Internationalization choices: a multinomial probit analysis*

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Abstract

Trade theory traces back different patterns of internationalization to heterogeneity between firms, measured both through differences in productivity levels and sales dispersion. In this paper we analyze the link between heterogeneity within sectors and internationalization choices, namely trade and FDIs (proxied by Mergers and Acquisitions), for a large sample of 25 domestic countries, 91 foreign countries and 57 manufacturing industries over the period 1994-2004. The focus of our paper is on the role played by the productivity level and the number of large firms in explaining different patterns of internationalization across sectors. By performing a multinomial probit analysis and controlling for other factors affecting the patterns of internationalization, our results confirm that sectors with a higher productivity and higher number of large firms are more likely to be present in international markets through both trade and foreign direct investments.

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1. Introduction

Firms can serve foreign consumers through two channels: (*i*) produce at home for exports and (*ii*) produce in the destination market through FDIs. The trade literature has shown that what is the best mode of foreign entry depends on the characteristics of the products, firms, sectors and countries involved (Barba Navaretti and Venables, 2004, chapter 6). Similar conclusions have been reached by several strands of firm-level international business research, notably that on the liabilities and benefits of foreignness and that on entry model choices (Slangen et al., 2011).

While there is a long tradition of studies on the factors underlying specific patterns of foreign expansion through trade or FDIs[1], the literature focusing on different forms of internationalization, controlling for the common factors affecting both trade and FDIs strategies, is relatively more recent (Brainard, 1993, 1997; Yeaple, 2003; Basile et al., 2003; Helpman et al., 2004; Castellani and Zanfei, 2007; Tomiura, 2007; Benfratello e Razzolini, 2009; Oldenski, 2010). In the traditional proximity-concentration trade-off literature, a well-accepted result is that FDIs become more convenient than exports as both the size of the foreign market and the costs of exporting increase, and less convenient as costs of setting up foreign production grow (Brainard, 1993, 1997; Yeaple, 2003). In other words, firms can be expected to invest abroad when the gains from avoiding transport and tariff costs outbalance the costs of maintaining capacity in multiple markets (Brainard, 1993).

However, as noted by Head and Ries (2003, p. 2), this strand of the literature does not predict what firms in each sector become exporters and foreign investors. More recent contributions, starting from the seminal paper by Melitz (2003), enriched the previous framework taking into account also the role of heterogeneities in firm-level productivity.[2] These models are based on the assumption that both export and production abroad entail some additional fixed costs with respect to domestic production (e.g. those linked to market researches, setting up of new distribution channels, and duplication of domestic plants). Fixed costs are higher for setting up production facilities abroad than for exporting, but foreign production allows the firm to save on transportation costs (Benfratello and Razzolini, 2009). This entails a productivity ranking in which multinational firms outperform exporters, which in turn outperform domestic firms. In Helpman et al. (2004), the within-sector heterogeneity of productivity levels induces a size distribution of firms, which affects the ratio of exports to affiliate sales. In other

[1] For a survey of this literature see Greenaway and Kneller (2007).
[2] A related issue is the traditional distinction between horizontal and vertical FDIs (see, e.g., Carr et al., 2001). However, this issue is out of the scope of our analysis here.

words, since the size distribution of firms is observable, they use its dispersion as a measure of firm-level heterogeneity.

While generating important insights, the empirical validation of these studies is still at a preliminary stage, since it is based almost uniquely on analyses focusing on specific countries, for which data on export and outward foreign investment at a disaggregated level are more readily available. [3]

The link between exports and FDIs has long been studied in international economics. Two aspects have been analyzed: the intensive margin of this choice, focusing on the relative value of trade and FDI, and the extensive margin, accounting for the number of countries where firms decide to export and to invest. In this paper we analyse the relationship between country and sector characteristics and export and the FDIs . In particular, we refer to the literature that studies firms' internationalisation choices using multiple-choice models (ordered or unordered).We enlarge previous empirical analyses using a large dataset including 25 domestic countries, 91 foreign countries and 57 manufacturing industries between 1994 and 2004. Following the existing literature, our focus is on the role of productivity and firm size in a sector. In particular, we make the hypothesis that a higher productivity level and the presence of a high number of large firms are associated with the presence of both FDIs and exports. Our results confirm that more productive sectors and sectors with a higher number of large firms are associated with a higher probability of foreign expansion, through both trade and FDIs.

Our analysis contributes to explain the nature of the firm internationalization processes along four dimensions. *First*, we expand the span of variables to introduce intra-industry firm heterogeneity since we, not only consider the productivity level, but also the number of large firms in a sector as determinants of different internationalization forms. This marks a departure from previous contributions which have either focused on the former or on the latter type of indicators. *Second*, we use bilateral flows of trade and FDIs at sector level for a large number of countries, both developed and developing. Moreover, in order to disentangle potential differences between groups of countries, we provide additional evidence on the patterns of internationalization for developing, G-10 and OECD countries. *Third*, we simultaneously measure the impact of several country-level and sector-level factors, alongside with productivity and the presence of large firms, on the probability of different

[3] An exception is provided by Pietrovito et al. (2012) that analyze the trade-off between trade and FDIs using a large dataset including 25 domestic countries, 91 foreign countries and 57 manufacturing industries between 1994 and 2004.

internationalization modes. This way we can highlight which types of sectors and country are more prone to choose one type of process of internationalization over another. The value added in incorporating industry-level insights in macro-level studies should be particularly high for the international business field, that traditionally has examined internationalization modes separately at the firm and country levels, and should hence have a keen interest in the links between the two (Slangen et al., 2011). *Fourth*, from a methodological point of view, we analyze the complexity of internationalization process in a multinomial framework. In our first set of estimation we consider the probit model to assess the impact of productivity and the presence of large firms, along with several controls, on the trade-off between internationalized (through trade and/or FDIs) and domestic sectors. In our second estimation we use a multinomial probit model, that provides several advantages over other discrete choice models used in the previous literature. First, differently from ordered choice models, the multinomial model prevents us from formulating an a priori ranking on the patterns of internationalization. Second, contrarily to the multinomial logit model, it does not assume the implausible independence from irrelevant alternative hypothesis that implies that adding another alternative or changing the characteristics of a third alternative does not affect the relative odds between other alternatives.

The rest of the paper is organized as follows. Section 2 briefly discusses the theoretical and empirical background and the hypothesis to be tested. Section 3 describes the data used in the analysis. Section 4 presents the empirical model used to test the main hypothesis. The main results of the analysis are presented in Section 5, while Section 6 presents the results of a number of robustness checks. Section 7 draws some conclusions.

2. Previous literature and testable hypothesis

The patterns of internationalization choices has long been studied in the international business field, where we can trace it back to the eclectic paradigm of Dunning (1977). More recently, in the international economics literature, Helpman et al. (2004) have developed an influential theoretical model to study the impact on the choice between trade and FDIs of a selection mechanism based on productivity, such as that of Melitz (2003).[4] In the model, a higher within-industry heterogeneity in

[4] In the seminal theoretical model by Melitz (2003), monopolistically competitive firms have different level of productivity, depending on a draw from an exogenous distribution. With fixed costs to export, only the most productive firms reach a sufficient scale to find it profitable to export. The model is therefore capable of explaining the positive link between productivity and export status, with a causality nexus running from the former to the latter.

firm sales is associated with a higher incidence of sales by foreign affiliates relative to exports, because with greater dispersion there is a larger share of firms with a sufficiently high level of productivity to find it profitable to invest abroad.

Using data on exports and on foreign sales of US manufacturing firms in 30 countries and 52 industries, Helpman et al. (2004) find direct firm-level evidence supporting their theoretical prediction (i.e., multinational firms are more productive than non-multinational exporters) as well as indirect industry-level evidence, since higher firm size dispersion, expressing a higher productivity dispersion, is associated with more foreign affiliates' sales relative to exports. Moreover, Oldenski (2010) extends the analysis of Helpman et al. (2004) showing that greater firm-level heterogeneity in firm size significantly increases FDIs relative to exports also in service industries.

Overall, the empirical evidence tends to confirm the theoretical hypothesis that firms self-select into internationalization strategies depending on their productivity level. For instance, studies performing test of stochastic dominance verify the hypothesis that the productivity distribution of one type of firms lies to the right of (i.e., dominates) another. The ranking of productivity has been tested for single countries. For instance, Girma et al. (2004) apply the concept of stochastic dominance to the level and the growth rate of productivity for groups of UK firms that do not export, export, or are domestic or foreign multinationals. They find that the cumulative productivity distribution of MNEs dominates that of non-MNEs in the level, while the productivity distribution of exporters dominates that of non-exporters. More recently, Arnold and Hussinger (2010) perform a stochastic dominance test for German firms finding that exporting firms generally outperform non-exporting firms over the entire productivity distribution, while multinational firms are at the top of the productivity distribution in manufacturing industries.

Looking at the literature more directly related to this paper, multiple choice models (both ordered and non-ordered) focus on exports and FDIs comparing productivity levels of multinationals against non-multinationals, exporters against non-exporters and of exporters against multinationals. In the real world, the choices available to a firm consist of "no internationalisation" and of all possible combinations of a set of internationalisation modes. In such models, choices are exhaustive and mutually exclusive and the firm chooses the strategy that maximises the profit function.

Calia and Ferrante (2010) show that a remarkable portion of firms adopt forms of internationalisation that avoid direct participations, such as exports or production agreement, and that the set of firm characteristics related to internationalisation choices varies significantly across the different forms. Basile et al. (2003) propose an internationalisation index that considers various

internationalisation categories for Italian manufacturing firms and model it with a univariate ordered probit, thereby assuming that the categories are ordered and that the internationalisation process is cumulative. Castellani and Zanfei (2007) provide evidence on the relationship between firm heterogeneity and internationalisation modes, with specific reference to the Italian manufacturing industry. In particular, they regress estimated TFP on a dummy variable for each internationalization category and, controlling for innovative activities, they find that technological intensity explains most part of the difference in productivity between multinational firms, exporters and domestic firms. Benfratello and Razzolini (2009), adopt a multinomial logit model for the categories of "no internationalisation", "only export" and "export plus horizontal FDI" and confirm the ranking of productivity predicted by theoretical models in a sample of 4, 000 Italian firms. Moreover, Bougheas and Görg (2008) estimate a multinomial logit model for Ireland to demonstrate empirically the relevance of considering a wide set of internationalisation forms. An important difference between our empirical framework and that of Helpman et al. (2004) is that their key explanatory variable is within-industry firm heterogeneity, measured by sales dispersion, while ours is the number of large firms in each country and sector. The choice of Helpman et al. (2004) is a direct consequence of the assumptions made in their theoretical model, namely that firm size depends on the level of productivity, that in turn follows a Pareto distribution. In this setting, the share of large (and highly productive) firms is an increasing function of within-industry firm heterogeneity. However, if firm size followed a different distribution across sectors, for example because of technological factors or economies of scale (Bartelsman et al., 2005), the relationship between dispersion and number of highly productive (large) firms could be non-linear (or even non-monotonic), since sectors presenting similar dispersion measures could feature a different number of large firms. For this reason, we prefer to focus on firm size.

Our main hypothesis, therefore, relates the productivity level and the number of large firms in a sector with the degree and modes of internationalization. In particular, they can be stated as follows:

Hypothesis 1: *a higher level of productivity and a greater incidence of large firms in a given sector of a given country is associated with a higher degree of internationalization.*

Hypothesis 2: *a higher level of productivity and a greater incidence of large firms in a given sector of a given country is associated with a higher probability that foreign expansion takes the form of both trade and FDIs.*

In practice, these hypotheses state that sectors enter the international market with "light" and indirect forms of internationalisation, denoted by low sunk costs and by a low international

commitment, but when they are able to assume higher risks associated with international activities, they cumulate forms requiring higher experience, investments and commitment (Calia and Ferrante, 2010).

3. Data and sample[5]

3.1 Dependent variable

To construct the discrete dependent variable for both probit and multinomial probit models, we need data on both exports and FDIs. The main statistical source of data on exports is the database UN Comtrade, managed by the statistical division of the United Nations, that reports data on the bilateral flows in several industrial sectors. In particular, it contains annual international trade statistics, detailed by commodity and partner country, from 1962 to 2009 for many countries. Commodities are classified according to different recognized classifications, such as the standard international trade classification (SITC) and the harmonized commodity description and coding system (HS). We use the international standard industry classification (ISIC), Revision 3, at 4-digit level to be able to concord data on export with other data used in the empirical analysis.

On the other hand, to overcome the limitations of data on bilateral FDIs at the sector level, we use information on M&As as a proxy for FDIs. While this is a limitation of our analysis, we believe that it should not affect the qualitative results of our analysis, because cross-border M&As are by and large the most widely used mode of operating a foreign firm (Herger et al., 2008).

Data on M&As are sourced from the SDC Platinum *global mergers and acquisitions*, a database provided by *Thomson financial securities data* that records all deals involving a change in ownership of at least 5 per cent of total equity and exceeding 1 million US dollar over the period 1985-2009. The Thomson dataset allows to analyze M&As for a large range of countries and years. This source records two related aspects of cross-border acquisitions: the number of acquisitions and their value.[6] Consistent with the literature on M&As, we do not consider undisclosed and incomplete deals for which the value of the transaction is not available. The database also contains information on target and acquirer profiles, such as primary industry and location, that are used in our empirical analysis. In particular, we

[5] Table 1 lists all variables used in our analysis and their sources.

[6] The main sources of information of data on M&As are financial newspapers and specialized agencies like Bloomberg and Reuters. It should be kept in mind that until the mid-1980s Thomson focused very much on M&As for the USA only, and it is only for about the last 20 years that (systematic) M&As data gathering took place for other countries (Brakman et al., 2005).

identify cross-border deals in manufacturing standard industry classification (SIC) codes at 4-digit level.[7]

3.2 Key independent variables

In testing our hypothesis we deal with the issue of measuring the presence of large firms. First, for each sector we divide the world distribution of firms by total sales in ten deciles. Then, for each sector of each domestic country, we count the number of firms in the first decile of the world distribution of firms by total sales. This indicator proxies for the incidence in each country and sector of those firms that are large enough to overcome the higher fixed costs of expanding abroad through FDIs rather than exports (Helpman et al., 2004).[8]

Data on firm's sales are drawn from the Worldscope database that includes financial statements of about 29,000 companies listed in developed and emerging markets, representing approximately 95% of the global market capitalization. Since we focus on large firms, excluding non-listed companies is unlikely to introduce a relevant bias in our measure of each sector's ability to internationalize. Data are classified according to the SIC classification at 4-digit level.

We include the average industry TFP, calculated under the assumption of constant returns to scale Cobb-Douglas production function:

$$TFP_i^h = \frac{Y_i^h}{(K_i^h)^{\alpha}(L_i^h)^{1-\alpha}} \qquad (3)$$

where (omitting indices): Y is the sector value added, K is the stock of capital at the sector level and L is the number of employees in the sector, assuming a capital share of 1/3 and a labor share of 2/3.

Total factor productivity at the national sector level is calculated from data on investment and labour from UNIDO (Indstat4, 2008 version), where each sector's capital stock is estimated by the inventory method (Bernanke and Gurkaynak's, 2002; Isaksson's, 2007). In particular: (*i*) for each country we calculate the sector's share of investment using flow information for the first five years of data available; (*ii*) we use investment shares to divide information on each country's total capital

[7] Domestic M&As, i.e., acquisitions with acquirer and target located in the same country, could still provide access to foreign markets if the target firm is active abroad or if the acquirer is controlled by a foreign firm. However, in the former case we do not know what are the foreign markets (possibly) involved, while in the latter case we have no information about foreign controls: as a consequence, we exclude domestic M&As from our sample.

[8] In the robustness checks we also consider other measures of the number of large firms: (*i*) the number of firms in the 9th and 10th decile, (*ii*) the number of firms in the 4th and 5th quintile and (*iii*) the dispersion of the distribution of sales within sectors.

provided by UNIDO's World Productivity Database across sectors; (*iii*) we use the estimates of the country and sector specific initial stock of capital obtained as described above as the starting point to apply the inventory method, i.e., adding each year's value of real term investment and applying a sector specific rate of depreciation to account for obsolescence.

3.3 Control variables

To limit the potential for omitted-variable bias, we add to the main variables of interest three sets of controls, that are chosen based on both the literature on relative incidence of different internationalization modes and the vast literature focusing on trade and on M&As. First, we control for some relevant sector characteristics in the country of origin. Second, we control for a set of characteristics of the bilateral relationship between each couple of countries. Finally, we include some sector characteristics that are specific of each pair of countries.

Country of origin sector-level variables.

Following Helpman et al. (2004), who show that capital intensity is a useful predictor of the incidence of exports relative to FDIs and that technological intensity favors FDIs relative to exports, we use the ratio between capital and number of employees at sector level from UNIDO to construct a measure of capital intensity, and the number of utility patents granted by the US Patent Office that have been produced worldwide in each sector, provided by the national bureau of economic research (NBER), as a measure of technological intensity.[9]

Bilateral country-level variables.

The empirical literature has identified a large set of variables that influence foreign market entry modes, though the magnitudes and even the signs of the impact on either trade or FDIs are not always consistent (see, for example, Blonigen, 2005; Disdier and Head, 2008; Helpman et al., 2008; Herger et al., 2008; Oldenski, 2010; Slangen and Beugelsdijk, 2010; Wang et al., 2010; Slangen et al., 2011). Distance directly increases transaction costs because of the transportation costs of shipping products, the cost of acquiring information about other economies, and the cost of finding a partner and contracting at a distance. Similarly, common legal system, common language, common religion,

[9] Since the original data on patents are classified according to the US Patent Classification, we combined them with other information adopting the correspondence scheme between the US Patent Classification and the International Patent Classification and between the latter and the ISIC3 provided by Johnson (2002).

common borders and colonial ties are expected to affect bilateral relationships, both through trade and investment.

Our data on bilateral characteristics (distance, number of islands and landlocked countries in a pair, common language, contiguity and colonial ties) are drawn from the dataset provided by the *centre d'etudes prospectives et d'informations internationales* (CEPII).[10] The only exception are the data on common legal systems that are from Djankov et al. (2002).

Bilateral sector-level variables.

We consider two bilateral sector-level variables. First, bilateral trade tariffs, that we expect to favor FDIs, according to the well-known "tariff jumping" effect pointed out in the literature (Brainard, 1997; Carr et al. 2001; Markusen and Maskus, 2002; Yeaple, 2003; Helpman et al., 2004). To make data comparable to other data used in the analysis, we aggregate HS 6-digit level data on tariffs from TRAINS to the 4-digit ISIC classification through simple averages. Second, building on the results of Chaney (2011) – who show that the existing contacts of a firm can be used to find new ones – we include in our specification a "network index" calculated as the number of common partners in trade and in M&As of each couple of countries (Francois, 2010). We expect that a higher number of common partners in exports (or in M&As) between two countries increases the probability of export (or M&As) between those same countries. Data on the number of common partners is built from our information on trade and FDIs.

3.4 Sample and summary statistics

Matching our different sources, we construct an original database that associates bilateral trade and FDIs flows at sector level in a common classification, for a sample of developed as well as developing countries. Ideally, the full set of industries should be included, with the extent of tradability reflected in transportation costs (Brainard, 1997). In practice, however, data on transport costs are only available for industries in which trade exists. As a consequence, industries including finance and utilities are excluded, along with wholesale and retail trade, because of the non-tradable nature of these activities. We also exclude agriculture and primary sectors (i.e., mining and oil and gas extraction) due to the lack

[10] The CEPII follows the great circle formula and uses latitudes and longitudes of the most important cities (in terms of population) to calculate the average of distances between city pairs. Data on distances are available at: http://www.cepii.fr/anglaisgraph/bdd/distances.htm. We also adopted distances between capitals as an alternative measure and the results remain unchanged.

of data on productivity. As a result, we focus on manufacturing sectors i.e., sectors with an ISIC code between 1511 and 3720.

Since our measures of M&As and sales are available in the SIC classification, we mapped SIC codes into ISIC codes, both at 4-digit level, using the concordances produced by Statistics Canada, as in Brakman et al. (2005).[11] To take into account that at the 4-digit level of disaggregation we have a large number of empty cells, both in exports and in M&As, we aggregate data available at 3 digits of ISIC classification. Matching different datasets yields data on 25 domestic countries and 91 foreign countries, covering 57 manufacturing industries at the 3 digits ISIC level from 1994 to 2004.

As shown by many theoretical and empirical studies (e.g., Caballero and Engel, 1999), investment dynamics are lumpy. This is even more true in the case of FDIs and M&As (see, for instance, Brakman et al., 2005). For these reasons, although our sample covers 11 years, we estimate our empirical model on data averaged over the entire sample, to smooth time-series variability.

Table 2 presents the descriptive statistics for the variables used in the estimations. It shows substantial variation in all our key variables.

Considering our explanatory variables, the number of firms in the first decile of the world distribution of firms by total sales is 2 with a high within sample variability (values range from 1 to 54). The TFP levels range from 14.702 to 875.631 (average value: 192.867) and the sectors presenting (on average) the highest values are: Refined petroleum products, Tobacco products, Motor vehicles and Automobiles. The number of patents, reflecting the level of technological development, shows an average value of 23 and a high variability since it ranges between 0 and 309.

Concerning bilateral characteristics, tariffs show a high variability, with values ranging between 0 and 58 per cent and an average level of 12 per cent. The average number of common partners in trade is 58, with values ranging between 0 and 117, whereas the average number of common partners in FDIs is much lower and the range narrower (between 0 and 30). This difference highlights that the two "networks" are quite different and the former is much larger than the latter (consistently with the lower fixed costs assumption, again).

In Table 3 we report simple correlations among the variables used in the empirical model. The correlation between the dependent variable for the multinomial probit and the number of large firms is positive, suggesting that having a larger share of world large firms favours both trade and FDIs. The same is valid for the correlations between the dependent variable of the probit model and the presence

[11] The concordances used are available at: http://www.macalester.edu/research/economics.

of large firms in a sector. Further, TFP levels are positively correlated with both dependent variables: higher levels of TFP in a given sector determine higher internationalization and higher probability of both trade and investment.

Bilateral correlations are suggestive, but they do not control for potentially confounding factors. For this reason, in what follows we perform a more refined econometric analysis.

4. Methodology

To analyze the two hypotheses testing the underlying motives of the composition of international commerce between trade and FDIs, we design two sets of regression models.

The first set is used to test *Hypothesis 1*. In particular, we estimate a probit model for the probability of internationalize (through trade and/or FDIs) against the probability of remaining at home:

$$Du\_probit_{ij}^{h} = \alpha + \beta_1 Number\_large\_firms_{i}^{h} + \beta_2 TFP_{i}^{h} + \beta_3 Z_{i}^{h} + \beta_4 T_{ij} + \beta_5 X_{ij}^{h} + \\ + \beta_6 DU_{i} + \beta_7 DU_{j} + \beta_8 DU^{h} + \varepsilon_{ij}^{h}. \quad (4)$$

where (omitting indices): *Du_probit* is a dummy variable equal to 0 for domestic sector *h* in country *i* and 1 for internationalized sector *h* in country *i*; *Number_large_firms* is the number of country *i* firms in the first decile of the world firms distribution of total sales in sector *h*; *TFP* is the average productivity level in sector *h* in country *i*; *Z* is the set of sector specific control variables for the exporting country in each sector (i.e. capital and technological intensity); *T* is the set of control variables describing the bilateral relationship between countries (e.g., distance, common language and common religion); *X* is the set of control variables describing the bilateral relationship between countries in a given sector (i.e., tariffs, number of common partners in trade or FDIs); and *DU* are three sets of dummies controlling for the domestic country, the foreign country and the sector-specific fixed effects.

To test *Hypothesis 2*, we apply an unordered discrete choice model to evaluate how countries' and sectors' characteristics affect the likelihood of different modes of internationalization. In general, a *K*-choice multinomial probit model is specified with the utility of the k^{th} internationalization choice for sector *h* is given by:

$$U^{h}{}_{k} = x'^{h}{}_{k}\,\beta + \varepsilon^{h}{}_{k}; k = 1,2,3,..K \quad (5)$$

The deterministic component *x* depends on sectors' and countries' characteristics (including the key explanatory variables and the three sets of variables defined above) and on the coefficients β. A sector

h in country *i* will choose the internationalization mode that yields the highest utility, so that the probability of choosing alternative *k* is:

$$\Pr[y=k]=\Pr[U^{h}{}_{k}>U^{h}{}_{q}];q\neq k;k=1,2,3,....,K$$
$$=\Pr[\varepsilon^{h}{}_{1}-\varepsilon^{h}{}_{q}<(x^{h}{}_{1}-x^{h}{}_{q})'\beta,...,\varepsilon^{h}{}_{K}-\varepsilon^{h}{}_{q}<(x^{h}{}_{K}-x^{h}{}_{q})'\beta;q\neq k \quad (6)$$

where the second expression denotes the difference with respect to the base outcome *q*. The multinomial probit model assumes the errors are distributed multivariate normal, with mean 0 and covariance matrix $\boldsymbol{\Sigma}$ which in turn allows for the errors to be correlated.

The multinomial probit model provides several advantages over other discrete choice models used in the previous literature. First, different from ordered choice models, the multinomial model prevents us from formulating an a priori assumption on the patterns of internationalization. Second, contrarily to the multinomial logit model, it relaxes the implausible independence from irrelevant alternative (IIA) hypothesis that implies that adding another alternative or changing the characteristics of a third alternative does not affect the relative odds between other alternatives.[12]

For the purpose of this study, we consider three internationalization states "domestic", "exporter" and "exporter and multinational", and we thereby develop a multinomial probit model with three choices where, for example, taking 0 as the base outcome, the probability of choosing alternative 1 is given by[13]:

$$\Pr[y=1]=\Pr[\varepsilon^{h}{}_{1}-\varepsilon^{h}{}_{0}<(x^{h}{}_{1}-x^{h}{}_{0})'\beta] \quad (7)$$

Therefore, based on a vector of sector and country characteristics we determine the unobserved propensity for the two modes of internationalization.

5. Results

5.1 Baseline specifications

The first step of our empirical analysis consists in estimating the probit model described in equation (4), where the dependent variable is the dummy that confronts domestic with internationalized sectors

[12] In the past, the main obstacle in implementing the multinomial probit model consisted in the difficulty in numerically computing the multivariate normal probabilities for any dimensionality higher than 2 (Greene, 2003); with the higher computational power now available, these models are finding a progressively larger use in empirical analyses.

[13] Since our database includes only a relatively small number of cases with positive flows of both trade and FDIs, we exclude form our set of internationalization strategies the category "multinational".

(via exports and/or foreign investment). We estimate this specification on a sample that includes all the 31,497 cases.[14]

Results in Column 1 of Table 4 show that an increase in the number of large firms increases the probability for a sector to internationalize. The positive coefficient of the number of firms in the first decile of the world distribution by total sales, statistically significant at the 99% level, is consistent with our first hypothesis, that when the distribution of firms in a given sector-country is shifted towards large firms, it is more likely that sectors explore foreign markets, via exports and/or foreign investment. Looking at the coefficient of the average level of productivity, positive and significant at the 99 per cent level, the theoretical hypothesis that only more productive sectors are likely to internationalize is also confirmed. Overall, these results provide support to the hypotheses that sectors characterized by a high presence of large firms and a high level of productivity are more likely to be able to afford the higher fixed costs required to serve foreign consumers.

The second set of regressions estimates a multinomial probit model to analyse the impact of our variables of interest, along with other controls, on the probability of internationalization through different combinations. Column 2 of Table 4 shows the results of the multinomial probit model where the base category is "domestic" and the other two categories are "trade" and "trade and FDIs". In other words, the first category includes sectors not internationalized at all, the second category includes sectors internationalized through exports and the third sectors through both exports and FDIs. The coefficients of the regressors for a given choice ("trade" and "trade and FDIs") can thus be interpreted as differences with respect to the coefficient of "domestic" choice.

As expected, the coefficient of the number of large firms is positive and highly significant for both internationalization choices. Moreover, the coefficient is larger for the "trade and FDIs" category than for the "trade" category, showing that the presence of large firms has a higher impact on the probability of internationalizing through both trade and FDIs (relative to the probability of being "domestic") than on the probability of exporting only. Even controlling for other covariates and industry and country dummies, the positive impact of the number of large firms in a sector is confirmed.

Regarding country-level bilateral characteristics, a first group of control variables (i.e., distance, contiguity, islands and landlocking) present a negative and statistically significant coefficient both on

[14] All estimates reported in this section include three sets of dummies controlling for the domestic country, the foreign country and the sector-specific fixed effects, as stressed in section 4.

"trade" and on "trade and FDIs" category. These results provide evidence that such factors induce sectors to remain at home, instead of internationalize through trade or trade and FDIs. The opposite is true for a second group of bilateral characteristics (i.e. common legal system, religion, colonial ties, language) showing a positive sign on internationalization choices.

Concerning sector-level bilateral characteristics, the coefficient of applied tariffs is negative and statistically significant, providing evidence of the "tariff jumping" effect: higher tariffs provide an incentive to switch internationalization to serve only the domestic market. The coefficients associated with the number of common partners in trade or in FDIs confirm the relevance of the network effects. Apparently, firms in sectors with a higher number of foreign contacts are more likely to enter an additional market, and sectors benefit from the contacts of their contacts. In other words, if a firm *k* has a contact in country *j'* which itself has a contact in country *j*, then firm *k* is more likely to enter country *j*. Furthermore, our results show that the trade and investment contacts form different networks and have opposite impacts on the internationalization choices.[15]

5.2 Robustness checks: groups of countries

In Table 5 we present the findings obtained considering different samples of countries. First, we consider the choice between different entry market modes made by sectors operating in developed countries, distinguishing G-10 (Belgium, Canada, France, Germany, Italy, Japan, Sweden, Switzerland, United Kingdom and United States) and OECD. In this respect, we consider G-10 and OECD as origin countries. Next, we test our main hypothesis limiting the sample to developing countries as destination markets.

Columns 1 and 2 refer to the internationalization strategies of firms based in G-10 and OECD countries, respectively. Restricting the sample of origin and destination countries does not change the overall picture drawn in Table 4. The coefficients of the number of large firms and of productivity level is higher for "Trade & FDI" mode of internationalization than for "Trade". The sign and the significance of the other coefficients remains by and large unchanged with a few exceptions.

In column 3 we analyze the determinants of foreign market entry modes considering the group of developing countries as destinations of foreign investment. Reassuringly, the overall results are confirmed. Indeed, also in this case, the coefficient of our variables of interest, as still positive and significant. In other terms, for internationalization toward developing countries, sectors characterized

[15] Similar results are obtained by estimating an ordered probit model. Results are available on request.

by large firms and a high level of productivity still prefer cumulate FDIs and trade as internationalization modes.

5.3 Robustness checks: different measures of the number of large firms and non-linearity in TFP

Table 6 reports several robustness checks aimed at verifying that our results do not change adopting different measures of the number of large firms in a sector. In particular, we use four different thresholds to define large firms in a sector: the number of large firms in the 9^{th} and 10^{th} decile, 4^{th} and 5^{th} quintile, 5^{th} quintile and a measure of the dispersion of sales in a sector. Reassuringly, as reported in columns 1-8, the coefficients of all different measures of the incidence of large firms confirm the positive impact on the probability of internationalize both through trade and through trade and FDIs. Reassuringly, our main results on the productivity level are confirmed also.

In the last column we study the potential non-liner effects of productivity. Substituting the continuous measure of TFP with a set of four dummies for each quartile level we verify that productivity has a non-linear effect on internationalization. The positive and statistically significant coefficient of the dummy for sectors in the top quartiles of the within-country distribution shows that only very high levels of productivity influence the choice between trade and FDIs. In other words, only the most productive sectors are likely to serve foreign markets through trade and/or both trade and FDIs. In all the other groups the opposite is true in the sense that firms tend to prefer remain at home.

6. Conclusions

Firms choice between exporting at arms' length and foreign direct investment, traditionally modeled as a proximity-concentration trade-off (Brainard, 1993, 1997), has been enriched in more recent contributions (Yeaple, 2003; Helpman et al., 2004; Oldenski, 2010) taking into account heterogeneity in firm productivity. While generating important insights, these studies have generally focused on single-country analysis.

In this paper, we study the determinants of the composition of international commerce between exports and FDIs across sectors and countries. Following the existing literature, our focus is on the role of productivity and firm size in a sector. In particular, we make the hypothesis that a higher productivity level and the presence of a high number of large firms are associated with the presence of both FDIs and exports. To this ends we use a novel dataset including 25 domestic countries, 91 foreign countries and 57 manufacturing industries covering the period 1994-2004. We found sound and convincing evidence in favor of this hypotheses. Our results confirm indeed that more productive

sectors and sectors with a higher number of large firms are associated with a higher probability of foreign expansion, through both trade and FDIs. Moreover, our results are robust to different country groups splits as well as to the exclusion of different sets of zero trade and/or FDIs flows.

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Table 1 - Variables description and sources

Description and sources of all the variables used in the empirical analysis..

Definition	Description and Source
Exports	Value of exports from country *i* to country *j* in sector *h*. *Source*: UN Comtrade
FDIs	Value of mergers and acquisitions from country *i* to country *j* in sector *h*. *Source*: SDC Platinum
Num. of large firms	Number of firms in country *i* in the first decile of the world distribution of firm sales in a given sector *h*. *Source:* Worldscope Database
TFP (log)	Log of average level of total factor productivity in sector *h* in country *i.* *Source*: UNIDO (Indstat4, 2008 version)
Capital intensity	Ratio between capital and number of employees in sector *h* in country *i*. *Source*: UNIDO (Indstat4, 2008 version)
Patents	Number of patents produced in a country *i* and in a given sector *h* and granted by the US Patent Office. *Source*: NBER
Distance (log)	Log of average distance between countries *i* and *j* calculated through the great circle formula that uses latitudes and longitudes of the most important cities (in terms of population). *Source*: CEPII http://www.cepii.fr/anglaisgraph/bdd/distances.htm
Islands	Number of countries that are islands in the pair of countries *i* and *j*. *Source*: CEPII http://www.cepii.fr/anglaisgraph/bdd/distances.htm
Landlocked	Number of countries that are landlocked in the pair of countries *i* and *j*. *Source*: CEPII http://www.cepii.fr/anglaisgraph/bdd/distances.htm
Common legal system	Dummy variable equal to 1 if country *i* and *j* share the same legal system. *Source*: CEPII http://www.cepii.fr/anglaisgraph/bdd/distances.htm
Common language	Dummy variable equal to 1 if country *i* and *j* share the same language. *Source*: CEPII http://www.cepii.fr/anglaisgraph/bdd/distances.htm
Common religion	Dummy variable equal to 1 if country *i* and *j* share the same religion. *Source*: CEPII http://www.cepii.fr/anglaisgraph/bdd/distances.htm
Contiguity	Dummy variable equal to 1 if country *i* and *j* share common borders. *Source*: CEPII http://www.cepii.fr/anglaisgraph/bdd/distances.htm
Colonial ties	Dummy variable equal to 1 if country *i* and *j* have ever been in colonial relationship. *Source*: CEPII http://www.cepii.fr/anglaisgraph/bdd/distances.htm
Tariffs	Tariffs applied from country *j* to country *i* in sector *h*. *Source*: TRAINS
Common partners in trade	Number of partners in trade common to country *i* and *j* in sector *h*. *Source*: UN Comtrade
Common partners in FDIs	Number of partners in FDIs common to country *i* and *j* in sector *h*. *Source*: SDC Platinum

Table 2 – Summary statistics

Variable	*Mean*	*Median*	*S.d.*	*Min*	*Max*
Num. of large firms (9th decile)	0.890	0.598	0.992	0.000	3.986
Num. of large firms (10th decile)	0.834	0.262	1.066	0.000	3.965
Num. of large firms (4th quintile)	1.273	0.981	1.100	0.000	4.433
Num. of large firms (5th quintile)	1.224	0.898	1.217	0.000	4.659
Sales dispersion	1.764	1.407	1.276	0.068	7.840
TFP (log)	5.262	5.308	0.508	2.688	6.775
Tariffs	0.116	0.091	0.105	0.000	0.581
Capital intensity	1.690	1.672	0.165	1.317	2.319
Patents	0.023	0.002	0.057	0.000	0.309
Distance	8.815	9.038	0.730	5.371	9.892
Contiguity	0.017	0	0.128	0	1
Islands	0.441	0	0.579	0	2
Landlocked	0.170	0	0.389	0	2
Common legal system	0.236	0	0.424	0	1
Colonial ties	0.041	0	0.199	0	1
Common language	0.102	0	0.303	0	1
Common religion same	0.173	0.032	0.276	0.000	0.959
Common partners in trade	0.058	0.056	0.038	0.000	0.117
Common partners in FDIs	0.001	0.000	0.002	0.000	0.030

Notes: Variables description and sources are provided in Table 1. Summary statistics are computed after excluding observations in the 1st and the 99th percentile of the distribution of the dependent variable. Summary statistics are calculated on 32,861 observations for all variables.

Table 3 – Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	*Du_probit*	1																				
2	*Du_mprobit*	0.633	1																			
3	*Num. of large firms (9th decile)*	0.266	0.107	1																		
4	*Num. of large firms (10th decile)*	0.254	0.097	0.873	1																	
5	*Num. of large firms (4th quintile)*	0.250	0.096	0.882	0.824	1																
6	*Num. of large firms (5th quintile)*	0.270	0.115	0.961	0.958	0.869	1															
7	*Sales dispersion*	0.220	0.069	0.703	0.728	0.713	0.733	1														
8	*TFP (log)*	0.177	0.161	0.319	0.358	0.269	0.346	0.242	1													
9	*Tariffs*	-0.073	0.002	0.021	0.007	-0.002	0.024	-0.040	0.021	1												
10	*Capital intensity*	-0.023	0.052	-0.316	-0.265	-0.356	-0.315	-0.230	0.252	-0.030	1											
11	*Patents*	0.237	0.062	0.643	0.622	0.588	0.624	0.562	0.253	-0.020	-0.170	1										
12	*Distance*	-0.108	-0.093	0.119	0.119	0.125	0.120	0.114	-0.006	0.052	-0.101	0.059	1									
13	*Contiguity*	0.077	0.011	-0.035	-0.035	-0.029	-0.041	-0.031	-0.049	-0.052	-0.007	0.001	-0.365	1								
14	*Islands*	0.033	0.023	0.202	0.161	0.177	0.193	0.048	0.160	-0.071	0.019	-0.037	0.102	-0.091	1							
15	*Landlocked*	-0.064	-0.019	-0.065	-0.060	-0.056	-0.069	-0.086	0.003	0.011	0.077	-0.034	-0.112	0.071	-0.142	1						
16	*Common legal system*	0.038	0.004	-0.052	-0.061	-0.070	-0.057	-0.057	-0.092	0.002	-0.092	0.026	-0.066	0.117	0.036	-0.048	1					
17	*Colonial ties*	0.131	0.040	0.048	0.010	0.046	0.042	0.017	0.001	-0.007	-0.052	0.012	-0.047	0.022	0.225	-0.051	0.266	1				
18	*Common language*	0.134	0.048	0.072	0.039	0.082	0.055	0.068	-0.077	0.008	-0.116	0.138	-0.054	0.132	0.096	-0.021	0.476	0.336	1			
19	*Common religion same*	0.014	-0.012	-0.126	-0.107	-0.156	-0.129	-0.139	-0.074	-0.183	-0.006	-0.023	-0.087	0.136	-0.071	0.059	0.306	-0.030	0.076	1		
20	*Common partners in trade*	0.286	0.064	0.023	0.020	0.038	0.021	0.030	-0.034	-0.239	-0.102	0.004	-0.095	0.066	-0.014	-0.119	-0.078	0.037	-0.060	0.019	1	
21	*Common partners in FDIs*	0.398	0.056	0.213	0.208	0.212	0.212	0.193	0.093	-0.196	-0.044	0.183	-0.038	0.038	0.075	-0.069	0.020	0.150	0.105	0.038	0.368	1

Notes. Variable definitions and sources are provided in Table 1. Correlations are computed after excluding observations in the 1st and the 99th percentile of the distribution of the dependent variable. Correlations are calculated on 32,861 observations for all variables.

Table 4 – Probit and multinomial probit

Variables description and sources are provided in Table 1. All estimates include unreported domestic country, foreign country and sector-specific fixed effects. Standard errors are reported in *italics*. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Probit			**Multinomial probit**				
				Trade			*Trade & FDI*	
	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.
Num. of large firms (log)	0.467	***	0.026	0.638	***	0.024	1.173	***	0.001
	0.038			*0.053*			*0.066*		
TFP (log)	0.133	***	0.007	0.175	***	0.006	0.687	***	0.001
	0.044			*0.061*			*0.116*		
Tariffs	-0.633	***	-0.035	-0.919	***	-0.035	-1.414	***	-0.001
	0.195			*0.275*			*0.468*		
Capital intensity	0.538	***	0.030	0.765	***	0.029	0.920	**	0.000
	0.171			*0.240*			*0.383*		
Patents	8.372	***	0.469	11.521	***	0.438	15.038	***	0.007
	0.711			*0.997*			*1.115*		
Distance	-0.377	***	-0.021	-0.506	***	-0.019	-1.025	***	-0.001
	0.039			*0.054*			*0.065*		
Contiguity	-0.437	***	-0.024	-0.620	**	-0.024	-0.416		0.000
	0.188			*0.263*			*0.288*		
Islands	-0.595	***	-0.033	-0.833	***	-0.032	-0.995	***	0.000
	0.062			*0.088*			*0.183*		
Landlocked	-0.368	***	-0.021	-0.523	***	-0.001	-11.512	***	-0.020
	0.063			*0.089*			*0.575*		
Common legal system	0.144	***	0.008	0.199	***	0.008	0.137		0.000
	0.053			*0.074*			*0.102*		
Colonial ties	0.483	*	0.027	0.599		0.022	1.057	***	0.001
	0.288			*0.398*			*0.408*		
Common language	0.681	***	0.038	0.943	***	0.035	1.812	***	0.002
	0.093			*0.131*			*0.161*		
Common religion same	0.795	***	0.044	1.119	***	0.043	1.452	***	0.001
	0.094			*0.133*			*0.228*		
Common partners in trade	7.553	***	0.423	9.850	***	0.323	42.155	***	0.058
	1.025			*1.437*			*2.170*		
Common partners in FDIs	248.568	***	13.916	295.529	***	11.020	513.275	***	0.409
	53.602			*75.955*			*77.288*		
Observations	31,497			31,495			31,495		

Table 5 – Groups of countries

Variables description and sources are provided in Table 1. Standard errors are reported in *italics*. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	G-10 (domestic)						OECD (domestic)						Developing countries (foreign)					
	Trade			*Trade & FDI*			*Trade*			*Trade & FDI*			*Trade*			*Trade & FDI*		
	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.
Num. of large firms (log)	0.238	**	-0.005	0.862	***	0.005	0.337	***	-0.017	0.972	***	0.018	0.433	***	0.003	1.006	***	0.005
	0.095			*0.109*			*0.067*			*0.077*			*0.060*			*0.094*		
TFP (log)	1.496	***	-0.004	2.087	***	0.004	1.098	***	-0.007	1.403	***	0.009	0.583	***	0.010	0.638	***	0.001
	0.330			*0.368*			*0.114*			*0.154*			*0.074*			*0.205*		
Tariffs	-3.072	***	0.007	-4.064	***	-0.007	-2.259	***	0.012	-2.819	***	-0.016	-1.554	***	-0.024	-1.896	***	-0.003
	0.544			*0.707*			*0.376*			*0.545*			*0.321*			*0.706*		
Capital intensity	-2.342	***	0.019	-4.917	***	-0.019	-0.733	**	0.006	-0.984	**	-0.007	0.631	**	0.026	-1.202	*	-0.016
	0.670			*0.877*			*0.292*			*0.407*			*0.258*			*0.724*		
Patents	0.200		-0.031	4.443	***	0.031	1.535		-0.104	5.379	***	0.107	4.445	***	0.042	8.812	***	0.039
	1.375			*1.484*			*1.067*			*1.176*			*1.007*			*1.353*		
Distance	-1.413	***	0.004	-1.916	***	-0.004	-1.547	***	0.009	-1.953	***	-0.012	-1.017	***	-0.013	-1.576	***	-0.005
	0.183			*0.191*			*0.109*			*0.118*			*0.075*			*0.099*		
Contiguity	11.146		0.000	11.152		0.000	-2.346	***	-0.018	-1.854	**	0.013	-0.512		-0.011	-0.297		0.002
	3181.552			*3181.552*			*0.715*			*0.727*			*0.657*			*0.755*		
Islands	0.251		0.003	-0.161		-0.003	0.307	***	0.003	0.208		-0.003	-0.467	***	-0.007	-0.553		-0.001
	0.226			*0.290*			*0.111*			*0.151*			*0.109*			*0.462*		
Landlocked	-0.226	***	0.091	-12.619		-0.091	0.180	**	0.028	-0.818	***	-0.028	-0.008		0.004	-0.471		-0.004
	0.151			*2659.428*			*0.091*			*0.208*			*0.080*			*0.334*		
Common legal system	0.632	***	-0.001	0.726	***	0.001	-0.095		-0.004	0.060		0.004	0.038		0.000	0.119		0.001
	0.243			*0.260*			*0.121*			*0.145*			*0.102*			*0.183*		
Colonial ties	11.731	***	-0.002	12.002	***	0.002	10.550	***	0.009	10.855	***	0.010	12.027	***	0.209	12.270	***	0.006
	0.127			.			*0.113*			.			*0.358*			.		
Common language	1.191	***	-0.008	2.293	***	0.008	1.531	***	-0.020	2.349	***	0.023	0.967	***	0.019	0.724	**	-0.002
	0.365			*0.387*			*0.296*			*0.315*			*0.169*			*0.341*		
Common religion same	-1.080	***	-0.003	-0.718		0.003	-0.131		0.007	-0.389		-0.007	0.853	***	0.007	1.827	***	0.009
	0.376			*0.454*			*0.187*			*0.260*			*0.182*			*0.377*		
Common partners in trade	27.983	***	-0.274	65.402	***	0.273	30.158	***	-0.904	64.483	***	0.961	19.703	***	0.183	39.284	***	0.174
	4.324			*4.736*			*2.630*			*3.149*			*2.167*			*3.847*		
Common partners in FDIs	10486.420	***	-1.263	10659.090	***	1.261	453.849	*	-4.576	645.618	**	5.405	12378.670	***	214.856	12636.720	***	5.969
	18.408			.			*275.908*			*276.316*			*109.959*			.		
Observations	15,665			15,665			24,578			24,578			19,118			19,118		

Table 6 – Robustness checks

Variables description and sources are provided in Table 1. Standard errors are reported in *italics*. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Trade			*Trade & FDI*			*Trade*			*Trade & FDI*			*Trade*			*Trade & FDI*			*Trade*			*Trade & FDI*			*Trade*			*Trade & FDI*		
	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.	Coeff.		M.E.
Num. of large firms (9th decile)	0.680	***	0.009	1.172	***	0.014																									
	0.060			*0.079*																											
Num. of large firms (10th decile)	0.190	***	-0.002	0.518	***	0.009																						0.650	***	0.007	1.260	***	0.017
	0.056			*0.070*																								*0.046*			*0.056*		
Num. of large firms (4th quintile)							0.216	***	-0.002	0.580	***	0.010																					
							0.046			*0.064*																							
Num. of large firms (5th quintile)							0.544	***	0.007	0.978	***	0.012	0.660	***	0.005	1.295	***	0.017														
							0.047			*0.062*			*0.040*			*0.052*																
Sales dispersion																			0.226	***	0.001	0.500	***	0.008								
																			0.029			*0.036*										
TFP (log)	0.576	***	0.008	0.967	***	0.011	0.564	***	0.007	1.002	***	0.012	0.564	***	0.008	0.966	***	0.011	0.636	***	0.009	1.134	***	0.014								
	0.049			*0.088*			*0.049*			*0.089*			*0.049*			*0.088*			*0.049*			*0.086*										
TFP (2nd quintile)																												-0.262	***	-0.008	-0.296	***	-0.001
																												0.073			*0.103*		
TFP (3rd quintile)																												-0.147	*	0.002	-0.425	***	-0.008
																												0.080			*0.115*		
TFP (4th quintile)																												0.140	*	0.006	0.073		-0.001
																												0.078			*0.111*		
TFP (5th quintile)																												0.368	***	0.016	0.241	*	-0.003
																												0.089			*0.126*		
Tariffs	-1.057	***	-0.024	-1.407	***	-0.011	-1.053	***	-0.026	-1.356	***	-0.009	-1.051	***	-0.024	-1.426	***	-0.011	-0.938	***	-0.024	-1.261	***	-0.010	-0.908	***	-0.022	-1.283	***	-0.011
	0.252			*0.425*			*0.252*			*0.425*			*0.252*			*0.426*			*0.249*			*0.418*			*0.248*			*0.424*		
Capital intensity	1.882	***	0.041	2.567	***	0.021	2.025	***	0.038	3.125	***	0.031	1.877	***	0.040	2.636	***	0.022	1.547	***	0.058	1.303	***	-0.004	2.499	***	0.072	3.043	***	0.019
	0.151			*0.251*			*0.155*			*0.260*			*0.151*			*0.254*			*0.147*			*0.240*			*0.137*					
Patents	-1.531	*	-0.111	1.052		0.065	-1.406	*	-0.103	1.045		0.060	-1.019		-0.113	2.390	**	0.085	3.810	***	-0.042	10.660	***	0.190	2.622	***	-0.035	7.663	***	0.137
	0.841			*0.964*			*0.819*			*0.940*			*0.820*			*0.933*			*0.767*			*0.857*			*0.837*			*0.935*		
Distance	-0.684	***	-0.009	-1.162	***	-0.013	-0.684	***	-0.010	-1.168	***	-0.013	-0.683	***	-0.010	-1.160	***	-0.013	-0.687	***	-0.013	-1.114	***	-0.013	-0.712	***	-0.013	-1.165	***	-0.013
	0.048			*0.058*			*0.048*			*0.058*			*0.048*			*0.058*			*0.047*			*0.057*			*0.047*			*0.057*		
Contiquity	-0.722	***	-0.033	-0.285		0.010	-0.726	***	-0.034	-0.276		0.010	-0.689	***	-0.032	-0.236		0.010	-0.718	***	-0.036	-0.267		0.011	-0.758	***	-0.036	-0.337		0.010
	0.227			*0.253*			*0.228*			*0.254*			*0.227*			*0.254*			*0.223*			*0.248*			*0.224*			*0.249*		
Islands	-0.182	***	-0.013	0.102		0.007	-0.183	***	-0.014	0.155	*	0.008	-0.180	***	-0.012	0.094		0.007	-0.185	***	-0.013	0.097		0.007	-0.152	***	-0.013	0.172	**	0.008
	0.056			*0.089*			*0.056*			*0.089*			*0.056*			*0.089*			*0.055*			*0.087*			*0.055*			*0.087*		
Landlocked	-0.119	*	0.019	-1.042	***	-0.024	-0.114		0.019	-1.071	***	-0.024	-0.111		0.018	-1.020	***	-0.023	-0.091		0.019	-0.971	***	-0.024	-0.089		0.020	-1.027	***	-0.025
	0.070			*0.192*			*0.070*			*0.194*			*0.070*			*0.193*			*0.069*			*0.192*			*0.069*			*0.192*		
Common legal system	-0.120	*	-0.004	-0.092		0.001	-0.102		-0.004	-0.080		0.000	-0.128	**	-0.005	-0.102		0.000	-0.144	**	-0.005	-0.133		0.000	-0.196	***	-0.008	-0.157	*	0.001
	0.063			*0.091*			*0.064*			*0.092*			*0.063*			*0.091*			*0.062*			*0.089*			*0.062*			*0.090*		
Colonial ties	0.750	**	0.016	1.041	***	0.009	0.762	**	0.017	1.052	***	0.008	0.743	**	0.016	1.030	***	0.008	0.734	**	0.017	1.038	***	0.009	0.687	**	0.016	0.989	***	0.009
	0.307			*0.319*			*0.309*			*0.321*			*0.310*			*0.322*			*0.300*			*0.312*			*0.291*			*0.302*		
Common lanquage	1.033	***	0.010	1.931	***	0.025	0.994	***	0.010	1.877	***	0.024	1.055	***	0.011	1.975	***	0.025	1.048	***	0.012	1.965	***	0.026	1.022	***	0.014	1.870	***	0.024
	0.116			*0.143*			*0.116*			*0.144*			*0.116*			*0.143*			*0.114*			*0.140*			*0.113*			*0.139*	***	
Common religion same	0.184	*	0.006	0.165		0.000	0.254	**	0.005	0.400	**	0.004	0.202	*	0.007	0.188		0.000	0.198	*	0.004	0.307	*	0.003	0.144		0.006	0.096		-0.001
	0.108			*0.184*			*0.109*			*0.186*			*0.108*			*0.184*			*0.108*			*0.180*			*0.107*			*0.179*		
Common partners in trade	5.462	***	-0.541	34.339	***	0.759	5.513	***	-0.527	34.636	***	0.748	5.283	***	-0.518	33.846	***	0.730	5.269	***	-0.535	33.835	***	0.772	5.507	***	-0.532	34.804	***	0.780
	1.193			*1.851*			*1.197*			*1.861*			*1.193*			*1.849*			*1.169*			*1.823*			*1.175*			*1.836*		
Common partners in FDIs	402.465	***	7.087	620.581	***	6.249	381.076	***	6.884	595.655	***	5.976	404.818	***	7.332	624.192	***	6.116	407.883	***	7.373	664.473	***	7.562	461.694	***	9.979	694.440	***	6.924
	64.634			*66.046*			*64.618*			*66.050*			*64.712*			*66.122*			*61.737*			*63.132*			*63.444*			*64.826*		
Observations	32,861			32,861			32,861			32,861			32,861			32,861			32,861			32,861			32,861			32,861		