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Intra−industry trade with emergent countries: what can we learn from spanish data?

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Abstract

In this paper, we study 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 the vertical intra−industry trade between different income countries. According to OLS estimations, technological differences increase DVIIT while physical capital differences lead to its decrease. The results obtained applying the 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 more accurately explained by the proximity of partners, similarity in development level and size of market than by the 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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1. Introduction

An important feature of international trade is the rapid growth of the intra-industry trade and especially the trade of vertical differentiated products. In the last decades, empirical and theoretical research has focused on the determinants of vertical intra-industry trade. According to this literature countries specialize in a quality segment depending on their comparative advantage. Consequently, differences in factor endowments enhance vertical intra-industry trade, just like inter-industry trade.

Thus, this type of two-way trade develops increasingly between high-income countries and emergent countries but only few studies have analysed the determinants of intra-industry trade with this kind of trading partners, mainly because these flows were negligible until the second half 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 the vertical intra-industry-trade between unequal partners.

This paper is organized as follows: the next section introduces 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 contains 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 consumers' preferences for variety, 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 is. As a larger market allows for economies of scale to occur, similar and large markets will also lead to more intra-industry trade. Finally, the more different their capital-labour ratios, the lower intra-industry trade will be.

But products can be differentiated horizontally or vertically. In the first case, products differ in their design, colour or other attributes 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 result of different production functions: 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 as in the Heckscher-Ohlin model (H-O). Vertical differentiated products can also be produced by more or less qualified employees (Gabszewicz *et al.* 1997). More in line with the 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 the Intra-industry Trade

Levels of IIT between Spain and 188 countries were calculated for the period 1988-2000 at the 8-digit level of disaggregation of the EU's Combined Nomenclature (CN). Data were obtained from COMEXT, Eurostat's database. Then, product categories were adapted 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 the 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:

$$IIT_k^j = \sum_{p \in k} IIT_p^j = \sum_{p \in k} 2\min(X_p^j; M_p^j)$$

The 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 classification)[1].

Abd-el-Rahman (1986) assumes that differences in unit value calculated per tonne reflect differences in quality and Greenaway *et al.* (1994) and Fontagné *et al.* (1987) use this methodology to differentiate 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 disaggregated level *p* and 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).

In the case of developing countries, the level of IIT could be concentrated in relatively few groups of products, while the total trade might be insignificant. According to Nillson (1999), the AGL which is unscaled in nature doesn't reflect the absolute level of IIT and can lead to biased estimations. Nillson suggested using the average level of intra-industry trade per product traded as an alternative measure for suitable comparisons of the extent of IIT between small and large countries.

Table II 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 the 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

[1] Even if estimations are performed at the country level, we calculate the intensity of IIT by regions (reg) in order to summarize the most stylized facts in graphs.

be used, when a difference in unit values of more or less 15% is used vertical intra-industry trade volume is correlated at 99% with the measure of vertical IIT when a margin of 25% is used. Similar results are obtained for the horizontal intra-industry trade, indicating that the choice of one of these two values for α, though arbitrary, should not have any substantial effects on the estimation's results. Hence, we will use the IIT volume and a margin of 25%.

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), Latin America, Developing Asian Countries, NIC (Asian New Industrialised Countries), CEEC (Central and Eastern European Countries), NIS (New Independent States, former USSR), MNA (Mediterranean and Northern African Countries), Middle Eastern Countries.

Intra-industry trade (IIT) takes up 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 the total volume of trade with the EU, 13,4% with the other countries of the OECD, 13% with CEEC, 6,2 % with NIC of Asia and 4,9 % with MNA. For all the regions, IIT consists mainly in vertical differentiated products except with CEEC and EU members for which each type of trade represents the same proportion. This fact implies that quality is the main concern for competitiveness. Manufactured products are more differentiated in nature but the industry with the highest level of IIT differs from one region to another. All these facts are supported by data presented in Table III for the year 2000.

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

4. Empirical Model

4.1. Variables that affect the nature of intra-industry trade

We include *differences in the per capita income between Spain and its trading partners* ($DifGDPpc_j$) as an indicator of differences in factor endowments like Greenaway *et al.* (1994) or Durkin and Kryger (2000) for instance. Since we assume that DVIIT should be explained by the comparative advantage, we expect a positive influence of this variable on DVIIT while the effect of this variable should be negative on DHIIT.

Alternatively, we consider other proxies for factor endowment differences, namely investment expenditure per capita (*Dif Invest*), per capita research and development expenditure (*R&D*) and per capita expenditure in education (*Dif Educ*). Since high quality products are supposed to have a stronger intensity in physical, technological and human capital, we expect the differences in these expenditures to enhance the DVIIT. These variables are supposed to describe in a more precise way than GDP per capita the supply side since income per capita also reflects an income effect. For this reason, we also introduce in the alternative model the differences in total consumption expenditure (*Dif Consum*). The similarity of consumer expenditure should reflect more precisely the similarity in preferences and should enhance DHIIT.

We also include the *GINI index of income distribution of the trading partner* ($GINI_j$). The higher the Gini index, the more egalitarian is the income distribution of the trading partner. The predicted sign is negative for DVIIT, since a more unequal distribution of income will favor the demand for a larger spectrum of quality products, and positive for DHIIT since the demand for horizontal differentiated products is a major concern for medium and high-income households. Finally, and following Aturupane (1999), we introduce the variable *Number of flows* built as the number of products traded at the 8-digit level in each industry between Spain and country j. Some industries produce more differentiated goods than others and some of them produce more horizontal than vertical goods. Since horizontal differentiation results in more varieties, we expect this variable to reflect the degree of horizontal differentiation of the industry and a positive sign for when explaining DHIIT. Besides, vertical differentiation is not supposed to increase the number of products traded so we expect a neutral or a negative impact of this variable on DVIIT.

4.2. Variables that affect in the same way DVIIT and DHIIT

We consider two further indicators that influence the trade of differentiated goods in general:
– $DifGDP_j$: Differences in GDP between Spain and its respective trading partner. A big difference in economic size reflects both differences in demand and in supply sizes and is supposed to reduce any kind of IIT.
– $AVGDPpc_j$: average per capita GDP of Spain and its respective trading partner. We assume that IIT is positively related with this variable. First, the demand for variety increases with income. Secondly, the higher the income per capita is, the higher the intensity in capital in relation to labour and the higher the production of differentiated goods[2]

To predict adequately the level of trade, we follow the "gravity" approach of international trade by taking into account the following variables:
– $AvGDP_j$ is the average GDP of Spain and its trading partner *j*. This variable is a measure of market sizes. 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 model, the preference for varieties of consumers is high and 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 differentiated goods since the production of these goods is under increasing returns to scale. The average economic size is, thus, expected to increase the volume of trade.
– $Dist_j$*:* the geographical distance (in km) between the Spanish capital (Madrid) and the capital of country *j* is a proxy for transportation costs. Like any trade barriers, it is supposed to reduce any kind of trade.
– *CodeEU*: a dummy that takes the value 1 if the trading partner belongs to the European Union and 0 if not. We expect that trading partners who maintain lower tariffs and non-tariff barriers, as EU members, should face higher levels of any kind of trade[3].
– *Contiguity:* a dummy that takes the value 1 if the trade partner shares a frontier with Spain.

5. Econometric Results

In the estimation of the model, we consider as dependent variable the volume of total (IITkj), vertical (DVIITkj) and horizontal (DHIITkj) intra-industry trade in order to identify

[2] In the alternative specifications described above (without *DifGDPpc*), we replace $AVGDPpc_j$ by the average levels of investment (*AvInvest)* and consumer *(AvConsum)* expenditures per capita of Spain and its respective trading partner. As for $AVGDPpc_j$ and for the same reasons we expect a positive sign.

[3] 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-tariff barriers by the means 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 belong to the same geographical region as reflected by distance) all these dummies could not be taken into account in the estimation.

differences in their determinants, where *j* represents the Spanish trade partner and *k* the industry[4]. The model is tested in its logarithmic form. We first present the results for the cross-section analysis for the year 1996 estimated by the ordinary least squares (OLS) method followed by the results of the Heckman procedure[5].

5.1. Cross-section Analysis with the OLS Method

The outstanding feature of the OLS estimations (Tables IV.A-C) is the robustness of the results, with most 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 that do not affect the nature of IIT show the expected signs and are significant. Concerning market size, *DifGDP* and *AvGDP* show the expected signs, namely negative and positive. The impact of distance is always negative and very significant. Sharing the same border seems to increase any kind of trade and, as expected, Spanish intra-industry trade with the EU members is higher than predicted by other variables. Finally, *AvGDPpc* (model 1 and 2) and *AvInvest* (model 3, 4 and 5) are associated with more IIT as expected while a higher average in consumer expenditure results in less IIT. This unexpected result may be due to the fact that Spain and the countries considered in this study are really different from a demand size perspective and that most part of this trade is inter-industry trade. This intuition is partly confirmed by the fact that, if we use consumer expenditure per capita instead of total expenditure in consumer goods as presented here, the variables don't seem significant.

Considering the variables that may affect the nature of IIT, $DifGDPpc_j$ affects negatively any kind of IIT, reflecting, that the more similar the endowments are, the higher the level of IIT. This result is not surprising and in line with Nillson (1999), considering unequal partners as was done in this study. This result is more surprising for vertical differentiated products, since imports and exports of similar products differentiated by their quality are expected to increase with differences in factor endowments, while the effect should be the opposite for horizontal differentiated products. In Blanes and Martin (2000) differences in GDP per capita also have a negative influence on any kind of intra-industry trade, whether OECD trading partners are considered or 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 favors the comparative advantage theory or, on the contrary, gives arguments against it.

Conclusions from model 1 and 2 are against the comparative advantage explanation of DVIIT. Using some components of GDP instead of GDP per capita (model 3, 4 and 5) allow to establish more accurately the effect of supply and demand factors. Differences in consumer expenditure do not display the expected sign or are not significant when explaining total IIT or DVIIT while they affect negatively DHIIT. For any kind of IIT, differences in investment expenditure have a negative influence and we do not observe any differences between the influences of this variable on vertical or horizontal differentiated goods. Differences in research and development expenditure increase the IIT. The influence of technology

[4] It is according to the NACE CLIOR25 nomenclature

[5] Panel data estimations of each type of IIT and tobit estimations on panel data for the AGL index have also been carried out. We omit the estimation of the AGL for two reasons. First, the estimation of volume of IIT is more consistent with the gravity specification. Secondly, given the heterogeneity of countries we consider, the AGL index could be the same whether the total volume of trade is significant or not.

differences seems to be confirmed here, like it is in the studies of Mora (2002) for intra-EU trade and of Blanes and Martin (2000) for the Spanish case, where differences in human capital or technological capital have a more obvious positive effect on DVIIT than physical capital differences. In our study, human capital measured by differences in spending on education per capita have a negative effect on each type of intra-industry trade. Though, our result may be due to the bad quality of the proxy used.

Results from the OLS estimations show that technological differences unambiguously enhance intra-industry trade, while differences in physical and human capital have a significant negative effect on both types of intra-industry trade, and confirm that the similarity of demand is an important determinant of DHIIT. Without forgetting the important results obtained from models 3, 4 and 5[6], next we focus on model 1 since the results of all these models are quite similar.

In our opinion determinants of IIT and DVIIT differ slightly if we consider similar countries like EU members or partners more heterogeneous as far as tastes and levels of development are concerned. We have been looking for more evidence for or against the comparative advantage explanation of vertical intra-industry trade by estimating model 1 for EU countries on the one hand and other countries[7] on the other hand (Table V). The obtained results are significant. In this case, the differences in GDP per capita still influence negatively DVIIT for others countries (and thus overall IIT), but are not significant for DHIIT, nor can they 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 other countries while it reduces IIT in the case of the EU.

5.2. Cross-section estimation with the Heckman method

One problem of the estimations proposed in the previous section is that they are driven only on flows that present a non-zero value, since we use the logarithmic transformation of the IIT volume. We argue that we should take into account the determinants of overall IIT when considering the difference between determinants of vertical *versus* 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 concern horizontal or vertical differentiated products. Since these shares are very low in some cases, and we think that the determinants of IIT could differ strongly if countries share specific characteristics, we decided to use the Heckman estimation method that allows taking into account this selection effect. It consists in estimating separately a probit equation and an OLS equation. Thus, prior to the estimation of equation above for DVIIT and DHIIT, we define a binary variable D_{ij} according to the following scheme:

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

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:

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

[6] Variables in Model 5 are considered with a lag of one period.
[7] Namely countries from OECD, Asia, Latin America, MNA and CEEC.

The statistically significant variables will contribute to explain exclusively the probability of appearance of intra-industry trade flows. The next step consists in studying the determinants of DVIIT and DHIIT, 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 carried out for two different sets of countries: first, all countries, and then MNA, CEEC, NIC of ASIA and OECD countries, excluding EU and countries with the lowest income. Table VI displays the results for both, probit estimation (selection equation) and OLS estimation.

We analyse first 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, the results of the probit estimation in table VI are directly comparable with model 1 in table IV.A. All the variables show the expected sign or are not significant indicating that the variables used explain more accurately the level of IIT volume than the reason why some bilateral flows consist in inter or intra-industry trade. This is particularly the case for differences in market size (*DifGDP*), that are 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 the probability of IIT to occur is higher, when market size are higher. 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 occur. With regard to the remaining variables, nor distance nor the GINI index have a significant impact on the probability to engage in IIT.

In the second stage of the estimation we explain the level of vertical or horizontal intra-industry trade. Here, different patterns are achieved since differences in market size have a negative and significant impact on the volume of IIT (regardless of its nature) but differences in factor endowments don't have a significant effect in determining the level of IIT. Thus, distance, GINI and the dummies for contiguity and EU membership present the expected signs, while they fail to explain the probability of IIT to occur.

6. Conclusions

In this paper, we have studied 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 a comparative advantage affects DVIIT. According to OLS estimations, technological differences increase DVIIT, while physical capital differences lead to its decrease. Results obtained with the Heckman method support the idea that differences in physical capital 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, have the same impact on vertical and horizontal IIT with emergent countries.

7. References

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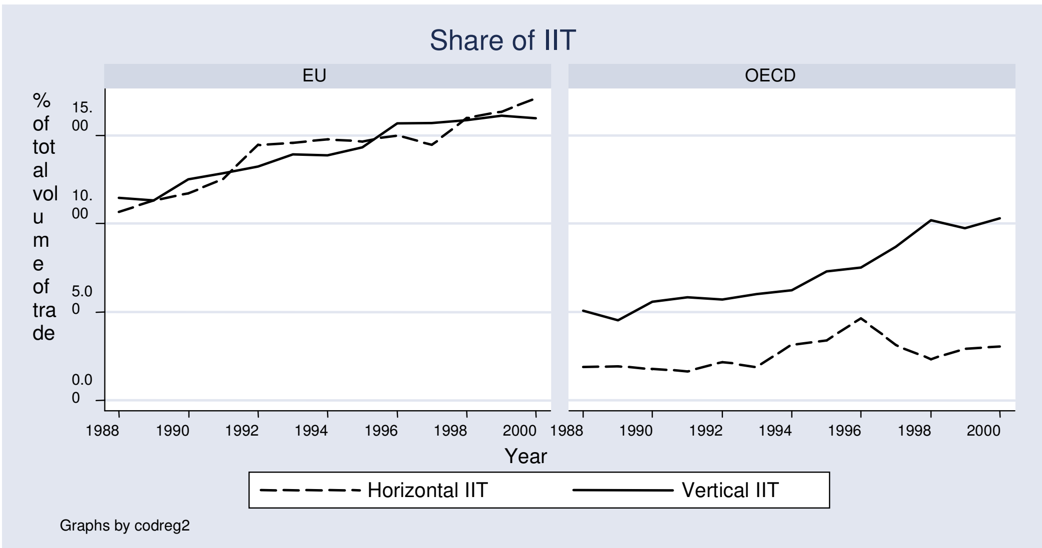
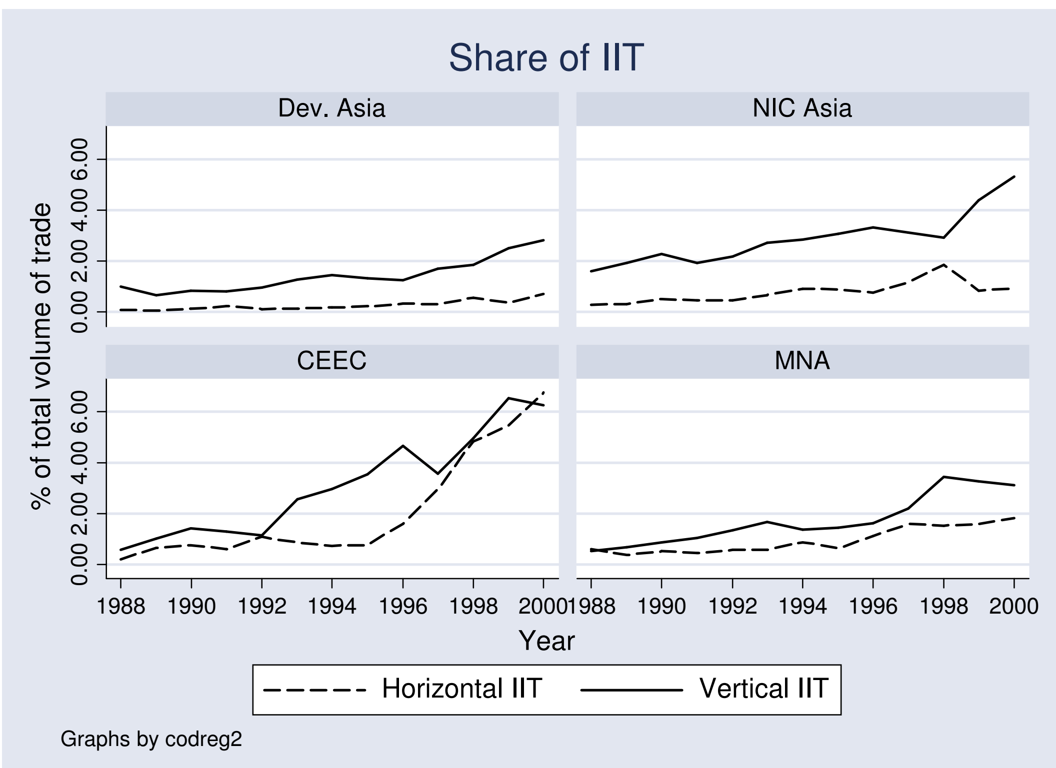
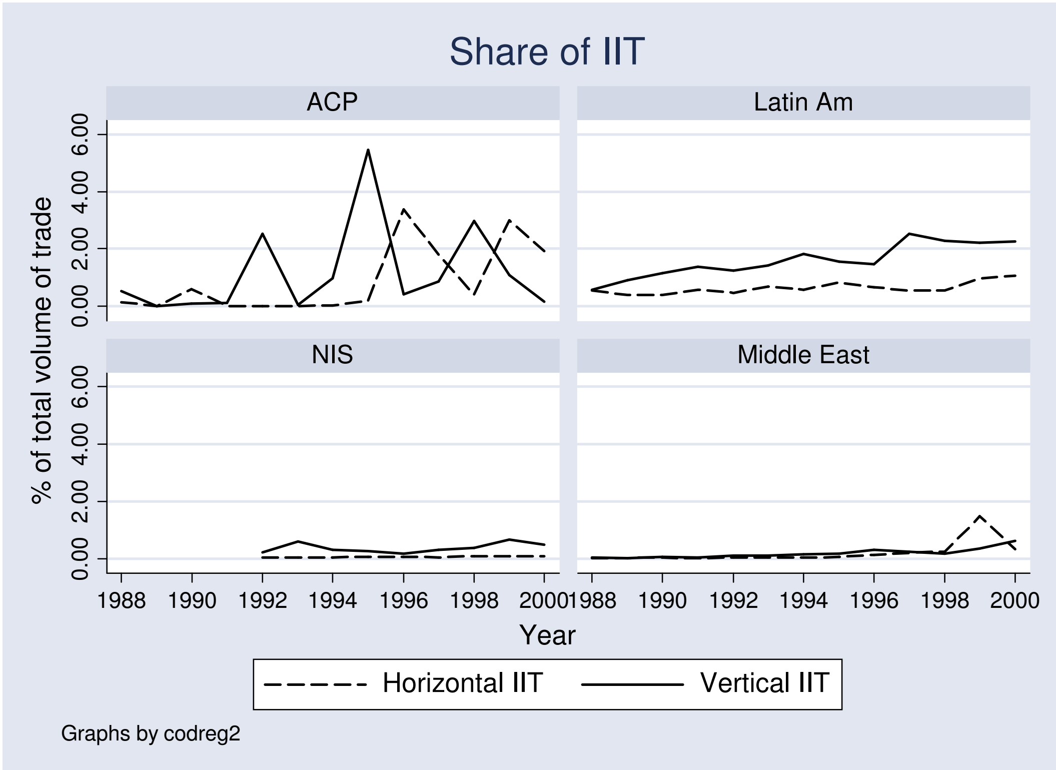
8. Appendix of Tables and Graphs

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

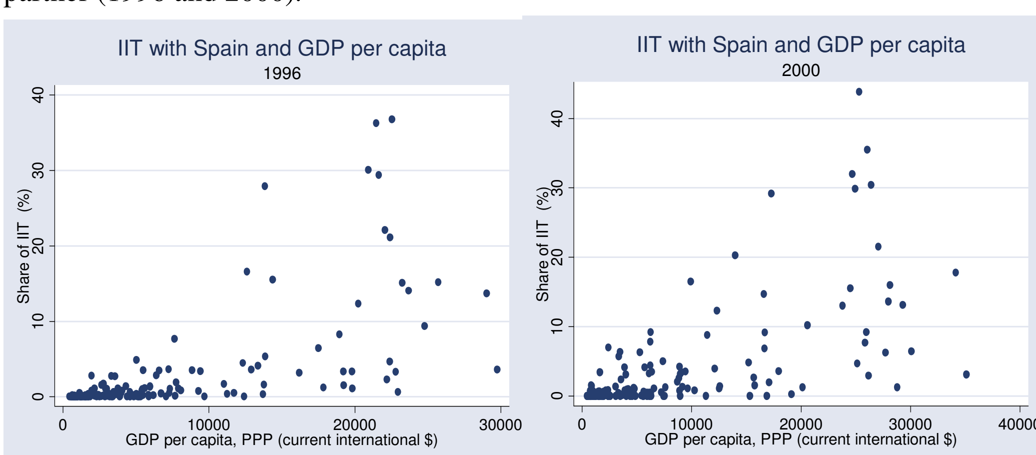






Source: See Table I

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 $)	WDI database
Distance	Distance in km between capitals	CEPII database
CConsum	Final total consumption expenditure (current US$)	WDI database
CInvest	Gross capital formation per capita (current US$ per capita)	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 to the EU (15)	CEPII database

Table II: Correlations between alternative measures of trade types (Spanish trade, 1996, #obs: 188).

All products	IIT vol.	DVIIT Vol.(α=.25)	DHIIT vol.(α=.25)	DVIIT vol.(α=.15)	DHIIT vol.(α=.15)	IIT Vol /nº prod.	IIT AGL	DVIIT AGL(α=.25)	DHIIT AGL(α=.25)	DVIIT AGL(α=.15)	DHIIT AGL(α=.15)
IIT volume	1.0000										
DVIIT vol (α=.25)	0.9818	1.0000									
DHIIT vol (α=.25)	0.9822	0.9287	1.0000								
DVIIT vol (α=.15)	0.9804	0.9991	0.9269	1.0000							
DHIIT vol (α=.15)	0.9351	0.8524	0.9834	0.8471	1.0000						
IIT Vol/ nºproducts	0.9588	0.9454	0.9377	0.9453	0.8871	1.0000					
IIT AGL	0.7761	0.7815	0.7430	0.7899	0.6735	0.8275	1.0000				
DVIIT AGL(α=.25)	0.7177	0.7529	0.6572	0.7579	0.5736	0.7246	0.9103	1.0000			
DHIIT AGL α=.25)	0.6955	0.6702	0.6956	0.6806	0.6527	0.7822	0.9105	0.6578	1.0000		
DVIIT AGL (α=.15)	0.7373	0.7702	0.6784	0.7791	0.5884	0.7454	0.9286	0.9900	0.7011	1.0000	
DHIIT AGL (α=.15)	0.5819	0.5397	0.6027	0.5445	0.5909	0.6884	0.7854	0.4738	0.9562	0.4997	1.0000

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 industry: 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 mineral 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 Other 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 industry: 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 Other 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	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-52.33***	-54.11***	-27.87***	23.37***	-2.888*
	(4.464)	(4.288)	(10.59)	(3.797)	(1.74)
Dif CGDP	-0.511***	-0.643***	-2.514***		
	(0.081)	(0.075)	(0.445)		
Av. CGDP	2.258***	2.527***	5.058***		
	(0.163)	(0.153)	(0.462)		
Dif CGDP pc	-0.432*	-0.208**			
	(0.136)	(0.107)			
Av. CGDP pc	2.749***	2.223***			
	(0.33)	(0.278)			
Distance	-0.813***	-0.614***	-2.745***	-2.163***	-0.430***
	(0.097)	(0.090)	(0.299)	(0.345)	(0.176)
Dif Consum			1.341***	-0.092	-0.300
			(0.291)	(0.265)	(0.201)
Dif Invest.			-1.431***	-1.008***	
			(0.180)	(0.204)	
Dif Invest Lag					-0.596***
					(0.200)
Av Consum.			-5.706***	-4.729***	0.095
			(0.780)	(0.923)	(0.228)
Av Invest.			5.679***	6.220***	
			(0.763)	(0.894)	
Av Invest.Lag					1.315***
					(0.248)
R & D			0.438***	0.540***	0.233**
			(0.127)	(0.149)	(0.108)
Education			-0.054	-0.560***	
			(0.185)	(0.209)	
Education Lag					0.004
					(0.194)
Gini	0.016*		-0.090***	-0.004	0.065***
	(0.009)		(0.019)	(0.20)	(0.016)
# flows	0.004***	0.004***	0.0008	0.003***	0.005***
	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0005)
Contiguity	1.126***	1.267***	-0.214	1.870***	1.586***
	(0.354)	(0.364)	(0.463)	(0.503)	(0.493)
CodeEU	1.249***	1.658***	1.179***	3.212***	2.301***
	(0.204)	(0.202)	(0.322)	(0.336)	(0.269)
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	0.834	0.760	0.699

(*)statistically significant a at 10%, (**)statistically significant at 5% and (***)statistically significant at 1%
(a)all sectors are statistically significant and positive at 1% except sector 6 which is negative at level 10%
(b)all sectors are statistically significant and positive except sector 6 and sector 42
Source: See Table I

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

DV ITT	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-49.74*** (4.562)	-52.68*** (4.351)	-24.23** (10.74)	24.09*** (3.854)	-1.831 (1.677)
Dif CGDP	-0.521*** (0.081)	-0.637*** (0.075)	-2.601*** (0.451)		
Av. CGDP	2.031*** (0.169)	2.393*** (0.156)	5.046*** (0.468)		
Dif CGDP pc	-0.303** (0.139)	-0.118 (0.108)			
Av. CGDP pc	2.972*** (0.327)	2.343*** (0.284)			
Distance	-0.799*** (0.100)	-0.627*** (0.093)	-2.756*** (0.304)	-2.168*** (0.350)	-0.373** (0.170)
Dif Consum			1.635*** (0.793)	0.160 (0.270)	-0.111 (0.193)
Dif Invest.			-1.493*** (0.185)	-1.057*** (0.209)	
Dif Invest Lag					-0.632*** (0.192)
Av Consum.			-6.135*** (0.793)	-5.172*** (0.935)	-0.086 (0.220)
Av Invest.			5.811*** (0.777)	6.402*** (0.906)	
Av Invest.Lag					1.288*** (0.238)
R & D			0.446*** (0.129)	0.552*** (0.150)	0.230** (0.104)
Education			0.048 (0.187)	-0.460** (0.212)	
Education Lag					0.081 (0.187)
Gini	0.022** (0.009)		-0.095*** (0.019)	-0.008 (0.020)	0.060*** (0.016)
# flows	0.004*** (0.0004)	0.004*** (0.0004)	0.0009 (0.0006)	0.003*** (0.0006)	0.005*** (0.0005)
Contiguity	0.969*** (0.360)	1.116*** (0.366)	-0.498 (0.469)	1.575*** (0.508)	1.404*** (0.472)
CodeEU	1.190*** (0.209)	1.570*** (0.206)	1.507*** (0.329)	3.028*** (0.342)	2.080*** (0.260)
Dummy Sector	Sig(a)	Sig(b)	Sig	Sig(a)	Sig(a)
# of obs.	800	968	313	313	455
Adj. R-squared	0.736	0.706	0.822	0.742	0.704

(*)Statistically significant at 10%, (**) Statistically significant at 5% and (***)Statistically significant at 1%
(a)all sectors are statistically significant and positive at 1%, only sector 36 at 5% and sector 42 at 10%
(b)all sectors are statistically significant an 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	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-45.50***	-41.52***	-44.21***	17.11***	-0.424
	(5.067)	(4.780)	(13.65)	(5.892)	(2.172)
Dif CGDP	-0.267***	-0.366***	-1.704**		
	(0.095)	(0.087)	(0.681)		
Av. CGDP	2.049***	1.960***	4.847***		
	(0.189)	(0.177)	(0.698)		
Dif CGDP pc	-0.299**	-0.135			
	(0.157)	(0.124)			
Av. CGDP pc	1.759***	1.671***			
	(0.368)	(0.316)			
Distance	-0.883***	-0.700***	-2.594***	-1.804***	-1.211***
	(0.118)	(0.108)	(0.482)	(0.513)	(0.214)
Dif Consum			0.638	-0.754**	-0.768***
			(0.477)	(0.359)	(0.246)
Dif Invest.			-1.079***	-0.507*	
			(0.302)	(0.309)	
Dif Invest Lag					0.021
					(0.253)
Avr Consum.			-4.619*	-1.755	0.273
			(1.416)	(1.539)	(0.279)
Avr Invest.			4.899***	3.467**	
			(1.390)	(1.564)	
Avr Invest.Lag					1.050***
					(0.309)
R & D			0.454***	0.374**	0.326***
			(0.161)	(0.181)	(0.126)
Education			-0.263	-0.640***	
			(0.236)	(0.250)	
Education Lag					-0.447*
					(0.250)
Gini	0.028***		-0.071***	-0.030	0.108***
	(0.011)		(0.031)	(0.027)	(0.020)
# flows	0.003***	0.003***	0.0007	0.003***	0.005***
	(0.0005)	(0.0005)	(0.0008)	(0.0008)	(0.0006)
Contiguity	1.543***	1.785***	0.554	2.352***	1.482***
	(0.381)	(0.379)	(0.590)	(0.592)	(0.555)
CodeEU	1.447***	1.568***	1.682***	2.972***	2.051***
	(0.231)	(0.223)	(0.467)	(0.452)	(0.320)
Dummy Sector	Sig(a)	Sig(b)	Sig(c)	Sig(b)	Sig(b)
# of obs.	604	715	252	252	383
Adj. R-squared	0.696	0.674	0.751	0.675	0.636

(*)statistically significant at 10%, (**)statistically significant at 5% and (***)statistically significant at 1%
(a)all sectors are statistically significant and positive except sectors 6, 15, 36 Y 42
(b)all sectors are statistically significant and positive except sectors 6, 15, 19, 36 Y 42
(cb)all sectors are statistically significant and 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	EU	Emergent countries	EU	Emergent countries	EU	Emergent 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

(*)statistically significant at 10%, (**) statistically significant at 5% and (***)statistically significant at 1%
(a)all sectors are statistically significant and positive at 1% except sector 15 at level 10%, and sector 6 is negative
(b)all sectors are statistically significant and positive except sector 15
(c)only sectors 6,13, 17 21, 28 and 49 are statistically significant,
(d)all sectors are statistically significant and positive except sector 36 and 42
(e)all sectors are statistically significant and positive except sector 13, 36 and 42
(e)all sectors are statistically significant and 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 countries	Emergent countries [(d)]	All countries	Emergent countries [(d)]
Intercept	-39.93***	-19.22***	-40.81***	-25.01***
	(4.721)	(5.656)	(5.141)	(6.049)
Dif CGDP	-0.363***	-0.379***	-0.204**	-0.109
	(0.084)	(0.087)	(0.095)	(0.094)
Av. CGDP	1.164***	1.236***	1.868***	2.038***
	(0.170)	(0.217)	(0.189)	(0.230)
Dif CGDP pc	-0.031	-0.245	-0.175	-0.271
	(0.141)	(0.0.164)	(0.155)	(0.175)
Av. CGDP pc	2.283***	1.390***	1.445***	1.028***
	(0.388)	(0.366)	(0.374)	(0.386)
Distance	-0.657***	-0.517***	-0.800***	-0.520***
	(0.097)	(0.115)	(0.115)	(0.131)
Gini	0.019***	0.010	0.029***	0.011
	(0.008)	(0.009)	(0.010)	(0.303)
# flows	0.004***	0.008***	0.003***	0.006***
	(0.0004)	(0.0009)	(0.0005)	(0.0010)
Contiguity	1.164***		1.611***	
	(0.363)		(0.374)	
CodeEU	1.327***		1.502***	
	(0.208)		(0.224)	
Dummy Sector	Sig[(a)]	Sig[(c)]	Sig[(b)]	Sig[(a)]
SELECTION EQUATION				
Intercept	-60.75***	-30.53***	-93.32***	-39.93***
	(23.06)	(4.217)	(30.60)	(4.721)
Dif CGDP	-0.072	0.512	0.311	1.566**
	(0.299)	(0.531)	(0.396)	(0.661)
Av. CGDP	1.975***	4.889***	2.680***	8.181***
	(0.572)	(1.446)	(0.777)	(1.922)
Dif CGDP pc	-0.483*	-0.705*	-0.608**	-0.866
	(0.281)	(0.299)	(0.301)	(0.349)
Av. CGDP pc	1.454**	1.101	1.861***	2.014
	(0.648)	(0.727)	(0.701)	(0.843)
Distance	-0.005	-0.199	-0.048	-0.266*
	(0.099)	(0.0.134)	(0.124)	(0.163)
Gini	-0.003	0.196**	-0.003	0.163
	(0.006)	(0.010)	(0.009)	(0.151)
# flows	0.024***	0.190***	0.026***	0.022***
	(0.002)	(0.002)	(0.002)	(0.0035)
Contiguity				
CodeEU	0.057		-0.472	
	(0.517)		(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

(*)statistically significant at 10%, (**)statistically significant at 5% and (***)statistically significant at 1%
(a)all sectors are statistically significant and positive at 1% except sector 15 at level 10% except 6,13,21,36,42
(b)all sectors are statistically significant and 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