

International Trade Integration: A Disaggregated Approach*

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Abstract

We investigate why the integration of international trade varies across industries. For that purpose we model disaggregated trade flows in an Anderson and van Wincoop gravity framework with heterogeneous trade costs and heterogeneous elasticities of substitution. We derive an analytical solution for time-varying multilateral resistance variables at the industry level that allows us to obtain a micro-founded measure of industry-specific bilateral trade integration. We then use this measure to explore the determinants of trade integration for manufacturing industries in European Union countries. We find that trade integration is high for industries characterized by high productivity, low transportation costs and low technical barriers to trade. We also show that trade integration improved significantly over the period 1997-2003. These improvements can on average explain one third of the growth in trade and are therefore a major driving force of international economic integration.

JEL classifications: F10, F15

Keywords: Trade Integration, Gravity, Trade Costs, Multilateral Resistance, Industries, Disaggregation

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1 Introduction

Trade costs are a staple ingredient in today's trade literature. They feature prominently in the models of Jonathan Eaton and Samuel Kortum (2002) and Marc Melitz (2003) as well as in the vast majority of other recent papers. Whereas most research on trade impediments has involved aggregate trade data, we know relatively little about trade impediments on the disaggregated industry level. Do some industries face higher trade barriers than others? Which industries have experienced the biggest declines in trade barriers?

The aim of this paper is to develop a measure of trade integration that is specific to individual industries. For that purpose we apply the gravity framework pioneered by James Anderson and Eric van Wincoop (2003) to disaggregated trade flows at the industry level. In particular, we allow trade costs and substitution elasticities to be heterogeneous across industries. The theoretical contribution of this paper is to derive an analytical solution for time-varying multilateral resistance variables at the industry level. We are thus able to find a micro-founded expression for industry-specific trade integration that controls for multilateral resistance and that we can track over time. Using data on 194 manufacturing industries in 14 European Union countries over the period 1997-2003, we find that trade integration improved significantly over time for the majority of industries in our sample.

Apart from describing how trade integration evolved over time, we also seek to explain its variation across country pairs and industries. The variation of trade integration across country pairs can to a large extent be captured by typical gravity variables such as distance and common language use but also by policy-related variables such as membership in the Eurozone. But trade integration also varies considerably across industries. In particular, trade integration tends to be high for industries that are characterized by high productivity, low transportation costs and low technical barriers to trade.

Furthermore, we ask to what extent the great increase in trade flows over recent years can be explained by better trade integration. For that purpose we use our model to decompose the growth in trade into two main components - the growth of income and manufacturing output and the improvement of bilateral and multilateral trade integration. We find that on average roughly one third of the growth in trade can be accounted for by improvements in trade integration, while two thirds can be attributed to income growth and increases in manufacturing output. The percentage of trade growth that can be explained by better trade integration is particularly high for Austria, Finland and Sweden, who were the last countries in our sample to join the European Union, and particularly low for those countries who did not adopt the Euro. This decomposition of the sources

of trade growth is consistent quantitatively with the findings of Scott Baier and Jeffrey Bergstrand (2001), who examine the growth in trade amongst OECD countries since the late 1950s, and the findings of David Jacks, Christopher Meissner and Dennis Novy (2006), who examine the trade boom during the classical Gold Standard.

The gravity framework introduced by Anderson and van Wincoop (2003) provides a simple and intuitive way of understanding the role of trade costs. Anderson and van Wincoop (2003) show that trade flows are determined not only by bilateral trade costs between two countries, but also by their average trade barriers with other countries. They refer to the appropriate average trade barrier as “multilateral resistance.” Our paper explicitly takes multilateral resistance into account at the industry level. Following the approach of Novy (2007), we derive an analytical solution for multilateral resistance that varies over time and that can thus be applied to panel data, not only to cross-sections. Our results in fact show that multilateral resistance changes considerably over time and can therefore not be treated as time-invariant.

Our approach of measuring trade integration falls into the category of papers that indirectly infer the level of trade impediments from trade flows. Examples of such studies include John McCallum (1995), Keith Head and Thierry Mayer (2000), Volker Nitsch (2000), Carolyn Evans (2003) and Natalie Chen (2004). We regard this approach as complementary to the direct measurement of trade impediments, for example the measurement of transportation costs by David Hummels (2007). Anderson and van Wincoop (2004) provide an extensive survey of empirical trade impediments. They consist of obvious candidates such as transportation costs and tariffs but also of impediments that are more difficult to measure such as language barriers and red tape.

The paper is organized as follows. In Section 2 we develop a general equilibrium model with industry-specific trade costs. In that section we also derive an analytical solution for industry-level multilateral resistance variables and our trade integration measure. Section 3 presents our data set. Sections 4 and 5 report descriptive statistics and our main results, focusing on the determinants of trade integration, the time trend of trade integration and our decomposition of trade growth into income growth and improvements in trade integration. Section 6 provides robustness checks and Section 7 concludes.

[To be completed.]

2 A Model with Industry-Specific Trade Costs

Our model closely follows the seminal paper by Anderson and van Wincoop (2003). Their general equilibrium model of trade results in a gravity equation that incorporates trade

costs. The key insight from their gravity equation is that bilateral trade flows are not determined solely by the absolute trade barrier between two countries but rather by their bilateral *relative* to their average trade barrier. Anderson and van Wincoop (2003) refer to the appropriate average trade barrier as “multilateral resistance.”

As a generalization, Anderson and van Wincoop (2004) model bilateral trade for an individual industry that is characterized by industry-specific bilateral trade costs and an industry-specific elasticity of substitution. We follow Anderson and van Wincoop (2004) in modelling industry-level trade flows with heterogeneous trade costs and heterogeneous elasticities of substitution. The innovation of our approach is to derive an analytical solution for time-varying industry-specific multilateral resistance variables. With this solution at hand, we are able to derive a micro-founded measure of industry-specific bilateral trade integration. Furthermore, given the solution for time-varying multilateral resistance variables, we can decompose the growth of trade in a given industry into two elements - the growth in income and productive capacity and improvements in bilateral and multilateral trade integration. Bergstrand (1989, 1990) also derives gravity equations for industry-level trade flows but does not focus on multilateral resistance.

2.1 The Basic Framework

Denote x_{ij}^k as nominal exports from country i to country j in goods associated with industry k . Suppose that consumers in country j allocate an exogenous expenditure x_j^k on industry- k goods and that their preferences over these goods can be described by a standard CES utility function given by

$$C_j^k \equiv \left(\sum_{i=1}^J \left(c_{ij}^k \right)^{\frac{\sigma_k-1}{\sigma_k}} \right)^{\frac{\sigma_k}{\sigma_k-1}} \quad (1)$$

where c_{ij}^k is real consumption of industry- k goods from country i by country- j consumers and where the elasticity of substitution σ_k is specific to industry k and assumed to exceed unity. Furthermore suppose that the factory gate price of industry- k goods from country i is denoted by p_i^k and that trade costs associated with the trade cost factor $t_{ij}^k \geq 1$ are incurred when these goods are shipped to country j such that the price faced by country- j consumers, denoted by p_{ij}^k , can be written as $p_{ij}^k = t_{ij}^k p_i^k$. The demand function for exports $x_{ij}^k = p_{ij}^k c_{ij}^k$ then follows as

$$x_{ij}^k = \left(\frac{p_{ij}^k}{P_j^k} \right)^{1-\sigma_k} x_j^k = \left(\frac{t_{ij}^k p_i^k}{P_j^k} \right)^{1-\sigma_k} x_j^k \quad (2)$$

where the price index P_j^k can be derived as

$$P_j^k = \left(\sum_{i=1}^J (p_{ij}^k)^{1-\sigma_k} \right)^{\frac{1}{1-\sigma_k}} \quad (3)$$

2.2 The Gravity Equation

Denote the exogenous amount of production of industry- k goods by country- i firms as y_i^k and impose market-clearing as

$$y_i^k = \sum_{j=1}^J x_{ij}^k \quad (4)$$

Note that since both expenditure x_j^k and production y_i^k are exogenous, the model falls into the class of trade separable models (see Anderson and van Wincoop 2003). It is irrelevant for our model what one assumes about the underlying preference structure that leads to the expenditure allocation x_j^k or about the production technology that leads to y_i^k .

Substituting the demand function (2) into the market-clearing condition (4) and rearranging yields

$$p_i^k = \left(\sum_{j=1}^J \left(\frac{t_{ij}^k}{P_j^k} \right)^{1-\sigma_k} \frac{x_j^k}{y_i^k} \right)^{\frac{1}{\sigma_k-1}} \quad (5)$$

Now plug (5) back into the demand function (2) and define outward multilateral resistance for industry- k goods from country i as

$$\Pi_i^k \equiv \left(\sum_{j=1}^J \left(\frac{t_{ij}^k}{P_j^k} \right)^{1-\sigma_k} \frac{x_j^k}{y_i^k} \right)^{\frac{1}{1-\sigma_k}} \quad (6)$$

to arrive at the unidirectional gravity equation

$$x_{ij}^k = \frac{y_i^k x_j^k}{y_i} \left(\frac{t_{ij}^k}{P_j^k \Pi_i^k} \right)^{1-\sigma_k} \quad (7)$$

Trade flows x_{ij}^k depend on supply y_i^k of the k -good from country i and demand x_j^k for the good in country j . Large bilateral trade costs t_{ij}^k reduce trade flows x_{ij}^k , whereas large average outward trade barriers of country i (i.e. large Π_i^k) and large average inward trade barriers of country j (i.e. large P_j^k) lead to more bilateral trade x_{ij}^k . Substituting the

solution for p_i^k in (5) and the definition of Π_i^k in (6) into the price index (3) yields

$$P_j^k = \left(\sum_{i=1}^J \left(\frac{t_{ij}^k}{\Pi_i^k} \right)^{1-\sigma_k} \frac{y_i^k}{y_i} \right)^{\frac{1}{1-\sigma_k}} \quad (8)$$

which is inward multilateral resistance for industry- k goods entering country j .

2.3 Solving for Multilateral Resistance

A problem that arises in empirical work is that we do not have data for the multilateral resistance terms P_j^k and Π_i^k in equation (7). The method we employ here is to solve for these terms analytically as a function of observable trade flows. We exploit the fact that multilateral resistance is related to the amount of trade a country conducts with itself (see Novy 2007). Intuitively, the higher trade barriers are with other countries, the more a country will trade with itself. To see this formally, use gravity equation (7) and consider the implied domestic trade for industry- k goods

$$x_{ii}^k = \frac{x_i^k y_i^k}{y_i} \left(\frac{t_{ii}^k}{P_i^k \Pi_i^k} \right)^{1-\sigma_k} \quad (9)$$

where t_{ii}^k are intranational trade costs for industry- k goods. Equation (9) can be solved for the product of inward and outward multilateral resistance as

$$P_i^k \Pi_i^k = \left(\frac{x_i^k y_i^k}{x_{ii}^k y_i} \right)^{\frac{1}{1-\sigma_k}} t_{ii}^k \quad (10)$$

Note that we do not impose zero domestic trade costs.

2.4 Deriving a Micro-Founded Measure of Industry-Specific Trade Integration

Since we are interested in bilateral trade integration, it is useful to combine bilateral trade flows in both directions. A gravity equation for bidirectional bilateral trade flows can be obtained by multiplying (7) by the corresponding equation for x_{ji}^k . This yields

$$x_{ij}^k x_{ji}^k = \frac{x_i^k x_j^k y_i^k y_j^k}{y_i y_j} \left(\frac{t_{ij}^k t_{ji}^k}{P_i^k \Pi_i^k P_j^k \Pi_j^k} \right)^{1-\sigma_k} \quad (11)$$

Now plug in the solution for multilateral resistance given in (10) to obtain

$$x_{ij}^k x_{ji}^k = x_{ii}^k x_{jj}^k \left(\frac{t_{ij}^k t_{ji}^k}{t_{ii}^k t_{jj}^k} \right)^{1-\sigma_k} \quad (12)$$

From (12) it is easy to solve for trade costs as

$$\frac{t_{ij}^k t_{ji}^k}{t_{ii}^k t_{jj}^k} = \left(\frac{x_{ii}^k x_{jj}^k}{x_{ij}^k x_{ji}^k} \right)^{\frac{1}{\sigma_k - 1}} \quad (13)$$

Note that it is only possible to infer relative trade costs from trade flows, in this case bilateral trade costs relative to intranational trade costs (see Anderson and van Wincoop 2004, p. 709). We do not impose trade cost symmetry so that t_{ij}^k and t_{ji}^k on the left-hand side of (13) are generally asymmetric ($t_{ij}^k \neq t_{ji}^k$). As Anderson and van Wincoop (2003, footnote 11) point out, it is problematic to infer from trade data to what extent bilateral trade barriers are asymmetric because there are multiple combinations of t_{ij}^k and t_{ji}^k that can give rise to the same trade flows x_{ij}^k and x_{ji}^k . But fortunately, taking the square root gives a consistent estimate of the *average* bilateral trade barrier. Therefore, average relative trade costs can be expressed as

$$\theta_{ij}^k \equiv \left(\frac{t_{ij}^k t_{ji}^k}{t_{ii}^k t_{jj}^k} \right)^{\frac{1}{2}} = \left(\frac{x_{ii}^k x_{jj}^k}{x_{ij}^k x_{ji}^k} \right)^{\frac{1}{2(\sigma_k - 1)}} \quad (14)$$

We interpret θ_{ij}^k as a micro-founded measure of bilateral industry-specific trade frictions, or the inverse of bilateral trade integration. Intuitively, the more two countries trade with each other (i.e. the higher $x_{ij}^k x_{ji}^k$), the lower ceteris paribus is our measure of trade frictions. In addition, an important aspect of θ_{ij}^k is that it has an in-built control for multilateral resistance. Remember from (10) that there is a positive relationship between domestic trade and multilateral resistance. If each country starts trading more with itself (i.e. the higher $x_{ii}^k x_{jj}^k$), the higher ceteris paribus are the implied bilateral trade frictions. The reason is that if domestic trade and thus multilateral resistance goes up, it must have become less attractive to trade internationally. For given bilateral trade flows $x_{ij}^k x_{ji}^k$ this means that θ_{ij}^k as a relative trade barrier increases.

Let's use this example to contrast θ_{ij}^k with other measures of trade integration such as trade to output ratios (i.e. $x_{ij}^k x_{ji}^k / (y_i^k y_j^k)$) that are not micro-founded but nevertheless frequently used. Suppose that bilateral trade flows are constant but that output increases so that the trade to output ratio falls. The conclusion that trade integration therefore fell would only be correct if domestic trade increased. But if domestic trade does remain constant and the increase in output is in fact caused by an increase in demand from third countries, then bilateral trade integration does not change at all and one would have erroneously inferred a deterioration of trade integration.

The industry-specific elasticity of substitution σ_k controls for differences in market power and competition across industries. Imagine an industry with a high elasticity σ_k

and thus a high degree of competition and a low markup given by $\sigma_k/(\sigma_k - 1)$. As consumers in this industry are price-sensitive, a given ratio of domestic over bilateral trade implies lower bilateral frictions because a relatively small friction can be sufficient for big switches in consumer spending. Controlling for heterogeneous elasticities is thus important in order not to confuse differences in market power with differences in trade frictions.

For the interpretation of θ_{ij}^k it is helpful to think of a frictionless world with no trade costs. In that case $t_{ij}^k = t_{ji}^k = t_{ii}^k = t_{jj}^k = 1$ and hence θ_{ij}^k would be one. Intuitively, in a frictionless world the ratio of country i 's trade with itself over country j 's exports to i (i.e. x_{ii}^k/x_{ji}^k) should be the same as country i 's exports to j over country j 's trade with itself (i.e. x_{ij}^k/x_{jj}^k) because both ratios will simply reflect the relative country size of i and j . Trade costs distort this frictionless world in a way captured by θ_{ij}^k . The opposite extreme would be a closed economy in which bilateral trade $x_{ij}^k x_{ji}^k$ tends towards zero and thus θ_{ij}^k will tend towards infinity. In summary, provided that domestic trade costs do not exceed international trade costs, the bilateral measure of trade frictions θ_{ij}^k is therefore bounded by one and infinity and its inverse can be interpreted as a measure of trade integration between two countries in a specific industry. In particular, our aim is to rank industries according to their degree of integration and to relate this variation to observable industry characteristics.

2.5 Explaining the Growth in Trade

In this section we decompose the growth in bilateral trade into two basic contributions: the contribution of the growth in income and production as well as the contribution of improvements in trade integration. For this decomposition it is useful to adjust multilateral resistance in (10) for intranational trade costs by defining

$$\Theta_i^k \equiv \frac{P_i^k \Pi_i^k}{t_{ii}^k} = \left(\frac{x_i^k y_i^k}{x_{ii}^k y_i^k} \right)^{\frac{1}{1-\sigma_k}} \quad (15)$$

Gravity equation (11) can then be rewritten as

$$x_{ij}^k x_{ji}^k = \frac{x_i^k x_j^k y_i^k y_j^k}{y_i y_j} \left(\frac{t_{ij}^k t_{ji}^k}{t_{ii}^k t_{jj}^k \Theta_i^k \Theta_j^k} \right)^{1-\sigma_k} \quad (16)$$

The gravity equation in (16) is more practical than (11) because even if σ_k is unknown, we know all the components of (16), i.e. we know $(t_{ij}^k t_{ji}^k / (t_{ii}^k t_{jj}^k))^{1-\sigma_k}$ from (13) as

$$\left(\frac{t_{ij}^k t_{ji}^k}{t_{ii}^k t_{jj}^k} \right)^{1-\sigma_k} = \frac{x_{ij}^k x_{ji}^k}{x_{ii}^k x_{jj}^k} \quad (17)$$

and $(\Theta_i^k \Theta_j^k)^{1-\sigma_k}$ from (15) as

$$\left(\Theta_i^k\right)^{\sigma_k-1} = \left(\frac{x_{ii}^k y_i}{x_i^k y_i^k}\right) \quad (18)$$

Now take logs and first differences of (16) to arrive at

$$\Delta \ln \left(x_{ij}^k x_{ji}^k\right) = \Delta \ln \left(\frac{x_i^k x_j^k y_i^k y_j^k}{y_i y_j}\right) + (1 - \sigma_k) \Delta \ln \left(\frac{t_{ij}^k t_{ji}^k}{t_{ii}^k t_{jj}^k}\right) + (\sigma_k - 1) \Delta \ln \left(\Theta_i^k \Theta_j^k\right) \quad (19)$$

The left-hand side of (19) is the growth of bilateral trade between i and j in industry- k goods. Now divide (19) by the left-hand side to obtain

$$100\% = 1 = \frac{\Delta \ln \left(\frac{x_i^k x_j^k y_i^k y_j^k}{y_i y_j}\right)}{\Delta \ln \left(x_{ij}^k x_{ji}^k\right)} + (1 - \sigma_k) \frac{\Delta \ln \left(\frac{t_{ij}^k t_{ji}^k}{t_{ii}^k t_{jj}^k}\right)}{\Delta \ln \left(x_{ij}^k x_{ji}^k\right)} + (\sigma_k - 1) \frac{\Delta \ln \left(\Theta_i^k \Theta_j^k\right)}{\Delta \ln \left(x_{ij}^k x_{ji}^k\right)} \quad (20)$$

The right-hand side components of (20) can be interpreted as follows. The first term is the contribution of the growth in the demand for k -goods and the growth in output of k -goods. The second term is the contribution of the decline in bilateral trade frictions. The third term is the contribution of increases in multilateral resistance over time. Intuitively, assume that bilateral trade increases over time so that the denominator $\Delta \ln \left(x_{ij}^k x_{ji}^k\right)$ is positive. If bilateral trade costs fall (i.e. $\Delta \ln \left(\frac{t_{ij}^k t_{ji}^k}{t_{ii}^k t_{jj}^k}\right) < 0$), then the second term will be positive (remember that $\sigma_k > 1$). But if multilateral resistance also falls, then the third term will be negative. This means that the decline in multilateral resistance diverted some trade away from i and j to other country pairs. If multilateral resistance had been stable, the observed growth in bilateral trade flows would therefore have been bigger.

3 Data

3.1 Trade Frictions

To compute our measure of trade integration across countries, sectors and time, ($\theta_{ij,t}^k$ as given by equation 14), we first need data on the domestic trade of both countries i and j for sector k , x_{ii}^k and x_{jj}^k , as well as their bilateral exports x_{ij}^k and x_{ji}^k . As in previous literature (see, for instance, Wei 1996, Nitsch 2000, Evans 2003, Head and Mayer 2000, Chen 2004), domestic trade for country i is given by the output of sector k , y_i^k , minus total exports of country i to the rest of the world in sector k and denoted by x_i^k .

The data are from Eurostat, the Statistical Office of the European Commission. Bi-

lateral and total trade flows (exports and imports in thousand Euros, as well as their corresponding weight in tons) are available for all 15 EU countries between 1995 and 2004, and are disaggregated at the 4-digit Nace rev.1 level of manufacturing industries (data for the ten new Members are available over a shorter period only and so are excluded from the analysis). The data for Belgium and Luxembourg are aggregated until 1998 so we merged the two countries from 1999 onwards, and end up with 14 exporting and importing countries and 194 sectors.¹ The value of output, which is also disaggregated at the 4-digit Nace rev.1 level, is from Eurostat's New Cronos database and is in million Euros.

One important issue relates to the measurement of the elasticity of substitution for each sector k , σ_k , that enters directly into the expression for our measure of trade integration. We address this problem in several ways. Firstly, we use the elasticities provided by Broda and Weinstein (2006) at the 5-digit SITC rev.3 level and estimated for the US over the period 1990-2001. Using tables of correspondence from the SITC rev.3 to the ISIC rev.3, and then from the ISIC rev.3 to the Nace rev.1 classification, we converted those elasticities (that vary across sectors but not across countries nor time) to the Nace rev.1 level of sectors. As some of the Nace rev.1 sectors are aggregates of the finer SITC rev.3 sectors, the Nace level elasticities are just calculated as the average of the SITC elasticities.² The values so obtained are then used to compute the degree of trade integration according to (14).

Given that those elasticities of substitution can only be imperfectly matched with the industries we consider in the analysis, and therefore may be subject to measurement error, our second approach consists in reporting results while assuming that the elasticity of substitution is the same for all sectors and equal to 1.5, allowing to ignore the power that appears in the expression of (14).³ Although not ideal, this approach is informative as it gives us some indication about the sensitivity of our results to the use of the Broda and Weinstein (2006) elasticities.

Finally, Broda, Greenfield and Weinstein (2006) estimate 3-digit level substitution elasticities for 73 countries in the world (including EU countries) over the period 1994-2003. On the one hand, this allows us to let the elasticity of substitution vary both across countries and sectors. On the other hand, this information gives us the possibility to check whether the ranking of substitution elasticities across sectors remains similar across countries (*the data are not available yet, however*). If the ranking across sectors is indeed

¹As a robustness check, we report results when Belgium and Luxembourg are dropped from the sample.

²Ideally, we should compute a weighted average where the weights are given by the share of each SITC rev.3 sector into each Nace rev.1 sector grouping, but this information is unfortunately not available.

³In that case the measure so computed is the same as in Head and Ries (2001), and which is commonly referred to in the literature as the *phi*-ness of trade (see Head and Mayer 2004).

consistent across countries, then another approach consists in calculating a measure of *relative* trade integration, given by the ratio between $\theta_{ij,t}^k$ for sector k and country pair ij and $\theta_{im,t}^k$ for the same sector k and a different country pair im (i.e., a benchmark). The relative trade integration measure so obtained then becomes independent of the elasticity of substitution as the latter cancels out for each sector once the expression in (14) is expressed in deviation from a benchmark.

As our data are varying over time, and given that we are interested in the time series evolution of trade integration, one final issue relates to the computation of our trade integration variable in *real* terms. Ideally, to deflate one would need domestic price indices for the numerator and export price indices for the denominator in (14). Export price indices are however not available, so common practice is to use domestic deflators instead (see Rose 2000 or Rose and Spiegel 2004 who use GDP price indices to deflate aggregate nominal trade flows; see also Baldwin and Taglioni 2006 who discuss the biases arising in gravity equations due to the use of inappropriate deflators for nominal trade values). If we use domestic price indices to deflate bilateral exports in the denominator of (14), then the deflators cancel out and the use of nominal or real variables yields the same values for our measure of trade integration. We decided to follow this approach of using nominal variables only when calculating the values of θ , but since there are reasons to believe that domestic and export price indices across countries and sectors may differ from each other (in the case of pricing-to-market practices, for instance), we need to provide robustness checks on the results so obtained. One way of doing is to estimate our regressions on cross-sectional samples only; another is to control for the omitted sectoral deflators by including a set of time-varying sector fixed effects in our regressions.⁴ In both cases, we show that our main results remain qualitatively unchanged.

The factors we consider to explain trade integration can broadly be classified into two different categories according to their implications in terms of policy and welfare. We now describe our variables and their sources.

3.2 Policy-Related Determinants

Baldwin (2000) stresses the importance of Technical Barriers to Trade (TBTs) in shaping trade flows between countries and across sectors. TBTs result from norms (regulations and standards) that affect the sale of goods in some markets by requiring specific product characteristics or production processes. He argues that in the case of Europe, such barriers have become more and more visible over time, especially since tariff barriers were completely eliminated by 1968.⁵ We therefore wish to explore whether TBTs are indeed

⁴See Baldwin and Taglioni (2006).

⁵As explained by Baldwin (2000, p.255), “Europe’s first liberalization efforts focused on the “easy” barriers, tariffs and quotas. With these eliminated by 1968, liberalization attention turned to TBTs.”

important in explaining intra-EU trade integration. Data on TBTs are however hard to find, so our approach to measuring TBTs uses two different sources of information.

The European Commission’s Eurobarometer (2006) reports opinions and experiences of European managers about the Single Market. A total of 4,900 managers at companies were interviewed by telephone in early 2006, the sample of companies being selected according to the size of countries and of companies, and the sector of activity. Particularly useful for our purposes is the answer to the question: “Could you tell me whether you consider that for your company it is very important, rather important, rather unimportant or not important at all that future Single Market Policy tackles the question of *removing remaining technical barriers to trade in goods?*”. For each country, we grouped the answers from all managers who replied that TBTs are indeed an important issue, and used the corresponding percentage as a country-specific indication about the relevance of TBTs. We then computed a weighted average of the values for each of the two partner countries to obtain a pair-specific variable (the weights are the GDP shares of each country in the total GDP of the two partner countries).

Unfortunately, this information varies across country pairs only, and we would like to introduce some cross-sectoral variation in the variable to be included in our estimations. As in Chen (2004), to capture the relevance of TBTs across sectors, we rely on another study undertaken for the European Commission (European Commission 1998) which identifies the industries affected by TBTs and assesses, on a five-point scale, the effectiveness of different measures undertaken to eliminate TBTs: (1) measures are successful and all significant barriers are removed, (2) measures are implemented and function well, but some barriers remain, (3) measures are adopted, but with implementation or transitional problems still to be overcome, (4) measures are proposed or implemented, but not effective or with operating problems, and (5) no solution has been adopted. The study also identifies some industries which, prior to European integration, were not affected by TBTs. This information allows us to compute, for the sample of industries affected by TBTs, an industry-specific qualitative variable taking values between one and five, with a larger value indicating a lack of market integration due to subsisting TBTs.

We then interact both country pair (in log) and industry-specific variables on TBTs and denote the resulting variable by TBT_{ij}^k for each sector k and country pair ij . A higher value indicates that TBTs are most probably important impediments to trade across countries and sectors, and we would expect such barriers to be associated with lower trade integration.

In a similar fashion, Non-Tariff Barriers (NTBs) can also be suspected to increase the costs of trade. Data on NTBs are hard to find too, so we use a survey undertaken

by the European Commission (1990) which classifies sectors into three groups of High, Medium and Low NTBs. The measure we compute for each sector k is qualitative and takes on values between one and three for Low, Medium and High barriers respectively (and is equal to zero for sectors not affected by NTBs). We then interact this qualitative variable on NTBs with the country pair variable on TBTs described previously, which we denote by NTB_{ij}^k , and use it as an alternative to the TBT_{ij}^k variable in explaining trade integration.⁶

Overall, if TBTs or NTBs are found to significantly increase the costs of intra-EU trade, we would conclude that there is still some room for policy action and that the removal of such barriers would enable to increase trade integration and welfare.

We control for several other factors that can be suspected to affect the costs of trade in Europe. Firstly, we consider the effects of the non-adoption of the Euro by the United Kingdom, Denmark and Sweden by including a dummy variable, denoted by $OUT_{ij,t}$, which is equal to one for the three countries from 2002 onwards. We decided to choose the year 2002 instead of 1999 as the greater transparency created by the common currency is likely to be stronger since Euro notes and coins were made available to consumers. Secondly, we compute a dummy variable, denoted by $EU6_{ij}$, which characterizes the six founding countries of the European Union.⁷ The idea is to check whether those countries are on average more integrated, in which case they should display a lower θ . We further split this variable into two dummy variables, $EU6_{ij}^{intra}$ which captures trade integration between the six countries only (both i and j belong to the EU6), and $EU6_{ij}^{out}$ which characterizes trade integration between each of the EU6 countries and a country outside the EU6 group (only i or j belongs to the EU6). *A priori*, one might expect the “core” EU6 countries to display a higher degree of trade integration when trading with each other than when trading with countries outside the EU6. Finally, we check whether the countries that joined the EU the most recently in our sample (Finland, Sweden and Austria joined in 1995) display on average higher values for θ , which would indicate a lower degree of integration as compared to the other countries. This is captured by a dummy variable equal to one for each of the three countries, and is denoted by FI, SE, AT_{ij} .

Finally, we seek to account for the fact that market structure, and the resulting degree of trade integration, may be affected by collusive behavior. We use the number of judgments on anti-trust cases given each year by the European Court of Justice, which we

⁶The reason for interacting the variable on NTBs with the country-specific measure on TBTs is that we include sector fixed effects in our estimations, which means that any industry-specific variable included by itself would be dropped.

⁷The countries are Germany, France, Italy, the Netherlands, Belgium and Luxembourg.

denote by $Directives_t$, and enter it as a time-varying explanation for trade integration.⁸ The available information does not allow us to distinguish between countries or sectors, but we would expect anti-trust rulings to have liberalizing effects and therefore to increase the degree of trade integration over time.

3.3 Non-Policy-Related Determinants

Natural candidates to explain trade integration relate to geography. These include the distance between countries, $Dist_{ij}$, and a dummy for sharing a common land border, Adj_{ij} . A dummy for sharing a common (official) language, $Lang_{ij}$, is also considered. The three variables are from the *Centre d'Etudes Prospectives et d'Informations Internationales (CEPII)*.⁹ Several measures of distances are available, and for the sake of comparison we consider two: the distances between capital cities and between the most populated cities (see *CEPII* for further details). We also add quadratic terms to the specifications to control for possible non-linearities in the effects of distance.

As our measure for trade integration is computed using data on both international and domestic trade flows, in our estimations we also need to control for domestic distances. The data are from Chen (2004) where domestic and international distances are calculated as a weighted average of the distances between regions, using GDP shares as weights. Note that we decided to control separately for international and domestic distances (for both partner countries), the latter being denoted by $D_{ii} \times D_{jj}$.

We consider two variables to proxy for transportation costs that vary across sectors. Indeed, when trade is disaggregated at the industry level, the inclusion of distance does not capture that different goods are subject to different transportation costs. Since the weight-to-value ratio of shipments provides a significant explanation of freight rates (Hummels 2001, 2007), weight-to-value is accordingly considered as a determinant of trade integration. Our weight-to-value measure, wv_t^k , expressed in kilograms per Euro, is year and industry-specific and averaged across all country pairs ij . We do not consider bilateral weight-to-value because Hillberry and Hummels (2000) show that bilateral weight-to-value significantly falls with distance, suggesting that the commodity composition of trade is sensitive to bilateral trade costs, but also that weight-to-value is endogenous. Overall, since the freight component of costs is higher for bulky, high weight-to-value raw materials than for manufactures, we expect to find a positive relationship between weight-to-value and our trade integration measure.¹⁰

⁸The number of judgments by the European Court of Justice are available from <http://ec.europa.eu/comm/competition/court/antitrust/iju51990.html>.

⁹This is available online at <http://www.cepii.fr/francgraph/bdd/distances.htm>.

¹⁰The role of weight-to-value, when measured at the level of industries only, cannot be investigated once sector fixed effects are included in the estimations. To get around this problem, we will interact this

Besides, given that our trade data report both bilateral import and export flows, the ratio between the two gives another indication of transportation costs as the former include “Costs, Insurance and Freight”, whereas the latter are typically registered “Free On Board”. This proxy is however known to suffer from measurement error. Harrigan (1999) recommends averaging observed values for each sector across countries to minimize measurement error, so we calculate this ratio separately for each country i , sector k and time t , take the average between all countries, and use it as an additional proxy for transportation costs that varies across sectors and years (and denoted by $cfob_t^k$).

Finally, the new trade literature on heterogeneous firms rationalizes why some firms export while others do not. In particular, models such as Melitz (2003), or Melitz and Ottaviano (2005) (*add other references like Tybout et al, Bernard et al. etc*), argue that only the most productive firms will participate in foreign markets as only those will be productive enough to sunk the fixed costs of exporting abroad. This implies that sectors with more productive firms should, on average, display a higher degree of trade integration. The likely endogeneity between trade and productivity levels is, however, of great concern. To address this problem, we measure real labor productivity across sectors but for a country that is not included in our dataset, i.e. the US. The variable is given by value added (in volume) divided by the number of employees, taken from the OECD STAN database and denoted by $Prod_{US,t}^k$. The sectors are however slightly more aggregated (at the 2-digit level) than the sectors we consider in our analysis.

4 Descriptive Statistics

[To be written]

5 Results

This section reports our main empirical results. Firstly, we provide an analysis of the determinants of trade integration across countries, sectors and years. We investigate the relevance of the various factors described above, bearing in mind that some have different implications in terms of policy recommendations than others.

Secondly, we focus on the time series analysis of trade integration, i.e. how trade costs have changed over time and on average over the whole sample, across countries, and across sectors. Such analysis is useful as it helps to shed new light on the debate about whether impediments to trade have declined over time (Hummels 2007). The changes

sector-specific weight-to-value ratio with distance.

across countries and sectors are in turn informative to assess the change in the degree of market integration of the various countries and sectors.

Thirdly, we decompose the increase in trade over the sample period into two components – the contribution from the income growth in the two partner countries and the one stemming from the decrease in trade costs, the latter being further split into the proportion that is attributable to the decrease in bilateral trade costs and the one due to the decrease in multilateral trade costs (“multilateral trade resistance”). Finally, the last sub-section provides a battery of robustness checks.

5.1 The Determinants of Trade Integration

We now analyze the determinants of intra-EU trade integration. We focus on an unbalanced sample of countries, sectors and years. We regress the log of our trade integration measure, $\ln \theta_{ij,t}^k$, on the various factors discussed earlier, and include separate intercepts for years and sectors.¹¹ The inclusion of independent variables that vary across country pairs only, such as the dummies for belonging to the EU6 or to the most recent joiners in the sample, precludes us from controlling for country fixed effects.

The regression is

$$\ln \theta_{ij,t}^k = \psi_t + \lambda^k + \beta Pol_{ij,t}^k + \zeta NonPol_{ij,t}^k + \epsilon_{ij,t}^k \quad (21)$$

where $Pol_{ij,t}^k$ is the set of policy-related variables, $NonPol_{ij,t}^k$ the set of non-policy related variables, ψ_t are intercepts for years, λ^k are fixed effects for each sector k at the 4-digit level, β and ζ are vectors of coefficients to be estimated and $\epsilon_{ij,t}^k$ is a residual. A higher value for $\theta_{ij,t}^k$ should be interpreted as a lower degree of trade integration.

Table 1 reports our main results. Column (1) only includes aggregate, “macro” type variables that vary across countries only: international and domestic distances, adjacency, sharing a common border, a common language, the regional dummies and the one for not adopting the Euro. The effects of the different variables are highly significant and display coefficients with the expected signs: trade integration decreases with international distances (here calculated between capital cities) and is inversely proportional to domestic distances. Trade integration is also higher between countries that share a common border and a common language but is lower for Finland, Sweden and Austria. Trade integration is also significantly lower in the United Kingdom, Denmark and Sweden since the introduction of the Euro in 2002, as can be seen from the positive and significant coefficient

¹¹The results obtained when including time-varying sector fixed effects are reported as a robustness check only.

on the $OUT_{ij,t}$ dummy variable. This is consistent with the findings of Rose (2000) who shows that common currencies have a strong positive impact on trade.¹²

The coefficients on the $EU6_{ij}^{intra}$ and $EU6_{ij}^{out}$ dummies are both negative and significant, but the former is significantly more negative than the latter (we can reject at the 1 percent level that the two coefficients are equal). This is interesting as it indicates that trading with the EU6 countries is less costly on average, but trade is even easier within the EU6 only. We conclude from this that the founding countries of the European Union are definitely more integrated than the other EU countries in the sample.

In Column (2) we add variables that vary across sectors: transportation costs, given by the ratio between *c.i.f.* and *f.o.b.* trade values, the extent of TBTs and labor productivity. The coefficients on all three variables are significant and their effects are as expected: trade integration decreases with transportation costs, the extent of TBTs across countries and sectors, and increases with labor productivity. The finding on TBTs is consistent with Baldwin (2000) who argues that TBTs have become relatively more important in shaping trade flows in Europe. This also suggests some room is left for policy action and that the removal of such barriers might increase welfare through a lowering in trade impediments. Besides, the finding of a negative relationship between θ and productivity confirms the predictions of the new trade literature that the most productive firms are more likely to participate in foreign markets, in which case they should be characterized by higher trade integration.

Column (3) adds a quadratic term on international distance to the specification in (2). Both distance and distance squared are significant, and we can calculate that the threshold effect of distance on trade costs is equal to 148 kilometers. This is much lower than the average distance in our sample, which is equal to 1338 kilometers. *[To be completed]*

In Column (4), when we include distance, distance squared, and an interaction between distance and the average weight-to-value calculated for each sector and year, all three coefficients are significant. We decided to interact weight-to-value with distance because sector fixed effects preclude us from including any independent variable that varies across sectors only. This approach is of interest because it allows us to calculate, for each sector (each characterized by a different average weight-to-value), the distance from which trade costs begin to rise. In Table 2 we calculate this threshold level of distance for a few illustrative sectors: the sector producing the less transportable goods is Plaster (with an average weight-to-value equal to roughly 41 kilograms per Euro exported) while the sector producing the most transportable good is Nuclear Fuel. We also report the results

¹²The huge literature that investigates the trade creating effects of common currencies raises the issue of endogeneity of the common currency dummy. This needs to be addressed in the section on robustness.

for the sector of Non-distilled fermented beverages as its weight-to-value is the closest to the sample average, and for the sector of Steel tubes which weight-to-value is close to unity. The second column reports our findings using the coefficients of Column (4) in Table 1. It appears that for Plaster, distance begins to have a detrimental effect on trade integration after 117 kilometers. This makes sense as the geographic market for plaster is, indeed, very local since its low transportability constrains the distance over which it can be delivered. In contrast, Nuclear fuel can be transported up to 192 kilometers before distance significantly begins to be an impediment. For Non-distilled fermented beverages, the distance is equal to 144 kilometers, which is indeed very similar to one calculated for the whole sample (using the coefficients reported in Column (3) of Table 1) and equal to 148 kilometers.

In Column (5), the variable on TBTs is replaced by the one on NTBs. The results remain qualitatively similar, and indicate that in sectors that are identified as being affected by NTBs, trade costs are on average higher.

Column (6) of Table 1 replicates the specification of Column (4) but with an alternative distance measure, i.e. the distance between the most populated cities. The results remain qualitatively similar, the main difference being the magnitude of the estimated coefficients on the distance terms. The resulting threshold distances for each sector are reported in Table 2, and although they tend to be longer, the ranking across sectors remains the same. Note that in this specification, the coefficient on the variable for not adopting the Euro becomes insignificantly different from zero.

Finally in Column (7) we add the number of judgements on anti-trust cases given each year by the European Court of Justice, and this shows up with a negative and significant coefficient. This suggests that anti-trust directives may be useful in liberalizing and making markets more competitive, leading to higher trade integration. *[Add this regression to the tables – To be completed].*

As explained earlier, the elasticities of substitution σ_k we use to compute our measure of trade integration are likely to be measured with error as we couldn't perfectly match the different trade classifications together. When computing the elasticities, it appeared that some displayed huge values which might actually affect our results. As noted by Anderson and van Wincoop (2004), it is difficult to say anything about trade impediments when the elasticities are too high.¹³ We therefore run the same regressions as in Table 1 but restricting the sample to substitution elasticities smaller than 25. The regressions are

¹³To quote them, "More generally, it is difficult to learn much about trade barriers from a gravity equation for sectors where the elasticity of substitution is extremely high" (Anderson and van Wincoop 2004, p.709).

reported in Appendix Table A1 and the results remain unaffected by the exclusion of those observations.

We also report the results from running the same specification but on cross-sectional samples only. Recall that the reason for doing so is to demonstrate that our results are not affected by the use of nominal variables to compute trade integration over time. Table A2 in the Appendix reports cross-sectional estimates of the specification in Column (4) of Table 1. The main difference with Table 1 is that labor productivity in the US and the ratio between *c.i.f.* and *f.o.b.* (which both vary across sectors and time only) and the dummy for non-adoption of the Euro are now omitted. Speaking a common language and the extent of TBTs are not significantly different from zero in 1997 and 1998 but become significant and with the expected signs in later years, again revealing that a common language lowers trade costs while TBTs impede trade. All other results remain unchanged.

Table A3 in the Appendix report our findings when assuming that the elasticity of substitution is equal to 1.5 for all sectors. The magnitudes of the estimated coefficients tend to be different from the ones in Tables 1 and A1, but the sign and significance of the various factors remain unchanged. This is reassuring as it suggests that our main conclusions regarding the determinants of trade integration are not strongly biased by the use of imperfect proxies for the elasticities of substitution.

Finally, Table A4 reports, for both dependent variables on trade integration and for the full and the restricted (to substitution elasticities smaller than 25) samples, the coefficients obtained when including time-varying sector fixed effects in an attempt to control for the omitted sectoral deflators in the computation of trade integration. Labor productivity for the US and the ratio between *c.i.f.* and *f.o.b.* trade values are now dropped, but all other results remain unchanged.

To conclude, in this section we showed that the use of a micro-founded measure of industry-specific bilateral trade integration proves useful in the investigation of the likely determinants of trade impediments across EU countries. It is found that trade frictions increase with distance, transportation costs across goods, the extent of TBTs and NTBs and are still more important for the countries that joined the EU most recently in our sample. In contrast, trade impediments are decreased by common borders, common languages, stronger productivity and are on average lower for the “core” EU6 countries.

5.2 The Evolution of Trade Integration Over Time

To analyze the time series evolution of trade integration, we need samples that are balanced over time. Given the size of our dataset, several combinations of countries, sectors

and years are possible. We decided to focus on two balanced samples. The first covers the period 1997 to 2003 and includes ten countries (Austria, Denmark, Finland, France, Ireland, Italy, the Netherlands, Portugal, Spain and the United Kingdom) and 163 sectors, for a total number of observations equal to 16,177. However, to include Germany in the analysis as well, we need to restrict the sample to the shorter period between 1999 and 2003.¹⁴ The second sample includes the ten countries listed previously as well as Germany, 187 sectors between 1999 and 2003, for a total number of observations equal to 17,065. In this section we present the results obtained using the first sample only as the period covered is longer (the results pertaining to the second sample that includes Germany are reported in the section on robustness).

Using the data from our balanced sample, Figure 1 in the Appendix plots the time series evolution of our trade integration measure, averaged across countries and sectors. It is interesting to observe that trade frictions display a strong downward trend over the period, suggesting that the countries and sectors we consider have significantly become more trade integrated over time.

As explained by Hummels (2007), to investigate changes in transportation costs over time, one needs to control for systematic differences in trade costs between trade partners and for changes in the characteristics of the products that are traded (i.e. change in the composition of goods traded). As transportation costs are naturally a major component of our trade integration measure, we follow Hummels (2007) in choosing the empirical specification we estimate. We use a regression where the dependent variable is again the log of our trade integration measure for sector k , between countries i and j , at time t , i.e. $\ln \theta_{ij,t}^k$. The independent variables include a separate intercept for each country pair-sector, the weight-to-value ratio in logs, and year dummy variables.¹⁵ The country pair-sector intercepts control for the fact that cars traded between Germany and Spain have higher transportation costs in all periods than shoes traded between France and Italy, while the weight-to-value controls for compositional change over time such as for instance Spain trading higher quality shoes.

The regression takes the form:

$$\ln \theta_{ij,t}^k = \gamma_{ij}^k + \psi_t + \alpha \ln wv_{ij,t}^k + \varepsilon_{ij,t}^k \quad (22)$$

where γ_{ij}^k are country pair dummies interacted with sector intercepts (at the 4-digit Nace rev.1 level), ψ_t are year dummies and $\varepsilon_{ij,t}^k$ is the regression residual. Having controlled

¹⁴This is because sectoral output data are missing for Germany prior to 1999.

¹⁵In this case, as distance is omitted, we consider the actual weight to value ratio that varies across sectors, country pairs and years and not the sector and year-specific measure we used in the previous section.

for compositional change, the evolution of trade integration over time is given by the estimated coefficients on the year dummies, ψ_t .

The first column in Table 3 reports the coefficients on the year dummies that are obtained from the estimation of equation (22) over our pooled (and balanced) sample of ten countries and 163 sectors between 1997 and 2003. Trade integration has, on average, significantly increased by 0.857 per annum. This is consistent with Figure 1 and with Hummels (2007) who shows that *[To be completed]*.

The next columns in Table 3 repeat the same exercise as in Column (1) but for each country separately. On average, trade impediments have significantly been reduced for most countries over the period, but to a greater extent for some countries than for others. In particular, trade costs have decreased more in the case of Spain (by 1.41 percent each year) and to a smaller extent in the case of the Netherlands (0.335 percent per annum). Trade costs have not significantly changed in Denmark, as the annualized growth rate reported in the last row of the table is not significantly different from zero. Note that it seems unlikely that the finding of a systematic increase in trade integration for most countries in the sample is driven exclusively by the use of nominal variables in the computation of our trade integration measure θ *[To be completed]*.

In Table 4 we report, for each sector, the annualized growth rate of trade integration between 1997 and 2003, obtained from the estimation of equation (22) for each sector separately. Some sectors experienced significant decreases in trade frictions, while others are instead characterized by an increase over the same period. The sectors are ordered in terms of increasing growth rates, from negative to positive. As some of the annualized growth rates are not significant from a statistical point of view, we report in bold characters the sectors that experienced a significant change (either positive or negative and significant at the 10 percent level) in trade integration over time. Distilled potable alcoholic beverages display the strongest decrease in θ over the period of approximately 9.24 percent per annum. Other sectors where trade integration significantly increased are Underwear, Accumulators, Ice cream, Publishing of sound recording or Pharmaceutical preparations. On the other hand, trade integration is today lower for Articles of concrete (4.41 percent per year), which are likely to be characterized by a low transportability, followed by Cold rolling of narrow strips, Non-electric domestic appliances, Other publishing or Other glass. *[To be completed]*.

Figure 2 in the Appendix plots, for the sectors that experienced a significant change in trade integration over time (i.e. those sectors which are reported in bold characters in Table 4), their growth in trade integration over the period. It is interesting to note that the vast majority of sectors experienced a decrease in trade frictions over time, which is

consistent with our finding that on average, trade impediments have significantly decreased over the period.

[To be completed]

5.3 Decomposing the Growth in Trade

Finally, in this section we decompose the growth in trade across countries and sectors into two fundamental factors – one that captures the contribution of the income growth of the two partners and the other the contribution of the decline in trade costs. Using equation (20), we deflate all variables to constant prices using the GDP deflators of each country.¹⁶ We then calculate, for each year in the sample, the value of each factor for each country pair and sector, and then compute a weighted average of all values, using value added shares (of both partner countries and at the sector level) as weights.¹⁷

Table 5 reports the growth in trade for our balanced sample between 1997 and 2003 and the respective contributions of economic expansion and the decline in trade costs in explaining the growth in trade across countries and sectors. We carry out this exercise for the whole sample and various subsamples of our dataset. The first row refers to the whole sample, in which trade has on average grown by 7.6 percent over the period. We see that 62.7 percent of this trade expansion can be accounted for by changes in trading partners’ income growth, whereas declines in trade costs account for about 37.3 percent of the growth in trade. These proportions are very similar to the findings of Baier and Bergstrand (2001) who argue that two-thirds of the growth in trade amongst OECD countries between 1958 and 1988 was explained by the growth of output. They are also consistent with the findings by Jacks, Meissner and Novy (2006) who find that roughly 44 percent of the global trade boom between 1870 and 1913 can be explained by reductions in trade costs, the remaining 56 percent being attributable to economic expansion.

Of particular interest is our ability to further decompose the contribution of the decrease in trade costs into the proportion due to changes in bilateral trade costs and that due to changes in trade costs with and between the other countries in the sample (“multilateral trade resistance”). The last two columns of the table show this decomposition. For the whole sample, the increase in trade can be accounted for by a 62.4 percent decline in bilateral trade costs between partners. However, trade would have been increased by

¹⁶In contrast to the computation of our trade integration measure, it now appears that even when using domestic price indices only to deflate the variables that appear in the expressions for each of the different factors, the deflators do not cancel out so we need to deflate in a way or the other. In this section, we report the results obtained when using GDP deflators. As a robustness, we also report the results obtained when using sectoral domestic price indices and the main conclusions remain unchanged.

¹⁷We also tried to compute weights using trade shares and the results remain unaffected.

more had the trade costs with and between other partners in the sample not gone down as well (as the contribution from trade resistance is negative and equal to -25.1 percent).

The next rows of the table report the same decompositions for various subsamples of the dataset. On average, trade has gone up by more for Finland, Sweden and Austria (10.2 percent) but has not been much increased for the countries that decided to remain outside the Eurozone (in that case in the growth in trade is equal to 1.9 percent only, but is only calculated for the period 2002 to 2003).

Trade cost declines have also contributed most to the growth in trade for countries like Finland, Austria and Sweden. Note that the negative contribution of trade costs for the United Kingdom, Sweden and Denmark, which have not adopted the Euro, and which is equal to -3.4 percent, indicates that trade costs have actually increased for the three countries. Multilateral trade costs have also increased for the three countries, as can be seen from the positive contribution from the multilateral trade costs.

We also consider sample splits according to distance. The decline in trade costs has been a more important determinant of the growth in trade for countries that are farther apart (71.2 percent).

[To be completed – add the alternative decomposition]

6 Robustness

[To be completed]

7 Conclusion

We investigate why the integration of international trade is more advanced in some industries than in others. For this purpose we use the gravity framework pioneered by Anderson and van Wincoop and apply it to industries with heterogeneous trade costs and heterogeneous elasticities of substitution. The model yields a micro-founded measure of bilateral trade integration at the industry level that controls for time-varying multilateral resistance. We find that trade integration is high in industries that are characterized by high productivity, low transportation costs and low technical barriers to trade. These systematic differences across industries suggest that modelling trade costs as a ‘one-fits-all’ trade impediment is at odds with the empirical evidence from disaggregated trade data. Instead, when dealing with industry-level data it is important to allow for trade cost heterogeneity across industries.

Moreover, we show that trade integration improved significantly over the period 1997-2003. These improvements can on average explain one third of the growth in trade and are therefore a major driving force of international economic integration.

[To be completed]

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[To be completed]

Table 1: The Determinants of Intra-EU Trade Costs: Dependent Variable $\ln(\theta_{ij}^k)$

	(1)	(2)	(3)	(4)	(5)	(6)
Macro variables						
$\ln Dist_{ij}$	0.961 (48.963)	0.892 (38.190)	-2.489 (-7.169)	-2.490 (-7.187)	-2.447 (-7.019)	-3.359 (-11.103)
$\ln Dist_{ij}^2$	—	—	0.249 (9.771)	0.252 (9.893)	0.248 (9.666)	0.316 (14.057)
$\ln Dist_{ij} \times \ln wv_t^k$	—	—	—	0.025 (5.240)	0.026 (5.374)	0.028 (5.772)
$\ln(Dist_{ii} \times Dist_{jj})$	-1.505 (-19.950)	-1.338 (-16.393)	-1.336 (-16.426)	-1.336 (-16.423)	-1.312 (-16.213)	-1.276 (-15.702)
Adj_{ij}	-0.439 (-16.233)	-0.472 (-15.242)	-0.431 (-13.869)	-0.429 (-13.827)	-0.439 (-14.190)	-0.423 (-13.653)
$Lang_{ij}$	-0.195 (-4.364)	-0.180 (-3.585)	-0.325 (-6.550)	-0.328 (-6.614)	-0.322 (-6.504)	-0.393 (-7.736)
$EU6_{ij}^{intra}$	-0.588 (-19.314)	-0.668 (-19.410)	-0.647 (-18.612)	-0.648 (-18.638)	-0.656 (-18.894)	-0.569 (-16.575)
$EU6_{ij}^{out}$	-0.250 (-12.821)	-0.285 (-13.222)	-0.239 (-10.994)	-0.239 (-11.006)	-0.245 (-11.380)	-0.228 (-10.426)
FI, SE, AT_{ij}	0.338 (17.853)	0.320 (15.940)	0.320 (15.943)	0.321 (16.018)	0.323 (16.070)	0.266 (13.070)
$OUT_{ij,t}$	0.101 (3.088)	0.071 (1.984)	0.062 (1.745)	0.061 (1.718)	0.066 (1.864)	0.038 (1.076)
Micro variables						
$\ln cfob_t^k$	—	0.042 (4.383)	0.042 (4.376)	0.044 (4.547)	0.043 (4.521)	0.044 (4.560)
$\ln TBT_{ij}^k$	—	0.339 (7.439)	0.254 (5.652)	0.250 (5.568)	—	0.154 (3.332)
$\ln Prod_{US,t}^k$	—	-0.120 (-2.717)	-0.120 (-2.741)	-0.120 (-2.749)	-0.105 (-2.407)	-0.129 (-2.960)
$\ln NTB_{ij}^k$	—	—	—	—	0.007 (8.532)	—
c	2.078 (8.186)	-0.149 (-0.332)	11.841 (9.204)	11.977 (9.332)	12.983 (10.371)	15.494 (13.601)
Sample	Whole	Whole	Whole	Whole	Whole	Whole
Distance	Capitals	Capitals	Capitals	Capitals	Capitals	Pop Cities
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	53801	47162	47162	47162	47162	47162
R^2	0.166	0.154	0.157	0.158	0.158	0.157

Notes: t-statistics in parentheses.

Table 2: Threshold Effects of Distance

Sector	Nace code	Weight-to-value (kg/euro)	Using coefficients in Table 1 and column:		
			(3)	(4)	(6)
Average	–	–	148km	–	–
Plaster	2653	40.87 (max)	–	117km	173km
Nuclear fuel	2330	0.002 (min)	–	192km	269km
Non-distilled fermented beverages	1595	0.644 (\sim mean)	–	144km	208km
Steel tubes	2722	1.012 (\sim 1)	–	141km	204km
Distance			Capitals	Capitals	Pop Cities
Sample			Whole	Whole	Whole

Table 3: Evolution over Time – Average and Countries

	Whole sample									
	Spain	Austria	Portugal	Italy	France	UK	Finland	Ireland	Denmark	Netherlands
1997	3.35 (114.16)	4.15 (38.56)	3.50 (55.32)	3.34 (55.48)	2.96 (66.79)	3.05 (69.77)	4.21 (68.02)	2.99 (21.65)	3.10 (38.19)	3.38 (32.74)
1998	3.31 (115.84)	4.04 (37.86)	3.44 (52.45)	3.30 (55.88)	2.92 (65.08)	3.05 (75.42)	4.17 (75.16)	2.93 (22.13)	3.12 (38.66)	3.37 (31.61)
1999	3.34 (122.91)	4.08 (44.23)	3.45 (61.08)	3.30 (52.61)	2.92 (63.44)	3.04 (80.04)	4.22 (73.37)	2.84 (20.75)	3.20 (38.86)	3.52 (37.00)
2000	3.25 (107.72)	3.95 (33.19)	3.36 (49.93)	3.19 (51.70)	2.86 (59.01)	2.98 (75.92)	4.12 (70.69)	2.98 (20.17)	3.07 (39.04)	3.46 (29.34)
2001	3.27 (109.77)	3.88 (32.45)	3.35 (56.28)	3.20 (45.94)	2.88 (60.04)	3.00 (79.78)	4.12 (62.93)	2.97 (21.58)	3.17 (43.38)	3.47 (3.088)
2002	3.22 (110.00)	3.94 (35.74)	3.26 (50.03)	3.18 (50.34)	2.87 (65.08)	2.96 (77.18)	4.08 (73.49)	2.92 (21.70)	3.09 (39.37)	3.37 (28.62)
2003	3.19 (108.01)	3.86 (36.21)	3.26 (51.92)	3.15 (49.85)	2.84 (55.74)	2.94 (76.43)	4.06 (64.80)	2.90 (21.88)	3.03 (38.63)	3.31 (29.24)
Annualized										
Growth Rate (%)	-0.857 (-10.01)	-1.196 (-5.24)	-1.164 (-5.51)	-0.949 (-6.96)	-0.709 (-4.58)	-0.633 (-4.40)	-0.590 (-3.03)	-0.508 (-1.89)	-0.405 (-1.53)	-0.335 (-1.15)
N	16177	4963	3199	4844	4683	4256	2919	777	2163	2422
R ²	0.01	0.04	0.03	0.03	0.01	0.01	0.01	0.02	0.02	0.01

Notes: Coefficients on year dummies are obtained from regressing equation (22) in the text. Country-pair fixed effects interacted with sector dummies, as well as the (log) weight-to-value are included in all regressions (not reported). t-statistics in parentheses.

Table 4: Evolution over Time – Sectors

Sectors	Annualized Growth Rate (%)	Sectors	Annualized Growth Rate (%)
Dressing, dyeing of fur (1830)	-15.21 (-0.90)	Rusks, biscuits (1582)	-2.44 (-4.97)
Distilled potable alcoholic beverages (1591)	-9.24 (-2.06)	Plastics (2416)	-2.42 (-3.96)
Underwear (1823)	-7.37 (-2.04)	Aluminium (2742)	-2.42 (-2.40)
Accumulators (3140)	-6.19 (-6.32)	Tanning, dressing of leather (1910)	-2.41 (-2.69)
Ice cream (1552)	-4.28 (-4.06)	Light metal packaging (2872)	-2.30 (-3.33)
Publishing of sound recordings (2214)	-4.15 (-2.21)	Medical, surgical equipment (3310)	-2.25 (-4.05)
Pharmaceutical preparations (2442)	-4.14 (6.42)	Lighting equipment (3150)	-2.16 (-3.08)
Homogenized food preparations (1588)	-4.04 (-2.76)	Pet foods (1572)	-2.06 (-1.16)
Plaster products (2462)	-3.96 (-6.06)	Mattresses (3615)	-2.03 (-3.09)
Electricity distribution (3120)	-3.76 (-6.44)	Office machinery (3001)	-2.02 (-2.46)
Other rubber products (2513)	-3.53 (-7.44)	Insulated wire (3130)	-1.93 (-4.98)
Crude oils, fats (1541)	-3.50 (-5.95)	Wines (1593)	-1.88 (-3.19)
Grain mill products (1561)	-3.43 (-16.20)	Textile articles, except apparel (1740)	-1.87 (-4.82)
Refined oils, fats (1542)	-3.41 (-1.88)	Kitchen furniture (3613)	-1.85 (-2.16)
Glues and gelatines (2911)	-3.33 (-4.30)	Steel drums (2871)	-1.83 (-2.14)
Pesticides (2420)	-3.15 (-2.68)	Footwear (1930)	-1.82 (-1.98)
Luggage, handbags (1920)	-2.97 (-3.07)	Starches (1562)	-1.78 (-1.27)
Wire drawing (2734)	-2.95 (-2.39)	Sugar (1583)	-1.75 (-2.01)
Taps, valves (2913)	-2.90 (-4.03)	Poultrymeat (1512)	-1.72 (-2.03)
Tea, coffee (1586)	-2.88 (-3.29)	Household, sanitary goods (2122)	-1.71 (-2.47)
Cutlery (2861)	-2.88 (-3.69)	Cocoa, chocolate (1584)	-1.65 (-3.23)
Machinery for mining (2952)	-2.82 (-2.31)	Paper, paperboard (2112)	-1.65 (-4.71)
Optical instruments (3340)	-2.77 (-5.28)	Bearings, gears (2914)	-1.61 (-2.69)
Basic iron, steel (2710)	-2.65 (-5.88)	Synthetic rubber (2417)	-1.59 (-0.72)
Pre-press activities (2224)	-2.64 (-2.78)	Parts, accessories for motor vehicles (3430)	-1.58 (-2.41)
Electric domestic appliances (2971)	-2.59 (-3.36)	Fruit, vegetable juice (1532)	-1.56 (-3.42)
Steel tubes (2722)	-2.53 (-4.31)	Radiators, boilers (2822)	-1.56 (-1.56)
Lead, zinc (2743)	-2.46 (-1.14)	Other agricultural machinery (2932)	-1.53 (-3.66)

Table 4: Evolution over Time – Sectors (continued)

Sectors	Annualized Growth Rate (%)	Sectors	Annualized Growth Rate (%)
Electronic valves, tubes (3210)	-1.53 (-0.65)	Other textiles (1754)	-1.00 (-1.73)
Brooms, brushes (3662)	-1.51 (-2.34)	Instruments and appliances (3320)	-1.00 (-0.82)
Knitted, crocheted hosiery (1771)	-1.50 (-3.31)	Refractory ceramic products (2626)	-0.99 (-1.48)
Plastic plates (2621)	-1.50 (-2.36)	Corrugated paper (2121)	-0.98 (-4.43)
Television, radio (3220)	-1.46 (-1.58)	Other articles of paper (2125)	-0.98 (-2.98)
Sports goods (3640)	-1.46 (-0.84)	Machinery for textile (2954)	-0.98 (-0.65)
Articles of cork (2052)	-1.42 (-1.28)	Publishing of journals (2213)	-0.93 (-2.52)
Non-metallic mineral products (2682)	-1.42 (-3.31)	Building, repairing of boats (3512)	-0.89 (-0.64)
Condiments, seasonings (1587)	-1.41 (-2.22)	Shaping of flat glass (2612)	-0.87 (-1.75)
Meat (1513)	-1.39 (-4.10)	Building stone (2670)	-0.87 (-2.56)
Concrete products (2661)	-1.39 (-2.30)	Games, toys (3650)	-0.85 (-0.92)
Cold forming (2733)	-1.36 (-1.31)	Electrical equipment (3161)	-0.83 (-1.02)
Other outerwear (1822)	-1.34 (-2.44)	Pulp (2111)	-0.81 (-0.49)
Macaroni, noodles (1585)	-1.31 (-1.32)	Abrasive products (2681)	-0.81 (-1.91)
Mineral waters, soft drinks (1598)	-1.31 (-2.42)	Wooden containers (2040)	-0.78 (-2.91)
Machinery for paper (2955)	-1.28 (-1.38)	Building, repairing of ships (3511)	-0.72 (-0.53)
Paints, varnishes (2430)	-1.25 (-4.02)	Non-wovens, except apparel (1753)	-0.70 (-0.65)
Other products of wood (2051)	-1.23 (-2.53)	Bodies for motor vehicles (3420)	-0.70 (-1.69)
Bread, fresh pastry (1581)	-1.14 (-3.75)	Furnaces (2921)	-0.61 (-0.41)
Locks and hinges (2863)	-1.10 (-2.36)	Lifting, handling equipment (2922)	-0.59 (-2.40)
Carpets, rugs (1751)	-1.09 (-1.68)	Watches, clocks (3350)	-0.57 (-0.83)
Perfumes (2452)	-1.09 (-0.87)	Chairs (3611)	-0.55 (-1.17)
Ceramic sanitary fixtures (2622)	-1.09 (-1.46)	Fish (1520)	-0.54 (-0.64)
Other fabricated metal products (2875)	-1.04 (-2.89)	Cement (2651)	-0.54 (-0.40)
Other general purpose machinery (2924)	-1.04 (-3.45)	Dairies, cheese (1551)	-0.51 (-1.17)
Basic pharmaceutical products (2441)	-1.02 (-1.05)	Knitted, crocheted fabrics (1760)	-0.51 (-0.65)
Fasteners (2874)	-1.02 (-1.18)	Agricultural tractors (2931)	-0.44 (-0.47)
Non-domestic cooling equipment (2923)	-1.01 (-3.36)	Plastic products (2524)	-0.39 (-1.99)

Table 4: Evolution over Time – Sectors (continued)

Sectors	Annualized Growth Rate (%)	Sectors	Annualized Growth Rate (%)
Builders' carpentry (2812)	-0.39 (-0.92)	Chemical products (2466)	0.44 (4.19)
Other inorganic basic chemicals (2413)	-0.30 (-0.57)	Potatoes (1531)	0.56 (0.59)
Ceramic tiles (2630)	-0.28 (-0.44)	Other electrical equipment (3162)	0.56 (0.71)
Bricks (2640)	-0.22 (-0.53)	Veneer sheets, plywood (2020)	0.73 (1.16)
Other wearing apparel (1824)	-0.20 (-0.24)	Weapons, ammunition (2960)	0.73 (1.59)
Builders' carpentry, joinery (2030)	-0.20 (-0.67)	Other special purpose machinery (2956)	0.74 (1.86)
Other office and shop furniture (3612)	-0.20 (-0.73)	Publishing of newspapers (2212)	0.75 (2.17)
Cordage (1752)	-0.18 (-0.34)	Industrial gases (2411)	0.75 (1.19)
Jewellery (3622)	-0.17 (-0.13)	Other manufacturing (3663)	0.95 (1.82)
Fruit, vegetables (1533)	-0.16 (-0.26)	Railway, tramway locomotives (3520)	0.98 (0.57)
Plaster products (2662)	-0.11 (-0.12)	Fertilizers, nitrogen compounds (2415)	1.09 (0.96)
Printing (2222)	-0.06 (-0.32)	Other ceramic products (2625)	1.32 (0.46)
Feeds for farm animals (1571)	-0.05 (-0.12)	Steam generators (2830)	1.35 (0.81)
Plastic plates (2521)	-0.03 (-0.11)	Other organic basic chemicals (2414)	1.39 (1.22)
Glass fibres (2614)	-0.01 (-0.01)	Flat glass (2611)	1.51 (1.22)
Wire products (2873)	0.01 (0.03)	Copper (2744)	1.76 (2.89)
Sawmilling, planing of wood (2010)	0.04 (0.10)	Margarine (1543)	2.06 (0.51)
Machinery for food, beverage (2953)	0.09 (0.22)	Man-made fibres (2470)	2.36 (1.38)
Publishing of books (2211)	0.10 (0.35)	Other glass (2615)	2.41 (1.80)
Tanks, reservoirs (2821)	0.12 (0.24)	Motor vehicles (3410)	2.41 (0.87)
Metal structures (2811)	0.14 (0.52)	Other publishing (2215)	2.59 (3.21)
Other transport equipment (3550)	0.17 (0.08)	Non-electric domestic appliances (2972)	2.60 (3.19)
Electric motors (3110)	0.20 (0.34)	Aircraft, spacecraft (3530)	2.67 (1.34)
Hollow glass (2613)	0.23 (0.65)	Cold rolling of narrow strip (2732)	4.29 (11.91)
Mortars (2664)	0.24 (0.13)	Articles of concrete (2666)	4.41 (3.38)
Leather clothes (1810)	0.36 (0.05)		

Notes: Numbers represent the annualized growth rates of the coefficients on the year dummies obtained from regressing equation (22) in the text for each sector separately. Country-pair fixed effects and weight-to-value are included in all regressions (not reported). t-statistics in parentheses.

Table 5: Decomposition of Trade Growth

	N	Growth in trade 1997-2003, average	Contribution of income growth	Contribution of trade costs decline	Bilateral costs	Multilateral costs
Full sample	13764	7.6%	62.7%	37.3%	62.4%	-25.1%
$EU6_{ij}^{intra}$	1352	5.5%	55.8%	44.2%	134.7%	-90.5%
FI, SE, AT_{ij}	4160	10.2%	23.3%	76.8%	89.7%	-12.9%
OUT_{ij} (2002 onwards)	1732	1.9%	103.4%	-3.4%	-84.6%	81.2%
$Adj_{ij} = 0$	10936	6.9%	29.2%	70.8%	85.9%	-15.1%
Long distance ¹	6923	8.1%	28.8%	71.2%	86.4%	-15.2%
$Adj_{ij} = 1$	2551	11.1%	61.3%	38.7%	95.3%	-56.6%
Short distance	6841	7.3%	90.7%	9.3%	42.5%	-33.2%

¹Mean distance is 1338 km²Mean weight-to-value is 0.65 kg/euro

Appendix

Table A1: The Determinants of Intra-EU Trade Costs: Dependent Variable $\ln(\theta_{ij}^k)$, $\sigma_k < 25$

	(1)	(2)	(3)	(4)	(5)	(6)
Macro variables						
$\ln Dist_{ij}$	0.985 (48.986)	0.917 (38.246)	-2.593 (-7.312)	-2.593 (-7.327)	-2.542 (-7.139)	-3.454 (-11.145)
$\ln Dist_{ij}^2$	—	—	0.258 (9.931)	0.261 (10.036)	0.256 (9.784)	0.324 (14.094)
$\ln Dist_{ij} \times \ln wv_t^k$	—	—	—	0.023 (4.657)	0.023 (4.796)	0.025 (5.123)
$\ln(Dist_{ii} \times Dist_{jj})$	-1.535 (-19.885)	-1.367 (-16.344)	-1.366 (-16.382)	-1.365 (-16.379)	-1.337 (-16.119)	-1.305 (-15.676)
Adj_{ij}	-0.451 (-16.280)	-0.486 (-15.306)	-0.443 (-13.922)	-0.441 (-13.882)	-0.453 (-14.290)	-0.435 (-13.705)
$Lang_{ij}$	-0.191 (-4.209)	-0.177 (-3.453)	-0.327 (-6.470)	-0.330 (-6.531)	-0.324 (-6.403)	-0.396 (-7.637)
$EU6_{ij}^{intra}$	-0.601 (-19.264)	-0.684 (-19.379)	-0.663 (-18.587)	-0.663 (-18.609)	-0.673 (-18.897)	-0.582 (-16.523)
$EU6_{ij}^{out}$	-0.256 (-12.810)	-0.292 (-13.227)	-0.244 (-10.958)	-0.244 (-10.967)	-0.251 (-11.382)	-0.233 (-10.391)
FI, SE, AT_{ij}	0.345 (17.804)	0.327 (15.893)	0.327 (15.920)	0.329 (15.986)	0.330 (16.042)	0.272 (13.030)
$OUT_{ij,t}$	0.104 (3.116)	0.073 (2.003)	0.064 (1.759)	0.063 (1.735)	0.069 (1.898)	0.040 (1.102)
Micro variables						
$\ln cfob_t^k$	—	0.043 (4.376)	0.042 (4.370)	0.044 (4.527)	0.044 (4.496)	0.044 (4.536)
$\ln TBT_{ij}^k$	—	0.348 (7.517)	0.260 (5.695)	0.256 (5.622)	—	0.159 (3.367)
$\ln Prod_{US,t}^k$	—	-0.114 (-2.577)	-0.115 (-2.603)	-0.115 (-2.601)	-0.098 (-2.242)	-0.123 (-2.811)
$\ln NTB_{ij}^k$	—	—	—	—	0.007 (8.795)	—
c	2.097 (8.072)	-0.233 (-0.511)	12.212 (9.295)	12.330 (9.404)	13.320 (10.417)	15.838 (13.573)
Sample	$\sigma_k < 25$	$\sigma_k < 25$	$\sigma_k < 25$	$\sigma_k < 25$	$\sigma_k < 25$	$\sigma_k < 25$
Distance	Capitals	Capitals	Capitals	Capitals	Capitals	Pop Cities
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	52481	45904	45904	45904	45904	45904
R^2	0.17	0.158	0.161	0.161	0.162	0.161

Notes: t-statistics in parentheses.

Table A2: The Determinants of Intra-EU Trade Costs: Dependent Variable $\ln(\theta_{ij}^k)$
Cross-Sectional Samples

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	1997	1998	1999	2000	2001	2002	2003
Macro variables							
$\ln Dist_{ij}$	-2.539 (-2.581)	-3.108 (-3.039)	-2.068 (-2.248)	-2.387 (-2.640)	-2.748 (-3.160)	-3.511 (-3.799)	-2.413 (-2.407)
$\ln Dist_{ij}^2$	0.275 (3.774)	0.316 (4.146)	0.231 (3.439)	0.258 (3.903)	0.280 (4.384)	0.329 (4.869)	0.251 (3.389)
$\ln Dist_{ij} \times \ln wv_t^k$	0.157 (3.943)	0.169 (4.148)	0.129 (4.020)	0.181 (5.469)	0.166 (5.170)	0.115 (3.505)	0.212 (6.552)
$\ln(Dist_{ii} \times Dist_{jj})$	-0.568 (-2.436)	-0.831 (-3.381)	-1.404 (-6.390)	-1.671 (-6.656)	-1.337 (-6.422)	-1.417 (-6.368)	-1.346 (-5.472)
Adj_{ij}	-0.525 (-5.054)	-0.540 (-5.435)	-0.396 (-4.962)	-0.400 (-4.740)	-0.398 (-5.329)	-0.384 (-4.792)	-0.559 (-7.006)
$Lang_{ij}$	-0.025 (-0.198)	-0.225 (-1.330)	-0.401 (-3.174)	-0.376 (-2.659)	-0.340 (-3.047)	-0.474 (-3.015)	-0.522 (-3.472)
$EU6_{ij}^{intra}$	-0.631 (-5.549)	-0.529 (-4.657)	-0.731 (-8.211)	-0.641 (-6.913)	-0.677 (-8.274)	-0.476 (-4.898)	-0.729 (-7.228)
$EU6_{ij}^{out}$	-0.188 (-2.851)	-0.214 (-3.389)	-0.293 (-5.091)	-0.208 (-3.386)	-0.243 (-4.356)	-0.156 (-2.626)	-0.399 (-5.927)
FI, SE, AT_{ij}	0.210 (3.393)	0.281 (5.095)	0.294 (5.377)	0.346 (5.990)	0.279 (5.304)	0.377 (6.829)	0.556 (8.669)
$OUT_{ij,t}$	-	-	-	-	-	-	-
Micro variables							
$\ln cfob_t^k$	-	-	-	-	-	-	-
$\ln TBT_{ij}^k$	0.143 (0.896)	0.031 (0.222)	0.235 (1.934)	0.089 (0.766)	0.288 (2.587)	0.449 (4.106)	0.537 (4.549)
$\ln Prod_{iS,t}^k$	-	-	-	-	-	-	-
c	10.129 (2.703)	13.769 (3.492)	10.844 (3.246)	14.039 (4.290)	12.762 (4.090)	14.151 (4.136)	10.620 (2.922)
Sample	Whole	Whole	Whole	Whole	Whole	Whole	Whole
Distance	Capitals	Capitals	Capitals	Capitals	Capitals	Capitals	Capitals
Sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5287	5344	6526	6270	6449	5536	5372
R^2	0.15	0.162	0.166	0.158	0.169	0.171	0.193

Notes: t-statistics in parentheses.

Table A3: The Determinants of Intra-EU Trade Costs: Dependent Variable $\ln\left((\theta_{ij}^k)^{2(\sigma_k-1)}\right)$

	(1)	(2)	(3)	(4)	(5)	(6)
Macro variables						
$\ln Dist_{ij}$	2.887 (104.058)	2.650 (84.077)	-9.444 (-24.473)	-9.445 (-24.733)	-9.531 (-25.064)	-11.464 (-34.677)
$\ln Dist_{ij}^2$	-	-	0.890 (31.060)	0.897 (31.594)	0.904 (31.992)	1.046 (41.967)
$\ln Dist_{ij} \times \ln wv_t^k$	-	-	-	0.064 (9.073)	0.066 (9.441)	0.066 (9.542)
$\ln(Dist_{ii} \times Dist_{jj})$	-4.686 (-44.776)	-4.168 (-37.510)	-4.163 (-38.082)	-4.162 (-38.085)	-4.173 (-38.027)	-3.966 (-36.116)
Adj_{ij}	-0.955 (-28.249)	-1.135 (-29.972)	-0.987 (-26.399)	-0.984 (-26.324)	-0.969 (-25.941)	-0.984 (-26.088)
$Lang_{ij}$	-0.685 (-13.805)	-0.670 (-12.286)	-1.190 (-21.569)	-1.197 (-21.744)	-1.204 (-21.821)	-1.356 (-24.211)
$EU6_{ij}^{intra}$	-1.553 (-41.408)	-1.833 (-44.110)	-1.757 (-42.455)	-1.758 (-42.622)	-1.746 (-42.542)	-1.561 (-36.683)
$EU6_{ij}^{out}$	-0.695 (-25.001)	-0.842 (-28.150)	-0.677 (-22.396)	-0.678 (-22.438)	-0.666 (-22.296)	-0.651 (-21.523)
FI, SE, AT_{ij}	0.903 (32.851)	0.882 (30.504)	0.880 (30.760)	0.884 (30.905)	0.893 (31.246)	0.714 (24.766)
$OUT_{ij,t}$	0.141 (3.007)	0.125 (2.402)	0.094 (1.827)	0.092 (1.781)	0.084 (1.629)	0.028 (0.543)
Micro variables						
$\ln cfob_t^k$	-	0.132 (7.947)	0.131 (7.973)	0.136 (8.269)	0.135 (8.207)	0.136 (8.260)
$\ln TBT_{ij}^k$	-	1.481 (23.872)	1.178 (18.901)	1.169 (18.778)	-	0.910 (14.282)
$\ln Prod_{US,t}^k$	-	-0.456 (-5.768)	-0.458 (-5.862)	-0.458 (-5.884)	-0.400 (-5.156)	-0.482 (-6.201)
$\ln NTB_{ij}^k$	-	-	-	-	0.023 (17.932)	-
c	5.944 (17.597)	-3.365 (-5.244)	39.515 (26.470)	39.859 (26.955)	46.515 (34.084)	48.100 (37.175)
Sample	Whole	Whole	Whole	Whole	Whole	Whole
Distance	Capitals	Capitals	Capitals	Capitals	Capitals	Pop Cities
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	53801	47162	47162	47162	47162	47162
R^2	0.453	0.446	0.458	0.459	0.459	0.458

Notes: t-statistics in parentheses.

Table A4: The Determinants of Intra-EU Trade Costs: Time-Varying Sector Fixed Effects

	(1)	(2)	(3)
Macro variables			
$\ln Dist_{ij}$	-2.455 (-7.045)	-2.558 (-7.186)	-9.601 (-26.091)
$\ln Dist_{ij}^2$	0.263 (10.258)	0.271 (10.340)	0.937 (34.136)
$\ln Dist_{ij} \times \ln wv_t^k$	0.161 (12.666)	0.149 (11.453)	0.351 (23.297)
$\ln (Dist_{ii} \times Dist_{jj})$	-1.333 (-16.242)	-1.362 (-16.192)	-4.125 (-37.998)
Adj_{ij}	-0.429 (-13.991)	-0.442 (-14.055)	-0.987 (-27.045)
$Lang_{ij}$	-0.335 (-6.801)	-0.337 (-6.710)	-1.214 (-22.653)
$EU6_{ij}^{intra}$	-0.650 (-18.830)	-0.665 (-18.795)	-1.755 (-43.696)
$EU6_{ij}^{out}$	-0.238 (-10.951)	-0.243 (-10.908)	-0.681 (-22.916)
FI, SE, AT_{ij}	0.324 (15.973)	0.330 (15.893)	0.888 (31.433)
$OUT_{ij,t}$	0.034 (0.962)	0.037 (1.009)	0.072 (1.416)
Micro variables			
$\ln cfob_t^k$	—	—	—
$\ln TBT_{ij}^k$	0.239 (5.311)	0.248 (5.416)	1.134 (18.400)
$\ln Prod_{US,t}^k$	—	—	—
c	11.936 (9.288)	12.240 (9.320)	39.609 (28.428)
Dependent variable	$\ln \theta_{ij}^k$	$\ln \theta_{ij}^k$	$\ln (\theta_{ij}^k)^{2(\sigma_k - 1)}$
Sample	Whole	$\sigma_k < 25$	Whole
Distance	Capitals	Capitals	Capitals
Time varying Sector fixed effects	Yes	Yes	Yes
N	47162	45904	47162
R^2	0.162	0.165	0.47

Notes: t-statistics in parentheses.

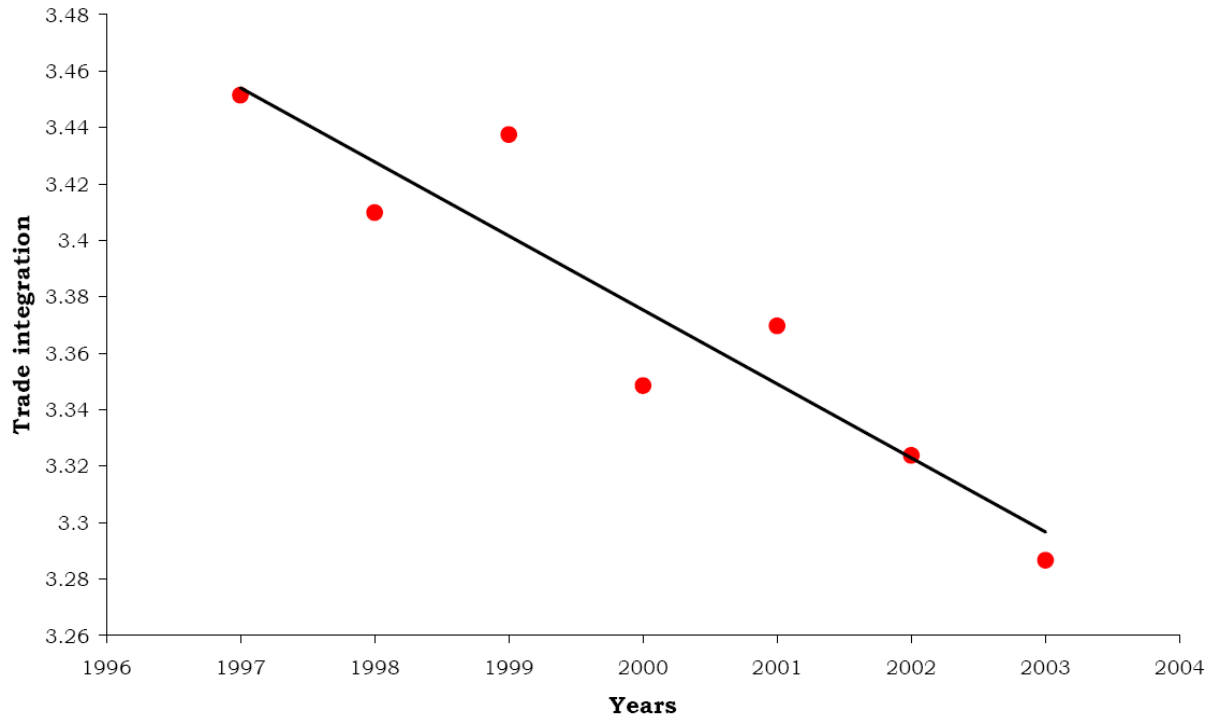


Figure 1: Trade integration 1997-2003, average across countries and sectors (balanced sample)

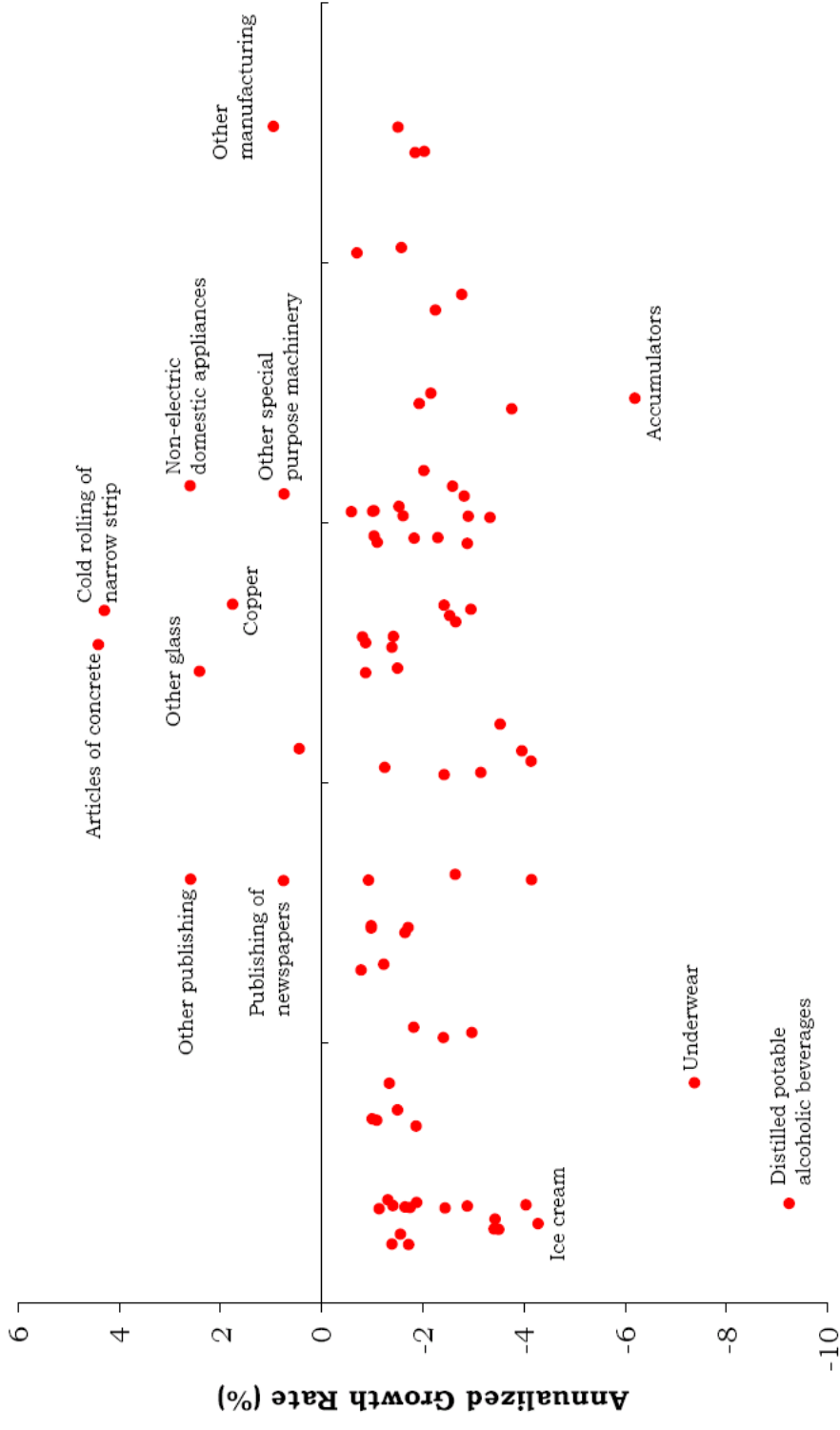


Figure 2: Annualized Growth Rates per Sector (significant only), 1997-2003 (balanced sample) as reported in Table 4