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The internationalization process of firms: From exports to FDI?



by Paola Conconi, André Sapir and Maurizio Zanardi

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The Internationalization Process of Firms: from Exports to FDI?*

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Preliminary version

Abstract

We describe a simple model in which domestic firms decide whether to serve a foreign market through exports or horizontal foreign direct investment (FDI). This choice involves a trade-off between the higher variable trade costs associated with exports and the higher fixed set-up costs associated with establishing foreign subsidiaries. Crucially, firms are uncertain about their profitability in foreign markets and can only learn it by operating there. To obtain market-specific knowledge, firms may follow an “internationalization process”, serving the foreign market via exports first and eventually, in some cases, switching to local subsidiary sales. To assess the validity of the predictions of our model, we use firm-level data on export and FDI decisions in individual destination markets for all companies registered in Belgium over the period 1997-2008. We show that firms’ strategies to serve foreign markets depend not only on the variable and fixed costs associated with exports and FDI, but also on the export experience they have acquired in that market.

JEL classifications: F10, D21, F13.

Keywords: Exports, FDI, Uncertainty, Experimentation.

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1 Introduction

This paper examines firms’ strategies to serve foreign markets. In particular, it aims to shed light on the choice between exports and “horizontal” foreign direct investment (FDI), where the latter refers to an investment in a foreign production facility that is designed to serve customers in the foreign market. The key question addressed is whether firms follow an “internationalization process”, serving a foreign market via exports first, before engaging in FDI. The basic idea is that, if firms must acquire market-specific knowledge, they will choose to engage first in export activities, which entail higher variable costs but lower fixed set-up costs, switching to FDI only if they discover that the foreign market is profitable enough.

A vast literature in international business studies emphasizes that market-specific knowledge can only be gradually gained through experience in foreign markets, putting forward the idea that firms follow an “internationalization process” of increasing involvement in foreign markets. One of the earliest and most influential studies in this literature is by Johanson and Vahlne (1977). They stress the difficulty that firms face to obtain knowledge about “characteristics of the specific national market — its business climate, cultural patterns, structure of the market system, and, most importantly characteristics of the individual customer”. To acquire such knowledge, firms follow a process of increasing involvement in foreign markets, first exporting to individual countries and eventually, in some cases, establishing foreign subsidiaries there.

In this paper, we provide a simple theoretical model to formalize the idea of firms’ gradual involvement in foreign markets and provide systematic evidence supporting this internationalization process. In our theoretical analysis, a domestic firm must decide whether to serve a foreign market, and whether to do so through exports or local subsidiary sales. The firm faces the so-called “proximity-concentration” trade-off between the higher variable trade costs associated with exports and the higher fixed set-up costs associated with establishing foreign subsidiaries. In line with the above-mentioned international business literature, the firm is uncertain about the profitability of serving a foreign market and can only learn it by operating there. Under some conditions, the firm will choose to “test” the foreign market by exporting small amounts first; following this “trial” phase, it will either exit, expand its export volumes, or switch to FDI. In this setting, exports and FDI are substitute at any given point in time — since they represent alternative ways of serving a foreign market — but may be complements over time — since the knowledge acquired through export experience can lead firms to open a foreign subsidiary. This implies that countries undergoing trade liberalization reforms

may experience first an increase in imports, followed by an increase in FDI.

To assess the validity of the predictions of our model, we employ firm-level data from the National Bank of Belgium (NBB), which allows us to track the behavior of all companies registered in Belgium in terms of their export and FDI decisions in individual destination markets over the period 1997-2008. Using this panel dataset, we investigate firms' decisions on how to serve a foreign market over time. In line with previous studies, our preliminary regression results show that firms' entry choices in foreign markets depend on the variable and fixed costs associated with exports and FDI. We also find that the likelihood that a firm will open a subsidiary to serve a foreign market depends on the export experience acquired by the firm in that market, suggesting that firms follow a dynamic strategy when serving foreign markets.

Our paper contributes to the literature on the the "proximity-concentration" trade-off, which has examined the determinants of firms' choices to serve foreign markets via exports or horizontal FDI. Our analysis departs from standard theoretical models in this literature (e.g., Horstmann and Markusen, 1992; Brainard, 1993; Markusen and Venables, 2000) and from previous empirical studies (e.g., Brainard, 1997) by studying the role of uncertainty and experimentation in firms' decision. Recent papers by Helpman *et al.* (2004) and Head and Ries (2003) highlight the importance of within-sector productivity differences in explaining a firm's choice over export and horizontal FDI and provide empirical evidence (based on cross-sectional evidence for US and Japanese firms) showing that the least productive firms serve only the domestic market, the relatively more productive firms export, and the most productive firms engage in FDI. Rather than on firm heterogeneity in the domestic market, our analysis focuses on uncertainty and knowledge acquisition in foreign markers, which can lead firms to switch from export to FDI.

Our paper is also related to a recent literature on the dynamics of firms' exporting strategies. On the empirical front, a series of recent papers have identified some "stylized facts" about these dynamics. Using data on Colombian manufacturing firms, Eaton *et al.* (2008) document that most new exporters do not survive into the next year. New exporters begin by exporting small amounts but — conditional on survival — they grow rapidly and account for a substantial proportion of export growth. Further evidence in line with these patterns is provided by Aeberhardt *et al.* (2009) for French exporters, Lawless (2009) for Irish firms, and Alborno *et al.* (2010) for Argentinian firms.

Theoretical models seeking to account for these export market dynamics have emphasized learning about foreign markets and trade relationships.¹ One of the earlier papers

¹Standard sunk-cost hysteresis models (e.g., Dixit, 1989; Baldwin and Krugman, 1989; Das *et al.*,

on trade dynamics and incomplete information is Rauch and Watson (2003). They describe a model with costly search in which a buyer from a developed country is uncertain about whether exporters from developing countries are able to fill a large scale order. In this setting, trade relations start small because importers “test” exporters by placing small orders that reveal their type. Eaton *et al.* (2010) develop a model where producers learn about the appeal of their products by devoting resources to finding consumers and by observing the experiences of competitors. Freund and Pierola (2010) focus on the incentives of firms to develop new export products in the face of uncertainty about export costs. Their analysis of the frequency of entry and exit from foreign markets for Peruvian firms in the non-traditional agricultural sector in Peru shows a process of “trial and errors”. Arkolakis (2008) builds a model in which firms face convex costs of advertising and are thus forced to slowly build market share in export markets. An alternative explanation for why export relations start small and grow if the relationship is successful is provided by Aeberhardt *et al.* (2009). Their paper builds on the idea that exporting firms must find a local distributor in each market; initially, the quality of the distributor is unknown but exporters learn it as they acquire experience. Most related to our analysis is the recent work by Alborno *et al.* (2010), which our theoretical model builds on. They develop a tractable model based on learning and experimentation in which firms discover their profitability in foreign markets only after actually engaging in exporting. Their analysis is focused on firms’ export dynamics *across different* destinations and shows that firms experiment their products in one market before eventually expanding in other markets (“sequential exporting”). Our focus is instead on how learning and experimentation *within* a given destination can lead firms to switch from exports to FDI (“internationalization process”). To the best of our knowledge, none of the recent studies on export dynamics has examined the relationship between exports and FDI and whether export experience can lead firms to open subsidiaries in foreign countries.

The remainder of this paper is organized as follows. Section 2 presents the theoretical model. Section 3 describes our dataset and provides some descriptive statistics for Belgian firms’ involvement in foreign markets. Section 4 and 5 presents our empirical methodology and our results. Section 6 concludes, discussing ongoing work to extend our empirical analysis.

2007) and heterogeneous firm models (e.g., Melitz, 2003) emphasize the importance of the start-up costs that new exporters face and can help to explain patterns of foreign market entry and exit by individual firms. However, as noted by Ruhl and Willis (2008), they provide little guidance as to why some exporters are able to expand their foreign sales rapidly while others struggle.

2 The model

2.1 Setup

We describe a simple model in which a risk-neutral firm producing good k in its domestic market must decide whether or not to serve a foreign market i , and whether to do that via exports or horizontal FDI. To focus on the role of uncertainty and knowledge acquisition in foreign markets, in our theoretical analysis we abstract from firm heterogeneity in the domestic market.

Variable costs comprise a unit cost of production, which for simplicity is normalized to zero, and a unit cost c_{ik} for selling to consumers in country i (e.g., capturing distribution costs in the foreign market). If the firm exports, it bears a unit trade cost equal to τ_{ik} (reflecting both transport costs and barriers to trade), and must also incur a fixed cost equal to F_{ik}^E (e.g., capturing the costs of dealing with customs procedures). If the firm engages in FDI, setting up a foreign plant, it avoids trade costs, but incurs higher fixed costs equal to $F_{ik}^I > F_{ik}^E$.²

The firm faces the following demand in the foreign market:

$$q_{ik}(p_{ik}) = a_{ik} - p_{ik}, \quad (1)$$

where q_{ik} and p_{ik} denote the output sold in the foreign market and the corresponding price.

The main feature of our model is the uncertainty about the profitability of selling abroad: before serving the foreign market, the firm does not know the unit cost of selling its product to foreign consumers (captured by c_{ik}) and their willingness to pay for its product (captured by the parameter a_{ik}). We denote profitability in the foreign market by

$$\mu_{ik} \equiv a_{ik} - c_{ik}. \quad (2)$$

We assume that μ_{ik} is a random variable with a continuous cumulative distribution function $G(\cdot)$ on the support $[\underline{\mu}_{ik}, \bar{\mu}_{ik}]$. $\bar{\mu}_{ik}$ is realized with the highest possible demand intercept (\bar{a}_{ik}) and the lowest possible unit cost (\underline{c}_{ik}); $\underline{\mu}_{ik}$ is realized instead under the opposite extreme scenario, i.e., with \underline{a}_{ik} and \bar{c}_{ik} .

To simplify notation, in what follows, we drop country and sector subscripts, with

²In what follows, we will assume that the fixed cost of setting up a foreign subsidiary in a given market is independent of whether a firm has already exported to that market. The implications of relaxing this assumption are discussed at the end of this section.

the understanding that sectoral variables refer to industry k and country variables refer to foreign market i . The minimum level of profitability that guarantees that a firm earns positive profits by entering the foreign market via exports is

$$\mu^E \equiv (F^E)^{1/2} + \frac{\tau}{2}. \quad (3)$$

We assume the following:

Assumption 1 $\underline{\mu} < \tau$ and $\bar{\mu} > \mu^E$.

The restriction $\underline{\mu} < \tau$ ensures that, even if there are no fixed costs associated with exports ($F^E = 0$), exporting is not always profitable; $\bar{\mu} > \mu^E$ guarantees that exporting can be profitable under some realizations of μ .

Opening a foreign subsidiary yields positive profits only if μ exceeds the following threshold:

$$\mu^I \equiv (F^I)^{1/2}. \quad (4)$$

To make sure that FDI is profitable for at least some realizations of μ , we impose the following restriction:

Assumption 2 $\bar{\mu} > \mu^I$.

For the choice between export and horizontal FDI to be interesting, firms must face a proximity-concentration trade-off. We thus assume the following:

Assumption 3 $\mu^E < \mu^I$.

This guarantees that the fixed costs of setting up a foreign subsidiary are large enough that FDI does not always dominate exports, i.e., $F^I > \frac{1}{4}(2(F^E)^{1/2} + \tau)^2$.

2.2 Timing and entry strategies

The timing of a firm's decisions is as follows:

$t = 1$: the firm chooses between exporting to the foreign market, setting up a foreign subsidiary, or not entering the market at all. If the firm decides to enter via exports (FDI), it pays the per-destination fixed entry cost F^E (F^I) and chooses how much to sell in that period. At the end of this period, if the firm has sold a positive amount, it infers μ from its profit.

$t = 2$: If the firm has not entered the foreign market at $t = 1$, it decides whether or not to do so. If the firm has entered at $t = 1$, it decides whether to exit the foreign market, serve it under the same mode, or switch mode.

For simplicity, and without loss of generality, we will assume that firms do not discount the future. Notice that only firms that pay the fixed cost of entering the foreign market — either F^E or F^I , depending on the mode of entry — and sell a strictly positive amount can learn profitability in that market.³

There are three possible strategies to enter the foreign market:

- a) No entry in the foreign market at $t = 1$.
- b) Entry via exports at $t = 1$: in the first period, the firm pays the fixed cost F^E , exports to the foreign market and discovers its profitability; in the second period, it decides whether to continue serving the foreign market through exports, switch to FDI, or exit;
- c) Entry via FDI at $t = 1$: in the first period, the firm pays the fixed cost F^I and serves the foreign market through its foreign subsidiary; in the second period, the firm decides whether to continue serving the foreign market through FDI, switch to exports, or exit;

In what follows, we solve for the firm's decisions (in terms of mode of entry and quantity produced) by backward induction.

2.2.1 Period $t = 2$

a) *No entry at $t = 1$*

In this case, the firm does not enter the foreign market in the second period, earning zero profits.

b) *Entry via exports at $t = 1$*

Consider a firm that has exported to the foreign market in the first period and discovered its profitability μ . In the second period, it must decide whether to continue exporting,

³The setup is similar to Jovanovic (1982)'s model of firm survival, in which entrepreneurial ability is dispersed in the population of potential entrepreneurs and only known to individuals who have business experience.

open a foreign subsidiary, or exit the foreign market. If the firm continues to export, its second-period profits are given by

$$\pi^{EE}(\tau) \equiv (\mu - \tau - q^{EE})q^{EE}. \quad (5)$$

The firm will choose q^{EE} so as to maximize (5), which yields second-period export sales equal to

$$\hat{q}^{EE}(\tau) = K_{\{\mu > \tau\}} \frac{\mu - \tau}{2}, \quad (6)$$

where “ \hat{q} ” denotes optimal quantity choices and $K_{\{\cdot\}}$ is an indicator variable, here denoting whether $\mu > \tau$. Notice that for lower levels of realized profitability (i.e., $\mu \leq \tau$), export sales will be equal to zero. Plugging (6) into (5), we can rewrite second-period export profits as

$$\pi^{EE}(\tau) = K_{\{\mu > \tau\}} \left(\frac{\mu - \tau}{2} \right)^2. \quad (7)$$

Alternatively, after discovering its profitability in the foreign market, the firm can decide to switch to FDI. In this case, its second-period profit are given by

$$\pi^{EI}(F^I) \equiv (\mu - q^{EI})q^{EI} - F^I. \quad (8)$$

Notice that second-period FDI profits are positive only if μ exceeds the threshold μ^I defined in equation (4). Maximization of (8) yields the optimal quantity decision

$$\hat{q}^{EI} = K_{\{\mu > \mu^I\}} \frac{\mu}{2}. \quad (9)$$

Profits obtained when opening a subsidiary at $t = 2$ are thus equal to

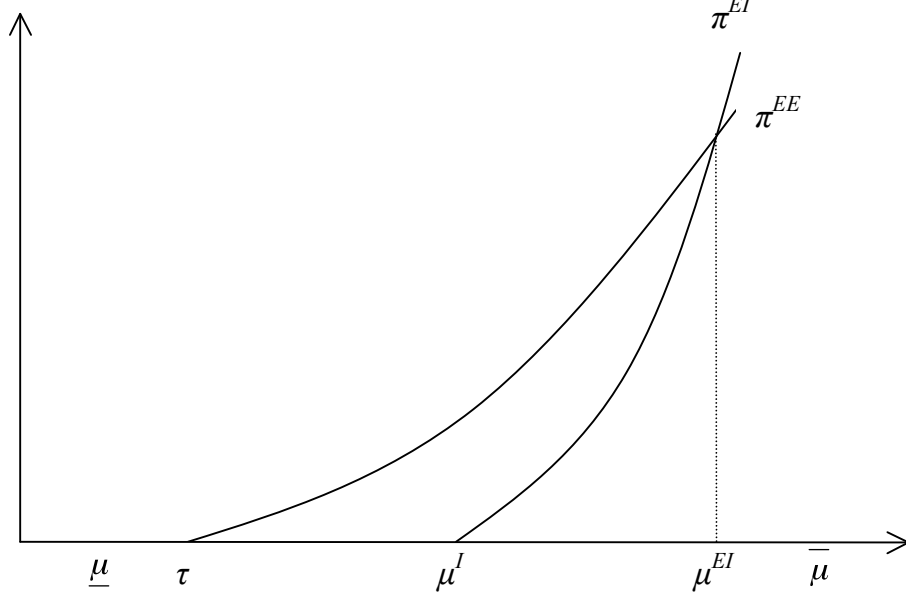
$$\pi^{EI}(F^I) = K_{\{\mu > \mu^I\}} \left(\frac{\mu^2}{4} - F^I \right). \quad (10)$$

Comparing (10) with (7), we can derive the profitability threshold above which a firm that has exported to the foreign market in the first period will switch from export to FDI in the second period:

$$\mu^{EI} \equiv \frac{2F^I}{\tau} + \frac{\tau}{2}. \quad (11)$$

Notice that such threshold increases with the fixed costs of setting up a foreign sub-

Figure 1: Export and FDI profits at $t = 2$ following entry via exports at $t = 1$



sidiary:

$$\frac{\partial \mu^{EI}}{\partial F^I} = \frac{2}{\tau} > 0. \quad (12)$$

An increases in the trade costs τ leads instead to a fall in this threshold, making a switch to FDI more appealing:⁴

$$\frac{\partial \mu^{EI}}{\partial \tau} = \frac{1}{2} - \frac{2F^I}{\tau^2} < 0. \quad (13)$$

Figure 1 illustrates second-period profits for a firm that has exported to the foreign market in the first period. The firm's decision on whether to switch from export to FDI in the second period depends on its profitability in the foreign market, discovered at the end of the first period. If μ is below the trade cost τ , serving the foreign market is not profitable and the firm will exit. If profitability lies in the range between τ and μ^{EI} , the firm will continue to serve the foreign market via exports. If instead μ is higher than μ^{EI} , the firm will open a foreign subsidiary.

⁴To verify this, notice that $F^I > \frac{1}{4}(2(F^E)^{1/2} + \tau)^2$ by Assumption 3. This implies that $\frac{2F^I}{\tau^2} > \frac{1}{2}$ and thus $\frac{\partial \mu^{EI}}{\partial \tau} < 0$.

Ex ante, the firm anticipates that, after exporting a positive amount in the first period, in the second period it may be forced to exit the foreign market (with probability $G(\tau)$), continue to export (with probability $G(\mu^{EI}) - F(\tau)$), or open a foreign subsidiary (with probability $1 - G(\mu^{EI})$). Recalling the comparative statics of equations (12) and (13), we can state the following:

Proposition 1 *A firm that has entered the foreign market via exports at $t = 1$ will open a foreign subsidiary at $t = 2$ with probability $1 - G(\mu^{EI})$. The switch to FDI is more likely to occur the higher are the trade costs and the lower are the fixed costs of setting up a foreign subsidiary.*

From an ex-ante perspective (i.e., evaluated at $t = 0$), second-period profits for a firm that starts exporting to the foreign market in the first period are thus given by

$$V^E(\tau, F^I) = \int_{\tau}^{\mu^{EI}} \left(\frac{\mu - \tau}{2} \right)^2 dG(\mu) + \int_{\mu^{EI}}^{\bar{\mu}} \left(\frac{\mu^2}{4} - F^I \right) dG(\mu). \quad (14)$$

Equation (14) captures the firm's option value of serving the foreign market in the second period, after exporting and discovering its profitability in the first period. The term $\int_{\tau}^{\mu^{EI}} \left(\frac{\mu - \tau}{2} \right)^2 dG(\mu)$ reflects the option value of continuing to export, while the term $\int_{\mu^{EI}}^{\bar{\mu}} \left(\frac{\mu^2}{4} - F^I \right) dG(\mu)$ captures the option value of switching to FDI.

c) Entry via FDI at $t = 1$

Finally, consider the case in which the firm opens a subsidiary in the foreign market at $t = 1$, paying the fixed costs F^I . In this case, second-period FDI profits are given by

$$\pi^{II} = (\mu - q^{II})q^{II}, \quad (15)$$

and optimal subsidiary sales in the second period are equal to

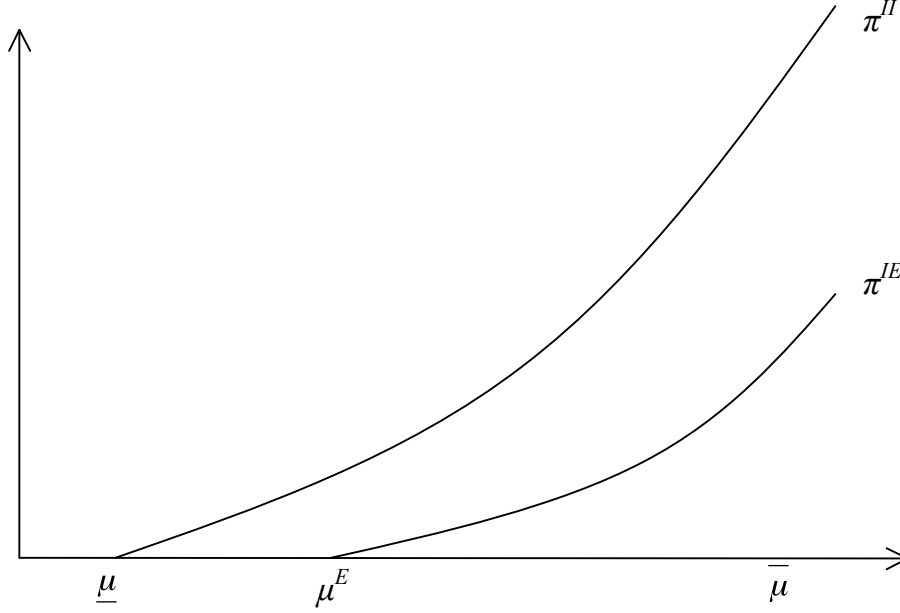
$$\hat{q}^{II} = \frac{\mu}{2}. \quad (16)$$

Plugging (16) into (15), second-period FDI profits can be written as

$$\pi^{II} = \frac{\mu^2}{4}. \quad (17)$$

Notice that expression (17) can never be negative, implying that exiting the foreign market at $t = 2$ is a dominated strategy.

Figure 2: Export and FDI profits at $t = 2$ following entry via FDI at $t = 1$



Exporting in the second period, after having opened a subsidiary in the first, is also a dominated strategy. To verify this, notice that a firm switching to exports at $t = 2$ will earn profits equal to

$$\pi^{IE}(\tau, F^E) = K_{\{\mu > \mu^E\}} \left(\left(\frac{\mu - \tau}{2} \right)^2 - F^E \right). \quad (18)$$

Comparing (18) with (17), it is straightforward to verify that, for any level of profitability μ , $\Pi^{II} > \Pi^{IE}(\tau, F^E)$. Thus continuing to serve the foreign market through foreign subsidiary sales is always preferable to the option of switching to exports. The intuition for this result is simple: once a firm has paid the fixed costs F^I , starting to serve the foreign market via exports would imply paying additional fixed costs F^E and trade costs τ . We can thus state the following:

Proposition 2 *A firm entering the foreign market via FDI at $t = 1$ will never exit or switch to exports at $t = 2$.*

Having derived the firm's expected profits in the second period, we can now move to the analysis of its entry strategies in the first period.

2.2.2 Period $t = 1$

c) *No entry at $t = 1$*

The firm does not enter the foreign market, earning zero profits.

b) *Entry via exports at $t = 1$*

From an ex-ante perspective (before discovering its profitability in the foreign market, at $t = 0$), the firm will choose export volumes q^E to maximize

$$\begin{aligned} \omega^E(\tau, F^E, F^I, q^E) \equiv & \int_{\underline{\mu}}^{\bar{\mu}} (\mu - \tau - q^E) q^E dG(\mu) - F^E \\ & + K_{\{q^E > 0\}} \left\{ \int_{\tau}^{\mu^{EI}} \left(\frac{\mu - \tau}{2} \right)^2 dG(\mu) + \int_{\mu^{EI}}^{\bar{\mu}} \left(\frac{\mu^2}{4} - F^I \right) dG(\mu) \right\} \end{aligned}$$

The first line of (19) captures the firm's expected export profits in the first period. The second line represents instead expected second-period profits.

Expected first-period profits are positive only if $E\mu > \mu^E$ as defined in (3). In this case, the firm will choose to export an amount $\hat{q}^E = \frac{E\mu - \tau}{2}$. However, even if $E\mu \leq \mu^E$, the firm may be willing to “test” the foreign market, exporting an arbitrarily small amount $\epsilon > 0$ in the first period, in order to find out whether serving the foreign market (via exports or FDI) is actually profitable. For experimentation to occur, the following condition must hold:

$$(E\mu - \tau - \epsilon)\epsilon - F^E + V^E \geq 0. \quad (20)$$

Expected profits from entering the foreign market at $t = 1$ via exports can thus be written as

$$\begin{aligned} \Omega^E(\tau, F^I, F^E, q^E) \equiv & \int_{\mu^E}^{\bar{\mu}} \left(\frac{\mu - \tau}{2} \right)^2 dG(\mu) - F^E \\ & + K_{\{q^E > 0\}} \left\{ \int_{\tau}^{\mu^{EI}} \left(\frac{\mu - \tau}{2} \right)^2 dG(\mu) + \int_{\mu^{EI}}^{\bar{\mu}} \left(\frac{\mu^2}{4} - F^I \right) dG(\mu) \right\} \end{aligned}$$

c) *Entry via FDI at $t = 1$*

A firm setting up a foreign subsidiary at $t = 1$ chooses foreign sales q^I to maximize

$$\omega^I(F^I, q^I) \equiv \int_{\underline{\mu}}^{\bar{\mu}} (\mu - q^I) q^I dG(\mu) - F^I + K_{\{q^I > 0\}} \int_{\underline{\mu}}^{\bar{\mu}} \frac{\mu^2}{4} \quad (22)$$

The first two terms capture the firm's expected profits from FDI at $t = 1$, while the second term denotes expected profits at $t = 2$. Notice that expected first-period profits are only positive if $E\mu$ exceeds the threshold μ^I defined in equation (4). However, even if $E\mu < \mu^I$, the firm may be willing to engage in FDI and sell an arbitrarily small amount $\epsilon > 0$ at $t = 1$. For this to be the case, the following must be true:

$$(E\mu - \epsilon)\epsilon - F^I + \int_{\underline{\mu}}^{\bar{\mu}} \frac{E\mu^2}{4} \geq 0. \quad (23)$$

We can thus rewrite the firm's expected profits from entering the foreign market via FDI as follows:

$$\Omega^I(F^I, q^I) \equiv \int_{\mu^I}^{\bar{\mu}} \frac{(\mu)^2}{4} dG(\mu) - F^I + K_{\{q^I > 0\}} \int_{\underline{\mu}}^{\bar{\mu}} \frac{\mu^2}{4} dG(\mu). \quad (24)$$

As discussed above, entering the foreign market via exports has an option value, since it allows the firm to discover its profitability and to choose between continuing serve the foreign market via export, switch to FDI, or exit. In contrast, there is no option value in entering via FDI in the first period, since in this case serving the foreign market through the foreign affiliate is always the most profitable option in the second period.

2.2.3 Entry strategy

In our analysis above, we have derived export and FDI profits from an ex ante perspective, i.e., evaluated at $t = 0$, when the firm does not yet know its profitability. This allows us to understand how uncertainty about profitability in the foreign market affects the firm's decision to enter via exports or FDI.

We have established that, if a firm enters via FDI, it will never exit or switch to exports as an alternative way to serve the foreign market. If instead a firm enters via exports, it may continue to serve the market via exports, switch to FDI, or exit. The firm's "internationalization strategy" from exports to FDI can be described as follows:

Proposition 3 *In the first period, if $\Omega^E(\tau, F^I, F^E) > 0$ and $\Omega^E(\tau, F^I, F^E) > \Omega^I(F^I)$, the firm will enter the foreign market via exports; in the second period, it will open a foreign subsidiary with probability $1 - G(\mu^{EI})$.*

We can show that, when "experimentation" matters, the firm will always follow such a strategy. To verify this, recall that, if expected profitability is low enough ($E\mu \leq \mu^E$), the firm may be willing to incur a first-period loss to "test" the foreign market, exporting an arbitrarily small amount to find out whether serving the foreign market (via exports

or FDI) is actually profitable. In this case, the firm will never want to enter the foreign market via FDI. To see this, suppose $E\mu = \mu^E$. In this case, the firm anticipates that, if it enters via exports, it will make zero profits in the first period, but positive profits in the second:

$$\Omega^E(\tau, F^I, F^E) = \int_{\tau}^{\mu^{EI}} \left(\frac{\mu - \tau}{2} \right)^2 dG(\mu) \int_{\mu^{EI}}^{\bar{\mu}} \left(\frac{\mu^2}{4} - F^I \right) dG(\mu) > 0. \quad (25)$$

In contrast, when $E\mu = \mu^E$, expected profits from FDI entry are negative:⁵

$$\Omega^I(F^I) = \frac{E\mu^2}{4} = \frac{((F^E)^{1/2} + \frac{\tau}{2})^2}{4} - F^I < 0. \quad (26)$$

Thus, uncertainty about its profitability in the foreign market can lead the firm to “experiment” by exporting small amounts first. Following this “trial” phase, the firm will either exit, expand its export volumes, or switch to FDI.

In our analysis above, we have assumed that setting up a foreign subsidiary is independent of whether a firm has already exported to that market. This is the case if F^E includes only fixed costs specific to exporting (e.g., dealing with customs procedures) and F^I captures only the fixed costs linked to FDI (e.g., building a plant in the foreign country). However, serving a foreign market may involve other kinds of fixed costs common to both exports and FDI (e.g., establishing distribution channels, designing a marketing strategy, dealing with foreign bureaucracies, product standards). In this case, we could re-write the fixed costs of exports and FDI as $F^E = K + f^E$ and $F^I = K + f^I$, respectively, with $f^I > f^E$. Changing the formulation of the fixed costs along these lines will not affect the main results of our analysis, i.e., Propositions 1- 3 will still hold. Notice, however, that the profitability threshold above which the firm can gain from opening a foreign subsidiary at $t = 2$ after having exported at $t = 1$ will be lower and equal to $\mu^{EI} = \frac{2f^I}{\tau} + \frac{\tau}{2}$. This will lead to an increase in the likelihood that the firm will switch to FDI after entering the foreign market via exports.

To sum up, in our model exports and horizontal FDI are alternative ways in which firms serve foreign markets. Firms’ should be more (less) likely to export (engage in FDI) the lower the trade costs and the higher the fixed costs of setting up foreign subsidiaries. Moreover, firms’ desire to acquire market specific knowledge can lead them to enter a foreign market via exports first, before switching to FDI. Thus, export experience should increase the likelihood that firms open foreign subsidiaries.

⁵This follows from Assumption 3.

3 Dataset and descriptive statistics

3.1 Dataset

To assess the validity of the predictions of our model, we exploit detailed information provided by the National Bank of Belgium (NBB) on foreign activities of all companies registered in Belgium. For each company, we have information on its exports and foreign subsidiaries in each destination country, in each year during the 1997-2008 period. This allows us to track firms' export and FDI decisions in individual destinations and to investigate how they serve a foreign market over time.

Our dataset combines information from three main sources (see Table 5 for a definition of the variables used in our empirical analysis and their sources). The first is the Central Balance Sheet Data, from which we obtain firm-level information such as size (e.g., number of employees) and productivity (e.g., value added divided by employment). The second source is the Foreign Trade Data, which allows us to identify the countries to which a firm is exporting in a given year and to construct measures of export experience. (e.g., number of years that the firm has been exporting to a given destination).⁶ The last source is the Survey on Foreign Direct Investment, which allows us to identify the countries and years in which a Belgian firm maintains foreign affiliates.⁷ From the same source, we can also determine if the Belgian enterprise is itself part of a multinational company (i.e., it is the recipient of inward FDI).

We have augmented our dataset with variables derived from other sources. Most importantly, to control for changes in trade barriers, we have constructed time-varying averages of applied tariffs by sector and destination, starting from the disaggregate tariff line data available in the World Integrated Trade Solution (WITS). The procedure to construct average tariffs is rather cumbersome and involves different steps. The original tariff data are reported at the 6-digit level of the Harmonized System (HS6), while the activity of a firm, as identified in the Belgian annual accounts, is defined by a 5-digit code from the NACE classification. We have thus aggregated HS data into NACE codes, taking into account that the HS classification changed various times during our sample period. In order to minimize the subjectivity of such procedure, we have relied on the fact that WITS also reports average tariffs aggregated at the 3 digits of the ISIC (revision 3) classification. We have found a one-to-one mapping

⁶Since we only have export data from 1993 and the first year of our sample is 1997, we can only calculate export experience considering the last four years

⁷Notice that a firm may operate different "FDI projects" in a host country. For most of the analysis, we will aggregate all FDI project that a firm has in a given country at time t into one.

between 3-digit ISIC and 4-digit NACE classification for about 30% of the NACE codes. When an ISIC code could map into more than one NACE code, we have recovered the HS6 tariff lines underlying the ISIC code and manually assigned them to NACE codes. This procedure was straightforward for about 33% of NACE codes. In the remaining cases, some discretion had to be applied. For about 14% of the NACE codes, it was impossible to assign only one NACE code to each given HS6. In this case, we have used a higher level of aggregation by imputing the average tariff of a given ISIC code to the NACE codes assigned to it.⁸ Obviously, whenever working directly with HS6 tariff data, we have tracked the changes in the HS classifications that occurred over time to ensure consistency. Using this procedure, we have obtained data for tariffs (MFN or preferential) applied by all available destination countries vis-à-vis imports from Belgium.

We have also gathered some standard macro variables for the destination countries, such as GDP and GDP per capita from the World Development Indicators (WDI) and distance from Belgium (from CEPII). Finally, we have collected information on countries' "rule of law" from Kaufmann *et al.* (2009). This captures the enforceability of rules in a country (with a higher value denoting stronger enforceability), which should affect the fixed costs associated with serving a foreign market (via exports and even more via FDI).

In terms of our sample, we focus our analysis on manufacturing firms (i.e., two-digit NACE codes between 15 and 37) and impose a threshold in terms of employment (i.e., minimum 5 employees). Moreover, we only consider destinations outside the EU Single Market, in which the presence of trade costs gives rise to a proximity-concentration trade-off. The EU Single Market comprises the 27 EU Member States plus Iceland, Liechtenstein and Norway through the European Economic Area. Switzerland is also considered part of it because it has a series of bilateral treaties with the EU. We further restrict our attention to countries that are member of the WTO (as of 2010). These criteria still leave us with a large number of Belgian firms that do not export to any country. In order to keep the analysis manageable, we will consider only firms that have exported in at least one year during our sample period to at least one country in our set of possible destinations. These criteria leave us with 6,743 firms.

⁸In these cases, we are aggregating at a level intermediate between 3 and 4-digit NACE, since an ISIC code is a subset of a 3-digit NACE code.

3.2 Descriptive statistics

This section provides some preliminary descriptive statistics aimed at understanding how and where Belgian firms (i.e., firms with a legal status in Belgium) are active. Exploiting the detailed nature of the available data, we can distinguish three channels in which a firm can be active in a given country: i) exports; ii) FDI; and iii) licensing.⁹ Since only a tiny minority of Belgian firms (i.e., less than 0.4%) engage in foreign markets via licensing, in what follows we focus on those firms involved in channels i) and ii).

As discussed above, our interest is on export and FDI activities of Belgian firms outside the Single Market (SM). In Table 1 we thus reports descriptive statistics for all destinations and then for those ‘Outside SM’. Notice that Belgian firms are very open: over the entire sample, on average 63% of firms with more than 5 employees export. The number of Belgian firms is roughly constant during the sample, with the exception of 2008, when the number of firms decreases substantially as a result of the economic and financial crisis. The total number of exporting firms is decreasing over time, but this observation may be partly driven by the fact that the minimum threshold required for firms to report their intra-EU exports has significantly increased during the sample. Instead the figures regarding firms exporting outside the single market are not biased, since the threshold required for firms to report their export activities outside the EU has remained constant during the sample period (i.e., all transactions whose value is higher than 1,000 euro or whose weight is bigger than 1,000 Kg). The number of firms exporting outside the single market has not changed significantly during our sample, again with the exception of 2008.

Table 1 shows that the number of exporting firms is a subset of total firms and that firms engaging in outward FDI are an even smaller group (4.6% of the total number of Belgian firms).¹⁰ When considering the location of foreign affiliates, it is clear that most of them are located within the Single Market. However, the presence outside the Single Market is clearly increasing over time and reaching a peak in 2006, when the number of firms with outward FDI is more than double than the number at the beginning of the sample. Table 2 reports the total number of export and FDI relationships that Belgian firms maintain every year. The ratio of the figures in Tables 1 and 2 show that firms export to 11 countries on average. Restricting our attention to the firms that export outside the Single Market, we see that on average they serve 7 countries outside of

⁹We do not consider a firm that only imports as being active internationally.

¹⁰Notice that these statistics have been corrected to eliminate, where possible, a “gap” problem (i.e., situations in which the dummy variable for outward FDI of a firm is 0 in a given year, while it is equal to 1 in the previous and subsequent year). The correction implies inputting a 1 when the identifier of the FDI project carried out by the firm is the same for the year before and after the occurrence of a 0.

Table 1: Population of firms by export and FDI status

Year	Total Firms in Belgium	World		Outside SM	
		Exporting	With FDI	Exporting	With FDI
1997	8,527	5,694	308	3,536	42
1998	8,763	5,490	346	3,567	47
1999	8,839	5,516	347	3,593	51
2000	8,787	5,526	360	3,603	60
2001	8,667	5,568	435	3,568	77
2002	8,499	5,521	446	3,532	74
2003	8,416	5,467	451	3,489	76
2004	8,350	5,391	464	3,526	84
2005	8,345	5,307	388	3,548	83
2006	8,369	5,040	391	3,579	91
2007	8,372	5,064	379	3,702	90
2008	7,168	4,561	323	3,371	76

Notes: Only firms with at least 5 employees included. Single Market defined as the EU27 plus Iceland, Liechtenstein, Norway, and Switzerland.

Table 2: Export and FDI relationships (i.e., all bilateral relationships)

Year	Export Relationships		FDI Relationships	
	World	Outside SM	World	Outside SM
1997	55,572	23,420	807	173
1998	55,822	23,119	974	214
1999	56,025	22,923	1,004	230
2000	57,330	23,748	1,127	283
2001	58,603	24,135	1,335	330
2002	58,693	24,172	1,383	332
2003	58,846	24,025	1,369	336
2004	60,046	24,517	1,324	334
2005	60,774	25,194	1,222	322
2006	57,155	25,366	1,312	390
2007	57,156	25,591	1,296	387
2008	53,408	24,764	1,147	349

Notes: Only firms with at least 5 employees are included. Single Market defined as the EU27 plus Iceland, Liechtenstein, Norway, and Switzerland. Outward FDI present for only 1 year excluded (except if occurring in 2008).

the block, a number that is relatively constant over time. With respect to FDI, firms engaging in outward FDI maintain a simultaneous presence on average in 4 countries outside single market, a number also stable over time.

Table 3: FDI entry

Year	World	Outside SM	
		with exports in previous 2 years	
1997	160	36	36
1998	94	22	22
1999	98	31	31
2000	170	60	58
2001	223	58	57
2002	111	27	27
2003	90	25	25
2004	99	32	31
2005	74	30	29
2006	84	40	39
2007	72	26	26
2008	74	31	31
Total	1,349	418	412 (98.6%)

Notes: Only firms with at least 5 employees are included. Single Market defined as the EU27 plus Iceland, Liechtenstein, Norway, and Switzerland.

Since our research focus is on how export experience affects FDI entry, Table 3 presents some preliminary statistics showing the number of firms that set up new foreign affiliates in a given year, taking 1996 as the reference year to identify firms engaging in new FDI starting in 1997.¹¹ The first column of Table 3 shows that there is quite a lot of variation from year to year, with more action in the early years of the sample. Out of the total 1,349 new FDI affiliates, 418 were opened outside the single market, with the United States the preferred destination, followed by Brazil, China (and Hong Kong), and Mexico. Table 3 also provides some direct and compelling evidence related to our theoretical model. In particular, it shows that most of the new FDI by Belgian firms takes place in countries where these firms were exporting beforehand (i.e., in period $t - 1$ and/or $t - 2$). Based on these figures, 98.6% of new affiliates were opened in countries

¹¹FDI data for 1996 is derived from balance sheet data since the Survey of FDI only started in 1997. We compared the two sources for a common year (i.e., 1997) and the large majority of FDI reported in the survey are also reported in the balance sheet. The converse is not necessarily the case because of different methodologies with the survey being considered a more reliable source.

where the Belgian firms undertaking the FDI were previously exporting. This rate is only one percentage point lower when considering FDI entry all over the world.

Table 4: Firm size and productivity

	Mean	St. dev.	Min	Max
Domestic firms				
Employment	40	73	5	1,542
Productivity	0.50	0.91	0.004	43.86
Exporting firms				
Employment	142	446	5	10,283
Productivity	0.60	0.49	0.006	12.77
Firms with FDI				
Employment	970	1613	12	8,559
Productivity	0.77	0.33	0.201	1.67

Notes: Domestic firms defined as those that do not export to any market in our sample 1997; Exporting firms defined as those that export to at least one market in our sample in 1997. Firms with FDI defined as those that engage in FDI in at least one markets in our sample in 1997. Employment measured in units; productivity defined as the ratio of value added to employment (and divided by 100).

Table 4 provides some information on the size and productivity of Belgian firms engaging in exports and FDI. In particular, we report summary statistics for those firms in our sample that in the first year of our sample (1997) do not export to any country (i.e., Domestic firms), those that export to at least one country, and those that engage in outward FDI in at least one country.¹²

It should be stressed that these statistics are based on the sample used for our empirical analysis, which includes only firms that export at least once to at least one country outside of the Single Market during our sample period. Thus, those firms defined as ‘Domestic’ would be exporting at some other point in time and, as such, are probably larger and more productive than truly domestic firms (i.e., firms that do not export to any country in any period). With this caveat in mind, these descriptive statistics are in line with the sorting patterns suggested by the literature on heterogeneous firms and trade (e.g., Helpman *et al.*, 2004; Head and Ries, 2003). This suggests that, *at a given point in time*, the least productive firms should only sell in the domestic market, the most productive ones should engage in FDI, while the remaining ones should export. In our empirical analysis, we will control for size and productivity and show that firms may change their mode of serving a foreign market *over time*.

¹²The same patterns hold for any other year in our sample period.

4 Empirical methodology

This section and the next one describe some exploratory regression results, while the concluding section discusses different ways in which we plan to extend our empirical analysis.

As a first step, we examine the determinants of a firm's decision to enter or not a foreign market, distinguishing between entry via exports and horizontal FDI. The dependent variable in our analysis can thus take three different values, depending on whether a firm does not serve a foreign market, it exports to that market, or it establishes foreign subsidiaries. The decision is the result of a continuous latent dependent variable of which we only observe three discrete outcomes. This latent dependent variable corresponds to μ_{ik} in our theoretical model, capturing the profitability of selling good k in destination market i . Higher values of μ_{ik} make it more likely, *ceteris paribus*, that a firm will decide to serve the foreign market through subsidiary sales.

This setup calls for the use of an ordered probit model, since the three different categories of the dependent variable can be ordered as a function of μ_{ik} . The underlying latent regression model takes the form:

$$y_{fit}^* = \beta X_{fit} + \varepsilon_{fit} \quad (27)$$

for firm f in destination i at time t where X_{fkit} is a matrix of regressors (with k denoting the sector of a firm's economic activity), β is a vector of coefficients, and ε_{fit} is random error assumed to be normally distributed. However, we do not observe y_{fit}^* but only three outcomes:

$$y_{fit} = \begin{cases} 0 & \text{if } \kappa_0 < y_{fit}^* \leq \kappa_1 \\ 1 & \text{if } \kappa_1 < y_{fit}^* \leq \kappa_2 \\ 2 & \text{if } \kappa_2 < y_{fit}^* \leq \kappa_3 \end{cases} \quad (28)$$

Thus, the probability that one of the three outcomes is realized corresponds to

$$Prob(y_{fit} = m) = \Phi(\kappa_m < \beta X_{kfit} \leq \kappa_{m+1}) \quad m = 0, 1, 2, \quad (29)$$

where $\Phi(\cdot)$ is the cumulative normal distribution and κ_0 and κ_3 are taken as $-\infty$ and $+\infty$, respectively. This is a generalization of a standard probit model but it requires the estimation of the two cutpoints κ_1 and κ_2 , which split the support of a standard normal distribution in three regions, corresponding to the three outcomes. These cutpoints bear a direct link to the theory and we would expect that the data confirm that $\kappa_2 > \kappa_1$ and

that the two are statistically different from each other.

The interpretation of the estimated coefficients is not straightforward because of the non-linearity of the model and the fact that there are more than two outcomes. In fact, the marginal effect for the change in the j th regressor is given by

$$\frac{\delta [Prob(y_{fit} = m)]}{\delta x_{jkfit}} = [\phi(\kappa_m - \beta X_{kfit}) - \phi(\kappa_{m+1} - \beta X_{kfit})] \beta_j \quad (30)$$

where $\phi(\cdot)$ is the normal density function. Clearly, the marginal effects depend on the full dataset, the full set of estimated coefficients (including the cutpoints), and the outcome of interest.¹³ In order to facilitate the interpretation of the estimated coefficients, in the tables we report marginal effects for the export and FDI outcomes expressed in terms of percentage changes of the baseline predicted probability of each outcome.

If the ordered probit model represents the obvious choice given our theoretical model, it does impose some structure on the data in that it presumes that there is an order in the outcomes that we observe. An alternative empirical strategy is to avoid any assumption on the internationalization process that firms follow and not postulate an order in the choice between exports and FDI as a way to serve a foreign market. As an alternative empirical strategy, we will thus estimate a multinomial logit, where the dependent variable is the same as above but the outcome $y_{fit} = 2$ is not interpreted to follow after $y_{fit} = 1$. In this case, the probability of any outcome is modeled as

$$Prob(y_{ikt} = m) = \frac{e^{\beta^m X_{ikt}}}{e^{\beta^0 X_{ikt}} + e^{\beta^2 X_{ikt}} + e^{\beta^3 X_{ikt}}} \quad m = 0, 1, 2 \quad (31)$$

where one of the three vectors β^m needs to be taken as the reference category and set to zero since the model is underidentified. Then, the remaining two vectors measure the change in the likelihood of an outcome with respect to this reference category, which we take to be the $y_{ikt} = 0$ outcome. Also in this case, the estimated coefficients are not fully informative; hence, we report the marginal effects of the regressors.

Moving to the regressors included in X_{fit} , we can distinguish variables that are firm specific, firm-destination specific, sector-destination specific, and destination specific.

Variables like employment, productivity and multinational status fall within the first group while the export experience of a firm in a given destination market is an important firm-destination variable since our theoretical model tells us that this an important determinant of a possible decision to switch from exports to FDI as a way to serve a

¹³The only general result available is that the sign of β_j unambiguously determine the sign of the marginal effect for the first (i.e., opposite sign of β_j) and last outcome (i.e., same sign as β_j).

foreign market. We measure export experience with a dummy variable equal to one if a firm has exported to a particular market at any time during the past four years. Four years is the maximum window of time that we can consider without encountering any censoring issue, since our sample begins in 1997 and we have detailed export data from 1993.

Applied tariffs at the 4-digit NACE code are the only (time-varying) sector-destination variable at our disposal, and one that is crucial since our theoretical model suggests that the variable costs of exporting (i.e., tariffs and transportation costs) are the main determinant of the mode of entry into a foreign market. The construction of this variable is quite cumbersome (see discussion in Section 3.1) and is also hampered by the many missing observations from the original source. In order to reduce the number of missing observations, we construct our tariff variable as the average of the available applied tariffs during the previous three years. Among the destination specific regressors, distance between Belgium and the foreign market (measured as the distance between capital cities) complements tariffs as a proxy for the transport costs associated with exporting. Moreover, we include GDP to control for the size of the destination country and GDP per capita as a measure of its level of development. Finally, and especially important for the FDI decision, we control for the quality of the legal institutions in the destination market using the variable “rule of law” from Kaufmann *et al.* (2009).

Finally, we will include year and sector (at the 2-digit NACE level) fixed effects. The inclusion of destination fixed effects will force us to drop the other destination-specific regressors, but it would allow us to control in the most comprehensive way for any time-invariant feature of the foreign markets. Faced with this trade off, we experiment with both strategies.

5 Preliminary results

Table 6 reports the marginal effects for the decision of exporting and engaging in FDI for three specifications based on the sample of firms with more than five employees.¹⁴ The first two columns refer to what we call a minimal specification where we include destination (together with year and sectoral) fixed effects instead of the destination-specific variables. In the second specification we replace the destination fixed effects with destination specific variables while the last specification focuses on OECD high

¹⁴The estimation of an ordered probit model delivers one set of estimated coefficients for all the possible outcomes. However, the calculation of the marginal effects is specific for each outcome (see Section 3 for details).

income countries in an effort to disentangle horizontal from vertical FDI.

Considering the results from the first specification, with the exception of one regressor for the FDI decision, the marginal effects present the expected signs and they are all significant. In particular, it is clear that there is sorting in the various modes, as the larger and more productive a firm is and the more likely it is that it exports and opens foreign affiliates. Being itself a part of a multinational company makes it also more likely to penetrate foreign markets. With respect to the variables that our theoretical model highlights as key determinants of foreign activities, export experience shows a huge effect on the probability to export, which is consistent with the significant hysteresis of the export decision due to substantial sunk costs to export. Importantly, export experience is also a very important determinant of the likelihood of deciding to engage in FDI. As expected, higher tariffs discourage exports. However, contrary to what predicted by our theoretical model, they also discourage FDI. This result is confirmed in some other specifications and can be explained in different ways (see discussion in Section 6). The cutpoints are statistically different from each other and confirm the ordering suggested by our model. Their numerical values clearly suggest that FDI is a rare event since it occurs only in a very small region in the right tail of the normal distribution.

In the second specification, we replace the destination fixed effects with some destination-specific variables. First of all, we notice that the Pseudo R^2 does not change much, indicating that most of the variation in the data is not simply explained by the time-invariant effects. As for the marginal effects, they are broadly in line with those in the first specification except that the tariff rates are not significant anymore. As for the destination-specific variables, we see that also distance is insignificant while GDP and GDP per capita exert a negative and positive effect, respectively, on both outcomes. Finally, the rule of law presents the expected and positive effect, as stronger enforceability leads to higher probability of exporting and engaging in FDI.

Admittedly, we are assuming that all instances of FDI observed in our data are of the horizontal type. However, this is most likely not the case. A way to possibly be more confident that we are restricting our attention to horizontal FDI is to restrict our sample of destinations to countries with levels of income per capita similar to Belgium. It has been argued that horizontal FDI is most prevalent among countries that are similar in both size and in relative endowments and that “it is similarities between countries rather than differences that generate the most multinational activities” (Markusen and Maskus (2001), p. 39). Recent studies that try to distinguish horizontal and vertical FDI (e.g., Carr *et al.*, 2001; Markusen and Maskus, 2002; Blonigen *et al.*, 2003) also conclude that horizontal FDI emerge when countries are of similar size and share similar

relative factor endowments, while Vertical FDI emerge when countries differ in relative factor endowments.

Following this reasoning, the last specification in Table 6 only considers OECD high income countries (i.e., Australia, Canada, Japan, New Zealand, South Korea, and United States) as possible destinations. Restricting the sample in this way does not seem to improve the results on our tariffs, which turn out not to be a significant determinant of either export or FDI. Still, it has to be recognized that tariffs for these high income countries were already quite low at the beginning of the sample and did not vary much during the period. Considering the cutpoints, we see that they “move” to the left since it is much more likely that Belgian based firms export and engage in FDI towards this large markets.

In Table 7, we exclude firms with fewer than 20 employees, as our model does not apply to self-employment or very small firms (see also Acemoglu *et al.*, 2009; Alfaro *et al.*, 2010). In this case, the sample is dramatically reduced but the three specifications do not provide substantially different results, with one exception. In fact, when considering the variables destination specific variables (i.e., the second specification), the marginal effect of the tariff is negative for the export decision but insignificant for FDI, which is closer to what we would expect based on our theoretical model if FDI is motivated by tariff-jumping.

Finally, in Table 8 we report the marginal effects for the same specifications as in Table 6 but estimated using a multinomial logit. This provides a more flexible estimation, since it does not impose the ordering of the three outcomes, and yields two set of coefficients for the export and FDI decision (taking the outcome $y_{ikt} = 0$ as the reference category). The results are very much similar to those obtained with an ordered probit. The only notable difference is that in second specification distance has a negative effect on exports but a positive one on FDI, as we would expect if distance captures variable costs associated with exports (e.g., transportation costs), which should make FDI more likely. However, the effect of tariffs on FDI is still negative (when significant).

In conclusion, our preliminary results suggest that export experience is an important determinant for the decision of a firm to engage in FDI, as predicted by our theoretical model. However, we fail to find robust evidence concerning the role that tariffs and distance should play in the determining the choice between export and FDI. Nevertheless, as discussed below, the richness of our dataset should allow us to improve considerably upon the results obtained so far.

6 Future work

In Section 2, we have presented a simple model in which firms can serve foreign markets in two alternative ways: by exporting their products to foreign customers, or by establishing foreign subsidiaries. Firms invest abroad when the gains from avoiding trade costs outweigh the costs of maintaining capacity in multiple markets. Differently from standard models on the proximity-concentration trade off, we assume that firms are uncertain about foreign market conditions and can only gain market-specific knowledge through experience. This allows us to formalize the idea of firms’ “internationalization process” put forward by a vast international business literature: firms may choose to “test” a foreign market by engaging first in export activities, which entail higher variable costs but lower fixed set-up costs, switching to FDI only if they learn that their profitability in that market is high enough.

In our empirical analysis so far, we have started to explore the dynamics of firms’ choices to serve individual market destinations, to verify whether export experience affects a firm’s decision to open a foreign subsidiary. To do so, we have employed firm-level data from the National Bank of Belgium, which allows us to track the behavior of all companies registered in Belgium in terms of their export and FDI decisions in individual destination markets over the period 1997-2008. In line with previous studies, we find that firms’ entry choice in foreign markets depend on the variable and fixed costs associated with exports and FDI. Moreover, the likelihood of opening a foreign subsidiary depends on the export experience acquired in that market. This provides some very preliminary evidence suggesting that knowledge acquisition may play an important role in firms’s internationalization decisions.

In the remaining of this section, we discuss three avenues we intend to pursue to obtain more compelling evidence for the idea that uncertainty can lead to export experimentation and gradual involvement of firms in foreign markets.

Measuring export experience

In our empirical analysis so far, we have examined the determinants of whether a firm is active — in terms of exports or FDI — in a given market and year. Notice that, by focusing on the *presence* in foreign markets, we are not able to precisely measure export experience. This is because, for some firms in our dataset — those that were already exporting to a given market in 1993, the first year for which we have export data — we do not know when they entered the foreign market. Due to this censoring issue, and given that we have FDI data since 1997, we have measured experience based on whether

the firm was exporting to a market during the previous four years.

To better capture the role of uncertainty and knowledge acquisition, we plan to focus next on firms' *entry* into new markets. In particular, we will restrict our analysis to firms that have started exporting to a given destination from 1997, conditional on not having exported to this market in the previous four years for which we have detailed trade data. This will allow us to construct a time-varying measure of export experience for each firm f entering market i at time t . For example, for a Belgian firm that starts exporting to China in 1997, its export experience will vary between 0 (in 1997) and 10 years (in 2008, the last year of our dataset). Moreover, we can also define export experience in terms of the volume of exports, and especially its pattern over time to discern a possible "test" phase. Given these more precise indicators, we will examine how the experience acquired by the firm since entering a new destination affects its decision to open a subsidiary there.

Identifying horizontal FDI

Our theoretical analysis focuses on horizontal FDI as an alternative to exports for serving foreign markets. In our empirical analysis, we would thus like to identify those subsidiaries that are established only to produce the firm's final good in the host country, so as to avoid paying the trade costs. One way to do so would be to use information on sales of foreign affiliates (see, for example, Helpman *et al.*, 2004). Unfortunately, this information is not available in the NBB Survey of Foreign Direct Investment. As a result, the analysis presented in Section 5 includes information on all foreign subsidiaries of Belgian firms, independently of their purpose. Some of these affiliates may reflect the international fragmentation of production and vertical FDI motives. Foreign subsidiaries may also be established to set up distribution centers and sales offices to penetrate export markets.¹⁵ Notice that, in both cases — and particularly in the case of foreign affiliates established for distribution purposes — exports and FDI should be complements. This could explain why in some of the specifications reported in Tables 6-8, the marginal effect of tariffs on the FDI decision is negative.

In future work, we plan to use two strategies to better identify whether the FDI affiliates are horizontal in nature. First, our model suggests that exports and FDI should be substitutes, so there should be a switch in the mode of entry: once a firm engages in horizontal FDI, exports to that country should fall. As a matter of fact, the

¹⁵The importance of export-supporting FDI and of distribution networks is emphasized by recent theoretical and empirical studies (e.g., Krautheim, 2007; Arkolakis, 2008; Aeberhardt *et al.*, 2009) and surveys of outward FDI activities (e.g., China Council for the Promotion of International Trade, 2010).

data provide some evidence of a switch. Taking t to be the year in which a firm initiates outward FDI activity, we can calculate the growth rate of exports between $(t - 2$ and $t)$ and between $(t$ and $t + 2)$. For the destinations in our sample, the growth rate before FDI entry is 57.49% while after entry is 22.73, which is statistically lower at 1% than in the pre-FDI period. Although a “perfect” substitution would lead to a -100% growth rate in the second period, the huge decrease that we observe is indicative that there is a change in the export patterns once FDI takes place. Along this line, we plan to exploit the detailed nature of the trade dataset at our disposal (which reports firm-level export and import data by destination and by product (defined at the 8-digit level of the combined nomenclature)). Comparing the exports of a firm’s “core products” to a given market before and after the opening of a foreign subsidiary, we should observe a substantial fall in the exports of these products in the presence of horizontal FDI.¹⁶ Thus, detailed export data should allow us to isolate horizontal FDI from other types of foreign investment (vertical FDI and distribution subsidiaries) and establish a better link between our theoretical and empirical analysis.

Another possibility is to exploit the (spotty) intra-firm trade data available from the Survey of Foreign Direct Investment. As already suggested, a problem in following this approach is data availability and its internal consistency (e.g., intra-firm values should be smaller than reported import/export data for that country). However, exploiting the available information about intra-firm trade may allow us to rule out some FDI as being vertical. In order not to confound the effects of multiple FDI projects in a given foreign market, we will focus only on the first FDI entry (i.e., the first time a Belgian firm opens a subsidiary in given foreign market)¹⁷ and classify FDI as being horizontal only if it does not lead to substantial intra-firm trade.

Regional markets

A growing recent literature (e.g., Motta and Norman, 1996; Grossman et al., 2006) stresses the increasing importance of yet a different type of FDI. This is the so-called “export-platform” FDI, whereby a firm sets up a production facility in a given market with the objective of serving mainly other destinations in the region. Our theoretical model applies equally well to this scenario once we re-interpret a foreign market as a region or trade bloc. To account for export-platform FDI empirically, however, the

¹⁶To identify the firm’s core products, we will follow focus on products with the highest export sales to the world, as in Mayer *et al.* (2010).

¹⁷In our preliminary results, FDI occurs in market i whenever a firm declares that it has foreign operations in this country, independently of the number of distinct FDI project that may coexist in country i .

variables capturing the firm's mode of entry should not be constructed with the data of the country where the investment takes place, but using information on the greater regional market that can be served from that base.

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Table 5: Definition of variables and sources

Variable	Definition	Source
Employment $_{ft}$	Firm's employment (in hundreds)	NBB Central Balance Sheet Data
Productivity $_{ft}$	Value added divided by firm's employment (in hundreds)	NBB Central Balance Sheet Data
MNE $_{ft}$	Dummy equal to 1 if firm receives inward FDI	NBB Survey on Foreign Direct Investment
Export experience $_{fit}$	Dummy equal to 1 if firm exported to country i in any of the previous 4 years	NBB Foreign Trade Data
Tariff $_{kit}$	Average of applied tariffs by country i in sector k (NACE 4 digit)	WITS
Distance $_i$	Distance between Bruxelles and the capital of country i (in thousands km)	CEPII
GDP $_{it}$	Gross Domestic Product in constant 2000 US\$ (in billions)	WDI
GDP per capita $_{it}$	Gross Domestic Product per capita in constant 2000 US\$ (in thousands)	WDI
Rule of law $_{it}$	Rule of law index (higher values indicate better legal enforceability)	Kaufmann <i>et al.</i> (2009)

Table 6: Ordered probit regressions (firms with more than 5 employees)

	(1)			(2)			(3)		
	All countries			All countries			OECD high income		
	Exports	FDI		Exports	FDI		Exports	FDI	
Employment _{ft}	6.68%***	6.00%***		5.45%***	4.70%***		0.78%***	6.46%***	
Productivity _{ft}	0.73%***	0.65%***		0.60%***	0.52%***		1.80%***	14.81%***	
MNE _{ft}	139.16%***	118.71%***		113.44%***	91.81%***		-0.71%	-5.69%	
Export experience _{fit}	2533.39%***	124.43%***		4752.24%***	120.30%***		83.16%***	113.93%***	
Tariff _{kit}	-41.17%***	-37.02%***		-4.02%	-3.47%		0.37%	3.08%	
Distance _i				0.25%	0.22%				
GDP _{it}				-0.004%***	-0.004%***				
GDP per capita _{it}				1.34%***	1.15%***				
Rule of law _{it}				7.93%***	6.84%***				
Year fixed effects	included			included			included		
Sector fixed effects	included			included			included		
Destination fixed effects	included			not included			included		
Cutpoint 1	2.70			3.04			0.53		
Cutpoint 2	6.31			6.63			3.79		
Observations	3,529,921			3,442,793			59,701		
Log pseudolikelihood	-93,194.15			-93,954.64			-27,555.07		
Pseudo R ²	0.87			0.87			0.26		

Notes: The dependent variable equals 0 if firm f does not export and does not engage in FDI in country i at time t , equals 1 if it exports to country i , and equals 2 if it has subsidiaries in country i . Marginal effects calculated at the sample mean (except those for employment and productivity for the 'FDI' outcome, which are set at the average value of the observations for which the dependent variable equals 1). Marginal effects expressed as percentage changes in estimated baseline probability for an infinitesimal change in each regressor (calculated as discrete changes from 0 to 1 for dummy variables). Statistical significance based on robust standard errors in parenthesis; *** denotes significance at 1% level; ** 5% level.

Table 7: Ordered probit regressions (firms with more than 20 employees)

	(1)			(2)			(3)		
	All countries			All countries			OECD high income		
	Exports	FDI		Exports	FDI		Exports	FDI	
Employment _{ft}	5.64%***	5.26%***		4.58%***	4.12%***		0.67%***	5.86%***	
Productivity _{ft}	17.04%***	15.90%***		13.98%***	12.57%***		1.47%***	21.44%***	
MNE _{ft}	89.31%***	81.28%***		75.55%***	65.69%***		-2.05%***	-17.06%***	
Export experience _{fit}	1074.77%***	121.97%***		242.41%***	118.42%***		80.46%***	113.20%***	
Tariff _{k, it}	-39.59%***	-36.93%***		-6.81%***	-6.12%		-0.44%	-3.89%	
Distance _i				0.43%***	0.39%				
GDP _{it}				-0.003%***	-0.002%***				
GDP per capita _{it}				0.82%***	0.74%***				
Rule of law _{it}				8.74%***	7.86%***				
Year fixed effects	included			included			included		
Sector fixed effects	included			included			included		
Destination fixed effects	included			not included			included		
Cutpoint 1	2.67			3.00			0.57		
Cutpoint 2	6.28			6.58			3.79		
Observations	2,088,340			2,035,795			47,968		
Log pseudolikelihood	-76,916.59			-77,473.83			-22,429.18		
Pseudo R ²	0.87			0.86			0.25		

Notes: as in Table 6

Table 8: Multinomial logit regressions (firms with more than 5 employees)

	(1)		(2)		(3)	
	All countries		All countries		OECD high income	
	Exports	FDI	Exports	FDI	Exports	FDI
Employment _{ft}	2.62%***	7.30%***	2.70%***	4.95%***	0.25%***	6.44%***
Productivity _{ft}	0.43%***	0.72%***	0.43%***	0.49%***	0.80%***	22.44%***
MNE _{ft}	59.44%***	56.47%***	59.73%***	22.72%***	-0.70%	10.51%
Export experience _{fit}	4648.09%***	105.23%***	676.87%***	97.71%***	84.80%***	79.76%***
Tariff _{kit}	-16.62%**	-154.11%***	2.78%	-85.35%***	0.88%	40.29%
Distance _i			-0.75%***	2.90%***		
GDP _{it}			-0.01%***	0.02%***		
GDP per capita _{it}			1.77%***	-1.50%***		
Rule of law _{it}			-2.94%**	27.86%***		
Year fixed effects	included		included		included	
Sector fixed effects	included		included		included	
Destination fixed effects	included		not included		included	
Observations	3,529,921		3,442,793		59,701	
Log pseudolikelihood	-87,825.53		-90,191.36		-26,531.73	
Pseudo R ²	0.88		0.87		0.29	

Notes: as in Table 6

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