index 2010		
Rank	**Country**	**Points**	**Rank**	**Country**	**Points**
1	Belgium	68.42	1	Belgium	77.33
2	Ireland	60.93	2	Austria	65.74
3	France	59.36	3	Netherlands	64.54
4	Netherlands	59.03	4	France	64.24
5	Spain	57.23	5	Germany	64.08
6	Austria	56.97	6	Ireland	62.38
7	Germany	52.86	7	Finland	61.54
8	Sweden	49.96	8	Sweden	57.22
9	Portugal	49.13	9	Spain	57.16
10	Finland	48.82	10	Italy	56.08
11	Italy	46.09	11	Portugal	55.86
12	United Kingdom	44.62	12	Denmark	55.72
13	Denmark	44.17	13	United Kingdom	52.17
14	Greece	33.09	14	Greece	43.65

Source: Own calculations.

Most of the founding members of the European Economic Community (EEC) are placed among the five most integrated countries in 2010, and only Italy demonstrates a low integration level. With respect to the current euro zone crisis, the EU Index

identifies the four most troubled nations, or 'GIPS' (Greece, Italy, Portugal and Spain), to be in the lower part of the ranking. The three non-members of EMU (Sweden, Denmark and the United Kingdom) also appear in the lower part. These differences in the level of European integration hold for the entire period since 1999, as Figure 2.1 shows. The EEC founding members are further integrated than the EU average, whereas the EMU-outs and the GIPS show integration levels below the EU average.

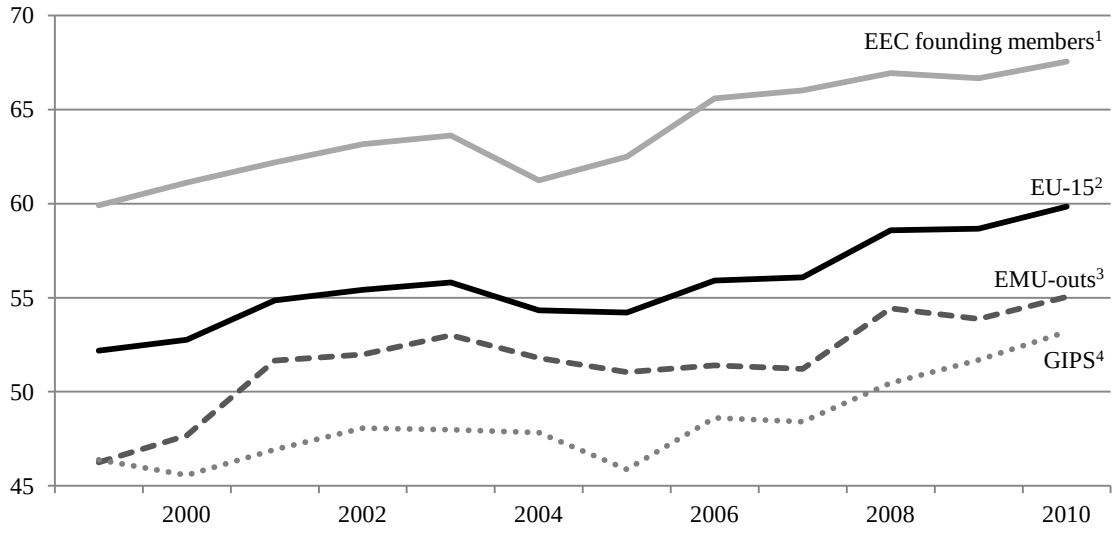

Figure 2.1 European Economic Integration for Certain Country Groups

Source: Own calculations.
Notes: [1] without Italy; [2] without Luxembourg; [3] Sweden, Denmark, United Kingdom; [4] Greece, Italy, Portugal, Spain.

In order to better interpret these developments, the sub-indices representing the four dimensions of European integration are regarded more closely in Table 2.3. The discrepancy between the most and least integrated country is even higher in the sub-index representing the single market than in the overall index. Comparing the 2010 values with those of 1999 illustrates that some countries are actually less integrated today. These are the GIPS, Ireland and the United Kingdom. The sub-index measuring economic homogeneity in the EU shows that the member states are, on average, less homogeneous than in 1999. Important economic factors including per capita GDP, price levels, labour costs and public debts have diverged fundamentally across the EU members in the last 12 years. The symmetry of business cycles, however, has improved considerably in the last decade. Whereas many countries have shown almost no co-movement effects in their economic activities in 1999, the members' business cycles

seem to be strongly correlated today. In spite of the overall improved symmetry, Greece and Ireland are the members that are lagging behind the other EU members. Endogeneity of optimum currency areas implies that a common monetary union increases the amount of trade within that union, which ultimately adjusts the economic cycles of its member states (De Grauwe and Mongelli, 2005). The overall improved symmetry detected by the EU Index, though, only partly underscores this reasoning. In fact, the three non-members of EMU were also able to increase their cyclical correlations to a great extent and are now better off than many EMU members. The sub-index on institutional conformity shows no great changes in index values between 1999 and 2010. Although not a member of EMU, Denmark raised its level of institutional integration due to its low amount of infringement proceedings and ECJ verdicts and its participation in the European Exchange Rate Mechanism II. Spain and Portugal, on the other hand, decreased their level of integration due to relatively high non-compliance with EU law. The United Kingdom is far behind the remaining EU member states when it comes to overall institutional conformity.

Table 2.3 Results of the Sub-Indices for 1999 and 2010

		Single market		***Homogeneity***		***Symmetry***		***Conformity***	
		Rank	*Points*	*Rank*	*Points*	*Rank*	*Points*	*Rank*	*Points*
2010									
	Belgium	1	74.62	5	73.12	6	79.67	6	84.70
	Austria	5	39.36	2	80.39	8	78.15	3	89.32
	Netherlands	3	47.70	10	59.66	11	75.58	2	91.64
	France	7	36.12	3	78.98	1	92.01	10	80.08
	Germany	9	34.75	1	84.85	9	78.03	5	85.67
	Ireland	2	55.19	7	67.44	14	53.25	11	76.45
	Finland	11	30.90	8	67.02	2	83.97	1	94.86
	Sweden	4	42.22	11	50.71	4	79.95	13	74.57
	Spain	10	33.73	9	62.05	3	83.96	12	75.22
	Italy	13	23.78	4	75.36	12	74.69	8	81.23
	Portugal	8	36.05	12	49.52	7	79.55	9	80.92
	Denmark	6	37.24	13	42.37	10	75.91	4	87.85
	United Kingdom	12	29.39	6	67.57	5	79.77	14	57.99
	Greece	14	18.75	14	38.67	13	60.29	7	81.29
1999									
	Belgium	1	68.18	8	69.93	2	47.72	8	81.75
	Ireland	2	60.06	11	60.94	4	40.83	10	76.47
	France	6	35.56	2	83.67	1	54.16	9	80.96
	Netherlands	3	46.85	4	79.09	10	11.13	1	93.98
	Spain	10	33.83	7	70.77	3	47.10	2	92.34
	Austria	7	35.13	1	86.08	5	23.20	4	90.17
	Germany	9	34.09	3	82.58	11	10.07	5	86.29
	Sweden	4	38.94	6	77.61	6	21.09	12	62.01
	Portugal	5	36.40	13	51.09	7	18.28	3	91.30
	Finland	12	30.48	10	69.01	8	15.96	7	84.10
	Italy	13	25.58	9	69.75	12	9.47	6	84.36
	United Kingdom	11	30.78	5	78.57	13	8.11	14	60.66
	Denmark	8	34.45	12	53.98	9	12.85	11	73.45
	Greece	14	23.56	14	45.12	14	-0.76	13	61.60

Source: Own calculations.

By looking at the sub-indices, the reasons for the different positions of the individual countries are better understood. We find that the country rankings differ widely between the four dimensions of European economic integration. Some countries exhibit a greater capability and/or willingness to contribute to market integration, and others rather get involved in institutional integration. When considering the integration process over time, the four dimensions show quite different trends. The single market sub-index and the sub-index on EU conformity exhibit no significant change, on average. In some countries we find a slight improvement, in others a slight worsening. The sub-index on EU symmetry, however, documents a strong harmonization of business cycles in the last 12 years. In the sub-index on EU homogeneity divergence, and not convergence, has prevailed. With regards to the great efforts undertaken by the EU in order to reduce economic differences between the member states, this is quite a remarkable observation. Furthermore and conversely to the underlying assumption of the endogeneity of optimum currency criteria by Frankel and Rose (1998), it is shown that improvements in the co-movement of business cycles (so far) do not necessarily induce economic convergence in an integrated area.

2.6 Robustness of the Results

2.6.1 Sensitivity Analysis

As shown in the previous section, it seems that some country patterns can be established. The EEC founding members usually show high levels of European integration, whereas the GIPS and the non-members of EMU generally show levels below the EU average. Thus, the EU seems to be a heterogeneous community with several homogeneous country groups. In principle, homogeneous countries are more likely to take similar integration steps based on common preferences. The identification of homogeneous country groups may therefore enhance the opportunity for these countries to undertake further (flexible) integration into the EU. The EU has laid down general arrangements for the principle of ‘enhanced co-operation’ for this purpose. Growing heterogeneous interests among the member states is seen as one key problem for the future of the European integration process (Ahrens *et al.*, 2007).

To reassess the visually detected country groups, a hierarchical cluster analysis is performed with the 25 indicators of the EU Index. The analysis is hierarchical in a sense that it seeks to build a hierarchy of clusters – in our case by using squared Euclidean distances to uncover those countries that are most closely linked to each other according to the proximity of their indicator values. As the cluster analysis refers to the raw data used to calculate the index, this analysis also assesses the sensitivity of our results to an alternative weighting scheme.

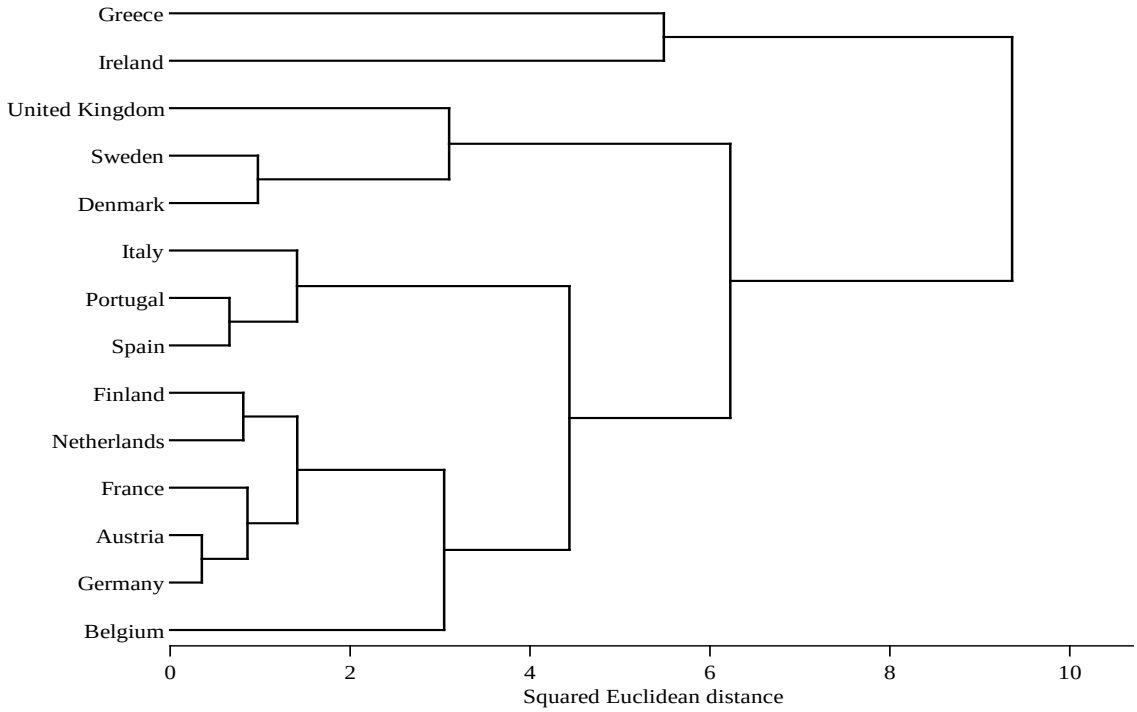

Figure 2.2 Dendrogram for 2010

Source: Own calculations based on 25 indicators used to calculate the EU Index. Using Ward's clustering.

The dendrogram shown in Figure 2.2 reveals the country groups for 2010. Germany and Austria are identified as the two countries with the lowest heterogeneity between each other. Together with France, Netherlands and Finland they form a group of countries that shows large distances from the other clusters. These countries can be regarded as the 'core group' of European integration in 2010. Belgium is the first among the remaining countries to approach this core group. This country order underscores the robustness of the weighting in the EU Index as these six countries are placed among the top seven in the overall index. Three of the GIPS form the next cluster – namely Italy, Portugal and Spain. They already display a large distance from

the core group. The three non-members of EMU form another cluster and are even further away from the core group. The largest distance is shown by Ireland and Greece, which are incidentally the two countries that had to take part in lending operations by the European Stability Mechanism (ESM) first. Portugal and – in the meantime – Spain are the other two countries financed by the ESM. Thus, the groups identified by the cluster analysis strongly confirm the country patterns detected by the visual inspection of the EU Index.

When performing a cluster analysis for 1999, it seems that the core group is much more homogeneous today than it was in the past. According to Figure 2.3, the Euclidean distances needed to build the core group were much larger in 1999. Also, much more countries were involved in this group (when compared to the 2010 figures). In 1999, the European integration process was basically dominated by two clusters: a core group (again, led by Germany and Austria) of seven to nine countries, on the one side, and a cluster of three Nordic countries and the United Kingdom, on the other side, with Greece showing large distances to both groups.

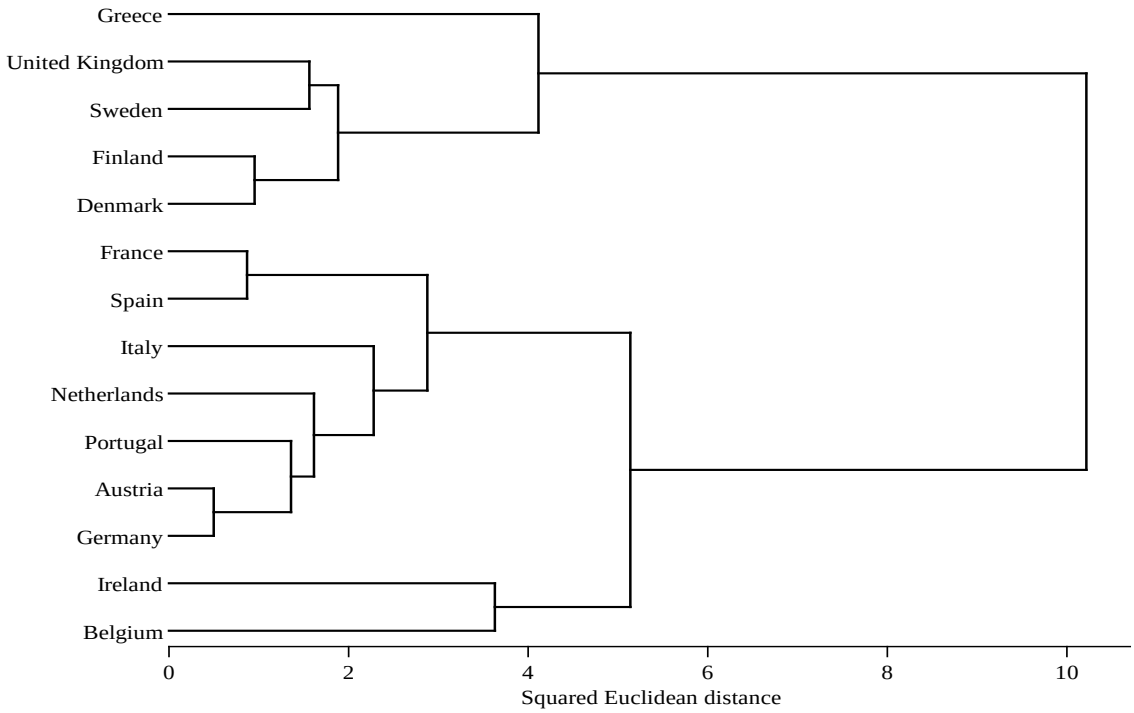

Figure 2.3 Dendrogram for 1999

Source: Own calculations based on 25 indicators used to calculate the EU Index. Using Ward's clustering.

To further assess the sensitivity of our results to different weighting schemes, we have recalculated the EU Index using *a priori* weights – that is, equally weighted indicators – as these were used to calculate some of the globalization indices. The Spearman correlation coefficient between the results of the two different weighting schemes (PCA and *a priori* weightings) is estimated for this purpose. The high and statistically significant correlation coefficient of 0.97 indicates that our results are robust in that regard. Except for Netherlands and Finland, which exchange their ranking positions with one another, most of the countries are ranked the same, independently of the weighting scheme. Hence, the EU Index does not heavily depend upon the choice of weighting. However and as previously discussed, we believe that using PCA is still the most adequate procedure when trying to maximize the explained variance in the data set and when relying on an objective measure. Moreover, varying the PCA by the amount of variables, countries and years has no substantive impact on the composite values of the EU Index, as in each case all three (oblique rotated) factor loadings per indicator are considered.

2.6.2 Comparison with Other Indices

It was argued above that that European economic integration should be distinguished from globalization in conceptual terms. Thus, in empirical terms, the respective indices may not be perfectly correlated. To test this hypothesis, the Spearman rank correlations are calculated between the EU Index (EUI) and those globalization indices that contain data developments over several years – that is, ATK/FP 1999–2005, CSGR 1999–2004 and KOF 1999–2009. All the correlation coefficients are significant at the 1 percent level, being 0.47 for the EUI-ATK/FP, 0.44 for the EUI-CSGR, and 0.50 for the EUI-KOF. On the contrary, Dreher *et al*. (2008) show much higher rank correlation coefficients across globalization indices (between 0.75 and 0.91). The rather moderate coefficients between European integration and globalization indicate that the EU Index delivers comparable but certainly not equal results. For instance, Belgium and Austria are highly integrated countries according to the globalization indices and the EU Index, with Greece being very low integrated in all of these indices. The globalization indices, however, rank Germany, France and Finland as relatively low globalized countries when compared to the other European countries, whereas the EU Index identifies these

economies to be especially homogeneous and symmetric. The less homogeneous and less EU conforming countries as Spain, Portugal, Ireland, Sweden, Denmark and the United Kingdom seem to be more strongly connected to the global economy. This becomes even more prominent when examining the economic dimension of the globalization indices. Whereas this order might be accurate within the broad concept of globalization, it is somewhat less convincing with regards to these countries' capability and willingness towards a deeper process of European integration. Given the specific intra-European dimensions in the EU Index, the rather moderate coefficients indicate that the index induces additional revenue when the patterns of European economic integration are to be investigated rather than the more general degree of overall economic internationalization.

To investigate these results further, the rank correlations between the single market dimension and the economic dimensions of the globalization indices are computed. Again, all the correlation coefficients are statistically highly significant, being 0.68 for the EUI-ATK/FP, 0.75 for the EUI-CSGR and 0.73 for the EUI-KOF. The high correlation coefficients seem to indicate that the ranking results of the single market dimension are robust – that is, they do not strongly depend on the weighting scheme. Reducing barriers to trade, capital and labour within the EU single market can be regarded as a stepping-stone towards globalization. Accordingly, the correlation coefficients between these market dimensions are much higher than the ones between the overall indices.

To underline the robustness of our results, it is shown that the EU Index is not biased against richer economies. This impression might arise given that the GIPS and the EEC founding countries are skewed towards different sides of the index. The correlation coefficients between real GDP per capita and the various country ranks are the lowest for the EU Index (being -0.46) among the four indices (being -0.75 for the ATK/FP, -0.52 for the CSGR, and -0.58 for the KOF). Thus, a bias against richer economies seems to be of a lesser concern for the EU Index than for some of the globalization indices. Additionally, a bias against smaller countries is also not a relevant issue for the EU Index as small and large countries are placed on either ends of the index (in contrast to the globalization indices; see Lockwood, 2004).

2.7 Conclusions

The EU Index is designed to measure the national level of economic integration within the European Union. Analyzing 25 indicators over the period 1999–2010, it verifies that the member states indeed hold different levels of economic integration. The index identifies great differences in integration efforts and capabilities across the countries and with respect to the various aspects of European integration. Within the past decade, however, the EU members were able to increase their individual integration level. Only Spain was not able to enhance its integration performance.

By considering the overall index as well as the sub-indices representing the four dimensions of European integration, one may assume that the EU countries form a heterogeneous community rather than a homogeneous group of countries with similar integration levels. Using cluster analysis confirms this assumption. Today's European integration is driven by a core group. To this core group belong Germany, Austria, France, Finland, the Netherlands and – at some distance – Belgium. The GIPS are far away from this core group, with Italy, Portugal and Spain forming one group, and Greece and Ireland forming another group with the greatest distance to the other EU members. The three non-EMU member states (Denmark, Sweden and the United Kingdom) are clustered together as one group of less integrated countries that show great distances to the core group.

The large economic heterogeneities and the strong and growing clustering of the EU members may create fundamental difficulties for negotiating further integration steps in the EU and may even put existing integration steps (such as monetary union) into question – at least for some countries. Missing economic homogeneity is usually caused or accompanied by heterogeneous economic preferences and interests and unsuitable common policies. Hence, it can also increase the trade-off between integration and further enlargement, since future members of EU and EMU might be even more heterogeneous to this core group.

In contrast to the globalization indices, the EU Index sheds light on the complexity of European integration. It captures the content of the integration process and offers a solid and statistical base for both political discussions and empirical investigations, since the degree of European economic integration is numerically tangible and can be determined individually for each country.

2.8 Appendix

Table 2.4 Description and Sources of Indicators Measuring a Country's European Integration Level

Indicator	Description	Source
EU Single Market		
EU openness		
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)
Labour migration	Amount of European employees (ILO definition) as a percentage of the total number of employees (foreign and national).	Eurostat
EU importance		
Trade in goods	Intra-European imports and exports of goods as a percentage of total trade in goods.	Eurostat
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)
Labour 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 current 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
Labour cost	Labour 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

Table 2.4 (continued)

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 value of 0.	Ministry 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 to less than 1 percent of the data.

Table 2.5 Correlation Matrix of the 25 Indicators Measuring European Economic Integration

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
(1)	1																								
(2)	.53*	1																							
(3)	.84*	.62*	1																						
(4)	.73*	.53*	.74*	1																					
(5)	.53*	.30*	.32*	.26*	1																				
(6)	.46*	.20*	.23*	.19*	.75*	1																			
(7)	.26*	.12	.34*	.10	.19*	.27*	1																		
(8)	.74*	.37*	.74*	.78*	.32*	.05	.18*	1																	
(9)	.42*	.53*	.44*	.50*	-.07	-.22*	-.11	.57*	1																
(10)	.16*	.26*	.30*	.30*	-.12	-.44*	-.02	.48*	.61*	1															
(11)	.43*	-.01	.40*	.59*	-.09	-.16*	-.06	.61*	.51*	.56*	1														
(12)	-.15*	.10	-.09	-.14	-.14	-.06	-.19*	-.24*	-.25*	-.18*	-.27*	1													
(13)	.04	-.23*	-.14	-.03	-.15*	.12	.05	-.23*	-.35*	-.48*	.02	.26*	1												
(14)	.31*	.35*	.34*	.12	.17*	-.20*	.10	.43*	.55*	.80*	.35*	-.23*	-.51*	1											
(15)	-.21*	-.36*	-.10	-.06	.15	-.03	-.06	.01	-.13	.28*	.11	-.10	-.17*	.08	1										
(16)	.08	-.13	.23*	.12	-.30*	-.11	.11	.09	.21*	.17*	.42*	-.15	.01	.01	.09	1									
(17)	-.01	.02	.18*	.27*	-.31*	-.23*	.04	.01	-.02	.16*	.33*	.06	.13	-.05	.10	.43*	1								
(18)	.04	.08	.18*	.11	-.11	-.05	.20*	.15	.18*	.14	.20*	-.06	-.19*	.11	-.07	.52*	.20*	1							
(19)	-.19*	.01	.15	.08	-.39*	-.43*	.05	.04	.15	.31*	.14	-.01	-.36*	.12	.13	.44*	.53*	.32*	1						
(20)	.24*	.14	.04	.02	.22*	.43*	.36*	-.16*	-.19*	-.40*	-.09	-.01	.33*	-.28*	-.46*	.12	.04	.17*	-.18*	1					
(21)	.06	-.38*	-.12	-.16*	.12	.31*	.11	-.17*	-.37*	-.26*	.22*	-.15	.34*	-.08	-.08	.21*	.24*	.13	-.07	.42*	1				
(22)	.18*	.29*	.34*	.18*	-.03	-.20*	-.11	.23*	.39*	.50*	.27*	-.11	-.51*	.57*	.03	.26*	.22*	.17*	.38*	-.25*	-.11	1			
(23)	.10	.17*	.03	-.05	.12	-.13	-.11	.17*	.25*	.29*	-.07	-.09	-.37*	.42*	-.02	-.29*	-.40*	-.12	-.21*	-.31*	-.30*	.19*	1		
(24)	.14	.13	.11	.02	.11	-.10	-.08	.22*	.20*	.29*	.11	-.06	-.33*	.46*	-.10	-.08	-.15	.02	-.07	-.19*	-.05	.40*	.47*	1	
(25)	.11	.20*	.11	.01	.21*	.09	-.03	.14	.19*	.25*	-.04	-.05	-.41*	.40*	-.01	-.05	-.25*	.01	-.05	-.21*	-.16*	.30*	.47*	.37*	1

Source: Own calculations.

Notes: (1) Openness to goods, (2) Openness to services, (3) Openness to capital, (4) Openness to labour, (5) Importance of goods, (6) Importance of services, (7) Importance of capital, (8) Importance of labour, (9) Per capita income, (10) Purchasing power standards, (11) Labour costs, (12) Long-term interest rates, (13) Public debt ratios, (14) Consumer tax rate, (15) Capital tax rate, (16) Economic growth, (17) Inflation rate, (18) Change in unemployment, (19) Government net borrowing, (20) EMU membership, (21) Schengen participation, (22) Infringement proceedings, (23) ECJ: single market, (24) ECJ: environment and consumer protection, (25) ECJ: other sectors.

The shaded values refer to those correlation pairs that form a joint integration group (EU single market, EU homogeneity, EU symmetry and EU conformity); * $p < 0.05$.

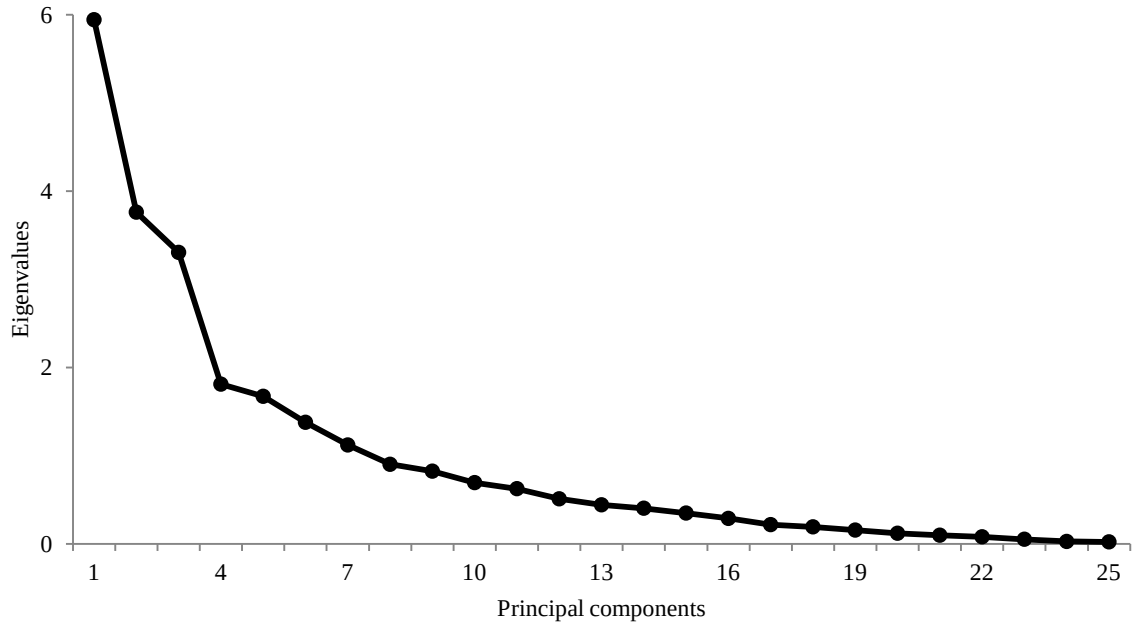

Figure 2.4 Scree Test of Principal Component Analysis

Source: Own calculations.
Notes: There is an obvious 'kink' in the figure at component 4. Thereafter, the components are much closer to each other in terms of their respective eigenvalues and the slope flattens rapidly, indicating that three components should be extracted.

Table 2.6 Eigenvalues and Variances of Principal Components

Component	Eigenvalue	Difference	Explained variance (%)	Accumulated variance (%)
1	5.94	2.18	23.77	23.77
2	3.76	0.45	15.04	38.82
3	3.31	1.50	13.22	52.04
4	1.81	0.14	7.24	59.28
5	1.67	0.29	6.69	65.97
6	1.38	0.26	5.51	71.49
7	1.12	0.22	4.48	75.97
8	0.90	0.08	3.61	79.58
9	0.82	0.13	3.30	82.88
⋮	⋮	⋮	⋮	⋮
25	0.02	-	0.001	100.00

Source: Own calculations.

3 Effects of European Economic Integration on the Quality of Life

Abstract

The present study analyzes whether European citizens have become more or less satisfied with life due to increased economic integration in the European Union (EU). With more than 180,000 observations and a unique set of explanatory variables, it shows that a country's overall level of European economic integration has a significant positive impact on reported life satisfaction. Furthermore, empirical evidence is given that increased economic activity in the EU single market, as well as increased economic homogeneity among the member states, positively affects subjective well-being. The symmetry of business cycles – a sufficient condition for effective common policy in a monetary union – yields no significant results, however. This bears important implications for future EU policies. The empirical findings hold true after controlling for socio-demographic characteristics, macroeconomic effects, country fixed effects, year effects, country-specific time trends and different estimation strategies.

Note: A similar version of this chapter is currently under review in an international journal.

Acknowledgements: The author gratefully acknowledges helpful comments from Prof. Dr. Renate Ohr and her research assistants at various sessions of the Brownbag Seminar, Georg-August-Universität Göttingen. Many thanks go to Prof. Dr. Thomas Kneib and the participants of the Graduate Seminar in Applied Statistics and Econometrics, Georg-August-Universität Göttingen.

3.1 Introduction

Does European economic integration enhance the quality of life of European citizens? According to the European Union's (EU) own standards, the promotion of economic and social welfare among its people has always been the leading task of the EU and its predecessors. Since the Treaty of Rome (1957), the community has sought to achieve 'accelerated raising of the standard of living and quality of life' (Art. 2 TEC). In the current consolidated version of the Treaty on European Union, the member states further confirm that 'the Union's aim is to promote peace, its values and the well-being of its people' (Art. 3 TEU). In support of this effort, the members are 'in view of further steps to be taken in order to advance European integration' (Preamble TEU).

If the EU has been only partly successful in achieving its aims, European citizens should be more satisfied with life today than in the past. Figure 3.1, which depicts on the left axis the average share of EU citizens who have responded to be fairly or very satisfied with the life they lead, however, does not favour such reasoning. Over the past 40 years, the average levels of life satisfaction have not increased on average across the European countries. Has the EU, then, failed to achieve its aims? In the present study, we argue that this interpretation is misleading and that the EU was indeed successful in promoting life satisfaction among its people. Moreover, we are able to identify those aspects of European economic integration that positively influence people's quality of life and those that do not, thereby providing important policy implications.

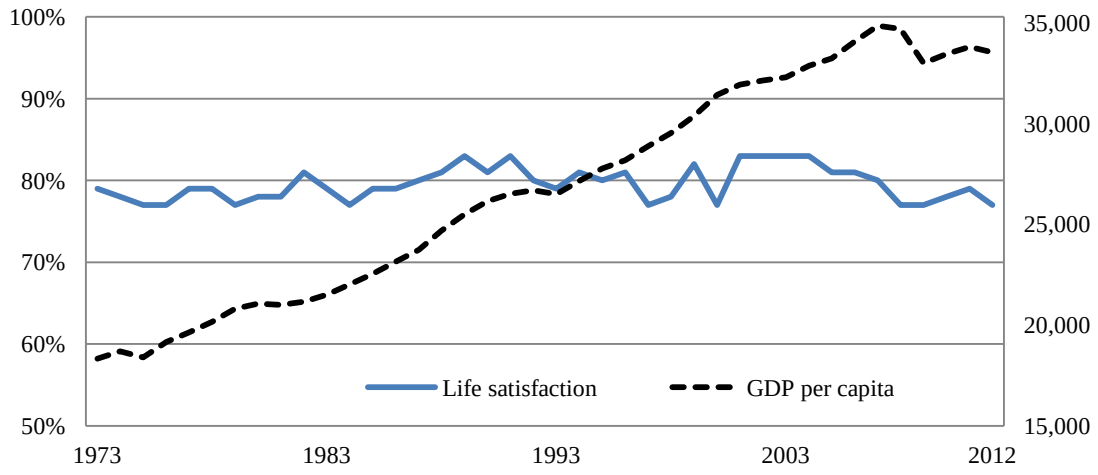

Figure 3.1 Life Satisfaction Levels and Real GDP per Capita for the EU-15

Source: The real GDP per capita (in 2005 US$) is taken from the Economic Research Service of the United States Department of Agriculture. The life satisfaction data stem from the Standard Eurobarometer Survey Series.

Previous research on the economic benefits of European integration has tended to focus mostly on the change in real gross domestic product (GDP) per capita as the main dependent variable. Among others, these include empirical ex-post evaluations of continuous market integration (Badinger, 2005), the introduction of the Euro (Barrell *et al*., 2008) and specific policies like the EU cohesion policy (Everdeen and De Groot, 2006).

In recent years, scepticism has emerged regarding whether the GDP on its own reflects a sufficiently complete picture of people's economic and social welfare.[25] Academic criticism of the real GDP as a measure of well-being is usually associated with the seminal article published by Easterlin (1974), who documents that the reported happiness levels in the United States have remained stagnant while the average income has increased over time. This paradox can also be illustrated with the European data in Figure 3.1. The average real GDP per capita almost doubled in the EU-15 countries from $18,329 in 1973 to $33,540 in 2012, whereas the average life satisfaction remained rather flat. A vast body of literature replicated Easterlin's empirical findings in a variety of countries and across different time spans (e.g., Inglehart, 1990; Veenhoven, 1993; Oswald, 1997; Diener and Oishi, 2000; Inglehart and Klingemann, 2000; Blanchflower and Oswald, 2004; Kahneman and Krueger, 2006). Other studies claim to have rejected the 'Easterlin paradox' (Hagerty and Veenhoven, 2003; Deaton, 2008; Stevenson and Wolfers, 2008). Common explanations for the paradox include the phenomena of social comparisons (e.g., Ferrer-i-Carbonell, 2005; Senik, 2009; van Praag, 2011), hedonic adaptation to living standards (e.g., Clark *et al*., 2008; Di Tella *et al*., 2010) and the possible existence of economic satiation points (e.g., Veenhoven, 1991; Layard, 2011).

The reason why we believe Figure 3.1 to be misleading in analyzing the EU's aim of promoting life satisfaction lies in these explanations. As noted by Diener (1984) no simple mood is stated in brief emotional episodes when evaluating one's life satisfaction. In effect, conscious cognitive judgements are made that implicitly compare oneself with the situation of others or with oneself in the past. As individual aspirations also change over the life cycle, the responded life satisfaction scores do not seem to be

[25] See, for instance, Van den Bergh (2009) for a recent overview of the shortcomings of the GDP indicator in explaining human welfare.

comparable over a longer period of time. Following this reasoning, changing macroeconomic conditions could only have an observable effect on reported well-being, for instance, as long as individual adaption to the current living standard has not yet fully taken place.

In a recent article, Easterlin (2013) implicitly shares our interpretation. He points out that his critics are not able to invalidate his paradoxical findings but are rather confused about short-term and long-term effects. He argues that those studies claiming to have rejected the Easterlin paradox (in particular the analyses of Deaton 2008 and Stevenson and Wolfers 2008) only show robust positive correlations between economic growth and subjective well-being (SWB) in shorter periods. Over longer periods, the effects of changing macroeconomic variables on SWB data become less clear due to adaptation processes. Hence, it can be argued that investigating macroeconomic effects – such as European economic integration – on life satisfaction should be restricted to a shorter time frame that prevents the study from accidently capturing the smooth effect caused by individual adaption processes.

The debate on the GDP as a useful indicator has attracted further public attention due to the 2009 release of the 'Report of the Commission on the Measurement of Economic Performance and Social Progress'. A group of renowned economists, the so-called Stiglitz–Sen–Fitoussi Commission, has identified the limits of the GDP as an indicator of living standards and assessed the feasibility of alternative measurement tools. The omission of subjective measures of well-being is regarded as particularly problematic. Therefore, the commission advocates a shift of emphasis from production-oriented measures to the enumeration of people's perception of life satisfaction for designing public policies and assessing social progress (Stiglitz *et al*., 2009).[26]

In line with these recommendations, large-scale subjective well-being (SWB) data are used in our study to evaluate the effects of European economic integration. As we will discuss in more detail in the next sections, European economic integration can be characterised by direct effects (i.e., movements in goods, services, capital and labour within the EU single market as well as national infringement of EU law) and indirect effects (i.e., national levels of economic homogeneity (convergence) and the synchronization of business cycles). It is plausible to believe that these direct and

[26] See also Di Tella and MacCulloch (2006) regarding the use of happiness data in economics.

indirect effects may affect a person's well-being explicitly as well as implicitly. As noted by Frey and Stutzer (2005), the life satisfaction approach also captures the indirect effects of externalities on a person's utility function. As there is no behavioural trace in this case, utility losses cannot be measured using the revealed preferences axiom of neoclassical economics. Thus, the life satisfaction approach reveals important advantages over the standard neoclassical approaches.

With respect to the evaluation of European integration effects, this alternative empirical approach has been used only rarely in the literature so far. Among the few studies using SWB data from an EU integration perspective are those by Blanchflower and Shadforth (2009) examining the impact on the UK economy of working immigrants from Eastern European countries after their accession to the EU, Wunder *et al*. (2008) investigating the effects on SWB in Germany arising from the Euro cash changeover, Welsch and Bonn (2008) exploring the importance of economic convergence at the national level with aggregated data for the EU-12 countries from 1991 to 2003 and Pittau *et al*. (2010) analyzing the empirical correlation between economic convergence and SWB at the regional level for 70 sub-national units from 1992 to 2002.

Given the limited amount of SWB studies within a European integration context, our article provides valuable information to extend the existing literature. Our article has two aims. The first is to show that citizens care about European integration. Data on multiple dimensions of European economic integration (direct and indirect effects) that have been suggested in the literature are used, thereby widening the narrow focus of previous studies on single EU policies. The study contributes to the existing literature not only by exposing the impact of overall economic integration in the EU on reported life satisfaction, but also by carving out the most important integration effects in that regard, which is the second aim of the paper. We, therefore, also provide findings at the disaggregate level of European economic integration, which bear important implications for future EU policies.

The article proceeds as follows. The next section provides information on the data and estimation strategy. The article then goes on to present the theoretical background and derive hypotheses. The findings of our empirical estimations are presented in the main section and the validity of our results is further tested for robustness. The final section summarizes and discusses the main implications.

3.2 Data and Methodology

The baseline econometric approach adopted in this article is similar to the procedure employed by Di Tella *et al*. (2003). Reported life satisfaction is regressed against a set of individual characteristics and macroeconomic variables identified by the literature as affecting a person's quality of life. In order to detect significant correlations between reported life satisfaction and European economic integration (and its subcomponents), the explanatory variables are complemented by data representing a country's level of economic integration into the EU. The EU integration data are derived from an 'EU Index' developed by König and Ohr (2013), which will be explained in more detail below.

Data on reported life satisfaction and socio-demographic characteristics are taken from the Standard Eurobarometer Survey Series. To be consistent with the data structure representing European economic integration, they cover the period 1999–2010 and refer to the EU-15 countries (without Luxembourg). A total of 180,453 individuals are recorded in this sample. The question on life satisfaction reads as follows: 'On the whole, are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the life you lead?' (small 'Don't know' and 'No answer' categories are not studied here as they account for less than 0.7 percent of the total responses).

Table 3.1 'How satisfied are you with the life you lead?'

	Total		**Current occupation**	
	Frequency	All (%)	Self-employed (%)	Unemployed (%)
Not at all satisfied	6,189	3.4	3.4	9.6
Not very satisfied	23,778	13.2	13.7	27.5
Fairly satisfied	102,487	56.8	57.3	49.0
Very satisfied	47,999	26.6	25.6	13.9
	Age		**Marital status**	
	Young/Old (%)	Middle (%)	Married (%)	Divorced (%)
Not at all satisfied	3.2	3.6	2.9	6.0
Not very satisfied	12.6	13.7	12.0	19.5
Fairly satisfied	56.1	57.4	56.2	55.9
Very satisfied	28.1	25.3	28.9	18.6

Source: Own presentation based on data from the Standard Eurobarometer Survey Series.
Notes: Responses from 180,453 individuals surveyed in 14 EU countries between 1999 and 2010.

The distribution of responses is shown in Table 3.1. The life satisfaction scores appear to be skewed towards one side of the possible answer distribution. On average, European citizens respond positively to the question on life satisfaction. Across countries and time, only 16.6% declare themselves to be not very or not at all satisfied with the life they lead. Most of the respondents seem to be fairly satisfied. The table also excerpts some of the responses on socio-demographic characteristics. The distribution tends to agree with the standard literature: the self-employed appear to be much happier than the unemployed, married persons seem to be more satisfied with life than divorced and separated ones and well-being tends to be U-shaped over the life cycle (i.e., the young and the old are more content with life than middle-aged persons).[27]

Further individual characteristics investigated in this study include gender, marital status (widowed) and occupation (retired, student, staying at home). Due to changes in the Eurobarometer survey structure in 2003, the data set does not contain information on household income. The lack of these data is usually disadvantageous as personal income provides SWB studies with important explanatory power. However, it can also be regarded as an advantage: when people are not asked to give information on their household income, it can be argued that the reported life satisfaction data are less prone to bias from what is called a 'focusing illusion' (Kahneman *et al*., 2006). Hence, our observed responses to the life satisfaction question presumably reflect less biased conscious cognitive judgements in that regard.

Among the first, Di Tella *et al*. (2001) find evidence for a significant impact of macroeconomic variables on life satisfaction. In their pioneering study across twelve European countries over the period 1975–1991, they find a statistically significant inverse relationship between European citizens' reported life satisfaction and the rate of inflation and unemployment. In another study published by the same authors in 2003, levels of GDP per capita and their respective growth rates are further included. At least some support for statistically significant effects of income on life satisfaction is found. The same macroeconomic effects on European citizens' self-reported life satisfaction levels are reaffirmed by Welsch (2007) for the period 1990–2002.

[27] Blanchflower and Oswald (2008) estimate the turning point to be roughly at the age of 45 years for Europeans. Hence, in Table 1, middle age refers to an age between 30 and 60 years.

Table 3.2 Summary Statistics

	Obs.	Mean	Std. Dev.	Min	Max
Unemployment rate	180,453	0.074	0.027	0.025	0.201
Inflation rate	180,453	0.021	0.011	-0.017	0.053
GDP per capita	180,453	10.119	0.179	9.562	10.516
Δ GDP per capita	180,453	0.019	0.027	-0.084	0.099
European economic integration	180,453	0.558	0.077	0.331	0.773
EU single market	180,453	0.384	0.126	0.188	0.789
EU homogeneity	180,453	0.680	0.134	0.387	0.883
EU symmetry	180,453	0.514	0.209	-0.083	0.922
EU conformity	180,453	0.773	0.115	0.475	0.949

Source: Own presentation based on data from the Standard Eurobarometer Survey Series.
Notes: Responses from 180,453 individuals surveyed in 14 EU countries between 1999 and 2010.

Given this empirical evidence, our study also includes macroeconomic variables in the regressions. Data are taken from the Eurostat database. By incorporating these variables into our estimations, we are also able to reassess the above-mentioned effects on life satisfaction in Europe over a more recent period (1999–2010). Table 3.2 reports the summary statistics for the macroeconomic (country-specific) variables used in our study. Except for the log of real GDP per capita (in 2005 Euro prices), the macroeconomic variables are measured as fractions.

A country's level of European economic integration is taken from a recent study by König and Ohr (2013). Using a set of 25 different indicators and a weighting scheme derived from principal component analysis, the authors present an index measuring a country's efforts and capabilities to participate in the EU. This 'EU Index' covers the 'older' EU member states (the EU-15 without Luxembourg) over the period 1999–2010. Using information from the EU Index has two main advantages: (1) it provides aggregated data on economic integration in the European Union in order to evaluate the EU's ultimate aim of promoting life satisfaction and (2) it reveals disaggregated data on single integration effects on the individual member states in order to derive policy implications.

With this novel information, the present study aims not only to assess the relationship between SWB and overall European economic integration, but to investigate the impact of the various subcomponents of economic integration on reported life satisfaction. The four subcomponents consist of the integration levels regarding the EU single market, the extent of economic homogeneity and co-

movements of business cycles and *de jure* and *de facto* compliance with common EU law across the member states. The index scores range between 0 and 100 points, the latter referring to the highest possible level of EU integration.[28]

Throughout the article we assume that individual preferences can be described by:

$$Utility = U(Micro, Macro) \tag{3.1}$$

where an individual's utility at a given point in time not only depends upon personal settings such as being young and employed but also upon the macroeconomic conditions surrounding the individual.

Then, the basic regression that we seek to estimate is of the form:

$$Life\ Satisfaction_{ict} = \alpha + \beta Micro_{ict} + \gamma Macro_{ict} + \delta_c + \mu_t + \sigma_{ct} + \varepsilon_{ict} \tag{3.2}$$

where our dependent variable $Life\ Satisfaction_{ict}$ is the life satisfaction level reported by individual i from country c in year t. Life satisfaction levels are coded from 1 to 4, the latter referring to the highest possible life satisfaction level ('very satisfied'). $Micro_{ict}$ refers to a set of socio-demographic characteristics of the respondents. $Macro_{ct}$ is a vector of macroeconomic variables aggregated at the country level for each year, including national scores achieved in the 'EU Index' capturing the various European economic integration effects. Further, the regressions include an intercept α, country fixed effects δ_c, time effects μ_t, country-specific time trends σ_{ct} and an error term ε_{ict}. Country fixed effects are included to correct for unchanging institutional and cultural influences on reported life satisfaction within the countries. Time effects capture any global shocks that are common to all European countries in each year (such as the 'Global Recession' and the subsequent euro area crisis beginning at the end of 2008). Time trends are incorporated into the model to control for country-specific variation over time. As the data consist of a series of cross-sections, individual-specific fixed effects cannot be considered.

Given the categorical and ordinal structure of the dependent variable, ordered discrete choice models are used. Assuming logistically distributed error terms, our

[28] Information on the data and possibilities of downloading the data set are given at www.eu-index.org.

baseline model is estimated with ordered logit regressions.[29] Some literature suggests that similar results can be obtained by treating SWB data as cardinal and using ordinary least squares regressions instead (Ferrer-i-Carbonell and Frijters, 2004). The robustness of our baseline model is therefore tested with simple OLS regressions. Furthermore, we test the validity of our results with a two-stage OLS estimation procedure in the type of Di Tella *et al*. (2001).

3.3 Hypotheses

In line with the dimensions of the 'EU Index', we derive four hypotheses under the headings EU single market, EU homogeneity, EU symmetry and EU compliance. A fifth hypothesis accounts for overall European economic integration at the end of this section.

3.3.1 EU Single Market

The European single market clearly affects peoples' daily lives and should therefore be included in estimations determining individual life satisfaction across Europe. With the immanent four 'fundamental freedoms' – the free movement of goods, services, capital and labour – liberalized markets provide the foundation for increased economic activity as well as personal flexibility and autonomy within the European borders.

Individual benefits arising from the exchange of goods and services might imply lower price levels and higher degrees of product variety, both enhancing consumers' abilities to purchase goods and services closer to their own preferences. The 'love-of-variety' approach suggests that individual utility increases as the amount of differentiated goods and services consumed increases, other things being equal (Dixit and Stiglitz, 1977). Hence, the amount of varieties should increase along with greater trade openness towards the EU single market and the variety of goods should that of those countries with less intense market participation. Furthermore, the international trade volumes may increase due to product specialization accompanied by positive scale effects in production processes (Krugman, 1979, 1980). Taking advantage of economies of scale is associated with lower commodity prices due to a reduction in the average

[29] Ordered probit regressions (assuming normally distributed error terms) have also been estimated, leading to identical results, which are available upon request and not reported in this article.

costs of production, eventually benefiting both consumers and producers. Empirical evidence that increasing actual trade flows significantly promote life satisfaction has been recently presented by Bjørnskov *et al*. (2008) and Dluhosch and Horgos (2013), although they do not analyze the specific case of intra-European trade.

Empirical research also suggests that individual well-being is on average higher in countries with high personal freedom and that a shift to an industrial society creates more room for such autonomy (Diener *et al*., 1995; Veenhoven, 1999). Industrial societies emphasise the inalienable value of each individual, thereby allowing for self-expression and the opportunity and capability to choose (Inglehart *et al*., 2008; Suh and Koo, 2008). The free movement of people and capital incorporated into the four fundamental freedoms is mainly a matter of self-expression. EU citizens may freely decide where to live and work and where to invest, thereby increasing the possibility to match their individual preferences. As increasing marginal returns on labour and capital provide efficient incentives for migration and investment, this also implies optimization in the allocation of production factors. Thus, utility at the individual and aggregate level should rise, leading to increased social welfare in the particular economy. This reasoning leads to the following hypothesis:

H_1: Exploiting the potential of the EU single market promotes life satisfaction.

3.3.2 EU Homogeneity

Another fundamental issue in assessing SWB is the potential role of reference groups. There is ample empirical evidence that individual well-being is affected by social comparisons with others in society (e.g., Ferrer-i-Carbonell, 2005; Clark and Senik, 2010; Winkelmann, 2012). An individual's inability to keep up with his or her direct community members (also known as 'keeping up with the Joneses') might result in dissatisfaction with life. Therefore, it is argued that interdependent utilities should also be taken into account in well-being functions in addition to standard economic theory independent utilities (Clark and Oswald, 1998).

In an empirical investigation of the relationship between life satisfaction and the Gini-coefficient, Alesina *et al*. (2004) find evidence for high inequality aversion especially among European citizens when compared with U.S. citizens. Ebert and

Welsch (2009) also confirm the evidence that Europeans dislike income inequality and find even stronger results using alternative sets of inequality measures.

In a recent article, Cullis *et al*. (2011) find strong evidence that reducing income inequality *between* the European countries also positively affects life satisfaction. They argue that this finding provides a normative rationale for supranational organizations such as the EU to undertake effective redistribution policies among their member states. This reasoning has recently been reaffirmed for the EU-15 countries by Becchetti *et al*. (2013). They conclude that European people do care about their neighbouring countries due to the intensity of media exposure and that international economic inequality may harm life satisfaction even among the more wealthy citizens.[30] In international comparisons, the gap between rich and poor may be greater than within a country, leading to stronger feelings of social injustice. In fact, European solidarity with economically weaker member states becomes visible, for instance, through financial transactions via the EU cohesion policy and the European Stability Mechanism (at least for the euro area countries). Thus, the following second hypothesis may be derived:

H_2: Reducing the economic heterogeneities between the EU member states increases the well-being of European citizens.

3.3.3 EU Symmetry

Individual well-being is also affected by what people expect economically from the future. Large fluctuations in important economic variables may cause difficulties in making reliable expectations about the future economic situation of oneself and of the surrounding society. In an article investigating business cycle volatility in the EU-15 countries, Wolfers (2003) confirms that negative short-term relationships exist between life satisfaction levels and fluctuations in inflation and unemployment rates.

Economic fluctuations are even more harmful to society if the national government is not able to coordinate monetary policy according to its own needs. The Economic Monetary Union (EMU) of the EU is such an example: its members rely upon a common currency and monetary policy that is not in national charge (having the burden of following a policy of 'one size fits all'). In cases in which heterogeneous

[30] These relative concerns have also been affirmed with other variables influencing people's welfare, such as wages and tax rates (see, for instance, Luttner, 2005 and Akay *et al*., 2012)

economies have to share one monetary policy, Pareto-efficient outcomes are hardly achieved. Balanced against potential positive trade effects due to reduced transaction costs in a monetary union, the shift to a single currency may exacerbate unemployment by eliminating the opportunity for differences in interest rates and changes in nominal exchange rates between the member states. A negative relationship between being unemployed and SWB was first found by Clark and Oswald (1994). A causal negative effect of entry unemployment on life satisfaction is also affirmed in a more recent work by Kassenboehmer and Haisken-DeNew (2009).

Contrariwise, symmetric co-movements of the countries' business cycles favour efficient policy reactions. In a widely recognized article, Frankel and Rose (1998) assume that optimum currency areas are endogenous. Even if the participating economies may not be suited to sharing a common monetary policy *ex ante*, they may become more homogenous *ex post* through time. Increased intra-industry trade is the expected channel through which the member states' business cycles should become more symmetric and, thus, more suitable for a common currency and monetary policy. The risk of inappropriate policies is then reduced, leading to a situation in which the society's preferences and needs are matched. Hence, a third hypothesis can be derived:

H_3: Increasing symmetry of business cycles lowers the risk of inefficient currency and monetary policy, leading to a rise in social welfare.

3.3.4 EU Conformity

With the concept of the *acquis communautaire*, the EU member states share one common law that provides the setting for successful market transactions and ensures similar institutional frameworks across the individual countries. The aim is to reduce economic uncertainty among the market actors. In the case of violating the common law, the European Commission may initiate infringement proceedings against a particular country or market actor. The European Court of Justice is the last instance to ensure overall compliance with the law and its underlying regulations and directives.

Aspects of good governance, such as legal quality and the absence of corruption have been proposed to affect life satisfaction positively (e.g., Helliwell, 2006; Ovaska and Takashima, 2006; Bjørnskov *et al*., 2010). The enforcement costs of law are thereby reduced, providing a reliable economic environment in which increased market

transactions are more likely. Trust in political institutions and their compliance with national and international law is of vital importance in that regard. According to Helliwell (2003) and Hudson (2006), it can be shown that especially the European countries show positive correlations between life satisfaction and trust in political institutions. The resulting increase in market transactions influences the extent to which the allocation of goods and production factors is in line with people's preferences. Thus, hypothesis four takes the following form:

H_4: Compliance with EU law reduces economic uncertainty, which leads to increased market transactions, thereby enhancing individual well-being.

3.3.5 Overall Level of European Economic Integration

As this is the first analysis to assess the impact of overall European economic integration on reported well-being, no empirical evidence from other studies can be derived. However, there are at least some recent articles that analyze the impact of economic integration on life satisfaction from a global perspective.

Bjørnskov *et al*. (2008) find some positive effects of economic integration on life satisfaction in 70 countries. These are merely due to increases in trade openness. However, the shortcoming of their study is the pure cross-country nature of the data set, thereby missing important information that can otherwise be derived from the variation in economic variables over time. To overcome the mentioned shortcoming of the data set, Hessami (2011) uses a larger time frame in her analysis of globalization effects. She finds support that globalization as such has a positive effect on reported life satisfaction. Nonetheless, her study is of limited use for our analysis as only an aggregated 'globalization' dimension is investigated. Unfortunately, no disaggregation is undertaken that could reveal comparable economic integration effects.

Given that the previously derived hypotheses on the EU single market, EU homogeneity, EU symmetry and EU conformity expect positive effects on life satisfaction, overall European economic integration should also improve SWB in the end. The last hypothesis therefore is written as:

H_5: Overall European economic integration leads to positive effects on cognitive judgements about one's quality of life.

3.4 Empirical Results

Table 3.8 in the Appendix illustrates the effects of individual socio-demographic characteristics on reported life satisfaction over the entire period. It can be shown that the variables are all statistically significant and show the expected signs. The similarity in the results between order logit estimations and OLS regressions is also demonstrated, which becomes relevant in the robustness analysis section of this article.

Table 3.3 presents the dependence of life satisfaction on macroeconomic variables that are regarded by the standard economic literature as particularly important. The set of socio-demographic characteristics has been estimated like those presented in Table 3.8 in the Appendix, with extremely similar coefficients. Hence, to save space, those coefficients are not reported individually in the tables. The regressions also control for country-specific time trends, country fixed effects and year effects.

Table 3.3 Life Satisfaction and Macroeconomic Determinants: Ordered Logit

	(1)	**(2)**	**(3)**
Unemployment	-5.122***	-4.772***	-4.506***
	(0.470)	(0.562)	(0.502)
Inflation	-0.191	-0.237	0.825
	(0.864)	(0.865)	(0.912)
GDP per capita		0.306	
		(0.269)	
Δ GDP per capita			0.018***
			(0.005)
Socio-demographic characteristics	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Year effects	Yes	Yes	Yes
Cut1	-4.915	-1.837	-4.791
Cut2	-3.030	0.047	-2.907
Cut3	0.114	3.191	0.237
Pseudo R^2	0.107	0.107	0.107
No. of observations	180,453	180,453	180,453

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors are in parentheses.

As expected, the unemployment rate has a statistically significant negative impact on a person's life satisfaction. This is consistent with the idea that unemployment is a major economic source of human distress (e.g., Blanchflower, 2007). Conversely to the findings of Di Tella *et al*. (2003), the impact of inflation on life satisfaction remains low

and statistically insignificant throughout the regressions. Possible explanations are given by the low numbers of the mean and standard deviation of the inflation rates across the countries over the last decade, as presented in Table 3.2. With an average inflation rate of 2.1 percent, this rate only slightly exceeds the inflation target of the European Central Bank (ECB). The variation in inflation rates iss also very low with a 1.1 percent standard deviation between 1999 and 2010. Being confronted with low and fairly constant inflation rates might have contributed to a certain loss of fear of inflation. It thus turns out that people do not care much about changes in the domestic price level as long as the inflation rate is kept to a certain minimum. In the study by Di Tella *et al*. (2003), both figures appear to be much higher, with the mean inflation being 7.9 percent and standard deviation being 5.6 percent.

GDP per capita seems to be statistically insignificant in most of the regressions. This could be explained by the fact that all the countries in our sample are developed countries, mostly with relatively high per capita income, suggesting that a certain satiation point has been achieved whereby living in a country with slightly higher per capita income does not pay off in terms of life satisfaction. On the contrary, short-term fluctuations in GDP per capita seem to matter to European citizens. These findings are quite robust to all the regressions estimated in our study.

Table 3.4 presents the estimated effects of our baseline model on reported life satisfaction, including European economic integration data as explanatory variables. According to our estimation results of the first column, overall European economic integration has a positive and statistically significant impact on life satisfaction. The more deeply a country is integrated into the EU, the higher is the probability of its citizens being satisfied with the life they lead. The same is true for a country's integration level in the EU single market and for a country's rate of economic homogeneity relative to the other member states, as indicated by columns 2 and 3 of Table 3.4. Hence, hypotheses 1, 2 and 5 seem to be confirmed: the well-being of EU citizens depends upon overall European economic integration, upon interaction with the four fundamental freedoms of the EU single market and upon relative concerns about macroeconomic conditions in neighbouring countries.

Table 3.4 Life Satisfaction and European Economic Integration: Ordered Logit

	(1)	(2)	(3)	(4)	(5)
European economic integration	0.820***				
	(0.303)				
	[0.14]				
Sub-indices:					
EU single market		2.472***			
		(0.598)			
		[0.43]			
EU homogeneity			0.801***		
			(0.223)		
			[0.14]		
EU symmetry				0.019	
				(0.063)	
EU conformity					0.074
					(0.094)
Unemployment	-4.922***	-4.980***	-5.111***	-4.772***	-4.789***
	(0.564)	(0.563)	(0.569)	(0.562)	(0.562)
	[-0.86]	**[-0.87]**	**[-0.89]**		
Inflation	0.608	0.549	0.423	-0.170	-0.186
	(0.920)	(0.886)	(0.884)	(0.895)	(0.868)
GDP per capita	0.330	0.689**	0.564**	0.299	0.292
	(0.269)	(0.284)	(0.278)	(0.270)	(0.269)
Socio-demographic characteristics	Yes	Yes	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Cut1	-1.151	2.834	1.379	-1.901	-1.930
Cut2	0.733	4.719	3.264	-0.016	-0.045
Cut3	3.877	7.863	6.408	3.127	3.098
Pseudo R^2	0.107	0.107	0.107	0.107	0.107
No. of observations	180,453	180,453	180,453	180,453	180,453

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors are in parentheses. Marginal effects at the mean for selected independent variables are in squared brackets and bold letters indicate the change in probability of an individual responding that he or she is 'very satisfied' with life.

Hypotheses 3 and 4, however, are not confirmed by our results. Neither the symmetry of business cycles nor a country's compliance with EU law seem to affect individual life satisfaction. As the symmetrical co-movement of relevant macroeconomic factors is expected to increase the optimality condition (*ex post*) of a common monetary policy, this is a remarkable result. According to König and Ohr (2013), the symmetry of business cycles increased sharply between 1999 and 2010. European citizens, however, do not seem to be affected by such an increase. One could

argue, for instance, that improper monetary policy undertaken by the common central bank has a less negative impact in times of modest economic fluctuations than in times of high asymmetric fluctuations. In fact, when re-estimating the regression for the effects of EU symmetry on life satisfaction only for the more volatile years of 2008 to 2010, the regression coefficient becomes larger and statistically significant at the 5-percentage level.

Furthermore, a country's compliance with EU law is expected to reduce economic uncertainty for investment, thereby increasing the possibility for market transactions. According to our hypothesis, this should have a positive impact on life satisfaction. However, the coefficient turns out to be small and statistically insignificant. One possible explanation for this finding could be that infringement proceedings are often not recognized by the respective citizens and, thus, do not influence a person's level of life satisfaction. In most cases, the accused country corrects for legal abuse within a short time frame. Hence, although noncompliance with EU law has occurred, the abuse has been too short-lived to have any (direct or indirect) effect on people's utility. Another likely explanation could imply that the potential benefit of living in a society with reliable and trustful institutions and firms is offset by the advantages arising from violating the law. In some cases, the penalty payments imposed by the ECJ do not fully compensate for discrimination against other market participants. Although not proven here, these could be reasonable interpretations of the somewhat surprising results.

Since the coefficients' magnitudes have no direct meaningful interpretation, the marginal effects at the mean values of the independent variables are reported in squared brackets and bold letters. Regression 2 of Table 3.4 shows the highest marginal effects. With a 1-point increase in the sub-index measuring EU single market interactions, the probability of being 'very satisfied' with life rises by 0.43 percent. Given that the index is scaled between 0 and 100 (but presented as fractions), we can conclude that especially integration into the common market and making use of its full potential have a sizeable effect on well-being. Furthermore, the predicted probabilities show that once a country reaches an index value of more than 70 in the single market dimension, the majority of its citizens will tend to respond that they are 'very satisfied' with life.[31]

[31] The predicted probabilities were also estimated with other integration values and are available upon request.

Although not directly related to each other, it may also be argued that the negative impact of unemployment on life satisfaction can be partly compensated for by greater market interactions due to positive marginal effects. Given the marginal effects on life satisfaction of both variables at the mean values, it can be calculated that a 1-percentage point increase in unemployment can be compensated for by a 2-point increase in EU single market interactions (-0.87 / 0.43 = -2.02), *ceteris paribus*. This would in fact reveal important policy implications. Further liberalizing a country's market for trade in goods, services and production factors could compensate for negative effects on life satisfaction, such as unemployment, to a considerable extend. Against this background, the promotion of further liberalization of the single market should stay at the forefront of European policy.

Table 3.5 Life Satisfaction and European Economic Integration (with GDP growth): Ordered Logit

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
European economic integration	0.688**				
	(0.306)				
Sub-indices:					
EU single market		2.182***			
		(0.567)			
EU homogeneity			0.712***		
			(0.216)		
EU symmetry				0.003	
				(0.063)	
EU conformity					0.046
					(0.095)
Unemployment	-4.705***	-5.019***	-5.049***	-4.505***	-4.516***
	(0.510)	(0.520)	(0.528)	(0.502)	(0.503)
Inflation	1.455	1.666*	1.482	0.833	0.841
	(0.954)	(0.938)	(0.934)	(0.932)	(0.913)
Δ GDP per capita	0.017***	0.020***	0.019***	0.018***	0.018***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Socio-demographic characteristics	Yes	Yes	Yes	Yes	Yes
Country-specific time trends	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Cut1	-4.427	-4.050	-4.224	-4.790	-4.763
Cut2	-2.542	-2.165	-2.339	-2.905	-2.878
Cut3	0.602	0.979	0.806	0.239	0.266
Pseudo R^2	0.107	0.107	0.107	0.107	0.107
No. of observations	180,453	180,453	180,453	180,453	180,453

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors are in parentheses.

Our results are robust to several changes in model specifications. Exchanging the log of real GDP per capita with its annual growth rate, for instance, delivers no substantively different results in the EU coefficients, as Table 3.5 shows. The GDP growth rate seems to affect life satisfaction more robustly than the levels of GDP per capita. Moreover, multicollinearity issues seem to be of no concern between the macroeconomic variables. According to O'Brien (2007), a variance inflation factor (VIF) of more than 10 indicates a multicollinearity problem. As shown in Table 3.9 and Table 3.10 in the Appendix, the VIF is much less than 10 among our variables. Further robustness checks are presented in the next section.

3.5 Robustness Analysis

Ferrer-i-Carbonell and Frijters (2004) demonstrate in their application that in most discrete choice estimations, the estimated effects appear to be invariant to whether individual responses are treated as ordinal or cardinal. They argue that similar results can be obtained by using ordinary least squares (OLS) estimations instead of ordered logit estimations. In the same vein, Schwarz (1995) assumes that respondents also generally interpret a choice of numbers as a cardinal meaning with equal distances between them. Hence, according to this view, effects on reported life satisfaction can also be estimated with linear models.

This is exactly what we have done in the robustness analysis of our results. The analysis consists of two robustness checks. In the first case, the coefficients illustrated in Table 3.6 are re-estimated using simple OLS regressions.[32] In the second case, a more complicated two-stage OLS procedure in the type of Di Tella *et al*. (2001) is estimated. The statistical significance and the signs of the coefficients reported in Table 3.6 demonstrate that estimating simple OLS regressions reveals very similar results when compared with the results of the ordered logit procedure. There is evidence that again overall European economic integration as well as the sub-indices EU single market and EU homogeneity positively affect well-being. EU symmetry and EU conformity still seem to have no impact on reported life satisfaction, yet the statistical significance of the GDP per capita has become slightly stronger.

[32] The results do not change if the GDP growth rate is used instead of its per capita levels.

Table 3.6 Life Satisfaction and European Economic Integration: OLS

	(1)	(2)	(3)	(4)	(5)
European economic integration	0.290***				
	(0.099)				
Sub-indices:					
EU single market		1.011***			
		(0.194)			
EU homogeneity			0.345***		
			(0.072)		
EU symmetry				-0.004	
				(0.021)	
EU conformity					0.018
					(0.031)
Unemployment	-1.693***	-1.727***	-1.791***	-1.640***	-1.645***
	(0.182)	(0.183)	(0.184)	(0.182)	(0.182)
Inflation	0.267	0.285	0.284	-0.034	-0.019
	(0.301)	(0.289)	(0.289)	(0.292)	(0.284)
GDP per capita	0.162*	0.309***	0.262***	0.152*	0.148*
	(0.087)	(0.093)	(0.090)	(0.088)	(0.088)
Adjusted R^2	0.198	0.198	0.198	0.198	0.198
No. of observations	180,453	180,453	180,453	180,453	180,453

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors are in parentheses. In congruence with the baseline model, the regressions reported in this table also include socio-demographic characteristics, country-specific time trends, country fixed effects and year effects.

In their pioneering study, Di Tella *et al*. (2001) apply two-stage OLS procedures in order to detect the effects of macroeconomic changes on SWB. In the first stage, microeconometric OLS regressions are performed for each country over 1999–2010, regressing reported life satisfaction against a set of socio-demographic characteristics. The first-stage procedure can be described by:

$$Life\ Satisfaction_{it} = \alpha + \beta Micro_{it} + \varepsilon_{it} \tag{3.3}$$

where the residuals of this regression can be interpreted as the average assessment of personal satisfaction per country that is not explained by socio-demographic characteristics. For the second stage, the mean residuals of life satisfaction are calculated for each country in each year and are used as the dependent variable. Thus, second-stage data are aggregated at the country level, leading to 168 observations in this stage (14 countries over 12 years). The mean residuals of life satisfaction are then regressed against a vector of macroeconomic variables including the EU Index data.

The second-stage OLS regression controls for country fixed effects, year effects and country-specific time trends and takes the form:

$$Mean\ \varepsilon_{ct} = \alpha + \gamma Macro_{ct} + \delta_c + \mu_t + \sigma_{ct} + \epsilon_{ct} \tag{3.4}$$

Illustrated in Table 3.7, the two-stage OLS procedure generates similar but not equal results. Here, overall European economic integration is statistically significant only at the 20-percentage level. Nevertheless, the dimensions EU single market and EU homogeneity still have a positive and statistically significant impact on well-being. With regard to the previously estimated compensation of negative impacts on life satisfaction, the same substantive calculations can be made. A negative effect of a 1-percentage point increase in unemployment, *ceteris paribus*, may be compensated for with regard to life satisfaction by (less than) a 2-point increase in further liberalizing and making use of the EU single market (1.775 / 0.959 = 1.85).

Table 3.7 Life Satisfaction and European Economic Integration: Two-Stage OLS

	(1)	(2)	(3)	(4)	(5)
European economic integration	0.303				
	(0.234)				
Sub-indices:					
EU single market		0.959**			
		(0.441)			
EU homogeneity			0.427**		
			(0.167)		
EU symmetry				-0.003	
				(0.049)	
EU conformity					0.011
					(0.072)
Unemployment	-1.743***	-1.775***	-1.907***	-1.693***	-1.696***
	(0.432)	(0.427)	(0.431)	(0.434)	(0.434)
Inflation	0.207	0.204	0.223	-0.104	-0.085
	(0.697)	(0.664)	(0.657)	(0.684)	(0.664)
GDP per capita	0.055	0.195	0.177	0.042	0.039
	(0.201)	(0.211)	(0.204)	(0.203)	(0.203)
Adjusted R^2	0.540	0.551	0.557	0.534	0.534
No. of observations	168	168	168	168	168

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels respectively. Standard errors are in parentheses. This is a second-stage OLS regression. It uses as the dependent variable the regression-corrected life satisfaction levels from national micro data first-stage OLS regressions across 180,453 observations (similar to the one shown in Table 3.8 in the Appendix). The regressions reported in this table include country-specific time trends, country fixed effects and year effects.

3.6 Conclusions

The aim of this paper was to analyze whether subjective well-being is affected by a member state's European economic integration level. The empirical results of our ordered logit estimation including socio-demographic characteristics and other macroeconomic variables indicate that European citizens seem to care about European integration. The overall economic integration levels have a statistically significant positive impact on reported life satisfaction. Moreover, empirical evidence is provided that increasing economic activity in the EU single market as well as enhancing economic homogeneity among the member states positively affect people's well-being.

The symmetry of business cycles and the member states' compliance with EU law, however, yield no significant results over the observed period. Only for the years 2008 to 2010 (during the euro area crisis with highly volatile and heterogeneous economic fluctuations), business cycle symmetry is shown to have a significant positive effect on life satisfaction. Hence, the symmetry of business cycles seems to be less important for a well-functioning monetary union in times of modest fluctuations. Then, other mechanisms need to be taken into account. Increasing economic homogeneity among the member states seems to be a reasonable effort in that regard.

It is further shown how self-reported life satisfaction alters with the change in macroeconomic conditions. Above all, the unemployment rate is estimated to have the largest effect on life satisfaction. Estimating the marginal effects of selected explanatory variables in the ordered logit and OLS regressions with regard to life satisfaction yields, *ceteris paribus*, that the negative effect of a 1-percentage point increase in unemployment can be compensated for, for instance, by a 2-point increase in a country's single market transactions. The potential compensation of life satisfaction losses further underscores the importance of a well-functioning single market. Consequently, further efforts to unleash the full potential of the common market and its four fundamental freedoms should stay at the forefront of future European integration policies.

3.7 Appendix

Table 3.8 Life Satisfaction and Socio-Demographic Characteristics

	Ordered logit estimation		**OLS estimation**	
	Coefficient	Standard error	Coefficient	Standard error
Unemployed	-1.112***	0.123	-0.387***	0.432
Self-employed	0.094**	0.045	0.026*	0.015
Male	-0.071*	0.037	-0.021*	0.012
Age	-0.053***	0.005	-0.017***	0.002
Age squared	0.000***	0.000	0.000***	0.000
Married	0.475***	0.039	0.153***	0.010
Divorced/separated	-0.372***	0.032	-0.127***	0.011
Widowed	-0.201***	0.052	-0.068***	0.017
Retired	-0.177***	0.047	-0.068***	0.016
Home	-0.255***	0.049	-0.094***	0.016
Student	0.210***	0.069	0.064***	0.223
Country:				
Belgium	0.553***	0.011	0.177***	0.001
Netherlands	1.419***	0.024	0.445***	0.003
Germany	0.005	0.007	0.009***	0.002
Italy	-0.418***	0.013	-0.129***	0.002
Denmark	2.266***	0.031	0.677***	0.002
Ireland	0.846***	0.016	0.265***	0.002
United Kingdom	0.909***	0.017	0.286***	0.001
Greece	-1.029***	0.026	-0.348***	0.003
Spain	0.147***	0.006	0.058***	0.002
Portugal	-1.244***	0.026	-0.432***	0.003
Finland	0.865***	0.020	0.291***	0.002
Sweden	1.410***	0.027	0.452***	0.003
Austria	0.333***	0.006	0.120***	0.001
Cut1	-4.456		-	
Cut2	-2.577		-	
Cut3	0.554		-	
Pseudo R^2	0.104		0.194	
No. of observations	180,453		180,453	

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors are robust to heteroskedasticity (that is, standard errors adjusted for cluster effects at the country level). The base country for the country dummy is France. The regression includes year dummies from 1999 to 2010. The exact question for the dependent variable is: *'On the whole, are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the life you lead?'*

Table 3.9 Testing Multicollinearity

	VIF	VIF	VIF	VIF	VIF
Unemployment rate	1.26	1.26	1.25	1.65	1.25
Inflation rate	1.10	1.07	1.19	1.07	1.07
GDP per capita	1.72	1.37	1.27	2.35	1.25
European economic integration	1.48				
EU single market		1.17			
EU homogeneity			1.15		
EU symmetry				1.99	
EU conformity					1.01

Notes: The variance inflation factor (VIF) indicates multicollinearity between the variables if it is greater than 10.

Table 3.10 Testing Multicollinearity (with GDP growth)

	VIF	VIF	VIF	VIF	VIF
Unemployment rate	1.07	1.10	1.05	1.05	1.05
Inflation rate	1.14	1.10	1.23	1.10	1.09
Δ GDP per capita	1.11	1.11	1.10	1.26	1.10
European economic integration	1.09				
EU single market		1.06			
EU homogeneity			1.14		
EU symmetry				1.21	
EU conformity					1.00

Notes: The variance inflation factor (VIF) indicates multicollinearity between the variables if it is greater than 10.

4 Economic Growth and Country Size in the European Union

Abstract

Does the size of a country affect its economic growth rate? Theory suggests that the existence of a national scale effect is favouring large countries. Moreover, it is argued that small countries may overcome the impediments of smallness once their markets become internationally more integrated, leading to a catching-up process and higher growth rates in those countries. Empirical evidence of a distinct impact of country size on growth, however, is rather limited. Using a panel data set for the EU-27 countries over the period 1993–2012, we find that economic convergence has occurred among the EU members since the creation of the European single market 20 years ago. We further show that country size negatively affects its economic growth rate and that membership in the EU indeed enhances the convergence process. However, when accounting for relevant country-specific characteristics in the regressions, the statistical significance of country size diminishes. Yet, investigating the old and new member states separately, we find that country size matters. Observing differences in the direction, magnitude and significance of the country size effect suggests that the long-term growth path of the EU members depends on prevailing market imperfections and on their level of economic integration. The effect of country size seems to decrease as market integration increases. This implies important policy implications to finally complete the single market, particularly in the light of the large and increasing number of small EU member states.

Note: A similar version of this chapter is currently under review in an international journal.

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4.1 Introduction

In the last two decades, the European Union (EU) has grown remarkably in size and numbers through the accession of new member states. The number of members more than doubled over the last 20 years. With the latest accession of Croatia, the EU represents more than half a billion citizens living in 28 member states. This is quite large opposed to the 12 member states that created the European single market in 1993. It is striking that mainly the small countries entered the EU in the last enlargement rounds. Among the member states that joined the EU since 1993 only Poland is regarded as relatively large with a population of nearly 40 million. The remaining new members show relatively low levels of population.

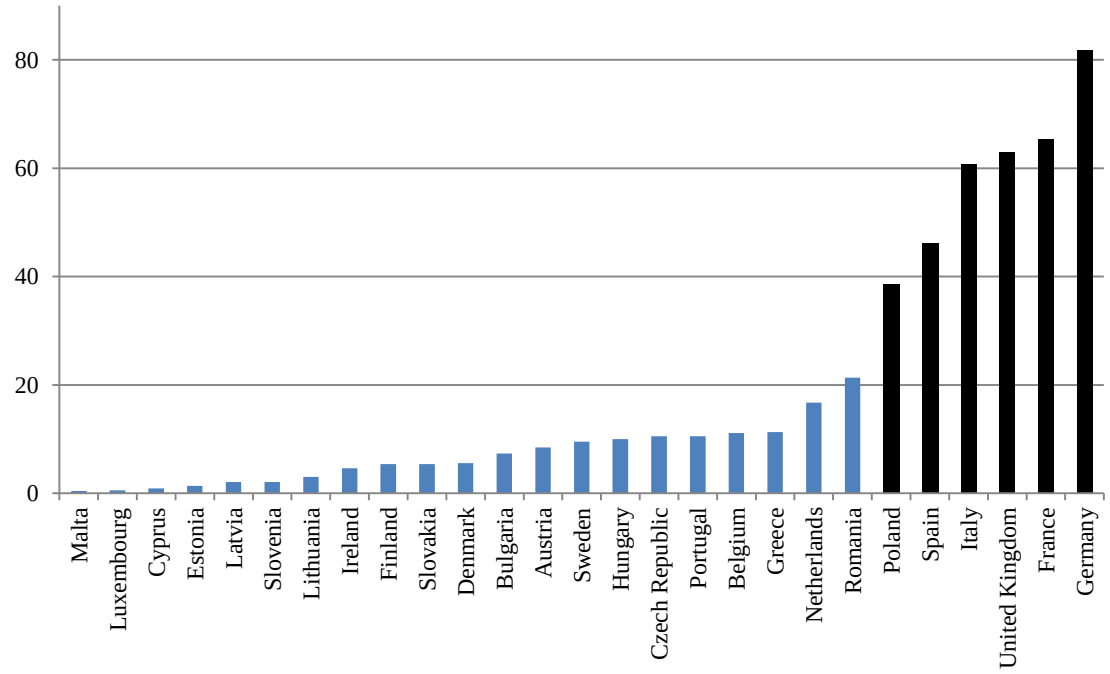

Figure 4.1 Population of the EU Member States in 2012 (in millions)

Source: Own presentation based on Eurostat data.

Figure 4.1 illustrates the EU member states ordered according to their population size in 2012. As the subsequent investigations refer to the EU-27, Croatia is not included here. The largest leap in size takes place between Romania and Poland. This is where the line is drawn in this study in order to make a distinction between ‘small’ and ‘large’ countries. With respect to the EU-27, this leads to two country groups: a group of 21 small countries (from Malta to Romania) representing roughly 150 million people

and a group of 6 large countries (from Poland to Germany) with a total population of around 350 million.[33]

This large and increasing number of small countries suggests that EU membership provides some economic (and political) advantages that might be particularly beneficial to these countries. The underlying intuition is that the large EU single market with its four fundamental freedoms – the free movement of goods, services, capital and persons – is especially vital for economies of smaller market size. As presented in the next section more closely, a number of economic studies that mostly date back to Robinson (1960) see small countries as the relatively weaker economies. However, it is also argued that increasing openness and market integration can compensate for those initial limitations. Because of increasing marginal returns, the sales market and the markets for factors of production are disproportionately to the size of small countries, resulting in a more efficient allocation of resources. Thus, the relative market expansion should be larger for those countries whose own domestic market is small and physical and human capital is limited. The provoked competition effects of an extended market lead to more efficient outcomes and lower sales prices. As a consequence, the rise in competitiveness and the induced growth effects from market integration should be relatively larger in small countries.

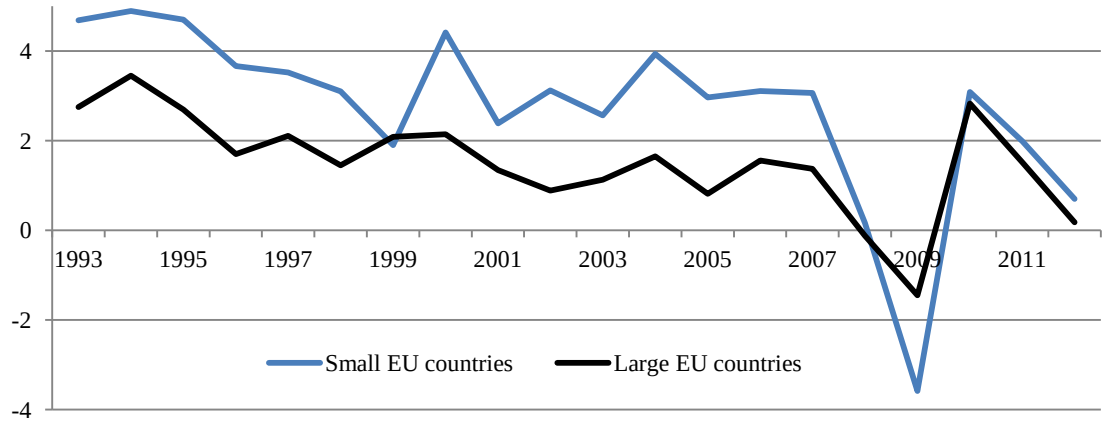

Figure 4.2 Economic Growth across Small and Large EU Member States

Source: Own presentation based on Eurostat data.
Note: The figure shows the average annual growth rate in percent of real GDP (2005 prices) per worker (15–64 years).

[33] There is no definite rule on how to distinct countries from one another in terms of size. One could justify other measures of size such as the theoretical concept of the 'small open economy' (i.e., price takers), land area, real GDP, or a combination of these (Jalan, 1982; Downes, 1988). However, population is used here because it serves as a good proxy for two important economic variables: the domestic market size and the potential labour force.

Figure 4.2 encourages this view. Over the last 20 years, the average annual economic growth rate of the small EU countries generally exceeds the growth rate of their larger counterparts. Only the years 2008 and 2009 show a larger decline in growth rates among the group of small countries.[34] On average, the group of small states grew in terms of real GDP per worker by 2.6 percent per year, whereas the economies of the large states grew annually only by 1.4 percent during the same period.[35]

The aim of this paper is to investigate empirically with panel data growth regressions whether the mentioned intuition is true and the size of a country contains statistically significant explanatory power to the economic success of the small EU member states. As we will discuss below, the intuition becomes less straight forward when the EU single market is *de facto* not yet completed in all areas and the large member states exploit the integration effects more efficiently than the small countries due to their comparative advantage in absolute factor endowments and their greater ability to make use of economies of scale and to internalize external effects. More importantly, a country contains individual characteristics that influence its economic growth. These individual characteristics might outweigh the expected effects arising from other attributes than being a small member state. It is therefore essential to control for these country-specific effects and make use of appropriate estimators.

Using the human capital augmented growth model (Romer, 1986; Lucas, 1988) as the baseline model, it is shown that, at least at first sight, country size seems to matter in the expected way: the lower the population of an EU member state the higher its economic growth rate. However, this is only half the story. It is further shown that the statistical significance of country size disappears when the model is specified in a way that it controls for country-specific fixed effects. Successive optimization of the regression specification leads to a robust finding that – against *a priori* expectations – smaller countries do not automatically grow faster in economic terms once their markets

[34] Most likely, this effect is due to the global financial and economic crisis (also called the 'Great Recession') that negatively affected world trade and production and, apparently, had a larger impact on the usually more open and internationally dependent economies of small countries.

[35] This is a remarkable difference. For instance, if the two country groups had an identical initial per capita income of €30,000, the average income of the group of small countries would increase to €49,000 after 20 periods, whereas the average income of the large-country group rises to only €39,000. In terms of economic convergence, the small (i.e., initially weaker) countries would catch up to the larger ones after 25 periods, if the latter started, for instance, with €40,000 instead of €30,000 in period 1.

become more integrated into the large single market. As the EU is a highly heterogeneous community with tremendous differences in unobservable and observable characteristics (König and Ohr, 2013), country-specific (fixed) effects along with initial income are regarded as the relevant factors behind this result. This is especially true for the EU-27 where half of the small countries are former Soviet states. Eventually enjoying the benefits from market-oriented reforms, these countries experience high growth rates rather irrespective of their country size. If these effects are incorporated into the model through fixed effects estimations, the impact of the size of a country on economic growth is reduced to a rather negligible extent.

However, this does not mean that country size has no effect at all. By splitting the sample into two groups of 'old' and 'new' EU members it is shown that country size matters within the groups – although in opposite directions. The opposite signs of the coefficients of population between these two groups may indicate that the duration of membership and the level of economic integration are affecting the long-term convergence path. This result implies for the EU-27 countries that their long-term convergence path is characterized by multiple turning points, in which temporarily the country groups' economic growth rates are affected differently. Investigating the two different country groups by only one regression could therefore offset the opposite impacts of country size on economic growth leading to misleading or insignificant coefficients.

The results are contributing to the existing literature as they combine two related lines of empirical research that investigate the effects of country size on economic performance. Whereas the first line of research tests for a national scale effect on economic growth in general, the second line of research focuses on the integration effects on small member states' export ratios when new members enlarge the trade bloc (the so-called 'Casella effect'). Both lines of research deliver very mixed empirical results when markets become more integrated.

Belonging to the first line of research, the empirical analyses by Streeten (1993) and Easterly and Kraay (2000) find that many small countries were able to achieve high rates of economic growth in spite of their initial economic drawbacks. Both studies underline that small countries tend to be more open to trade and that this openness causes volatility in their growth rates. However, they bring forward that this greater

openness on balance has a positive net payoff for growth due to productivity advantage and technical spillovers. Milner and Westaway (1993) argue that, in general, a simple relation between growth and country size cannot be established. Nevertheless, they observe a higher marginal product of capital for small economies, interpreting this as evidence that economic growth is restricted by constraints on resource accumulation in the case of small economies. Moreover, they notice that this effect diminishes as openness increases. Likewise, Backus *et al*. (1992) find little empirical evidence of a relation between economic growth and measures of scale. Merely, small correlations are found between manufacturing scale and productivity growth. The authors, however, argue that this correlation could also reflect policy (e.g., export promotion strategies) rather than scale effects. More fundamentally, Rose (2006) argues that country size simply does not matter at all. He finds no substantial impact of size on economic growth assuming that scale effects may occur only at the sub-national level. On the contrary, Alesina *et al*. (2005) claim that a robust positive correlation exists between economic growth and country size. They emphasize the general economic inferiority of small countries and that these states suffer from an inability to exploit increasing returns to scale in production and organization. They agree that openness may partially substitute for a large domestic market. However, they conclude that larger countries are always better off economically in the end.

The second line of empirical research focuses on the so-called ‘Casella effect’ and investigates how the economic gains from enlarging a trade bloc are distributed among its members. Casella (1996) assumes that the economic gains from trade bloc enlargement disproportionately fall on small countries, resulting in a higher trade share. Accordingly, the reasoning that small countries benefit relatively more from market integration is not restricted to the extreme case of moving from autarky to full union membership (or any options in between during the pre-accession phase). Here, the relative enhancement of exports results from a relatively larger market expansion in small countries that reduces the importance of the domestic market. The accession effects of Portugal and Spain on the relative export volumes of the other member states, however, yield mixed results as demonstrated by Casella over the period 1975–1992. Likewise, testing this hypothesis over a longer period of time (1960–1990), Badinger and Breuss (2006) reach the same conclusion that a small country bonus with regards to

trade flows is not empirically verifiable. Nevertheless, they conclude that the Casella effect might coexist with forces favouring large countries that partly neutralize the small country bonus. These forces might include, among others, larger absolute factor endowments, market power, product variety and technological advantages in large countries. On the other hand, Badinger and Breuss (2009) find a small country bonus when examining the trade effects of the Euro members over the period 1994–2005. They conclude that monetary integration has improved the small countries' export performance by 3–9 percent.

Overall, both lines of research deliver very mixed empirical results. Therefore, it is not unambiguous whether the higher economic growth rates of the small EU member states over the last 20 years are induced by their small country size. The article at hand combines the two lines of research as it includes the general idea behind the Casella effect into economic growth regressions of the first line of research. As also the Casella effect relies on the assumption of economic convergence through increased market integration, it is plausible to analyze the effects of country size directly on economic growth instead of investigating relative export ratios. Thus, this article sheds light upon these two lines of arguments from a European integration and economic growth perspective. The creation of the European Single Market in 1993 and the continuous deepening and enlarging of the EU over the last 20 years provide an excellent possibility for empirical research.

The article is structured as follows. The next section reviews the main characteristics of country size and its effects on economic growth both in general terms and in the context of European integration. In Section 3, the article goes on to test whether a process of economic convergence has occurred among the EU members over the last two decades. The detection of economic convergence is important when the expected positive effects of increased European integration on the small and weak countries should hold. Section 4 eventually estimates the effects of country size on economic growth. Some robustness checks are also performed in this section. The final section summarizes and discusses the main findings and implications.

4.2 Overview of Main Theoretical Arguments

4.2.1 Welfare Implications of Country Size

New growth theory suggests that human capital drives innovation (in the form of increased product variety and improved production processes), leading to a rate of technological progress that is able to stimulate productivity growth in the long-run (Romer, 1986; Lucas, 1988). To the extent that country size influences productivity, large countries are able to realize greater economies of scale. In the provision of public goods, for instance, per capita expenditure on these goods usually decreases with the number of taxpayers (Rodrik 1998). Public goods relevant to economic growth and that shape human capital might be public education, research and health care, or the ones that attract foreign investment such as a functioning infrastructure and reliable crime prevention. In fact, Alesina and Wacziarg (1998) show that larger countries have smaller share in government spending over gross domestic product. Moreover, Afonso and Furceri (2010) show that low government spending has a sizeable, positive and statistically significant effect on productivity growth.[36]

To some extent, large countries are also able to better internalize interregional externalities by redirecting the provision of those public goods that involve strong external effects, such as environmental pollution and overfishing of international waters. In the same vein, it is argued that large countries demonstrate a greater ability to provide regional insurance and redistribution of income in the case of exogenous shocks (Alesina and Spolaore, 1997). Additionally, large countries usually have greater military power in absolute terms and, thus, are less subject to foreign aggression (Alesina and Spolaore, 2005). The implied greater international awareness of large countries may also raise their voice in multilateral negotiations, leading to more beneficial outcomes and stronger group ties in international trade talks. Most importantly, however, large countries benefit from increasing returns in the dimension of their markets and can afford to be more closed. Among others, Grossman and Helpman (1991) emphasize the benefits of scale in light of positive externalities in the accumulation of absolute factor

[36] On the other hand, political philosophers from Plato to Montesquieu have argued that governing a small state is more efficient because the government is closer to its citizens (which may have more homogenous preferences in small states) and the public good is more strongly felt. This line of argumentation is also found in a number of studies in Robinson (1960).

endowments and the transmission of knowledge and technology. Thus, larger markets are more likely to achieve higher productivity due to enhanced specialisation in industries with large increasing returns to scale and by raising the intensity of product market competition (Aghion *et al*., 2005).

Small countries, on the other hand, are usually identified with the opposite characteristics. According to Ward (1975), small countries tend to possess a smaller range of skilled labour. This reduces specialization in products with large increasing returns. In the same direction, Milner and Westaway (1993) indicate that foreign investors are rather reluctant to invest in small countries due to limited market opportunities, which prevents knowledge spillovers and technological progress in those countries. If the small country is also restricted in territory, it often faces a scarcity in natural resources, which may affect its diversification possibilities in products and exports (Knox, 1967). Alesina and Spolaore (2003) observe that producers in these countries are confronted with relatively high unit prices, thereby raising the sales prices. A low number of firms also limits competition in the respective industry and further hinders innovative processes (Briguglio, 1998).

Due to the limited domestic market size, significant asymmetry between the patterns of domestic consumption and production arises and leads to a situation in which consumptive and productive processes in small countries are highly dependent upon imports (Kuznets, 1960). Necessarily, these countries must be closely integrated with the international economy and pursue highly open trade regimes (Scitovsky, 1960). In turn, this high level of structural openness and the dependence upon trade combined with an inability to influence international market prices makes small countries more prone to idiosyncratic shocks (Briguglio, 1995). As a consequence, small countries are less likely to experience autonomous self-sustaining productivity growth.[37]

4.2.2 Impact of European Integration on Small Countries

According to Scitovsky (1960, p. 284) ‘international trade and/or economic union can offset the disadvantages of smallness’. By expanding their markets to the EU single market, the initial lack of resources in small countries can be compensated by capital and labour from the EU partner countries. Incentives to invest in and migrate to the

[37] For a detailed view on the determinants of growth in small states see Armstrong and Read (2003).

small member states should increase due to expected higher marginal returns, thereby allowing for optimal allocation of production factors. The freedom of establishment contained in the free movement of persons further promotes capital inflow in the form of foreign direct investments (FDI). Usually, a transfer of technology occurs with FDI leading to growth promoting industrial structures in these countries (De Mello, 1999). The removal of barriers to trade in the single market reduces transaction costs and expands the market size for both consumers and producers. More specifically, the access to a larger market reduces the small countries' dependence upon fewer trade partners and their vulnerability to idiosyncratic shocks. Domestic firms are confronted with more competition and have to produce more efficiently and domestic consumers may benefit from lower consumption prices and larger product variety. In a nutshell, this should result in a higher rise in productivity in small EU member states due to a larger change in relative prices (see, among others, Armstrong and Read, 1998).

Furthermore, a country's international negotiation power generally increases after joining a regional trade agreement (Fernández and Portes, 1998). In case of a small EU country, important benefits should arise from negotiations in the World Trade Organization, as the EU is represented in international trade talks by one Commissioner for Trade. This could result in better trade conditions with third parties outside the EU. Inside the EU, small member states gain special bargaining power as the votes in the EU Council is designed to favour the less populous countries. Although the Lisbon Treaty moves away from the inherent concept of qualified majority voting to a system of double majority voting, the decisions in the Council are usually made unanimously, thereby giving disproportionately large veto power to the numerous small EU countries. Leading examples are the vetoes of Ireland and the Czech Republic in the ratification of the Lisbon Treaty. Small members then may influence European integration policy directly according to their own needs.

If it also happens that the small country consists of many poor regions (with a per capita income of below than 75 percent of the EU average), considerable financial assistance from the EU Cohesion Policy is granted for structural investments to boost economic growth. Moreover, in the case of monetary integration and in light of the recent Euro area debt crisis, there seems to be a tendency that small countries are more likely to be financed by the European Stability Mechanism (ESM) as their need of

financial assistance is usually lower in absolute values. In addition, it is argued that the export-oriented small EU countries gain relatively more from monetary integration when transaction costs are reduced and the internal market is further strengthened (Badinger and Breuss, 2009).

Overall, according to this line of argumentation and under the general assumption that small countries are on average initially weaker than large countries, increased economic integration through EU membership causes a catching-up process of the initially weaker small economies. Consistent with the neoclassical concepts of growth and trade, the small member states are expected to converge economically to the large members along the transition path. The neoclassical growth model developed by Solow (1956) and Swan (1956) implies that the effect of diminishing returns to the accumulation of capital eventually causes economic growth to cease and per worker income to converge. Heckscher-Ohlin trade theory further implies economic convergence processes through increased trade and the equalization of factor prices (Samuelson, 1948). Both theories have in common that the movement of goods, services and production factors has to be completely free and the markets involved need to be highly competitive.

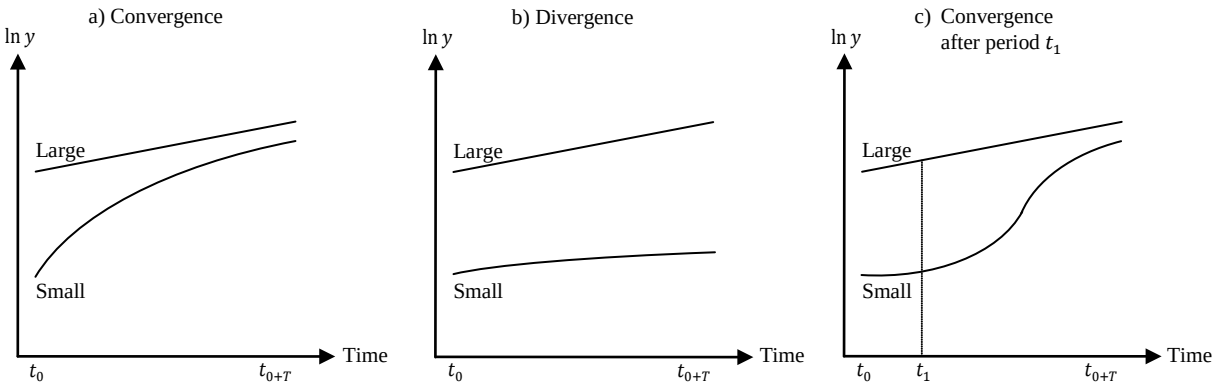

Figure 4.3 Scenarios of the Economic Convergence and Divergence

Source: The diagrams a) and b) are remodelled from Sala-i-Martin (1996). Diagram c) is an own presentation.

As an illustration, diagram a) in Figure 4.3 displays such a convergence process of the natural logarithm of GDP per capita for two (‘small’ and ‘large’) economies over time. It is assumed that the domestic market of the large country remains mostly unaffected by external factors. Thus, its economic growth rate is, on average, constant over time. In congruence with neoclassical growth theory, it could also be assumed that

the large economy has reached the long-run steady state where the economic growth rate is constant by definition. The small economy starts out being poorer than the large economy in period t_o. Because of diminishing returns to capital, the small economy is able to grow economically faster. Thus, the initial dispersion of income steadily decreases as time and economic integration increase (t_{0+T}).

However, the EU single market is far from being complete. Barriers to trade in services still exist. Particularly, the market of financial services (e.g., security trading regulations) is just one prominent example of the so-called politics of competing advocacy coalitions in the EU that restricts the free movement of services (Howarth and Sadeh, 2011). The incompletion of the single market is also reflected in the prevailing differences between *de jure* regulations and *de facto* practices of EU law. This becomes especially apparent in the insufficient national implementation of European public procurement and the ongoing infringement proceedings against member states with regards to competition law (Ohr and König, 2012).

Additionally, given the different cultures and languages in the EU, labour is still very inflexible and intra-European migration is highly unbalanced between the member states. The migration flow is rather one-sided from Eastern to Western Europe (Zimmermann, 2009). Likewise, consumption baskets and investment portfolios of the EU members still contain a larger share of home products and equity (Balta and Delgado, 2009; Pacchioli, 2011). This home bias reduces the efficient allocation of resources among the member states and increases the small member states' vulnerability to exogenous shocks (Furceri and Karras, 2007). Thus, the incompletion of the Single Market could have a larger negative effect on the small countries' productivity, whereas the large countries could compensate those effects with their comparative advantage in absolute factor endowments and their greater ability to make use of economies of scale and internalize external effects. The small member states are then less capable to follow an economic catching-up process.

Moreover, economic divergence can also be explained by endogenous growth theory (Romer, 1986; Lucas, 1988) and the new economic geography model (Krugman, 1991). According to endogenous growth theory, the differences in externalities, human capital, innovation, economies of scale and absolute factor endowments cannot be accumulated by the economically weak countries. Due to the absence of diminishing

returns to capital (in contrast to the neoclassical models), large countries are more competitive and can exploit the removal of market imperfections better than small countries. Then, large countries gain actually more from market integration in relative terms. The same applies in the models of new economic geography, in which spatial concentration of economic activities and reduced transaction costs lead to agglomeration effects that favour the economy whose domestic market is large and efficient. Due to centripetal forces, the large economy attracts a more than proportional share of firms along with capital and labour. Again, the presence of increasing returns in the size of the market implies increasing returns in the size of countries. For the small country, the loss of physical and human capital (i.e., 'brain drain') flattens the economic growth rate. This divergence effect is illustrated by diagram b) in Figure 4.3. Here, the initially poorer small economy grows relatively slower, thereby steadily widening the economic gap between the two economies.

However, according to theory there could be at least one further scenario. The models of new economic geography also state that the divergence process may change to a process of convergence after a certain amount of time (see the 'bell-shaped curve' argument in Tabuchi and Thisse, 2002). Once the migrated workers have reached a certain living standard they are less willing to trade their families and specific amenities against more individual consumption. The attachment of people to their region of origin receives growing importance. Growing urban costs can further motivate remigration tendencies. Remigration from the richer economy transfers skilled labour as well as physical and human capital to the economically weaker economy. Additionally, if the increased capital is not only spent on the consumption of imported goods but encourages domestic investment, the economy is able to achieve high productivity growth rates because of increasing marginal returns. Then, the small country might leave its initial divergence path and moves to a process of economic convergence. This scenario is shown by diagram c) in Figure 4.3. Period t_1 marks the turning point after which convergence is achieved in the long-run.

Allowing for both divergence and convergence effects along the economic development path might provide additional explanation to the mixed empirical results from the above discussed studies. A study whose countries are placed on average to the right of period t_1 is more likely to deliver a negative relation between country size and

economic success than a study whose countries are placed further left, and vice versa. As we will see below, the transition process may not only be interrupted by one but rather by multiple turning points. Therefore, it is important to know whether the countries under investigation are, on average, on a rather diverging, converging or neutral path.

4.3 The Existence of Economic Convergence in the European Union

4.3.1 Concepts of Economic Convergence

First introduced by Barro and Sala-i-Martin (1992), two classical concepts of convergence can be established: σ-convergence and β-convergence. Neoclassical growth theory suggests that economies with access to identical technologies should converge to a common income level. If the dispersion of welfare across economies is actually falling over time, this is called σ-convergence. Within an open and integrated economy such as the European Single Market, access to foreign production factors and larger markets (which enhances the optimum allocation of production factors and removes market size constraints) should further strengthen the presumption of σ-convergence.

As poorer economies usually show higher marginal productivity of capital they should grow faster in the transition to the long-run steady state. If the poorer economies indeed show higher growth rates than the richer ones, there appears to be β-convergence. Unconditional β-convergence occurs when the economic gap between rich and poor economies decreases irrespective of economies' specific characteristics. That is, economic growth relies solely on the initial income level of the economy and is not conditioned on other factors. Conditional β-convergence, on the other hand, occurs when the dispersion of welfare is becoming narrower over time only between economies that are similar in observable characteristics. Convergence in this case is conditional as it also depends on factors other than initial income, for instance on investment and trade policies, institutions or other economy-specific circumstances.

The two classical concepts are related in a way that β-convergence is a necessary condition for σ-convergence. If there is unconditional β-convergence, the cross-sectional variance is able to decrease over time. However, as conditional β-convergence

may lead to multiple (economy or group-specific) equilibriums in the long-run, the variation factor may also increase, leading to overall economic divergence in the long-run. Moreover, an increase in the dispersion of welfare might even be possible in the case of unconditional β-convergence, i.e. when the initial dispersion of welfare is quite large and the average growth rates for the economies are quite similar.[38] Hence, β-convergence is a necessary but not a sufficient condition for σ-convergence. As the two concepts of convergence are related to one another, both concepts are studied and applied empirically in the following sections.

4.3.2 Testing for β-convergence

4.3.2.1 The Case of Unconditional Convergence

Following Baumol (1986), who first documented the existence of unconditional convergence on a sample of 16 industrial nations, unconditional β-convergence is estimated by regressing the average annual growth rate of the log of real labour productivity for economy i over a given period T on the log of real labour productivity in the initial year of the period. The estimated equation then takes the form

$$\left(\frac{1}{T}\right) \times \ln\left(\frac{y_{i,t_{0+T}}}{y_{i,t_0}}\right) = \alpha + \beta \ln\left(y_{i,t_0}\right) + \varepsilon_{i,T} \tag{4.1}$$

where $y_{i,t_{0+T}}$ refers to the value of real GDP per worker in the last year of period T and y_{i,t_0} refers to the value of real GDP per worker in the initial year of the period.[39] The constant α is estimated in all regressions but not reported in the tables. $\varepsilon_{i,T}$ is the error term. According to theory, the β-coefficient should a negative sign as poorer countries are expected to grow faster due to their longer distance to the long-run steady state.

Table 4.1 indeed shows a strong tendency toward unconditional convergence across the EU-27 member states over the period 1993–2012. The first column is estimated as a standard cross-country regression comparable to that of Baumol. The

[38] Consider the following example: two countries have an initial per capita income of €20,000 and €40,000 and a respective average growth rate of 3 and 2 percent. The cross-sectional variance will then actually increase until period 30, despite the higher economic growth rate of the poorer country.

[39] Throughout the paper, we use data on GDP per worker instead of GDP per capita for the measurement of economic growth. Most formal growth models are based on production functions and their implications relate more closely to labour productivity.

estimated effect is significantly different from zero at conventional levels of statistical significance and shows the expected negative sign. It reports a negative β-coefficient of 1.5 percent, implying that an increase in a country's initial income per worker by 1 percent in 1993 reduces its average annual economic growth rate in the following 19 years by 1.5 percent.

Table 4.1 Testing for Unconditional Convergence

Independent Variable	Cross-country	Pooled OLS	Pooled OLS w/ period effects
$\ln(y_{i,t_0})$	-0.015***	-0.018***	-0.016***
	(0.002)	(0.004)	(0.003)
Period effects	-	-	Yes
Adjusted R^2	0.70	0.39	0.53
No. of observations	27	108	108

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors in parentheses are robust to heteroskedasticity and serial correlation (i.e., clustered at the country level). Coefficients (std. err.) for period dummies: -0.008 (0.005) for period 2, -0.004 (0.003) for period 3, and -0.024 (0.005) for period 4. Base period: 1993–1997.

In the second and third column, the number of observations is increased by applying ordinary least squares to a pooled regression of the panel. Using panel data allows capturing within-country variation over time. Similar to the majority of econometric growth studies, the panel is split in five-year periods in order to lessen the issue of serial correlation in the transitory component of the disturbance term. The respective periods are 1993–1997, 1998–2002, 2003–2007 and 2008–2012. The initial level of income per worker and the average growth rate then refer to each period. In both specifications, the β-coefficient is negative and statistically significant and only slightly higher than in the cross-country analysis. The similarity in the coefficients between these specifications is important because using panel data may induce an upward bias in the convergence coefficient in the presence of related business cycles (Caselli *et al*., 1996). The similar results across the three different specifications seem to indicate that this effect is of no concern.

The third column shows the estimated β-coefficient under the assumption of fixed period effects. These period dummies are expected to capture common shocks affecting aggregate production across the board. Including period dummies is important as the structural openness of small countries creates critical risk asymmetry, which could harm economic growth in the case of exogenous shocks. The relatively large and negative

coefficient (standard error) of -0.024 (0.005) for the dummy referring to period 2008–2012 indicates that time effects do matter in the sample and should be considered. Presumably, this time effect is mostly due to the 'Great Recession' and the emerging European debt crisis that negatively affected economic growth in almost all European countries in the last five years. Incorporating period effects, however, seems to have almost no effect on the β-coefficient.

All specifications reported in the table point toward the existence of unconditional convergence. The coefficient of the initial level of income per worker is always negative and statistically highly significant. Depending on the specification, the estimated β-coefficient varies between 1.5 and 1.8 percent. To give a first impression whether country size might be responsible for the convergence effect, column 3 of Table 4.1 has been re-estimated for only the 21 small countries in our sample. As this regression specification allows for within-country variation over time, the estimated coefficient should be larger if the country size is the dominant factor. However, the β-coefficient (standard error) does not increase but slightly decreases to -0.015 (0.004), indicating that the size of a nation might not be relevant here. On the other hand, if only the twelve 'new' EU member states are analyzed (of whom eleven are categorized as small states), the β-coefficient (standard error) increases to -0.025 (0.008), assuming that most of the above shown convergence is found due to the economic transition process of the new members. This argument is explored more closely in the end of this article.

4.3.2.2 The Case of Conditional Convergence

Following the seminal empirical growth study by Mankiw, Romer, and Weil (1992), the neoclassical growth model developed by Solow (1956) and Swan (1956) serves as the reference model to test for conditional β-convergence. Here, the assumption of parameter homogeneity in the estimation of convergence equations is relaxed. Assuming positive and decreasing returns to capital, neoclassical growth theory suggests that the rates of saving and population growth determine the long-run steady state of an economy.[40] As the variables usually vary across economies, this leads to a situation where the economies reach different (individual or group-specific) steady states.

[40] See, for instance, Mankiw *et al.* (1992) and Barro and Sala-i-Martin (1992) for a more detailed discussion and the mathematical implementation into the neoclassical growth model.

Given a standard Cobb-Douglas production by

$$Y = AK^{\alpha}L^{1-\alpha} \qquad 0 < \alpha < 1 \tag{4.2}$$

where Y is output, A the level of technology, K capital, and L labour, the long-run steady state stock of capital per effective unit of labour, k^*, can be derived as

$$k^* = \left(\frac{s}{n + g + \delta}\right)^{1/(1-\alpha)} \tag{4.3}$$

where the steady state capital-labour ratio is related positively to the savings rate s and negatively to the rate of population growth n, the rate of technological progress g and the rate of depreciation δ. Inserting equation (4.3) into the production function (4.2) and taking the natural logarithm, the long-run steady state income per worker i defined as

$$\ln\left(\frac{Y}{L}\right) = \ln(A) + \beta \ln(s) - \beta \ln(n + g + \delta) \tag{4.4}$$

where β equals $\alpha/(1-\alpha)$. As the Solow growth model treats technology as exogenously and equally distributed across the economies, $\ln(A)$ can be treated as constant. This assumption implies that equation (4.4) can serve as our basic empirical model. In order to see whether conditional β-convergence has occurred across the EU member states between 1993 and 2012, equation (4.4) is rewritten as

$$\left(\frac{1}{T}\right) \times \ln\left(\frac{y_{i,t_{0+T}}}{y_{i,t_0}}\right) = \alpha + \beta_1 \ln\left(y_{i,t_0}\right) + \beta_2 \ln\left(s_{i,T}\right) + \beta_3 \ln\left(n_{i,T} + g + \delta\right) + \varepsilon_{i,T} \tag{4.5}$$

It is expected that average economic growth depends negatively on the initial level of income per worker and the sum of population growth, technical progress and capital depreciation and positively on the savings rate. In line with De Long and Summers (1991), the savings rate s is measured as the average share of real equipment investment in real GDP for economy i over period T. By definition, the national current account is then balanced. The population growth rate n is also averaged over period T. The rate of technological progress g and the rate of depreciation δ are assumed to be identical among the economies and take jointly the value 0.05 for each year and economy. This is assumed to be a reasonable assessment of the value of $g + \delta$ (Mankiw *et al.*, 1992; Islam, 1995).

Table 4.2 Testing for Conditional Convergence in the Standard Neoclassical Growth Model

Independent Variable	Cross-country	Pooled OLS	Pooled OLS w/ period effects
$\ln(y_{i,t_0})$	-0.011***	-0.013***	-0.012***
	(0.002)	(0.003)	(0.003)
$\ln(s_{i,T})$	0.207**	0.126***	0.022
	(0.103)	(0.039)	(0.055)
$\ln(n_{i,T}+\delta+g)$	-0.148	-0.339*	-0.565***
	(0.421)	(0.184)	(0.195)
Period effects	-	-	Yes
Adjusted R^2	0.74	0.47	0.56
No. of observations	27	108	108

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors in parentheses are robust to heteroskedasticity and serial correlation. Coefficients (std. err.) for period dummies: -0.008 (0.005) for period 2, -0.003 (0.003) for period 3, and -0.024 (0.006) for period 4. Base period: 1993–1997.

Table 4.2 reports the estimates of conditional β-convergence in the standard neoclassical growth model. Again, a negative coefficient is shown for the initial level of income per worker that remains statistically significant throughout the regression specifications. Hence, conditional β-convergence seems to occur between the EU members. Similar to the case of unconditional convergence, the β-coefficient of initial income per worker is higher (-0.016) if only the new member states were considered in the pooled least squares regression with fixed period effects. The average growth rate of equipment investment shows the expected positive impact on economic growth and is partly statistically significant throughout the regressions. The same holds with the expected negative effect of population growth in combination with the rates of technical progress and depreciation.

An important extension of the neoclassical growth model, first explored empirically by Romer (1990) and Barro (1991), distinguishes human capital from physical capital. It is argued that human capital provides additional explanatory power with respect to economic growth.[41] Identifying an empirically robust correlation between economic growth and human capital, however, turned out to be a difficult endeavour (Krueger and Lindahl, 2001; De la Fuente and Doménech, 2006). In order to give a more complete picture, we test if human capital should serve as an additional regressor to equation (4.5) and if it changes the outcome of conditional convergence. To

[41] See Mankiw *et al*. (1992) and Barro and Sala-i-Martin (2004, chap. 5) for the algebraic derivation.

be in line with former economic growth studies, educational attainment is used as a proxy for human capital – that is, persons with at least upper secondary educational attainment as a percentage share of the total working-age population (15 to 64 years).

Table 4.3 Testing for Conditional Convergence in the Human Capital Augmented Growth Model

Independent Variable	Cross-country	Pooled OLS	Pooled OLS w/ period effects
$\ln(y_{i,t_0})$	-0.012***	-0.014***	-0.013***
	(0.003)	(0.003)	(0.003)
$\ln(s_{i,T})$	0.167	0.120***	0.010
	(0.117)	(0.039)	(0.054)
$\ln(n_{i,T}+\delta+g)$	-0.059	-0.240	-0.450**
	(0.442)	(0.187)	(0.195)
$\ln(EDU_{i,T})$	0.102	0.145***	0.179***
	(0.137)	(0.041)	(0.038)
Period effects	-	-	Yes
Adjusted R^2	0.73	0.49	0.58
No. of observations	27	108	108

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors in parentheses are robust to heteroskedasticity and serial correlation. Coefficients (std. err.) for period dummies: -0.009 (0.005) for period 2, -0.005 (0.003) for period 3, and -0.025 (0.006) for period 4. Base period: 1993–1997.

The estimation results for the human capital augmented growth model are presented in Table 4.3. Human capital seems to affect economic growth in the expected positive manner. In the pooled least squares specifications the coefficient of educational attainment is statistically significant at the 1-percentage level. The coefficient of income per worker remains largely unaffected by this model extension, ranging between 1.2 and 1.4 percent. These numbers are only slightly higher than in the standard neoclassical growth model regressions. In general, there seems to be evidence for β-convergence conditioned on country-specific factors other than the initial level of income per worker.[42] Before turning to population size as a possible explanatory factor, the subsequent section illustrates whether the detected β-convergence has lead to a decrease in the dispersion of welfare across the EU member states.

[42] At this stage of the analysis, country dummies that are designed to control for unobserved country-specific fixed effects are not incorporated into the model. According to Barro (2012), the inclusion of country dummies would lead to an upward bias in the β-convergence rate if the time period considered is relatively short. In the regression specifications shown in Table 4.3, the coefficient (standard error) for the log of initial income per worker would increase to -0.084 (0.012) if country-specific fixed effects were incorporated into the model.

4.3.3 Testing for σ-convergence

The above shown negative correlation between initial income per worker and economic growth does not necessarily imply a reduction in income variation over time as β-convergence is a necessary but not a sufficient condition for σ-convergence. In order to test for σ-convergence, the standard deviation of income per worker is estimated for each year. As it was possible to also identify unconditional β-convergence in the sample, the standard deviation is expected to decline over time. Figure 4.4 shows to which extent there has been σ-convergence across the EU-27 member states between 1993 and 2012.

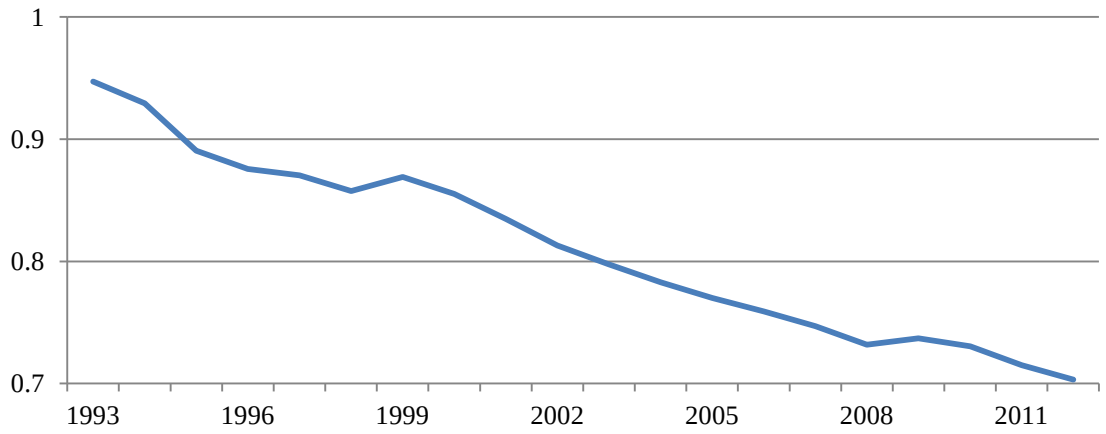

Figure 4.4 Dispersion of Welfare across the EU-27 Member States

Source: Own calculation based on Eurostat data.
Note: The figure shows the unweighted cross-sectional standard deviation of the natural logarithm of real GDP (2005 prices) per worker (15–64 years) from 1993 to 2012.

The decline in the unweighted cross-sectional standard deviation of the log of real GDP per worker illustrates that the dispersion of welfare between the European economies gradually decreases over time. It fell from 0.95 in 1993 to 0.70 in 2012.[43] Only in 1999 and 2009 there appears to be a slight increase in the overall declining path. Altogether, it can be concluded that the β-convergence rate found in the previous section did in fact lead to σ-convergence across the EU member states within the last two decades. The next section investigates whether the size of a nation (i.e., population size) is partly responsible for these growth-enhancing and converging effects.

[43] As the average income in 2012 could be much higher than in 1993, the shown σ-convergence between might even be underestimated. When weighted with the arithmetic mean of the log of real GDP per worker in each year, however, it can be shown that this is not the case here. The dispersion of welfare is reduced by a very similar proportion: it fell from 0.093 in 1993 to 0.067 in 2012.

4.4 The Effects of Population Size in the European Union

4.4.1 Main Results

Based on the assumptions from the previous section, the human capital augmented growth model serves as the baseline model. As the group of small EU member states shows a much higher average annual growth rate over the last 20 years than their larger counterparts and as the members seem to be on a distinct convergence path, population size is expected to have an overall significant negative effect on economic growth.

However, it is shown below that this intuition can only be confirmed when the regression specification does not control for the relevant factors. As the EU is a highly heterogeneous community with tremendous differences in observable and unobservable characteristics, country-specific fixed effects are regarded as the relevant factors that should be controlled for in the regressions. Any unobserved effect becomes part of the error term, which may bias the coefficient results. We will successively approach this argument. Including population size into the baseline model leads to the following equation:

$$\left(\frac{1}{T}\right) \times \ln\left(\frac{y_{i,t_0+T}}{y_{i,t_0}}\right) = \alpha + \beta_1 \ln\left(POP_{i,t_0}\right) + \beta_2 \ln\left(y_{i,t_0}\right) + \beta_3 V1_{i,T} + \varepsilon_{i,T} \tag{4.6}$$

The natural logarithm of population POP_{i,t_0}, our main variable of interest, is measured at the initial year of each period. The initial income per worker is included to check for inconsistent results due to model specifications as it provides large explanatory power with respect to economic growth. Vector $V1_{i,T}$ consists of the remaining variables included in the human capital augmented growth model. Again, five-year periods are used and the estimated standard errors are fully robust to arbitrary heteroskedasticity and serial correlation (i.e., they are clustered at the country level; Wooldridge, 2010).

Column 1 of Table 4.4 shows that the estimated impact of population size on economic growth is significantly different from zero at conventional levels of statistical significance and shows the expected negative sign. The result implies that a country whose population was increased by 1 percent in 1993 reduces its average annual economic growth rate by 0.3 percent. Initial income per worker as well as the control

variables also show the expected signs and are statistically highly significant. Similar results are obtained when the regression specification also controls for period effects as displayed in column 2. At this point, one would be tempted to infer from this result that most of the EU members show relatively higher economic growth rates over the last 20 years due to their small country size.

This interim result is also confirmed by Breuss (2013). Using annual data and fewer control variables (without correcting the standard errors for heteroskedasticity), a statistically significant negative impact of population on economic growth among the EU-27 over the period 1993–2010 is observed. Following this methodology, we reach similar results. The results are not reported here but are available upon request.

Table 4.4 Estimating the Effects of Population on Economic Growth

Independent Variable	Pooled OLS	Pooled OLS w/ period effects	Pooled OLS	Pooled OLS w/ period effects
$\ln(POP_{i,t_0})$	-0.003***	-0.003***	-0.002**	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
$\ln(y_{i,t_0})$	-0.012***	-0.011***	-0.006**	-0.005*
	(0.003)	(0.003)	(0.003)	(0.003)
$\ln(s_{i,T})$	0.126***	0.018	0.059	-0.036
	(0.040)	(0.055)	(0.040)	(0.041)
$\ln(n_{i,T}+\delta+g)$	-0.420**	-0.626***	-0.643***	-0.920***
	(0.202)	(0.209)	(0.212)	(0.244)
$\ln(EDU_{i,T})$	0.190***	0.224***	0.135**	0.190***
	(0.056)	(0.050)	(0.054)	(0.045)
$\ln(OPEN_{i,T})$			-0.130**	-0.190**
			(0.060)	(0.073)
$\ln(PRICE_{i,T})$			0.095**	0.064
			(0.039)	(0.051)
$\ln(GOV_{i,T})$			-0.191**	-0.078
			(0.093)	(0.083)
$\ln(FDI_{i,T})$			0.061**	0.047*
			(0.024)	(0.026)
Period effects	-	Yes	-	Yes
Adjusted R^2	0.53	0.62	0.64	0.71
No. of observations	108	108	108	108

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors in parentheses are robust to heteroskedasticity and serial correlation.

By including more control variables, however, the statistical effect of population on economic growth diminishes. Omitted variable bias can be of serious concern if not all relevant factors are considered. Any omitted variables are lumped into the error term, yielding biased and inconsistent estimates (Wooldridge, 2010). The open-ended capacity of economic growth theory, though, admits a broad number of logical and testable control variables. In fact, the Durlauf *et al*. (2005) survey of empirical growth literature identifies 43 distinct growth theories and a total of 145 significant regressors. Bayesian Model Averaging (BMA) methods may help to tackle the issue of model uncertainty and to identify the most robust growth determinants empirically. The basic idea of BMA is to make inferences based on weighted averages over model space, thereby accounting for model uncertainty in parameter estimates through probabilities within a Bayesian framework. Building on the seminal work of Levine and Renelt (1992) and Sala-i-Martin *et al*. (2004), Moral-Benito (2012a, 2012b) addresses the problem of model uncertainty using BMA explicitly to panel data growth models including country-specific fixed effects. As we apply a very similar model specification in this section, our choice of list of control variables depends on these two studies undertaken by Moral-Benito. In addition to population size, initial income and the regressors in vector $V1_{i,T}$, the following variables are considered as additional control variables: trade openness (imports plus exports as a share of GDP), investment price level (as a proxy for the level of distortions of market prices in the economy), the ratio of government consumption to GDP (as it could lower saving and growth through the distorting effects from taxation or government-expenditure programs), and the role of a secure investment environment (captured by inward stocks of foreign direct investments (FDI)).[44] The additional control variables are combined in vector $V2_{i,T}$.

Column 3 of Table 4.4 illustrates that the additional control variables indeed seem to provide some explanatory power with respect to economic growth. More importantly, the inclusion of more control variables reduces the statistical significance of the

[44] The polity measure in Moral-Benito (as a proxy for a secure investment environment) is exchanged by inward stocks of FDI. We have tested for several polity measures but neither the indices from Freedom House, from the Polity IV Project nor from the Corruption Perceptions Index reveal statistically significant coefficients. Possibly, this is due to the limited variation in index scores among the EU-27 member states and over time. Inward stocks of FDI, on the other hand, show much more variation among the countries and also reflect an economically and politically secure environment.

population effect. This becomes even more prominent when the regression specification also controls for period effects as in column 4.

However, adding more control variables increases the risk of multicollinearity between the independent variables. One possibility to test for multicollinearity is the variance inflation factor (VIF). The square root of the VIF illustrates the increase in standard errors compared to the ideal situation of completely uncorrelated independent variables. The VIF of the independent variables in column 4 ranges from 1.18 to 3.18 and therefore complies with a common rule of thumb that the VIF should not exceed the factor of 10 (O'Brien, 2007). At this stage, multicollinearity seems to be of no concern but an ongoing increase in the amount of control variables may bias the efficiency of well-derived regressors (which could be the reason for the reduced initial income coefficient in columns 3 and 4 of Table 4.4).

Table 4.5 Fixed Effects and Instrumental Variable Estimations

Independent Variable	Fixed effects	Fixed effects	Instrumental variables	Instrumental variables
$\ln(POP_{i,t_0})$	-0.051	-0.029	-0.092	-0.064
	(0.050)	(0.044)	(0.064)	(0.058)
$\ln(y_{i,t_0})$	-0.097***	-0.069***	-0.107***	-0.078***
	(0.019)	(0.016)	(0.020)	(0.018)
$\ln(s_{i,T})$	-0.073*	-0.080**	-0.076**	-0.081***
	(0.040)	(0.032)	(0.037)	(0.029)
$\ln(n_{i,T}+\delta+g)$	-0.625**	-0.826**	-0.615**	-0.803***
	(0.289)	(0.309)	(0.267)	(0.289)
$\ln(EDU_{i,T})$	-0.012	-0.009	-0.006	-0.003
	(0.078)	(0.070)	(0.071)	(0.061)
$\ln(OPEN_{i,T})$		-0.128		-0.120
		(0.088)		(0.083)
$\ln(PRICE_{i,T})$		0.013		0.011
		(0.048)		(0.040)
$\ln(GOV_{i,T})$		-0.055		-0.055
		(0.101)		(0.093)
$\ln(FDI_{i,T})$		0.023		0.022
		(0.029)		(0.027)
Period effects	Yes	Yes	Yes	Yes
Within / centred R^2	0.67	0.70	0.67	0.70
No. of observations	108	108	108	108

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors in parentheses are robust to heteroskedasticity and serial correlation. Population is instrumented by land area and five-year lag of population.

The incorrect treatment of country-specific fixed effects representing differences in technology, tastes or political circumstances gives further rise to omitted variable bias. Instead of expanding the list of control variables and inducing multicollinear tendencies, fixed effects estimations are used to further test the statistical impact of population on economic growth. Columns 1 and 2 of Table 4.5 show the regression results with fixed effects, corresponding to the coefficients of columns 2 and 4 of Table 4.4. Apparently, the statistical significance of population disappears once the model is specified in a way that it controls for country-specific fixed effects. In both regression specifications, country size has no longer a statistical significant impact on economic growth. Above all, it seems that initial income per worker along with the variables of the neoclassical growth model are still the relevant factors in determining growth in the EU over the last 20 years.

4.4.2 Sensitivity Analysis

In order to increase the validity of the results, the possible issue of endogeneity between population and economic growth is taken into account. Endogeneity might appear through simultaneous causation of the two variables. Then, population could not only have an effect on economic growth but workers and their families could have an incentive to move to a country whose economic performance implies favourable employment possibilities, thereby increasing population in that particular country. We address the potential for endogeneity bias by using a country's land area as an instrumental variable, similar to Rose (2006). As a second instrument, the five-year lag of population used. The test statistics presented in Table 4.9 and Table 4.10 in the Appendix indicate that these are valid instruments. The results of the instrumental variables regression with fixed effects are shown in columns 3 and 4 of Table 4.5. The coefficient of population still remains statistically insignificant.

As a further robustness check annual data are used instead of five-year periods. The dependent variable then becomes the actual annual growth rate of per worker income at time t. Accordingly, the issue of endogeneity is becoming larger. Therefore, all independent variables are estimated with lagged values. The second instrumental variable is then lagged by two years. In order to save space, the coefficient results of the two control variable groups are not displayed but are available upon request. Table 4.6

illustrates that in both regression specifications (with and without additional control variables) population remains statistically insignificant. This holds for the fixed effects estimations as well as for the instrumental variables regressions.

The regressions in Table 4.6 have also been estimated with an EU dummy to control for the potential positive effect of the EU membership. The dummy is 0 if the country is not a member of the EU at time t and becomes 1 when the country enters the union. The estimated coefficient is positive and always statistically significant, ceteris paribus, indicating that entry into the EU increases economic growth of the particular country. Thus, the initial underlying assumption of this paper is confirmed as it is shown that countries in general benefit from further market integration. This positive and statistically significant effect is also confirmed by the instrumental variables regressions. On the contrary, the respective dummy controlling for the membership in the economic and monetary union (EMU) yields neither positive nor significant effects on economic growth. Assumingly, this is due to the little change in relative price elasticities in trade between EMU members after the launch of the Euro, as recently demonstrated by Holtemöller and Zeddies (2013).

Table 4.6 Panel Regressions on Annual Basis

Independent Variable	Fixed effects	Fixed effects	Instrumental variables	Instrumental variables
$\ln(POP_{i,t-1})$	-0.088	-0.089	-0.095	-0.096
	(0.082)	(0.071)	(0.079)	(0.068)
$\ln(y_{i,t-1})$	-0.156***	-0.163***	-0.157***	-0.164***
	(0.037)	(0.034)	(0.036)	(0.033)
$EU_{i,t}$	0.016***	0.014**	0.016***	0.014***
	(0.005)	(0.006)	(0.005)	(0.006)
$EWU_{i,t}$	-0.005	-0.004	-0.005	-0.004
	(0.005)	(0.005)	(0.005)	(0.005)
$\ln(V1_{i,t-1})$	Yes	Yes	Yes	Yes
$\ln(V2_{i,t-1})$	-	Yes	-	Yes
Year effects	Yes	Yes	Yes	Yes
Within /centred R^2	0.33	0.34	0.33	0.34
No. of observations	513	513	513	513

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors in parentheses are robust to heteroskedasticity and serial correlation. Population is instrumented by land area and five-year lag of population.

4.4.3 Further Results

The detected statistical insignificance of country size could also be due to the coexistence of forces favouring large countries that partly neutralize the small country bonus (Badinger and Breuss, 2006). It is quite reasonable to believe that the integration effects are more beneficial to a country in the years surrounding its entry date. Then, the small country bonus from the relatively larger market expansion would be diminishing over time. After a certain threshold, the convergence process could even lead to a process of economic divergence due to prevailing market imperfections in the common market. In the case of an incomplete common market, the initial narrowness of the small country size is still existent to some extent, leading to a situation in which the larger countries can compensate for market imperfections relatively better because of increasing returns due to their larger domestic market power.

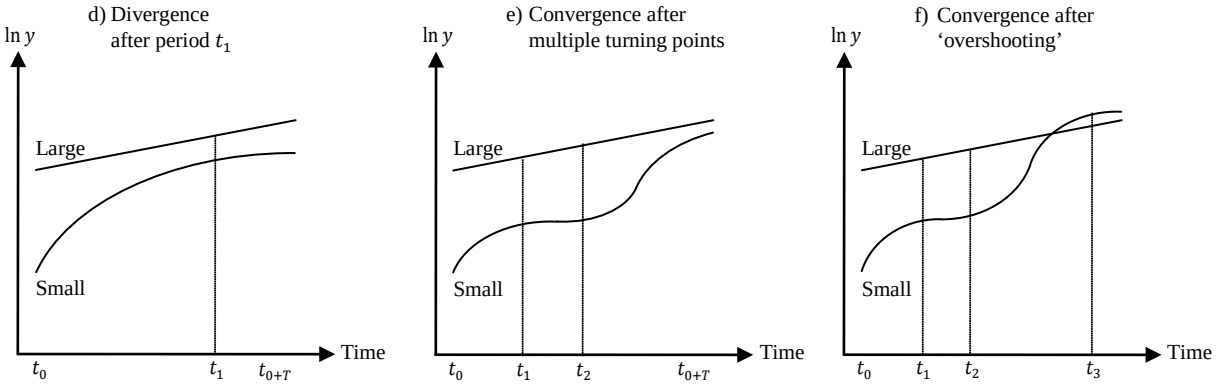

Figure 4.5 Extending the Scenarios of Economic Convergence

Source: Own presentation extending the ideas behind Figure 4.3.

Diagram d) in Figure 4.5 illustrates such an example. This would lead to economic divergence after period t_1 and implies that convergence is not achieved in the end. Depending on which side of the turning point most of the sample countries are placed along the economic growth path, the respective coefficient of population is positive, negative, or insignificant. However, the implied result of economic divergence in the end certainly does not comply with our robust findings of converging incomes among the EU members. In congruence with our empirical results, it is more likely that convergence is achieved in the long-run and that this process is characterized by multiple transitory turning points. Diagram e) combines the two ideas behind the

diagrams c) of Figure 4.3 and d) of Figure 4.5. Several periods of converging and diverging effects mark the long-term convergence process due to different nonlinear stages of economic integration. The length of EU membership then leads the countries closer to the steady state and determines in which part of the long-term convergence process they are located. The significant effect of the length of EU membership on the long-term growth path is confirmed by Crespo-Cuaresma *et al*. (2008).[45]

Splitting our sample into two groups of countries that are expected to be located in different periods along the long-term convergence path should provide some empirical clarity. For this purpose, the 'old' EU members (EU-15) that entered the community before 1996 are combined in one group of countries and the 12 'new' member states that joined the EU in 2004 and 2007 form a second country group. Table 4.7 reveals very interesting results in that regard. Population seems to matter within the two country groups. Whereas the new members now state that being small is beneficial, the old members show the opposite result. Among the EU-15, the large and not the small countries seem to benefit economically. The same substantive results are obtained when adding the control variables of vector $V2_{i,t-1}$ and when using five-year periods instead of annual data. As both groups show statistically significant results throughout the regressions, the larger population coefficient of the new members could explain why population turned out to be negative and statistically insignificant in the regressions on all member states together. It is reasonable to believe that the two country groups are simply at different points of economic integration and the effects may outweigh each other. The differences in magnitude and significance of the coefficients of population between the old and new member states also imply that the effect of country size on economic growth seems to decrease as market integration increases.

That the EU-15 members reveal positive population coefficients and the new members negative ones tends to confirm the hypothesis that the EU-27 is characterized by a long-term convergence process with multiple turning points. The estimation results from Table 4.7 then display only small excerpts of this process. In Diagram e) the new members would lie somewhere between t_0 and t_1 and the old members between t_1 and t_2. Given the longer membership of the EU-15 countries and their experienced integration effects, they should be placed closer to the steady state and to the right of the

[45] Diagram f) of Figure 4.5 is explained further below.

new member states. In fact, the data show much higher average per worker income levels for the small EU-15 countries (being roughly €62,000) than for the small new member states (being €17,000) in 2012.

Table 4.7 Population Effects on Economic Growth for Country Groups

	EU-15		New members	
Independent Variable	FE	IV	FE	IV
$\ln(POP_{i,t-1})$	0.215*	0.219**	-0.325**	-0.336***
	(0.110)	(0.102)	(0.120)	(0.109)
$\ln(y_{i,t-1})$	-0.203***	-0.203***	-0.289***	-0.291***
	(0.060)	(0.055)	(0.072)	(0.065)
$\ln(V1_{i,t-1})$	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Within /centred R^2	0.44	0.44	0.41	0.41
No. of observations	285	285	228	228

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard errors in parentheses are robust to heteroskedasticity and serial correlation.

However, as the regressions of both country groups yield also negative coefficients of income per worker (i.e., economic convergence), it is less plausible to believe that the EU-15 countries are on a temporary divergence path between t_1 and t_2. As the population coefficient indicates that the large EU-15 countries are on a catching-up process to the small countries, it is more likely that the small EU-15 countries have exceeded the average per worker income level of their larger counterparts in the light of increased economic integration. The data confirm this assumption. In 1993, the average income per worker was higher in the large EU-15 countries, whereas in 2012 the average income level of the small EU-15 countries is higher. The small EU-15 countries are thus placed above their larger counterparts, however, with a less steep growth path, resulting in convergence in the end. Diagram f) in Figure 4.5 illustrates such a case. The convergence process then restarts after t_3, where over- and undershooting the common convergence path (e.g., due to fluctuations in the investment levels) could be a natural process along the long-run steady state of the EU member states.

4.5 Conclusions

It is shown that β-convergence as well as σ-convergence exists among the EU-27 member states since the creation of the EU single market in 1993. Not only do our results show that the countries with lower initial incomes grow faster than the more advanced countries, the estimates also imply that the EU members' income levels seem to converge in the long-run. It is further shown that, ceteris paribus, without controlling for country-specific fixed effects, the size of a country negatively affects its economic growth rate. This result would confirm the initial intuition that EU membership and access to the large internal market provides an effective means of evading the penalties of smallness.

However, this effect diminishes once more control variables are included into the regressions. The effect even turns out to be statistically insignificant after controlling for country-specific fixed effects. Here, only initial income and the standard variables of neoclassical growth theory seem to matter for the economic transition process of the EU member states. The robustness of this result is confirmed by estimating instrumental variable regressions to deal with the issue of endogeneity and by using annual data instead of five-year periods. Additionally, the annual panel data regressions detect a positive impact of a country's EU membership on its economic growth rate. This confirms the general assumption that increased market integration reveals positive effects on economic productivity. A similar effect of monetary integration through the launch of EMU, however, cannot be confirmed.

Moreover, it is argued that the insignificant impact of population on economic growth in the fixed-effects estimations may be due to the fact that the EU members show different integration levels and that each level is characterized by different growth effects according to multiple transitory turning points on the long-term convergence path. Then, the different durations of EU membership of the 27 countries distort the detection of the positive accession effects on the economic growth rate of the small EU members if all EU-27 countries are investigated by only one regression. When splitting the countries into two groups of 'old' and 'new' members, country size remains to be statistically significant even after controlling for country-specific fixed effects, additional control variables and endogeneity issues. As the old member states show a positive impact of country size on growth the new members a negative one, it can be

assumed that the small countries indeed benefit from the relative enlargement of their markets and are placed further left in diagram e) and f) of Figure 4.5. The older small members would then lie further to the right of the new members within a stage of integration, where market imperfections inherent in the EU Single Market offset their long ago positive accession effects. At this stage of economic integration, the large countries' ability to exploit more economies of scale due to their larger domestic markets gives them a temporary bonus.

Whether the results obtained from the very last section are robust and display the 'true' convergence process of the EU-27 must be left for future research. If this is the case, only further integration steps such as the elimination of all barriers to trade or extensive reduction in the home bias effect would induce another small country bonus, eventually leading to a *de jure* and *de facto* completed common market, where the size of a country becomes less relevant for its economic success and volatility. This finding would lead to important policy implications as further completion of the EU Single Market should be at the forefront of the future European integration process – especially with regard to the large and increasing number of small EU member states.

4.6 Appendix

Table 4.8 Data Description and Sources

Variable	Description	Source
$\left(\frac{1}{T}\right) \times \ln\left(\frac{y_{i,t_{0+T}}}{y_{i,t_0}}\right)$	Average annual growth rate of income per worker for economy i over period T.	Eurostat http://epp.eurostat.ec.europa.eu
$\ln(y_{i,t_0})$	Initial income per worker. Measured as the natural logarithm of real GDP (chain weighted 2005 prices) per worker (age 15–64). In the simple cross-country regressions, initial income refers to 1993. In the five-year pooled regressions, initial income refers to 1993, 1998, 2003, and 2008. In the panel regressions with annual data, initial income and all other independent variables are lagged by one year.	Eurostat
$\ln(s_{i,T})$	Savings rate. Measured as the natural logarithm of the average share of real equipment investment in real GDP for economy i over period T.	Eurostat
$\ln(n_{i,T} + \delta + g)$	Sum of the rates of population growth, capital depreciation and technological progress. The rates of technological progress and depreciation take jointly the value 0.05 for each year and country (see Mankiw *et al*., 1992 and Islam, 1995).	Eurostat
$\ln(POP_{i,t_0})$	Natural logarithm of population on 1 January of each year or period.	Eurostat
$\ln(EDU_{i,T})$	Persons with upper secondary or tertiary education attainment per working age population (age 15–64).	Eurostat
$\ln(OPEN_{i,T})$	Openness in trade. Measured as the natural logarithm of the average share of the sum of exports and imports of total trade in goods and services in real GDP.	Eurostat
$\ln(PRICE_{i,T})$	Price level of investment (price level of capital formation, price level of US-GDP in 2005=1).	Penn World Table http://www.ggdc.net/pwt
$\ln(GOV_{i,T})$	Total government expenditure as a percentage of GDP.	Eurostat
$\ln(FDI_{i,T})$	Stocks of inward foreign direct investments (FDI) as a percentage of GDP.	OECD, UNCTAD http://stats.oecd.org http://unctadstat.unctad.org

Source: Own presentation.

Table 4.9 Test Statistics for Instrumental Variable Estimations with Fixed Effects

Test	Description	Five-year data regression	Annual data regression
Instrumented variable	Population		
Excluded instruments	Lag of population; land area		
Underidentification test	Kleibergen-Paap rk LM statistic	p = 0.02	p = 0.01
Weak identification test	Cragg-Donald Wald F statistic	110.15	4.7e+04
	Kleibergen-Paap Wald rk F statistic	68.66	2.5e+04
Weak-instrument inference	Anderson-Rubin-Wald test	p = 0.23	p = 0.47
	Stock-Wright LM S statistic	p = 0.16	p = 0.45
Overidentification test	Hansen J statistic	p = 0.52	p = 0.68
Endogeneity test	'endog' option	p = 0.04	p = 0.12

Notes: Statistics are robust to heteroskedasticity and serial correlation (clustering on countries). The dependent variable is the real GDP per worker annual growth rate. The independent variables are population, initial income, vector *V1* and time dummies.

Table 4.10 Test Statistics for Instrumental Variable Estimations with Fixed Effects and V2 Variables

Test	Description	Five-year data regression	Annual data regression
Instrumented variable	Population		
Excluded instruments	Lag of population; land area		
Underidentification test	Kleibergen-Paap rk LM statistic	p = 0.02	p = 0.01
Weak identification test	Cragg-Donald Wald F statistic	103.66	4.5e+04
	Kleibergen-Paap Wald rk F statistic	82.74	1.7e+04
Weak-instrument inference	Anderson-Rubin-Wald test	p = 0.56	p = 0.39
	Stock-Wright LM S statistic	p = 0.47	p = 0.37
Overidentification test	Hansen J statistic	p = 0.93	p = 0.70
Endogeneity test	'endog' option	p = 0.24	p = 0.20

Notes: Statistics are robust to heteroskedasticity and serial correlation (clustering on countries). The dependent variable is the real GDP per worker annual growth rate. The independent variables are population, initial income, vectors *V1* and *V2* and time dummies. The complete set of estimated instrumental variable regressions is available upon request.

5 Concluding Remarks

Over the past decades, the European economic integration process has generated remarkable and far reaching achievements. Among them, the most notable are the creation of a common market with four fundamental freedoms and the establishment of an economic and monetary union with a single currency and monetary policy. In addition to the progressive deepening of the integration process, the number of member states of the EU and EMU has accelerated tremendously in recent years.

However, the integration strategy of gradual and simultaneous deepening and widening bears significant risks with respect to the current and future functioning of the community. According to Ohr (2003b), there exists a 'conflict of aims' between the optimal number of member states and the allocation of prerogatives to the supranational level. It is argued that there is one simultaneous optimum of the two integration aims for each specific policy area and for the overall European integration level. Beyond this optimum, one has to either reduce the number of member states or withdraw some of the allocated competences from the supranational level. One possibility of transferring this optimum to a higher integration level is to reduce the costs associated with integration – that is, increasing the homogeneity of current integration levels among the member states. Hence, in evaluating the European economic integration process, it is fundamental to detect the exact degree of integration for each member state with respect to overall integration and the underlying dimensions. Economic research on this specific and important topic, however, is rather limited.

Therefore, the aim of the first analysis presented in this dissertation was to unveil the extent of the members' European economic integration level in certain years as well as the development of their integration (or disintegration) over time. A novel integration index – the EU Index – was developed for this purpose. Special focus was given on the incorporation of the most relevant spheres and indicators of European integration and

the use of adequate statistical procedures (i.e., principal component analysis and cluster analysis) and robustness tests.

In analyzing 25 indicators over the period 1999–2010 for the EU-15 countries (without Luxembourg), the EU Index revealed very interesting findings. Large differences in the country's integration efforts and capabilities were identified. This concerns especially the difference in index scores between a 'core group' of countries (led by Germany and Austria) and the group of EMU-outs as well as the GIPS. By performing a cluster analysis, these groupings are confirmed according to the small distances within each group and the large distances between them.

Investigation of the development of European economic integration over time further confirmed a strong and even growing clustering of the member states. From this follows that a 'multi-speed Europe' rather than the often cited 'two-speed Europe' is determining the current integration process. This is of particular concern as it challenges present and future steps of integration – especially in the light of the EU's aim to build 'an ever closer union'.

The policy implication that can be derived from this analysis implies the necessity of providing and making use of flexible European integration strategies. Flexible integration would enhance the probability that only those member states are engaged with deeper integration whose degrees of homogeneity are well suited for sharing a certain policy area or public good. The less homogeneous countries, then, are not negatively affecting the efficiency in this field and may enter the more integrated group of countries once they meet certain criteria.

Through the concept of 'enhanced cooperation' the EU is already providing such a strategy. As laid down in Article 20 of the Treaty on European Union (TEU), a minimum of nine member states must be involved in the cooperation and it has to remain open to any other country. As participation among the member states is voluntary it is likely that only those countries join the group that share common interests, thereby enhancing mutual agreement on specific aims within this group. Countries that refrain from joining the group in the beginning may become integrated at a later stage of progress when desired. Recently, the concept of enhanced cooperation gained increasing interest and it is approved for a common financial transaction tax. However, so far this form of cooperation has hardly been used. Therefore, further action

is needed in that regard to enhance the flexibility of the European integration process. One has to keep in mind, though, that flexible integration also includes the risk of temporarily widening the integration gap between some of the member states. Nonetheless, in such a case at least the success of the cooperating countries is not put at risk, as opposed to the situation when all members – homogeneous and heterogeneous alike – are trying to simultaneously pursue a certain goal.

The EU Index has revealed this necessity by showing large discrepancies between the integration efforts and capabilities of the member states. One other major benefit of the index is that it captures the countries' level of European economic integration across four sub-indices. Investigating the sub-indices has the advantage of highlighting those dimensions that need particular integration efforts. Current disparities between the members occur particularly in the economic homogeneity dimension and in the single market dimension. Another policy implication is therefore to provide more incentives for the countries to raise their degree of integration in some of the dimensions. For the homogeneity dimension, the recently invented 'fiscal compact' might become such a tool. For the single market dimension, further improvement in the countries' international competitiveness and in the definite completion of the single market is needed. The EU's growth strategy 'Europe 2020' as well as the 'Single Market Act I and II' are considered as steps moving to the right direction.

As a result of the EU Index, the degree of European integration is numerically tangible for each investigated country over a longer time frame. Thus, the index and its sub-indices have established a sound statistical basis for future empirical work. One of the former leading political scientists, Ernst B. Haas (1970, p. 622) once famously wrote that 'we need a dependent variable' in order to analyze European integration more accurately. Apparently, the EU Index sheds some light on this desire.

Hence, in chapter 3 the EU Index was used in an empirical assessment. According to the EU's aim of raising the quality of life of its people, the study investigated whether the European citizens had become more or less satisfied with life due to increased European economic integration. As the EU Index provides national integration levels over time, it was possible to conduct 'between' as well as 'within' country comparisons, thereby increasing the explanatory power of the analysis. In accordance with the theoretical and empirical literature about happiness and (global) economic integration,

several hypotheses were derived for the specific case of European integration. These hypotheses were tested in applying rich micro and macro data. The empirical strategy developed for this purpose consisted of ordered logit, linear OLS and two-stage OLS estimations. The regression results eventually showed that a country's overall level of integration has a statistically significant positive effect on reported life satisfaction. The same was exposed for a country's increase in single market activities as well as for its level of economic homogeneity with the other member states. Among the investigated dimensions, the single market showed the largest marginal impact.

Another estimation result was the calculation of a hypothetic compensation of life satisfaction losses. It was estimated that the negative effect of a 1-percentage point increase in the unemployment rate, for instance, could be compensated for by a 2-point increase in a country's single market transactions, *ceteris paribus*. This hypothetic compensation of life satisfaction losses underlines the importance of a well-functioning single market. The policy implication derived from this effect, therefore, implies that realizing the full potential of the single market and its fundamental freedoms should stay at the forefront of European integration policies. Given the omnipresent discussion of the euro area crisis and the role of EMU in public policy, raising awareness of the importance of the common market is a difficult but essential endeavour.

Moreover, it was estimated that the member states' compliance with EU law and their symmetry of business cycles have (almost) no significant effects on the people's reported well-being. As the symmetry of business cycles is regarded as a sufficient condition for an effective common monetary and exchange rate policy in EMU, this result implies that, at least in times of modest macroeconomic fluctuations, other factors such as the level of homogeneity need to be emphasized. The positive impact of economic homogeneity between the member states on reported life satisfaction underlines that European citizens do care about their relative situation in the EU. This gives evidence for high inequality aversion and implies, as a policy implication, that the disparities in economic conditions between the member states should be further reduced. Supply-driven policy, for instance, would ask for further improvements in the members' international competitiveness; demand-driven policy rather takes this finding as a normative rationale for redistributive action, which could involve, among others, larger financial assistance to poorer European regions via the EU cohesion policy.

In chapter 4, the more traditional indicator of well-being – the (change in) real GDP per capita – was used as the dependent variable. In an empirical investigation of the EU-27 countries over the period 1993–2012, the effects of country size and economic integration on the members' economic growth rates and their convergence path were estimated. Economic theory suggests that small countries are generally considered to rely heavily on fragile domestic markets. It is further argued that the access to a larger market (such as the EU single market) provides an effective means of evading the penalties of smallness. Thus, it was also tested whether economic growth and a possible long-term convergence path depend on increased economic integration.

Both effects were confirmed in the analysis. The members' income levels are indeed converging in the long-run due to higher growth rates in those countries that possessed lower initial incomes per capita. It was further shown that, *ceteris paribus*, the size of a country negatively affects its economic growth rate. However, this effect diminishes once important control variables were included into the regressions. Furthermore, by using more appropriate panel estimation strategies that take unobserved heterogeneity (fixed effects estimations) and endogeneity issues (instrumental variable estimations) into account, this effect even turned out to be statistically insignificant. Only initial income, the standard variables of neoclassical growth theory and a country's membership in the EU seemed to matter for economic growth. A significant impact of a country's membership in EMU was not confirmed.

By splitting the sample into groups of 'old' and 'new' member states, however, the regression coefficients of country size then became statistically significant. As the population coefficients of both groups showed opposite signs, it is assumed that the small member states benefit relatively more from market enlargement than the large countries. It was further shown that in the case of market imperfections inherent in the common market, the large countries benefit more as they are able to exploit greater economies of scale due to their larger domestic markets. The results further suggest that the long-term convergence path in the EU-27 is characterized by multiple transitory turning points. The analysis revealed that the definite elimination of all barriers to trade and factor movements would generate another small country bonus. Thus, the main policy implication derived from this chapter is that – again – further completion of the EU single market should stay at the forefront of the future European economic

integration process. This is of particular concern given the large and still increasing number of small countries in the EU.

This dissertation has envisaged a novel approach in measuring European economic integration and its effects on the economic performance of the EU member states. As the EU Index currently captures the EU-15 countries, further research could include to widen the scope of the index to all current (and maybe candidate) countries of the EU. This could clarify whether the 'new' EU member states are in fact less integrated into the community or whether some of them show already higher integration levels than some of the 'old' member states. This could also be of interest when considering the analysis undertaken in chapter 4. There, it was implicitly argued with an EU dummy that the 'old' member states show higher average GDP per capita also due to their longer membership in the EU. With an updated and expanded index, this hypothesis could be further tested.[46]

Currently, the members of the EU and EMU face difficult and demanding times due to the 'global recession' and the successive euro area crisis. Recent efforts of the community point at further deepening the integration process in allocating important policies to the supranational level. The 'Fiscal Compact' and the 'Banking Union' are some prominent examples. Continuous deepening of the EU could lead to a loss of support among the European citizens (or even to a loss of democratic legitimacy). The likeliness of this effect could be tested in an empirical assessment analogue to chapter 3, as the Standard Eurobarometer Series also asks the European citizens if they are satisfied with the work of the EU and its institutions. Furthermore, this urges the question on whether the people believe their country has benefitted from the EU membership. It could then be tested if the EU Index (or an extended version) as well as its sub-indices have a sizeable effect in that regard.

Ever since the existence of the EU, the pursuit of an 'ever closer union' is the main political idea behind the European integration process. However, the detected increasing heterogeneity between the member states puts this endeavour at risk. In order to make efficient policy decisions on how to continue with the European way, measuring European economic integration will remain an inevitable task.

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[46] There is a concrete plan to further update and expand the EU Index. More information is given at www.eu-index.org.

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Eidesstattliche Erklärung

Ich versichere an Eides statt, dass ich die eingereichte Dissertation „Measuring European Economic Integration“ selbständig verfasst habe. Anderer als der von mir angegebenen Hilfsmittel und Schriften habe ich mich nicht bedient. Alle wörtlich oder sinngemäß den Schriften anderer Autorinnen und/oder Autoren entnommenen Stellen habe ich kenntlich gemacht.

Göttingen, 13. März 2014