FDI and Trade in Portugal: a gravity analysis

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ABSTRACT

This study investigates the relation between the stock of foreign direct investment (FDI) and the geographical pattern of trade flows in the Portuguese economy. The gravity model is applied to bilateral trade between Portugal and OECD countries plus Brazil from 1998 to 2000. The stock of inward FDI is positively related to trade suggesting the existence of complementary between the two. This effect is stronger on exports than on imports resulting in a positive impact on trade balance. It is also found that the stock of outward FDI has no significant relation either with Portuguese exports or imports. Finally, FDI helps to explain the above "normal" exports to the EU and the below "normal" imports from Candidate Countries.

JEL codes: F1, F4.

Keywords: International Trade, Foreign Direct Investment, and Gravity Model.

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I. INTRODUCTION

In the Portuguese economy traditional sectors - textile, apparel, shoemaking, and other consumer goods industries - have an above average weight in production, employment and exports compared to most developed economies. This specificity is expected to enhance the adjustment pressures associated with greater integration within the EU – with the eastern enlargement - and greater integration in world economy under the multilateral negotiations of WTO – Doha round. Several opinions point to the crucial role that foreign direct investment (FDI) has played in changing the specialization of Portuguese economy (Gonçalves and Guimarães, 1996). Yet, it is noticed that, in recent years, FDI was negative with some multinational enterprises (MNEs) moving their facilities to more advantageous locations (eastwards to candidate countries, or elsewhere). In these circumstances, it seems crucial to understand how FDI relates to trade in the Portuguese economy. Theoretical models discuss and present the circumstances under which FDI and trade are complementary – e.g. they have a positive relation - and those in which FDI and trade are substitutes – e.g. they have a negative relation. The nature of that relationship does have distinct implications for economic development and for policy making and needs to be clarified in the Portuguese economy.

UNCTAD (1996) and WTO (1996) point to the fact that there is contradictory evidence to argue on the impossibility of a general conclusion about the relationship between FDI and trade. They also suggest that findings of complementary or substitutes should be cautiously used for policy purposes. Despite the strong theoretical support for a substitute relation between trade and FDI the fact is that empirical research has found little evidence to support it (Frank and Freeman, 1978; Cushman, 1988; Blonigen, 2001). On the other hand, there is quite a large empirical evidence that FDI and trade

have a complementary relation (Lipsey and Weiss 1981, 1984; Grubert and Mutti, 1991; Blomstrom and Kokko, 1994; Pfaffermayr, 1996; Brenton et al., 1999; Clausing, 2000; Muchieli et al., 2000).

This paper researches how the stock of FDI – inward and outward – affects the pattern of Portuguese trade – imports and exports. The paper is organised as follows: section two reviews the literature on the complementary versus substitute relation between trade and FDI; section three presents the gravity model; section four informs on the data and sample; section five reports the results and section six concludes.

II. LITERATURE REVIEW

Traditionally, trade theories were developed in frameworks that assumed the international immobility of production factors. Yet, the activities of multinational enterprises (MNEs) have been growing since the Second World War, particularly among developed economies. These growing flows and stocks of FDI could not be ignored by trade theories and there is a stream of the theoretical research that takes into consideration the existence of MNEs along side with national enterprises (NEs). This is done within a variety of general equilibrium trade models that are in line with the new trade theories. Overall, the theory reveals that, depending on the circumstances FDI and trade may have a complementary, as well as, a substitute relationship. This brief review of the literature follows closely the work by Forte (2004).

Complementary, between trade and FDI, is normally found when foreign investment is vertical, meaning that the MNE fragments/splits the production process across countries in order to reduce costs. In these type of models, as is the case of Helpman (1984), and Grossman and Helpman (1991), the differences in relative factors endowments between countries play a determinant role in explaining both trade and

FDI. They are particularly useful to explain FDI from developed into developing economies. Complementary is still possible when countries have identical endowments, preferences and technology. Markusen (1984) additionally assumes multi-plant economies of scale, and distinguishes firm/headquarter specific activities– R&D, marketing, distribution - from plant specific activities, that refer to the production process. One possible solution for the model is a multinational monopoly, in witch headquarter activities concentrate at the home country and the production plant goes to the host country, originating bilateral trade – headquarter services and final goods.

FDI substitutes trade when the investment is horizontal, meaning that the MNE produces the same goods and services in different countries. This is the most common type of FDI and refers to bilateral investments between developed economies. Some trade models that include horizontal MNEs assume similarity between countries – in size, endowments and technology – plus economies of scale at the firm and plant levels. In these circumstances the models by Hortsman and Markusen (1992) and Brainard (1993) show that the equilibrium depends on the trade-off between proximity to the market and the concentration of production facilities. In other words, these models admit alternative solutions depending on the relative size of firm's scale economies, transaction costs – including transport plus barriers to trade and investment – and plant scale economies. High transport costs and plant scale economies favours horizontal FDI that maybe associate with distinct equilibriums. In their model HM found a multinational monopoly solution and a multinational duopoly solution and in both cases FDI substitutes trade. The Brainard's model also admits solutions with MNEs, a pure multinational equilibrium – trade in final goods is fully substituted by trade in headquarter services - and a mixed equilibrium where both type of enterprises exist as well as trade. On the other hand, Markusen and Venables (1998, 2000), Egger and

Pfaffermayer (2002) research the convergence hypothesis, i.e., starting with the assumption of asymmetry between countries they demonstrate that the convergence in terms of size, endowments and income increases the activities of MNEs. As multinational enterprises displace national enterprises the volume of trade decreases, meaning that FDI substitutes trade.

Finally, trade models by Markusen (1997, 2000) and Carr et al. (2001) admit both vertical and horizontal FDI and consequently there are solutions that admit both complementary as well as substitution between FDI and trade.

Explanatory theories from the International Business literature typically look at FDI and trade as alternative modes of entry in foreign markets. The internalization theory, developed by Buckley and Casson (1976), says that a firm will enter a foreign market trough FDI when alternative entry modes, namely exports, have associated higher transaction costs. Dunning (1979) uses the OLI paradigm to explain that a firm may choose FDI instead of exports when possesses ownership advantages, when the foreign market has location advantages – access to a big domestic market or production resources – and when there is advantages of internalizing market access operations. In this case, FDI and trade can be substitutes as well as complementary depending on which of those advantages was determinant for the investment decision.

Most empirical research on this topic has looked for how changes on FDI correlate to changes on trade and vice versa. In other words, they have questioned whereas systematic changes on FDI are related to systematic changes on trade, in particular if trade and FDI are substitutes (negative correlation) or complementary (positive correlation). These studies have not questioned or researched the direction of causality between FDI and trade. They also have distinct focus, namely at country, sector, firm and product levels.

Several studies find evidence of a substitute relation between FDI and trade, Frank and Freeman (1978), Cushman (1988) and Blonigen (2001) yet, there is much more empirical evidence on complementary. At firm level studies, Lipsey and Weiss (1984), Head and Ries (2001) stress the positive effect that foreign production has on exports (intermediate goods) from the home firm to the host country, while Mucchielli et. al. (2000) calls the attention to the possibility of complementary between FDI and intra-firm trade at the same time that substitution occurs between FDI and inter-firm trade. Pfaffermayr (1996) and Brainard (1997) find complementary in industry level studies. Finally, at country level studies Grubert and Mutti (1991), Blomstrom and Kokko (1994), Eaton and Tamura (1994), Brenton et al. (1999), Clausing (2000), and Hejazi and Safarian (2001) also find complementary. In several of these studies the gravity model approach is used with success.

III. THE GRAVITY MODEL

This model applies the Newtonian idea to the study of trade between countries and assumes that trade between any two countries is positively affected by their income (mass) and negatively affected by their distance. The pioneer studies by Tinberg (1962) and by Linneman (1966) were criticised based on the lack of theoretical foundations for the gravity equation. Yet, over the years, this limitation has been overcome with the contributions of several authors. Anderson (1979) supports the gravity approach preferences with constant substitution elasticities for goods that are differentiated according to their country of origin. Bergstrand (1989), Deardorf (1998), Evenett and Keller (2002) among others have shown that the gravity equation can be the reduced form of trade models that incorporate both Hecksher-Ohlin determinants as well as monopolistic competition structures with economies of scale and product

differentiation. The basic gravity model takes the following logarithmic form:

$$\ln T_{ij} = \beta_0 + \beta_1 \ln Y_i Y_j + \beta_2 \ln Dist_{ij} + \mu_{ij} \quad (1)$$

Where T_{ij} is the value of country i imports from (or exports to) country j, $Y_i Y_j$ stands for the GDP of countries i and j respectively, and $Dist_{ij}$ is the geographical distance between capitals. The GDP captures the market dimension and is expected to have a positive effect on trade between pairs of countries, while distance is a proxy to transport costs and has a negative effect.

The basic model has been modified in a variety of studies trough the inclusion of additional explanatory variables in order to capture different factors that facilitate or obstruct trade between countries. Per capita income (Y_{pc}) is included to capture the degree of similarity between countries in terms of economic development. It is expected to have a positive impact on bilateral trade as countries with higher levels of development are more prone to trade and have similar demand structures, Ethier (1982) and Frankel et al. (1995). Also the existence of a common border ($Bord_{ij}$) and a common language ($Lang_{ij}$) is seen as reducing transaction costs, thus favouring trade. Equation 2 incorporates these variables and represents the basic model to be used in this study:

$$\ln T_{ij} = \beta_0 + \beta_1 \ln Y_i Y_j + \beta_2 \ln Ypc_i Ypc_j + \beta_3 \ln Dist_{ij} + \beta_4 Bord_{ij} + \beta_5 Lang_{ij} + \mu_{ij} \quad (2)$$

Also, belonging to a trade bloc means the existence of trade preferences and is the reason for above "normal" intra-bloc trade. To test this hypotheses the model is further extended to include several geographical dummies. In particular, the EU variable tries to single out trade between Portugal and other EU's members which, given the long process of economic integration, must show a positive impact. The other dummies stand for the remaining countries in the sample according to their regional location:

candidate countries (CC) includes some central and eastern European countries[1] plus Turkey, Asia for the Asian countries,[2] America for NAFTA countries plus Brazil, and Oceania for Australia and New Zealand. Equation 3 includes all these variables:

$$\ln T_{ij} = \beta_0 + \beta_1 \ln Y_i Y_j + \beta_2 \ln Ypc_i Ypc_j + \beta_3 \ln Dist_{ij} + \beta_4 Bord_{ij} + \beta_5 Lang_{ij} + \\ + \beta_6 EU + \beta_7 CC + \beta_8 Asia + \beta_9 America + \beta_{10} Oceania + \mu_{ij} \quad (3)$$

Finally, the gravity equation is also extended to include two FDI stock variables: $FDIin_{ij}$ – FDI stock of country j in country i (Portugal); and $FDIout_{ij}$ – stock of FDI of country i (Portugal) in country j. The main objective is to test for the complementary or substitute relation between the stock of FDI and trade flows. Equation 4 accomplishes these purposes:

$$\ln T_{ij} = \beta_0 + \beta_1 \ln Y_i Y_j + \beta_2 \ln Ypc_i Ypc_j + \beta_3 \ln Dist_{ij} + \beta_4 Bord_{ij} + \beta_5 Lang_{ij} + \\ + \beta_6 EU + \beta_7 CC + \beta_8 Asia + \beta_9 America + \beta_{10} Oceania + \\ + \beta_{11} FDIin_{ij} + \beta_{12} FDIout_{ij} + \mu_{ij} \quad (4)$$

Thus, equations 2, 3, and 4 constitute the basis for the empirical research in this study.

IV. DATA

To test the relationship between trade and FDI in the Portuguese economy we use a sample of OECD countries plus Brazil. Bilateral trade between Portugal and these 28 countries[3] account, on average, for 89% of Portuguese exports and 87% of Portuguese imports. As for investment, these countries are the source of 90% of inward FDI and the destination of 91% of the outward FDI of Portuguese economy.

[1] Czech Rep., Hungry, and Poland.
[2] Japan and Korea.
[3] Within EU15, Belgium and Luxembourg are taken together.

For most variables average values for the period 1998 to 2000 are used. This follows similar procedure applied in other cross-section studies with the advantage of capturing the lagged effects between investment and trade, and smoothing out atypical values for particular years.

Values of Portuguese bilateral trade were taken from the OECD Statistical directory at current USD. These values were converted into the 1995 base year prices through the consumer price index from the International Financial Statistics. Only the trade in goods is included, meaning that trade in services is not taken into account in this study.

Values of the explanatory variables GDP per capita, and population are from the Penn world table (PWT 6.1). The GDP per capita is in purchase power parity of 1996, and values for the other years were calculated with the Chain index. The GDP values were obtained from the GDP per capita and population values. Inward and outward FDI are from the OECD International Direct Investment Database, in millions of escudos, and than converted in USD with the yearly average exchange rate from the IMF, International Financial Statistics CD-ROM (June 2002). The variable distance is measured in kilometres and refers to the great circle distance between Lisbon and each capital of countries included in the sample.

V. RESULTS

The gravity equation is first applied to Portuguese imports and than to Portuguese exports. In each case three different sets of regressions were run: the first one refers to the basic gravity model – corresponding to equation 2. The second set of regressions refers to the gravity model – equation 3 - including dummies that capture particular geographical patterns, namely trade preferences with the EU and than trade

with candidate countries, and other regional groups - America, Asia and Oceania. Finally, equation 4 is regressed with the introduction of Portuguese inward and outward FDI. The analysis is a cross-section one with a OLS estimation. The hypotheses of heteroskdasticity are rejected as the White heteroskdasticity test was applied to all regressions.

Gravity Equation of Portuguese Imports

Table 1 reports the regression results of the gravity model applied to Portuguese bilateral imports. The first column reports the estimates of the basic model – equation 2. The results indicate that GDP and distance have the expected signs and are significant at the 1 percent level. Per capita GDP appears to have no effect on Portuguese imports but this result is not surprising considering that per capita GDPs varies little across most of the countries in the sample. The estimates of variables Lang – common language with Brazil - and Bord – common border with Spain – are not statistically significant, meaning that Portuguese imports from those countries are not above their normal values as given by the gravity determinants. This result may be explained by the fact that each of those dummies apply only to one trade partner. This basic conclusion is not changed upon addition of regional variables and FDI variables and for that reason those variables were excluded from the other specifications of the gravity equation.

Table 1 Regression Results for Portuguese bilateral Imports

		A	B	C	D	E
$\ln Y_i Y_j$	β	**0.523**	**0.548**	**0.582**	**0.391**	**0.361**
	σ	(0.136)	(0.128)	(0.123)	(0.111)	(0.091)
	P-value	0.001	0.000	0.000	0.003	0.001
$\ln Ypc_i Ypc_j$	β	**0.616**	**0.227**	**0.146**	**-0.183**	**0.034**
	σ	(0.449)	(0.462)	(0.384)	(0.359)	(0.292)
	P-value	0.183	0.627	0.708	0.616	0.907
$l\text{nDist}_{ij}$	β	**-1.163**	**-1.016**	**-0.995**	**-0.634**	**-0.736**
	σ	(0.286)	(0.311)	(0.365)	(0.235)	(0.244)
	P-value	0.001	0.003	0.013	0.015	0.008
$Lang_{ij}$	β	**0.987**				
	σ	(1.197)				
	P-value	0.418				
Bordij	β	**0.657**				
	σ	(1.226)				
	P-value	0.597				
EU	β		**0.544**		**0.049**	
	σ		(0.555)		(0.405)	
	P-value		0.337		0.906	
CC	β			**-1.439**		**-0.093**
	σ			(0.532)		(0.490)
	P-value			0.014		0.851
Asia	β			**0.395**		**1.048**
	σ			(0.890)		(0.596)
	P-value			0.662		0.097
America	β			**-0.622**		**-0.965**
	σ			(0.713)		(0.585)
	P-value			0.393		0.117
*Ocean*ia	β			**-1.130**		**0.533**
	σ			(1.019)		(0.734)
	P-value			0.280		0.478
$\ln FDIin_{ij}$	β				**0.314**	**0.305**
	σ				(0.061)	(0.057)
	P-value				0.000	0.000
$\ln FDIout_{ij}$	β				**-0.027**	
	σ				(0.051)	
	P-value				0.604	
Observations.:		28	28	28	24	26 b)
F((k-1),(n-k)):		8.288	10.80	9.90	21.19	22.88
Prob>F:		0.000	0.000	0.000	0.000	0.000
Adj.R-squared:		0.574	0.592	0.698	0.84	0.875

Source: own calculations. Estimates in bold, standard deviation in brackets.
All variables, except dummies, are in logs. Estimation method: OLS.

Columns B and C show the regressions of the extended gravity model that includes regional dummy variables. The former includes the EU dummy that is not statistically significant. When the EU is excluded from the regression the remaining regional dummies indicate how Portuguese trade with each region differs from that with the EU given their respective market size and distance. The coefficient of CC - candidate countries – is negative and statistically significant. The interpretation is that Portuguese imports from CCs are below average level (-76.3%) of imports coming from current EU members, after controlling for distances and market sizes. It seems that, in the Portuguese economy, there is scope for further trade adjustments with these countries as their EU membership has not been fully accommodated. The other regional dummy's coefficient – America, Oceania, Asia - are not statistically significant meaning that Portuguese imports coming from these regions do not deviate from expected values given their market sizes and distances.

Columns D and E report the regression results for equation 4 - the extended gravity equation that includes stocks of outward and inward FDI. This specification of the model has a greater explanatory power and the overall goodness of fit is improved. The variable FDIin, stock of inward foreign direct investment, has a positive and significant effect on the level of imports. It suggests that the presence of foreign firms in the country favours imports or, their presence may act as an extra channel through which foreign products access Portuguese market.

Note also, that the inclusion of foreign investment stocks as determinants of Portuguese imports changes the significance of two regional dummies, CC and Asia. The CC's coefficient is still negative but not significant and indicates that Portuguese imports from these countries are "normalized" given their market size, distances and

investments. Asia's coefficient is positive and statistically significant and indicates that Portugal imports more from those countries than "average" values after controlling for distance, market size and investment stocks – e.g. imports from Asia are some 200 per cent above "normal" values. In this specification distance also becomes less negative.

In contrast, the stock of outward investments (FDIout) has a coefficient very close to zero and is not statistically significant meaning that Portuguese investments abroad do not act as a channel for imports into the country. It is not surprising as Portuguese investments abroad are very small and highly concentrate in just two economies – 50% in Brasil and 23% in Spain. Overall, the conclusion is that the presence of FDIin in the gravity equation improves the explanatory capacity of the model and for that reason our understanding of the geographical pattern of Portuguese imports.

Gravity Equation of Portuguese Exports

Table 2 reports the estimates for three different specifications of the gravity equation applied to Portuguese bilateral exports. We begin by estimating the basic gravity equation – column A. The regression results show that the coefficients for GDP and distance are significant, at the 1 per cent level, and have the expected sign, while per capita income (GDPpc) has a positive effect and is significant at 10 per cent level. Note also, that distance has a stronger negative effect on exports than that found on imports. The existence of a common language or border does not affect Portuguese exports as the coefficients are not significant, and for that reason they are not included in the following specifications. These results do not change upon the addition of regional dummies and FDI variables, except for the per capita GDP that becomes not significant in all subsequent specifications.

Table 2: Regression Results for Portuguese bilateral Exports

		A	B	C	D	E
$\ln Y_i Y_j$	β	**0.533**	**0.523**	**0.688**	**0.296**	**0.428**
	σ	(0.140)	(0.143)	(0.137)	(0.119)	(0.090)
	P-value	0.001	0.001	0.000	0.024	0.000
$\ln Ypc_i Ypc_j$	β	**0.845**	**0.240**	**0.449**	**0.042**	**0.086**
	σ	(0.460)	(0.470)	(0.429)	(0.384)	(0.289)
	P-value	0.079	0.614	0.308	0.914	0.770
$l\text{nDist}_{ij}$	β	**-1.407**	**-0.978**	**-1.098**	**-0.470**	**-0.779**
	σ	(0.293)	(0.286)	(0.408)	(0.252)	(0.241)
	P-value	0.000	0.002	0.014	0.080	0.005
$Lang_{ij}$	β	**0.992**				
	σ	(1.227)				
	P-value	0.428				
Bordij	β	**-0.122**				
	σ	(1.256)				
	P-value	0.924				
EU15	β		**1.101**		**0.516**	
	σ		(0.534)		(0.433)	
	P-value		0.051		0.250	
CC	β			**-0.879**		**0.431**
	σ			(0.594)		(0.485)
	P-value			0.154		0.387
Asia	β			**-1.840**		**-1.111**
	σ			(0.993)		(0.590)
	P-value			0.079		0.077
America	β			**-0.813**		**-0.825**
	σ			(0.796)		(0.579)
	P-value			0.319		0.172
Oceania	β			**-0.047**		**1.845**
	σ			(1.136)		(0.727)
	P-value			0.967		0.021
$\ln FDIin_{ij}$	β				**0.215**	**0.352**
	σ				(0.066)	(0.056)
	P-value				0.005	0.000
$\ln FDIout_{ij}$	β				**0.059**	
	σ				(0.055)	
	P-value				0.297	
Observations:		28	28	28	24 a)	26 b)
F((k-1),(n-k)):		9.407	15.07	8.858	15.92	26.69
Prob>F:		0.000	0.000	0.000	0.000	0.000
Adj.R-squared:		0.609	0.676	0.671	0.796	0.892

Source: own calculations. Estimates in bold, standard deviation in brackets.
All variables, except dummies, are in logs. Estimation method: OLS.

Columns B and C report the regression results for the "regional" specification of the gravity equation. As before dummy variables are included for the EU, CC, Asia, America and Oceania. The EU coefficient is positive and significant at the 5 per cent level, meaning that Portugal exports more to EU countries than to other destinations with identical distances and market sizes. This result is not surprising as Portuguese exports benefit from EU membership with free access to its single market. None of the other regional dummies is significant meaning that they provide no explanation for the geographical pattern of Portuguese exports.

Columns D and E show the regression results for the gravity equation of Portuguese exports including the FDI stock variables. The FDIin's coefficient is positive and significant suggesting that the presence of foreign investments in the Portuguese economy acts, overall, as a gateway for Portuguese exports. In this specification, the regional dummies for Asia and Oceania become statistically significant and their coefficients are: negative in the former and positive in the latter case. Taking the presence of foreign investments into account reveals that Portugal exports much less to Asia than it exports to EU members. On the other hand, her exports to Oceania are above their expected values. The variable FDIout is not statistically significant, which means that Portuguese investments abroad do not act as an extra channel for exports. Somehow, this is no surprise as outward FDI is a very recent economic fact in the Portuguese economy and is concentrate in two markets – Brazil (50%) and Spain (23%).

Comparing the regressions in Tables 1 and 2 one concludes that FDI in Portugal has a positive impact on both imports and exports. Moreover the impact on exports is bigger than on imports suggesting that foreign investment has a positive contribution to the balance of trade. Portuguese investment abroad has no effect on either exports or

imports. These results clearly show that, in the Portuguese economy, inward FDI has a positive correlation with trade suggesting a complementary relation between the two.

Additional Gravity Analysis

Foreign investments in Portugal are highly concentrate in just few sectors as 88% of FDI goes to just four sectors - real state (35%), manufacturing industry (23%), financial services (15%) and retail (15%). Depending on the geographical origin of the investment the distribution across sectors may differ from these average values. Investments coming from "America" are mainly in real state (42%) and financial services (25%), and overall they amount to 11% of the value of inward FDI stock included in this study. In contrast, "Asian" investments are highly concentrate in the manufacturing industry (76,5%) and retail (14,5%) yet they account for less than 1% of foreign investment's stock. The EU is the source of 85% of the FDI stock in Portugal and for that reason its distribution by sectors is similar to the average values mentioned before.

Regressions in Tables 1 and 2 have used values of total FDI as a way to guarantee a bigger sample than if a stricter concept was used, in other words that option was taken for practical reasons. It is acceptable that FDI as a whole may work as a channel linking international and host country's markets. However, FDI in manufacturing industries is only a small share of that value, as seen before only 23% of foreign investment in the Portuguese economy goes into this sector. In these circumstances, it is expected that if this value is used in the gravity trade equations the relation between trade and FDI may differ from that found in the results reported before. Therefore, we run new regressions of the gravity equations on imports and exports using this stricter concept of FDI.

Table 3 shows the results for two sets of regressions in which the basic gravity equation is applied, respectively, to Imports and Exports. In each case, FDI stock variables are taken at a time, and whereas in regressions A and C values for FDI refer to investments across sectors, in regressions B and D values for FDI refer to investments in the manufacturing sector. This procedure reduces the sample in both regressions as several countries are excluded due to the absence of industrial FDI. These countries either do not have industrial investments in, or do not receive industrial investments from Portugal. Consequently, there is a reduction on the degrees of freedom and for that reason regional dummies are not included in these regressions.

Table 3: Gravity model – Total FDI vs Manufacturing FDI

		Imports				**Exports**			
		A	**B**	**C**	**D**	**A**	**B**	**C**	**D**
$\ln Y_i Y_j$	β	**0.341**	**0.472**	**0.527**	**0.236**	**0.350**	**0.285**	**0.359**	**0.292**
	σ	(0.097)	(0.160)	(0.165)	(0.319)	(0.113)	(0.152)	(0.149)	(0.250)
	P-value	0.002	0.016	0.004	0.492	0.005	0.094	0.026	0.295
$\ln Ypc_i Ypc_j$	β	**-0.101**	**-0.551**	**0.485**	**1.440**	**0.160**	**0.178**	**0.882**	**1.658**
	σ	(0.301)	(0.629)	(0.428)	(0.666)	(0.351)	(0.597)	(0.389)	(0.521)
	P-value	0.740	0.403	0.270	0.083	0.652	0.773	0.034	0.025
$l\text{nDist}_{ij}$	β	**-0.565**	**-0.700**	**-0.164**	**-0.591**	**-0.728**	**-0.935**	**-1.06**	**-0.673**
	σ	(0.205)	(0.287)	(0.281)	(0.455)	(0.239)	(0.273)	(0.255)	(0.356)
	P-value	0.012	0.037	0.000	0.246	0.006	0.007	0.000	0.117
$\ln FDIin_{ij}$	β	**0.293**	**0.282**			**0.275**	**0.444**		
	σ	(0.055)	(0.190)			(0.064)	(0.180)		
	P-value	0.000	0.0171			0.000	0.036		
$\ln FDIout_{ij}$	β			**0.696**	**0.517**			**0.118**	**0.301**
	σ			(0.072)	(0.267)			(0.065)	(0.209)
	P-value			0.344	0.110			0.0086	0.208
Observations.:		26	14	26	10	26	14	26	10
F((k-1),(n-k)):		30.77	6.59	10.19	5.31	12.27	8.52	12.27	8.16
Prob>F:		0.000	0.009	0.000	0.048	0.700	0.020	0.000	0.020
Adj.R-squared:		0.827	0.632	0.5953	0.657	0.643	0.698	0.643	0.761

Source: own calculations. Note: Estimates in bold, standard deviation in brackets. All variables, except dummies, are in logs. Estimation method: OLS.
A and **C -** FDI values refer to investments across sectors;
B and **D** - FDI values refer to investments in the manufacturing sector.

To some extent, these new regressions confirm the results of previous ones. The stock of FDI in Portuguese manufactures has a positive and statistically significant impact on trade flows, with a much stronger effect on Exports than on Imports. In other words, the positive impact of inward FDI on the Portuguese balance of trade is even stronger than that found before. Note that foreign investment on manufactures has a positive impact on Portuguese exports that is 1,6 bigger than when values for total FDI are considered. It means that foreign investments on manufactures have a stronger positive correlation with exports than foreign investment in general. These results are in line with other studies, at the firm level, on FDI and trade in Portugal. Castro (2004) shows that when foreign investments in the manufacturing industry were strongly motivated by cost reduction, exports to the home country were well above average. Tavares and Young (2002) also found, in a firm level study, that FDI in the Portuguese manufactures had a positive impact on exports, but the intensity of exports was conditioned to the strategic role of MNE subsidiaries. Finally, foreign investment in the manufactures has a slightly weaker impact on imports than total investment.

As for Portuguese investment abroad (FDIout), again it is not statistically significant which means that has no impact on trade flows. One explanation is the overall small dimension of investments abroad and its strong concentration, particularly in Brazil. According to Castro (2000) Portuguese manufacturing subsidiaries in that country produce mainly for the local market.

VI. CONCLUSION

This study examines the relation between FDI stock, inward and outward, and Portuguese trade, imports and exports. Two main objectives are followed: (1) to find if foreign investments (inward FDI) in the Portuguese economy favours or reduces trade

flows, and (2) to find if Portuguese investments abroad (outward FDI) favour or reduce trade flows. With that aim, it is used an extended gravity model of trade which includes FDI stock variables. The model is than applied to Portuguese imports and exports, respectively, with 28 trade partners, using average values for the years 1998 to 2000. Some of the conclusions are as follows:

- Inward FDI (stock) in the Portuguese economy has a positive and statistically significant impact on both exports and imports. This result suggests that FDI and trade have a complementary relation.
- Moreover, inward FDI (stock) has a greater impact on exports than on imports meaning that foreign investments are a positive contribution to the balance of trade and are export oriented.
- When the values of foreign investments are restricted to inward FDI into the manufacturing industry previous results are confirmed and complementary between FDI and exports is even stronger as well as the impact on the balance of trade.
- Finally, there is no significant relation between Portuguese investments abroad (outward FDI) and exports or imports meaning that they do not relate at all to trade flows.

Other results deserve to be stressed:

- Each time the gravity model was extended to include FDI stock variables the explanatory capacity improved compared to both the basic and the regional versions of the gravity equation.
- Also, taking stocks of FDI into account changes the significance of some of the regional dummies. On the imports equation, the inclusion of foreign investments reveals that under- imports from CCs are not significant whereas over-imports from Asia are significant. On the export model, below average exports to Asia and above

average exports to Oceania become statistically significant while above average exports to the EU become insignificant.

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Table 3: Gravity model – Total FDI vs Manufacturing FDI

.		Imports				Exports			
		A	**B**	**C**	**D**	**A**	**B**	**C**	**D**
$\ln Y_i Y_j$	β	**0.341**	**0.472**	**0.527**	**0.236**	**0.350**	**0.285**	**0.359**	**0.292**
	σ	(0.097)	(0.160)	(0.165)	(0.319)	(0.113)	(0.152)	(0.149)	(0.250)
	P-value	0.002	0.016	0.004	0.492	0.005	0.094	0.026	0.295
$\ln Ypc_i Ypc_j$	β	**-0.101**	**-0.551**	**0.485**	**1.440**	**0.160**	**0.178**	**0.882**	**1.658**
	σ	(0.301)	(0.629)	(0.428)	(0.666)	(0.351)	(0.597)	(0.389)	(0.521)
	P-value	0.740	0.403	0.270	0.083	0.652	0.773	0.034	0.025
$l\text{nDist}_{ij}$	β	**-0.565**	**-0.700**	**-0.164**	**-0.591**	**-0.728**	**-0.935**	**-1.06**	**-0.673**
	σ	(0.205)	(0.287)	(0.281)	(0.455)	(0.239)	(0.273)	(0.255)	(0.356)
	P-value	0.012	0.037	0.000	0.246	0.006	0.007	0.000	0.117
$\ln FDIin_{ij}$	β	**0.293**	**0.282**			**0.275**	**0.444**		
	σ	(0.055)	(0.190)			(0.064)	(0.180)		
	P-value	0.000	0.0171			0.000	0.036		
$\ln FDIout_{ij}$	β			**0.696**	**0.517**			**0.118**	**0.301**
	σ			(0.072)	(0.267)			(0.065)	(0.209)
	P-value			0.344	0.110			0.0086	0.208
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Source: own calculations. Note: Estimates in bold, standard deviation in brackets. All variables, except dummies, are in logs. Estimation method: OLS.
A and **C -** FDI values refer to investments across sectors;
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