



Measuring Economic and Institutional Integration

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1. Introduction

A quantitative assessment of the level of integration among geographic units (such as regions, states or countries) is of interest to a wide range of audiences. Policy-makers, for instance, may want to identify barriers to cross-regional interaction. José Manuel Barroso (2009, p. 28), the then President of the European Commission, provides an illustrative example; in the political guidelines for his second term as the head of the Commission he notes: “I intend to launch a major analysis of the ‘missing links’ in the internal market, to find out why it has not delivered on its full potential and thereby to identify new sources of growth and social cohesion.” Five years later, but still along similar lines, the European Commission (2013, p. 4) argues: “Today, during the crisis, it is more necessary than ever to address where the single market does not yet function as it should to the benefits of citizens and businesses.”

For economists, the measurement of integration is of particular importance when quantifying the gains from exchange. Any reasonable assessment of the consequences of a removal of barriers to trade requires measures (observed or constructed) that allow a comparison of different states of integration. As a result, empirical findings may be sensitive to the exact definition of measures of integration. Rodriguez and Rodrik (2001), for instance, highlight the relevance of measurement issues in an article which has become an instant classic; in a critical review of empirical analyses of the effect of trade openness on economic growth, they illustrate the difficulties in quantifying a country’s openness to trade.

In this chapter, we review the process of European integration in the post-World War II period and discuss issues related to the measurement of economic and institutional integration. Starting from the observation that the quantitative assessment of the level of integration is a non-trivial task, in Section 2 we highlight the challenges involved in the quantification from a European perspective. In Section 3, we review a selection of available indicators of European integration in more detail. A brief summary concludes the chapter.

2. Challenges

European integration has always been a process involving periodic stops and leaps. Measures towards further integration were taken and implemented at irregular intervals. The underlying decisions were often driven by hard-to-build political consensus and shaped by circumstances. As a consequence, integration has followed a path not necessarily aiming at gradual improvement and not always following economic logic. Examples include the discussions of monetary union, which first occurred in the late 1960s but was not implemented before the late 1990s, and the formation of a banking union only in response to the euro area crisis some ten years later.ⁱ

In view of these nonlinear developments, it may be particularly useful to summarize and document the progress of European integration with a single quantitative indicator. In the European context, however, the quantitative assessment of the level of integration is further complicated by two features: the various qualitative dimensions of integration and the geographic expansion of the integration area. We will discuss each of these features in turn.

Dimensions of integration

Empirical analyses that aim to analyze the effects of institutional integration have often used the simplest possible measure, a plain binary dummy variable that differentiates between participants and non-participants of a particular integration scheme. Based on this indicator

variable, the level of integration can then be assessed by examining relevant economic data (such as, for instance, cross-border trade or pair-wise differentials in the price level). However, while this approach may work well in a setting with only one single integration scheme, it becomes increasingly problematic when the integration measures taken differ across arrangements and/or over time.

To address these issues, various extensions have been proposed in the literature. An obvious solution is to replace the single integration dummy with separate dummies for different integration arrangements; see, for example, Frankel's (1997) analysis of regional trading blocs for an application of this procedure which comes at the cost of limited generalizability.ⁱⁱ Baier, Bergstrand and Feng (2014) provide a more general approach. Instead of differentiating between individual arrangements, they analyze different types of economic integration arrangements. Specifically, they distinguish between one-way preferential trade agreements, two-way preferential trade agreements, free trade agreements, customs unions, common markets, and economic unions. However, there may be still considerable heterogeneity in the coverage of issues even within a single type of economic integration arrangements, such as free trade agreements, as emphasized by Horn, Mavroidis and Sapir (2010) and Kohl (2013), among others. To highlight and capture these differences, they examine in detail the policy areas that are covered by individual agreements and code the content of these agreements. Kohl (2013), for instance, reviews 296 free trade agreements and finds that almost all agreements contain provisions on export and import restrictions, anti-dumping measures and customs administration, while environmental issues are covered in less than one third of the sample and labour policies are regulated in just one out of six agreements.

While a quantification of the level of integration based on categorical variables is already difficult for integration initiatives pursued along a single dimension (such as trade liberalization), it can be close to impossible to capture the effects of wider forms of integration which occasionally span a wide range of policy domains. European integration provides a notable example. A hard-to-predict historical process during which a core of neighboring countries with a long shared political, social, and economic history agrees to deepen their integration is difficult to model based on (ordered-)categorical variables alone. However, even continuous measures are unlikely to capture the full extent of European integration. For instance, a non-categorical indicator of trade integration, such as within-area trade intensity, may be appropriate to illustrate the effects of a gradual removal of formal and informal barriers to trade, but fails to capture other, potentially more relevant, areas of integration, such as a harmonization of structural, fiscal, and monetary policies.

Geographic expansion

For a proper assessment of the effects of preferential integration (where a selection of partners is treated favorably relative to others who stay outside), it is essential to define a benchmark area, where none of the analyzed integration measures are taken, to which developments in the integration area can then be compared. Ideally, this benchmark area shares with the integration area as many other characteristics as possible to avoid potential misspecifications, such as omitted variables bias. The proper selection of the control group is critical, given that observed differences in the patterns of development across areas may be explained by many factors other than integration, and it may be difficult (if not impossible) to control for all these factors in an econometric model.ⁱⁱⁱ

In the case of European integration, a natural starting point for the selection of a comparison group of countries may be other European countries that did not participate in the (institutional) process of European integration. However, such countries are rare. A number of

countries joined the European Union along the way towards further integration; the number of member countries of the European Union increased from six founding members in 1957 to 28 member countries in 2014. Other countries participated indirectly in European integration; examples include the establishment of the European Economic Area which allow member states of the European Free Trade Area to participate in the European Union's internal market in 1994 and the bilateral agreements between the European Union and Switzerland. In sum, the variation in the geographic expansion of the integration area, with a gradual enlargement of the European Union and a corresponding decrease in the number of countries which did not participate in the process of integration, makes a long-run comparison difficult.

3. Selected Measures

Despite these conceptual challenges, there have been a number of attempts to quantify the level of European integration. Before we discuss a selection of measures in more detail, it may be useful to provide a taxonomy of the various approaches. While integration indicators can probably be organized along many dimensions, two features seem to be particularly relevant. A first possible categorization differentiates between *de jure* and *de facto* measures.^{iv} *De jure* measures of integration refer to legal arrangements, such as Kohl's (2013) analysis of the content of trade agreements; *de facto* measures, in contrast, determine the level of integration based on actual data, such as trade flows adjusted for country characteristics as a measure of trade liberalization. While both measures can be expected to be correlated (at least in the long term), there are often sizable differences. For instance, the European Commission typically reports considerable delays in the implementation of integration measures related to the Single Market legislation by individual member countries.^v Another reasonable categorization groups indicators into single measures and composite indices. Single measures explore one specific aspect of integration (and often draw on a single statistic), such as cross-border migration as a fraction of a country's total population; summary measures, in contrast, provide an aggregation of various indicators (occasionally even comprising information from many different areas). Table 1 provides a tabulation of selected individual measures of economic and institutional integration.

Trade

Many attempts to quantify the extent of European integration focus on one particular aspect of cross-border activities, trade. This focus seems to be motivated, among others, by the European Union's initial emphasis on trade integration, with the completion of a customs union on 1 July 1968; early analyses of European integration therefore examine specifically, almost by definition, the progress in this area.^{vi} Another plausible rationale for the particularly strong interest in trade is that, both conceptually and practically, integration schemes tend to start with a removal of barriers to trade. The European Union may then provide a reasonable example for studying the measurement of the effects of integration. Finally, data on cross-border trade transactions are readily available, allowing a relatively easy, straight-forward assessment of the *de facto* level of integration.^{vii}

The analysis of trade integration further benefits from the fact that the methodological challenges seem to be manageable. A *de jure* analysis may focus on legal barriers to trade, such as the level of tariffs. When most of the easily identifiable restrictions have been formally removed, however, probably more complex measures have to be constructed. For a *de facto* analysis, actual patterns of trade can be analyzed which are often compared to some relevant benchmark. For instance, an obvious measure is the ratio of trade within the

integration area (that is, exports, imports or the aggregate of both) to the total external trade of the respective member countries. An alternative indicator is a measure of trade intensity, calculated as the ratio of the intra-area trade share to the share of world trade with the integration area, where index values above one indicate that trade within the integration area is larger than expected given the importance of the area in world trade.

Still, the most prominent and by now widely-used empirical approach to assessing biases in empirical patterns of trade, including possible deviations from the benchmark level due to institutional integration, is the application of the gravity model of trade. Building on the analogy of Newton's law of universal gravitation, the gravity equation states that the volume of trade between any pair of countries is directly proportional to the (product of the) size of these countries and the distance between them. Since this framework is, even in its simplest form, extremely successful empirically, it provides a reasonable counterfactual to which actual cross-border trade within an integration scheme can be compared. Specifically, a binary dummy variable is typically added to the gravity equation to capture any measurable differences in the patterns of trade within and outside the integration area.

Numerous studies have applied variants of the gravity model to analyze the trade effects of European integration. Often, the results turn out to be somewhat weak, with statistically significant but moderate effects; see, for instance, Frankel (1997). However, as interests have gradually shifted away from the estimation of simple integration effects, early estimates of the trade effect of European integration, such as Frankel's results, are hardly any more comparable with more recent findings from gravity estimates.^{viii} For one thing, the estimation of the gravity model has become much more sophisticated over the last few years. For instance, standard practices involve the derivation and estimation of theory-consistent specifications of the gravity equation.^{ix} Baldwin (2006) provides an extensive discussion of potential pitfalls in the estimation of gravity models; see also De Benedictis and Taglioni (2011) for some interesting (historical) background on the gravity approach. Head and Mayer (2015) carefully analyze best-practice methods in the application of gravity equations.

Another extension is to supplement the estimation of simple (time-invariant) average effects with more flexible approaches in which integration effects are allowed to vary over time. These approaches not only highlight the speed of adjustment in patterns of trade after the implementation of liberalization measures; they also allow identifying possible anticipation effects. In practice, time-varying integration effects are often identified by estimating cross-section equations for individual years. Alternatively, pooled estimation may be applied to panel data, thereby jointly estimating year-specific integration effects. For European integration, it has become commonplace to focus on individual (and clearly identifiable) steps towards further integration (such as the single market initiative or the introduction of the euro) and then to estimate separate effects.

With a greater availability of micro data sets in recent years (containing information on patterns of trade at finely disaggregated industry level, at the firm level, or even at the level of the individual trade transaction), there has also been a growing interest in new dimensions of trade integration. An obvious starting point is to simply replicate analyses examining aggregate trade for separate industries or product groups and then aiming to explain observed differences in trade integration. Flam and Nordström (2003), for instance, find particularly strong effects of the euro for differentiated products (relative to homogeneous or standardized products). Later studies focus on the effects of integration on the number of firms active in international trade, the number of traded product varieties, or the number of markets served (in short, the extensive margins) and differentiate these effects from a plain extension of an

already existing trade relationship (that is, the intensive margin); see, among others, Nitsch and Pisu (2008).

Foreign Direct Investment

In principle, it seems reasonable to augment the results on trade integration with evidence on foreign direct investment, potentially even applying similar techniques of analysis. In practice, however, there are various reasons why this exercise is more complicated than the analysis of patterns in trade. An obvious issue is the broad variety of motives for foreign direct investment. Motivations for firms to acquire foreign assets range from using a foreign location's comparative advantage and exercising control to decisions primarily determined by financial considerations such as taxation, exchange rate movements and/or stock market developments. Depending on the motives, it may also be useful to examine different measures of foreign direct investment. Specifically, capital account data may mainly reflect financial considerations and valuation issues, while production (and other real economy) motives are perhaps best captured by analyzing firm-level data on the number, employment and sales of foreign affiliates. At a more technical level, integration measures may also be affected by the decision whether investment stocks or flows are analyzed--for example, stocks and flows vary in their sensitivity to fluctuations in the exchange rate, flows are occasionally heavily influenced by a few large transactions (so-called, megadeals), and both variables will influence each other as existing foreign direct investment can make additional investment more or less likely.

In view of these difficulties, there are fewer studies available which aim to assess the level of integration in foreign direct investment. Reviewing the literature on the effects of the euro on foreign direct investment, Baldwin, DiNino, Fontagné, De Santis, and Taglioni (2008) and Flam (2009) provide more extensive discussions of the issues involved in the analysis of cross-border investment patterns.

Capital

While the analysis of foreign direct investment may be easily extended to other types of capital flows, a broader range of analytic approaches is typically applied to assess financial market integration. The diversity of available indicators is probably best illustrated by the European Central Bank's regularly published statistical indicators of integration in the euro area financial markets. Among other things, these price and quantity-based indicators cover the money market, the government and corporate bond markets, the equity market, the banking sector as well as the market infrastructure. Examples of indicators include the cross-country standard deviation of interbank lending rates (money markets), the share of cross-border holdings of debt securities (bond markets), the dispersion in equity returns (equity markets), the foreign affiliates' share of total loans (banking) and the share of debit transactions processed in Single Euro Payments Area (SEPA) format (infrastructure).^x

In view of the various features of financial integration, some indicators explicitly seek to reduce the dimensionality of the data. The European Central Bank, for instance, has recently constructed a composite measure, the Synthetic Indicator of Financial Integration (SYNFINT), by aggregating selected indicators. The composite measure is computed as a weighted average where the weights reflect the average relative size of each market segment in terms of outstanding amounts.^{xi}

Another useful empirical methodology to identify and describe common features of a set of economic variables is principal components analysis (PCA) which converts a vector of possibly correlated variables into a smaller number of new, linearly uncorrelated variables

(components) such that the first principal component accounts for most of the observed variability in the data. Volosovych (2011, 2013) provides an application of this method for financial market integration, analyzing monthly sovereign bond data for the period from 1875 to 2009 to track integration in financial and physical asset markets and explore potential determinants of its long-run dynamics.^{xii}

The level of financial integration can also be assessed by analyzing macroeconomic data from national accounts. Feldstein and Horioka (1980) examine domestic saving and investment rates and find that both rates are highly correlated both within and between OECD countries; they interpret this finding as evidence of low capital mobility.^{xiii} More specifically, when capital is mobile, countries should be able to borrow and lend abroad, without being constrained by domestic saving decisions. Choudhry, Jayasekera, and Kling (2014) provide an application of this approach for the European Union. The approach has also recently been used to evaluate the degree of risk sharing in the euro area compared to other currency areas such as the United States; see, for example, Furceri and Zdzienicka (2013).

Prices

An alternative approach to the exploration of cross-border flows and interactions (relative to some benchmark) is the analysis of discrepancies in consumer, wholesale or producer prices across locations. Implicitly, it is hypothesized that large price differentials between geographic localities could only exist because of bilateral barriers to trade, where the existence of information and transaction costs hinder arbitrage transactions to exploit price differentials.

The use of prices to analyze market integration offers some notable advantages. For one thing, there is, in principle, very detailed price information available. At an extreme, scanner price data register the exact product or service as well as the time and location of individual purchases. Consequently, price differentials can be computed at a deeply disaggregated level; for instance, since the variation in prices between locations within a given country can often be easily computed, intra-national price differentials may serve as a reasonable benchmark when assessing the level of cross-border integration. Moreover, for some goods (and commodities), price information has been collected for centuries, allowing a long-term analysis of integration by economic historians.

However, there are also disadvantages. Most notably, a major challenge is often the compilation of comparable price statistics since scanner price data are not always readily available. In particular, raw price level data (in absolute terms) are rarely published by official sources; statistical offices typically release price level indices (relative to some base year). Also, prices have to refer to identical products such that, for instance, quality differences do not affect the results. In addition, aggregation issues, taxation, the exchange rate and various specifics of the data collection (such as timing and the outlet from which the price data are obtained) may be relevant.

Where adequate data can be collected, an obvious approach to assessing the degree of price level integration is to analyze absolute price differences. This analysis can be applied to individual products and services within a single industry. In the European context, for instance, probably the most heavily analyzed market is automobiles; see, among others, Flam (1992) and Goldberg and Verboven (2001, 2004). Alternatively, the analysis may cover a diverse set of items, potentially reflecting the full range of consumer expenditures, as with Engel and Rogers (2004). In similar fashion, it is possible to vary the level of geographic detail that is involved in the compilation of the integration indicator. In its simplest form, the

measure merely highlights the price level at a specific location (e.g., defined as an index relative to the mean of the integration area). However, the indicator could also focus more explicitly on relative price pairs between locations (e.g., defined as the maximum price differential within the integration area), or it captures the average price dispersion within the area (e.g., defined as the mean squared error of relative prices). Exploring the evolution of such measures over time then allows drawing conclusions about the convergence or divergence of prices. Baldwin, DiNino, Fontagné, De Santis, and Taglioni (2008) provide a useful survey; see also Anderson and van Wincoop (2004).

Composite Indicators

Few attempts have been made to construct indicators which cover simultaneously a broad range of integration areas and, thereby, allow assessing the European experience of a deepening of integration along multiple dimensions and over a long period. In the following, we discuss four selected composite indicators in more detail, each putting particular emphasis on a specific aspect of European integration.^{xiv}

Mongelli, Dorruci and Agur (2005) focus strongly on the institutional features of integration.^{xv} Following Balassa (1961), they distinguish between five main stages of regional integration, free trade area, customs union, common market, economic union, and total economic integration. For each of these stages, they assign scores between 0 and 25, according to the degree of integration achieved. Summing up the scores at each point in time, they construct an overall index ranging between 0 and 100. This procedure has various advantageous features, apart from covering different areas of integration. For one thing, the measure can, in principle, be constructed on a daily basis. Indeed, Mongelli, Dorruci and Agur (2005) report a monthly indicator based on the actual implementation of integration measures. Also, the measure quantifies the degree of integration for individual countries. Still, a major disadvantage of this methodology is the arbitrary nature of assigning scores based on the individual assessment of the researcher.

Berger and Nitsch (2008) construct an index of European integration based on measures of de facto integration. Similar to Mongelli, Dorruci and Agur (2005), they define sub-indicators which apply to different episodes of integration and then sum up these index values to obtain the aggregate indicator. Instead of distinguishing between formal stages of integration, however, they focus on three separate phases of integration: the removal of quantitative restrictions on trade in the 1950s, the phase-out of tariffs in the 1960s, and the completion of the single market. For each of these episodes, they identify a variable which summarizes the key element of the integration process, based on the actual progress that is made by a country in a given year. These variables are scaled from 0 (no liberalization) to 10 (full liberalization), such that the overall index ranges from 0 to 30. Reassuringly, the results on the integration performance of European countries do not differ substantially from the findings in Mongelli, Dorruci and Agur (2005).

Another composite indicator of the European Union's de facto integration is the Single Market Scoreboard (formerly labeled the Internal Market Index) that is compiled and published by the European Commission.^{xvi} This indicator focuses exclusively on the implementation of single market policies. Accordingly, the index value for each country is scaled to be 100 in 1992, when the internal market entered into force. This methodology allows tracking integration trends over time, but is not particularly helpful for cross-country comparisons. While the construction of the index has been revised several times, its key feature is the combination of various sub-indicators which are meant to measure the 'core business' of the internal market; these sub-indicators include, among others, the value of

published public procurement (in % of GDP), telecommunication costs, electricity prices, gas prices and postal tariffs. A principal components analysis is then applied to compute the index.

König and Ohr (2013) basically follow a similar approach. In line with the Internal Market Index, they apply a principal components analysis to assess the degree of single market integration. However, borrowing from the literature on the measurement of ‘globalization’ (see Dreher, Gaston and Martens [2008] for a good introduction), they explore a broader range of indicators, analyzing 25 different variables. Specifically, they define four dimensions of European integration and group the variables accordingly; the dimensions are the single market, homogeneity, symmetry and conformity.^{xvii}

4. Summary

The measurement of economic and institutional integration has become the subject of a growing literature. There is considerable interest in all aspects of economic integration--from trade to financial markets--and researchers have been deploying a variety of approaches, including the analysis of economic transactions or price data. Other approaches are documenting the de jure and de facto integration of markets and their institutional underpinnings in the form of indicators.

At the global level, researchers are often interested in the assessment of the level of integration. At the regional level, there is considerable interest in the measurement of the progress of integration--not least by those institutions and policymakers who are charged with fostering these processes (such as, for example, the European Commission and the Asian Development Bank).^{xviii} Within regions, the academic literature has focused primarily on border effects and the question of whether different degrees of institutional or economic integration affect them. European integration, with its long history of stops and leaps, from trade to currency and banking union, has drawn particular attention in this regard.

This chapter discusses issues related to the measurement of economic and institutional integration. A selection of available indicators is reviewed, with a special focus on European integration.

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Table 1: A Classification of Integration Measures

	Single Indicator	Summary Index
De jure	Integration agreement membership classification	Integration index covering different stages of integration
De facto	Trade openness (ratio), Cross-border activities adjusted for country pair characteristics ('gravity estimates')	Principal components analysis, Single Market Indicator

ⁱ It is interesting to note that most of the variation in the process of European integration occurred over time, with periods of rapid progress and episodes of stagnation ('Eurosclerosis'). There has been much less variation, in contrast, in the depth of integration. Integration measures have been rarely scaled back, except for some minor corrections (especially in the field of monetary integration).

ⁱⁱ At an extreme, a separate dummy variable is defined for each single integration arrangement.

ⁱⁱⁱ The argument is related to the synthetic control method applied in case studies; see, for example, Abadie, Diamond, and Hainmueller (2010).

^{iv} Alternatively, the categories could be labeled institutional and actual measures.

^v In view of possible discrepancies between legal measures of integration and their actual implementation, the European Commission provides a single market scoreboard. Specifically, the European Commission notes on its website: "The Single Market is based on a large body of EU law, accompanied by national transposition measures. However, it is essential to ensure that the Single Market does not exist only on paper but also in reality for citizens and businesses who want to work, travel, shop, invest or do business across borders. This requires effective governance of the Single Market by the European Commission and by the EU and EEA Member States, as well as effective implementation "on the ground", in the Member States. This scoreboard aims to give an overview of the practical management of the Single Market."; see http://ec.europa.eu/internal_market/scoreboard/index_en.htm.

^{vi} The customs union had been completed one and a half years earlier than planned in the 1957 Treaty of Rome. For a more detailed documentation, see http://ec.europa.eu/taxation_customs/40customs/index_en.htm.

^{vii} The analysis has become more complicated, however, with the establishment of the single market, which had been accompanied by the compilation of separate statistics for the trading of goods between member states (Intrastat) and for the trading of goods with countries outside the union (Extrastat); see the Council Regulation (EEC) No 3330/91 of 7 November 1991 on the statistics relating to the trading of goods between Member States available at <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31991R3330>.

^{viii} Analyzing the European Union's external trade policies, De Benedictis and Salvatici (2011) provide an extensive discussion of current issues in the application of the gravity equation, including a meta-analysis by Cipollina and Pietrovito (2011) to reconcile the variation in estimation results from various studies.

^{ix} Theory-consistent specifications, for instance, highlight the fact that all bilateral patterns of trade are determined simultaneously such that bilateral frictions alone are inadequate to deal with this N-body problem where for each country the distance from all others matters (typically captured by adding 'multilateral resistance' terms to the gravity equation). Another recent modification is the use of estimation techniques that properly take into account the discrete choice features of trade observations by allowing for zero trade, with Poisson pseudo-maximum likelihood estimation being a prominent example.

^x After the first release of the indicators in September 2005, the European Central Bank (ECB) has gradually extended work on the measurement of financial integration in the euro area. The indicators are updated and published biannually on the ECB's website at <https://www.ecb.europa.eu/stats/finint/html/index.en.html>; the ECB also publishes a yearly report on "Financial Integration in Europe".

^{xi} To our knowledge, the index values have not been officially published yet. For more details, see <http://www.ecb.europa.eu/press/pr/date/2014/html/pr140428.en.html>.

^{xii} Volosovych (2011, 2013) also provides a discussion and critique of alternative measures of financial market integration, such as cross-market correlations.

^{xiii} Obstfeld and Rogoff (2001) argue that the Feldstein-Horioka finding is one of the six major puzzles in International Macroeconomics.

^{xiv} An alternative but similarly encompassing approach is to analyze survey-based data on sentiments toward integration; see, for example, Guiso, Sapienza and, Zingales (2014).

^{xv} Dorrucci, Ioannou, Mongelli, and Terzio (2015) provide an update.

^{xvi} Detailed results are available online at

http://ec.europa.eu/internal_market/score/index_en.htm. For technical details, see
http://ec.europa.eu/internal_market/score/docs/score11/im-index-2002_en.pdf.

^{xvii} For more details, see König (2014) and <http://www.eu-index.uni-goettingen.de/?lang=en>.

^{xviii} See, for instance, <http://aric.adb.org/integrationindicators>.

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