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INTRA-INDUSTRY TRADE AND THE SINGLE MARKET: QUALITY MATTERS*

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Abstract

Analysing data on values and unit values of bilateral trade flows at a very detailed level (some 10,000 product items), we examine the nature of intra-EC trade over the period 1980 to 1994, identify its general determinants and then estimate the specific impact of the Single European Market programme.

Breaking up total trade into three types identifies the intra- versus inter-industry nature: one-way trade, two-way trade in horizontally differentiated products, and two-way trade in vertically differentiated products. One of the main findings is that the observed increase in intra-industry trade in Europe is almost entirely due to two-way trade in vertical differentiation: thus, the 1980-1994 period is characterised by a increasing specialisation of countries along ranges of qualities within products, suggesting a "qualitatively" division of labour in Europe.

General determinants as well as direct and indirect effects of the single market in this evolution are assessed with an econometric model integrating country, industry and integration variables. We conclude that the first years of the Single market have neither validated the optimistic scenario entailed in *ex ante* studies, nor led to a more pronounced *inter-industry* specialisation of European members potentially associated with cohesion costs. Adjustments have taken place *within industries*, on the quality spectrum.

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Introduction

The first wave of European integration, following the creation of the Common Market in the 1950s, was accompanied by a strong increase in intra-European trade. But economic integration in Europe remained incomplete though, such that in the mid 1980s, the "costs of non-Europe" were stressed: thus, for example, the strong differences in prices (excluding taxes) among member states could not be explained by transport costs only, suggesting an imperfectly integrated market.

As a consequence, the 1985 White Paper on the single market proposed some 300 measures designed to liberalise trade in goods and services and the movement of factors. The measures taken consist mainly of a cut of non-tariff barriers (NTBs), the cancellation of border formalities, the liberalisation of public procurement practices, and the mutual recognition of technical standards. Also included were the liberalisation of factor movements, notably through financial deregulation and integration; as well as the deregulation of sectors formerly subject to tight national regulation. At the same time, to overcome the potential problem of cohesion in the Community, structural funds were boosted in order to foster a convergence in real income levels and to facilitate industrial conversions in sensitive sectors. This entire process was implemented within the perspective of a monetary union.

The reasoning behind these measures – as put forward by a series of *ex ante* studies such as the Cecchini Report - was that liberalisation would tend to lower prices through increased competition, induce market structure transformations, and foster a concentration of resources in more efficient uses, translating not only into sizeable welfare gains, but also into an increased competitiveness of European firms. Economies of scale were at the very heart of most *ex ante* studies assessing the gains from integration and the "costs of non-Europe."

In contrast, international trade *per se* was only indirectly treated by these studies. However,

variations in trade patterns among member states can provide important information about the nature and the size of the effects of the Single European Market (SEM) upon production structures, and thereby give indirect indications about the magnitude of efficiency gains achieved so far. In addition, differences in these variations between developed and less developed member states should provide indications of the effects of the Single Market *cum* Structural Fund programme upon economic and social cohesion. It would help clarify whether the degree of structural asymmetry among member states can be expected to increase or to decrease as a consequence of economic integration. This is an important issue for determining whether there is a complementarity between the Single Market and monetary union.

The implicit assumption of most *ex ante* studies being that the removal of the remaining barriers to the mobility of goods would translate into an *increase in trade flows within the Community*[1], and that most of this increase would be *intra-industry* trade (IIT), i.e. simultaneous exports and imports *within* industries.[2] The latter scenario was based on the experience obtained after the implementation of the Common Market. In the 1950s, fears were expressed that the Common Market might drive to an "excessive" specialisation among member states, where the most advanced countries specialise in high value added industries and the others countries in the remaining sectors abandoned by the former group. But contrasting with traditional theories associating integration and *inter*-industry trade, the empirical evidence during the 1960s showed that an important part of intra-European trade was of an *intra*-industry nature, a phenomenon which has continued to increase since then.

Theoretical models developed by the end of the1970s and early 1980s emphasised the gains of trade associated with intra-industry trade based on imperfect competition and consumer preferences. *Intra*-industry trade in horizontally differentiated products - based upon the similarity of nations -

may lead to increase efficiency through increasing returns and welfare gains through a larger choice of varieties for consumers. Adjustment costs in that case are supposed to be much smaller than for *inter*-industry trade - traditionally associated with comparative advantages – where increased specialisation implies the abandon of contested, comparatively disadvantaged industries and the displacement of factors towards a limited number of export-oriented industries, which in turn has distribution effects for factor rewards.[3]

The European Commission, comforted by past experience and imperfect competition models in international trade, hoped that this rather optimistic scenario of a relatively painless integration in Europe would work again in the case of the single market, even if some studies (such as the European Commission, 1990-a) expected that not all sectors and member states would be affected in the same way.[4]

However, the association of inter-industry with trade painful adjustments and intra-industry trade with less costly adjustments might be challenged by new developments in international trade theory related to (vertical) product differentiation and to agglomeration economies.

Inter-industry trade is no longer exclusively based upon comparative advantages: external economies and agglomeration effects, spillover effects, or more generally the country size (and differences in size) do matter. Agglomeration economies might increase inter-industry trade, in the same manner as in the United States, where states and regions exhibit a high degree of industrial specialisation (Krugman, 1993). This is important with respect to the monetary union in Europe: if the single market pushes towards intra-industry trade, "one market" is complementary to "one money", as structural asymmetries between member states are reduced. In contrast, if it pushes towards an inter-industry specialisation, asymmetries between countries may increase, and sectoral shocks may have different macro-economic consequences for individual member states: in that case, the

coexistence of the single market and a single currency might lead to tensions in Europe.

Determinants and consequences of *intra-industry trade in* horizontally differentiated products are different from those in *vertical differentiation*. In the former case, products sold at the same price are perfect substitutes, while in the second a common ranking of consumer preferences can be associated with differences in quality, based on factor endowments (Falvey, 1981; Falvey and Kierzkowski, 1987), on fixed costs in R&D (Gabszewicz, Shaked and Sutton, 1981) or on the qualification of the labour force (Gabszewicz and Turrini, 1997).

In total, a large diversity of trade patterns is expected as determinants, nature, and effects of trade are highly dependent of market structures (Figure 1).

{Figure 1 about here}

Driven by a horizontal differentiation of products, IIT leads to gains in variety and potential economies of scale, without implying high reallocation costs for member countries. At the opposite of this smooth path towards integration, inter-industry trade, and the associated specialisation of countries, has a cost in terms of resources displacement along comparative advantages, to the benefit of large countries in case of agglomeration economies. Between these two polar cases, IIT associated with a vertical differentiation of products leads to specialisation along the quality spectrum, as a result of R&D expenses, endowments in human capital, or simply advertising. In this case, IIT might be associated with a costly displacement of resources, as inter-industry trade under specialisation. Thus, contrasting with IIT in horizontal differentiation (exchange of varieties), the adjustment costs associated with IIT in vertical differentiation (exchange of qualities) might be sizeable, as it may not be equivalent to specialise in high or low quality products in the same industry (Table 1).

{Table 1 about here}

This paper investigates the evolution of the nature of trade flows within the Community over 1980-1994, using disaggregated data and a methodology to identify trade types derived by Fontagné and Freudenberg (1997) from Abd-El-Rahman (1986). The first section is a brief discussion on methodological issues in the measurement of intra-industry trade. The second section gives empirical evidence and highlights that the increase in the share of IIT in intra-European bilateral trade over the completion period has been associated with a vertical differentiation of products. The third section discusses the econometric model. The last section applies econometric analysis in order to capture general determinants as well as direct and indirect effects of the single market on trade patterns inside Europe.

This paper tries thus to answer multiple questions. Has the SEM led to an in depth specialisation of member countries along comparative advantages? Has the SEM led to an in depth specialisation of member countries along agglomeration economies, potentially detrimental to small countries? What kind of effects might have had corrective instruments have, such as structural funds? Finally, has convergence lead to more IIT or more specialisation?

1. Brief methodological discussion on the measurement of IIT

The most widely used indicator is that put forward by Grubel and Lloyd (1975). It calculates the part of balanced trade (overlap between exports and imports) in all trade in a given industry j:

$$GL_j = \frac{X_j + M_j - \left|X_j - M_j\right|}{X_j + M_j} = 1 - \frac{\left|X_j - M_j\right|}{X_j + M_j}$$

Studies on intra-industry trade sometimes strongly overestimate the extent of intra-industry trade, as an insufficient country and/or product disaggregation lead to the well-known geographic[5] or

sectoral[6] aggregation biases. While these biases may arise with *any* indicator of IIT, the Grubel and Lloyd indicator (based on the degree of overlap in trade) may set an additional, analytical problem, as explanations of international trade have been inspired by the decomposition of total trade in *trade overlap* (representing intra-industry trade) and the *imbalance* (inter-industry trade). In this case, the flows related to inter-industry trade remain largely explained by traditional theory, whereas intra-industry trade is explained by the "new international trade theory." This helps to reconcile what are *a priori* two incompatible paradigms (along Helpman and Krugman, 1985 or Erkel-Rousse, 1997), but raises the problem that there are two different explanations for the same (majority) trade flow, one being under perfect competition, the other under imperfect competition.[7]

Therefore, our analysis of intra-EC trade is based on a methodology initiated by Abd-El-Rahman (1986) and refined by Fontagné and Freudenberg (1997), that has the following characteristics:

(a) It minimises the bias of geographic aggregation by only considering bilateral flows;

(b) It minimises the bias arising from sectoral aggregation by using far more disaggregated classifications;

(c) It considers, depending on the degree in overlap, *both* exports and imports as being as being part of *either* two-way trade *or* one-way trade; and finally

(d) It distinguishes between vertical and horizontal differentiation by incorporating price differences[8].

The analysis of trade patterns is conducted on a strict bilateral basis and at the most detailed level for which statistics are available: data published by Eurostat in the classification of the 8-digit Combined Nomenclature (CN) (and, until 1987, the 6-digit Nimexe) concern some 10,000 product items. Since products may differ by their quality, even at the most detailed level of disaggregation, it

is assumed that differences in prices (unit values) reflect quality differences. Products whose unit values are close are considered as similar, i.e. horizontally differentiated. The criterion is necessarily arbitrary[9]: if the export and import unit values differ by more than 15% products are considered *vertically* differentiated. Finally, trade at the elementary level will be *either* inter-industry *or* intra-industry: when the value of the minority flow (for example imports) represents at least 10% of the majority flow (exports in that case), then *both* these flows are considered as being part of "two-way trade." Otherwise, both flows would be considered as being part of "one-way trade."

This method allows elementary trade flows to be broken down into different categories according to the similarity in unit values and to the overlap in trade:

(a) Two-way trade in similar, horizontally differentiated, products (significant trade overlap and small unit value differences);

(b) Two-way trade in vertically differentiated products (overlap and high unit value differences);

(c) One-way trade (very weak overlap).

Notice that each trade type can be presented both in *value* or, alternatively, in *share* of total trade. This approach permits the *totality* of trade to be broken down according to these criteria, both imports and exports being part of one and the same of these types. In contrast to the Grubel and Lloyd indicator, a surplus or a deficit may thus appear for each of the three types. This has important implications both for theoretical and empirical considerations, as we can identify situations where intra-"industry" trade goes along with revealed comparative advantages. The indicator proposed by Grubel and Lloyd and the one used here to calculate the degree of overlap in trade are therefore supplementary rather than substitutes, since each one tries to answer a specific question. The first one is interested in the *intensity of overlap* in trade, whereas the latter approach measures

the *relative importance of each trade types in all trade*.

2. Empirical evidence on the nature of intra-EC trade

Figure 2 indicates both the evolution of the share of the three trade types in intra-EC trade from 1980 to 1994, and, for comparison's sake, the GL indicator. The considered time period was characterised by an increase in intra-industry trade: the GL was around 33% in the beginning of the 1980s, and gained rather regularly about five points until 1994. While this observation comes as no surprise, as it is well documented in the literature, the *level* of the GL might seem low when compared to other studies, but this is, of course, due to the strong disaggregation of trade flows. Intra-industry trade increased for most countries, but the rise is most important for Portugal and Spain: between 1980 and 1994, the GL almost quadrupled for Portugal (from the very low level of 5% to more than 18%) and doubled for Spain (from 17% to 32%, at par with Italy). Note that the rise of intra-industry trade for Spain and Portugal began well before their entry into the EC (Appendix 1).

One-way trade, with a share of some 45% the most important trade type in the beginning of the 1980s, experienced a decline from the mid-1980s onwards. In that sense, the evolution of one-way trade (which is the complement of two-way trade) is symmetric to the GL indicator. In contrast to what is often implicitly assumed, *the rise in intra-industry trade in intra-EC trade does not concern horizontally differentiated products, but products which are vertically differentiated*. In fact, two-way trade in similar products remains rather stable and represents less than 20% of all intra-EC trade, whereas two-way trade in vertically differentiated products increased from less than 35% in 1980 to 1985 to more than 40% in 1994. However, this phenomenon, the pre-eminent feature of intra-European trade, has received little attention in the theoretical literature when

compared to intra-industry trade in horizontal differentiation.

{Figure 2 about here}

Trade patterns of European Member states

Two groups of countries can be identified which roughly correspond to European "core" and "periphery" countries (Figure 3 and Figure 4).

The first group is composed of countries for which *intra*-industry trade in 1994 accounts for more than half of their total, intra-European trade: France, Germany, Belgium-Luxembourg, the United Kingdom, the Netherlands, Italy and - due to its rapid convergence towards the trade structure of the more developed European countries - Spain.

With the exception of Denmark, the other countries in the second group (Greece, Portugal, and Ireland) have rather low levels of economic development and are characterised by an *inter*-industry specialisation. This phenomenon is particularly true for Greece, whose trade is almost completely of an inter-industry nature. In contrast to Portugal this situation has hardly changed since 1980.

For each country, two-way trade in vertically differentiated products is much more important than in horizontally differentiated goods. This indicates a specialisation that operates at a very detailed level, by quality ranges inside products.

Concerning the evolution of trade patterns between 1980 and 1994, all countries, with the exception of Ireland, increase the share of two-way trade. For most countries, this increase it almost exclusively due to the vertical product differentiation (less specialisation between industries along lines of comparative advantages, more intra-industry trade in goods differing by quality), whereas the rise in two-way trade for Spain and Italy concerns mostly horizontally differentiated products.

{Figure 3 about here}

{Figure 4 about here}

Trade patterns have a clear bilateral dimension, highlighted in Figure 5.

Two-way trade in similar products represents almost a third of bilateral trade between Belgium-Luxembourg and the Netherlands, and more than a third between France-Belgium, France-Germany and France-Spain. By the way, Spain shows up an above average share with Italy and Portugal. In contrast, this type of trade represents a negligible share of bilateral trade between Greece with Ireland, Portugal Denmark, the Netherlands and Belgium, as well as Ireland with Italy and Portugal. Geographic and economic proximity seems to favour two-way trade in similar products.

More than half of the United Kingdom's bilateral trade with Germany, Belgium and the Netherlands is two-way trade in vertically differentiated products. On the other extreme we find the couples Portugal-Greece and Portugal-Ireland.

The share of one-way trade - by construction the complement of the two former trade types to 100% - is particularly important among "periphery" countries, and low among the "core" countries. Trade between Greece and Ireland or Portugal is almost exclusively one-way trade, whereas it represents only 17% in trade between France and Germany. This suggests that the level of development and country size play an important role, which have to be controlled for in the econometric model.

In short, "South"-"South" trade is characterised by one-way trade, and "North"-"North" trade by two-way trade. If less developed countries engage in two-way trade, it is primarily in vertical differentiation with the "North."

{Figure 5 about here}

Trade patterns of industries

The 14 industries used in this paper were determined in interaction of available statistics for the econometric model referred to below, thereby operating a trade-off between different constraints.[10] Three groups of industries may be distinguished on the basis of the relative importance of trade types in 1994 (Figure 6).

Agriculture, mining, food and beverages, non-metallic minerals as well as textiles are characterised by a high share of one-way trade (50% or more), suggesting a specialisation of member states along lines of comparative advantages.

Other transport equipment and motor vehicles[11], and, to a lesser extent, basic metals, chemicals and wood and paper product are characterised by a high share of two-way trade in similar products, i.e. the "traditional" intra-industry trade.

Finally, electrical as well as non-electrical machinery and professional goods have an important share of two-way trade in vertically differentiated products, based on a specialisation along ranges of qualities.

{Figure 6 about here}

3. Assessing the impact of the Single Market

The large increase in IIT, and the importance of intra-European trade in vertically differentiated products are two phenomenon which can be associated with SEM completion, but also with other features of the European economy, such as growth, convergence of countries etc. As a result, SEM completion and the rise in IIT can be simultaneous and independent events. The link between pre-SEM-NTBs and market fragmentation is either not perfectly assessed. Head and Mayer (1998) calculate border effects at the 3-digit level of the industry classification and stress that there is no

correlation between the internal market fragmentation and barriers identified in *ex ante* studies.

Another important issue is whether the associated increase in FDI flows has strengthened the benefits of IIT. International capital mobility potentially leads to intra-firm trade, which can be of either type, but also gives the opportunity to discriminate among markets, to realise high mark-ups. This raises into question the gains associated with increased IIT. First factor mobility can displace trade flows[12] as a result of increasing affiliates' sales. Second, the competitive pressure associated with the internal market programme is likely to be smoothed by the surge in M&A potentially leading to more concentrated market structures.

Features of the econometric model

In order to isolate single market related effects from general determinants, we use an econometric model combining four subscripts (country, partner, industry, time) and proceed in two stages. First, general determinants of intra-EC trade patterns are controlled by country variables (size, differences in size, income per capita, economic distance and geographic distance), by a market structure variable (scale economies). Once these general determinants are taken into account, we estimate single market related effects, not only in its trade liberalisation dimensions (suppression of NTBs and border formalities), but also looking at the impact of foreign direct investment (see Table 2 as well as the appendix 2).

Hence, the econometric model has the features of a gravity model. These models were initially developed without a satisfactory theoretical foundation, on a rather *ad hoc* basis. But they were recently extended in order to provide them with greater legitimacy. Bergstrand (1990), in particular, was able to construct a general equilibrium model, tested in a partial equilibrium form, which permits the sign of parameters to be constrained, and hence to avoid specification errors.[13] These models are often used to analyse the effects of trade preferences. They may also be used as an interesting tool in

explaining the nature of trade, rather than its volume, the latter being their original object.

Concerning the choice of the dependent variable, as we are interested in the nature of trade, we seek to explain the *share* (rather than the *value*[14]) of the different trade types in bilateral intra-EC trade at the industry level, from 1980 to 1994. Equations for each of the three trade types were estimated separately[15].

{Table 2 about here}

Table 3 provides a crude overview of some of the approaches currently used in the literature in this field: departing from other studies, the present study combines 4 dimensions (i.e. country-partner-industry-time). Consequently, the estimation procedure is more complex than that traditionally found in the literature. Careful econometric testing was performed, concerning heterogeneity, heteroskedasticity, multicolinearity and influential observations. Broadly speaking, the estimation of the models was first made with OLS (Ordinary Least Squares). Since potential heterogeneity of parameters may introduce strong biases in this estimator, fixed effect and random effect models were also estimated: both were rejected by appropriate econometric tests.[16] This indicates that, despite a slight heterogeneity of parameters, OLS models can be used.

{Table 3 about here}

Determinants of intra-EC trade patterns

Overall, the explanatory power of the different models is rather high, there is no heteroskedasticity (see c^2), and problems of multicolinearity are reduced because of the large number of observations. However, Belsley, Kuh and Welsh tests[17] indicates some multicolinearity if we include variable GDP in the equation corresponding to one way trade. The same problem occurs if we include variable PCID (economic distance) in the vertical two-way trade equation. Since the

inclusion of these variables affects the sign of some other variables, they have been removed in the final specification[18].

On the basis of the recent developments in the international trade theory, the following results are expected.

Concerning country variables, larger countries in terms of market size offer both a greater product variety (horizontal differentiation) and a larger quality spectrum (vertical differentiation). Thus, the size of the integrated market is likely to boost the share of IIT in total trade, detrimental to the share of inter-industry trade.

Likewise, average per capita income of declaring and partner countries is suppose to have a similar effect, since richer countries offer more variety as well as a larger quality spectrum to consumers.

The difference in per capita incomes is taken as a proxy for the intensity of comparative advantages. Hence, in accordance with the Helpman-Krugman's synthesis, different countries will trade bilaterally on an inter-industry basis and conversely similar countries on an IIT basis. However, such scheme is associated with a horizontal differentiation of products. When the vertical differentiation is introduced, different countries may specialise on different ranges of qualities and engage in IIT in vertically differentiated products.

In contrast, transportation costs will have a negative influence on both types of IIT, and this independently from the traditional gravitational impact (since shares and not values of trade are considered): any change in transportation, and more generally transaction costs, can affect the patterns of intra-European trade. This negative relationship between distance (transportation costs) and the share of IIT in total trade is to be explained by the fact that larger differences in prices

between distant countries reduce IIT: when products are close substitutes (differentiated), demand is more sensitive to price differences.

Turning to increasing returns, larger countries should be more efficient in industries subject to external economies of scale. Thus, differences in the size between trading partners should promote inter-industry specialisation and thus reduce the share of IIT. Internal returns to scale are supposed to favour IIT of both types: in case of existing economies of scale it is impossible to offer a large variety to consumers or to cover the whole quality spectrum. Hence, openness leads to two-way trade in differentiated products.

Finally, based on the Markusen's (1995) hypothesis, foreign direct investment in Europe must be associated with a non-linear relationship with trade. As countries converge in size and endowments the *volume* of IIT will increase in a first stage, and decrease when countries become similar enough. In this latter stage, multinationals develop endogenously and displace trade, while the sum of affiliates sales and residual trade continues to increase with convergence. In total, diminishing values of inter-industry trade are no longer balanced by increasing IIT when countries become very similar. Such conclusions are however hardly relevant in our framework. First, in contrast to the empirical evidence of product differentiation referred to above, Markusen and Venables (1995) consider homogeneous goods, IIT being based on the reciprocal dumping argument. Second, we are interested in the share of IIT in intra-EC bilateral trade, not in values. Lastly, intra-firm trade and FDI are complementarity and such trade can be of an intra-industry nature.

Turning to single market related variables the reduction in transaction costs associated with the cancellation of border formalities will be captured by the distance variable Transportation costs are likely to affect adversely trade in similar products. Such negative impact is expected to decrease (in absolute terms) as a result of the completion of the single market.

The literature on economic geography suggests that high transaction costs may hinder specialisation and thus promote IIT. Hence, a *positive* impact of non-tariff barriers on the share of IIT is expected. This effect will decrease along the single market completion. Brülhart and Torstensson (1996) suggest that this relation is however non-monotonic.

Finally, agglomeration economies can be tackled by considering the role of differences in country sizes, for each industry. Industries highlighting a strong and positive impact of these differences on specialisation are supposed to be more concerned by the potential of agglomeration associated with the single market.

The estimates (Table 4) highlight that the size of the integrated market (here the average size of the trade partners) has a positive impact on the share of IIT in total trade of both types. This is in accordance with the theoretical prediction. However, it is impossible to conclude for inter-industry trade due to multicolinerarity.

As expected, average per capita income of countries has also a positive impact on both types of IIT, detrimental to inter-industry trade.

Geographic distance, the classical proxy for transportation costs, reduces the share of both types of IIT in bilateral trade. As expected, the corresponding elasticity is higher for horizontally differentiated products being closer substitutes than vertically differentiated ones.

The share of two-way trade in horizontally differentiated products is indeed negatively affected by differences in sizes, and symmetrically positively for inter-industry trade; however, and unexpectedly, a positive impact on two-way trade in vertically differentiated products is observed. This may be explained as followed: since fixed costs increase with the quality index, larger countries enjoying external scale economies will specialise in high quality products, whereas small countries will

specialise in low quality products. Thus, differences in size between partner promote specialisation between and within industries.

Another interesting result is that the economic distance does not promote traditional inter-industry specialisation within the EU [19]: in fact, the share of one-way trade is *negatively* affected by differences in *per capita* income. The economic distance creates opportunities for specialisation, but along ranges of quality within industries rather than between industries. This result suggests a "qualitatively" division of labour in Europe. Due to multicolinearity, it has been impossible to establish the (negative) relationship between economic distance and IIT in horizontally differentiated products.

Turning to market structure related variables, internal returns to scale, as expected, favour IIT of both types, with a particular intensity for IIT in horizontally differentiated products. The positive impact on inter-industry trade, even justifiable on theoretical grounds, remains problematic since we work on shares adding to one.

FDI has no significant impact on the share of inter-industry trade in bilateral trade. In contrast, its positive impact is clearly assessed by our estimates: within the EU, FDI has not displaced trade. In addition, we checked that the trade displacement effect referred to in Markusen (1995) and Markusen and Venables (1995) was not observed: there is a *positive* relationship between FDI and the *value* of IIT.

As expected, the intensity of non-tariff barriers in intra-EC trade before the SEM completion has a *positive* effect on two-way trade, since these barriers hindered the exhaustion of returns to scale, leading to a greater variety of products.

{Table 4 about here}

A multidimensional impact of the SEM

Having identified these determinants of intra-EC trade patterns, they can be controlled for in order to assess the impact of the SEM. We first examine at the industry level the occurrence of specialisation associated with agglomeration economies. In a second step we address the issue of specialisation as a result of the cancellation of internal NTBs. Lastly, the impact on trade patterns of the cancellation of border formalities is considered.

Agglomeration economies

It is possible to estimate the model industry by industry, over the period considered here. Therefore, equations explaining shares of trade types were estimated, each with some 1,600 observations. Statistical tests were implemented for each equation[20]. We consider here the impact of differences in country sizes on the share of inter-industry trade in bilateral trade: differences in size may lead to mono-location of industries, if external economies of scale/agglomeration economies play an important role. Complementary results are presented in Appendix 3. It has been referred to such an effect above, when using the panel (all industries all countries): on the whole *GDPD, i.e.* the differences in sizes between economies, or the potential for agglomeration economies, reduce the share of IIT in horizontal differentiation and increase conversely the share of inter-industry trade. This result is significant at the 1% level. Are such economies of location only country-related, or on the contrary industry-related?

Looking at detailed results by industry in Table 5, this effect can be observed for most industries. In addition to country related effects in the panel referred to above, agglomeration economies are likely to be industry-related. Their magnitude appears very large in other transport equipment, motor vehicles and machinery. Thus, for these industries, the SEM is likely to have promoted agglomeration economies, increased adjustment costs and fuelled asymmetries among member-states. A second

group of industries is professional goods, chemicals, wood/paper, and metal products. For the remaining industries, such effects are very weak or non-significant.

Within the first group of industries, other forces have counter-acted however, notably the level of income per capita. This must have limited the extent of agglomeration in professional goods in particular, as the corresponding elasticities highlight it.

{Table 5 about here}

Non-tariff barriers

A striking result of our econometric modelling is the negative impact of NTBs, before the completion of the Single Market, on inter-industry specialisation. Benefiting from NTBs, some European firms have been maintained artificially on their home market, and might have differentiated their products in order to reinforce the non-contestability of markets. Therefore, *the cancellation of NTBs associated with the completion of the SEM has raised inter-industry trade*: markets becoming more contestable, countries have specialised along their lines of comparative advantages, notwithstanding the traditional increase in IIT associated with trade liberalisation among rich countries.[21]

In order to point out this phenomenon, we estimated the evolution of parameters associated with NTBs, by cutting the panel into sub-periods to smooth their high inter-annual variations (Figure 7).[22]

The (positive) effect of NTBs on IIT in vertical differentiation is continuously *declining*; thus, no effect of the SEM *per se* is captured, as this decline might be due to other, uncontrolled, factors.

In contrast, we clearly capture an impact of the SEM on IIT in horizontal differentiation: the positive impact of NTBs on IIT in horizontally differentiated products is declining with the completion of the single market. NTB1 highlights two sub-periods of sharp decline just after 1986 and during

the years 1988-1993.

{Figure 7 about here}

Border formalities

The cancellation of border formalities[23] is another channel through which the SEM has influenced trade patterns. Since transaction costs decrease, a decline in absolute values of the parameters associated with *Gdist* is to be expected: distance to market is less costly after in the Single Market. Such reduced transactions costs can either have induced more trade among member states or changed the nature of trade.

Clearly, Figure 8 points out that the cancellation of border formalities has resulted in more Intra Industry Trade in Europe, by lowering transaction costs. Conversely there is no evidence of such influence on inter-industry trade: the negative impact of transaction costs does not change over time. Where differences in production costs were large enough, transaction costs were not a hindrance to specialisation among member countries, in contrast to NTBs: a foreign firm can bear transaction cost, but public procurement practices may not be circumvented[24].

Thus, the *Single Market* has not only increased trade among member states: it has also changed the nature of their bilateral trade flows, by *increasing the share of IIT in total trade*.

{Figure 8 about here}

Conclusion

Bilateral intra-European trade flow statistics for some 10,000 products were used in order to break down trade into three categories: inter industry trade, intra-industry trade in horizontally differentiated products and intra-industry trade in vertically differentiated products. As expected,

intra-industry trade has increased since the mid-1980s: thus, on the whole, this evidence does not support a possible scenario of concentration of industries in a limited number of countries. Contrasting with the conclusions of *ex ante* studies, *the share of intra-industry trade of varieties has remained remarkably stable over time*, whereas the share of intra-industry trade of qualities has increased rapidly, and is now the most important trade type in intra-European trade. As a result, the deep integration of European economies has not so far implied increased specialisation. Spain and Portugal have successfully managed their openness to European competition withdrawing from a scheme of residual specialisation in labour intensive activities abandoned by the core countries.

Nevertheless the importance of intra-industry trade in qualities, and not in varieties, suggests a *qualitatively division of labour within the EU*. Adjustments are taking place within industries along the quality spectrum, rather than between industries.

The increase in intra-industry trade is the result of numerous determinants, here identified using an econometric model having four dimensions (country, partner, industry, time) and combining explanatory variables on country characteristics (comparative advantage, size etc.), market structure (returns to scale, product differentiation), and European integration (border formalities, non tariff barriers, agglomeration economies). One of the main conclusions is that the share of IIT in vertically differentiated products increases with the economic distance between countries, a result so far rather associated to inter-industry trade. This suggests that the *adjustment costs associated with intra-industry trade in vertically differentiated products are not negligible*.

The Single market in itself has only had a limited *direct* impact on this evolution of intra-EC trade patterns.

The cancellation of NTBs might not be the main vector of integration associated with the

internal market programme. However, since these barriers have hindered specialisation along comparative advantages among European countries, intra-industry trade has been boosted to artificially high levels before the completion of the SEM. Their cancellation has thus led to more inter-industry trade.

In contrast, *the cancellation of border formalities, by reducing transaction costs,* has had a positive influence on trade among member states. But it has led to intra-industry trade, of both types (horizontal and vertical differentiation). Hence, *border formalities were not a hindrance to specialisation along comparative advantage lines in Europe*. Where comparative advantages were the basis for trade, differences in costs were large enough to overcome additional transaction costs in the pre-completion period.

Lastly, for some industries, there is some evidence of the presence of agglomeration economies, which may lead to increasing adjustment costs and asymmetries among member states.

Thus, so far, the first years of the Single market have neither validated the optimistic scenario entailed in *ex ante* studies, nor led to a more pronounced *inter-industry* specialisation of European members potentially associated with cohesion costs. Adjustments have taken place *within industries*, on the quality spectrum. This suggests that a qualitatively division of labour has emerged in Europe.

Bibliography

Abd-El-Rahman Kamal S. (1984), "Echanges intra-sectoriels et échanges de spécialisation dans l'analyse du commerce international: le cas du commerce intra-C.E.E. de biens manufacturés," *thèse de doctorat d'Etat*, Université de Paris X - Nanterre.

Abd-El-Rahman Kamal S. (1986), "Réexamen de la définition et de la mesure des échanges croisés de produits similaires entre les nations," *Revue économique*, **1**.

Aitken Norman D. (1973), "The effect of the EEC and EFTA on European trade: a temporal cross-section analysis," *American Economic Review*, **63**, p. 881-892.

Aturupane, Chonira, Simeon Djankov and Bernard Hoekman, "Determinants of Intra-industry trade between East and West Europe", *CEPR Discussion Paper*, **1721**.

Balassa Bela (1986), "Intra-industry Specialisation: A Cross-section Analysis," *European Economic Review*, 30, **1**.

Balassa Bela and Bauwens L. (1987), "Intra-industry Specialization in a Multi-Country and Multilateral Framework," *The Economic Journal*, **97**, pp.923-939.

Bayoumi Tamin and Eichengreen Barry (1995), "Is regionalism simply a diversion? Evidence from the evolution of the EC and EFTA" *NBER Working Paper*, **5283**.

Bergstrand Jeffrey H. (1990), "The Heckscher-Ohlin-Samuelson Model, the Linder Hypothesis and the Determinants of Bilateral Intra-industry Trade," *The Economic Journal*, **3**, p.1216-29,.

Bikker Jacob A. (1987), "An international trade flow model with substitution: an extension of the gravity model," *Kyklos*, **40**, p.315-337.

Blanes Vicente and Carmela Martin (1998), "The nature and causes of intra-industry trade : back to the comparative advantage explanation ? the case of Spain", *Conference on International Trade and Market Structure*, Le Mans, France, April.

Brada Josef C. and Mendez Joze A. (1983), "Regional economic integration and the volume of intra-regional trade: a comparison of developed and developing country experiences," *Kyklos*, **36**, p. 589-603.

Brülhart, Marius and R.C. Hine (Eds) (1998), *Intra-industry Trade and Adjustment : the European Experience*, MacMillan, London.

Brülhart Marius, Torstensson Johan (1996), "Regional Integration, Sale Economies and Industry Location in the European Economy", *CEPR Discussion Paper*, **1435**.

Brülhart, Marius, and Robert J.R. Elliott (1998), "Adjustment to the European Single Market : inferences from intra-industry trade patterns", *Journal of Economic Studies*, 25, **3**, p. 225-247.

Caves Richard E. (1981), "IIT and Market Structure in the Industrial Countries," *Oxford Economic Papers*, 32, **2**, p.203-223.

CEPII (1997) "Trade Patterns inside the Single Market," *The Single Market Review*, Subseries IV, vol 2, Kogan Page, Earthscan.

Clark Don P. (1993), "Recent Evidence on Determinants of IIT," *Weltwirtschaftliches Archiv*, 129

(2).

European Commission (1990-a), "Marché unique, monnaie unique : une évaluation des avantages et des coûts potentiels de la création d'une union économique et monétaire," *Economie Européenne*, **44**.

European Commission (1990-b), "L'impact sectoriel du marché intérieur sur l'industrie : les enjeux pour les Etats membres," *Economie Européenne*, special issue.

European Commission (1988), "'The Economics of 1992', an assessment of the potential effects of completing the internal market of the European Community," *European Economy*, **35**, March.

Erkel-Rousse Hélène (1997) "Endogenous differentiation strategies, comparative advantage and the volume of trade" *Annales d'Economie et de Statistique*, **47**, pp.121-149.

Falvey Ronald E. (1981), "Commercial Policy, and Intra-industry Trade," *Journal of International Economics*, **11**, pp. 495-511.

Falvey Ronald E. and Henrik Kierzkowski (1987), "Product Quality, Intra-industry Trade and (Im)perfect Competition," in H. Kierzkowski (ed.), *Protection and Competition in International Trade*, Basil Blackwell, Oxford and New York, pp. 143-161.

Fontagné Lionel and Michael Freudenberg (1997), "IIT: Methodological Issues Reconsidered," *CEPII Working Paper* **97-02**, January.

Fontagné Lionel and Michael Freudenberg (1998), "Endogenous (A)Symmetric Shocks in the Monetary Union," *mimeo*, June.

Fontagné Lionel, Michael Freudenberg and Deniz Ünal-Kesenci (1996), *Statistical Analysis of EC trade in Intermediate Products*, Eurostat, Série 6 D.

Fontagné Lionel, Michael Freudenberg and Nicolas Péridy (1997), "Trade Patterns inside the Single Market," *CEPII Working Paper* **97-07**, April.

Frankel Jeffrey and Wei Shang Jin (1993), "Trade blocs and currency blocs," *NBER Working Paper*, 4335.

Freudenberg Michael and Friedbert Müller (1992), "France et Allemagne : quelles spécialisations commerciales ?", *Economie prospective internationale*, **52**, 4e trimestre.

Gabszewicz Jean, Avner Shaked and John Sutton (1981), "International Trade in Differentiated Products," *International Economic Review*, 22, **3**, October, pp. 527-534.

Gabszewicz Jean and Alessandro Turrini (1997), "Workers' Skills, Product Quality and Industry Equilibrium," *CORE Discussion Paper*, **9755**, August.

Globerman Steven. and James W. Dean, (1990), "Recent Trends in IIT and their Implications for Future Trade Liberalization," *Weltwirtschaftliches Archiv*, 126, **3**.

Greenaway David, Robert Hine and Chris Milner (1994), "Country-Specific Factors and the Pattern of horizontal and Vertical Intra-industry Trade in the UK," *Welwirtschaftliches Archiv*, 130, **1**.

Greenaway David, Robert Hine and Chris Milner (1995), "Vertical and Horizontal Intra-industry Trade: A Cross Industry Analysis for the United Kingdom," *The Economic Journal*, **105**.

Greenaway David, Chris Milner and Robert Elliott (1998), “UK intra-industry trade with EU North and South : a Multi Country and Multi-industry analysis”, *Conference on International Trade and Market Structure*, Le Mans, France, April.

Grubel Herbert G. and Peter J. Lloyd (1975), *Intra-industry Trade, the Theory and Measurement of International Trade in Differentiated Products*, London, McMillan.

Haveman John, Hummels David (1996), "Trade creation and trade diversion: new empirical results" Paper presented at the *International conference on globalisation and regionalisation*, Sorbonne, Paris, 29-30 May.

Head, Keith and Thierry Mayer (1998) “Non-Europe: The magnitude and Causes of Market *mimeo*, University of British Columbia.

Helpman, Elhanan and Paul R. Krugman (1985), *Market Structure and Foreign Trade*, Wheatsheef Boods, Harvester Press, MIT.

Hoekman, Bernard. and Simeon Djankov.(1996), « Intra-Industry Trade, Foreign Direct Investment and the reorientation of East European exports », *CEPR Discussion Paper*, **1377**.

Hughes Kirsty S. (1993), "IIT in the 80’s: A Panel Study," *Welwirtschaftliches Archiv*, 123, **3**, p.561-572.

Krugman Paul (1980), "Scale Economies, Product Differentiation, and the Pattern of Trade," *American Economic Review*, **70**, 950-959.

Krugman Paul (1993), 'Lessons of Massachussets for EMU," in F. Torres and F. Giovezzi (eds), *Adjustment and Growth in the European Monetary Union*, CEPR, Cambridge University Press.

Loertscher Rudolf and Frank Wolter (1980), "Determinants of Intra-industry Trade Among Countries and Across Industries," *Weltwirtschaftliches Archiv*, **116**, p. 281-293.

MAC (1988), "The cost of non-Europe: technical barriers in six industries," *Research on the cost of non-Europe*, Vol. 3, Document series, CEC.

Markusen, James R. (1995), "The Boundaries of Multinational Enterprises and the Theory of International Trade," *Journal of Economic Perspectives*, **9**, pp. 169-189.

Markusen, James R. and Anthony J. Venables (1995), "Multinational firms and the new trade theory," *NBER working paper*, **5036**, February.

Matthews, Kathryn. (1998), Intra-industry trade : an Australian panel study, Journal of Economic Studies, 25, (2), p. 84-97.

Mayer, Thierry and Keith Head (1998), “The Magnitude and Causes of Market Fragmentation in *Manuscript*, University of British Columbia, October.

Nerb Gernot (1988), "The completion of the internal market: a survey of European industry’s perception of the likely effects". *Research on the Cost of Non-Europe*, Vol 1, Document series, CEC.

Neven David J. and Lars H. Röller (1990), "European Integration and Trade Flows," *European economic Review*, **35**, pp.1295-1309.

Péridy Nicolas (1992), "Trade Preference Effects of EC-Morocco Trade since 1969; the

Application of Temporal-Cross-Sectional Generalized Gravity Models," *PhD. Dissertation*, European University Institute.

Stone Joe A., Hyun H. Lee (1995), "Determinants of Intra-industry Trade: A Longitudinal, Cross-Country Analysis," *Weltwirtschaftliches Archiv*, (131), **1**, pp.67-85.

Viner Jacob (1950), *The Customs Union Issue*, NewYork, Carnegie Endowment for International Peace.

APPENDIX 1:

{Figure 9 about here}

APPENDIX 2: The database of explanatory variables

Country variables

For the country variables, $GDP_{kk'}$ is an indicator of the size of the economies under study. Since the dependent variable is measured on a bilateral basis, it is necessary to use the average GDP as the GDP value of the declaring country k and its partner k', following the methodology put forward by Bergstrand (1990). It is to be expected that size will have a positive impact on the intensity of the division of labour, leading to a reinforcement of the "intra-industry" nature of intra-European trade. A greater variety of goods exists in "large" countries.

The variable $GDPD_{kk'}$ is the difference in size between the countries. In accordance with Balassa (1986), Balassa and Bauwens (1987) the following ratio is used:

$$GDPD_{kk'} = 1 + \frac{\left[w \ln w + (1-w)\ln(1-w)\right]}{\ln 2}$$

$$\text{where } w \equiv \frac{GDP_k}{GDP_k + GDP_{k'}}$$

This indicator is of a better quality than the absolute difference in GDP, in as far as the latter is sensitive to the absolute size of the partners. Here $GDPD_{kk'}$ has a value ranging from 0 to 1, which is independent of the absolute size of the trade partners. The difference in size is traditionally an obstacle to two-way trade in similar products.

Income *per capita* $PCI_{kk'}$ is also expressed as the bilateral average. As widely established in the theoretical literature, "rich countries" should have higher levels of two-way trade. Therefore, we expect $PCI_{kk'}$ would have a positive impact.

To obtain a proxy variable for the economic distance between (the comparative advantage of) two countries, $PCID_{kk'}$ a very simple measure will be used[25]: the difference between PCI_k and

$PCI_{k'}$. An eclectic vision of world trade *à la Helpman-Krugman* traditionally suggests that the economic distance between two countries increases the share of inter-industry trade in bilateral trade: countries separated by a large economic distance specialise. The variable $PCID_{kk'}$ should thus have a *negative* impact on IIT if the latter was only based on a horizontal differentiation of products. In contrast, in a context of vertical differentiation *à la Falvey* (1981) and as suggested in Fontagné and Freudenberg (1997), a negative relationship is expected between the economic distance and the share of IIT in vertically differentiated products[26].

The geographic distance $Gdist_{kk'}$ is expressed in nautical miles between the centre of gravity of the declaring country and its partner. Given that we are dealing with intra-European trade, this indicator of transportation costs has to be corrected using data from PCGlobe. The distance between producers should lead to a reduction in intra-industry trade.

Market structure variable

This variable is introduced in order to control the sectoral dimension of the problem considered here; and to assess the traditional relationships between economies of scale, barriers to entry, product differentiation and IIT.

Economies of scale were initially measured by the average size of the largest companies in each industry, *à la* Neven and Röller (1990) and Hughes (1993). This size is standardised by the average size of all companies in the industry in question. The literature on intra-industry trade generally considers that increasing returns to scale should reinforce the intra-industry nature of trade, economies of scale being best exploited in a large-scale market. However, on empirical grounds, this conclusion is challenged in the literature. Other variables were introduced in preliminary estimates, such as the capital ratio of industries (K/VA) *cap*, which is a proxy of "natural" barriers to entry, and

the capital intensity of industries, *intcap*. Lastly, we decided to build new variables in a rather different way: using Eurostat Industrial Data by Size[27] of Enterprises, the below indicators were calculated for the "core countries" (Germany, France, Italy and the United-Kingdom) as a whole, in 1987:

(a) The share of large companies in the number of enterprises by industry;

(b) The share of large companies in the employment by industry;

(c) The share of large companies in the value added by industry;

(d) The relative productivity of large firms by industry.

We chose the last indicator (*Scale*), relative to productivity differentials, on the basis of the minimisation of multicolinearity problems in the specification tested.

Single market variables

Three categories of variables may be used[28]:

(a) Variables relative to trade barriers hindering trade between member states;

(b) Variables relative to Foreign Direct Investment (FDI) and M&A -understood as the result of a microeconomic response to the Single market perspective-;

(c) Transaction costs: cancellation of border formalities will reduce transaction costs; as a result, the assumption is made that *Gdist* will have a decreasing impact on trade types and values;

Two variables (**Erreur! Source du renvoi introuvable.**) reflecting Non-Tariff Barriers hindering intra-EC trade were calculated:

(a) The first (*NTB1*) is derived from Buigues, Ilzkowitz and Lebrun in European Commission (1990-b)[29]: in a first step, following Neven and Röller (1991), we use an ordinal variable according to the level of NTBs in intra-European trade at the NACE 3-digit level. At this

level, for example, we identify pharmaceuticals (NACE 257) or wine (NACE 425) as industries with high barriers to intra-European trade before the completion of the internal market. Thereafter, the values obtained are weighted by EC value added in 1987, in order to return to the nomenclature in 14 industries.

(b) A second proxy for NTBs (*NTB2*) is derived from the same study of the Commission, but taking into account the price discrepancies in Europe, excluding taxes.[30] These differentials are weighted by the 1987 EC value added.

Concerning FDI, Balance of Payments data on bilateral FDI is considered here. Using data published by Eurostat in 1994, flows over 1984-1991 were deflated with gross prices indexes (IMF financial statistics, various issues) and cumulated, in order to cancel the very high inter-annual variability of data. Two matrixes have then been constructed, giving outflows and inflows on a bilateral basis. Then, the bilateral intensity in FDI flows, for each pair of member states, was calculated over the Single Market completion period. More precisely, we calculate the following indicator:

$$FDI_{kk'} = FDI_{k'k} = \frac{1}{2}\left(\max\left(\sum_{t=84}^{91} FDI_{kk't}^{k}, \sum_{t=84}^{91} FDI_{kk't}^{k'} \right) + \max\left(\sum_{t=84}^{91} FDI_{k'kt}^{k}, \sum_{t=84}^{91} FDI_{k'kt}^{k'} \right) \right)$$

{Figure 10 about here}

It must be pointed out that the two NTBs' variables are relatively co-linear: we do not aim at introducing them simultaneously into our equations, but rather to use each one in different specifications, explaining different trade types.

APPENDIX 3 : estimations by industry

{Table 6}

Notes

Figure 1: Market structure, differentiation of products and the determinants of trade

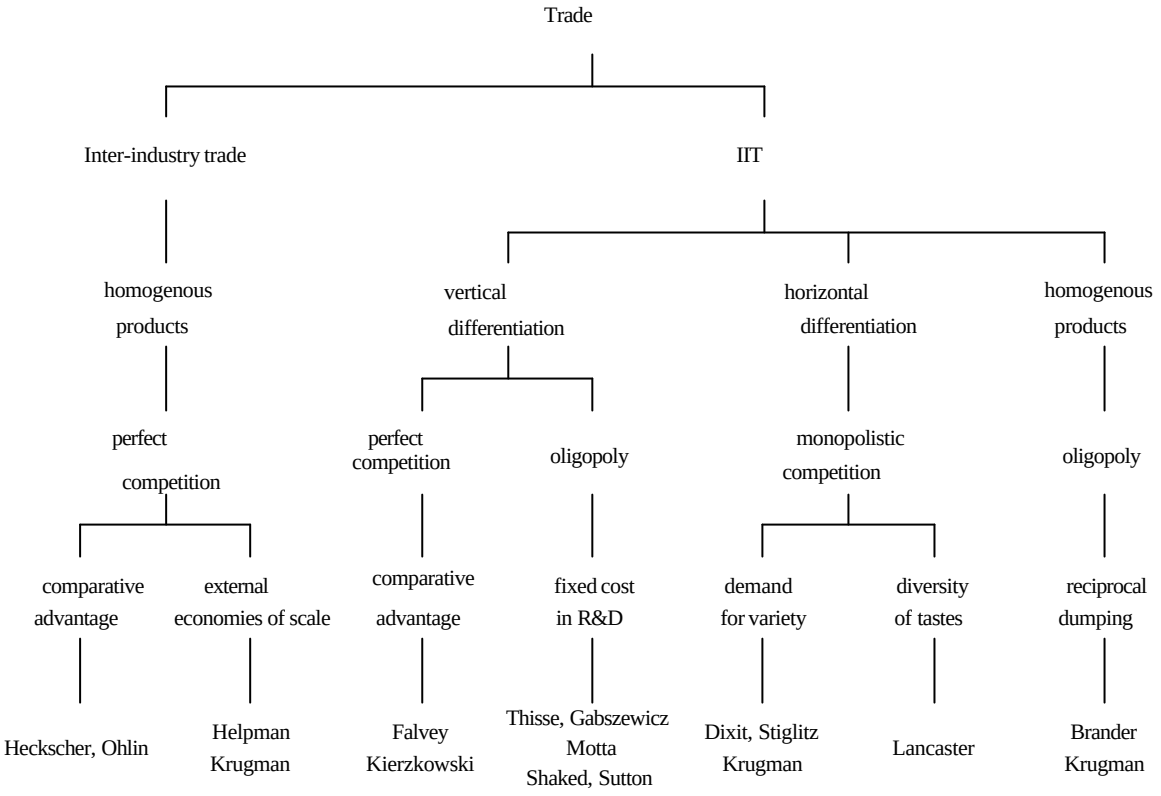
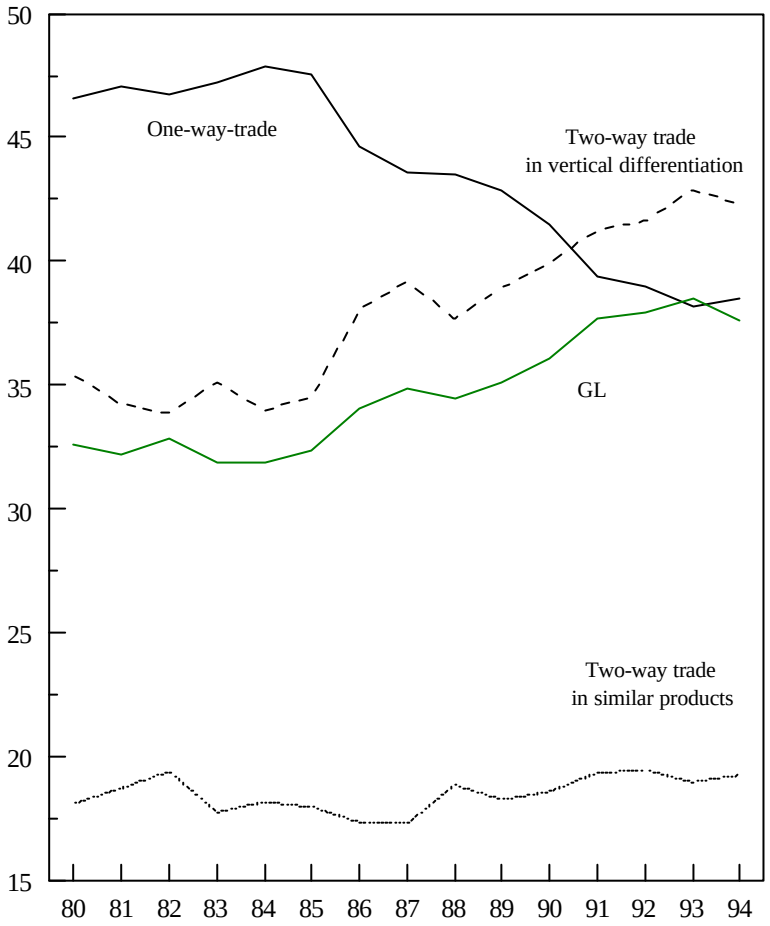


Table 1: Determinants of trade types and potential effects on integration

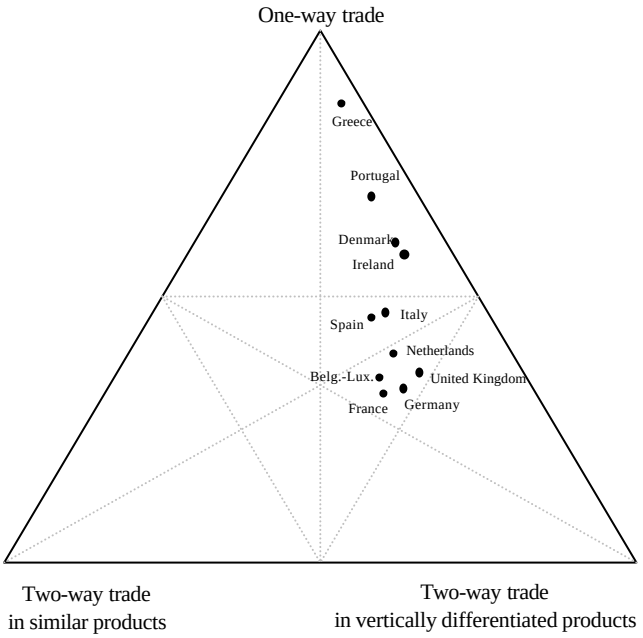
	Traditional theories		**New International Trade Theory**		
Determinants	Factor endowments	Productivity differences	Scale economies: external	Scale economies: internal	
Trade patterns	*Inter*-industry trade			*Intra*-industry trade in *vertical* differentiation	*Intra*-industry trade in *horizontal* differentiation
Specialisation	along comparative advantages		through agglomeration economies	along the quality spectrum	in varieties
Adjustment costs	Important (changes in factor prices among industries within countries)		Potentially important (potential income divergence among countries)		Weak

Figure 2: Evolution of trade types and the GL indicator in intra-EC trade, 1980-1994



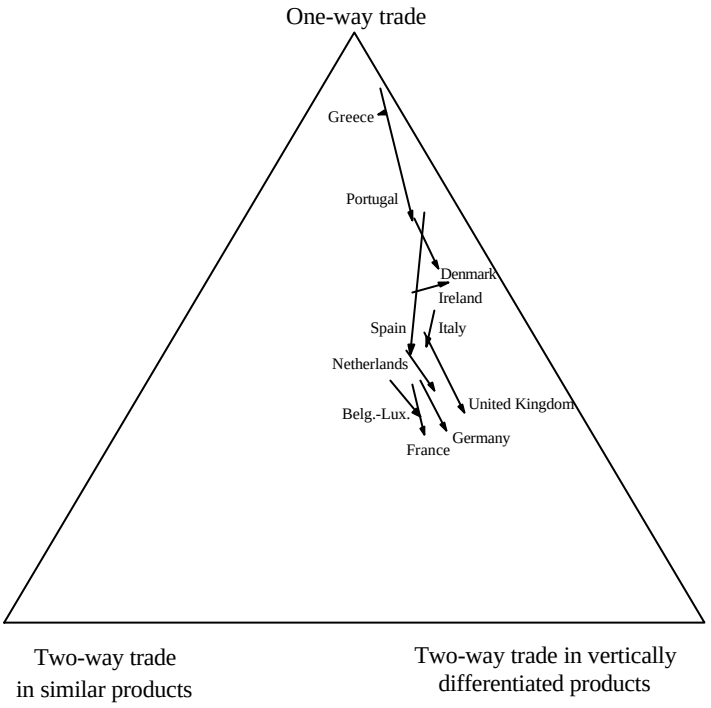
Source: Eurostat-Comext, authors' calculations.

Figure 3: Share of trade types in intra-EC trade by country, 1994



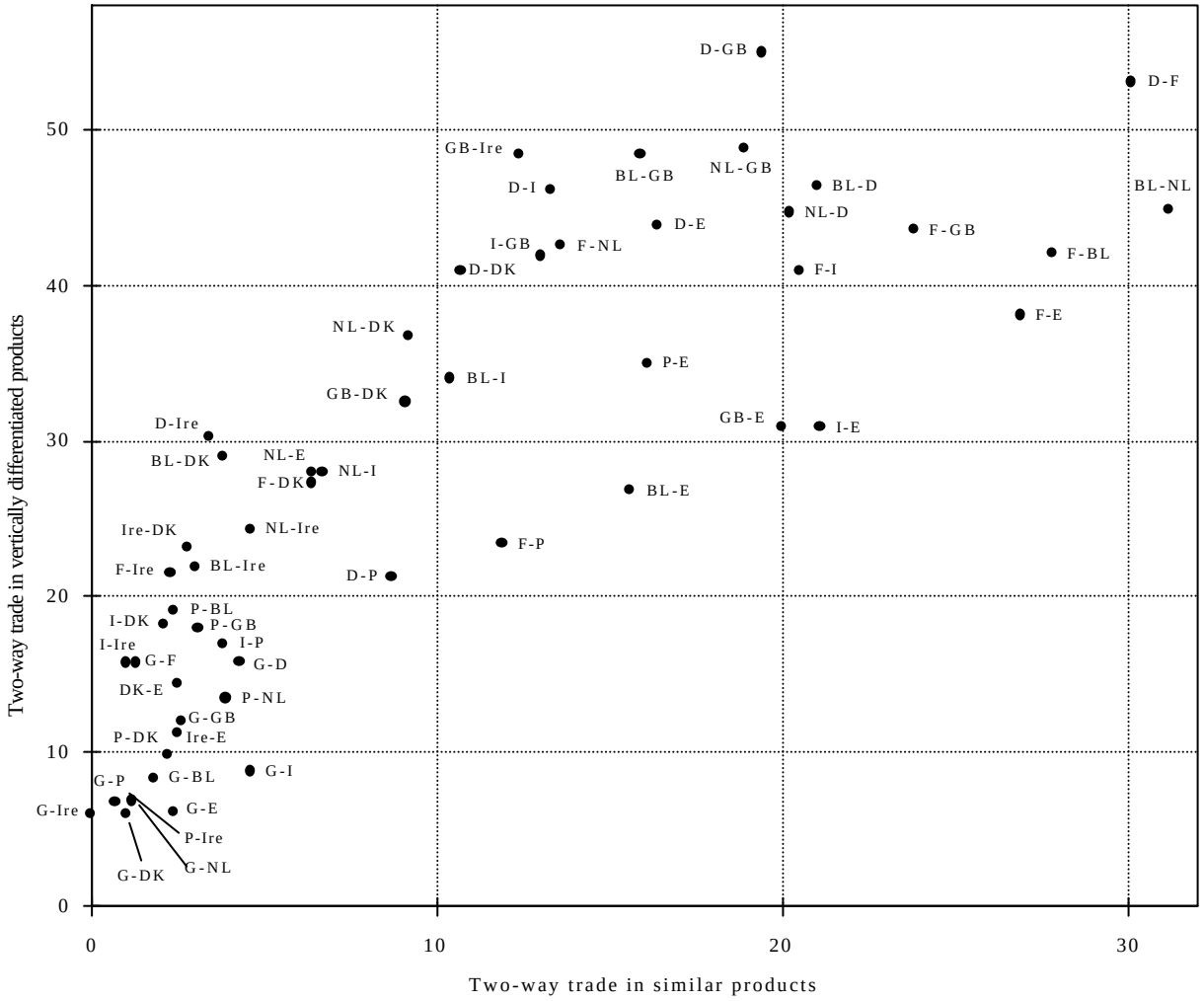
Source: Eurostat-Comext, calculations by the CEPII.

Figure 4: Variation of the share of trade types in intra-EC trade by country, 1980 to 1994



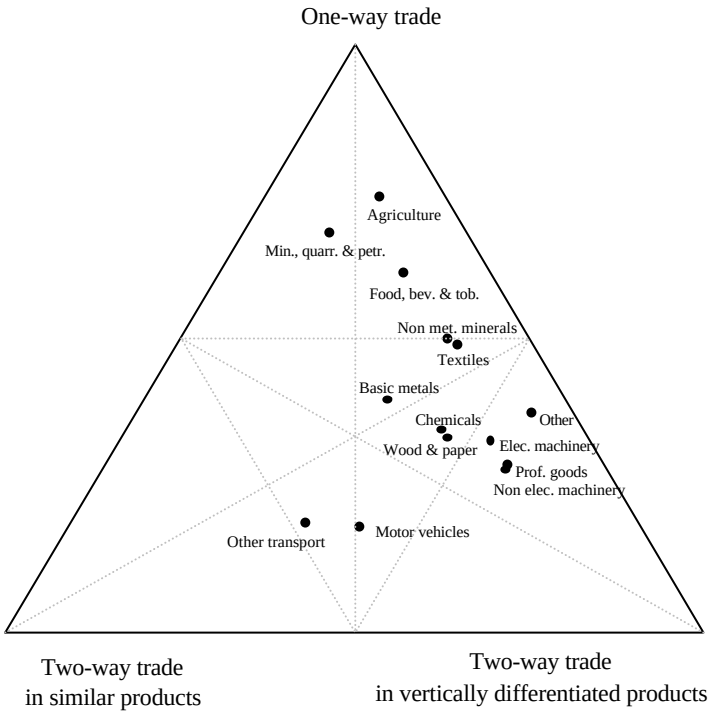
Source: Eurostat-Comext, calculations by the CEPII.

Figure 5: Trade types in bilateral, intra-EU trade relations, 1993/1994



Source : Eurostat - Comext, authors' calculations.

Figure 6: Share of trade types in intra-EC trade by industry, 1994



Source: Eurostat-Comext, authors' calculations.

Table 2 : Explanatory variables for the model

Characteristics	Variable		Indicator
Country	Size	$GDP_{kk't}$	Average of Gross Domestic Products of the two countries
	Differences in size	$GDPD_{kk't}$	Normalised difference in GDPs
	Income per capita	$PCI_{kk't}$	Average income *per capita* of the two countries
	Economic Distance (comparative advantage)	$PCID_{kk't}$	Differences in incomes *per capita*
	Geographic distance	$GDist_{kk't}$	Distance between capital cities
Market structures	Economies of scale	$Scale_j$	Relative productivity of larger firms, by industry (France-Germany-Italy-United Kingdom)
Integration	Non tariff barriers	$NTB1_j$	Value added weighted NTBs
		$NTB2_j$	Differences in prices excl. taxes among member states
	Foreign investment	$FDI_{kk'}$	Foreign Direct Investment in Balance of Payments

See appendix 2 for details.

Table 3: Overview of econometric models on IIT

Characteristics	Intra-industry trade	
	global	bilateral
Industry	Caves (1981) Greenaway, Hine, Milner (1995)	
industry-time	Neven, Röller (1990) Globerman, Dean (1990) Hughes (1993)	
Country		Greenaway, Hine, Milner (1994) Bergstrand (1990) Matthews (1998) Hoekman and Djankov (1996)
country-time	Stone, Lee (1995)	
country-industry	Clark (1993) Balassa (1986) Aturupane, Djankov, Hoekman (1997)	Balassa, Bauwens (1987) Loertscher, Wolter (1980) Greenaway, Milner, Elliott (1998) Blanes and Martin (1998)
country- industry-time		Fontagné, Freudenberg, Péridy (1997)

Table 4: Econometric results for shares of trade types in bilateral, intra-EC trade flows; panel data 1980-1994

		One-way trade	Two-way trade	
			vertical	horizontal
Size	$GDP_{kk't}$		0.4718***	1.1208***
			(0.0250)	*(0.0354)*
Income per capita	$PCI_{kk't}$	-0.0592***	1.0081 ***	0.6361***
		(0.0081)	*(0.0491)*	*(0.0693)*
Geographic distance	$GDist_{kk't}$	0.5951***	-1.0314 ***	-2.0083***
		(0.0038)	*(0.0189)*	*(0.0256)*
Differences in size	$GDPD_{kk't}$	0.3282***	0.3767***	-0.6158***
		(0.0122)	*(0.0637)*	*(0.0891)*
Economic distance	$PCID_{kk't}$	-0.0253***	0.2406***	
		(0.0033)	*(0.0155)*	
Economies of scale	$Scale_j$	2.5117***	3.9797 ***	15.9424***
		(0.0955)	*(0.4535)*	*(0.6413)*
Foreign investment	$FDI_{kk'}$	0.0002	0.1431***	0.1311***
		(0.0009)	*(0.0051)*	*(0.0074)*
Non tariff barriers	$NTB1_j$	-0.2198***	2.9721 ***	4.2633***
		(0.0220)	*(0.1045)*	*(0.1468)*
Number of obs.		19,524	19,524	19,524
adj R2 (%)		98.87	63.85	44.69
F value		243,087.2	4,312.2	2,254.5
Prob>F		0.1%	0.1%	0.1%
X2 (White test)		1679.2	1531.8	4743.24
Prob >X2		0.1%	0.1%	0.1%
condition. number.		24.89	30.26	27.62

Standard error in parentheses

*** significant at 1%

** significant at 5%

* significant at 10%

ns not significant

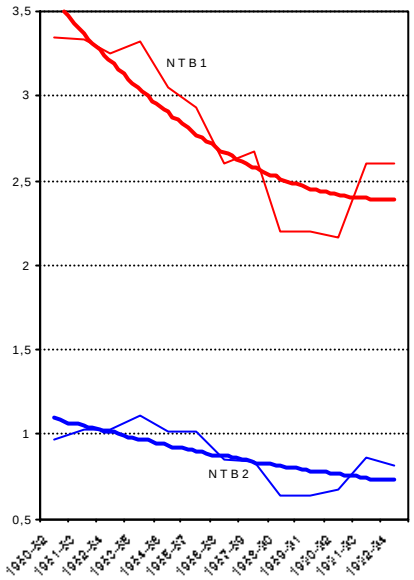
Table 5: Econometric evidence for potential agglomeration economies at the industry level (by descending order)

Dep. Var. One way trade :	GDPD	PCI	Gdist	PCID	FDI	Nb of obs	Adj- R2	X2(White	cn
Other transport equipment	**0.73*** **	-0.19***	0.60***	0.02**	-0.01**	1624	0.95	92	15.47
Motor vehicles	**0.57*** **	-0.12***	0.60***	0.02**	-0.03***	1630	0.97	309	15.28
Machinery	**0.49*** **	-0.17***	0.60***	0.00 ns	-0.01***	3264	0.99	427	15.27
Professional goods	**0.38*** **	-0.40***	0.66***	0.01***	-0.01***	1632	0.99	166	15.27
Chemicals	**0.36*** **	-0.05***	0.60***	0.01***	0.00 ns	1632	0.99	329	15.27
Wood, paper, printing	**0.32*** **	-0.14***	0.62***	0.01 ns	0.00 ns	1632	0.99	264	15.27
Metal products	**0.29*** **	-0.02 ns	0.59***	0.01***	0.01***	1632	0.99	176	15.27
Non metallic mineral products	**0.12*** **	0.06***	0.58***	0.01***	0.01***	1632	0.99	298	15.27
Mining and Quarrying	**0.11*** **	0.25***	0.53***	0.01***	0.01***	1632	0.99	168	15.27
Textile, leather	**0.07*** **	-0.05***	0.61***	0.01***	0.01***	1632	0.99	263	15.27
Agriculture	**0.03 ns**	0.28***	0.54***	0.01***	0.02***	1632	0.99	156	15.27
Food, Beverages	**-0.03 ns**	0.14***	0.58***	0.01***	0.02***	1632	0.99	167	15.27
Other Industries	**0.04 ns**	-0.10***	0.61***	0.01***	0.01***	1630	0.99	134	15.32

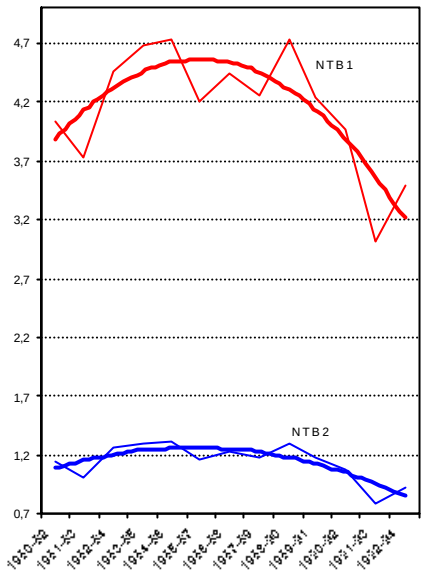
* significant at 10%
** significant at 5%
*** significant at 1%
ns not significant

Figure 7: Impact of NTBs on the share of two-way trade (all countries all industries, 1980-1994)

Vertical differentiation

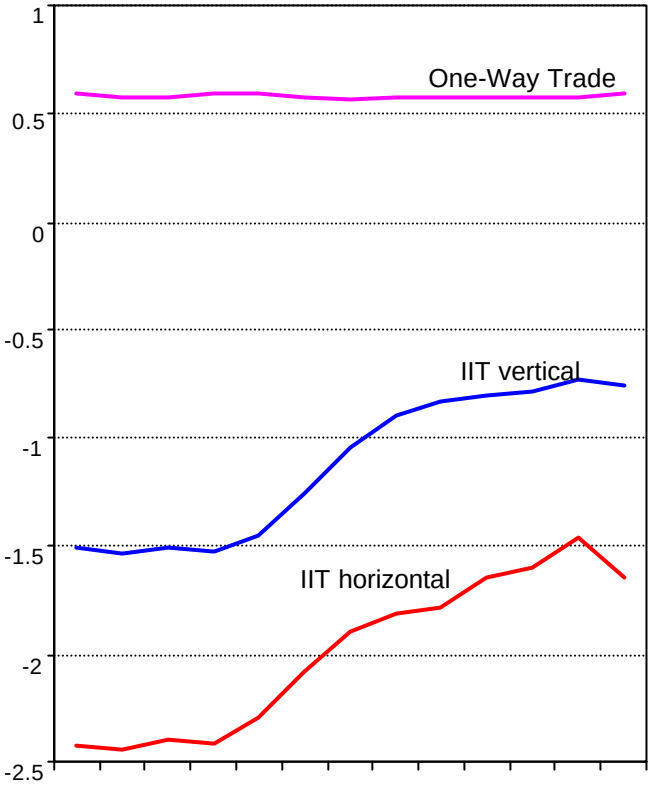


Horizontal differentiation



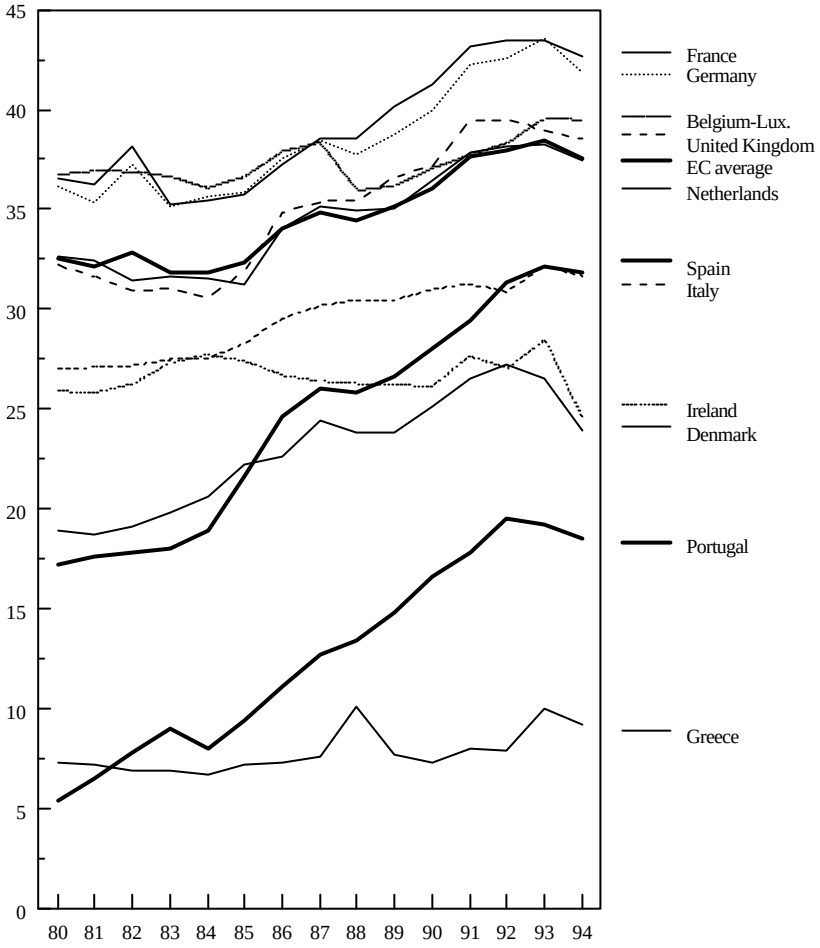
Note: value of NTBs parameter estimates on the vertical axis; all parameters are significant at the 1% level.

Figure 8: The influence of transaction costs on shares of IIT inside the EC (1980-94)



Note: value of Gdist parameter estimates on the vertical axis; all parameters are significant at the 1% level.

Figure 9 : Evolution of the Grubel and Lloyd indicator of intra-industry trade in intra-EC trade, 1980-1994



Source: Eurostat-Comext, authors' calculations.

Figure 10 : Non Tariff Barriers on intra-EC trade associated with the pre-completion period

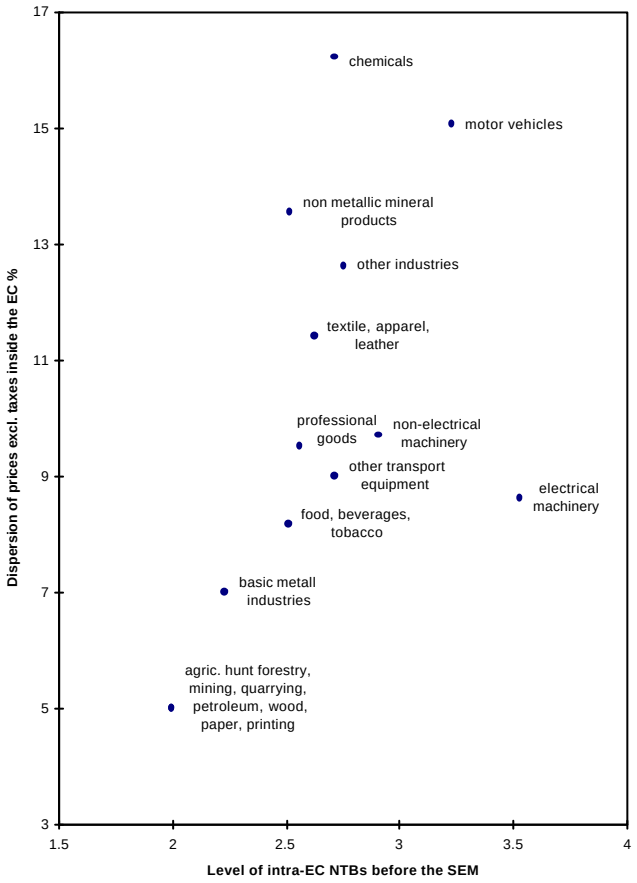


Table 6 : parameter estimates by industry for equations of two-way trade

Two way trade : Horizontal differentiation	GDP	Gdist	GDPD	NFDI	*Nb of obs*	*Adj- R2*	*X2 (White)*	*Cond. number*
Agriculture	1.61***	-1.53***	-0.63***	0.16***	*1632*	*0.55*	*386*	*16.60*
Food, Beverages	1.64***	-1.50***	-0.85***	0.16***	*1632*	*0.57*	*348*	*16.60*
Mining and Quarrying	2.35***	-2.11***	-4.39***	0.13***	*1632*	*0.52*	*463*	*16.60*
Chemicals	1.13***	-0.85***	-0.66***	0.17***	*1632*	*0.61*	*165*	*16.60*
Wood, paper, printing	1.54***	-1.32***	-1.57***	0.23***	*1632*	*0.57*	*278*	*16.60*
Textile, leather	0.76***	-0.54***	0.19 ns	0.12***	*1632*	*0.62*	*100*	*16.60*
Non metallic mineral products	1.89***	-1.73***	-0.64***	0.17***	*1632*	*0.57*	*420*	*16.60*
Metal products	1.21***	-1.00***	-0.04 ns	0.23***	*1632*	*0.61*	*209*	*16.60*
Machinery	1.07***	-0.87***	-0.21 ns	0.20***	*3264*	*0.53*	*406*	*16.60*
Motor vehicles	2.17***	-1.88***	-2.58***	0.20***	*1630*	*0.53*	*490*	*16.61*
Other transport equipment	2.61***	-2.40***	-2.71***	0.04	*1624*	*0.56*	*243*	*16.70*
Professional goods	1.36***	-1.21***	-0.38*	0.19***	*1632*	*0.47*	*295*	*16.60*
Other Industries	1.28***	-0.86***	-1.21***	0.15***	*1630*	*0.43*	*282*	*16.62*

Two way trade : Vertical differentiation	PCI	Gdist	GDPD	PCID	NFDI	*Nb of obs*	*Adj- R2*	*X2 (White)*	*Cond. number*
Agriculture	1.73***	-0.76***	1.61***	0.31***	0.27***	*1632*	*0.58*	*209*	*15.27*
Food, Beverages	2.78***	-1.02***	1.44***	0.16***	0.20***	*1632*	*0.61*	*183*	*15.27*
Mining and Quarrying	2.16***	-0.98***	1.24***	0.18***	0.30***	*1632*	*0.37*	*289*	*15.27*
Chemicals	1.52***	-0.19***	0.19 **	-0.04**	0.11***	*1632*	*0.91*	*130*	*15.27*
Wood, paper, printing	2.12***	-0.57***	0.69***	0.10***	0.21***	*1632*	*0.77*	*106*	*15.27*
Textile, leather	1.44***	-0.17***	0.57***	0.00 ns	0.08***	*1632*	*0.89*	*56*	*15.27*
Non metallic mineral products	1.79***	-0.57***	1.71***	0.11***	0.25***	*1632*	*0.73*	*128*	*15.27*
Metal products	1.51***	-0.37***	0.93***	0.12***	0.20***	*1632*	*0.81*	*101*	*15.27*
Machinery	1.48***	-0.16***	0.41***	-0.03*	0.14***	*3264*	*0.87*	*130*	*15.27*
Motor vehicles	2.24***	-0.73***	0.44 **	0.24***	0.26***	*1630*	*0.56*	*197*	*15.28*
Other transport equipment	2.65***	-1.08***	1.50***	0.38***	0.36***	*1624*	*0.50*	*269*	*15.47*
Professional goods	1.91***	-0.55***	1.44***	0.23***	0.26***	*1632*	*0.77*	*129*	*15.27*
Other Industries	1.80***	-0.35***	1.05***	0.13***	0.12***	*1630*	*0.78*	*82*	*15.32*

*** significant at 1%
** significant at 5%
* significant at 10%
ns not significant

[1] Since it is a step forward in the regional integration, the single market might lead to trade creation effects but also to trade diversion effects detrimental to third countries. Reasons for such an ambiguous mechanism are well known (see for example Viner, 1950). In contrast, econometric evidence of such a diversion is far from being clear. Haveman and Hummels, 1996; Bikker, 1987; Frankel and Wei, 1993; Aitken, 1973; Brada and Mendez, 1983; Bayoumi and Eichengreen, 1995).

[2] European Commission (1990-a, Chap. 6).

[3] See Krugman (1980) for a stylised framework associating the costs of inter-industry trade and the gains of IIT. See also Brülhart and Hine (1998) as well as Brülhart and Elliott (1998) for the empirical relationship between intra-industry trade and adjustment costs.

[4] For a certain number of so-called *"sensitive" sectors* with important NTBs in the "pre-completion" situation, conversion costs, implying factor mobility, possibly sunk costs and cohesion costs could not be excluded. In addition, the sectoral adjustment occurring in the *less developed member states* was all but clear. One possible scenario was an increased specialisation along comparative advantages giving rise in *inter*-industry trade, whereas a convergence in production and demand structures might increase *intra*-industry trade. Trade would thereby contribute to reducing the asymmetries in production and trade structures among the member states.

[5] *Geographic bias* arises when only a country's trade relations with "the rest of the world" are examined, notwithstanding bilateral relationships with its partners. However, the sign of the trade balance for a particular product may change for trade from one partner to another, corresponding to the accumulation of various inter-industry flows for the same item of the product classification, and will show up a "multilateral" intra-industry flow, which is a pure artefact.

[6] The *sectoral bias* stems from insufficient disaggregation in the trade classifications: the lesser the detail of the classification used, i.e. the more products are lumped together into a single industry, the more trade becomes of an intra-industry nature.

[7] For a more detailed discussion, see Fontagné and Freudenberg (1997).

[8] Abd-El-Rahman's PhD dissertation (1984) suggested, *inter alia*, to introduce unit values, a proxy of prices, in the calculation of IIT ratios. This proposal has been largely adopted since then: see for example Freudenberg and Müller (1992); Fontagné, Freudenberg and Ünal-Kesenci (1996), Fontagné and Freudenberg (1997) for trade types and Greenaway, Hine and Milner (1994, 1995) for the Grubel and Lloyd indicator.

[9] Following Abd-El-Rahman, Greenaway, Hine and Milner (1994) used the same 15% threshold to distinguish between similar products and vertically differentiated products, despite a more limited degree of classification disaggregation. Sensitivity tests based on the distribution of unit values of elementary trade flows within the EU are given in Fontagné and Freudenberg (1997).

[10] Shortly, different sources of data have been used, including trade figures in different nomenclatures, and figures for production or industrial structures emanating from Eurostat and OECD.

[11]The automobile industry is characterised over the period 1980-94 by a sharp decrease in vertically differentiated products and a sharp increase of IIT in horizontally differentiated products. The latter phenomenon might be the result of an increasing difficulty to maintain practices of discrimination in prices on European markets, to the benefit of the SEM completion.

[12] The convergence hypothesis (Markusen and Venables, 1995) leads to a complex relationship between FDI, trade values and trade structure: as countries converge, multinational firms might *displace* trade.

[13] For a more detailed discussion see Péridy (1992).

[14] The success of models explaining the *value* of overall trade is more or less guaranteed, precisely because of the presence of gravity variables relating to size and geographic distance. This is not necessarily the case however once total trade trade types break down, even for values (See Fontagné, Freudenberg and Péridy, 1997).

[15] The equations for the three types of trade in share were estimated using variables in logarithmic form: (1) for the 1980-94 panel, all countries, all industries; (2) for the 1980-94 panel, all countries less Portugal and Spain, all

industries; (3) for each country, all industries; and (4) for each industry, all countries.

[16] The model presented here is a panel data model with four dimensions: time, industry, reference countries and partner countries. Complete tests of heterogeneity are unfortunately impossible in our case for several reasons: first, the theoretical econometric literature is limited to 2 (and most recently 3) dimensions. Second, and consequently, econometric software is limited to 2 dimensions. Lastly the size our dataset (at the minimum 463,200 values) is such that the stratification variables frequently contain too many individuals for the software used (LIMDEP). Despite these problems, we have been able to test for heterogeneity across countries. It appears that despite the conclusion of heterogeneity of the parameter, the re-estimation of the model through Least Square Dummy Variable (LSDV) or Generalised Least Square (GLS) in fixed or random effects, gives results extremely close to the OLS pooled estimates. Thus, on the basis of this test, the heterogeneity bias due to countries is negligible.

[17] Two tests have been performed : the calculation of the condition numbers and of the variance inflation factors (VIF test)

[18] See CEPII (1997) and Fontagné and Freudenberg (1997) for detailed results. Separate estimates were also made including and excluding Portugal and Spain in order to appraise the robustness of the results and to capture the difference between accession and completion. In a previous draft (CEPR n° 1959) we used a slightly different specification embodying exchange rates and a variable of vertical differentiation. These variables have been dropped out the current version: exchange rates were largely colinear with the geographic distance (see Fontagné and Freudenberg, 1998) and multicolinearity problems were associated with the differentiation variable.

[19] It must be kept in mind that in our sample of European countries, comparative advantages may not be the main determinant of specialisation and trade.

[20] Due to multicolinearity problems, the trade equations corresponding to one way trade and two way trade in vertically differentiated products have been estimated without SCALE and GDP ; in the same way, the two way trade equation in horizontally differentiated products has been estimated without SCALE, PCI.

[21] Variables related to NTBs, which are considered here as characteristics of industries, might have captured effects associated with general features of these industries (as economies of scope etc.) rather than to commercial policies. In this case, the perturbing causes might be strong enough to overcome effects associated to barriers *per se*. A first argument suggesting that this point must not be excluded lies in the multicolinearity problems encountered between *FDI*, *Scale* and *NTB*. These multicolinearity problems are particularly accurate for the vertical differentiation, in value as in share. But estimating the model with or without any combination of the related variables leads to similar results. This proves that we do not face an artefact.

[22] Due to multicolinearity, these estimates have been done with a reduced number of explanatory variables.

[23] The lower influence of transaction costs on trade in vertically differentiated products, compared with horizontally differentiated ones, has to be noticed. The demand for the latter is more price elastic, as qualities are similar.

[24] Another explanation is that the border effect remains significant in Europe and can not be tackled in terms of NTBs (Mayer and Head, 1998).

[25] Factor endowments and technology endowments pose different problems. Apart from natural resources, factor endowments and income *per capita* are two parts of the same problem, namely the level of development. The inclusion of these variables in the same specification generates important multicolinearity problems, as shown by Bergstrand (1990). In any case, as far as differences in *per capita* income are a proxy of economic distance, all effects related to comparative advantage are already captured by our specification.

[26] More formally, Fontagné and Freudenberg (1997) use a two countries model in which consumers combine quality and variety in their choices: defining the economic distance as differences in the country distribution of resources along the quality spectrum, the result referred to here is derived from a monopolistic competition scheme.

[27] Size: "large enterprises": >500 employees; "small and medium size": < 500 employees.

[28] Is it possible to take a dummy (0 before 1986, and 1 afterwards for example) as a measure of the impact of the SEM? Alternative dates would indicate the expectation effect on private sector of the SEM. Intellectually such a strategy is unsatisfactory; in addition results are poor as expected in workshops carried out during this research,

and this strategy has been dropped out: trade barriers and FDI are intellectually more satisfactory and work well. A dummy variable for Southern countries integration might to provide insights on the impact of Spain's and Portugal's integration in the EC as of 1986. This variable is highly significant and has a positive impact on intra-European trade, but we do not present these results, since they do not separate effects associated with the integration of Southern countries into the EC from those we are interested in here.

[29] The authors establish their classification using Nerb (1988), Commission (1988) and Mac (1988).

[30] The database of prices gathered by Eurostat is traditionally used to calculate PPP. Buigues et al. in European Commission (1990-b) base their calculus on an original exploitation of this database: they highlight the fact that domestic discrepancies, which might be considered as "natural" are far less than inter-country intra-European ones. Moreover, these discrepancies have grown over the 1975-85 period in sectors heavily affected by NTBs.