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TRADE TYPES WITH DEVELOPED AND DEVELOPING COUNTRIES WHAT CAN WE LEARN FROM SPANISH DATA?

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Abstract

In this paper, we investigate the nature of Spanish intra-industry trade and find that intra-industry trade with CEEC, Asian and Mediterranean countries has increased considerably since the middle of the Nineties. The second aim of the paper is to study if the comparative advantage argument also explains vertical intra-.industry trade between different income countries. According to OLS estimations, technological differences do increase DVIIT while physical capital differences decreases it. Results obtained applying Heckman method support the idea that differences in physical capital reduce the probability of IIT to occur but the level of vertical and horizontal IIT is better explained by the proximity of partners, the similarity in development level and size of market than by differences in physical capital endowments. The variables considered, mostly country-specific do have the same impact on vertical and horizontal IIT with emergent countries.

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JEL Classification Numbers: F13, F17

1. Introduction

An important feature of international trade is the rapid growth of intra-industry trade and especially trade of vertical differentiated products. Empirical and theoretical research has focussed in last decades in the determinants of vertical intra-industry trade. According to this literature, countries specialise in a quality segment depending on their comparative advantage and, as for inter-industry trade, differences in factor endowments would enhance vertical intra-industry trade.

Thus, this type of two-way trade develops more and more between high income countries and emergent countries but little studies have focused on the determinants of intra-industry trade in this case, in general because these flows were negligible until the second part of the Nineties. The purpose of this paper is to examine Spanish intra-industry trade for the period 1988-2000 and to study if the comparative advantage explanation allows for a good understanding of vertical intra-industry-trade between unequal partners.

This paper is organized as follows: the next section presents the theoretical framework of the empirical model tested further on. Section 3 briefly describes the level of intra-industry trade for Spain. Section 4 presents the empirical model and section 5, the econometric results. Finally, the last section summarises the main conclusions.

2. Theoretical framework

Production under increasing returns to scale, together with the hypothesis of consumer's preferences for varieties justify that similar products could be both exported and imported (Krugman, 1979; Lancaster 1980; Helpman, 1981). These arguments also explain why intra-industry trade generally takes place among similar and rich countries. Helpman and Krugman (1985) provide the first explanation for intra-industry trade (IIT) between unequal partners by adding differences in endowments to the previous explanations. Since differentiated products are supposed to be more capital-intensive, the volume of intra-industry trade will be larger, the larger the intensity in capital relative to labour of the trading partners. And because a larger market allows for economies of scale to occur, similar and large markets will result also in more intra-industry trade. Finally, the more different their capital-labour ratios, the lower will be intra-industry trade.

But products can rather be differentiated horizontally or vertically. In the first case, products differ in their design, colour or another attribute but not intrinsically. In the second case, products are differentiated by their quality. According to Falvey (1981) and Falvey and Kierzkowski (1987), vertically differentiated products are the fruit of different production function: low quality products may be labour-intensive while high quality products might be capital-intensive. Consequently, differences in factor endowments are expected to enhance vertical IIT. In this sense, the explanation of vertical intra-industry trade would be in essence the one of the Heckscher-Ohlin model. Vertical differentiated products can also be produced by more or less qualified employees (Gabszewicz *et al.* 1997). More in line with Ricardian models, countries can also have a comparative advantage in a quality segment due to technology differences (Flam and Helpman, 1987) or differences in research and development expenditures (Gabszewicz *et al.* 1981).

3. Measurement of intra-industry trade.

Levels of IIT between Spain and 188 countries were calculated for the 1988-2000 period at the 8-digit level of disaggregation of the EU's Combined Nomenclature (CN). Data were obtained from COMEXT, Eurostat's database. Then products categories were concorded to the 15 industries of the NACE Clio R 25 classification.

We use the Adjusted Grubel-Lloyd Index (1975), following Greenaway and Milner (1983). We define volume of intra-industry trade (*IIT*) between Spain and country *j* for each 8-digit product p as the overlap between Spanish exports X and imports M. For each industry k, IIT is obtained as the sum of IIT volume at the product level: $IIT_k^j = \sum_{p \in k} IIT_p^j = \sum_{p \in k} 2\min(X_p^j; M_p^j)$

Adjusted Grubel-Lloyd Index (*AGL*) is therefore the share of IIT in total volume of trade:

$$AGL_k^j = \frac{IIT_k^j}{X_k^j + M_k^j} * 100 = \frac{\sum_{p \in k} 2\min(X_p^j; M_p^j)}{\sum_{p \in k} X_p^j + M_p^j} * 100$$

This measure of IIT allows for both geographic and industry aggregation (k can either be the total or any level of a classification). Even if estimations are performed at the country level, we also calculate the intensity of IIT by regions (reg) in order to summarize the most stylized facts in graphs. The index is calculated as follows:

$$AGL_k^{reg} = \frac{\sum_{j \in reg} IIT_k^j}{\sum_{j \in reg} X_k^j + M_k^j} * 100 = \frac{\sum_{j \in reg} \sum_{p \in k} 2\min(X_p^j; M_p^j)}{\sum_{j \in reg} \sum_{p \in k} X_p^j + M_p^j} * 100$$

Abd-el-Rahman (1986) assumes that differences in unit value calculated per tonne reflect differences in qualities and Greenaway et al. (1994) and Fontagné et al. (1987) use this methodology to disentangle between vertical and horizontal intra-industry trade. Therefore, if the export and import unit values differ less than $\pm\alpha$ percent, products are considered similar or horizontally differentiated. Otherwise, that is if unit values of export and import differ substantially, this flow is considered as trade of vertically differentiated products. Unit values of export *UV(X)* and import *UV(M)* are calculated at the most desagregated level p for each overlap bilateral flow. Then, IIT of vertical differentiated products (*DVIIT*) and IIT of horizontal differentiated products (*DHIIT*) are obtained as follows:

$$IIT_p^j = DHIIT_k^j \text{ if } UV(X_p^j)/UV(M_p^j) \in [1-\alpha; 1+\alpha]$$
$$IIT_p^j = DVIIT_k^j \text{ if } UV(X_p^j)/UV(M_p^j) \notin [1-\alpha; 1+\alpha]$$

, where the parameter α is an arbitrarily fixed threshold (usually equal to 0.15 or 0.25).

Nillson (1999) also suggested another measure in the case of developing countries for which the level of IIT could be concentrated in relatively few groups of products while the total trade might be small. In this case, the AGL which is unscaled in nature since it doesn't reflect the absolute level of IIT can conduce to biased estimations. Nillson suggested using the average level of intra-industry trade per product traded as an alternative measure. This measure could facilitate the comparisons of the extent of IIT between small and large countries and can easily be computed for different level of aggregation.

Table I displays the correlation coefficient between all measures. The volume of IIT is highly correlated with IIT volume per product traded (96%) while the correlation with each of these variables with the AGL index is much lower (respectively 78% and 82%). As a consequence, using IIT volume or IIT volume per product traded as explained variable in the estimations should lead to the same results while explaining the AGL index could introduce some important differences in the results. Turning to the value of the parameter α that should be used, vertical intra-industry trade volume when a difference in unit values of more or less 15% is used is correlated at 99% with the measure of vertical IIT when a margin of 25% is used. Similar results are obtained for Horizontal intra-industry trade, indicating that the choice of one of these two values for α, although arbitrarily, should not have substantial effects on the estimations results. So we will use the IIT volume and a margin of 25%.

3 Levels of Spanish intra-industry trade

Graph I summarizes the importance of each type of trade between Spain and the different regions. The regions we consider are EU, OECD, ACP (African-Caribbean Pacific Countries), Latina America, Developing Asian countries, NIC (Asian New Industrialised Countries), CEEC (Central and Eastern European), NIS (New Independent States, former URSS), MNA (Mediterranean and Northern African Countries), Middle Eastern countries.

Intra-industry trade (IIT) represents a great proportion of the Spanish trade with the EU but also represents more and more of its trade with OECD, CEEC, NIC of Asia and MNA countries. In 2000, IIT represented 33% of total volume of trade with the EU, 13,4% with the others countries of OCDE, 13% with CEEC's, 6,2 with NIC of Asia and 4,9 with MNA. For all regions, IIT consists mainly in vertical differentiated products except with CEEC's and EU members for which each type of trade represent the same weight. This fact implies that quality is the main concern for competitiveness. Manufactured products are more differentiated in nature but the industry with highest level of IIT differs from one region to another. All these facts are supported by data presented in Table II for 2000.

Graph II displays the level of IIT trade between Spain and 188 countries and their GDP per capita for two years: 1996 and 2000. It is clear that low income countries have a relatively low level of IIT trade with Spain. Thus, the relation between these two variables is not so straightforward if countries with an intermediate or high income per capita are considered.

4 Hypothesis of the model

It is generally assumed in the literature that IIT, like total volume of trade, is positively correlated with averages of country size (proxied by GNP) and negatively correlated with the trade barriers that may exist among them (such as, for example, transportation costs represented by the geographical distance). It is also assumed that IIT is negatively related to differences in factor endowments (proxied by differences in per capita GDP) and positively with capital intensity (proxied by average per capita GDP). When the different natures of IIT are taken into account, some of these variables are likely to have a different impact and some additional factors should be added. We discuss below the hypothesis for each variables:

Differences in per capita income between Spain and the trading partner ($DifGDPpc_j$): This variable is the most important since its influence is not clearly established. In line with the model developed by Falvey and Kierkowski (1987), differences in factor endowments would enhance trade of vertical differentiated products (comparative advantage explanation). The effect of this variable should be positive on two-way trade of horizontal differentiated products.

Average per capita income of Spain and the trading partner ($AVGDPpc_j$): Since demand for variety is assumed to increase with income, both type of IIT are assumed to be positively related with average per capita income.

Differences in GDP between Spain and the trading partner ($DifGDP_j$): A great difference in economic size reflects both differences in demand and in supply sizes and is supposed to reduce any kind of IIT.

Average GDP of Spain and the trading partner ($AvGDP_j$): The greater the economic size used as a measure of market size. In the line of the Linder hypothesis, external markets can be considered as an extension of the internal market and local demand stimulates the innovation of products. In the context of the Chamberlin hypothesis of the preference for varieties of consumers is high, a large market indicates a more diverse demand for differentiated goods. Economic size also reflects the supply potential and therefore the export potential in general, but more likely for differentiated goods since the production of these goods are under increasing returns to scale. The average economic size is therefore expected to increase the volume of trade.

Differences in government expenditures between Spain and the trading partner (difG): This variable is used as a proxy of public services. The idea is that public services contributes to increase the efficiency of private firms and particularly in the case of horizontally differentiated goods since competitiveness is not only based on prices but on others attributes, quality of inputs, services quality, etc...We expect *a positive sign for HIIT* while the effect on *VIIT is undetermined.*

Average government expenditures of Spain and the trading partner (G): Again, we also include the average value of government expenditure since the same differences can occur for different levels of expenditure. This variable should have a *positive impact on IIT* whatever the definition is used.

Distance ($dist_j$,): the geographical distance (in km) between the Spanish capital (Madrid) and the capital of country *j* is a proxy for transportation costs that is supposed to reduce any kind of trade.

GINI index of the trading partner ($GINI_j$): The higher the Gini index, the more egalitarian is the income distribution in the trading partner. The predicted sign is negative for VIIT since a more unequal distribution of income will favour the demand for a larger spectrum of quality products and positive for HIIT since demand for horizontal differentiated products is a major concern for medium and high incomes households.

Trading blocks: We include a dummy that takes the value 1 if the trading partner belongs to the European Union and 0 if not. Since trade barriers should reduce any kind of trade we expect that trading partners that maintains lower tariffs and non-.tariffs barriers should face higher levels of any kind of trade. Since the EU (and thus Spain) grants a preferential access to developing countries depending on their development level and their region of origin, we seek to capture the effect of tariffs and non-tariffs barriers by the mean of dummies for the 11 main regions considered by the common trade policy. Thus, due to multicollinearity problems (these groups present similar GDP already taken into account or are in the same region of the world as reflected by the distance) all these dummies could not be taken into account in the estimation.

Common language: we also introduce a dummy that captures the effect of idiomatic differences that takes the value 1 if Spanish is the official language of the trading partner and 0 if not.

Number of flows considered: Some industries produce more differentiated goods than others and some of them produce more horizontal than vertical goods. In order to account for these country-industries specificities, and following Aturupane (1999) we introduce the number of flows registered at the 8 digit level in each industry between Spain and country j.

Three alternative specifications (model 3, 4, 5) have been tested in order to better capture the effect of demand, and endowments like physical capital, human capital and technology capital. Thus, GDP per capita not only reflect a supply side phenomenon but also an income effect. Besides, we also replace this variable by more direct proxies for factor endowment differences, namely physical capital per capita (INV), technological capital per capita (R&D) and Human capital (expenditure in education). We also introduce differences in consumer expenditure in order to reflect the demand side phenomenon (see Table III for a list of variables).

5. Econometric results

In the model, the explained variable is alternatively total intra-industry trade volume of trade (IIT_{kj}) and vertical ($DVIIT_{kj}$) and horizontal ($DHIIT_{kj}$) intra-industry trade in order to identify differences in theirs determinants, where *j* represents the Spanish trade partner and *k* the industry according to the NACE CLIOR25 nomenclature. The model is tested in its logarithmic form. We first present the results for the cross-section analysis for year 1996 estimating by OLS method and thereafter the results of the Heckman procedure[1].

5.1. Cross-section analysis with OLS method

The overall picture for the OLS estimations (Tables IV.A-C) is the robustness of the results with the majority of them significant at the 1 percent level and a high level adjusted R-squared (ranging from 0.65 for DVIIT to 0.83 for total IIT). In general, variables show the expected signs or are not significant. Concerning the variables which we guess that have the same influence on any kind of trade like *DifGDP* and *AvGDP*, they show the expected signs, namely negative and positive. Sharing the same border seems to increase any kind of trade also, Spanish intra-industry trade is higher with the EU members as expected and Dummies for industries are in general significant and positive for IIT and VIIT but in more cases negative and significant for DHIIT.

The impact of the distance is always negative and very significant. Whereas not presented here, estimations performed for the volume of inter-industry-trade shows that the effect of distance is higher in this case than for IIT in general reflecting that transportation costs matter more for homogeneous products where prices are the important issue. More surprising is that distance seems to have a worse effect on DHIIT than on DVIIT. These results can be explained by the fact that the nearest countries of Spain are also the countries that share the same tastes for goods and so, the countries that are more willing to engage in DHIIT with Spain. When GDP per capita is substituted by others proxies for endowments (model 3, 4, 5), the effect of distance increases drastically reflecting the fact that furthest countries are also those with lower income per capita or which income per capita differ much from Spain.

Turning to the most important variable, $DifGDPpc_j$, it affects negatively any kind of IIT, reflecting that the more similar the endowments the higher the level of IIT. This result is not surprising and in line with Nillson (1999) considering unequal partners as in this study. This result is more surprising for vertical differentiated products since imports and exports of similar products differentiated by their quality is expected to increase with difference in factor endowments while the effect should be the opposite for horizontal differentiated products. The works of Mora (2002) for intra-EU trade and of Blanes y Martin (2000) for the Spanish case show that vertical differentiated products can mainly be explained by the comparative advantage explication in the line of the H-O and Ricardian models. Though, differences in human capital or technological capital have a more evident positive effect on DVIIT than physical capital differences. In Blanes and Martin (2000) differences in GDP per capita have a negative influence on any kind of intra-industry trade both when OECD trading partners are considered or when a larger sample of both developed and developing countries are considered. Crespo and Fontoura (2004) observed that the traditional determinants of trade ought to explain the Portuguese volume of vertical intra-industry trade when considering a sample of 46 countries. Thus, the authors also include the interaction between the Gini variable and per capita income differences. We are sceptical about this multiplicative variable since its expected influence is not clear and we are unable to determine if the negative sign it displays goes in the sense of the comparative advantage theory or, on the opposite, gives arguments against it.

Conclusions from model 1 and 2 show that differences in per capita income are against the comparative advantage explanation of DVIIT. To confirm this conclusion we aim at verifying if GDP per capita is a good proxy for capital difference or if a more refined measure of endowment could shed some light on the vertical explanation (model 3, 4 and 5). Differences

[1] Panel data estimations of each type of IIT and tobit estimations on panel data for the AGL index have also been driven. Results didn't really differ and were omitted due to space requirements. Results are available on request.

in consumer expenditure do not display the expected sign since they affect positively any kind of IIT, while a higher average in consumer expenditure results in less intra-industry trade. We guess that this unexpected results is due to the fact that inter-industry trade is the most excellent trade between Spain and countries that are really different from a demand size perspective. This intuition is partly confirmed by the fact that, if we use consumer expenditure per capita instead of total expenditure in consumer goods, the variables appear not significant.

On the other side, models 3, 4 and 5 capture better the effect of supply factors. For any kind of IIT, differences in investment expenditure have a negative influence and we do not observe differences between the influences of this variable on vertical or horizontal differentiated goods. Differences in research and development expenditure increase IIT and DV IIT while this effect is less clear in the case of DH IIT (the coefficients are not always significant). Influence of technology differences appear to be confirmed here. The differences in human capital factor endowments measured by differences in spending on education per capita have a negative effect on each type of intra-industry trade. The differences on government expenditures do not have a stable influence on any kind of intra-industry flows.

In sum, results from the OLS estimations do not confirm the impact of human capital differences on DV or DH IIT, certainly due to the bad quality of the proxy used. The most important result is that technological differences unambiguously enhance intra-industry trade while differences in physical capital have a significant negative effect on both type of intra-industry trade. Without forgetting the important outcome deduced from models 3, 4 and 5, we will now pay more attention to model 1 since we seek to find more evidence in favour or in opposition of the comparative advantage explanation of vertical intra-industry trade as far as differences in physical capital is concerned (model1).

More consistent results have been searched considering the heterogeneity of countries. In Table V, we present the estimation of model 1 for EU countries on one part, and other selected countries namely countries from OECD, Asia, Latin America, MNA and CEEC. Interesting results are found. In this case, differences in GDP per capita still influence negatively DVIIT for others countries (and thus overall IIT) but are not significant for HIIT and neither explain significantly vertical intra-industry trade with the EU. Another important feature is that a high GINI index enhances any kind of IIT in the case of others countries while reduce IIT in the case of the EU. These results confirm our initial intuition that determinants of IIT differs slightly if we consider whether similar countries or unequal partners.

5.2. Cross-section estimation with Heckman method

One problem of the estimations proposed in the previous section is that we don't take into account the flows that present a zero value since we use the logarithmic transformation of IIT volume. We argue that we should take into account the determinants of overall IIT when considering the difference between determinants of vertical whether horizontal IIT. That is, explaining variables (both country and industry-specific effects) may explain the fact that countries engage in IIT but could influence in a different way the fact that these two-way flows concerned horizontal or vertical differentiated products. Since these shares are very low in some case and we guess that determinants of IIT could differ strongly if countries share specific characteristics, we finally use the Heckman estimation method that allows to into accounting this selection effect. It consists in estimating separately a probit equation and an ordinary least squares equation. Thus prior to the estimation of equation above for DV IIT and DH IIT, we must define a binary variable D_{ij} according to the following scheme:

$$D_{kj} = \begin{cases} 1 & if \quad IIT_{kj} \neq 0 \\ 0 & f \quad IIT_{kj} = 0 \end{cases} \cdots$$

This variable takes the value 1 if total intra-industry trade exists and 0 in the opposite case. Using D_{ij} as the dependent variable, we estimate the probit equation:

$$Pr(D_{kj} = 1 / z_{kj}) = F(\beta' z_{kj})$$

The statistically significant variables will contribute to explaining exclusively the probability of appearance of intra-industry trade flows. The next step consists of studying the determinants of DV IIT and DH IIT, provided that IIT_{ij} is different from zero. We should take into account the bias introduced due to the elimination of the zero observations from the sample when specifying the model, that is

$$E(DVIIT_{kj} / ITT_{kj} \neq 0) = \delta' z_{kj} + E(u_{kj} / ITT_{kj} \neq 0)$$

Where z_{kj} represents the set of explanatory variables defined in the previous section for the industry *k* and country *j* and the second term of the right-hand side of the equation is proportional to the inverse of the Mills ratio. The estimation of this inverse is obtained from the probit model estimated in the first stage of the analysis.

Estimations have been driven for two different sets of countries: all countries and excluding EU and countries with lowest income what finally means MNA, CEEC. NIC of ASIA and OCDE countries. Table V displays the results for both probit estimation (selection equation) and the OLS estimation.

Let look first at the results of the probit estimations that explain the probability for IIT to occur. Since we use the same variables (model 1) as for the OLS estimation for positive IIT volume, results of the probit estimation in table VI are directly comparable with model 1 in table IV.A. All the variables present the expected sign or are not significant indicating that the variables used explain better the level of IIT volume than the reason why some bilateral flow consist in inter or intra-industry trade. It is particularly the case for differences in market size (GDP) that is not significant and the average income per capita which is significant and has a positive sign only when EU countries are included. The results also suggest that IIT trade is more likely, the higher the aggregate level of income, as expected. The indicator of differences in factor endowments has a significant negative sign which implies that some degree of similarity in endowments is a condition for IIT to appear. With regard to the remaining variables, nor distance nor the GINI index have a significant impact on the probability to engage in IIT.

Let turn now to the second stage of the estimation, where the level of vertical or horizontal intra-industry trade is explained. Here, different patterns are achieved since difference in market size has a negative and significant impact on the volume of IIT trade (regardless to its nature) but difference in factor endowment doesn't have a significant effect in determining the level of IIT. Thus, distance, GINI and the dummies for contiguity and EU membership do present the expected signs while they fail to explain significantly the probability of IIT to occur.

6. Conclusions

In this paper, we have investigated the nature of Spanish intra-industry trade and found that intra-industry trade with CEEC, Asian and Mediterranean countries has increased considerably since the middle of the Nineties. The second aim of the paper was to determine how comparative advantage affects DVIIT. According to OLS estimations, technological differences do increase DVIIT while physical capital differences decreases it. Results obtain with the Heckman method support the idea that differences in physical capital do play a role for IIT to occur but the level of vertical and horizontal IIT is better explained by the proximity of partners, the similarity in development level and size of market. Furthermore, our results suggest that the variables considered, mostly country-specific do have the same impact on vertical and horizontal IIT with emergent countries.

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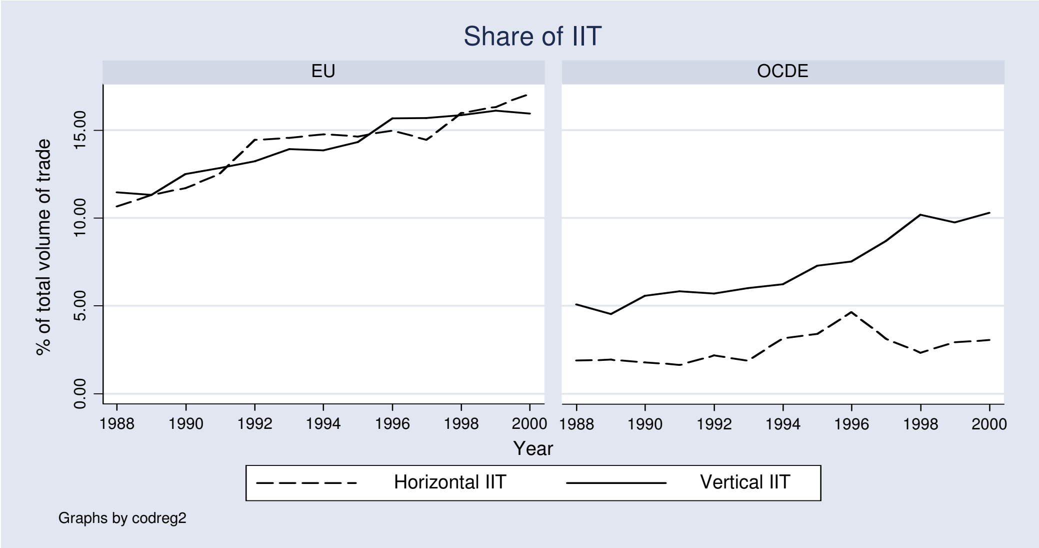
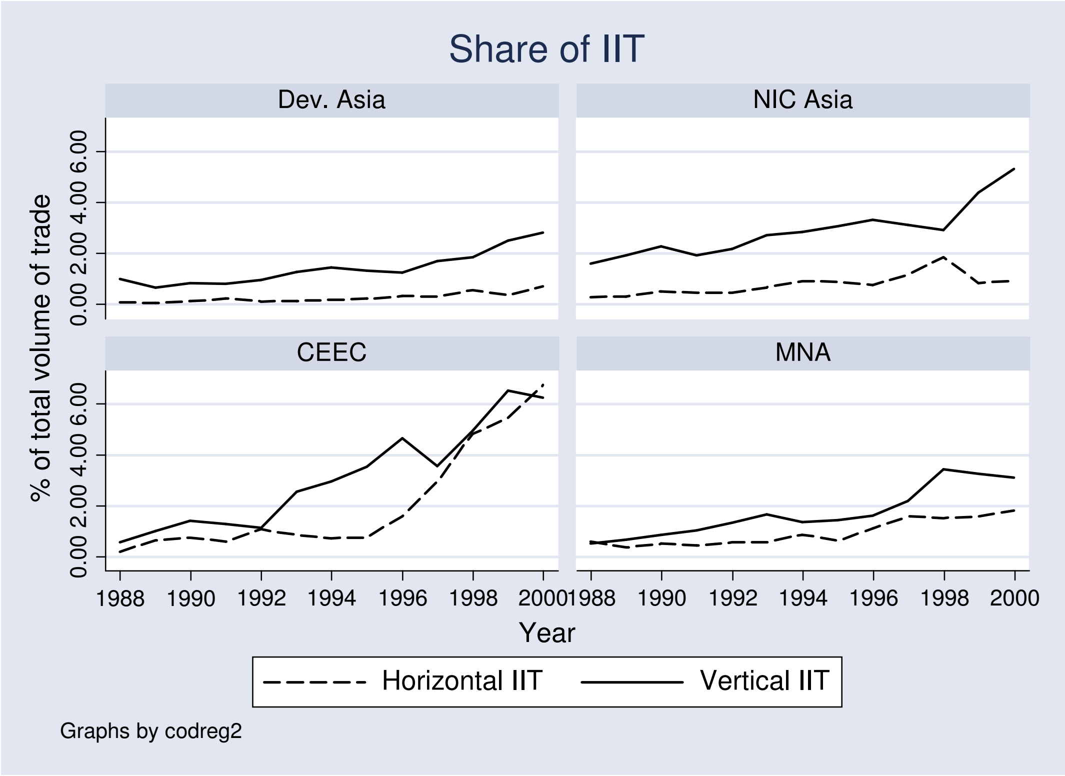
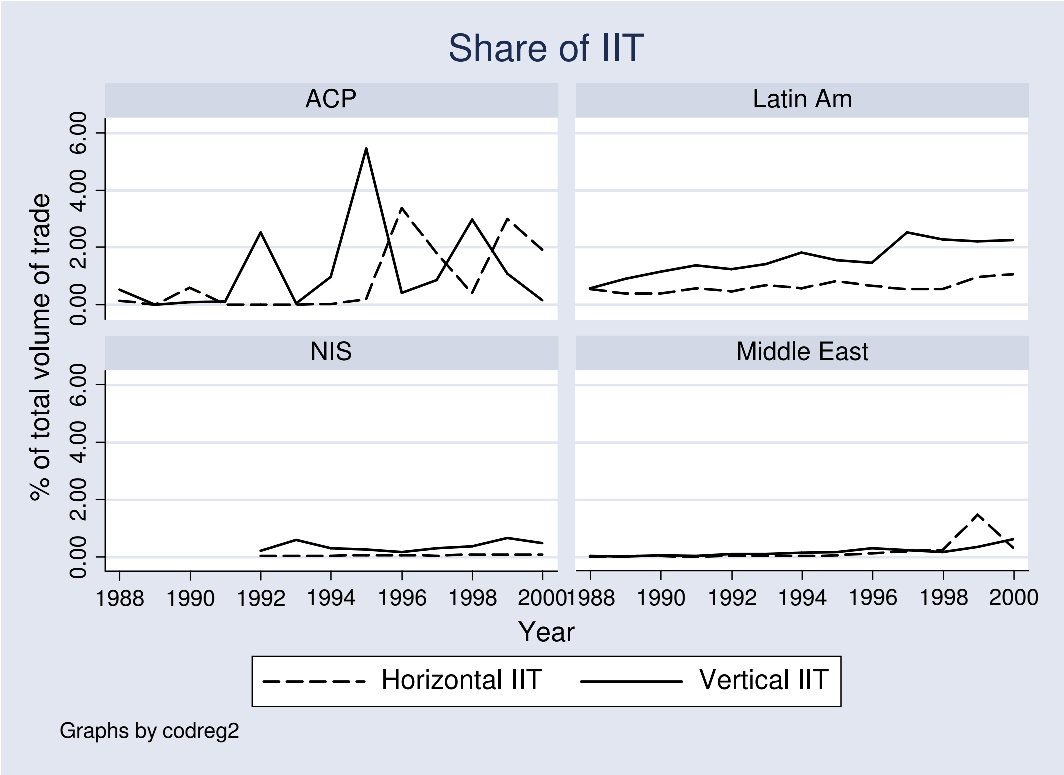
8. Appendix of Tables and Graphs

GRAPH I: Adjusted Grubel-Lloyd Index by regions (Vertical and Horizontal Intra-industry trade, 1988-2000).

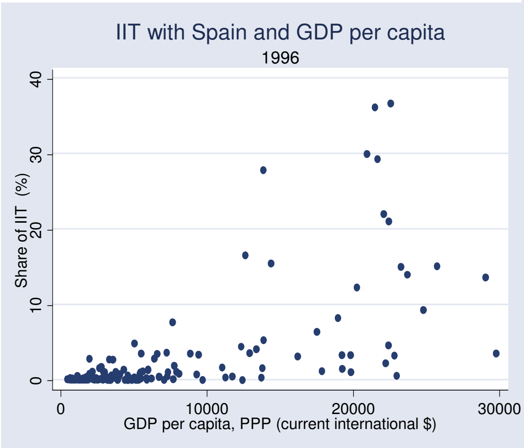


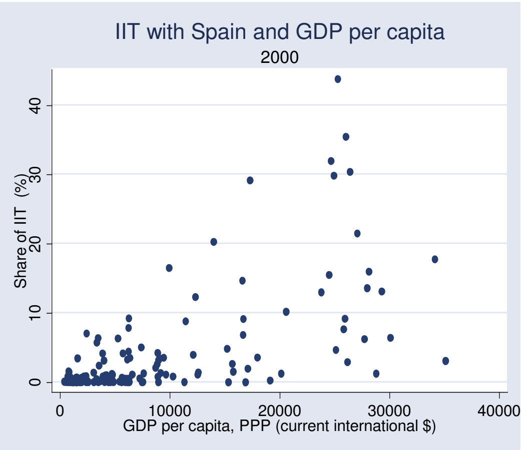




Source: See Table I

GRAPH II: Spanish Intra-industry trade with 188 countries and GDP per capita of the trading partner (1996 and 2000).





Source: See Table I

Table I: List of variables

Variable	definition	Source
Trade volume		Comext, Eustostat database
CGDP	GDP, PPP (current international $)	WDI database
RGDP	GDP, PPP (constant 1995 international $)	WDI database
Distance	Distance in km between capitals	CEPII database
CConsum	Final consumption expenditure (current LCU)	WDI database
rconsum.	Final consumption expenditure (constant LCU)	WDI database
CInvest	Gross capital formation (current LCU)	WDI database
RInvest	Gross capital formation (constant LCU)	WDI database
CGovern.	General government final consumption expenditure (current LCU)	WDI database
RGovern..	General government final consumption expenditure (constant LCU)	WDI database
R & D	Research and development expenditure (% of GDP)	WDI database
Education	Public spending on education, total (% of GDP)	WDI database
Gini	Gini Index	WDI database
# flows	Number of 8.digit products traded	Comext, Eustostat database
Contiguity	1 if partners share the same border	CEPII database
CodeEU	1 if partner belongs from the EU(15)	CEPII database

Table II: Correlations between alternative measures of trade types (Spanish trade, 1996).

lYear 1996 #obs: 188 For all products	IIT volume	DVIIT volume (α=.25)	DHIIT volume (α=.25)	DVIIT volume (α=.15)	DHIIT volume (α=.15)	IIT Volume /nº of products traded	IIT AGL	DVIIT AGL (α=.25)	DHIIT AGL (α=.25)	DVIIT AGL (α=.15)	DHIIT AGL (α=.15)
IIT volume	1.000										
DVIIT volume (α=.25)	0.9818	1.000									
DHIIT volume (α=.25)	0.9822	0.9287	1.000								
DVIIT volume (α=.15)	0.9804	0.9991	0.9269	1.000							
DHIIT volume (α=.15)	0.9351	0.8524	0.9834	0.8471	1.000						
IIT Volume / nº of products traded	0.9588	0.9454	0.9377	0.9453	0.8871	1.000					
IIT AGL	0.7761	0.7815	0.7430	0.7899	0.6735	0.8275	1.000				
DVIIT AGL (α=.25)	0.7177	0.7529	0.6572	0.7579	0.5736	0.7246	0.9103	1.000			
DHIIT AGL (α=.25)	0.6955	0.6702	0.6956	0.6806	0.6527	0.7822	0.9105	0.6578	1.000		
DVIIT AGL (α=.15)	0.7373	0.7702	0.6784	0.7791	0.5884	0.7454	0.9286	0.9900	0.7011	1.000	
DHIIT AGL (α=.15)	0.5819	0.5397	0.6027	0.5445	0.5909	0.6884	0.7854	0.4738	0.9562	0.4997	1.000

Notes: *IIT*: volume of intra-industry trade; *DVIIT*: IIT of vertical differentiated products; *DHIIT*: IIT of horizontal differentiated products; *AGL:* Adjusted Grubel-Lloyd Index

Table III.A: Adjusted Grubel Lloyd Index by industries, Spain's trade with lower income countries.

2000 (% of total volume of trade)	ACP			Dev, Asia			Latin Am			MNA		
NACE CLIO R25	*IIT*	DH	DV	*IIT*	DH	DV	*IIT*	DH	DV	*IIT*	DH	DV
01 Agricultural, forestry and fishery products	*0,1*	0,0	0,1	*2,8*	1,4	1,4	*1,6*	0,1	1,5	*0,9*	0,5	0,3
06 Fuel and power products	*0,0*	0,0	0,0	*0,1*	0,0	0,1	*0,3*	0,2	0,2	*0,1*	0,0	0,1
13 Ferrous and non-ferrous ores and metals	*0,3*	0,0	0,3	*4,1*	1,9	2,2	*0,7*	0,1	0,6	*1,3*	0,3	1,1
15 Non-metallic minerals and minerals products	*0,1*	0,0	0,1	*3,7*	0,5	3,2	*3,9*	1,1	2,8	*3,1*	1,0	2,2
17 Chemical products	*1,2*	1,1	0,1	*5,2*	2,5	2,7	*6,7*	3,3	3,3	*5,0*	2,0	3,0
19 Metal products	*0,4*	0,0	0,4	*5,8*	2,4	3,4	*3,2*	0,1	3,1	*4,1*	0,2	3,9
21 Agricultural and industrial machinery	*0,6*	0,1	0,5	*6,1*	1,3	4,7	*5,3*	0,6	4,6	*3,4*	0,6	2,8
23 Office and data processing machines, precision and optical instruments	*1,3*	0,3	1,0	*15,2*	8,9	6,3	*4,7*	0,5	4,3	*6,5*	1,2	5,3
25 Electrical goods	*0,2*	0,1	0,2	*11,7*	8,2	3,5	*9,6*	1,1	8,5	*6,5*	1,1	5,4
28 Transport Equipment	*21,1*	20,4	0,7	*3,6*	1,2	2,4	*17,4*	2,5	14,9	*7,4*	5,1	2,4
36 Food, Beverages, tobacco	*0,3*	0,1	0,2	*0,8*	0,2	0,6	*2,9*	1,2	1,7	*1,3*	0,4	0,9
42 Textiles and clothing, leather and footwear	*1,1*	0,0	1,0	*13,8*	4,1	9,7	*0,9*	0,1	0,8	*4,4*	0,9	3,4
47 Paper and printing products	*0,1*	0,0	0,1	*1,5*	0,4	1,0	*3,0*	0,3	2,7	*5,1*	0,8	4,3
48 Others manufactured products	*0,4*	0,1	0,3	*12,8*	2,0	10,7	*4,3*	0,5	3,8	*9,5*	1,2	8,3
49 Rubber and plastic products	*0,4*	0,0	0,4	*22,0*	10,1	12,0	*3,8*	2,5	1,4	*7,8*	2,3	5,5
Total	***2,1***	**1,9**	**0,2**	**4,9**	**1,8**	**3,1**	***3,5***	**0,7**	**2,8**	***3,3***	**1,1**	**2,3**

Table III.B: Adjusted Grubel Lloyd Index by industries, Spain's trade with intermediate and high income countries.

2000 (% of total volume of trade)	EU			OCDE			CEEC			NIC Asia					
NACE CLIO R25	*IIT*	DH	DV	*IIT*	DH	DV	*IIT*	DH	DV	*IIT*	DH	DV			
01 Agricultural, forestry and fishery products	*9,5*	3,9	5,6	*0,9*	0,1	0,8	*0,5*	0,2	0,3	*0,3*	0,1	0,2			
06 Fuel and power products	*19,6*	12,3	7,3	*0,5*	0,3	0,2	*0,1*	0,0	0,0	*0,3*	0,0	0,3			
13 Ferrous and non-ferrous ores and metals	*27,1*	19,4	7,7	*3,2*	1,6	1,6	*0,7*	0,5	0,3	*2,9*	2,0	0,9			
15 Non-metallic minerals and minerals products	*21,8*	5,6	16,2	*3,4*	1,0	2,3	*6,2*	0,7	5,6	*2,1*	0,2	1,9			
17 Chemical products	*36,0*	14,9	21,1	*17,9*	2,2	15,6	*6,8*	1,1	5,8	*6,6*	3,2	3,4			
19 Metal products	*37,5*	13,6	24,0	*17,5*	2,6	14,8	*12,0*	4,3	7,7	*6,5*	0,9	5,6			
21 Agricultural and industrial machinery	*26,5*	10,1	16,4	*17,8*	3,5	14,3	*13,6*	2,5	11,2	*6,8*	0,9	5,9			
23 Office and data processing machines, precision and optical instruments	*21,2*	4,7	16,5	*12,3*	2,0	10,3	*12,7*	6,3	6,3	*7,4*	0,4	7,0			
25 Electrical goods	*36,8*	11,6	25,2	*21,0*	3,4	17,6	*8,7*	3,1	5,6	*9,5*	2,1	7,4			
28 Transport Equipment	*45,6*	31,5	14,1	*20,2*	6,7	13,4	*23,8*	16,6	7,2	*4,6*	0,2	4,5			
36 Food, Beverages, tobacco	*15,9*	7,0	8,9	*2,7*	0,8	1,9	*1,2*	0,3	0,9	*3,1*	0,1	3,0			
42 Textiles and clothing, leather and footwear	*32,4*	7,9	24,6	*9,1*	2,2	6,9	*8,0*	3,0	5,0	*6,3*	0,4	5,9			
47 Paper and printing products	*29,1*	9,2	19,9	*15,0*	3,7	11,3	*9,8*	4,0	5,8	*6,4*	0,9	5,5			
48 Others manufactured products	*40,4*	12,2	28,2	*23,9*	2,4	21,5	*16,1*	3,3	12,8	*11,3*	1,6	9,8			
49 Rubber and plastic products	*48,4*	31,0	17,4	*21,3*	12,6	8,7	*24,1*	14,0	10,0	*22,0*	10,1	12,0	8,8	3,0	5,8
Total	***33,0***	**17,1**	**16,0**	***13,4***	**3,1**	**10,3**	***13,0***	**6,7**	**6,3**	***4,9***	**1,8**	**3,1**	**6,2**	**0,9**	**5,3**

TABLE IV.A : OLS Estimation of Total Volume of Intra-industry trade

TOTAL ITT	MODELO1	MODELO 2	MODELO 3	MODELO 4	MODELO 5
Intercept	-52.33*** (4.464)	-54.11*** (4.288)	-16.71 (11.93)	23.75*** (3.802)	-2.498 (1.73)
Dif CGDP	-0.511*** (0.081)	-0.643*** (0.075)	-3.169*** (0.524)		
Avr. CGDP	2.258*** (0.163)	2.527*** (0.153)	5.399*** (0.466)		
Dif CGDP pc	-0.432* (0.136)	-0.208** (0.107)			
Avr. CGDP pc	2.749*** (0.33)	2.223*** (0.278)			
Distance	-0.813*** (0.097)	-0.614*** (0.090)	-3.020*** (0.303)	-2.264*** (0.351)	-0.523*** (0.174)
Dif Consum			0.948*** (0.342)	-0.322 (0.394)	0.573*** (0.315)
Dif Invest.			-1.588*** (0.182)	-1.059*** (0.207)	-0.536*** (0.200)
Dif Invest Lag			0.672** (0.333)	0.222 (0.327)	
Dif Govern.					-1.032*** (0.630)
Avr Consum.			-3.329*** (1.005)	-3.479*** (1.189)	-0.132 (0.630)
Avr Invest.			5.748*** (0.753)	6.365*** (0.839)	
Avr Invest.Lag					1.394*** (0.247)
Avr Govern.			-2.709*** (0.744)	-1.388* (0.893)	0.253 (0.599)
R & D			0.303*** (0.117)	0.472*** (0.159)	0.172* (0.111)
Education			0.241** (0.132)	-0.501** (0.219)	
Education Lag					-0.090 (0.207)
Gini	0.016* (0.009)		-0.099*** (0.019)	-0.004 (0.20)	0.064*** (0.016)
# flows	0.004*** (0.0004)	0.004*** (0.0004)	0.0006 (0.0006)	0.003*** (0.0006)	0.005*** (0.0005)
Contiguity	1.126*** (0.354)	1.267*** (0.364)	-0.353 (0.483)	1.934*** (0.522)	2.117*** (0.498)
CodeEU	1.249*** (0.204)	1.658*** (0.202)	2.244*** (0.348)	3.563*** (0.399)	2.185*** (0.274)
Dummy Sector	Sig(a)	Sig(a)	Sig	Sig(a)	Sig(b)
# of obs.	827	1016	317	317	461
Adj. R-squared	0.7531	0.7171	0.8347	0.7607	0.7393

(*)siginificative at 10%, (**)significative at 5% and (***)significative at 1%

(a)all sectors are significative positive at 1% except sector 6 which is negative at level 10%

(b)all sectors are significative positive except sector 6 and sector 42

Source: See Table I

TABLE IV.B: OLS Estimation of Vertical Intra-industry trade

DV ITT	MODELO1	MODELO 2	MODELO 3	MODELO 4	MODELO 5
Intercept	-49.74*** (4.562)	-52.68*** (4.351)	-14.37 (12.18)	24.37*** (3.866)	-1.6368 (1.675)
Dif CGDP	-0.521*** (0.081)	-0.637*** (0.075)	-3.171*** (0.534)		
Avr. CGDP	2.031*** (0.169)	2.393*** (0.156)	5.333*** (0.475)		
Dif CGDP pc	-0.303** (0.139)	-0.118 (0.108)			
Avr. CGDP pc	2.972*** (0.327)	2.343*** (0.284)			
Distance	-0.799*** (0.100)	-0.627*** (0.093)	-2.991*** (0.310)	-2.244*** (0.356)	-0.466*** (0.168)
Dif Consum			1.284*** (0.351)	0.013 (0.400)	0.624** (0.303)
Dif Invest.			-1.626*** (0.188)	-1.097*** (0.213)	
Dif Invest Lag					-0.559*** (0.192)
Dif Govern.			0.591* (0.339)	0.134 (0.331)	-0.916*** (0.235)
Avr Consum.			-4.104*** (1.028)	-4.244*** (1.206)	0.003 (0.607)
Avr Invest.			5.874*** (0.772)	6.513*** (0.912)	
Avr Invest.Lag					1.383*** (0.238)
Avr Govern.			-2.318*** (0.760)	-1.025 (0.851)	-0.072 (0.567)
R & D			0.332*** (0.135)	0.497*** (0.160)	0.158* (0.106)
Education			0.163 (0.192)	-0.411** (0.222)	
Education Lag					0.034 (0.200)
Gini	0.022** (0.009)		-0.103*** (0.019)	-0.008 (0.020)	0.059*** (0.015)
# flows	0.004*** (0.0004)	0.004*** (0.0004)	0.0008 (0.0006)	0.003*** (0.0006)	0.005*** (0.0005)
Contiguity	0.969*** (0.360)	1.116*** (0.366)	-0.625 (0.492)	1.637*** (0.528)	1.916*** (0.478)
CodeEU	1.190*** (0.209)	1.570*** (0.206)	1.965*** (0.359)	3.291*** (0.408)	2.008*** (0.264)
Dummy Sector	Sig(a)	Sig(b)	Sig	Sig(a)	Sig(a)
# of obs.	800	968	313	313	455
Adj. R-squared	0.7364	0.7062	0.8220	0.7424	0.7155

(*)siginificative at 10%, (**)significative at 5% and (***)significative at 1%
(a)all sectors are significative positive at 1%, only sector 36 at 5% and sector 42 at 10%
(b)all sectors are significative positive at 1%, only sector 13 and 36 at 10%
Source: See Table I

TABLE IV.C: OLS Estimation of Horizontal Intra-industry trade

DH ITT	MODELO1	MODELO 2	MODELO 3	MODELO 4	MODELO 5
Intercept	-45.50***	-41.52***	-42.56***	17.33***	0.9604
	(5.067)	(4.780)	(18.05)	(5.959)	(2.195)
Dif CGDP	-0.267***	-0.366***	-1.900**		
	(0.095)	(0.087)	(0.939)		
Avr. CGDP	2.049***	1.960***	5.027***		
	(0.189)	(0.177)	(0.777)		
Dif CGDP pc	-0.299**	-0.135			
	(0.157)	(0.124)			
Avr. CGDP pc	1.759***	1.671***			
	(0.368)	(0.316)			
Distance	-0.883***	-0.700***	-2.799***	-1.938***	-1.260***
	(0.118)	(0.108)	(0.550)	(0.526)	(0.212)
Dif Consum			0.550	-0.958**	0.369
			(0.492)	(0.504)	(0.392)
Dif Invest.			-1.225***	-0.593**	
			(0.340)	(0.314)	
Dif Invest Lag					-0.060
					(0.251)
Dif Govern.			0.145	0.176	-0.985***
			(0.510)	(0.406)	(0.293)
Avr Consum.			-2.658*	-0.198*	-1.897**
			(1.668)	(1.848)	(0.806)
Avr Invest.			5.100***	3.685**	
			(1.470)	(1.628)	
Avr Invest.Lag					0.967***
					(0.313)
Avr Govern.			-2.177**	-1.720*	2.188***
			(1.060)	(1.111)	(0.774)
R & D			0.309*	0.272	0.396***
			(0.175)	(0.200)	(0.131)
Education			-0.072	-0.541**	
			(0.244)	(0.264)	
Education Lag					-0.824
					(0.274)
Gini	0.028***		-0.080***	-0.028	0.103***
	(0.011)		(0.033)	(0.028)	(0.020)
# flows	0.003***	0.003***	0.0005	0.003***	0.005***
	(0.0005)	(0.0005)	(0.0008)	(0.0008)	(0.0006)
Contiguity	1.543***	1.785***	0.674	2.476***	1.720***
	(0.381)	(0.379)	(0.68º)	(0.618)	(0.569)
CodeEU	1.447***	1.568***	2.191***	3.443***	1.719***
	(0.231)	(0.223)	(0.515)	(0.558)	(0.330)
Dummy Sector	Sig$^{(a)}$	Sig$^{(b)}$	Sig$^{(c)}$	Sig$^{(b)}$	Sig$^{(b)}$
# of obs.	604	715	252	252	383
Adj. R-squared	0.6965	0.6742	0.7518	0.6759	0.6484

$^{(*)}$siginificative at 10%, $^{(**)}$significative at 5% and $^{(***)}$significative at 1%

$^{(a)}$all sectors are significative positive except sectors 6, 15, 36 Y 42

$^{(b)}$all sectors are significative positive except sectors 6, 15, 19, 36 Y 42

$^{(cb)}$all sectors are significative positive except sectors 15, 19, Y 47

Source: See Table I

TABLE V: OLS Estimation for MODEL 1 of total IIT, DVIIT, DHIIT : EU and selected emergent countries

	TOTAL ITT		DV ITT		DH ITT	
MODEL 1	EUROPEAN UNION	OTHER COUNTRIES	EUROPEAN UNION	OTHER COUNTRIES	EUROPEA N UNION	OTHER COUNTRIES
Intercept	11.006 (17.51)	-30.46*** (5.64)	3.488 (16.25)	-27.33*** (6.00)	35.425 (26.21)	-29.51*** (6.50)
Dif CGDP	-2.386*** (0.393)	-0.441*** (0.079)	-2.207*** (0.365)	-0.450*** (0.083)	-3.032*** (0.586)	-0.128 (0.093)
Avr. CGDP	4.819*** (0.294)	1.535*** (0.191)	4.586*** (0.367)	1.360*** (0.204)	5.565*** (0.594)	1.304*** (0.221)
Dif CGDP pc	-0.086* (0.480)	-0.396** (0.185)	-0.069 (0.448)	-0.380** (0.197)	0.025 (0.730)	-0.108 (0.223)
Avr. CGDP pc	-3.157* (1.922)	1.962*** (0.363)	-2.243 (1.783)	2.121*** (0.386)	-5.921** (2.908)	1.327*** (0.416)
Distance	-3.322*** (0.341)	-0.469*** (0.123)	-3.309*** (0.316)	-0.521*** (0.131)	-3.535*** (0.503)	-0.604*** (0.149)
Gini	-0.166*** (0.030)	0.003 (0.009)	-0.177*** (0.028)	0.013 (0.010)	-0.162*** (0.045)	0.014 (0.012)
# flows	0.0001 (0.0006)	0.009*** (0.0008)	0.00003 (0.0005)	0.009*** (0.0009)	0.0001 (0.0009)	0.005*** (0.001)
Contiguity	-0.055*** (0.336)	1.267*** (0.364)	-0.047 (0.312)		-0.047 (0.312)	
Dummy Sector	Sig(a)	Sig(d)	Sig(b)	Sig(e)	Sig(c)	Sig(f)
# of obs.	194	538	193	516	193	348
Adj. R-squared	0.8485	0.6410	0.8576	0.6104	0.8576	0.5011

(*)siginificative at 10%, (**)significative at 5% and (***)significative at 1%
(a)all sectors are significative positive at 1% except sector 15 at level 10%, and sector 6 which is negative
(b)all sectors are significative positive except sector 15
(c)only sectors 6,13, 17 21, 28 and 49 are significatives,
(d)all sectors are significative positive except sector 36 and 42
(e)all sectors are significative positive except sector 13, 36 and 42
(e)all sectors are significative positive except sector 6 and 42
Source: See Table I

TABLE VI: Estimation (HECKMAN'S METHOD) for MODEL 1 of DVIIT and DHIIT : all countries and selected emergent countries.

	DV ITT		DH IIT	
MODEL 1	ALL REGIONS	SOME COUNTRIES[d]	ALL REGIONS	SOME COUNTRIES[d]
Intercept	-39.93*** (4.721)	-19.22*** (5.656)	-40.81*** (5.141)	-25.01*** (6.049)
Dif CGDP	-0.363*** (0.084)	-0.379*** (0.087)	-0.204** (0.095)	-0.109 (0.094)
Avr. CGDP	1.164*** (0.170)	1.236*** (0.217)	1.868*** (0.189)	2.038*** (0.230)
Dif CGDP pc	-0.031 (0.141)	-0.245 (0.0.164)	-0.175 (0.155)	-0.271 (0.175)
Avr. CGDP pc	2.283*** (0.388)	1.390*** (0.366)	1.445*** (0.374)	1.028*** (0.386)
Distance	-0.657*** (0.097)	-0.517*** (0.115)	-0.800*** (0.115)	-0.520*** (0.131)
Gini	0.019*** (0.008)	0.010 (0.009)	0.029*** (0.010)	0.011 (0.303)
# flows	0.004*** (0.0004)	0.008*** (0.0009)	0.003*** (0.0005)	0.006*** (0.0010)
Contiguity	1.164*** (0.363)		1.611*** (0.374)	
Dummy EU	1.327*** (0.208)		1.502*** (0.224)	
Dummy Sector	Sig[a]	Sig[c]	Sig[b]	Sig[a]
SELECTION EQUATION				
Intercept	-60.75*** (23.06)	-30.53*** (4.217)	-93.32*** (30.60)	-39.93*** (4.721)
Dif CGDP	-0.072 (0.299)	0.512 (0.531)	0.311 (0.396)	1.566** (0.661)
Avr. CGDP	1.975*** (0.572)	4.889*** (1.446)	2.680*** (0.777)	8.181*** (1.922)
Dif CGDP pc	-0.483* (0.281)	-0.705* (0.299)	-0.608** (0.301)	-0.866 (0.349)
Avr. CGDP pc	1.454** (0.648)	1.101 (0.727)	1.861*** (0.701)	2.014 (0.843)
Distance	-0.005 (0.099)	-0.199 (0.0.134)	-0.048 (0.124)	-0.266* (0.163)
Gini	-0.003 (0.006)	0.196** (0.010)	-0.003 (0.009)	0.163 (0.151)
# flows	0.024*** (0.002)	0.190*** (0.002)	0.026*** (0.002)	0.022*** (0.0035)
Contiguity				
Dummy EU	0.057 (0.517)		-0.472 (0.570)	
Dummy Sector	Sig	Sig[a]		Sig[a]
# of obs.	1.459	760	1261	613
# of censored obs	659	225	659	225
# of uncensored obs	800	535	602	388

(*)siginificative at 10%, (**)significative at 5% and (***)significative at 1%

(a)all sectors are significative positive at 1% except sector 15 at level 10% except 6,13,21,36,42

(b)all sectors are significative positive except sector 6,15,36,42

(c)only sectors 6,36 and 42

(d) MNA, CEEC. NIC of ASIA and OCDE countries

Source: See Table I