The industrial pattern of EU Foreign Direct Investment, trade policies and third country effects

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Abstract *According to the theoretical models of the multinational enterprise, trade costs play a fundamental role in determining the pattern of foreign direct investment (FDI). The aim of this paper is to assess the impact of trade policies on the outward stocks of FDI of the EU. We estimate a model based on the knowledge-capital theory of the multinational enterprise over the period 1995-2008 by using a sample of five EU countries and 26 partner countries. We consider first, manufacturing sector as a whole and, then, six manufacturing industries defined at the two-digit level of the NACE classification. Explanatory variables include an index of applied bilateral tariffs, a dummy to capture the presence of Bilateral Investment Treaties (BITs) and a variable to take into account the impact of the participation of host countries to free trade agreements (FTA) with other than EU countries. The paper also checks whether FDI in each host country is affected by the presence of FDI in nearby countries, by testing if there is a spatial lag dependence in bilateral FDI. The results show that the pattern of the EU outward FDI is driven mainly by market size and similarity, and not by differences in skilled-labour endowment. Trade costs play a relevant role in explaining the pattern of FDI in the manufacturing sector as a whole and in five out of six disaggregated industries. The impact of tariffs varies across industries, suggesting the predominance of horizontal FDI in some industries, and the existence of vertical export-platform FDI in others. BITs and the participation of the host country to other FTAs positively affect the outward stock of EU FDI, while we do not find empirical support to the hypothesis of spatial lag dependence in bilateral FDI.*

Keywords: FDI, trade protection, knowledge-capital model
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1. INTRODUCTION

Growing attention has been given in recent international trade literature to the important role of trade costs as a determinant of Foreign Direct Investments (FDI). Theoretical models of the multinational enterprise, such as the knowledge-capital model (Markusen, 2002; Bergstrand, Egger 2007), suggest that trade costs may have different impacts depending upon the nature of FDI. They are expected to positively affect horizontal FDI, while they should exert a negative impact on vertical FDI; in a three-country framework, third country trade policies may stimulate export-platform FDI in the third countries free trade area (e.g., Ekholm et al 2007; Baltagi *et al* 2007). More recent international trade models with heterogeneous firms show that trade costs may affect the number of firms involved in FDI and the number of affiliates established in the foreign country

(e.g. Antràs *et al* 2009). The importance of trade costs in determining the pattern of FDI suggested by theoretical models is confirmed, among others, by the observed surge of FDI in customs unions and free trade areas.

In the empirical literature, the importance of trade costs has been considered by including among the explanatory variables the usual gravity ones (Blonigen, Piger, 2011): geographical and cultural distances are used as a proxy for the transportation costs and the additional costs faced by firms when operating in a foreign country. As for the trade policies, dummies are used to capture the impact of regional agreements, while an index of the openness to trade has often been included to measure the degree of protection of the host country. However, these indirect measures of trade protection may be inappropriate; dummies implicitly assume that tariffs granted under different preferential schemes and across industries are all the same, while this is not the case. Moreover, we frequently observe wide differences in the degree of openness in countries sharing a common trade policy; this is the case, for example, of the EU member states. A direct measure of trade protection is more appropriate to capture the impact of trade policies on FDI.

The aim of this paper is to assess the impact of trade costs, and more specifically of trade policies, on the pattern of FDI of EU countries. For this purpose an empirical model based on the knowledge-capital theory of the multinational enterprise (Markusen, 2002; Bergstrand, Egger, 2007) is estimated over the period 1995-2008. Our contribution to the literature is threefold. First, besides the trade costs variables usually considered in the literature, we introduce in our empirical specification a direct measure of trade protection, that is, the value of the bilateral applied tariffs. The focus of this paper is the pattern of FDI of European countries with countries outside the EU. While there is a considerable amount of work examining the impact of trade costs on the pattern of the US FDI, studies focusing on the EU are few and focus mainly on the intra-European FDI (e.g. Baltagi et al 2008). We focus on the extra-EU FDI by considering several extra-EU countries including developed, developing and transition economies. As will be shown, by analysing the pattern of extra-EU FDI with 26 extra-EU countries, a considerable variability in the applied bilateral tariffs can be found, while this would not be the case with only EU members, candidate countries and/or other European countries that have signed free trade areas with the EU. The presence of Bilateral Investment Treaties (BITs) between the EU and the host country is also considered. The second contribution is that we focus on the manufacturing sector, with a disaggregation into six manufacturing industries. Indeed, the impact of trade policies is likely to be industry-specific, as the factors determining FDI and the pattern of FDI vary greatly among sectors. Few studies have used FDI data disaggregated at the industry level, because of the limited availability of data at the cross-country and industry level; indeed, these data are very often

unobtainable being considered confidential. As for the EU, we are not aware of studies considering extra-EU stocks of FDI disaggregated at the cross-country and industry level. As trade policies show a considerable variability across industries, in this paper we assess the impact of the bilateral applied tariffs at the industry level, by using the FDI database provided by Eurostat which reports FDI data disaggregated both at the industry and cross-country level. Third, we take into account also of the fact that FDI in each host country could be affected on one hand, by the participation of host countries to free trade agreements (FTA) with other than EU countries and, on the other hand, by the presence of FDI in nearby countries; these possible impacts has been often referred to as the "third country effects" (Baltagi *et al* 2007, Blonigen *et al*, 2007). In our model, the membership of host countries to other FTAs is captured by means of a dummy, while the existence of third country effects has been considered by testing if there is spatial lag dependence in bilateral FDI.

Overall, the results show that the pattern of the outward FDI is driven mainly by market size and similarity, and not by differences in skilled-labour endowment. Trade costs play a relevant role in explaining the pattern of FDI in the manufacturing sector as a whole and in five out of six disaggregated industries. BITs have a significant and positive impact on the outward FDI, while the participation of the host country to other FTAs also positively affects EU FDI in the manufacturing industry. The spatial lag of FDI does not significantly affect bilateral stock of FDI; hence, we found no evidence in favour of a spatial lag model.

The paper is organised as follows. The next section offers an overview of the main facts about EU FDI and trade policy from a preliminary look at the data here used. The third section illustrates the empirical specification used, while the fourth deals with the data and the econometric issues. The fifth section discusses the results while the final one offers some concluding remarks.

2. THE PATTERN OF FDI AND TARIFFS: A PRELIMINARY LOOK AT THE DATA

Given our interest in analysing bilateral FDI data at industry level, we have restricted our data set to five EU countries (France, Germany, Netherlands, Italy and United Kingdom) for which FDI stocks data disaggregated at the industry level during the considered period, that is 1995-2008, are available. Outward stocks of FDI come from the Eurostat database, which reports data on bilateral FDI from the balance of payments statistics disaggregated both at the country and industry

level. Our sample includes 26 partner countries,[1] which have been selected following two main criteria: first, the availability of data. As mentioned before, FDI data at the cross-country and industry level for the period 1995-2008 are often not available, especially for small developing countries, possibly because they are considered confidential. Second, we have taken also into account the variability of the EU trade policies and, hence, of the applied tariffs. Indeed, our sample includes partners who face the MFN tariffs, as well as countries that benefit from different level of preferences in the considered period within the various preferential schemes. Our database also includes non-OECD countries that are not considered in other studies using the EU FDI stock as the dependent variable (e.g. Egger, Merlo, 2007; Baltagi et al 2008).

As regards the industry disaggregation, we have first considered the manufacturing sector as a whole, and then six manufacturing industries - obtained by aggregating industries defined at the two-digit level of the NACE classification - have been selected on the basis of the availability of the FDI stock data. Overall, these six industries account for 79% of the outward FDI of the manufacturing industry.

The pattern of FDI of the five EU countries considered in this paper differs considerably across countries and industries. Figure 1 reports the outward stocks of FDI in the total manufacturing sector by group of third countries in the year 2005. The group "Developed countries" – which here includes seven extra-EU advanced countries (Australia, Canada, Israel, Japan, Norway, Switzerland and the US) – accounts for around the 75% of the total FDI of the five EU countries, but with important differences between them. While for the United Kingdom, France and Netherlands the share of FDI hosted by these advanced countries is higher than 80%, this is not the case for Italy and Germany. A major part of the German stock of FDI is hosted by the countries which joined the EU in 2004 and 2007 and by other extra-EU countries.

The industrial pattern of the outward FDI is even more differentiated, as shown by Figure 2. The vehicle industry has a major role for Germany and France, but a negligible one for the United Kingdom and the Netherlands. On the contrary, the "Petroleum chemicals and plastics industry" is important especially in the Netherlands and United Kingdom, but not for Germany and France. The "Metal and mechanicals" industry is especially important for the outward stock of Italy (over the 50%) but it is less important for France, Germany and the Netherlands. The food industry accounts for a considerable share of the outward FDI in the Netherlands, United Kingdom and, even to a lesser extent, Italy. Figure 3 shows the industrial pattern by group of partner countries of the

[1] More specifically, our sample includes the following countries: Algeria, Australia, Argentina, Brazil, Bulgaria, Canada, Chile, Czech Republic, Egypt, Estonia, Hungary, Israel, Japan, Latvia, Lithuania, Mexico, Morocco, Norway, Poland, Romania, Slovakia, Slovenia, South Africa, Switzerland, United States and Uruguay.

outward FDI of the five EU countries. The vehicles industry has a major role especially for the EU FDI hosted by developing countries, while the "Petroleum, chemical, rubber" and "Food" industries account each for about one third of the outward FDI hosted by developed countries.

Figures 4 and 5 report the values of the average tariffs applied by the EU and by the host countries in 1995 and 2005.[2] Our main interest is to understand if and how these tariffs have affected the pattern of FDI in the manufacturing sector as a whole, and in the six industries here considered. Tariffs applied by the EU are considerably lower than the tariffs faced on average by the European firms in the host countries here considered; in addition, tariffs have, by and large, decreased during the period 1995-2005. Overall, as regards differences in EU and host countries' tariffs, we find a similar pattern. Industries where tariffs are higher – both the EU and the host countries - are the food, textiles and the vehicle sectors, while tariffs are particularly low in the computer industry, both in the EU and in the host countries.

3. THE MODEL

Preliminary exploration of the data suggests that the pattern of FDI varies significantly across the five EU countries, both from a geographical and an industrial point of view; some countries (France, Germany and UK) show a prevalence of a one-way FDI in the six industries here considered, while for others the data suggest the existence of a two-way pattern of FDI (Italy and, to a lesser extent, the Netherlands). This evidence calls for a careful consideration in our empirical model of the possible determinants of FDI that may explain such variability across the countries and industries.

The empirical literature on the determinants of FDI has used a wide variety of model specifications to explain the pattern of FDI. Blonigen and Piger (2011) have shown that 47 different independent variables have been included in eight recent empirical studies on the pattern of FDI, most of which are included in just one study only. Using Bayesian statistical techniques they found that among all the considered variables, only a small number is likely to be determinants of FDI; these include the traditional gravity variables, distance, parent and host country GDP variables, relative labour endowments and trade agreements. Their findings support the view that any explanation of FDI needs three key sets of explanatory variables: market size of parent and host country, relative labour endowments and trade costs. These determinants are, by and large, those used in the empirical specification of the knowledge-capital theory of the multinational enterprise

[2] Details on the data and the methodology used to compute the average tariffs are provided in section 4.

(Carr et al. 2001; Markusen, Maskus, 2002), originally developed by Markusen (2002) and further expanded by Bergstrand and Egger (2007) to the three-factor and three-country case. The knowledge-capital model explains both the choice of replicating the same activities in many locations (horizontal FDI) and that of fragmenting production stages geographically (vertical FDI). According to the model, horizontal FDI is likely to prevail if countries are similar in size and in relative endowments and trade costs are high, while vertical FDI could occur when countries differ in factor endowments, especially if the country abundant in skilled-labour is small, and trade costs are low.

As in other recent empirical papers based on the knowledge-capital theory of the multinational firm (e.g. Braconier et al, 2005; Baltagi et al 2007), our specification includes market size, similarity and differences in the labour endowments as control variables, together with trade cost, which is our main variable of interest. [3] As regards trade costs, previous studies have used the degree of openness (Blonigen et al., 2007) or an index of the overall trade costs perceived by firms (Carr et al., 2001; Markusen, Maskus, 2002; Braconier et al, 2005; Ekholm et al., 2007) and dummies to capture the impact of regional trade agreements (Baltagi et al., 2008; Stein, Daude, 2007). As our interest is the impact of trade policies on FDI, in this paper we explicitly use the tariffs, measured by the weighted average of bilateral applied tariffs. Two further policy variables are here considered, that is, the presence of bilateral investment treaties (BITs) between the host and the EU country and the participation of the host country to FTAs with countries other than EU; previous studies have shown that BITs may exert a positive effect on FDI (Egger, Pfaffermayer, 2004; Egger, Merlo, 2007; Busse et al., 2010). Traditional gravity variables, i.e. distance and common language, have been included providing that have been found to be among the most important determinants of FDI (Blonigen, Piger, 2011). A dummy variable for each EU country aims at capturing home country fixed effects. The dependent variable used in this model is the stock of FDI, which is among the most used measure of FDI in the literature.[4] More accurate measures of FDI, such as the affiliate sales, are less available for the EU countries at the cross-country/industry level.

[3] The empirical model used in this paper is more parsimonious than the one originally proposed by Carr et al. (2001) and used by Markusen and Maskus (2002) to test the knowledge-capital theory. The reason is that the basic cross-section specification for the knowledge-capital model generally includes interaction terms between skilled labour relative endowments and other explanatory variables, such as the differences in GDP and trade costs. However, the inclusion of these variables leads to the multicollinearity of regressors in the case of data with time dimension, as panel data (Egger, Merlo, 2007).

[4] Many papers use the outward stocks of FDI (e.g. Baltagi *et al* 2007 and 2008; Stein, Daude, 2007), while others pool inward and outward stocks of FDI (e.g. Head, Ries, 2008, Blonigen, Piger, 2011).

In order to reduce the incidence of missing observations in the bilateral stock of FDI, we have used three-years data. [5]

The basic specification we use is thus the following:

$$\ln(FDI_{ijkt}) = \beta_0 + \beta_1 sumGDP_{ijt} + \beta_2 relGDP_{ijt} + \beta_3 SKILLdiff_{ijt} + \beta_4 host\,tariff_{ijkt} + \\ + \beta_5 home\ tariff_{ijkt} + \beta_6 BIT_{ijt} + \beta_7 FTA_{jt} + \beta_8 dist_{ij} + \beta_9 commlang_{ij} + \delta_i + u_{ijkt} \quad [1]$$

where subscripts i (i=1,…,5) and j (j=1,…,26) refer to the home and the host country, respectively, k is the industry and t indicates three-year periods (t = 1, ..., 5), u_{ijkt} is the error term and δ_i indicates EU country fixed effects. FDI indicates the bilateral stock of FDI, *sumGDP* is the sum of GDPs of the home and host country and measures the market size of countries; market similarity is taken into account through the variable *relGDP* which is ratio home-to-host GDP; *SKILLdiff* is the difference in skilled-labour endowment between the home and the host country; *host tariff* indicates the tariff applied to the home exports by the host country, while *home tariff* indicates the tariff applied by the home country, i.e. the EU, to imports from the host country. *BIT* is a dummy variable equal to one if a bilateral investment treaty is signed and zero otherwise. *FTA* is equal to one if the host country participates to FTAs with countries other than the EU and zero otherwise; *dist* is the distance between the home and the host country capitals, while *commlang* is a dummy equal to one if a language is spoken by at least 9% of the population in both countries.

On the basis of the theoretical and empirical literature we expect horizontal FDI to be positively correlated with market size, as the latter is crucial in determining whether to exploit plant economies of scale; the larger the size of the markets, the easier it is to cover the plant costs. Horizontal FDI is also expected to be positively influenced by market similarity; therefore, we expect a negative sign for the coefficient of the variable *relGDP*. Differences in factor endowments explain vertical FDI, while they are unlikely to affect horizontal FDI. Distance is expected to influence horizontal FDI positively and vertical FDI negatively (Egger, 2008). Common language, by decreasing the cost of operating abroad, is likely to positively affect FDI, as highlighted by previous empirical studies (Tekin-Koru, Waldkirch, 2010; Blonigen, Piger 2011). Tariffs may have a different impact depending upon the nature of FDI. Host country tariffs positively affect horizontal FDI, while they should have no effect on vertical FDI, or a negative impact if subsidiaries in the host country use intermediate goods imported from the home country.

[5] In more detail, we have computed the three-year period mean value of FDI, GDP, skilled labour endowments and tariffs, while the dummies BIT and FTA are equal to one if there is a BIT or a FTA in at least one year over each three-year period. Five periods are here considered: 1995-97,1998-2000, 2001-2003, 2004-2006 and 2007-2008

Conversely, home country tariffs are expected to negatively influence vertical FDI, especially if goods produced in the low cost partner country are shipped back to the home country.

BITs are expected, in general terms, to have a positive impact, although the empirical evidence to date is rather ambiguous, with different findings depending upon the nature and number of countries considered. Evidence of a significant positive impact of BITs on FDI has been found for the OECD countries (Egger and Merlo, 2007), while for developing countries Hallward-Driemeier (2003) found little evidence of any positive influence; however, Neumayer and Spess (2005) and Busse et al (2010), by using a larger sample of host and source countries, found that BITs do support FDI toward developing countries. Host country FTAs are expected to exert a positive effect on EU FDI, as they enlarge the size of the host market and stimulate export-platform FDI (Ekholm et al 2007).

4. DATA AND ECONOMETRIC ISSUES

Data on FDI stock are from Eurostat, while those on GDP are from the World Development Indicators (WDI). [6] The skilled labour endowment of each country is measured by the tertiary school enrolment provided by the WDI, while the distances and the dummy equal to one in the case of common language are those provided by CEPII.

Bilateral applied tariffs are from WITS. WITS database provides data on bilateral tariffs disaggregated at the ISIC-four digit level for each pair of countries. In aggregating tariffs the use of import value shares as weights leads to an "endogeneity bias" due to the fact that if tariffs are very high, imports are likely to be very low or nil. A weighted average has thus been computed following the MacMap procedure (Bouët *et al.,* 2005). Countries have been split into five groups on the basis of their level of development. Then, the weighted average of tariffs has been obtained by using as weights the share of imports of each country from the group the exporter belongs to. In this way, the endogeneity bias due to the use of bilateral imports in the weighting procedure is reduced (Cipollina, Salvatici, 2008).

Table 1 provides information on the variables included in the model. Following the classification by the IMF (2010), we have split our sample in two different groups of countries: on

[6] Our sample should include 570 observations for each two-digit industry. However, EU bilateral data of FDI stock at the industry level show a considerable number of missing values. For the total manufacturing sector as a whole, we count 284 missing values in the outward FDI vector. The share of missing values at the cross-country and industry level is, as expected, rather high. However, a preliminary exploration of the data suggests that the probability to find missing values is unlikely to be systematic and correlated with the FDI.

one hand, we have 10 developed and/or high-income partner countries (Australia, Canada, Czech Republic, Israel, Japan, Norway, Slovakia, Slovenia, Switzerland and United States), while the others are transition and developing countries.

As already mentioned, the EU FDI directed to advanced countries are, on average, much higher than those directed toward developing countries. Differences in the skilled labour endowment and in GDP between EU and host countries are higher if we consider developing host countries. Furthermore, developing countries apply, on average, higher tariffs on EU exports than the developed countries, while EU tariffs are on average higher for the advanced countries.

Eq. [1] is estimated by considering a Pooled OLS. However, as mentioned before, to check potential "third country FDI" effects, i.e. that EU FDI in each host country is affected by FDI in neighbouring countries (Blonigen *et al*, 2007), we have also included in eq. [1] a spatial lag of the dependent variable, that is, we have estimated the following model:

$$\mathbf{y} = \lambda \mathbf{W}\mathbf{y} + \mathbf{X}\boldsymbol{\beta} + \mathbf{u} \qquad [2]$$

where **y** indicates the dependent variables, which in our case is the log of the bilateral stock of FDI, ***X*** stands for all the regressors included in eq. [1] , **β** is the vector of the relative coefficients and **u** is the error term. **W** is a spatial weighting matrix based on the distances between capital of each host country-pair. Following Baltagi et al (2007), we have computed **W** by using row standardized inverse distance matrix based on the latitude and longitude coordinates of the capitals of each host country (provided by CEPII).[7] As in Baltagi *et al*. (2008), the specific weighting scheme here adopted implies that there is only spatial dependence among the hosts, while there is no such interdependence across home countries or across time periods.

If the coefficient λ is significantly different from zero, then FDI in host countries located nearby affect FDI in the host country j. However, our results show that the coefficient λ is not significant: the p-value relative to the test on its significance is equal to 0.127 if total manufacturing are considered, and to 0.906 if we consider data disaggregated in the six industries. Hence, we found no evidence in favour of the spatial lag model as in eq.[2]; this means that EU FDI are not affected by foreign investment in other host countries nearby located.

[7] We have used the *spmat* and *spreg* commands provided by Drukker et al (2011) for the STATA software to compute the weighting matrix and carrying out estimations, respectively. Distances are computed through the Haversine formula. Estimates of the spatial model as in eq. [2] are based on the generalized spatial two stage least square (GS2SLS) estimator with standard errors robust to heteroskedasticity.

5. RESULTS

Table 2 presents the results obtained by estimating equation [1] for the manufacturing sector as a whole and for the 6 industries we have selected.

As regards control variables, the coefficients of the joint size of the home and host country markets (*sumGDP*) and of the relative GDP are both significant and with the expected signs, while the coefficient of the skilled-labour endowments variable is not significant. Trade costs considerably influence the manufacturing sector, but not the six selected industries when considered as a whole. Host tariffs negatively influence the manufacturing industry; this outcome is consistent with the prevalence of vertical-type FDI involving trade of goods between the parent firm and the subsidiaries located in the host country. This hypothesis is confirmed by the negative impact that distance exerts on EU FDI in this industry: indeed, distance is expected to harm vertical multinationals, and not horizontal FDI, because they engage in trade of inputs and intermediate products. EU tariffs positively affect FDI in the manufacturing industry; therefore, EU (vertical) FDI seems to be attracted by countries facing high EU tariffs, suggesting that the EU multinationals probably do not ship the final product back to the EU markets. A confirmation of this hypothesis comes from the FTA variable showing a considerable positive impact on EU FDI. Hence, EU (vertical-type) FDI are attracted by countries where the size of the market potentially increases with FTAs, probably because EU firms sell the final product there, and not on the EU markets. Overall, the pattern of FDI in this industry appears to be consistent with what has been referred to as export-platform FDI (Baltagi *et al* 2007, Ekholm *et al* 2007): inputs or intermediate goods are probably exported from the EU toward the foreign subsidiaries (which explains why host tariffs and distance exert a negative impact on outward FDI) while goods produced by the foreign subsidiaries are sold on third countries market (which explains the significant positive impact of FTAs) and are not shipped back to the EU. Our results also confirm the significant impact that common language exerts on FDI, as found by previous studies (e.g. Tekin Koru, Waldkirch, 2010). The six industries we selected show a rather different pattern. As mentioned, neither tariffs nor distance in this case influence EU FDI, while host countries FTAs exerts a positive impact. Differently from the manufacturing sector, the presence of BITs has a significantly positive influence on FDI. In both estimates, the inclusion of EU country dummies confirms the existence of country fixed effects; indeed, the coefficients of the EU country dummies are all significant except for the dummy referring to Italy.

Estimations have also been run by splitting the sample in advanced economies and other countries (Table 3) in order to verify if the trade policy variables, i.e. home and host tariffs, have a different impact on the outward FDI depending on the income level of the host country.

Results reported in Table 3 confirm the relevance of trade cost as a determinant of FDI in the manufacturing industry taken as a whole: the coefficients of tariffs, distance and host country FTAs are all significant, even though the impact of tariffs varies between developed and developing countries. Host tariffs negatively affect FDI in developing countries, while they positively impact FDI towards developed economies, suggesting the prevalence of vertical-type FDI in developing countries and of horizontal-type FDI hosted by developed economies. On the contrary, the coefficient of EU tariffs is positive for both groups of countries and is considerably higher for developing economies; this confirms that the EU FDI in the manufacturing industry, considered as a whole, seems to concentrate in countries facing high EU tariffs; hence, it is very unlikely that these FDI, and particularly those hosted by developing countries, generate trade of products from the foreign subsidiaries back to the EU parent firm. Finally, the six industries here selected confirm a rather different pattern from manufacturing. Trade costs in general terms do not play a relevant role in determining the pattern of FDI, except for the host tariffs in developed economies which negatively influence the EU FDI while they do not have any significant impact in developing economies.

In order to gather further insights on the impact of tariffs on FDI at industry level, we have estimated the model by splitting the home and host tariffs in six groups, according to the aggregations previously used. Table 4 reports the results of these estimations. For robustness check we have run three different estimations. In the first model (column 1) we have split home tariffs only, in the second one (column 2) we have considered host tariffs disaggregated by industry only, while in the third model (column 3) we have split both EU and host tariffs. The coefficients of market size and similarity are significant, while the skilled labour endowment is confirmed not to affect EU FDI. As in Table 2 BITs and FTAs positively affect EU FDI, and distance exerts a significantly negative effect in two out of three models.

Results confirm, as expected, that the responsiveness of EU FDI to tariffs vary greatly across industries. Tariffs do not play any role in determining the pattern of FDI only in the “Total vehicles and other transport equipment” industry.

For two industries, “Total textiles and wood activities” and “Total office machinery, computers, RTV, communication equipments" the coefficient of the host tariff is significant and

negative. High tariffs in the host countries harm vertical FDI, and EU multinational firms locate where host tariffs are lower. In addition, if we consider EU disaggregated tariffs only (column 1), the coefficients of home tariffs are also negative. This suggests that in these industries EU firms are negatively affected by high EU tariffs, probably because they ship back (intermediate or final) products to the EU markets; hence, host countries facing lower EU tariffs are preferred locations by EU multinational firms with respect to the others. This pattern of FDI appears to be rather plausible for these industries. However, EU tariff coefficients become not significant if disaggregated host tariffs are considered as well (column 3).

Results of estimations indicate an opposite pattern of FDI for the lasting three industries, i.e. “Food industry”, "Total petroleum, chemical, rubber, plastic products" and "Total metal and mechanical products". The coefficients of host tariffs are almost always significant and positive, which is consistent with the prevalence of horizontal-type FDI in these industries. Further, we found also robust evidence of a significant positive impact of EU home tariffs. Hence, in these industries high tariffs in the host countries stimulate horizontal FDI and, at the same time, EU firms concentrate plants in countries facing also high EU tariffs. In other words, two-ways trade costs stimulate EU outward FDI. A possible explanation for this result may be found in the existence of two-way FDI in these industries. EU multinational firms invest in host countries facing high EU tariffs, because firms from these countries are probably the major investors in the EU market. This pattern of FDI, denoted as “strategic FDI”, has been highlighted since the eighties for some industries and countries by the literature on the multinational firm.

6. CONCLUDING REMARKS

Although trade cost is considered among the most important factors explaining FDI, there is relatively poor empirical evidence about the impact of trade policies on the industrial pattern of FDI. This paper addresses this issue by estimating the impact of trade policies on the EU outward FDI hosted by extra-EU countries. Our sample consists of five EU countries and 26 partner countries. Unlike previous studies, our analysis is disaggregated both at the country and industry level: we first consider the manufacturing sector as a whole; then six manufacturing industries have been selected. An empirical specification based on the knowledge-capital model is estimated over the period 1995-2008.

Bilateral tariffs have been used to measure bilateral trade protection, instead of using dummy variables or other indirect measures of trade protection included in the previous papers. A

dummy has been included to capture the possible positive impact on EU FDI of the participation of a host country to FTAs with countries other than the EU. Moreover, we include a dummy to also take into account the presence of bilateral investment treaties. A further issue addressed in this paper is the potential existence of "third country " effects, that is, that EU FDI in each host country is affected by FDI in neighbouring countries. For this purpose, we have tested if there is a spatial dependence in FDI across host countries.

As for the control variables, our findings are rather robust across estimations: the coefficients of market size and similarity turn out to be significant and of the expected sign, while we do not find evidence that differences in skilled-labor endowments affect EU outward FDI. Trade cost is a relevant determinant of FDI in the estimations for the manufacturing industry taken as a whole. Host tariffs and distance negatively affect EU FDI while FTAs of the host country and EU tariffs affect it positively. These results seem consistent with the prevalence of export-platform-type FDI. This pattern, however, dominates FDI hosted by developing countries, while in the developed countries horizontal FDI seem to prevail. Our findings suggest that trade cost play a minor role for the six industries when considered as a whole. However, estimations run by disaggregating tariffs by sector have shown that there is an industry specific responsiveness of FDI to tariffs. While in one industry (Vehicles) we do not find evidence of an impact of tariffs on EU FDI, in other two industries (Textile and Computers) both host and home tariffs negatively affect FDI; finally, in the Food, Petroleum and Mechanical sectors tariffs generally exert a positive impact. These findings support one driving idea of this paper, i.e. that trade policies impact is largely country and industry-specific. Moreover, FTAs of host countries turn out to exert an important role. Unlike previous papers (e.g. Blonigen *et al* 2007) we do not find empirical support to the hypotheses of the existence of third country effects. In our sample, FDI in neighboring countries do not influence EU FDI.

Improvements in the dataset on the extra –EU FDI of the European countries may obviously also improve the analysis, although we believe that, given the difficulties in gaining bilateral data on FDI disaggregated at industry level for the EU, our findings provide a sound basis for understanding the relationships between trade policies and the industrial pattern of FDI.

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Table 1- Descriptive statistics, 1995-2008 (millions US dollars)

	All host countries		Developed countries		Developing countries	
	Mean	*(s.d.)*	**Mean**	*(s.d.)*	**Mean**	*(s.d.)*
Outward FDI - Manufacturing	3326.953	*(9278.6)*	6045.848	*(12583.47)*	645.8207	*(934.87)*
Outward FDI - six industries	711.8953	*(2234.59)*	1099.857	*(2829.57)*	149.0247	*(306.82)*
Sum of GDPs home and host country	2081371	*(2302834.)*	3153885	*(3370759.)*	1407220	*(565365.7)*
GDPrel	29.7525	*(51.45)*	11.69685	*(19.55)*	41.10176	*(61.14)*
SKILLdiff	9.371116	*(19.4)*	-2.8435	*(17.15)*	17.63947	*(16.22)*
Host tariff - Manufacturing	7.23378	*(6.37)*	2.72256	*(2.4)*	9.998721	*(6.47)*
Host tariff - six industries	10.08705	*(26.56)*	3.343867	*(4.27)*	14.21997	*(32.9)*
EU Tariff- Manufacturing	1.959611	*(1.47)*	2.369861	*(1.51)*	1.70174	*(1.38)*
EU Tariff - six industries	2.701041	*(2.77)*	3.533209	*(3.09)*	2.177964	*(2.4)*
Total observations - Manufacturing	570		220		350	
Total observations - six Nace industries	3420		1320		2100	

Note: standard deviations in parenthesis.

Source: authors' computation

Table 2 - Estimation results. Dependent variable: outward stocks of FDI (in logarithm) (1995-2008)

	TOTAL MANUFACTURING	SIX INDUSTRIES
sumGDP	0.000207***	0.000267***
	(2.31e-05)	(2.10e-05)
relGDP	-0.0212***	-0.0142***
	(0.00425)	(0.00288)
SKILLdiff	0.00709	-0.000283
	(0.00571)	(0.00459)
Host tariff (extra- EU)	-0.0723***	0.0139
	(0.0189)	(0.00975)
Home Tariff (EU)	0.545***	0.00298
	(0.0757)	(0.0305)
BIT	0.329	0.391*
	(0.279)	(0.217)
FTA	1.046***	0.678***
	(0.272)	(0.212)
dist	-8.80e-05***	-1.71e-05
	(2.01e-05)	(1.63e-05)
commlang	0.903***	1.445***
	(0.258)	(0.187)
d_Germany	0.959***	1.748***
	(0.252)	(0.201)
d_Italy	-0.424	0.325
	(0.261)	(0.234)
d_Netherlands	1.192***	1.728***
	(0.247)	(0.252)
d_UK	0.680***	1.171***
	(0.238)	(0.198)
Constant	4.425***	1.778***
	(0.351)	(0.301)
Observations	259	807
R-squared	0.681	0.361
F-test	67.91	40.70
p-value	0	0

Notes: robust standard errors in parenthesis.
***; **, * indicate significance at 1%, 5% and 10% level, respectively.

Table 3. Estimation results. Dependent variable: outward stocks of FDI (in logarithm) (1995-2008).

VARIABLES	TOTAL MANUFACTURING	NACE SIX DIGITS
sumGDP	0.000248***	0.000275***
	(2.14e-05)	(2.10e-05)
relGDP	-0.0206***	-0.0135***
	(0.00413)	(0.00271)
SKILLdiff	0.00658	-0.00259
	(0.00547)	(0.00462)
Host tariff (extra- EU)	-0.104***	0.0168
	(0.0182)	(0.0118)
Home Tariff (EU)	1.000***	0.0561
	(0.0943)	(0.0672)
Host tariff *DC	0.142*	-0.0755**
	(0.0825)	(0.0337)
Home Tariff *DC	-0.756***	-0.00866
	(0.132)	(0.0793)
BIT	-0.298	0.364
	(0.310)	(0.225)
FTA	1.067***	0.588***
	(0.276)	(0.212)
dist	-8.38e-05***	-1.68e-05
	(1.99e-05)	(1.61e-05)
commlang	1.022***	1.482***
	(0.246)	(0.189)
d_Germany	0.957***	1.733***
	(0.242)	(0.202)
d_Italy	-0.442*	0.343
	(0.245)	(0.230)
d_Netherlands	1.259***	1.763***
	(0.238)	(0.252)
d_UK	0.656***	1.185***
	(0.230)	(0.197)
Constant	4.702***	1.805***
	(0.363)	(0.301)
Observations	259	807
R-squared	0.712	0.368
F-test	79.88	36.81
p-value	0	0

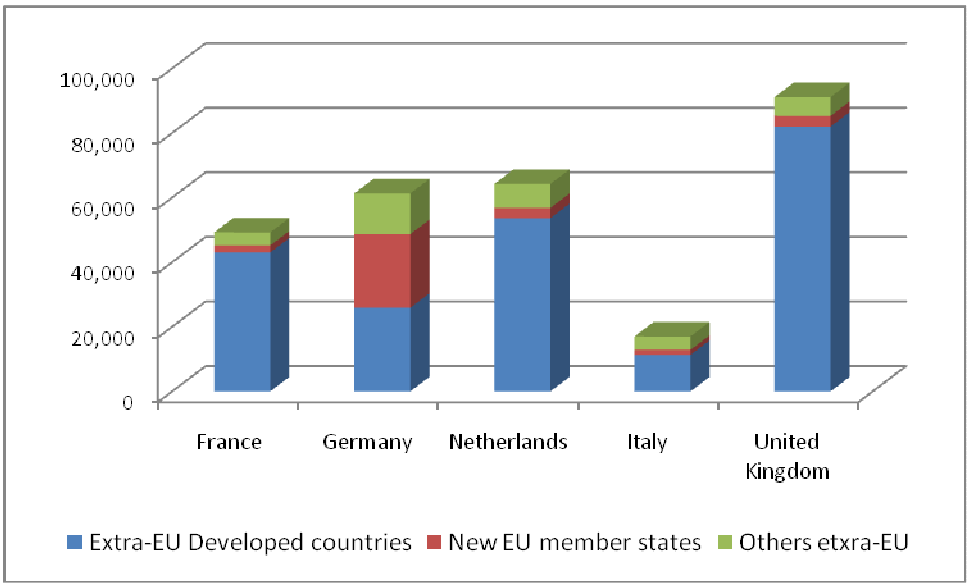
Notes: robust standard errors in parenthesis.
***; **, * indicate significance at 1%, 5% and 10% level, respectively.
DC indicate developed countries.

Table 4 - Estimation results. Dependent variable: outward stocks of FDI – Six industries (in logarithm) (1995-2008).

VARIABLES	(1)	(2)	(3)
sumGDP	0.000260***	0.000265***	0.000259***
	(1.90e-05)	(2.05e-05)	(1.91e-05)
relGDP	-0.0140***	-0.0150***	-0.0140***
	(0.00297)	(0.00331)	(0.00308)
SKILLdiff	0.00190	0.000905	0.00295
	(0.00441)	(0.00456)	(0.00462)
Host Tariff (extra-EU)	0.0128		
	(0.00966)		
Host Tariff *NACE1		0.00825	0.0155*
		(0.00947)	(0.00911)
Host Tariff *NACE2		-0.128***	-0.0808*
		(0.0268)	(0.0462)
Host Tariff *NACE3		0.0673**	0.0103
		(0.0285)	(0.0258)
Host Tariff *NACE4		0.106***	0.0781**
		(0.0290)	(0.0307)
Host Tariff *NACE5		-0.154***	-0.118***
		(0.0378)	(0.0378)
Host Tariff *NACE6		0.0125	0.00957
		(0.0232)	(0.0267)
Home Tariff (EU)		0.0592*	
		(0.0325)	
Home Tariff *NACE1	0.0606*		0.0622*
	(0.0312)		(0.0333)
Home Tariff *NACE2	-0.102**		0.0238
	(0.0446)		(0.0746)
Home Tariff *NACE3	0.560***		0.580***
	(0.0727)		(0.0729)
Home Tariff *NACE4	0.377***		0.329***
	(0.101)		(0.107)
Home Tariff *NACE5	-0.331**		-0.217
	(0.138)		(0.136)
Home Tariff *NACE6	0.0865		0.101
	(0.0557)		(0.0637)
BIT	0.634***	0.418*	0.721***
	(0.208)	(0.222)	(0.226)
FTA	0.879***	0.636***	0.920***
	(0.200)	(0.214)	(0.209)
dist	-3.80e-05**	-2.04e-05	-3.82e-05**
	(1.56e-05)	(1.68e-05)	(1.60e-05)
commlang	1.471***	1.458***	1.496***
	(0.175)	(0.186)	(0.177)
d_Germany	1.714***	1.722***	1.691***
	(0.190)	(0.197)	(0.189)
d_Italy	0.171	0.168	0.111
	(0.228)	(0.232)	(0.228)
d_Netherlands	1.717***	1.731***	1.729***
	(0.233)	(0.240)	(0.230)
d_UK	1.111***	1.124***	1.056***
	(0.185)	(0.193)	(0.186)
Constant	1.407***	1.746***	1.339***
	(0.294)	(0.293)	(0.300)
Observations	807	807	807
R-squared	0.449	0.408	0.461
F-test	55.79	35.11	46.43
p-value	0	0	0

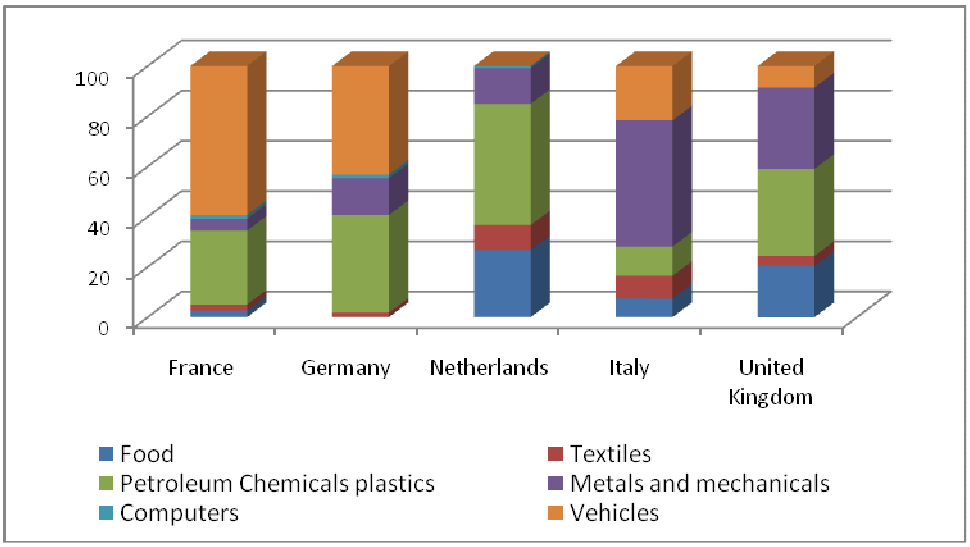
Notes: robust standard errors in parenthesis.
***; **, * indicate significance at 1%, 5% and 10% level, respectively.
NACE1: Food products, NACE2: Total textiles and wood activities; NACE3: Total petroleum, chemical, rubber, plastic products; NACE4 Total metal and mechanical products, NACE5 Total office machinery, computers, RTV, communication equipment and NACE6 Total vehicles and other transport equipment

Figure 1: The stock of outward FDI by countries in the manufacturing industry (2005, millions Euros)



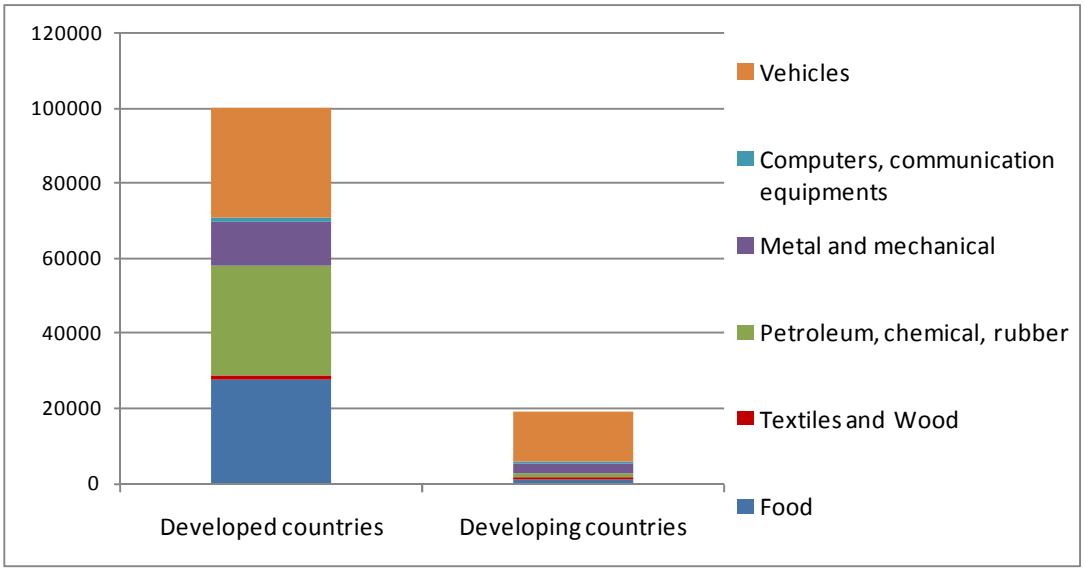
Source: authors' computations on Eurostat data.

Figure 2: The stock of outward FDI by industries (2005)



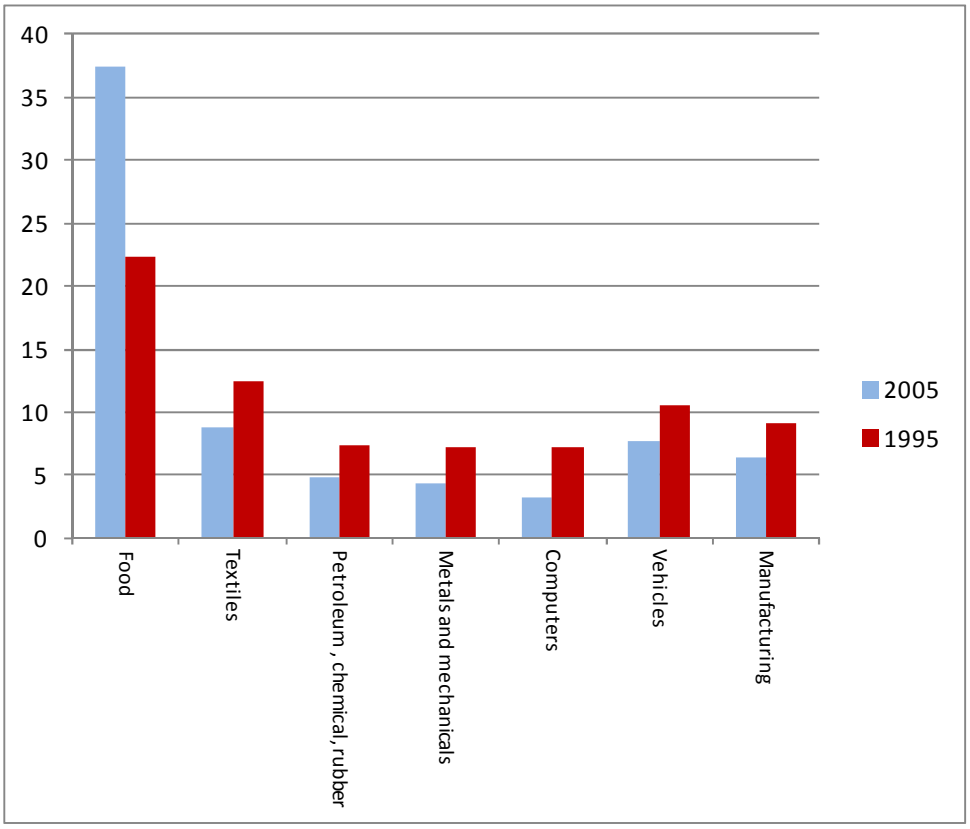
Source: authors' computations on Eurostat data.

Figure 3: The stock of outward FDI by industries and partner countries (2005)



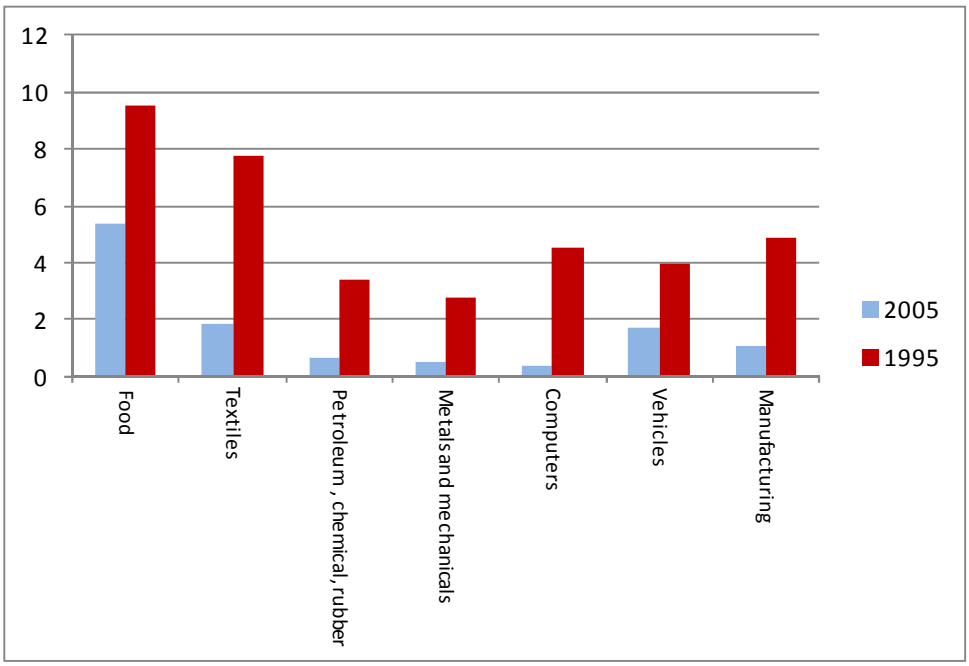
Source: authors' computations on Eurostat data

Figure 4: Average tariffs applied by host countries to EU products



Source: authors' computations on WITS data, World Bank.

Figure 5: Average tariffs applied by EU to host countries products



SOURCE: AUTHORS' COMPUTATIONS ON WITS DATA, WORLD BANK.

REFERENCES

Antràs, P., Foley, C. Fritz (2009). Regional Trade Agreement and Multinational Firm Strategies, NBER Working Paper 14891

Baier, S.L., Bergstrand, J.H. (2007). Do Free Trade Agreements Actually Increase Members' International Trade? Journal of International Economics 71: 72-95.

Baltagi, B.H., Egger, P. Pfaffermayr, M. (2007). Estimating models of complex FDI. Are there third-country effects? Journal of Econometrics 140: 260-281.

Baltagi, B.H., Egger, P. Pfaffermayr, M. (2008). Estimating regional trade agreement effect on FDI in an interdependent world. Journal of Econometrics 145: 2194-200.

Bergstrand, J.H., Egger, P. (2007). A knowledge-and-physical-capital model of international trade flows. Foreign direct investment and multinational enterprises. Journal of International Economics 73: 278-308.

Blonigen Bruce A. Piger, J., (2011). Determinants of Foreign Direct Investment, NBER Working Paper No. 16704;

Blonigen, B.A., Davies, R.B., Waddell, G.R., Naughton, H.T., (2007). FDI in space: Spatial

autoregressive relationships in foreign direct investment. European Economic Review 51, 1303–1325.

Bouët A., Decreux Y., Fontagné L., Jean S., Laborde D. (2005). A Consistent Picture of Applied Protection Across the World. TradeAg Working Paper 2005-05.

Braconier, H., Norback, P-J. and Urban, D. (2005). Reconciling the Evidence onthe Knowledge–Capital Model. Review of International Economics 13(4): 770–86.

Busse M., Koniger J., Nunnenkamp P., (2010). FDI promotion through bilateral investment treaties: more than a bit? Review of World Economics 146:147–177

Carr, D., Markusen, J.R., Maskus, K.E. (2001). Estimating the knowledge-capital model of the multinational enterprise. American Economic Review 91: 693–708.

Cipollina M. and Salvatici L. (2008) Measuring Protection: Mission Impossible?. Journal of Economic Surveys 22: 577-616.

Drukker, D. M., H. Peng, I. R. Prucha, Raciborski R. (2011). Creating and managing spatial-weighting matrices using the spmat command. Working paper, The University of Maryland, Department of Economics

Egger, P. (2008) On the Role of Distance for Outward FDI, Annual Regional Science, 42:375–389;

Egger P., Merlo V. (2007). The Impact of Bilateral Investment Treaties on FDI Dynamics. The World Economy 30: 1536-1549.

Egger, P., Pfaffermayr, M. (2004). The impact of bilateral investment treaties on foreign direct investment. Journal of Comparative Economics 32: 788–804.

Ekholm, K., Forslid, R., Markusen, J.R. (2007). Export-Platform Foreign Direct Investment. Journal of the European Economic Association 5(4): 776-95.

Hallward-Driemeier, M. (2003). Do bilateral investment treaties attract foreign direct investment? Only a bit…and they could bite. (World Bank Policy Research Working Paper 3121). Washington, DC: The World Bank.

Head, K. , Ries, J. (2008). FDI as an Outcome of the Market for Corporate Control:Theory and Evidence. Journal of International Economics . 74(1): 2-20.

International Monetary Fund (2010). World Economic Outlook, October 2010, Washington DC.

Markusen, J.R. (2002). Multinational Firms and the Theory of International Trade. MIT Press, Cambridge, MA.

Markusen, J.R., Maskus, K.E. (2002). Discriminating among alternative theories of the multinational enterprise. Review of International Economics 10: 694–707.

Neumayer, E., & Spess, L. (2005). Do bilateral investment treaties increase foreign direct investment to developing countries? World Development 33(10): 1567–1585

Stein, E., Daude C. (2007). Longitude Matters: Time Zones and the Location of Foreign Direct Investment. Journal of International Economics 71(1): 96-122.

Tekin-Koru A., Waldkirch, A., (2010) North-South Integration and the Location of Foreign Direct Investment, *Review of International Economics*, 18(4), 696–713.