The EU Single Market:
Impact on Member States

Technical report

LE Europe

About this study

This study was commissioned by the American Chamber of Commerce to the EU (AmCham EU) and conducted independently by LE Europe.

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Responsibility for the contents of this report remains with LE Europe.

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1 Introduction

The present technical report accompanies the study *Impact of the Single Market on Member States*. It provides the details of the more technical analysis undertaken as part of the study and describes:

- the process behind generating the index of integration (including the selection of variables and the weighting scheme used to construct the integration index);
- the detailed estimation results of the impact of the index of integration on various variables of interest; and,
- the quantitative assessments of the impact of deeper integration.

2 Selection of Single Market integration indicators for inclusion in a summary index of Single Market integration

The following approach was used to select variables for further analysis:

- First, we carried out a **targeted desk-based review** in order to arrive at a "long-list" of relevant variables identified by the relevant literature; and
- Second, we developed a **logic** model showing the links between indicators of integration and outcomes of interest. This process distinguished between direct indicators of integration (for example, measures of openness to EU trade) and indirect indicators (for example, increased competition and reduced price dispersion among Member States caused by greater trade openness).

2.1 Desk-based review

There exists an extensive literature examining the impacts of past and/or potential policy measures to increase integration among EU Member States. The indicators of the impact of such measures include those related to the four core freedoms of the Single Market (free movement of goods, services, labour and capital) as well as a number of related measures including indicators of the harmonisation of fiscal policies or overall conformity to EU regulations.[1] We summarise the literature below.

2.1.1 Free movement of goods and services

Free movement of goods and services can be tracked through two key sets of indicators, namely indicators related to the implementation of policies reducing barriers to trade and indicators of **cross-border trade within the European Union**. Integration indicators relating to barriers to cross-border trade include tariff (e.g. Aussiloux et al., 2011),[2] or non-tariff barriers (e.g. the Centre for

[1] Transposition and transposition deficits are considered in Decreux et al. (2012), Deutsche Bank Research (2013), DG-ECFIN (2008), European Commission (2015c), European Parliament (2014f) and Konig and Ohr (2013).

[2] See also the Centre for Economic Policy Research (2013), DG-ECFIN (2008), and la letter du CEPII (2011).

Economic Policy Research, 2013 and Decreux et al., 2012), as well as indices of market regulation such as OECD's Product Market Regulation Indicators (e.g. Ilzkovitz et al., 2007).[3]

Increases in cross-border trade within the European Union can be measured through an increase in the **percentage of intra-European imports and exports** in **GDP** (e.g. Bertelsmann, 2014)[4] or percentage of intra-European imports and exports in turnover (European Commission, 2015b), or **intra-EU openness** relative to total openness, through the **percentage of intra-EU trade** in **total trade** (Bertelsmann, 2014 and Konig and Ohr, 2013).

2.1.2 Free movement of capital

Free movement of capital should imply an increased access to cross-border capital and investment. One obvious measure of increased capital market integration is increased **Foreign Direct Investment** (FDI), through increased **cross-border flows** (inflows and outflows) between Member States (Casalprim, 2013 and Ilzkovitz et al., 2007), as well as changes in **FDI stocks** (Konig and Ohr, 2013). Another measure of increased integration is the increased cross-border presence of EU financial institutions such as, for example, increases in assets of foreign branches and subsidiaries within the EU, or increased intra-EU exposure of financial institutions (European Commission, 2014a and European Parliament, 2014d).

On the regulatory and legislative side, closer integration can be achieved through harmonised legislation pertaining to capital and payments, for example through the Single European Payments Area (Capgemini Consulting, 2010), adoption of the Financial Services Action Plan (European Commission, 2014a), or a common deposit guarantee scheme (European Parliament, 2014g).

Finally, free movement of capital should imply convergence of the cost of capital (after taking into account of differences in risk), as measured by the price dispersion of interbank lending rates, repo rates, sovereign bond yields or spreads of liquidity premia (European Parliament, 2014d).

2.1.3 Free movement of persons

Free movement of persons is supported by agreements such as the Schengen Agreement (Casalprim, 2013), harmonisation of recruitment or placement services (European Commission, 2015c), or harmonisation of employment-related regulation (e.g. recognition of professional qualifications).[5] Implementation of these measures may imply a greater **presence of foreign EU workers** in EU Member States. Indicators of integration used in the literature include the **number of inbound EU workers** or the **share of inbound EU workers** in total domestic employment (e.g. Ilzkovitz et al., 2007 and Konig and Ohr, 2013).

2.1.4 Other indicators of integration including homogeneity and transposition deficit

Bertelsmann (2014) includes additional indicators of integration measuring the convergence (or lack of convergence) of EU Member States in terms of policies (e.g. fiscal policies and transposition of EU regulations), prices (e.g. goods, services and capital costs) and outcomes (e.g. GDP). The

[3] Canton et al. (2014), Deutsche Bank Research (2013), European Parliament (2014c), and Thum-Thysen and Canton (2015).

[4] See also DG-ECFIN (2008), Ilzkovitz et al. (2007), and Konig and Ohr (2013)

[5] Canton et al. (2014), Casalprim (2013), Deutsche Bank Research (2013), European Commission (2012a), European Commission (2015a), and European Commission (2015b)

literature also considers other channels through which greater integration can be achieved, including harmonisation of fiscal policies (PWC, 2013), reducing frictions in the digital market,[6] harmonisation of procurement policies in order to increase cross-border procurement and competition (Deutsche Bank Research, 2013 and European Parliament, 2014e), or liberalisation or harmonisation of the institutional/regulatory framework in the areas of energy and infrastructure.[7]

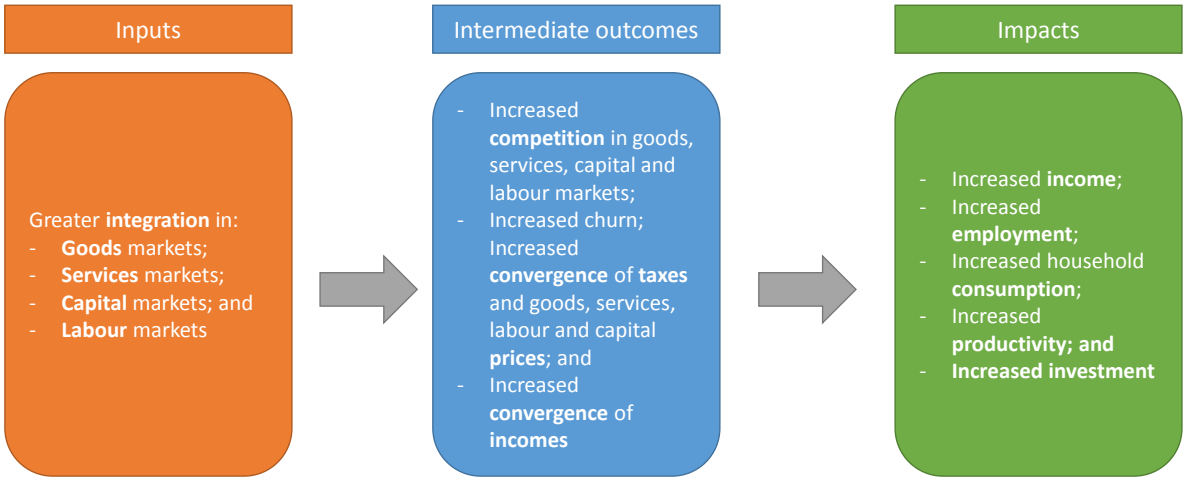
2.2 Logic model

Integration can affect macroeconomic outcomes of interest through two broad channels, namely those:

- **Directly** affecting income (Aussiloux et al., 2011, la letter du CEPII, 2011) and GDP (Decreux et al., 2012),[8] or savings (European Commission, 2012b, European Commission, 2014b); or
- **Indirectly** affecting outcomes through the channels of competition and labour productivity: Greater openness to trade increases competition in markets, therefore incentivising productivity improvements and the exit of unproductive firms (e.g. European Commission, 2015a).[9] Prices may also be expected to converge as a result of increased competition (e.g. Copenhagen Economics, 2010).[10]

These effects are summarised in the figure below.

Figure 1 Logic for inclusion of variables to construct summary integration indicator



Source: LE Europe

[6] Copenhagen Economics (2010), European Commission (2012b), Lorenzani and Varga (2014), European Commission (2014b), and European Parliament (2015a)

[7] Casalprim (2013), European Parliament (2013c), and European Parliament (2014b)

[8] See also DG-ECFIN (2008), Deutsche Bank Research (2013), European Parliament (2014g), European Parliament (2014c), and Ilzkovitz et al. (2007)

[9] See also Canton et al. (2014), the Centre for Economic Policy Research (2013), Copenhagen Economics (2010), European Parliament (2015a)

[10] See also Deutsche Bank Research (2013), European Parliament (2014d), Ilzkovitz et al. (2007), Konig and Ohr (2013)

2.3 Selected variables for index of integration

Below we present the variables selected to construct the index of integration.

We note that we only retain variables that can be expressed in percentage terms, e.g. percentage of GDP of exports of goods to the EU. This is because using variables of different scale (e.g. millions of exports to the EU, as well as the share of EU exports in GDP) does not take account of differences in the size of Member States and may lead to components being over-weighted.[11]

In addition, we do not include variables pertaining to the movement of persons. This is because data is only available with sufficient coverage for the inbound share of EU employees, and not for the outbound share of EU employees. This means that an indicator of the movement of persons based on such data would only capture part of the true integration of Member States.

Finally, we consider measures of homogeneity of taxation policy (e.g. VAT rates), factor costs (e.g. interest rates on long-term bonds and nominal labour costs) and outcomes (e.g. per capita GDP in Purchasing Power Standard terms) relative to a group of 'core' EU Member States. This is because the benefits of integration, as seen in Table 3, may take some time to materialise, and the entry of newer Member States may cause imbalances among policies and outcomes between older and newer Member States, even if older Member States are well-integrated and homogeneous, relative to each other.

[11] Furthermore, as demonstrated in Abdi and Williams (2010), Principal Component Analysis (the technique used to construct the index of integration) is sensitive to the choice of units.

The table below lists all the indicators included in the summary indicator of Single Market integration constructed specifically for the present study.

Table 1 Indicators of Single Market integration included in the summary indicator of Single Market integration

Variable	Weight
Free movement of goods	
Percentage of GDP of exports of goods to the EU	Eurostat
Percentage of GDP of imports of goods from the EU	Eurostat
Free movement of services	
Percentage of GDP of exports of services to the EU	Eurostat
Percentage of GDP of imports of services from the EU	Eurostat
Free movement of capital	
Percentage of GDP of FDI inflow from the EU	OECD
Percentage of GDP of inward FDI stock from the EU	OECD
Percentage of GDP of FDI outflow to the EU	OECD
Percentage of GDP of outward FDI stock to the EU	OECD
Homogeneity of policies, prices and outcomes	
Transposition deficit	European Commission
GDP per capita in PPS relative to EU13, 2005=100	
Purchasing power relative to EU13, 2005=100	OECD/Eurostat
Nominal labour costs per hour relative to EU13 average	Eurostat
Nominal interest rate on government bonds of 10 years or more relative to EU13 average	Eurostat
Public debt to GDP ratio relative to EU13 average	Eurostat
VAT rate relative to EU13 average	European Commission (Taxation and Customs Union)

3 Construction of index of integration

The literature identifies a large number of possible indicators of integration (as seen in the previous section), many of which may be correlated with each other (that is, one variable can be used in a linear prediction of the other with reasonable accuracy) – an issue known as **multicollinearity**. This in turn means that the model may not perform well when indicating the relative importance of individual variables for predicting the outcome of interest. Therefore, we use Principal Component Analysis (PCA) to combine the indicators into the following sub-indices of integration and create an overall summary index of Single Market integration:

- Freedom of movement of goods;
- Freedom of movement of services;
- Freedom of movement of capital;
- Homogeneity between the performance of the EU Member States and the EU 13; and,
- Transposition of EU legislation.

Below we briefly summarise the technique of Principal Component Analysis, and then describe our approach to issues of missing, or volatile, data, as well as the construction of weights for each component of the summary index of integration.

3.1 Summary of Principal Component Analysis

Principal Component Analysis (PCA) is a way of expressing data as a set of **uncorrelated linear combinations** (or 'principal components') of the original variables. This approach can help to reveal the internal structure of the data by examining which variables are linked with each other. PCA not only reduces the number of variables, but helps to address the issue of multicollinearity since the 'new' variables are linearly uncorrelated. The general idea is to retain as few principal components as needed while explaining a substantial amount of variance. A commonly-used "rule of thumb" (which we employ) is the Kaiser criterion, which suggests that components should be retained if they contribute at least one unit of variance (Beavers et al., 2013).

3.2 Approach to address issues of missing data

Data is not always available for all Member States throughout the period of interest. If there are **relatively few missing observations** through the period of interest, we employ the method of linear **interpolation** of data (in which the missing observation is imputed based on the linear trend for the variable from available data for the Member State). If, however, there are longer periods of missing observations, we **impute** the missing data by assuming, when relevant, that the growth rate of the variable for the Member State is the same as that of a comparator country. For example, where there is insufficient data for the Member State of Belgium for the variable of inward FDI stock as a percentage of GDP, the growth rate of the variable is assumed to be the same as for the Netherlands. This assumed growth rate can be used to calculate assumed missing values, that is:

$$\left(\frac{FDI\ inward\ stock\ from\ EU}{GDP}\right)_{BE,1999} = \left(\frac{FDI\ inward\ stock\ from\ EU}{GDP}\right)_{BE,2000} - growth\ of\ FDI\ inward\ stock\ from\ EU\ as\ percentage\ of\ GDP_{NL,2000}$$

Sometimes data is very **volatile**, rather than missing. For example, in the cases of FDI inflows and outflows, or Gross Capital Formation by non-financial corporations, these variables are naturally volatile. Furthermore, in both cases the variable of interest is the trend over time in this variable and not yearly fluctuations. Therefore, volatile variables are **smoothed** by replacing them with moving **five-year centred averages**, that is:

$$\left(\frac{FDI\ Inflow\ from\ EU}{GDP}\right)_{BE,1999} = \frac{(Share\ of\ FDI\ Inflow\ from\ EU\ in\ GDP\ for\ 1997, 1998, 1999, 2000, 2001)}{5}$$

3.3 Ensuring consistent interpretation

It should be noted that some components of the index of integration are positively linked with integration (e.g. the share of GDP of exports to the EU of goods or services), while others are negatively linked (e.g. the transposition deficit). For variables that are negatively linked, we reverse the sign e.g. a Member State with a transposition deficit of 3% would be presented as having a conformity of -3%. This ensures that all variables can be interpreted consistently- that is, an increase in the component indicates an increase in integration.

3.4 Construction of weights of variables for integration index

Having generated the time series for the variables of the integration index, we then proceed to generate the weights of each variable. We follow the procedure used in Konig and Ohr (2013), and employed in Bertelsmann (2014). This approach is recommended in order to retain as much information as possible. In brief, the procedure is as follows:

- First, we carry out PCA on the variables identified in Table 1;
- Next, we retain components following the Kaiser Criterion noted above;
- Next, we rotate component loadings in order to evenly distribute the 'weights' (or coefficients of linear combinations) across retained components. The weights of a variable within a component are equal to the square of the component loading;
- Next, we weight components according to how much of the total variance they explain.
- Finally, for each variable we generate a weight: the sum of weights for each variable across components, weighted by the share of variance explained by each component, i.e. if *n* components have been retained, the weight of a variable would be expressed as:

$$Weight\ of\ variable = \sum_{i=1}^{n} Share\ of\ variance\ explained\ by\ component\ n * (Loading\ of\ variable\ in\ component\ n)^2$$

This procedure generates the following weights for each variable in the index of integration.

Table 2 Weights for individual indicators of Single Market integration in summary indicator of Single Market Integration

Variable	Weight
Free movement of goods	
Ratio of exports of goods to the EU to GDP	8%
Ratio of imports of goods from the EU to GDP	7%
Free movement of services	
Ratio of exports of services to the EU to GDP	8%
Ratio of imports of services from the EU to GDP	8%
Free movement of capital	
Percentage of GDP of FDI inflow from the EU	8%
Percentage of GDP of inward FDI stock from the EU	9%
Percentage of GDP of outward FDI flow to the EU	8%
Percentage of GDP of outward FDI stock to the EU	7%
Homogeneity of policies, prices and outcomes	
Transposition deficit (%)	7%
Difference between unit nominal labour costs of Member State and EU average	7%
Difference between per capita GDP of Member State and EU average	6%
Difference between interest-rates of long-term bonds of Member State and EU average	6%
Difference between VAT rates of Member State and EU average	8%
Difference between purchasing power in Member State and EU average	3%

Note: Data is insufficient for outbound share of EU employees

It should be noted that integration varies considerably along the dimensions of integration. This means that **Member States can have a high overall degree of integration which may be driven by one or a few highly-weighted component(s) of integration**.

4 Estimation of impact of integration on outcomes of interest

We employ an unbalanced panel estimation procedure in order to estimate the impact of the integration indicator (as well as of a number of other drivers of economic growth such as investment or educational attainment of the workforce) on the following outcomes of interest:

- Per capita GDP;
- Per capita consumption;
- Employment rate (measured as the percentage of the population in employment);
- Total Factor Productivity; and
- Investment (measured as the Gross Capital Formation of financial and non-financial corporations)

An **unbalanced panel** means that not every Member State has a 'balanced' representation in the panel i.e. some Member States will be present for a longer period than others. This approach is used in order to allow for the use of the best available time series for most variables in the estimation (from 1995 to 2015), while still allowing for the number of Member States in the analysis to change over time. For example, older Member States (e.g. Austria or Belgium) have data going back to 1995 in most cases, whereas newer Member States (e.g. Bulgaria or Poland) may only have sufficient coverage dating from a few years prior to joining the European Union. This approach allows for a large sample for the econometric analysis.

Below, we describe in more detail the equation we estimate, the explanatory variables that we use, the samples that we consider, and finally summarise the direction of impact of the integration index on outcomes of interest.

4.1 Estimation equation

The equation that we estimate takes the following form:

$$Y_{it} = \alpha + \beta_{Index} Index_{it} + \beta_2 X_{it} + \beta_3 \mathrm{I}_i + \beta_4 \mathrm{I}_t + \varepsilon_{it}$$

Where:

- Y_{it} is the growth rate of the dependent variable (for Member State *i* in year *t*) over the previous period, namely:
  - Per capita GDP;
  - Per capita consumption;
  - Employment rate, defined as the percentage of the population employed;
  - Total Factor Productivity; and
  - Investment (measured as the Gross Capital Formation of financial and non-financial corporations)
- $Index_{it}$ refers to the index of integration for Member State *i* in year *t;*
- X_{it} refers to the other explanatory variables, at the level of Member State *i* in year *t* (described in the following sub-section), related to economic growth;
- I_i is a country dummy: that is, a variable that takes the value 1 if data is for Member State *i*, and 0 otherwise. This variable is used to control for all characteristics of a Member State that do not vary over time;
- I_t is a year dummy: that is, a variable that takes the value 1 if data is for year *t*, and 0 otherwise. This variable is used to control for all characteristics of a year that do not vary across Member States;
- ε_{it} refers to an error term.

4.2 Other explanatory variables

A number of variables are used in the economic literature to explain macroeconomic growth. We include these in the estimation equation, in order to help to ensure that impacts on outcomes of interest are not erroneously attributed to the index of integration. Based on the findings of the literature, the other explanatory variables that we use are:

- Previous period per capita GDP, consumption, employment rate, TFP or investment (that is, the level of the dependent variable in the previous period);
- Population birth rate;
- Share of Gross Capital Formation in GDP;
- Share of government consumption expenditure in GDP;
- Inflation;
- Index of Rule of Law from the Fraser Institute;
- Ratio of public debt to GDP; and
- Previous period share of labour force with secondary education

To avoid the risk of reverse causality (that is a situation where the dependent variable explains the explanatory variable), all variables except the index of rule of law enter the model with a 1 period lag.

4.3 Samples considered and robustness checks

Finally, we consider the sample of Member States in the estimation equation. As described above, the approach that we employ is an unbalanced estimation. This may raise concerns of whether the impact of integration on outcomes of interest is biased by the representation of countries in the sample. In order to address this possible concern, we present below the direction of impact of integration on outcomes for three samples:

- Our baseline sample from 1995 to 2015, where newer Member States enter the panel two years prior to joining the European Union;
- EU-15, 1992-2012: the sample considered in Bertelsmann (2014), composed of older Member States only; and
- EU-28, 1992-2012: the sample considered in Bertelsmann (2014), plus newer Member States. These results are presented in order to assess whether the addition of newer Member States between 1992 and 2012 has a substantial impact on the estimation, relative to the sample with only the older Member States as in Bertelsmann (2014).

Finally, we drop three Member States from the estimation: Croatia, Luxembourg and Malta. Croatia is dropped since its entry into the EU is too recent to allow an assessment of the impact of integration on outcomes of interest, and Luxembourg and Malta are dropped since they are very large outliers in the case of the indicator of capital movements.

4.4 Estimation results

Below we present the direction of impact of the integration index on outcomes of interest. As can be seen in Table 3, the **index of integration is positively (and statistically significantly) correlated with the growth of per capita GDP, employment, TFP and consumption.**

The impact of integration on growth of per capita GDP, employment rate and TFP is, in addition, largely robust across samples (as can be seen in Table 4, Table 6 and Table 7).

However, the impact of integration on consumption and investment is more sensitive to sample selection: as seen in the overview Table 3, integration is positively and significantly correlated with consumption and corporations' investment for EU-15 nations between 1992-2012, but expanding the sample to include newer Member States is associated with more measurement error (further compounded by a lack of sufficient data in the case of corporations' investment and therefore smaller sample sizes, as well as natural volatility) and it becomes more difficult to detect statistically significant impacts of integration on outcomes.

In addition, the magnitude of impact drops as the sample expands to include newer Member States (compare, for example, column (4) and column (2) in Table 4 and Table 6), and the precision of estimates falls. This may suggest that the benefits of integration may take some time to become apparent, and newer Member States may reap lower or more volatile gains from increasing integration at first, but that over time the impact of integration on outcomes of interest may increase, as seen in older Member States.

Table 3 Overview of estimated impact of the integration index, across three econometric models

Group	Years	Growth of per capita GDP (%)	Growth of per capita consumption expenditure (%)	Growth of employment rate (%)	Growth of TFP (%)	Growth of investment (%)
EU15	1992 to 2012	+***	+***	+***	+***	+***
EU28	1992 to 2012	+***	+	+***	+***	+
EU28	1995 to 2015	+***	+~	+***	+*	+

Source: London Economics

Note: Values in tables represent the signs of the relationship (+ means positive, - means negative), and the stars reflect the level of significance. ***=significant at 99%, **=significant at 95%, *= significant at 90%, ~ = significnt at 85%. All regressions include country and year fixed effects.

Table 4 Estimated impact on GDP in the three samples

	EU28- 1995-2015	EU28 - 1992 to 2012	EU15 - 1992 to 2012
Index of overall European integration	0.0122*** (0.00388)	0.0409*** (0.0143)	0.278*** (0.0321)
Logarithm of previous period dependent variable	-11.79*** (1.799)	-14.47*** (0.768)	-7.242*** (1.800)
Logarithm of previous period birth-rate	-6.768*** (1.982)	-2.364 (1.508)	-8.458*** (1.821)
Share of Gross Capital Formation in GDP in the previous period (%)	0.189*** (0.0600)	0.0371 (0.0383)	0.340*** (0.0751)
Share of GDP of Government Consumption Expenditure in previous period (%)	-0.0503 (0.0682)	-0.0871*** (0.0308)	-0.0638** (0.0259)
Inflation in previous period (%)	-0.411*** (0.0776)	0.00172*** (0.000556)	-0.0767 (0.0747)
Fraser Institute Rule of Law	0.842** (0.368)	0.774** (0.307)	0.171 (0.287)
Share of GDP of Public debt in previous period (%)	0.000235 (0.0106)	0.0139* (0.00765)	0.0198** (0.0101)
Share of labour-force with secondary education in previous period	0.00760 (0.0308)	0.118*** (0.0169)	0.0863*** (0.0248)
Observations	459	568	284

Source: London Economics

Note: Values in tables represent the signs of the relationship (+ means positive, - means negative), and the stars reflect the level of significance. ***=significant at 99%, **=significant at 95%, *= significant at 90%. All regressions include country and year fixed effects.

Table 5 Estimated impact on per capita consumption in the three samples

	EU28- 1995-2015	EU28 - 1992 to 2012	EU15 - 1992 to 2012
Index of overall European integration	0.0581~ (0.00407)	0.0289 (0.0179)	0.175*** (0.0292)
Logarithm of previous period dependent variable	-10.47*** (1.509)	-10.47*** (1.509)	-12.70*** (1.729)
Logarithm of previous period birth-rate	-4.015* (2.176)	-7.963*** (1.924)	-10.55*** (1.729)
Share of Gross Capital Formation in GDP in the previous period (%)	0.260*** (0.0637)	0.143*** (0.0471)	0.602*** (0.0676)
Share of GDP of Government Consumption Expenditure in previous period (%)	-0.109 (0.0690)	-0.0161 (0.0386)	0.0113 (0.0231)
Inflation in previous period (%)	-0.447*** (0.0814)	0.000783 (0.000668)	-0.0162 (0.0672)
Fraser Institute Rule of Law	0.728* (0.379)	0.962** (0.394)	0.517** (0.257)
Share of GDP of Public debt in previous period (%)	-0.0321*** (0.0110)	-0.0289*** (0.00980)	0.0104 (0.00911)
Share of labour-force with secondary education in previous period	-0.00860 (0.0324)	0.000183 (0.0210)	0.114*** (0.0230)
Observations	459	568	284

Source: London Economics

Note: Values in tables represent the signs of the relationship (+ means positive, - means negative), and the stars reflect the level of significance. ***=significant at 99%, **=significant at 95%, *= significant at 90%, ~ significant at 85%. All regressions include country and year fixed effects.

Table 6 Estimated impact on employment in the three samples

	EU28- 1995-2015	EU28 - 1992 to 2012	EU15 - 1992 to 2012
Index of overall European integration	0.00909*** (0.00316)	0.0478*** (0.00939)	0.211*** (0.0314)
Logarithm of previous period dependent variable	-17.68*** (3.067)	-10.69*** (0.855)	-13.58*** (2.186)
Logarithm of previous period birth-rate	-3.452** (1.663)	-1.373 (0.989)	-4.319** (1.827)
Share of Gross Capital Formation in GDP in the previous period (%)	0.244*** (0.0523)	-0.00861 (0.0210)	0.370*** (0.0785)
Share of GDP of Government Consumption Expenditure in previous period (%)	-0.114** (0.0527)	-0.0499** (0.0202)	-0.0202 (0.0249)
Inflation in previous period (%)	-0.282*** (0.0626)	0.00115*** (0.000358)	-0.0245 (0.0747)
Fraser Institute Rule of Law	0.0883 (0.291)	-0.0494 (0.200)	-0.649** (0.276)
Share of GDP of Public debt in previous period (%)	-0.00709 (0.00892)	0.00272 (0.00528)	0.0108 (0.00977)
Share of labour-force with secondary education in previous period	-0.0122 (0.0249)	-0.0119 (0.0109)	0.0536** (0.0242)
Observations	459	568	284

Source: London Economics

Note: Values in tables represent the signs of the relationship (+ means positive, - means negative), and the stars reflect the level of significance. ***=significant at 99%, **=significant at 95%, *= significant at 90%. All regressions include country and year fixed effects.

Table 7 Estimated impact on total factor productivity in the three samples

	EU28- 1995-2015	EU28 - 1992 to 2012	EU15 - 1992 to 2012
Index of overall European integration	0.00438* (0.00261)	0.0324*** (0.0124)	0.187*** (0.0233)
Logarithm of previous period dependent variable	-10.50*** (1.941)	-10.15*** (1.573)	-11.21*** (1.821)
Logarithm of previous period birth-rate	-4.194*** (1.288)	-5.534*** (1.311)	-3.852*** (1.327)
Share of Gross Capital Formation in GDP in the previous period (%)	-0.108*** (0.0398)	-0.0140 (0.0327)	0.0337 (0.0551)
Share of GDP of Government Consumption Expenditure in previous period (%)	0.0609 (0.0448)	-0.0194 (0.0269)	-0.0625*** (0.0193)
Inflation in previous period (%)	-0.276*** (0.0522)	0.00904*** (0.000603)	-0.107* (0.0548)
Fraser Institute Rule of Law	0.205 (0.243)	-0.527* (0.271)	0.221 (0.226)
Share of GDP of Public debt in previous period (%)	-0.0103 (0.00706)	-0.0111 (0.00695)	0.000319 (0.00734)
Share of labour-force with secondary education in previous period	0.0163 (0.0207)	0.00339 (0.0144)	0.0707*** (0.0186)
Observations	459	568	284

Source: London Economics

Note: Values in tables represent the signs of the relationship (+ means positive, - means negative), and the stars reflect the level of significance. ***=significant at 99%, **=significant at 95%, *= significant at 90%. All regressions include country and year fixed effects.

Table 8 Estimated impact on Gross Capital Formation of financial and non-financial corporations in the three samples

	EU28- 1995-2015	EU28 - 1992 to 2012	EU15 - 1992 to 2012
Index of overall European integration	0.0298 (0.0418)	0.0690 (0.0503)	0.157*** (0.0529)
Logarithm of previous period dependent variable	-6.410*** (1.876)	-9.750*** (2.419)	-15.13*** (2.916)
Logarithm of previous period birth-rate	-1.487 (2.086)	-2.173 (2.591)	-1.854 (3.079)
Share of Gross Capital Formation in GDP in the previous period (%)	0.0368 (0.0658)	0.0987 (0.0765)	0.179 (0.124)
Share of GDP of Government Consumption Expenditure in previous period (%)	0.0328 (0.120)	0.0339 (0.145)	0.00963 (0.179)
Inflation in previous period (%)	-0.00192 (0.0861)	0.0822 (0.0942)	-0.0375 (0.176)
Fraser Institute Rule of Law	0.433 (0.389)	0.385 (0.444)	0.151 (0.441)
Share of GDP of Public debt in previous period (%)	-0.00514 (0.0112)	0.00591 (0.0147)	0.0183 (0.0165)
Share of labour-force with secondary education in previous period	0.00219 (0.0376)	0.00882 (0.0419)	0.00346 (0.0394)
Observations	395	332	231

Source: London Economics

Note: Values in tables represent the signs of the relationship (+ means positive, - means negative), and the stars reflect the level of significance. ***=significant at 99%, **=significant at 95%, *= significant at 90%. All regressions include country and year fixed effects.

5 Simulating the impact of deepening integration since entry into the European Union

The estimation results for the longest sample are used to assess the impact of the Single Market on each Member States by estimating the level of per capita GDP, per capita consumption and employment rates, assuming that the Member State's integration into the Single Market had remained unchanged at the level prevailing at the initial level (taken to be 1995 for older Member States, and two years prior to entry for newer Member States)

To undertake such an assessment, we first compute for each Member State the 'counterfactual' growth rate of the outcome of interest: that is, the growth rate of that variable if the summary index of Single Market integration of the Member States had remained unchanged at its initial level over the whole period 1992-2015.

We then compute the 'counterfactual' level of the outcome interest from the baseline year up to 2015.

We use the following procedure to compute the counterfactual growth rate of outcomes of interest:

- First, for the year after the 'baseline' period (1995 for older Member States, and 2 years prior to entry for newer Member States) we compute the difference between the integration index in a year and the level in the 'baseline' period. As seen in the table below,

on average, Member States show an increase in the the value of the summary integration indicator of 14% between the initial level and 2015.

- Next, we estimate the impact of the integration indicator on outcomes using the coefficient on the integration indicator (i.e. β_{Index}), as well as the coefficient on the lag outcome variable (denoted by $\beta_{lag\ outcome}$)
- Next, we compute the counterfactual growth rate of the outcome variable of interest by subtracting from the actual growth rate of that variable the product of the estimated coefficient of the summary indicator Single Market integration and the difference between the actual and initial value of the this indicator

  Thus, the 'counterfactual' growth rate due to integration is computed as follows:

$$g_{counterfactual}^{Integration} = g_{actual} - \beta_{Index} * (Index_{it} - Index_{i,baseline})$$

- Next, we apply this counterfactual growth rate to the levels of dependent variables in the previous period, in order to arrive at new levels of the dependent variables. For example, in the case of per capita GDP in the year 1996, this would be arrived at as follows:

$$GDP_{counterfactual,1996}^{Integration} = GDP_{1995} * (1 + \frac{1}{100} * g_{counterfactual,GDP}^{Integration})$$

- Therefore, for all periods from 2 years after the 'baseline' onwards, the growth rate of outcome variables is affected by two variables:
  - The difference between the value of the integration indicator (as described above), which is positively correlated with outcome variables; and
  - The difference between the log values of the dependent variable in the previous period as computed above, and the actual log values of the dependent variable in the previous period, which is negatively correlated with the outcome variables.
- The impact of lag dependent variables is computed analogously to the impact of integration, i.e.:

$$Impact_{counterfactual}^{lag\ outcome} = \beta_{lag\ outcome} * (Lag\ outcome_{it} - Lag\ outcome_{i,counterfactual})$$

- Finally, the counterfactual growth rate is calculated as the sum of the two impacts (change in integration indicator, and change in lag dependent variable)

$$g_{counterfactual} = g_{actual} - \beta_{Index} * \left(Index_{it} - Index_{i,baseline}\right) - \beta_{lag\ outcome} * \left(Lag\ outcome_{it} - Lag\ outcome_{i,counterfactual}\right)$$

Gains are calculated as follows:

$$Change\ in\ GDP\ per\ household = Percentage\ change\ in\ GDP\ per\ capita * Actual\ GDP\ per\ capita * population/(number\ of\ households)$$

$$Change\ in\ consumption\ per\ household = Percentage\ change\ in\ consumption\ per\ capita * Actual\ consumption\ per\ capita * population/(number\ of\ households)$$

$$Change\ in\ number\ of\ jobs = Percentage\ change\ in\ employment\ rate * Actual\ employment\ rate * population$$

The estimated changes in the outcome variables are shown in the Main Report.

The preceding section discussed the estimation of the benefits of deepening integration since 1995 (for older Member States) and since two years prior to entry in the EU (for newer Member States). However, this may not capture the true impacts of Single Market integration, since by 1995, the process of integration for older Member States was already under way. Average levels of integration were already high for all Member States at the 'baseline' period described above. Therefore, in order to capture the changes from integration more fully in a second analysis, we reset the integration index in the 'baseline' period as follows:

- For EU-15 Member States (except for Greece, Spain and Portugal), we construct a summary integration indicator for 1990 (i.e. 5 years prior to the original 'baseline' period). This is done by computing the average growth of the integration indicator for the baseline and the first following 5 years, and subtracting it cumulatively from the value of the integration indicator in the 'baseline' period, i.e.:

$$Index_{i,1990} = Index_{i,baseline} - 5 * Average(Index_{i,baseline+1} - Index_{i,baseline}, \ldots\ldots, Index_{i,baseline+5} - Index_{i,baseline+4})$$

- For Central, Southern and Eastern European Member States, this procedure yields artificially low levels of deepening integration. This is because growth of the integration index for these Member States is low (in the case of Southern European Member States, because the value of the integration index remains relatively low, while for Central and Eastern European Member States, the value of the index remains high). Therefore, for these cases, we adopt the following procedure:
  - First, we compute the average level of the integration summary indicator in 1990, as described in the previous bullet point;
  - Next, we apply this average level as the baseline level of the integration index for Southern, Central and Eastern European Member States;

- Therefore, the counterfactual can be interpreted as a case in which:
  - Northern and Western European Member States have not deepened integration since 1990 (for example, before the signing of the Maastricht treaty); and
  - Southern, Central and Eastern European Member States have not deepened integration since the average level of integration attained by the remaining Member States

The procedure for calculating the counterfactual growth rate for outcome measures, as well as the level of outcomes, is analogous to that described earlier.

The estimated changes in the outcome variables under each scenario are reported in the Main Report.

6 Benefits of deepening the current level of Single Market integration

Having considered the impact of the deeper Single Market integration achieved so far, we now turn to the estimating the benefits which could arise from an even deeper integration.

To that end we consider the impact of three scenarios of deeper integration:

- First, we estimate the benefits which would arise if all Member States were as integrated in the Single Market as the Member States showing the highest level of the summary indicator of Single Market integration.
- Next, in as second scenario, we estimate the benefits which could arise if all the Member States achieved for each Single Market indicator included in the summary indicator of Single Market integration the same level of integration as the best performing Member State. As shown earlier, the identity of the best performing Member State varies across indicators. We label this level of integration as the 'frontier' of integration. It is composed of the highest level for the indicators of free movement of goods, services, capital, homogeneity and transposition conformity; and
- Finally, in a third scenario, we assume that, in addition to a deepening integration to the 'frontier' of integration, and intra-EU trade in services is higher by 50%.

As described previously, the assessment of the impact involves first an estimation of the effect of deeper Single Market integration on the growth rate of the outcome variable of interest and second the computation of the impact on the level of the variable of interest by applying the higher growth to the variable's level in the previous year. Below we describe the approach adopted in the more complex scenarios 2 and 3.

For simplicity, the estimation of the impact of deeper integration is undertaken for 2015, using the actual levels of the outcome variables in 2015 as the baseline levels with no additional integration. Obviously, in practice, the gains may take a few years to materialise.

Scenario 2

- First, we compute the integration index for each dimension of integration (as listed in Table 2;
- Next, we identify the highest value of the integration index for each dimension (i.e. we compute 'sub-indices' for free movement of goods, capital etc.);
- Next, we compute a 'frontier', which is the sum of each 'sub-index', weighted by the weights for each dimension. The weights are derived by computing the sum of weights for individual variables (as shown in Table 2);

$$Frontier_t = Weight_{goods} * maximum_t Index_{goods} + Weight_{services} * maximum_t Index_{services} + Weight_{capital} * maximum_t Index_{capital} + Weight_{homogeneity} * maximum_t Index_{homogeneity} + Weight_{transposition} * maximum_t Index_{transposition}$$

- Next, we compute a 'counterfactual' growth rate as follows:

$$g_{counterfactual} = g_{actual} - \beta_{Index} * (Index_{it} - Frontier_t)$$

Scenario 3

The approach adopted to estimate the counterfactual growth rate is very similar to that described above, with one major difference: the 'frontier' computed now deepens Services Market integration by 50%, that is:

$$Frontier_t = Weight_{goods} * maximum_t Index_{goods} + Weight_{services} * maximum_t Index_{services*1.5} + Weight_{capital} * maximum_t Index_{capital} + Weight_{homogeneity} * maximum_t Index_{homogeneity} + Weight_{transposition} * maximum_t Index_{transposition}$$

As before, we compute a 'counterfactual' growth rate as follows:

$$g_{counterfactual} = g_{actual} - \beta_{Index} * (Index_{it} - Frontier_t)$$

The change in outcomes is calculated by applying the growth rate to the outcome level in the previous year.

To see the changes in the outcome variables under each scenario, please refer to the Main Report.

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The free movement of goods, people, services and capital is the cornerstone of the EU Single Market that has intertwined the economies of the Member States. The Single Market is bringing economic growth, job creation and prosperity for EU citizens and for businesses of all sizes. '*The EU Single Market: Impact on Member States*' offers an overview of the current state of Single Market integration across the EU. It describes how each Member State has integrated into the EU's single economic area. It also measures the impact of the Single Market on their economies and assesses potential further benefits. In addition, the study includes two-page overviews for all Member States, presenting key economic figures and avenues for policy action at national level.

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