Portuguese Intra-Industry Trade: A Dynamic Panel Data Analysis

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Abstract: This paper provides empirical evidence of the determinants of intra-industry trade (IIT), horizontal IIT and vertical IIT between Portugal and six European trading partners, using a dynamic panel data analysis. The paper introduces the distinction between the short-run and the long-run effects of the industry characteristics on IIT. The relationship between IIT and comparative advantages is also tested. The estimation results suggest that Portugal has comparative advantages in low-quality varieties and support Davis' (1995) hypothesis that decreasing costs are not necessary for IIT. The findings of the paper also provide an answer to Torstenson's (1996) question, namely that it is primarily human capital, rather than physical capital, that determines the quality of differentiated products.

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I. Introduction

This paper analyses the determinants of total intra-industry trade (IIT), horizontal IIT (HIIT) and vertical IIT (VIIT) between Portugal and six of its European trading partners, using a balanced panel with twenty one industries. We chose these six countries because they include Portugal's main trading partners (Spain, and Germany) and include some of the more developed EU15 countries (France, Germany, and the Netherlands) as well as some the less developed EU15 countries (Greece, Spain, and Ireland). In addition, we present the results on a multilateral basis.[1] We return to the tradition of bilateral IIT studies initiated by Loertscher and Wolter (1980), Bergstrand (1983) and Balassa and Bauwens (1987), although, as Greenaway and Milner asserted (1986:128): "…there are no strong theoretical grounds for automatically measuring on a bilateral basis. Clearly many of the models of ITT thus far developed are two-country cases, but these have been used for expositional convenience". More recently, these bilateral IIT studies have received increasing attention (see Blanes 2005; Zhang et al. 2005).

In recent years, IIT has been studied using a static panel data approach (see Hummels and Levinsohn 1995; Egger 2004; Zhang et al. 2005; Blanes 2005). The results of these applied works may be questionable due to the difficulty in finding exogenous variables that can be regarded *a priori* as being uncorrelated with the individual effects (industry-specific effects). In static panel data models, three kinds of estimators are used: pooled OLS, fixed effects (FE) and random effects (RE) estimators. Problems arise because these models may be subject to serial correlation, heteroskedasticity and endogeneity of some explanatory variables, and the endogeneity, at least, is not taken into account by the estimators used. The solution to these econometric problems was found by Arellano and Bond (1991), who developed the first-differenced GMM estimator. Later, Blundell and Bond (1998, 2000) criticised the first-differenced GMM estimator (the levels may be valid, yet can prove to be poor instruments for first differences, if the data is highly persistent) and developed the GMM system estimator, which is a better alternative. The GMM system estimator is a system containing both first-differenced and levels equations. In addition to using instruments in levels for equations in first differences, it uses instruments in first differences for equations in levels.

In dynamic panel data models, the GMM system estimator eliminates the unobserved industry-specific effects through the equations in first-differences. The GMM system estimator also controls for the endogeneity of the explanatory variables. A standard assumption on the initial conditions allows the use of the endogenous lagged variables for two or more periods as valid instruments if there is no serial correlation (Blundell and Bond 1998, 2000). If we assume that the first differences of the variables are orthogonal to the industry-specific effects, this additionally allows the use of lagged first differences of variables for one or two periods as instruments for equations in levels. Validity of instruments requires the absence of second-order serial correlation in the residuals. Overall validity of instruments is tested using a Sargan test of over-identifying restrictions. First-order and second-order serial correlation in the first-differenced residuals is tested using m_1 and m_2 Arellano and Bond (1991) statistics. The GMM system estimator is consistent if there is no second-order serial correlation in residuals (m_2 statistic). The dynamic panel data model is valid if the estimator is consistent and the instruments are valid.

Although the theoretical models of IIT do not suggest a dynamic specification, we decided to introduce a dynamic variant of the preferred static model. We believe that this has not previously been carried out in empirical studies of IIT. However, the idea of a dynamic variant without a theoretical support was previously introduced by Baier and Bergstand (2001) and Badinger and Breuss (2004). The dynamic approach has been frequently used in studies of production functions, firms' growth, growth of trade, productivity spillovers from foreign direct investment or from multinational corporations (see Arellano and Bond 1991; Blundell and Bond 2000; Godard et al. 2002). In this paper, we apply the methodology of Arellano and Bond (1991) and Blundell and Bond (1998, 2000) to estimate IIT, HIIT and VIIT dynamic panel data models, using the GMM-system estimator.

Despite our estimating the static and dynamic panel models data, we only present the dynamic analysis[2]. The dynamic estimations results are, in general, in accordance with some predictions of IIT theory. Therefore, we conclude that it may be preferable to use the GMM approach, which avoids the static panel data econometric problems and obtains reasonable results. However, the most empirical studies conclusion that there is less empirical support for industry-characteristics hypotheses also maintains. It is often considered that much more is known about the country pattern of IIT. Nevertheless, Hummels and Levinsohn (1995), using a static panel data, also concluded that country-pair dummies explain a large proportion of the variation in IIT, thereby casting doubt on general models of IIT. It has become hard to refute the warning of Greenaway et al. (1994, 1995) that we need to distinguish between HIIT and VIIT. The pattern of VIIT is predicted fairly well by the theoretical models (Greenaway et al., op.cit.; Torstensson, 1996a), whereas HIIT seems to be determined by a more eclectic array of causes.

In this paper, we disentangle IIT into HIIT vis-à-vis VIIT, using data at the five-digit level for the period 1995-2002. The findings indicate that Portuguese IIT, particularly VIIT, increased significantly during the period in analysis, which is in accordance with the values expected for a developed country. The econometric estimations confirm that Portugal has comparative advantages in low-quality differentiated products in the context of the EU15 and that there is no statistical association between comparative advantage variables and HIIT. In this paper, we pose the same question as Torstenson (1996a), namely: "What type of capital, physical or human, is more important in affecting the quality of vertical differentiated products?". The findings of the paper, particularly on a multilateral basis (EU15), are that it is primarily human, rather than physical, capital that determines the quality of differentiated products.

Nevertheless, the problems with insignificant estimated coefficients and the wrong signs still persist. Leamer (1994) argues that interpretation of tests of IIT is difficult. There is the problem of the robustness of the estimated coefficient to changes in the set of control variables, there are the errors in variables and there is difficulty in interpreting a partial correlation. Torstensson (1996b) made a sensitivity analysis to contribute to an understanding of the sensitivity of determinants of IIT and applied the instrumental variables method to overcome the measurement errors. With the GMM system estimator, these econometric problems are also resolved, but, as was pointed out by Hummels and Levinsohn (1995), the weak relationship between the empirical tests of the determinants of IIT and the theory is the main shortcoming of these studies.

The remainder of the paper is organized as follows: the next section reviews the theoretical literature of IIT models; Section 3 reports the evolution of the IIT, HIIT and VIIT between Portugal and the sample of six European partners for the period 1995-2002; Section 4 presents the dynamic panel data models of ITT, HIIT and VIIT, as well as the data source, variable definition and expected sign. Section 5 analyses the results. The final section concludes. In the appendix we present the static panel data results.

II. Previous Literature

The main breakthrough to a theoretical explanation of IIT occurred in the late 1970s.The pioneering work in intra-industry models is due to Krugman (1979, 1980), Lancaster (1980), Helpman (1981) and Eaton and Kierzkowski (1984). All these models consider that products are horizontally differentiated – different varieties of a product are of a similar quality - although varieties of the same product may be distinguished in terms of their actual or perceived characteristics. In these models, each variety is produced under decreasing costs and when the countries open to trade, the similarity of the demand leads to intra-industry trade. Hence, HIIT is more likely between countries with similar factor endowments and cannot be explained by traditional trade theories.

In the vertical differentiation, different varieties are of different qualities and it is assumed that consumers rank alternative varieties according to product quality. Falvey (1981), Shaked and Sutton (1984), Falvey and Kierzkowski (1987) and Flam and Helpman (1987) introduced the vertical differentiation models. A vertically differentiated product is produced in two countries, one of them having comparative advantages in the higher-quality varieties, whereas the other has comparative advantages in the lower-quality varieties. In these models, it is generally accepted that VIIT can be explained by traditional theories of comparative advantage. As Davis (1995: 205) stressed, there is an assumption that "…goods are distinguished on the demand side according to perceived quality and on the production side by the fact that high-quality goods are produced under conditions of greater capital intensity".

The relatively labour-abundant countries have comparative advantages in labour-intensive products (lower-quality varieties) and relatively capital-abundant countries have comparative advantages in capital-intensive products (higher-quality varieties). So, according to comparative advantage law, the former countries will export the labour-intensive varieties (low-quality products) and the latter countries will export the capital-intensive varieties (high-quality products).

Therefore, we exclude from vertical IIT those goods (varieties) produced under the same factor proportions. Otherwise, horizontal IIT may assume identical factor intensity.

Helpman and Krugman (1985) surveyed the various attempts to model IIT and synthesised insights into a general equilibrium model, which became known as the Chamberlin-Heckscher-Ohlin (CHO) model. This model incorporates factor endowments, decreasing costs and horizontal differentiation and generates both IIT and inter-industry trade. Helpman (1987) and Hummels and Levinsohn (1995) carried out empirical tests of this CHO model with different results.

The empirical studies of IIT have generally found more empirical support for country-specific than industry-specific hypotheses and some results appear to be inconsistent with IIT (Hummels and Levinsohn 1995).[3] Following Greenaway, Hine and Milner (1994, 1995), one possible explanation is that this may be the result of mis-specification, in particular, the failure to distinguish HIIT from VIIT. The recent empirical research includes attempts to distinguish between HIIT and VIIT. The approach taken by Abd-el-Rahaman (1991), Greenaway et al. (1994) and Torstensson (1996b) is employed, in which quality of vertically differentiated products is assumed to be measured by price. Rather than presenting solutions, the empirical studies have emphasized the econometric problems of this "untidy" phenomenon. Their results suggest that determinants of HIIT and VIIT are very different and the pattern of IIT is not yet resolved.

III. Measuring IIT, HIIT and VIIT over 1995-2002

We disentangle IIT into HIIT and VIIT using the Grubel and Lloyd (1975) index[4] and data at the five-digit level of the Combined Nomenclature (CN), according to the Portuguese Classification of Economic Activities (CAE). At this level of disaggregation, the CAE is similar to the NACE. However, a fine-lever data is frequently used in the literature (see Blanes and Martin 2000). There are four reasons for our choice. First, the source for trade data is the INE (Portuguese

National Institute of Statistics), which only publishes the data at this disaggregated level. Second, Greenaway et al. (1994) chose to work with the five-digit SITC level. Third, there are similar studies that built the index at the four-digit level (see Zhang et al. 2005). Fourth, according to Zhang et al. (op. cit.: 520): "… if the intra-industry trade index is based on the very low level of sub-industries, then the value of the index will be upward-biased if the trade imbalances of two product varieties have opposite signs".

Table 1- Portugal's Intra-Industry Trade for the Period 1995-2002

Countries	95	96	97	98	99	00	01	02
EU	0.490	0.520	0.544	0.537	0.540	0.543	0.507	0.589
Spain	0.495	0.492	0.490	0.495	0.525	0.532	0.532	0.574
France	0.453	0.421	0.425	0.489	0.438	0.419	0.487	0.432
Germany	0.438	0.467	0.517	0.555	0.517	0.532	0.575	0.553
Ireland	0.108	0.143	0.106	0.111	0.082	0.089	0.086	0.093
Greece	0.055	0.063	0.076	0.087	0.089	0.084	0.091	0.097
Netherlands	0.364	0.336	0.332	0.329	0.327	0.326	0.318	0.334

Source: INE. Trade Statistics, Trade by Country

According to Table 1, the IIT between Portugal and the European Union, Spain, and Germany amounts to over 50% of total trade. There is, however, a clear difference between Germany and Spain in the last three years under analysis (2000-2002). For the whole period (1995-2002), the IIT between Portugal and Spain is almost VIIT, but in Germany's case, the weight of HIIT and VIIT is similar for the period 2000-2002**.** The IIT with France (43.2%) and the Netherlands (33.4%) also reached significant values. Ireland and Greece present poor values; almost all of Portugal's trade with these two countries is inter-industry. Since IIT might be viewed as a direct way of measuring the similarity in production structures, we can say that there is more economic integration between Portugal and Spain, Germany and France than between Portugal and Ireland, Greece and the Netherlands. Finally, the weight of IIT in the total trade increased with respect to the EU15, Spain, Germany, Ireland and Greece and slightly decreased with respect to France and the Netherlands.

Table 2- Portugal's Horizontal Intra-Industry Trade for the Period 1995-2002

Countries	95	96	97	98	99	00	01	02
EU	0.223	0.224	0.255	0.264	0.211	0.087	0.117	0.158
Spain	0.127	0.146	0.072	0.106	0.117	0.136	0.155	0.107
France	0.159	0.078	0.068	0.100	0.141	0.107	0.007	0.140
Germany	0.148	0.271	0.068	0.061	0.068	0.243	0.309	0.247
Ireland	0.006	0.009	0.005	0.003	0.006	0.005	0.002	0.001
Greece	0.012	0.023	0.035	0.011	0.039	0.022	0.017	0.026
Netherlands	0.036	0.043	0.063	0.032	0.044	0.047	0.039	0.028

Source: INE. Trade Statistics, Trade by Country

According to Table 2, the highest values of HIIT are reached in trade between Portugal and Germany, Spain and France. The HIIT between Portugal and Ireland, Greece, and the Netherlands is very low. As the theoretical models indicate that HIIT occurs more frequently between countries with similar levels of development, these values confirm the *a priori* expectation of a greater extent of economic integration between Portugal and the more developed European countries and that the share of IIT on total trade is to some extent a function of the size of a trading partner.

The highest level of VIIT is reached in the bilateral trade with Spain (see Table 3). The bilateral trade with Germany, the Netherlands and France also present a significant level of VIIT. When we compare this with Table 2, we conclude that IIT is almost VIIT. In 2002, VIIT accounted for 73% of total IIT with the European Union and 82% of total IIT with Spain. These values are in accordance with those expected for a country with a level of development such as Portugal's. In the more developed countries, VIIT usually accounts for 80% to 90% of total IIT. The fact that VIIT has been dominant in Portugal's bilateral IIT suggests that comparative advantage can explain not only inter-industry trade, but also most of Portugal's IIT.

Table 3- Portugal's Vertical Intra-Industry Trade for the Period 1995-2002

Countries	95	96	97	98	99	00	01	02
EU	0.266	0.296	0.288	0.272	0.328	0.456	0.389	0.430
Spain	0.368	0.346	0.417	0.389	0.407	0.388	0.376	0.466
France	0.293	0.343	0.356	0.389	0.297	0.312	0.411	0.291
Germany	0.289	0.196	0.449	0.493	0.449	0.289	0.266	0.306
Ireland	0.102	0.134	0.101	0.107	0.076	0.083	0.008	0.092
Greece	0.043	0.040	0.041	0.075	0.049	0.061	0.073	0.070
Netherlands	0.328	0.293	0.269	0.277	0.283	0.279	0.279	0.306

Source: INE. Trade Statistics, Trade by Country

IV. Dynamic Panel Data Models

The panel data has obvious advantages: (i) we have more observations and potentially less multi-colinearity, which should yield more precise estimates; (ii) it allows us to control for cross-section effects; (iii) it extends easily to a dynamic model and allow us to address potential endogeneity problems of the explanatory variables.

We considered an individual effects autoregressive panel data model with endogenous explanatory variables. As Blundell and Blond (1998, 2000) proved, the GMM system estimator gives virtually no sample bias and much better precision, even in the smaller sample size, in contrast to the first-differenced GMM estimator.

IV.1. Model Specification

The general model is as follows:

$$IIT_{it} = \beta_0 + \beta_1 X_{it} + \delta t + \eta_i + \varepsilon_{it}$$

Where IIT_{it} stands for either IIT, HIIT, or VIIT index. X is a set of industry-specific explanatory variables (X is a vector). η_i is the unobserved time-invariant industry-specific effects and δ_t captures a common deterministic trend. ε_{it} is a random disturbance assumed to be normal, independent and identically distributed (IID) with E (ε_{it}) =0 and Var (ε_{it}) = σ^2 >0 .

This static econometric model can be rewritten in the following dynamic representation:

$$IIT_{it} = \rho IIT_{it-1} + \beta_1 X_{it} - \rho\beta_1 X_{it-1} + \delta t + \eta_i + \varepsilon_{it}$$

Table 4 summarizes the set of variables included in vector X as well as the data source and expected signs. Since there are different theoretical models to explain IIT, as well as to explain HIIT and VIIT, there are also contradictions with regard to the expected sign. Following Greenaway and Milner (1986:134-135), we used more than one measure for the same variable. Specifically, we have two variable proxies for the horizontal product differentiation (PD), for the human capital (HC), for the scale economies, or minimum efficient scale (MES) and for the industrial concentration (CONC). We selected the first or the second variable proxy according to the estimation results.

Table 4 –Variable Definition, Data Sources and Expected Signs

Variable definition	Data source	Expected sign		
		IIT	HIIT	VIIT
IIT= Intra-Industry Trade (Grubel and Lloyd 1975 index, calculated at the 5-digit level of the CN).	INE (Trade Statistics)			
HIIT= Horizontal Intra-Industry Trade (methodology proposed first by Abd-el-Rahman (1991) and also used by Greenaway et al. (1994, 1995). Calculated at the same level of disaggregation. The unit value of exports relative to the unit values of imports is within a range of ± 15 per cent).	INE (Trade Statistics)			
VIIT = Vertical Intra-Industry Trade (Abd-el-Rahaman (1991) methodology. If relative unit values of exports and imports higher than 1.15, we have superior VIIT (higher-quality varieties); if relative unit values of exports and imports lower than 0.85, we have inferior VIIT (low-quality varieties).	INE (Trade Statistics)			
PD1 = Horizontal Product Differentiation : the variable proxy is the Hufbauer index, i. e. variation of export unit values (see Greenaway and Milner, 1986: 116-117).	INE (Trade Statistics)	+/-	+	-
PD2 = Horizontal Product Differentiation : the second proxy is the number of 5-digit CAE categories in each 2-digit industry.	INE (Trade Statistics)	+/-	+	-
VPD = Vertical Product Differentiation : the percentage of the workers with qualification	Ministry of Labour (Quadros de Pessoal)**a**	+/-	-	+

HC1 = Human Capital: weight of non-manual workers in total employment of industry.	Ministry of Labour (Quadros de Pessoal)**a**	+/-	-/ns	+/- ?
HC2 = Human Capital : the second proxy is the weight of qualified and semi-qualified workers in total employment of industry.	Ministry of Labour (Quadros de Pessoal)**a**	+/-	-/ns	+/- ?
L* = Non-Qualified Labour (weight of non-qualified workers in the total employment).	Ministry of Labour (Quadros de Pessoal)**a**	+/-	-/ns	+/- ?
K/L = Intensity of Physical Capital: ratio between the non-salaried returns and the total employment of industry (see Hirsch 1974; Balassa 1978).	INE (Statistics of Firms)	+/-	-/ns	+/- ?
HCS/L = Intensity of Human Capital: the difference between salaries and the average salary of non-qualified workers, divided by the opportunity cost of capital (measure of Branson and Monoyios1977).	Ministry of Labour (Quadros de Pessoal)**a** Bank of Portugal	+/-	-/ns	+/- ?
PROD = Productivity: the value added by the employer.	INE (Statistics of Firms)	+	ns	+
MES1 = Minimum Efficient Scale: relative value added by the four largest firms. Instead of value added, we used the sales of the firms.	INE (Statistics of Firms)	+/-/ns	-*	-*/ns
MES2 = Minimum Efficient Scale: is the value of production of industry divided by the number of firms in industry (the average size of the enterprise).	INE (Statistics of Firms)	+/-/ns	-*	-*/ns
CONC1 = Industrial Concentration: is a 4-firm concentration ratio, i.e. this is a percentage of industry sales of the four largest firms of industry.	INE (Statistics of Firms)	+/-	-*	-*
CONC2 = Industrial Concentration: this second proxy is a percentage of industry sales of the four largest firms in total sales plus imports of industry.	INE (Statistics of Firms)	+/-	-*	-*

a Quadros de Pessoal is a data set based on a standardized questionnaire to which all firms with wage earners must respond every year. – n. s.: not significant. -?: it is a matter of empirical evidence. According to the Neo-HOS model, the expected sign depends on Portugal's relative factor abundance and industry factor proportions. - *: means that the dominant paradigm of a large number of firms expects a negative sign. - +/- : means that there are contradictory theoretical positions.

All of the indexes were calculated at the five-digit disaggregated level in order to avoid the well-known problem of statistical aggregation. In econometric analysis, the 5-digit product categories and indexes were aggregated to the 3-digit industry level (weighed average), according to the CAE.

Our sample comprises the fifteen member states of the European Union (EU15), prior to its enlargement in 2004 (trade data for Belgium and Luxembourg is aggregated).

IV.2. Explanatory variables

IIT_{t-1} (lagged IIT), $HIIT_{t-1}$ (lagged IIT) and $VIIT_{t-1}$ (lagged IIT): the expected sign is positive. There is an expectation that the impact of lagged values of the dependent variable on contemporary values of the same variable will be positive;

PD_1, PD_2 (horizontal product differentiation): our hypothesis is that the greater the PD in an industry, the greater (smaller) the HIIT (VIIT). Gray (1988) and Greenaway and Milner(1986) considered a positive relationship of this variable with IIT, although Ethier (1982) considered the existence of a negative relation. As in the IIT model, the data does not separate HIIT from VIIT, thus the ambiguity remains and we could expect a negative or a positive of PD on IIT;

VPD (vertical differentiation): the expected sign is positive for VIIT and negative for HIIT. In relation to IIT, the impact may be positive or negative;

HC_1, HC_2 (human capital*)*: this variable was included in the Heckscher-Ohlin-Samuelson (HOS) model as the third factor, jointly with labour and physical capital. Theoretically, it is generally accepted that the HOS theory can explain VIIT but not HIIT. Therefore, we can formulate the following hypothesis: the higher the HC, the greater (lesser) will be VIIT if Portugal is relatively abundant (scarce) in human capital. With respect to HIIT, the theory predicts that the coefficient of this variable is not statistically different from zero, or that it will be negative. Relative to IIT, the expected sign is ambiguous, because this variable has a positive influence on VIIT and a negative, or not statistically significant influence on HIIT. Both VIIT and HIIT are incorporated in IIT;

HCS/L (stock intensity of human capital): this is also an HOS variable and the explanation that we have put forward for HC applies to HCS/L;

L*(non- qualified labour), K/L (intensity of physical capital): these are variables of the HOS factor proportions theory used in the empirical studies of comparative advantages and that also explain the VIIT. With respect to HIIT, it is expected that the coefficients are not significantly different from zero at any conventional statistical level (non-statistical association between these variables and HIIT) or that the signs are negative. In relation to VIIT, we need to distinguish between lower-quality varieties (that are intensive in non-qualified labour) and superior-quality varieties (that are intensive in physical capital). So, it can be expected that

Portugal exports lower-quality varieties (products) if L* >0 and K/L <0 and exports higher-quality varieties (products) if L* <0 and K/L >0;

PROD (Productivity): following the approach of Falvey and Kierzkowski (1987) and Davis (1995), we introduced technology differences (labour productivity) as an explanatory variable. We expected a positive sign with respect to IIT and VIIT and a non-statistical association between PROD and HIIT;

MES_1, MES_2 (minimum efficient scale): Ethier (1982) and Harrigan (1995) questioned a continuous and positive relationship between the scale economies and IIT in the context of the monopolistic competition model. Davis (1995) argues that decreasing costs are not necessary for IIT. So, if we consider Davis (1995), the coefficient of MES is not statistically different from zero. When we separate VIIT from HIIT, the sign could be positive or negative, depending on the market structure. The dominant paradigm considers a large number of firms and a negative effect of MES on HIIT and VIIT (see Greenaway et al., 1995). If we consider the hypothesis of a small number of firms, the expected sign is positive (Shaked and Sutton, 1984; Eaton and Kierzkowski, 1984). However, Falvey (1981) and Falvey and Kierzkowski (1987) consider a large number of cases of VIIT in which there is no role for scale economies. As a result, the effect on VIIT remains unclear. Only the data and the estimation results can provide clarification. It is a matter of empirical evidence;

$CONC_1$, $CONC_2$ (industrial concentration): in the case of VIIT and HIIT, the sign could be positive or negative, depending on the market structure. With the hypothesis of a large number of firms, the expected sign is negative, whilst the contrary expectation applies when a small number of firms is hypothesised. As the data does not distinguish between HIIT and VIIT, the effect of CONC on IIT may be positive or negative.

V. Estimation Results

According to the specification of the dynamic models, and following Arellano and Bond (1991), we have two effects of the independent variables on the dependent variable. The first effect (the short-run or contemporaneous effect) is given by the coefficient of the current dated variables. The second effect (long-run effect) is given by the coefficient of the current dated variable plus the coefficients of the same lagged variable (current effect plus lagged effect). In the analysis of the empirical findings, we consider not only the magnitude and the sign of the coefficients, but also the short–run and the long-run effects.

Observation of Table 5 gives rise to the suggestion that decreasing costs (scale economies) are not necessary for IIT, as was predicted by Davis (1995). Only in the equation for the Netherlands is this variable statistically significant with a positive sign (the shot-run effect = 0.147 and the long-run effect =-0.027). The other main results of the IIT model can be summarised as follows: (i) the variable IIT_{t-1} enters significantly into all equations, except for Greece, with a positive expected sign at the one-percent level; (ii) surprisingly, the variable PD_1 is insignificant in all equations, except for Greece (negative current effect at ten-percent level of statistical significance); (iii) the variable, $CONC_2$ enters significantly into equations for the EU15 (ten-percent level), for Germany (ten-percent level) and the Netherlands (one-percent level), but only for the latter is the sign negative, as predicted by the dominant paradigm of a large number of firms. However, as we can see in Table 5, the long-run effect is positive (-1.62 + 1.764 = 0.144); (iv) the variable, PROD enters significantly into the EU15 and Netherlands equations at the one-percent level. The change in PROD has a negative impact on IIT between Portugal and the EU15 and a positive effect on IIT between Portugal and the Netherlands. The long-run effect is negative for the EU15 (-0.0007) and the Netherlands (-0.009); (v) thus far, these unsatisfactory results, in which estimated coefficients are often insignificant, or with the wrong sign, confirm the old problem in the empirical studies of IIT when we use the industry-specific hypothesis. As Greenaway et al. (1994, 1995) argued, we need to distinguish between HIIT and VIIT in order to avoid miss-specification.

Table 5: Dynamic IIT Model

Variables	European Union	Spain	France	Germany	Ireland	Greece	Netherlands
IIT_{t-1}	0.859	1.140	0.603	0.640	0.277	-0.241	0.863
	(8.04)**a**	(6.98)**a**	(4.51)**a**	(4.41)**a**	(1.47)	(-1.80)**c**	(4.31)**a**
PD1	-0.072	0.011	0.049	0.039	0.019	-0.145	0.040
	(-0.936)	(0.279)	(1.53)	(1.38)	(1.16)	(-1.72)**c**	(0.420)
$PD1_{t-1}$	0.063	-0.014	-0.056	0.034	0.014	-0.075	-0.008
	(1.17)	(-0.426)	(-1.30)	(0.714)	(3.24)**c**	(-0.925)	(-0.089)
MES1	-0.004	-0.028	0.048	-0.064	0.039	-0.008	0.147
	(-1.50)	(-0.822)	(0.774)	(-1.61)	(0.715)	(-0.090)	(2.18)**b**
$MES1_{t-1}$	0.052	0.019	0.048	0.011	-0.095	-0.005	-0.174
	(1.36)	(0.466)	(0.774)	(0.277)	(-1.46)	(-0.054)	(-2.49)**b**
CONC2	0.522	0.478	-0.032	1.262	1.680	-2.010	-1.620
	(1.82)**c**	(0.965)	(-0.420)	(1.82)**c**	(1.20)	(-0.554)	(-3.08)**a**
$CONC2_{t-1}$	-0.041	-0.181	-0.384	-1.196	-1.908	-2.010	1.764
	(-0.124)	(-0.383)	(-0.420)	(-3.11)**a**	(-1.29)	(-0.554)	(2.78)**a**
PROD	-0.0003	-0.004	-0.001	-0.005	-0.0002	-0.011	0.013
	(-3.85)**a**	(-0.934)	(-0.291)	(-0.756)	(-0.741)	(-1.04)	(2.81)**a**
$PROD_{t-1}$	-0.0004	0.005	0.0011	0.005	0.0003	0.021	-0.022
	(-3.96)**a**	(0.799)	(0.127)	(0.901)	(1.29)	(1.61)	(-2.84)**a**
C	-0.0011	-0.080	0.156	0.185	0.313	0.315	0.187
	(-0.017)	(-0.799)	(1.50)	(1.27)	(1.63)	(1.99)	(1.15)
M1	-0.888	-0.950	-1.807	-1.623	-0.285	-1.190	-0.911
	[0.374]	[0.342]	[0.071]	[0.105]	[0.775]	[0.234]	[0.362]
M2	0.468	-0.530	0.777	0.775	-0.256	-0.467	0.713
	[0.639]	[0.596]	[0.437]	[0.438]	[0.798]	[0.640]	[0.476]
W_{JS}	2692	144.7	67.56	74.88	246.9	8.797	161.6
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.456]	[0.000]
	df=9	df=9	df=9	df=9	df=9	df=9	df=9
Sargan	5.236	11.82	6.129	8.207	2.060	6.721	5.878
	[0.990]	[0.693]	[0.977]	[0.904]	[1.000]	[0.965]	[0.982]
	df=15	df=15	df=15	df=19	df=19	df=15	df=15
N	84	80	84	79	60	68	80
K	13	13	14	13	13	13	13
I	21	20	21	20	15	17	20

N=Number of observations; K= Number of parameters; I= Number of individuals derived from year.

The null hypothesis that each coefficient is equal to zero is tested using one-step robust standard error. T-statistics are in round parentheses (heteroskedasticity corrected). a/b/c- statistically significant, respectively at the 1%, 5% and 10% level. P-values are in square parentheses. Year dummies are included in all specifications (equivalent to transforming the variables into deviations from time means, i..e. the mean across the n industries for each period). M1and M2 are tests for first-order and second–order correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null hypothesis of no serial correlation (based on the efficient two-step GMM system estimator). W_{JS} is the Wald statistic of joint significance of independent variables (for first-steps, excluding time dummies and the constant term). Sargan is a test of the over-identifying restrictions, asymptotically distributed as χ^2 under the null of instruments validity (with two-step estimator).

For equations in first differences, the instruments in levels used are MES1(2,2), CONC2 (2,2), IIT (2,2) for the EU, Spain, France, Greece and Netherlands; MES2 (2,3), CONC1 (2,2), ITT (2,3) for Germany and Ireland. For levels equations, the instruments used are first differences of all variables lagged t-2. The model presents consistent estimates with no autocorrelation (m1,m2 tests). The specification Sargan test shows that we have no problems with the validity of the instrument used.

Observing Tables 6 and 7, the estimation results confirm that factor proportions can explain VIIT and that there is, in general, no statistical association between factor proportions variables (HCS/L , L*, K/L) and HIIT. With regard to the VIIT model and on a multilateral basis (EU15), the human capital (HC_2) and non-qualified labour (L*) variables have a positive significant effect on VIIT. However, the "long-run" effect is negative for HC_2 (5.153-7.716=-2.563) and for L* (6.125-6.307=-0.182). So, although the contemporaneous effects of both human HC_2 and L* on VIIT are found to be positive and significant, the corresponding long-run impact is negative. These findings may reveal that comparative advantages change over time. The variable, physical capital intensity (K/L) is not statistically significant, although it has a negative sign, as was predicted by the theory. These results (L*>0 and K/L <0) suggest that Portugal has comparative advantages in low-quality differentiated varieties. The results obtained for HC_2 and K/L variables also confirm that the other question posed by Torstenson (1996b) is favourable to HC_2, i.e., it is primarily human capital, rather than physical capital, that determines the quality of differentiated products. The results obtained for scale economies are also interesting. When we estimate for IIT, scale economies appear not to be statistically significant, as Davis (1995) predicted. When we estimate separately for HIIT and VIIT, the same conclusion occurs for the HIIT model. Although the sign is negative, as predicted by the dominant paradigm, this variable is revealed not to be statistically significant (see Table 6). This finding contradicts other empirical results. The estimations also indicate that industrial concentration does not explain VIIT, but can explain HIIT. Other results of these two models can be summarised as follows:(i) the lagged HIIT variable only has an expected positive effect on HIIT in the EU15 equation. For bilateral trade models, the sign estimated is always negative; (ii) lagged values of VIIT have a positive impact on VIIT only for France and the Netherlands; (iii) the horizontal product differentiation (PD_2) is statistically significant (ten-percent level) only for Greece and has a negative (unexpected) effect on HIIT; (iv) the vertical product differentiation variable (VPD) is not statistically significant for all equations in the VIIT model; (v) the results differ widely for the various partners and despite the fact that Spain and Germany are Portugal's main trading partners, the determinants are completely different; (vi) disentangling IIT into VIIT and HIIT does not substantially improve our understanding of IIT determinants across industries. The old problem remains.

Table 6: Dynamic HIIT Model

Variables	European Union	Spain	France	Germany	Ireland	Greece	Netherlands
HIIT $_{t-1}$	0.604	0.059	0.368	-0.209	-0.231	-0.461	-0.231
	(3.36)**a**	(0.412)	(1.27)	(-1.79)**c**	(-2.76)**a**	(-3.25)**a**	(-2.76)**a**
PD2	-0.001	0.001	0.157	0.047	0.004	-0.006	0.0004
	(-0.094)	(0.486)	(1.41)	(1.45)	(0.122)	(-1.68)**c**	(0.122)
PD2 $_{t-1}$	-0.001	0.001	-0.174	-0.028	-0.003	-0.006	-0.003
	(-0.094)	(0.486)	(-1.49)	(-0.891)	(-0.674)	(-1.68)**c**	(-0.674)
HCS/L	-0.006	-0.046	0.005	0.029	-0.014	-0.145	-0.014
	(-1.10)	(-0.700)	(0.034)	(0.224)	(-0.618)	(-1.59)	(-0.618)
HCS/L $_{t-1}$	0.022	0.216	0.049	-0.101	0.026	0.178	0.026
	(3.43)**a**	(2.73)**a**	(1.39)	(-0.729)	(0.841)	(1.64)	(0.841)
MES2	-0.0002	-0.0003	-0.0003	-0.0002	-0.0001	-0.0004	-0.0001
	(-0.093)	(-0.651)	(-1.39)	(-0.079)	(-1.29)	(-0.945)	(-1.29)
MES2 $_{t-1}$	0.0002	0.0004	0.0004	0.0003	0.0001	0.0002	0.0001
	(0.708)	(0.797)	(1.35)	(0.860)	(1.34)	(0.977)	(1.35)
CONC2	-0.251	-0.504	-0.863	-1.322	-0.184	0.289	-0.184
	(-1.81)**c**	(-1.13)	(-1.05)	(-1.00)	(-1.18)	(0.482)	(-1.18)
CONC2 $_{t-1}$	-0.190	0.927	0.768	0.589	0.110	0.008	0.110
	(-1.51)	(1.84)**c**	(1.12)	(0.548)	(0.609)	(0.015)	(0.609)
PROD	0.0004	0.006	0.010	0.0003	0.003	-0.0004	0.003
	(0.054)	(1.15)	(1.35)	(0.003)	(1.42)	(-0.050)	(1.42)
PROD $_{t-1}$	-0.007	-0.011	-0.013	-0.009	-0.003	0.002	-0.003
	(-0.671)	(-1.50)	(-1.18)	(-0.793)	(-1.25)	(0.371)	(-1.25)
L*	0.043	0.478	0.157	-0.212	0.501	1.126	0.501
	(1.01)	(0.586)	(0.113)	(-0.152)	(1.28)	(1.43)	(1.28)
L* $_{t-1}$	0.111	-0.065	-0.058	-2.585	-0.051	0.904	-0.051
	(2.20)**b**	(-0.123)	(-0.035)	(-2.06)**b**	(-0.302)	(1.16)	(-0.302)
K/L	0.0004	0.001	0.0009	0.001	-0.0002	-0.0009	-0.0002
	(0.379)	(0.830)	(0.391)	(0.367)	(-0.808)	(-1.10)	(-0.808)
K/L $_{t-1}$	-0.0009	-0.0005	-0.0006	-0.001	-0.0004	0.0009	-0.0004
	(-1.20)	(-0.512)	(-0.27)	(-0.844)	(-0.783)	(0.173)	(-0.783)
C	0.294	0.777	0.391	0.179	0.039	0.001	0.039
	(3.23)	(2.49)	(0.434)	(0.558)	(0.506)	(0.004)	(0.506)
M1	-1.601	-1.626	-0.954	-1.663	-1.314	-1.037	-1.314
	(0.109)	(0.104)	[0.340]	(0.096)	[0.189]	[0.300]	[0.189]
M2	0.668	1.605	-0.046	1.315	1.029	1.379	1.029
	(0.109)	(0.109)	[0.936]	(0.139)	[0.304]	[0.168]	[0.304]
W $_{JS}$	6306	145.5	10.82	2521	28.27	126.9	28.27
	[0.000]	[0.000]	[0.765]	[0.000]	[0.020]	[0.000]	[0.020]
	df=15	df=15	df=15	df=15	df=15	df=15	df=15
Sargan	12.90	8.642	17.10	28.04	10.32	6.889	10.32
	[0.610]	[0.979]	[0.705]	(0.139)	[0.945]	[0.998]	[0.945]
	df=15	df=19	df=21	dl=21	df=19	df=21	df=19
N	84	80	84	84	79	80	79
K	19	19	19	19	19	19	19
I	21	20	21	21	20	20	20

For equations in first differences, the instruments in levels used are MES2 (2,2), CONC (2,2),HIIT (2,2) for the EU and Netherlands; MES2 (2,3), CONC (2,2), HIIT (2,3) for Spain and Ireland; MES2 (2,3), CONC (2,3), HIIT (2,3) for France, Germany and Greece. For levels equations, the instruments used are first differences of all variables lagged t-1.This model presents consistent estimates with no autocorrelation (m1,m2 tests). The Sargan test shows that we have no problems with the validity of the instruments used.

Table 7: Dynamic VIIT Model

Variables	European Union	Spain	France	Germany	Ireland	Greece	Netherlands
$VIIT_{t-1}$	0.085	-0.063	1.391	0.146	0.028	-0.077	0.705
	(0.151)	(-0.240)	(2.20)**b**	(0.413)	(0.058)	(-0.167)	(4.92)**a**
VPD	-1.649	0.015	0.966	0.278	-0.196	0.608	-0.420
	(-1.17)	(0.019)	(0.845)	(0.320)	(-0.919)	(0.719)	(-1.37)
VPD_{t-1}	0.979	0.607	0.091	-0.918	-0.590	-1.574	-0.045
	(0.885)	(1.96)**b**	(0.040)	(-0.886)	(-0.461)	(-1.49)	(-0.076)
HCS/L	-0.032	-0.091	-0.242	0.001	-0.040	0.281	-0.012
	(-0.196)	(-0.327)	(-1.20)	(0.007)	(-0.398)	(1.23)	(-0.127)
HCS/L_{t-1}	-0.012	0.016	0.251	-0.084	-0.065	-0.338	-0.005
	(-0.054)	(0.055)	(1.00)	(-0.359)	(-0.558)	(-1.43)	(-0.049)
CONC2	0.1339	-0.785	2.774	2.101	1.214	0.710	-1.073
	(0.054)	(-0.257)	(0.990)	(1.60)	(1.08)	(0.448)	(-0.858)
$CONC2_{t-1}$	0.659	0.786	-1.764	-2.074	-1.326	-1.115	1.043
	(0.242)	(0.237)	(-0.760)	(-1.72)**c**	(-1.05)	(-0.881)	(0.839)
HC2	5.153	-0.373	-3.213	-0.698	-0.402	0.180	-0.229
	(1.98)**b**	(-0.093)	(-1.83)**c**	(-0.613)	(-0.340)	(0.040)	(-0.215)
$HC2_{t-1}$	-7.716	1.520	4.114	-0.158	0.549	-0.149	-0.371
	(-4.99)**a**	(0.276)	(2.03)**b**	(-0.141)	(0.491)	(-0.030)	(-0.437)
L*	6.125	-0.817	-0.709	-5.452	-2.393	-1.843	0.972
	(2.42)**b**	(-0.363)	(-0.221)	(-1.77)**c**	(-0.950)	(-0.737)	(-0.669)
L^*_{t-1}	-6.307	2.419	4.206	2.169	1.813	1.211	0.267
	(-2.33)**b**	(0.679)	(1.21)	(0.815)	(1.05)	(0.329)	(0.264)
K/L	-0.006	-0.002	-0.009	-0.003	0.009	0.0023	0.0003
	(-1.25)	(-0.133)	(-0.699)	(-0.902)	(0.232)	(0.720)	(0.190)
K/L_{t-1}	-0.0006	0.0002	0.0002	0.0003	0.0001	0.0004	-0.0002
	(-0.672)	(0.323)	(0.337)	(1.20)	(0.301)	(0.575)	(-1.05)
C	2.044	-1.080	-0.882	1.443	-0.301	-0.030	0.576
	(0.626)	(-0.515)	(-0.350)	(0.972)	(-0.366)	(-0.012)	(0.850)
M1	-1.498	-1.208	-0.399	-1.123	-0.939	-1.321	-1.948
	(0.134)	(0.227)	[0.689]	(0.261)	[0.347]	[0.186]	[0.051]
M2	0.038	0.617	0.309	1.175	0.683	0.217	-1.277
	(0.969)	(0.537)	[0.757]	(0.240)	[0.494]	[0.828]	[0.202]
W_{JS}	649.5	44.43	32.69	47.92	27.01	25.23	282.3
	[0.000]	[0.000]	[0.002]	[0.000]	[0.012]	[0.021]	[0.000]
	df=13	df=13	df=13	df=13	df=13	df=13	df=13
Sargan	3.306	4.260	2.093	6.124	3.135	2.523	3.399
	(0.855)	(0.749)	[0.955]	(0.525)	[0.872]	[0.925]	[0.996]
	df=7	df=7	df=7	df=7	df=7	df=7	df=13
N	84	80	84	84	79	80	84
K	17	17	17	17	17	17	17
I	21	20	21	21	20	20	21

The instruments used are CONC2 (3,3), HC2 (3,3), KL (3,3),VIIT (3,3) for the equations in differences. For the equations in levels, the instruments used are first differences of variables lagged *t-2* .The model presents consistent estimates with no serial autocorrelation (m1,m2 tests). The specification Sargan test shows that we have no problems with the validity of the instruments used.

VI. Summary, Conclusions and Further Research

In 2002 the IIT between Portugal and the European Union (EU), Portugal and Spain and Portugal and Germany constituted over 50% of total trade. The IIT between Portugal and France accounted for approximately 40% of trade, while between Portugal and the Netherlands, it amounted to 30% of total trade. The IIT with Greece and Ireland presented poor values (9%). The VIIT is generally much higher than the HIIT. This outcome is not surprising since VIIT accounts for most IIT in developed countries. All the models provide a different result for the different partners and there is no evidence that the determinants are different either for Portugal's main trading partners (Spain and Germany) or for the other partners. When we consider the IIT between Portugal and the European Union, few variables are statistically significant. The estimation results are better with the HIIT and VIIT models, but the problem of IIT determinants remains. This may be the result of inadequate proxies for the explanatory variables. Studies on IIT have generally found more empirical support for country-specific (i.e., endowments; income levels; cultural similarity; distance) than industry-specific hypotheses (market structure, scale economies, product differentiation). This is an enduring problem and unfortunately, our findings confirm its persistence. Our results also show that the long-run impact of the industry characteristics on IIT has, for some coefficient variables, the opposite sign to the corresponding contemporaneous (short-run) effect. These results possibly suggest that the theory could be refined to better fit the data. So, there are some questions that need to be answered: (i) what simple modifications can be found to improve the performance of the industry-characteristics model? (ii) what is the best specification to study the role of industry characteristics in explaining IIT, HIIT and VIIT? (iii) what is the contribution of the different components (country characteristics versus industry characteristics)? The next stage in our research will be an attempt to answer to these questions.

In general, there is no statistical association between HIIT and comparative-advantage variables, or the signs are negative, as was predicted by the theory. The results obtained for the EU15 suggest that Portugal has comparative advantages in low-quality varieties and support Davis' (1995) hypothesis that scale economies are not necessary for IIT. The findings of the paper also provide an answer to

Torstenson's (1996) question, namely, that it is primarily human capital, rather than physical capital, that determines the quality of differentiated products.

As was expected, the results obtained for the EU15 are different from those obtained on a bilateral basis. However, we believe that the bilateral empirical studies are very important. On a bilateral basis, we need to know which variables have a positive (negative) effect on IIT, HIIT and VIIT, as well as the short-run and the long-run impacts. Finally, although the use of more sophisticated econometric techniques should not be an end in itself, it may be preferable to use the GMM system estimator in empirical intra-industry trade studies rather than pooled OLS, fixed effects or random effects estimators. At the least, the results obtained from their use should be verified.

Notes

1. We have made the estimations on a bilateral basis for all European partners (EU15) but, due to space constraints, we selected these six countries as a representative sample.

2. The GMM system estimator that we report was computed using DPD for OX (see Doornik, Arellano and Bond 2002). We present the static results in appendix due to the already-large number of tables included in this paper. The static panel data regressions basically yield the same qualitative results as those of the dynamic panel estimation.

3. Hummels and Levinsohn (1995) concluded that most of the variation in the share of IIT for all country pairs of OECD was explained by factors that were idiosyncratic to the country pairs (pair-specific fixed effects). This result does not support the Helpman and Krugman (1985) monopolistic competition model and contradicts the results of Helpman's (1987) empirical test.

4. Grubel and Lloyd (1975) define Bi (ITTi) as the difference between the trade balance of industry i and the total trade of this same industry. In order to make the comparison more easily between industries or countries, the index is presented as a ratio where the denominator is total trade:

$$B_i = 1 - \frac{|X_i - M_i|}{(X_i + M_i)}$$

The index is equal to 1 if all trade is intra-industry trade. If Bi is equal to 0, all trade is inter-industry trade. To measure IIT by types (vertical or horizontal), we use relative unit values of exports and imports (or terms of trade), calculated at the same level of disaggregation. This methodology was proposed first by Abd-el-Rahman (1991) and also used by Greenaway et al. (1994, 1995). HIIT is defined as the simultaneous exports and imports of a 5-digit CN item where the terms of trade is within a range of ± 15 per cent (this range is arbitrary, but most empirical studies found that the results were not very sensitive to the range chosen). As it is considered that the terms of trade (TT) is a proxy for prices and that prices reflect quality, we can say that HIIT is a trade of products with similar quality. When the terms of trade is below/over the limit of 0.85/1.15, we have inferior/superior VIIT. Finally, we calculated the indexes in order always to have IIT= HIIT+VIIT. Mathematically, we have:

If $TT \in [0{,}85;1{,}15]$, we have RH; otherwise we have RV. TT < 0,85, we have inferior VIIT (lower-quality varieties). TT> 1.15, we have superior VIIT (higher-quality varieties).

$$HIIT = \frac{RH}{(X_i + M_i)}$$

HIIT- Horizontal intra-industry trade índex.

RH- Total HIIT.

Xi, Mi are the exports and imports of the industry i.

$$VIIT = \frac{RV}{(X_i + M_i)}$$

VIIT- Vertical intra- industry index .

RV- Total VIIT.

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Appendix – The static panel data estimations

Table A1: Static IIT Model

Fixed Effects Model	C	PD1	MES1	CONC2	PROD	Adjusted R^2	N	Hausman Test (H0:REVSFE)
European Union	-	0.010 (1.436)	-0.008 (-0.751)	0.763 (2.105)**b**	-0.0009 (-2.690)**a**	0.8110	105	CHISQ(2) = 0.722 P-value=0.696
Spain	-	0.030 (2.190)**b**	0.007 (0.667)	-0.187 (-0.748)	0.0003 (0.995)	0.908	105	CHISQ(2) = 0.461 P-value=0.793
France	-	-0.015 (-0.936)	0.002 (0.123)	0.308 (0.513)	-0.0001 (-0.746)	0.671	100	CHISQ(1)=0.002 P-value=0.962
Germany	-	0.047 (1.98)**b**	0.016 (1.249)	-0.370 (-0.970)	0.001 (1.153)	0.922	105	CHISQ(2) = 2.627 P-value=0.268
Ireland	-	0.014 (3.446)**a**	-0.002 (-0.084)	-1.823 (-2.116)**b**	0.0004 (3.033)**a**	0.766	75	CHISQ(2)=3.598 P-value=0.165
Greece	-	-0.019 (-0.571)	-0.020 (-0.652)	0.758 (0.885)	0.001 (0.486)	0.219	85	CHISQ(3)=2.403 P-value=0.493
Netherlands	-	0.019 (0.789)	0.009 (0.541)	-0.204 (-0.561)	.0.001 (-0.652)	0.839	100	CHISQ(1)=54.457 P-value=0.000

a/b/c- statistically significant, respectively, at the 1%, 5% and 10%level.
In parentheses are t-statistics (White-heteroscedasticity corrected).

Table A2: Static HIIT Model

Fixed Effects Model	C	PD2	HCS/L	MES2	CONC2	PROD	L*	K/L	Adjusted R^2	N	Hausman Test (H0:REVSFE)
European Union	-	-	-0.001 (-0.244)	0.0003 (2.071)**b**	1.179 (2.379)**b**	-0.092 (-2.127)**b**	-0.773 (-1.748)**c**	0.0001 (0.109)	0.546	105	CHISQ(1)=0.491 P-value=0.483
Spain	-	-	-0.005 (-1.088)	-0.0007 (-1.467)	-0.055 (-0.127)	0.002 (0.698)	-0.129 (-0.311)	0.0001 (0.744)	0.138	100	CHISQ(4)=4.104 P-value=0.392
France	-	-	-0.001 (-0.727)	0.379 (0.846)	-0.508 (-0.942)	-0.566 (-0.452)	-0.0003 (-1.030)	-0.0004 (-1.072)	0.532	105	CHISQ(3)=0.737 P-value=0.864
Germany	-	-	-0.006 (-1.484)	0.0003 (2.716)**a**	0.505 (0.709)	-0.010 (-2.707)**a**	0.253 (0.268)	-0.0009 (-0.590)	0.228	105	CHISQ(3)=4.991 P-value=0.172
Ireland	-	-	-0.002 (-2.324)**b**	-0.0001 (-2.001)**b**	-0.032 (-0.392)	0.004 (2.557)**b**	0.162 (1.929)**c**	-0.0001 (-1.142)	0.158	100	CHISQ(1)=0.008 P-value=0.976
Greece	-	-	0.001 (0.447)	-0.0009 (-0.496)	0.342 (1.114)	-0.004 (-0.561)	-0.334 (-1.778)**c**	-0.0002 (-1.388)	0.449	100	CHISQ(2)=9.756 P-value=0-007
Netherlands	-	-	-0.001 (-0.408)	0.0005 (0.974)	-0.178 (-0.450)	-0.001 (-0.862)	0.522 (2.346)**b**	-0.0001 (-0.466)	0.226	105	CHIS(3)=1.6303 P-value=0.6525

Table A3: Static VIIT Model

Fixed Effects Model	C	VPD	HCS/L	CONC2	HC2	L*	K/L	Adjusted R^2	N	Hausman Test (H0:REVSFE)
European Union	-	-0.107 (-0.675)	-0.004 (-0.881)	0.246 (0.643)	1.288 (1.448)	1.608 (1.726)**c**	-0.0003 (-1.321)	0.566	105	CHISQ(3)=6.533 P-value=0.088
Spain	-	0.121 (0.709)	-0.008 (-0.010)	0.036 (0.065)	-0.010 (-0.010)	0.210 (0.222)	-0.0003 (-1.887)**c**	0.328	100	CHISQ(4)=6.472 P-value=0.1665
France	-	0.148 (1.022)	-0.004 (1.418)	1.218 (2.464)**b**	-0.036 (-0.063)	-0.953 (-1.926)**c**	-0.0003 (-2.065)**b**	0.691	105	CHISQ(3)=4.450 P-value=0.2167
Germany	-	0.169 (0.950)	0.002 (0.449)	0.290 (0.500)	0.118 (0.115)	-0.655 (-0.563)	-0.0006 (-0.402)	0.582	105	CHISQ(3)=1.875 P-value=0.5987
Ireland	-	-0.022 (-0.267)	0.003 (1.116)	-0.577 (-1.167)	-0.155 (-0.345)	-0.566 (-1.238)	0.0005 (0.514)	0.633	100	CHISQ(2)=1.307 P-value=0.520
Greece	-	-0.058 (-0.074)	-0.005 (-1.179)	-0.158 (-0.405)	-0.851 (-1.307)	0.028 (0.042)	0.0009 (1.161)	0.097	100	CHISQ(4)=6.3754 P-value=0.1728
Netherlands	-	-0.064 (-0.443)	0.002 (0.780)	0.138 (0.283)	0.044 (0.093)	-0.718 (-1.296)	-0.0003 (-0.331)	0.670	105	CHISQ(3)=1.220 P-value=0.7480

References

Abd-el-Rahman, K. (1991): Firms' Competitive and National Comparative Advantages as Joint Determinants of Trade Composition, *Review of World Economics/Weltwirtschaftliches Archiv* 127(1), 83-97.

Arellano, M., and S.R Bond (1991): Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations, *Review of Economic Studie*s,58(2),227-297.

Badinger, H., and F. Breuss (2004): What Has Determined the rapid Post-War Growth of Intra-EU Trade? *Review of World Economics,* 140(1), 31-51.

Baier, S., and J. Bergstand (2001): The Growth of World Trade: Tariffs, Transport Costs and Income Similarity, *Journal of International Economics,* 53 (1), 1-17.

Balassa, B., and L. Bauwens (1987): Intra-Industry Specialization in a Multi-Country and Multilateral Framework, The Economic Journal, 97(December), 923-39.

Bergstrand, J. (1983): Measurement and Determinants of Intra-Industry International Trade, in P. Tharakan (ed.) *Intra-Industry Trade*, New York,North-Holland.

Blanes, J.V.,and C. Martin (2000): The Nature and Causes of Intra-Industry Trade: Back to the Comparative Advantage Explanation? The Case of Spain, *Review of World Economics,* 136(3), 423-441.

Blanes, J. (2005): Does Immigration Help to Explain Intra-Industry Trade? Evidence for Spain, *Review of World Economics,,* 141(2), 244-70.

Blundell,R., and S. Bond (1998): Initial conditions and moment restrictions in dynamic panel data Models, *Journal of Econometrics,* 87,115-143.

Blundell,R., and S.Bond (2000): GMM Estimation with Persistent Panel Data: An applications to Production Functions , *Econometric Review,* 19 (3) ,321-340.

Brander, J. (1981): Intra-industry Trade in Identical Commodities*, Journal of International Economics* , 11,1-14.

Brander, J., and P. Krugman (1983): A Reciprocal Dumping Model of International Trade, *Journal of International Economics*, 13 ,313-321.

Branson, W. and N. Monoyios (1977): Factor Inputs in US Trade, *Journal of International Economics,* 7:111-13.

Davis, D. R. (1995): Intra-Industry Trade: A Heckscher-Ohlin-Ricardo Approach, *Journal of International Economics,* 39 (3/4) ,201-226.

Doornik,J., M. Arellano, and S. Bond (2002): *Panel data estimation using DPD for OX.* (http:www.nuff.ox.ac.uk/Users/Doornik).

Eaton, J. and H. Kierzkowski (1984): Oligopolistic Competition, Product Variety and International Trade, in H. Kierzkowski (ed.) *Monopolistic Competition and International Trade,*Oxford, Oxford University Press.

Egger, P. (2004): Estimating Regional Trading Bloc Effects with Panel Data, *Review of World*

Economics, 140 (1), 151-165.
Ethier, W. (1982): National and International Returns to Scale in the Modern Theory of International Trade, *American Economic Review,* 72 (3), 389-405.
Falvey, R. E. (1981): Commercial Policy and Intra-Industry Trade, *Journal of International Economics*, 11(4), 495-511.
Falvey, R. and H. Kierzkowski (1987): Product Quality, Intra-Industry Trade and (Im)Perfect Competition, in H. Kierzkowski (ed.) *Protection and Competition in International Trade. Essays in Honor of W.M. Corden*, Oxford: Basil Blackwell.
Flam, H. and E. Helpman (1987): Vertical Product Differentiation and North-South Trade, *American Economi Review,* 77, 810-822.
Goddard, J., J. Wilson, and J. Blandon (2002): Panel tests of Gibrat´s law for Japanese Manufacturing, *International Journal of Industrial Organisation*, 20 (3),415-433.
Gray, H. (1988): Intra-Industry Trade: An «Untidy» Phenomenon, *Review of World Economics,*124, 211-229.
Greenaway, D., and C. Milner (1986): *The Economics of Intra-Industry Trade*, New York :Basil Blackwell.
Greenaway, D., R. Hine, and C. Milner (1994): Country-Specific Factors and the Pattern of Horizontal and Vertical Intra-Industry Trade in the UK, *Review of World Economics,* 130 (1), 77 100.
________________(1995): Vertical and Horizontal Intra-Industry Trade: A Cross-Industry Analysis for the United Kingdom, *The Economic Journal,* 105 (433), 1505-1518.
Grubel, H., and P. Lloyd (1975): *Intra-industry Trade. The Theory and Measurement of International Trade in Differentiation Products*, London,The Mcmillan Press.
Harrigan, J. (1995): The Volume of Trade in Differentiated Intermediate Goods: Theory and Evidence, *Review of Economics and Statistics,* 77(2),283-293.
Helpman, E.(1981): International Trade in the Presence of Product Differentiation, Economies of Scale and Monopolistic Competion, *Journal of International Economics,* 11,305-40.
Helpman, E. (1987): Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries, *Journal of the Japanese and International Economics*, 1 (1), 62-81.
Helpman, E. and P. Krugman (1985): *Market Structure and Foreign Trade* , Brighton:Harvester Wheatsheaf.
Hirsch, S. (1974): Capital or Technology? Confronting the Neo-Factor Proportions Theory and the Neo-Technology Accounts of International Trade, *Review of World Economics,* 110,535-563.
Hummels, D. and J. Levinsohn (1995): Monopolistic Competition and International Trade: Reconsidering the Evidence. *Quarterly Journal of Economics* 110 (3): 799-36.
Krugman, P. (1979): Increasing Returns, Monopolistic Competition, and International Trade, *Journal of International Economics,* 9(4),469-480.
____________(1980): Scale Economies, Product Differentiation, and the Pattern of Trade, *American Economic Review,* 70(December), 950-959.

Lancaster, K. (1980): Intra-Industry Trade under Perfect Monopolistic Competition, *Journal of International Economics,* 10 (May),151-170.
Leamer, E. (1994): Testing Trade theory, in Greenaway and Winters (ed.), *Surveys in International Trade*. Oxford :Blackwell.
Loertscher, R., and F. Wolter (1980): Determinants of Intra-Industry Trade:Among Countries and across Industries, *Review of World Economics,*116 (2),289-293.
Shaked, A., and J. Sutton (1984): Natural oligopolies and international trade. In H. Kierzkowski(ed.) *Monopolistic Competition and International Trade.* Oxford, Oxford University Press.
Torstensson, J. (1996a): Can factor Proportions Explain Vertical Intra-Industry Trade? *Applied Economics Letters,* 3, 307-09.
Torstensson, J. (1996b): Determinants of Intra-Industry Trade: A Sensitivity Analysis, *Oxford Bulletin of Economics and Statistics,* 58 (3), 507-24.
Zhang, J., A. van Witteloostijn, and C. Zhou (2005): Chinese Bilateral Intra-Industry Trade: A Panel Data Study for 50 Countries in the 1992-2001 Period, *Review of World Economics*, 141(3), 510-40.