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European Firms In a Global Economy EFIGE

SEVENTH FRAMEWORK PROGRAMME

The EFIGE project is coordinated by Bruegel and involves the following partner organisations: Universidad Carlos III de Madrid, Centre for Economic Policy Research (CEPR), Institute of Economics Hungarian Academy of Sciences (IEHAS), Institut für Angewandte Wirtschafts-forschung (IAW), Centro Studi Luca D'Agliano (Ld'A), Unitcredit Group, Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).

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Internationalization modes of European firms

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Abstract

This paper analyzes internationalization mode choices of European firms. Using survey data on three European countries, France, Italy and Spain, we find few differences between indirect exporters and nonexporters, while direct exporters and FDI conducting firms are significantly larger and more productive than nonexporters. Also, just about 3 percent of all firms or 5.5 percent of exporters exported only indirectly through domestic intermediaries. With a simple calibration of an international trade model in which heterogeneous firms choose between indirect exporting, direct exporting and FDI, we show that this pattern is in line with large fixed costs of direct exporting and FDI while the cost structure of indirect trade should consist either relatively large fixed or marginal cost. These observations suggest that sorting based on productivity do not describe well indirect traders. Furthermore, we find that features of firms and products such as innovative content will affect the trade mode choice - in line with theories of emphasizing contractual frictions.

Keywords: Firm heterogeneity, export, FDI, international trade mode, multinomial logit
JEL code: F14, F23

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1. Introduction

Firms can serve foreign markets in different manners. Sometimes manufacturers sell their own product to clients directly or wholesalers buy from several manufacturers and sell to several partners. Sometimes wholesale and retail activity is conducted within vertically integrated firms and consumers can find directly imported goods on store shelves. On other occasions firms choose foreign production to serve consumers directly. The choice of internationalization mode is important for firms as each mode requires a significant amount of investment and it can affect the cost of exporting for a long period of time.

Firms' choice between different internationalization modes enables us to test important predictions of theories about organizational choices in international trade. Indeed, as we will present in the next section, recent theories argue that internationalization mode is systematically related to the characteristics of firms: more productive firms may be more willing to invest into internationalization modes which require larger fixed costs but can be operated at smaller variable costs. The literature has argued that this sorting can affect trade patterns and reallocation following trade liberalization. Also, understanding the mechanisms behind internationalization mode choice may provide guidance for policies aimed at helping firms to establish long-term competitive advantage in foreign markets.

Furthermore, detailed trade statistics do not take into account all kinds of trade equally, hence the research on internationalization modes may help in understanding the possible uses and limitations of different datasets. Disaggregated trade data, for example, typically links transactions only to the firm conducting the deal, hence classifying firms exporting through intermediaries as non-exporters. Similarly, the sales of foreign affiliates will not show up in the exports of their parent company, hence foreign sales of FDI-conducting firms may be understated.

This paper compares manufacturing firms based on their mode of internationalization. In order to do this, we use European survey data gathered in the European Firms in a Global Economy (EFIGE) project. The questionnaire distinguished three modes of internationalization[1]. First, firms can sell their products directly to corporate and final consumers; this is *direct trade*. Second, they may sell to local intermediaries who will then sell it to consumers abroad; this is *indirect trade*. Finally, they may have sales from foreign production, or *FDI*.

Most of the literature on internationalization mode choice builds on datasets which do not permit analyzing the full set of internationalization modes available for manufacturing firms, i.e. the firm-level choice between indirect exports, direct exports and FDI. On the one hand, trade data allow for calculating the total trade by intermediaries, but it is not possible to link it to producers; also, production by foreign affiliates

[1]Our data does not allow a distinction between own product and carry along trade as suggested by Bernard et al. (2012).

does not show up in such datasets. For example Tang and Zhang (2011) considered product-destination level data and explained the share of exports by the prevalence of intermediaries in each product destination pair. On the other hand, firm-level data usually do not include indirect exports. Such databases allow researchers to compare manufacturing firms with wholesalers rather than directly and indirectly exporting manufacturers. A good example for such an approach is Bernard, Grazzi and Tomasi (2011) who classified firms by their sector classification and compared their features.

Our first contribution is to analyze trade mode choice with the cross-country EFIGE database which explicitly asks about the export mode of each firm together with a number of important quantitative and qualitative questions. This allows us to describe similarities and differences among manufacturing firms by three types of internationalization mode[2].

Our second contribution is that we interpret our findings in a simple model with three internationalization choices: indirect exporting, direct exporting and conducting FDI. We show that the small number of indirect exporters and their similarity to non-exporters suggests that the cost structure of this internationalization mode consists of relatively high fixed costs and/or high marginal costs. As a consequence, sorting models are less good in describing the choice between indirect trade through domestic intermediaries and direct exporting than among non-exporting, exporting and FDI.

Finally, we also show that - besides size and productivity - variables that may affect the relative fixed or marginal costs of internationalization modes - belonging to a group, importing or market access - have the predicted effect on this choice.

In what follows, we first review the literature, with a focus on the least understood internationalization mode, indirect exporting. Next, we describe our theoretical framework, followed by the description of our data. Then, we compare firms choosing different internationalization modes, and describe what does it imply about their relative cost structure. Finally, we analyze how variables related to theories of contractual frictions affect the cost structure of different internationalization modes, and hence, affect the probability of a firm's choice. In the conclusion we discuss the contributions of the paper.

2. Modes of serving foreign markets

In this review, we look at the characteristics of different internationalization modes, on how firm heterogeneity affects internationalization mode choice as well as consider what may affect the cost structure of various options. We will concentrate on the choice between direct and indirect exports, which got significantly less attention than the choice between exporting and FDI, which was surveyed by several authors.

[2]In terms of considering direct versus indirect traders, our dataset is closest to that of the EBRD on Turkey used in Abel-Koch (2011).

2.1. Internationalization modes

Direct trade can be defined quite straightforwardly: this is international commerce carried out by the manufacturer itself. One important distinction can be made when trade is carried out from a foreign country. This may be because the firm sets up a trading (wholesaler) arm abroad or offshore production outside the home country (FDI).

Indirect trade includes several forms. For example in the US, according to the South United States Trade Association[3], an "export merchant" buys and sells on his own account, purchasing goods from the manufacturer only to repackages and sell under its own brand. This agent will cover marketing and promotion costs but not potential losses related to unsold goods. An import agent (export commission house in the US) does the same for importers[4]. In homogenous goods such as cotton or wheat, specialized *brokers* will act as facilitators for a fee. The most complex services are offered by *export management companies* who do foreign market research, marketing, distribution, logistics, shipping and export intelligence and language translation services. A *freight forwarder* facilitates the shipments of goods acting as port representative for the exporter. A similar but broader category is an *export trading company* which, sometimes set up by the manufacturer overseas, provides export related services but also deals with products (buys and sells).

The literature on trade intermediaries attempted to identify the functions such intermediaries play in international trade. According to Spulber (1996), the primary role of intermediaries is to offer specialized trade transaction services. Intermediaries also help the matching process. As in the general equilibrium modeling of the middlemen in Rubinstein and Wolinsky (1987), trade intermediaries reduce search costs, which may be related, inter alia, to costs of setting up a network (Petropoulou (2011)). As the characteristics of the matching problem may be related to the contracting environment, product- or market level factors effecting contractual problems may also affect the export mode choice.

While intermediaries seem important in practice, there is rather limited empirical evidence on the share of intermediaries, mostly according to the limitations of available datasets. Still, some clear patterns emerge from this literature. The main stylized fact is that while the majority of exports is conducted directly, indirect trade also plays a significant role in international trade[5]. Few authors report results about the share

[3] `http://www.susta.org/export/intermediaries.html`

[4] An additional method described by US trade association is "piggyback marketing" when one manufacturer distributes another firm's product(s) thus these firms avoid marketing and distribution costs. Such product lines are frequently complementary and sold to the same customer base. Sometimes, even large companies do it in selected markets, e.g. Sony distributes in Japan for Whirlpool (source: SUSTA). In Bernard et al. (2012), this is called the carry along trade (CAT).

[5] Ahn and Wei (2011) finds that 20% of China's export is carried out by intermediaries Blum et al. (2010) report that around 35% of imports into Chile are done through intermediaries. In Hungary

of manufacturing firms exporting indirectly rather than the share of wholesalers in exports. Lu et al. (2011), who have presented that 27% of exporters export through intermediaries and 11% of exporters export both directly and through intermediaries in the World Bank's Private Enterprize Survey of Productivity and the Investment Climate (PESPIC) data on 12,679 firms in 29 developing economies during the period of 2002-2004. Abel-Koch (2011) used data on firms in Turkey to find that 9% of firms exported only indirectly, 15% both directly and indirectly while 39% exported only directly.

The third internationalization mode for firms is to set up a production facility abroad and serve local consumers from that plant rather than by export. In this case, the firm becomes a multinational and internalizes the foreign sales procedure (Helpman (1984)) allowing a greater control on the sales process. Direct sales may allow for the lowest marginal cost provided that production costs differences would not exceed savings from transport costs. The role of foreign production was surveyed by several authors (e.g. Markusen (2004), Barba Navaretti and Venables (2006), Helpman (2006), Helpman (2011)). In terms of numbers, FDI-conducting firms represent between around 5 and 10 percent of firms in surveys similar to EFIGE, depending on the size of the threshold: in Italy, for example, 4.6 percent of firms employing at least 500 people conducted FDI (Benfratello and Razzolini (2008)) while 10.6 percent of German firms in the Mannheim Innovation Panel (Arnold and Hussinger (2010)) was engaged in foreign production.

2.2. Firm heterogeneity and selection into modes

Heterogeneous firm international trade models imply that firms self-select into internationalization modes. Building on the seminal model of Melitz (2003) in which heterogeneous firms choose between exporting and non-exporting, a number of authors have shown that firms follow similar sorting patterns in different dimensions of international activity. In particular, Helpman et al. (2004) (HMY) proposed that such sorting is present with respect to exporting and horizontal FDI. As the fixed cost component of FDI is larger, while its marginal cost is smaller than that of exporting, investing into FDI is only profitable for more productive firms capable of selling a larger volume on the foreign market. This sorting pattern has been widely tested and found important; empirical evidence is surveyed by Greenaway and Kneller (2007).

A number of recent papers proposed that a similar trade-off is present when deciding between direct and indirect exporting, because direct exporting requires investment into marketing and different capabilities while it may spare the firm the extra variable cost charged by the intermediary. The main prediction of Felbermayr and Jung (2011) and

about a 30% of imports is carried out firms in wholesale and retail sector (Békés et al. (2009)). Bernard et al. (2010) find that wholesaler and retailer firms comprise 35% of exporters, they account for only 8% of export value. In contrast, firms with operations that include both trade and production (just 5% of firms), account for more than half the trade value. These large firms vertically integrate production and wholesale activity and cover a great deal of international trade.

Ahn and Wei (2011) models is that firms sort themselves by their productivity level: the least productive firms do not export, firms with medium productivity levels rely on intermediaries, while the most productive firms export directly. In multi-country settings firms decide on export mode for each country. As productivity increases, firms export through intermediaries first, then proceed to directly exporting to large markets as well as exporting through intermediaries to smaller ones, and finally to direct exporting to each of their markets.

The prediction that firms sort themselves was tested by multiple authors. Lu et al. (2011) test sorting on the World Bank dataset of 29 developing countries and finds that direct exporters have the highest productivity, followed by mixed (direct export and intermediary use) traders, indirect exporters and, finally, no traders. In relation to sorting by productivity, size is often used as a proxy of productivity. Abel-Koch (2011) argues that there is a negative relationship between firm size and the share of indirect export sales in total export sales and uses survey data on Turkey to support the claim. Another potential proxy is the age of the firm that may capture the cumulated experience of firms helping reduce fixed of directly exporting (Keller et al. (2011)).

Sorting may also be based on quality. Crozet et al. (2011) shows in a similar setting that when firms differ in terms of quality rather than productivity, wholesalers trade the least expensive, lower quality goods rather than the more expensive varieties which would be implied by productivity sorting. When heterogeneity is two-dimensional - firms differ both in terms of productivity and quality -, intermediaries will export more expensive varieties (working for higher-cost manufacturers) as well as the least expensive varieties (working for lower-quality manufacturers). The main prediction is that wholesalers may help less productive firms to enter export markets so their presence can increase the exported varieties at the aggregate level.

It is easily possible that the simple distinction between direct and indirect trade cannot do justice to the variety of options exports face when choosing their export mode. One relevant dimension of this choice is whether firms export through intermediaries based in their home country or look for a wholesaler in the foreign country. While Tang and Zhang (2011) considers agents located at the home country (discussing indirect versus direct exporting), Felbermayr and Jung (2011) compares intermediaries located abroad (making it closer to the FDI direct export choice). In this paper, we consider all these options in a comparable manner.

2.3. Determinants of cost structure

The difference in the cost structure between direct and indirect trade in specific markets may be affected by the fact that intermediaries can benefit from economies of scope when they export multiple products. Akerman (2010), building on a HMY model, assumes that intermediaries have the technology to export more than one product and face an additional fixed cost per period which is convexly increasing as the number of products rises. The model predicts that, owing to their specific cost structure, intermediaries will export a greater set of products and will export to countries with a

larger fixed cost[6]. Akerman (2010) uses firm-level data from Sweden classifying firms as wholesalers or manufacturers and compares the activity of these two groups. He tests relative export sales per good and differences regarding the direction of exports by country characteristics. This is confirmed by Bernard et al. (2012) finding that intermediary exporters are smaller but export relatively more products and reach fewer countries than direct exporters. This is also in line with the findings by Blum et al. (2010) who argue that the key contribution of intermediaries is regarding expanding product scope rather than selling to more countries.

Country characteristics affect relative entry costs. Keller et al. (2011) provide empirical evidence which supports the idea that the reduction of entry cost when exporting through intermediaries is more valuable in markets where entry cost are higher. Bernard et al. (2012) find that the share of indirect exports is positively correlated with country-specific fixed costs, proxied by the World Bank's Doing Business indicators[7].

Organization and contracting is emphasized by Felbermayr and Jung (2011), who analyze the choice between selling to an intermediary and setting up a wholesale operation abroad[8]. The argument emphasizes the organizational, rather than the technological side of internationalization mode choice. In this setup, contracting environment is key: export through intermediaries becomes less likely when the enforcement of contracts is weaker and, hence, hold-up problems play a more important role.

When firms invest in R&D, foster product innovation and posses more knowledge, it becomes more important to safeguard the knowledge and hence, exclude the middlemen (Anderson and Gatignon (1986)). In the framework of Felbermayr and Jung (2011), more knowledge-intensive export may generate more serious hold-up problems and hence innovativeness may be correlated with a smaller share of intermediary trade. Abel-Koch (2011), for example finds that highly skilled workforce and innovative products both lead to relatively less indirect exports.

Information about trading partners matter for exporting and costly information may be an obstacle for international trade (evidence in Das et al. (2007)) especially for smaller firms. This is why another strand of the literature views the problem of identifying and selling to customers as a random matching process (e.g. Antràs and Costinot (2011)). Uncertainty related to the value of each match may lead to starting in small (Rauch and Watson (2004)) or using intermediaries. Petropoulou (2011) uses a pair-wise matching model with two-sided information asymmetry, where intermediaries develop contacts and hence, expand the set of matching technologies available to traders. In such a framework, the proportion of indirect trade to total trade is increasing in the

[6]This argument may be extended into a dynamic setting where firms potentially make multiple products (see Bernard, Redding and Schott (2011)). In this environment, intermediary exporters, who have lower entry costs, will be more likely to add to and drop from the product mix.

[7]Number of documents for importing, cost of importing and time to import.

[8]The main difference to other models is that here direct export is not an option: firms must use a wholesaler abroad, and the question is whether to integrate or outsource it.

level of information frictions.

In a broader term, matching services include quality control under information frictions (Biglaiser (1993), Biglaiser and Friedman (1994), Li (1998)) as intermediaries can pre-screen goods. Provision of transactional services and screening are similar inasmuch they require a sunk cost investment that acts as barrier to smaller transactions. In Dasgupta and Mondria (2011), for example, internationalization mode serves as a signaling device. In such a case, firms are more likely to invest in signaling and export directly if their quality is high and hence, intermediated good quality may be lower than that of direct exports. Similarly, in the model of Tang and Zhang (2011) both manufacturing firms and intermediaries may invest into quality verification, but the efforts of intermediaries are non-verifiable, which generates hold-up problems. In this model larger horizontal differentiation leads to a larger share of indirect exporters, while greater vertical differentiation increases the share of direct exporters. On the empirical side, Abel-Koch (2011) showed that firms with quality certification and with a recent upgrade rely less on intermediaries.

Finally, market access may affect both fixed and marginal cost of trade operation. More centrally located firms will be able to sell more abroad (lower marginal cost) and hence, are more likely to invest in direct internationalization mode. Furthermore, more centrally located firms may find information about clients more easily thus reducing fixed costs[9].

3. Theoretical framework and hypotheses

The aim of this section is to describe the theoretical framework of our empirical analysis. First, we sketch a model in which firms self-select and sort according to their productivity given the cost parameters of different internationalization modes. Second, based on the literature, we describe the variables which may affect fixed and marginal cost of serving foreign markets in different fashions.

3.1. Productivity

The theoretical framework is based on the heterogeneous firm models of Helpman et al. (2004) and Ahn and Wei (2011)[10] and includes all three internationalization modes

[9]Bernard et al. (2010) showed that higher foreign market entry costs are associated with higher share of intermediated export. Crozet et al. (2011) confirms on French custom data that the share of exports channeled by wholesalers is larger in markets where trade costs are higher. Ahn and Wei (2011) found that the distance of destination country is positively correlated with intermediaries export share on Chinese data. Tang and Zhang (2011) also find a larger share of intermediated export to more distant market. Regarding wholesalers, Akerman (2010) found significant negative coefficient for distance in a gravity model on Swedish data.

[10]For details see their online "Technical Appendix for The Role of Intermediaries in Facilitating Trade"

in the EFIGE survey. One aim of our discussion is to provide formulae for the share and relative productivity of firms choosing different internationalization modes to link the unobserved cost structure to empirically observable quantities.

For simplicity, in the model we consider only two countries, the home and the foreign country. Consumers in both countries have CES preferences, with $\sigma = \frac{1}{1-\rho} > 1$ denoting the constant elasticity of substitution across varieties. Each consumer supplies inelastically a unit of labor and the home country wage is set to 1.

The model assumes a continuum of heterogeneous firms which compete on a monopolistically competitive market. The productivity of firm i is denoted by φ_i. Productivity follows a Pareto-distribution with a parameter k. For production at the home market each firm has to pay a per-period fixed cost f_d and producing q requires $l = f_d + q/\varphi_i$ units of labour. Conditional on the productivity draw, firms may exit the market and they face an exogenous probability of firm death in each period.

Firms which choose to operate on the domestic market can decide whether to sell abroad and their internationalization mode. In the model, firms can choose between three options regarding supplying customers in the host country. First, they can export directly. In order to do this, they have to pay a per-period fixed cost, f_{dir}. Second, exporting through intermediaries requires a smaller fixed cost ($f_{ind} < f_{dir}$), but intermediaries have to prepare each unit of the product for the export market, which process multiplies the marginal cost by $\gamma > 1$. Iceberg transportation costs ($\tau > 1$) have to be paid when firms export with either export mode. Third, firms may organize production at a third country by conducting horizontal FDI. In this case, the firm has to pay a fixed cost of $f_{FDI} > f_{dir}$. For simplicity, we also assume that wages are the same in both countries[11].

In such a framework, firms will sort according to their productivity level (φ_i): the least productive firms exit or sell their products in the domestic market, firms with intermediate productivity levels export through intermediaries, the next more productive firms export directly while the most productive firms conduct FDI.

In this setting the profit from indirect trade for a firm with productivity φ is given by:

$$\pi_{ind} = \sigma^{-1} R (\frac{\rho\varphi}{\tau\gamma} P)^{\sigma-1} - f_{ind} \tag{1}$$

where R and P are host-country total expenditure and price level, respectively. The profit from direct export is given by:

$$\pi_{dir} = \sigma^{-1} R (\frac{\rho\varphi}{\tau} P)^{\sigma-1} - f_{dir} \tag{2}$$

[11] Alternatively, we can consider τ to be shipment cost/wage differential, assuming it remains above unity.

while the profit from FDI is:

$$\pi_{FDI} = \sigma^{-1} R(\rho\varphi P)^{\sigma-1} - f_{FDI} \tag{3}$$

These profit equations determine internationalization modes. First, a firm is indifferent between exporting and non exporting when $\pi_i(\varphi_{ind}) = 0$. This threshold productivity level is given by:

$$\varphi_{ind} = f_{ind}^{\frac{1}{\sigma-1}} \frac{(\sigma R)^{\frac{1}{\sigma-1}}}{\rho P} \tau\gamma \tag{4}$$

Second, a firm is indifferent between exporting indirectly and directly when $\pi_{ind} = \pi_{dir}$, hence

$$\varphi_{dir} = (f_{dir} - f_{ind})^{\frac{1}{\sigma-1}} \frac{(\sigma R)^{\frac{1}{\sigma-1}}}{\rho P} \tau(1-\gamma^{1-\sigma})^{\frac{1}{1-\sigma}} \tag{5}$$

Finally, the threshold productivity level for conducting FDI is where a firm is indifferent between direct export and FDI:

$$\varphi_{FDI} = (f_{FDI} - f_{dir})^{\frac{1}{\sigma-1}} \frac{(\sigma R)^{\frac{1}{\sigma-1}}}{\rho P} (1-\tau^{1-\sigma})^{\frac{1}{1-\sigma}} \tag{6}$$

As the share of firms choosing different internationalization modes is observable, we express this using the thresholds and the properties of the Pareto distribution. First, the share of indirect exporters from all firms serving the foreign market is the probability that a firm's productivity is below φ_{dir} conditional on being an exporter ($\varphi > \varphi_{ind}$): $P_{ind} = 1 - \left(\frac{\varphi_{dir}}{\varphi_{ind}}\right)^{-k}$. Substituting in the thresholds:

$$P_{ind} = 1 - \left[\left(\frac{f_{dir} - f_{ind}}{f_{ind}}\right)^{\frac{1}{\sigma-1}} \frac{(1-\gamma^{1-\sigma})^{\frac{1}{1-\sigma}}}{\gamma}\right]^{-k} \tag{7}$$

This formula reflects a number of quite intuitive patterns. First, the larger the fixed costs of indirect exporting are, the smaller the share of indirect exporters. Second, a larger γ reflects that the marginal cost of indirect exporting is higher, and, hence, it leads to a smaller share of indirect exporters. Finally, the larger Pareto shape parameter, k, reflects a smaller degree of productivity dispersion, which means that more firms are below the direct exporting threshold. *Ceteris paribus* less productivity dispersion is associated with more indirectly exporting firms. Note that τ does not play a role as both internationalization modes include this part of the transportation cost.

As P_{dir} is observable in our data, it can be treated as known, hence it is useful to express the relative fixed cost: $f_{dir}/f_{ind} = 1 + (1-P_{ind})^{\frac{1-\sigma}{k}}(1-\gamma^{\sigma-1})\gamma^{\sigma-1}$. Using this equation, and making assumptions about k and σ, one can derive the cost parameters which can be reconciled with the observed share of indirect exporters.

Similarly, the share of firms conducting FDI from all firms serving the foreign market is $P_{FDI} = \left(\frac{\varphi_{FDI}}{\varphi_{ind}}\right)^{-k}$, from which it is possible to express the relative fixed cost of FDI and indirect exports:

$$\frac{f_{FDI}}{f_{ind}} - \frac{f_{dir}}{f_{ind}} = {P_{FDI}}^{\frac{1-\sigma}{k}} \left(1 - \tau^{1-\sigma}\right) \tau\gamma \tag{8}$$

The framework presented in this subsection embeds the three internationalization modes observed in our data into a heterogeneous firms international trade model. In the model, firms sort according to their productivity or size into non-exporting and the three internationalization modes. Motivated by the small number of indirect exporters, we have also derived formulae which relate the share of firms choosing the different internationalization modes to the cost structure of each internationalization mode relative to each other. These equations allow us to provide ballpark estimates for the relative costs of each trade mode.

3.2. Further predictions

The theoretical model sketched above shows that the threshold levels of productivity (and size) are determined by the relative cost structure of the three modes of supplying the foreign market. As we have seen, several theoretical models in the literature provide a number of predictions on factors which affect this cost structure and, hence, internationalization mode choice conditional on productivity. In this section we focus on theoretical relationships which have empirical counterparts in our firm-level dataset.

First, being in a multinational group may be negatively associated both with the fixed and marginal costs of all international activities, hence one may expect that members of such international groups are more likely to be engaged in exporting or FDI. There is no clear prediction, however, on the effect of such international connections on the relative cost structure of different internationalization modes.

Second, firms which import directly may already have business relationships with foreign partners and such firms are also more likely to have acquired necessary language skills and infrastructure. As a result such firms may be able to establish direct export connections more easily - with a lower fixed cost - than non-importing firms. Hence, one may expect that directly importing firms are more likely to export directly rather than indirectly.

Third, in the incomplete contract framework of Felbermayr and Jung (2011) as well as Abel-Koch (2011) hold-up problems may fundamentally affect costs of indirect exporting when a considerable amount of knowledge is embedded in the exported product. As a consequence, firms producing more innovative and R&D-intensive goods are more likely to choose direct exporting to indirect and FDI to exporting to safeguard their knowledge. Furthermore, in industries where quality is heterogeneous and hard to observe, high-quality firms may be more likely to export directly or establish production facilities for signaling reasons (Abel-Koch (2011)). If innovativeness is positively related

to quality, than this logic provides another mechanism supporting the prediction that innovativeness is positively related to direct exporting and FDI.

Finally, market access affects the likelihood of direct exporting but not really the choice between direct export and sales from foreign production. Hence, proximity may affect the fixed cost of both direct exports and FDI similarly.

4. Data and descriptive statistics

The dataset used in this work, created by the EFIGE project, is the first harmonized cross-country dataset containing quantitative as well as qualitative information on around 150 items for a representative sample of some 15,000 manufacturing firms. The survey covers seven European countries, Austria, France, Germany, Hungary, Italy, Spain, and the United Kingdom.

Data from EFIGE survey was merged with balance sheet information from Amadeus for three countries: France, Italy and Spain[12]. This linked dataset is exceptionally suitable for studying the hypotheses about the internationalization mode choice of European firms, and hence we focus our investigation on these countries - with providing robustness tests for an extended sample when possible.

To set up our variable of interest, we used two questions from the EFIGE survey. Indirect and direct exporters were identified from the question asking whether firms exported (i) "directly from home country", (ii) "through an intermediary based in home country". Note that about half of firms that do indirect trade would do it along with direct trade. These firms are included in the direct trade category. Unfortunately we cannot know what destinations are served and what products are exported directly and indirectly.

A firm was considered having sales from a foreign production site (FDI maker) in three cases: if it answered positively to "Does the firm currently run at least part of its production activity in another country?" - (a) "Yes, direct investments" or (b) "Yes, contracts and arm's length agreements with local firms" or (c) if it answered positively to "Has the firm sold abroad some or all of its own products/services in 2008? - Yes directly from third countries where the firm produces" *and* is foreign owned[13]. For a robustness check, we report the most important results with a more conservative definition (only firms answering positively to (a)) of foreign production in the Appendix. Non-traders are firms who answered no to all these questions. Table 1 shows the prevalence of these internationalization modes.

[12]Unfortunately, while we could match around 90% of firms from these three countries, adding balance sheet data is problematic for the other four countries, hence the restriction. For more on EFIGE data, see Barba Navaretti et al. (2011).

[13]As we know these are production sites but we do not know if they do actually sell to local consumers, this is just an assumption if a realistic one.

Table 1: Number of observations

	Core sample	Percent	Percent from exporters	Full sample	Percent	Percent from exporters
No trade	3488	39.5%		5998	40.6%	
Indirect only	294	3.3%	5.51%	438	3.0%	5.00%
Direct, no foreign prod.	4334	49.1%	81.19%	6916	46.9%	78.93%
Foreign production	710	8.0%	13.30%	1408	9.5%	16.07%
Total	8826	100.0%		14760	100.0%	

Note: The table contains the number of observations for the core as well as the extended sample. The core sample includes France, Spain and Italy with data merged with Amadeus. The extended sample also includes Germany, UK, Hungary and Austria.

4.1. Prevalence of internationalization modes

The main message Table 1 is that the overwhelming majority, more than 81%, of firms serving the foreign market exports directly. 13.3% of internationalized firms serve the foreign market by FDI while only 5.5% of such firms chose only indirect exporting. When considering all indirect exporters - whether they also export directly or not -, this figure rises to 13.2%.

The share of indirect exporters is relatively low compared to the results of Lu et al. (2011) who found that 27% of exporters exported only indirectly. This may be explained by different definitions of indirect exporting, as only firms exporting through home-country based intermediaries are classified as indirect exporters in the EFIGE database. While information about foreign intermediaries would also be interesting, sorting models can still be easily applied to this categorization. Note, however, that the fixed cost of exporting through domestic intermediaries may be smaller than that of other types of indirect trade, hence productivity premiums of all indirect exporters may be larger than what is observed in our dataset.

In contrast, the share of firms engaged in foreign production is 8%, which is in line with previous studies conducted on similar firm-level datasets.

Direct exporting is dominant in all industries. However, as shown in Table 2, industry classification affects internationalization mode choice. Internationalized firms are nearly as likely to choose indirect exporting in food and metal than in other industries. Foreign production is also significantly less frequent in food and metals, while it is the most frequent in the electronics and auto industries. As foods and metals tend to be more homogenous and represent less innovative content than other industries, while electronics and auto manufacturing is knowledge intensive, these observations are broadly in line with theories emphasizing hold-up problems.

5. Sorting

In this section we compare the productivity distribution of firms by internationalization mode to investigate whether the predicted sorting pattern is present in the data. Similarly to the previous section we classify firms to four categories based on

Table 2: Exporters by industry

	Core Sample	No trade	Indirect only	Direct, no foreign prod.	Foreign production
Food	913	47.9%	3.8%	45.2%	3.1%
Light industries	2218	41.8%	2.7%	46.9%	8.6%
Other heavy	1580	33.9%	2.8%	55.1%	8.3%
Metal	2030	50.3%	4.3%	40.7%	4.6%
Machinery	935	19.9%	3.5%	65.9%	10.7%
Electronics	661	28.7%	3.8%	53.4%	14.1%
Auto	275	35.3%	1.8%	50.2%	12.7%

their internationalization status: non-traders, indirect exporters, direct exporters, FDI makers[14].

Total Factor Productivity (TFP) can be estimated from balance sheet data. To treat endogeneity of inputs, we estimate TFP with the method proposed by Wooldridge (2009)[15]. For unobserved productivity shocks we use materials and capital in a control function and estimate the equation for all country-industry pairs separately. We expand the estimation by adding a control in the production function for international presence as a proxy for potentially different set of prices that may affect productivity (Amiti and Konings (2007)). For further details on the modified TFP, see the Appendix 2.

Simple descriptive statistics on internationalization modes, shown in Table 3, show that there are considerable differences in such dimensions as size and age. This suggests that export mode choice is systematically related to firm characteristics hence it can be approached by heterogeneous firms' internationalization models. Note that apart from TFP, we consider employment as another simple proxy for the capacity of covering large fixed costs.

Table 3: Characterstics by internationalization mode

	turnover (m euro)	no. Employees	year of estab.	TFP (modified)	TFP (original)	Labor prod.
No trade	5814.9	43.27	1981.4	4.02	4.02	4.78
Indirect only	6490.8	45.70	1980.4	3.97	3.97	4.77
Direct, no foreign prod.	20014.3	72.79	1975.5	4.06	4.05	5.12
Foreign production	72514.9	148.15	1971.1	4.38	4.37	5.27

As Table 3 shows, there is indeed sorting based on employment and TFP for both direct exports and foreign production. This finding is not only true for the means of the variables but sorting is also reflected in stochastic dominance. This is also depicted by the empirical cumulative density functions depicted on Figure 1. At the same time both means and distributions suggest that indirect trading firms are hardly different from non-traders.

[14]We checked the categorization with the more conservative definition of foreign production. Results are in the Appendix 1.

[15]We refer to this as original TFP in the tables.

Sorting is more pronounced by employment size than by TFP, especially regarding the choice between indirect trade and direct trade. This may be explained by the fact that firm size is a more direct measure of the economies of scale regarding fixed costs of entry to foreign markets, but measurement issues in TFP estimation may also play a role. In both cases, foreign producing firms are the largest and most productive and no exporters are hardly different from indirect traders. In Table 4 the Kolmogorov-Smirnov tests confirm that direct exporters and FDI conducting firms significantly differ from non-exporting firms and each other, but indirect exporters do not differ from non-exporters.

Figure 1: Log employment distribution

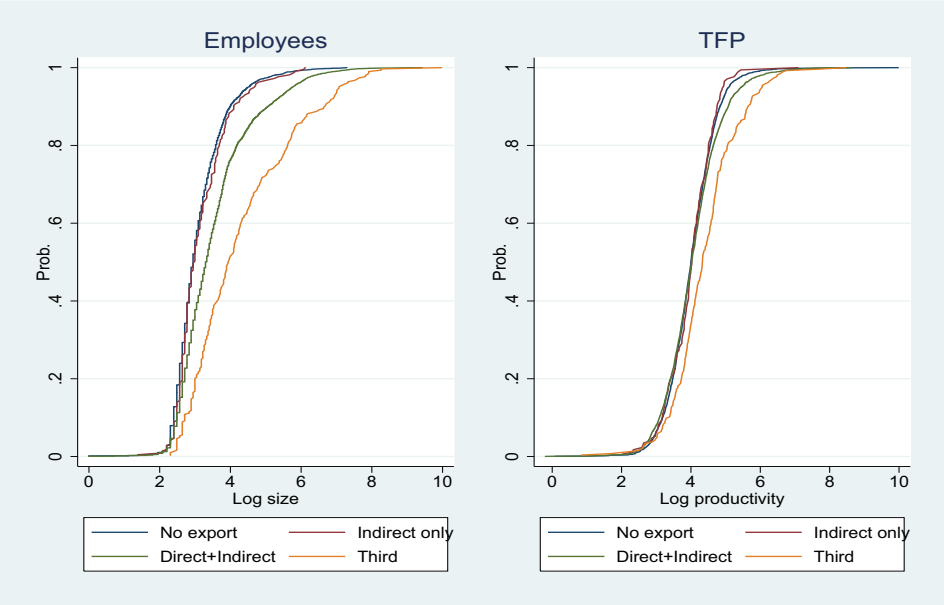

Table 4: Kolmogorov-Smirnov tests for TFP, log(employment)

	No v Indirect		Indirect v Direct		Direct v Foreign prod.	
	D	P-value	D	P-value	D	P-value
Log(employment)	0.063	0.459	0.089	0.180	0.170	0.000
TFP(modified)	0.057	0.708	0.169	0.000	0.296	0.000

While these statistics are informative, we need to control for potential differences across countries and industries and test sorting with such controls. To do this, we assume that firms maximize profits and make decision on which internationalization mode to choose subject to uncertainty and make decisions based on observable and unobservable variables but making mistakes at the same time. Hence we can relate to the random utility maximisation framework of McFadden (1974), where the scarcity of information and errors made by companies makes the maximization procedure per se less than perfect.

To test our hypotheses we run multinomial logit regressions, estimating the probability a firm i operating in country k, industry j is opting for internationalization mode Z[16]. We run two regressions, with TFP and log employment - both measured at year $t-1$ - and we controls for industry and country with a set of dummies:

$$\Pr(XM_{ijk} = Z) = F(\alpha + \beta' \mathbf{G}_{ijk} + \mu_i + \lambda_k + \nu_j + \epsilon_i) \tag{9}$$

where $\mathbf{G}_{ijk}$ refers to firm level characteristics (productivity), and λ_k are country dummies, ν_j are industry dummies. Our left hand side variable XM_{ijk} is a categorical variable related to foreign sales mode choice, Z. It can take for values: no trade, indirect export, direct export or foreign production sales. The base category is no exporting. Results are presented by three columns, with each showing the coefficients belonging to a certain outcome thus allowing estimates to be compared directly via F-tests presented at the bottom of the table. This has the advantage of not imposing an order but letting the data speak first.

Results from the multinomial logit regressions are presented in Table 5. To handle composition affects, we control for country and industry fixed effects in these regressions. The first three columns show sorting by size, followed by TFP, while the last three columns show results with both TFP and size. This suggests that employment size and TFP matter for both the choice between indirect and direct trade as well as direct versus foreign production sales, but indirect trade is not different from non-traders. All results suggest that the difference between sales via foreign production vs direct export is larger than exports vs indirect trade.

Table 5: Internationalization mode choice: sorting

Dep var: internationalization mode	(1)			(2)			(3)		
Base: No trade	Indirect	Direct	Foreign prod.	Indirect	Direct	Foreign prod.	Indirect	Direct	Foreign prod.
Log(employ.)	0.139	0.575***	1.136***				0.046	0.575***	1.142***
	(0.100)	(0.037)	(0.051)				(0.119)	(0.041)	(0.056)
TFP (mod)				-0.092	0.264***	0.622***	-0.108	0.115**	0.238***
				(0.123)	(0.043)	(0.070)	(0.129)	(0.046)	(0.074)
Country, industry (d)	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	-2.834***	-2.015***	-7.135***	-2.227***	-1.084***	-5.466***	-2.318***	-2.427***	-8.224***
	(0.382)	(0.149)	(0.310)	(0.527)	(0.189)	(0.371)	(0.610)	(0.219)	(0.420)
Observations	6,189	6,189	6,189	5,562	5,562	5,562	5,562	5,562	5,562
Log Likelihood	-5757	-5757	-5757	-5359	-5359	-5359	-5110	-5110	-5110
Pseudo R-squared	0.0851	0.0851	0.0851	0.0476	0.0476	0.0476	0.0918	0.0918	0.0918
Emp test		19.90***	187.0***					20.25***	160.2***
TFP test				8.480***	30.53***		3.040*	3.382*	

Notes: Multinomial logit. Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

[16]All results have been confirmed with a set of probit regressions as well as ordered probit, results available on request.

Regarding the control dummies, the estimates of industry dummies are in line with the pattern suggested by the descriptive statistics: direct exporting and FDI are more frequent in less homogeneous and more knowledge-intensive industries. As for country dummies, Italian firms enjoy a slightly greater likelihood of direct (vs indirect) export, while French firms are substantially more likely to conduct FDI.

6. What do these findings suggest about the cost structure?

These results show that few firms export indirectly and that the productivity premium of such exporters is small or nonexistent. In contrast, there is a relatively large number of both direct exporters and firms conducting sales from foreign production, and these two internationalization modes also reflect clear sorting patterns relative to each other as well as indirect exporting firms. Intuitively, the strong evidence for sorting suggests large differences in the fixed and marginal costs of direct trade and FDI, while the cost structure of indirect trade makes it less attractive for most firms, i.e. its fixed and/or marginal cost should be high. In this subsection, we build on the previously sketched simple theoretical framework to provide some ballpark estimates for the cost structures consistent with these observations.

To do this, we need to pin down some parameters of the model. The previous literature has provided a number of estimates for the elasticity of substitution and the Pareto-parameter of the productivity distribution. A usual assumption about σ is that it is between 3 and 6. In our calibration we will use $\sigma = 4$. Mayer and Ottaviano (2007) provides a number of estimates for k, which are typically between 1.5 and 3.

Based on Equation 8, Table 6 shows the combinations of γ, $\frac{f_{dir}}{f_{ind}}$ and $\frac{f_{FDI}}{f_{ind}}$ which are in line with the observed frequencies, $P_{ind} = 0.055$ and $P_{FDI} = 0.13$. As a robustness check, we also include results with $P_{ind} = 0.27$ as found by Lu et al. (2011). The third row, for example, shows that the relative fixed costs which are consistent with the observed export mode distribution and $\gamma = 1.2$. In this case, the fixed cost of direct exporting when $P_{ind} = 0.055$ is about 80 percent larger than the fixed cost of indirect exporting, while the fixed cost of FDI is 28.6 times larger than the fixed cost of indirect exporting.

The big picture is that there is a very large difference between the fixed costs of direct exporting and FDI: the observed patterns are in line with at least a tenfold difference between the two fixed cost levels. Sorting is less important in case of indirect vs. direct exporting: either high γ or relatively high fixed cost of indirect exporting discourages most firms from choosing this internationalization mode. A smaller fixed cost difference would only be in line with much more indirect exporters, as with Pareto-distribution firms are concentrated at lower productivity levels.

Furthermore, the framework also implies that there should be some productivity premium between indirect exporters and non-exporters. This is shown by a back-of-the-envelope calculation based simply on the Pareto cumulative distribution function, which is presented in Table 7 with the observed share of different firms. According to this

Table 6: Fixed cost values

	$(P_{ind} = 0.055)$		$(P_{ind} = 0.27)$	
γ	$\frac{f_{dir}}{f_{ind}}$	$\frac{f_{FDI}}{f_{ind}}$	$\frac{f_{dir}}{f_{ind}}$	$\frac{f_{FDI}}{f_{ind}}$
1	1.000	16.532	1.000	16.532
1.1	1.360	22.033	1.531	22.203
1.2	1.792	28.631	2.167	29.006
1.3	2.303	36.426	2.919	37.042
1.4	2.898	45.517	3.796	46.415
1.5	3.585	56.004	4.808	57.227
1.6	4.370	67.988	5.964	69.581
1.7	5.260	81.566	7.274	83.581
1.8	6.260	96.840	8.747	99.327
1.9	7.378	113.909	10.394	116.925
2	8.620	132.873	12.223	136.476

calculation, if one dimensional sorting describes well the choice of indirect exporting, indirect exporters should have about 10 percent productivity premium relative to non-traders. The calculation also shows, however, that the expected premium of indirect traders is small compared to direct exporters, which would 50 percent more productive than non-exporters according. Nonetheless, the sorting model suggests a relatively small but significant productivity and size premium for indirect exporters, which is in contrast with our data.

Table 7: Average productivity by internationalization mode

		Average productivity		
	Share	k=2	k=3	k=4
Domestic	0.395	1.12	1.08	1.06
Indirect	0.033	1.30	1.19	1.14
Direct	0.491	1.92	1.53	1.37
FDI	0.081	7.03	3.47	2.50

Note: Relative to the lowest productivity active firm.

The lack of such premium and the implied high costs of indirect trade together suggest that the idea of sorting based on productivity does not describe well the choice of firms between non-exporting, indirect exports and direct exporting. There can be at least two reasons for this finding. First, our data includes only indirect exports through domestic intermediaries, and such exporting may be different from other types of indirect exports: probably it does require a very small fixed cost, hence firms choosing such exporting will be very similar to firms which do not export at all. Second, it heterogeneity in other dimensions besides productivity, for example in the size of sunk costs, may play an important role in this decision, hence sorting based only on productivity may not describe this choice well.

7. What affects internationalization mode choice?

As our simple model suggested, thresholds determining internationalization mode choice will be affected by factors related to relative marginal or fixed costs. To make one step further, we will now consider how different factors, surveyed in subsection 3.2, may affect costs and hence, the choice of modes. To do this, we estimate the relationship between internationalization mode choice and several variables from the EFIGE survey, including benefits of belonging to groups of firms, savings owing to use of import channels as well as costs of protecting knowledge or matching.

To do this, we extend the sorting equations with cost proxies and use TFP and employment as controls. We estimate:

$$\Pr(XM_{ijk} = Z) = F(\alpha + \beta' \mathbf{G}_i + \gamma' \mathbf{M}_i + \lambda_k + \nu_j + \epsilon_{ik}) \tag{10}$$

where $\mathbf{M}_i$ are the additional firm features affecting the choice.

In terms of explanatory variables, let us consider first variables related to the firm's activities and relationships. We have used three variables to capture the advantage of being in a group. *Controlled by others* is dummy variable for controlling other firms as head of a group or having affiliates. *Controlling* firm is dummy variable for controlled by other firms: affiliate or acquired or is controlled by other firms as part of a group. Finally, *intra-group clients* is dummy variable for having clients who are part of the same group.

Second, we use the dummy variable *importer* for firms who are importer of raw materials and/or intermediate goods in 2008.

We capture knowledge intensity by a measure of recent innovation success in firms. The EFIGE dataset provides a set of variables that describe the result of innovative efforts during the 2007-09 period rather than just spending on it[17]. *Innovation success* is a variable that collects four dummy variables, hence it ranges between zero and 4. The four measures of innovation success is:

- applied for a patent
- registered an industrial design
- registered a trade mark
- claimed copyright.

Finally, we proxy market access with proximity to Brussels which is a good approximation for the distance of the EUs main markets.

[17]Other variables tested with no/marginal impact are share of white collar labor forces, or share of R&D investments within all investments. This suggests that product features that affect matching and require larger control are best captured by (successful) innovation.

To sum up, we extended our empirical model with the set of variables presented in Table 8. Results are presented in Table 9.

Table 8: Distribution of firms by internationalization mode

	No trade	Indirect only	Direct, no foreign prod.	Foreign production
Share of controlling firms	16.9%	19.4%	22.4%	39.2%
Share of controlled firms	10.2%	12.2%	16.6%	22.5%
Share of within group clients	7.2%	10.2%	11.1%	24.5%
Share of importers	25.4%	35.4%	51.9%	74.2%
Mean of innovation success	0.2	0.2	0.4	0.8
Mean of market access	6.7	6.7	6.6	6.4

Based on Table 9 first we can see that the coefficients of TFP and employment suggest the presence of sorting for direct exporting and FDI as shown by the tests at the bottom of the table, in line with the previous results. The productivity and size of indirect exporters, however, is not significantly different from that of non-exporters.

Second, importers are more likely to choose any of the three internationalization modes, hence importing seems to reduce the cutoff of all three modes. Interestingly, this is the only variable that sets indirect traders and non-traders apart. This is related to an interesting pattern - some firms may rely on the foreign partners to help selling some their products abroad[18].

Controlling other firms allows foreign production without new investments, no wonder it induces the likelihood of sales from those sites outside the host country. At the same time, it does not affect the likelihood of direct sales. Being controlled by other firms increases the likelihood of direct sales (to the parent company or partners of the parent company), and production abroad. These findings suggest that owning other firms naturally reduces the fixed cost of foreign production, while the main benefit of having a foreign owner may be a smaller fixed cost of exporting directly. Our results, emphasizing the importance of sales from foreign production as well as within group sales are in line with a recent strand of literature discussing intra-company sales (Defever and Toubal (2009); Corcos et al. (2012)).

Innovation success is key in terms of exporting and it also increases the chance of having a production site abroad. The ordering here is clear and significant. This finding provides evidence for the hypothesis that firms are less likely to use intermediaries for the export of more knowledge-intensive or higher quality goods to defend their knowledge or signal the higher quality of their products. We have to add, however, that innovation may be a good proxy of some capabilities or potential of the firm which are not captured fully by productivity.

Finally, as expected, market access also has a positive effect on both direct exporting

[18]We looked at several websites of firms, those who indicated direct trade were more likely to have a foreign language site than those who indicated indirect trade only.

Table 9: Internationalization mode choice: determinants

Dep var: internationalization mode	(1)			(2)		
Base: No trade	Indirect	Direct	Foreign prod.	Indirect	Direct	Foreign prod.
Controlling (d)	-0.113	0.151	0.795***	-0.088	0.007	0.361**
	(0.250)	(0.093)	(0.143)	(0.252)	(0.096)	(0.153)
Controlled (d)	-0.064	0.421***	0.384**	-0.054	0.261**	0.025
	(0.321)	(0.117)	(0.181)	(0.324)	(0.120)	(0.190)
Intra-group clients (d)	0.416	0.144	0.774***	0.427	0.002	0.350*
	(0.341)	(0.138)	(0.189)	(0.343)	(0.142)	(0.200)
Importer (d)	0.758***	1.263***	2.079***	0.764***	1.188***	1.874***
	(0.189)	(0.076)	(0.141)	(0.189)	(0.077)	(0.145)
Innovation success	0.115	0.711***	1.078***	0.120	0.660***	0.935***
	(0.185)	(0.068)	(0.085)	(0.184)	(0.068)	(0.088)
Market access	0.189	0.784***	0.693***	0.180	0.777***	0.630***
	(0.284)	(0.108)	(0.179)	(0.285)	(0.109)	(0.182)
Log (employees)				-0.048	0.441***	0.899***
				(0.136)	(0.050)	(0.070)
TFP (mod)	-0.120	0.151***	0.350***	-0.114	0.072	0.157*
	(0.136)	(0.052)	(0.079)	(0.140)	(0.053)	(0.082)
Country, industry dummies	yes	yes	yes	yes	yes	yes
Constant	-0.731	4.214***	-1.314	-0.686	3.101***	-3.880***
	(2.164)	(0.818)	(1.377)	(2.192)	(0.839)	(1.421)
Observations	4,795	4,795	4,795	4,795	4,795	4,795
Log Likelihood	-4208	-4208	-4208	-4115	-4115	-4115
Pseudo R-squared	0.136	0.136	0.136	0.155	0.155	0.155
Emp test					13.23***	67.59***
TFP test		4.091**	8.173***		1.813	1.428

Notes: Multinomial logit, Innovation success is variable ranging from 0 to 4. Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

and foreign production.

8. Conclusion

In this paper, we analyzed what affects the choice for a firm when selecting a mode of internationalization. Firms can sell their product abroad by relying on a local intermediary (e.g. a trade facilitator or a wholesaler), exporting directly to foreign parties or setting up a production facility to serve the local market. Being closer to consumers means lower marginal but higher sunk cost of investments.

Using survey data on three European countries, France, Italy and Spain, we found that there is no evidence on sorting to indirect trade from home sales only, however strong evidence is found for sorting into direct exporting and FDI. We calibrated a simple model to show that the frequency of various modes in our data suggest large trade costs for direct exporting and FDI, while indirect exporting has either a high fixed or marginal cost. The small number of indirect exporters and their similarity to non-exporters suggests that sorting models are less able to describe this choice well then the decision to invest into direct exporting or FDI. This may be explained by

the relatively low fixed cost of indirect trade or the presence of other dimensions of heterogeneity besides productivity, such as firm-level differences in sunk costs.

Furthermore, we found that features of firms and products such as innovative content at the firm or the industry level will affect the trade mode choice - in line with theories emphasizing contractual problems. Belonging to groups or directly importing seems to be associated with small fixed costs of direct exporting and foreign production.

In terms policy implications, our results suggest that fixed costs of upgrading to more costly internalization modes are high and hence, small policy interventions are unlikely to succeed. At the same, indirect export does not seem very costly hence fostering contacts between producers and intermediaries may be a relatively cheap solution to help foreign sales.

9. References

Abel-Koch, J. (2011), Firm size and the choice of export mode, Discussion Paper 1105, Gutenberg School of Management and Economics.

Ackerberg, D. A., Caves, K. and Frazer, G. (2006), Structural identification of production functions, mimeo, UCLA Department of Economics.

Ahn, Jaebin, A. K. K. and Wei, S.-J. (2011), 'The role of intermediaries in facilitating trade', *Journal of International Economics* **84**(1), 73–85.

Akerman, A. (2010), A theory on the role of wholesalers in international trade, Research Paper 2010:1, Stockholm University.

Amiti, M. and Konings, J. (2007), 'Trade liberalization, intermediate inputs, and productivity: Evidence from indonesia', *American Economic Review* **97**(5), 1611–1638.

Anderson, E. and Gatignon, H. (1986), 'Modes of foreign entry: A transaction cost analysis and propositions', *Journal of International Business Studies* **17**(3), 1–26.

Antràs, P. and Costinot, A. (2011), 'Intermediated trade', *The Quarterly Journal of Economics* **126**(3), 13191374.

Arnold, J. M. and Hussinger, K. (2010), 'Exports versus fdi in german manufacturing: Firm performance and participation in international markets', *Review of International Economics* **18**(4), 595606.

Barba Navaretti, G., Bugamelli, M., Schivardi, F., Altomonte, C., Horgos, D. and Maggioni, D. (2011), The global operations of european firms, Second EFIGE Policy Report, Bruegel Blueprint 12.

Barba Navaretti, G. and Venables, A. J. (2006), *Multinational Firms in the World Economy*, Princeton University Press.

Békés, G., Harasztosi, P. and Muraközy, B. (2009), Firms and products in international trade: Data and patterns for hungary, CeFIG Working Paper 9.

Benfratello, L. and Razzolini, T. (2008), Firms' heterogeneity and internationalisation choices: only productivity matters? evidence on italian manufacturing firms, Development Working Paper 236, University of Milan.

Bernard, A. B., Beveren, I. V., , Blanchard, E. J. and Vandenbussche, H. (2012), Carry-along trade, mimeo.

Bernard, A. B., Grazzi, M. and Tomasi, C. (2011), Intermediaries in international trade: direct versus indirect modes of export, NBER Working Paper 17711.

Bernard, A. B., Jensen, J. B., Redding, S. J. and Schott, P. K. (2010), 'Wholesalers and retailers in us trade', *American Economic Review* **100**(2), 408–413.

Bernard, A. B., Redding, S. J. and Schott, P. K. (2011), 'Multiproduct firms and trade liberalization', *Quarterly Journal of Economics* **126**(3), 1271–1318.

Biglaiser, G. (1993), 'Middlemen as experts', *RAND Journal of Economics* **24**(2), 212–223.

Biglaiser, G. and Friedman, J. W. (1994), 'Middlemen as guarantors of quality', *International Journal of Industrial Organisation* **12**(4), 509–531.

Blum, B. S., Claro, S. and Horstmann, I. (2010), 'Facts and figures on intermediated trade', *American Economic Review* **100**(2), 419–423.

Corcos, G., Irac, D. M., Mion, G. and Verdier, T. (2012), The determinants of intrafirm trade: Evidence from french firms, CEP Discussion Paper 1119.

Crozet, M., Lalanne, G. and Poncet, S. (2011), Wholesalers in international trade, mimeo.

Das, S., Roberts, M. J. and Tybout, J. R. (2007), 'Market microstructure and intermediation', *Econometrica* **75**(3), 837–873.

Dasgupta, K. and Mondria, J. (2011), Quality uncertainty and intermediation in international trade, mimeo, University of Toronto.

Defever, F. and Toubal, F. (2009), Productivity and the sourcing modes of international firms: Evidence from french firm-level data, mimeo. A previous, different version circulated as a CEP Discussion Paper No 842 (2007).

Felbermayr, G. J. and Jung, B. (2011), 'Trade intermediation and the organization of exporters', *Review of International Economics* **19**(4), 634–648.

Greenaway, D. and Kneller, R. (2007), 'Firm heterogeneity, exporting and foreign direct investment', *Economic Journal* **117**(517), F134F161.

Helpman, E. (1984), 'A simple theory of trade with multinational corporations', *Journal of Political Economy* **92**(3), 451–471.

Helpman, E. (2006), 'Trade, fdi, and the organization of firms', *Journal of Economic Literature* **44**(3), 589–630.

Helpman, E. (2011), *Understanding Global Trade*, Harvard University Press.

Helpman, E., Melitz, M. J. and Yeaple, S. R. (2004), 'Export versus fdi with heterogeneous firms', *American Economic Review* **94**(1), 300–316.

Keller, W., Li, B. and Shiue, C. H. (2011), 'China's foreign trade: Perspectives from the past 150 years', *The World Economy* **34**(6), 853–892.

Levinsohn, J. and Petrin, A. (2003), 'Estimating production functions using inputs to control for unobservables', *Review of Economic Studies* **70**, 317341.

Li, Y. (1998), 'Middlemen and private information', *Journal of Monetary Economics* **42**(1), 131–159.

Lu, J., Lu, Y. and Tao, Z. (2011), Exporting behavior in the presence of intermediaries: Theory and evidence, mimeo, Peking University.

Markusen, J. R. (2004), *Multinational Firms And The Theory Of International Trade*, MIT Press.

Mayer, T. and Ottaviano, G. (2007), happy few: the internationalisation of european firms new facts based on firm-level evidence, Open Access publications info:hdl:2441/10147, Sciences Po.

McFadden, D. (1974), Conditional logit analysis of qualitative choice behavior, *in* P. Zarembka, ed., 'Frontiers in Econometrics', Academic Press: New York, pp. 105–142.

Melitz, M. J. (2003), 'The impact of trade on intra-industry reallocations and aggregate industry productivity', *Econometrica* **71**(6), 1695–1725.

Petropoulou, D. (2011), Information costs, networks and intermediation in international trade, Working Paper 76, Federal Reserve Bank of Dallas.

Rauch, J. E. and Watson, J. (2004), 'Network intermediaries in international trade', *Journal of Economics and Management Strategy* **13**(1), 69–93.

Rubinstein, A. and Wolinsky, A. (1987), 'Middlemen', *Quarterly Journal of Economics* **102**(3), 581–593.

Spulber, D. F. (1996), 'Market microstructure and intermediation', *Journal of Economic Perspectives* **10**(3), 135–152.

Tang, H. and Zhang, Y. (2011), Quality differentiation and trade intermediation, mimeo.

Wooldridge, J. M. (2009), 'On estimating firm-level production functions using proxy variables to control for unobservables', *Economics Letters* **104**(3), 112–114.

Appendix 1: Further tables

Table 10: Exporters by country

	Full Sample	No trade	Indirect only	Direct, no foreign prod.	Foreign production
Austria	444	35.4%	1.8%	47.3%	15.5%
France	2973	44.5%	3.3%	41.1%	11.1%
Germany	2935	47.8%	2.7%	37.8%	11.7%
Hungary	488	37.9%	6.4%	50.4%	5.3%
Italy	3021	30.5%	2.4%	59.3%	7.7%
Spain	2832	43.9%	4.4%	46.6%	5.1%
United Kingdom	2067	37.0%	1.3%	49.2%	12.6%

Table 11: by internationalisation mode (2nd version)

	Full sample	Percent	Restricted sample	Percent
No trade	6099	41.3%	3540	40.1%
Indirect only	458	3.1%	309	3.5%
Direct, no foreign prod.	7277	49.3%	4558	51.6%
Foreign production	926	6.3%	419	4.7%
Total	14760	100.0%	8826	100.0%

Note: Foreign production is only based on the FDI dummy.

Table 12: Characteristics by internationalisation mode (2nd version)

	turnover (m euro)	no. Employees	year of estab.	TFP (modified)	TFP (original)	Labor prod.
No trade	5854.1	43.35	1981.4	4.02	4.02	4.78
Indirect only	6442.7	45.53	1980.8	4.00	4.00	4.78
Direct, no foreign prod.	20347.6	73.86	1975.4	4.07	4.06	5.12
Foreign production	108317.7	192.86	1968.1	4.50	4.49	5.33

Table 13: Internationalisation mode (2nd version) choice: sorting

Dep var: internationalization mode	(1)			(2)			(3)		
Base: No trade	Indirect	Direct	Foreign prod.	Indirect	Direct	Foreign prod.	Indirect	Direct	Foreign prod.
Log(employ.)	0.147	0.590***	1.313***				0.053	0.587***	1.315***
	(0.097)	(0.037)	(0.058)				(0.115)	(0.041)	(0.064)
TFP				-0.011	0.289***	0.762***	-0.024	0.138***	0.285***
				(0.120)	(0.043)	(0.082)	(0.126)	(0.045)	(0.088)
Country, industry (d)	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	-2.855***	-2.072***	-7.993***	-2.532***	-1.196***	-6.059***	-2.656***	-2.564***	-9.251***
	(0.374)	(0.148)	(0.361)	(0.517)	(0.187)	(0.425)	(0.594)	(0.217)	(0.494)
Observations	6,189	6,189	6,189	5,562	5,562	5,562	5,562	5,562	5,562
Log Likelihood	-5399	-5399	-5399	-5039	-5039	-5039	-4778	-4778	-4778
Pseudo R-squared	0.0911	0.0911	0.0911	0.0488	0.0488	0.0488	0.0981	0.0981	0.0981
Employment test		21.64***	221.9***					22.18***	185.7***
TFP test					6.386**	38.19***		1.694	3.312*

Notes: Multinomial logit. Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix 2: TFP estimation

The starting point for our TFP estimation is a production function in log-linearized form:

$$\ln VA_{it} = \alpha + \beta_K \ln Capital_{it} + +\beta_L \ln Labor_{it} + \eta_i + \epsilon_{it} \tag{11}$$

Here VA is value added, η_i is the time invariant firm specific fixed effects and ϵ_{it} is firm-specific productivity shocks. These productivity shocks represents the main problem in the estimation since they are not observable for the econometrician but firms decide on their choice of input based on their realized productivity. In addition the correlation problem between labor and the shocks can be more severe because labor assumed to adjust more rapidly than capital.

To solve this endogeneity problem Levinsohn and Petrin (2003) offered a method where unobservable productivity shocks can be proxied by intermediate inputs (such as materials and electricity) and capital. They propose a two-step estimation method where the standard errors are obtained by bootstrapping methods. One of the main problems with this two-step approach is that if firms choose labor input optimally in the first stage equation then labor is also a function of unobserved productivity and its coefficient is nonparametrically unidentified Ackerberg et al. (2006).

Wooldridge (2009) proposed a joint GMM estimation method for the two equation which has the advantage that the labor input can be identified properly. Further advantages of this estimation are that we can easily obtain the robust standard errors and the GMM's weighting matrix account for possible serial correlation and heteroskedasticity problems. We use this method to obtain TFP with materials as intermediate inputs. Since the shape of the production function can differ across countries and industries we estimate the equations separately for all country-industry pairs.

Table 14: Internationalisation mode choice: sorting with other variables

Dep var: internationalization mode	(1)			(2)		
Base: No trade	Indirect	Direct	Foreign prod.	Indirect	Direct	Foreign prod.
TFP (original)	-0.113	0.102**	0.238***			
	(0.129)	(0.046)	(0.074)			
Labour prod.				-0.018	0.542***	0.785***
				(0.115)	(0.044)	(0.082)
Log (employment)	0.046	0.579***	1.146***	0.144	0.545***	1.086***
	(0.119)	(0.041)	(0.056)	(0.102)	(0.038)	(0.052)
Country, industry (d)	yes	yes	yes	yes	yes	yes
Constant	-2.302***	-2.389***	-8.242***	-2.762***	-4.642***	-10.999***
	(0.610)	(0.219)	(0.422)	(0.660)	(0.266)	(0.528)
Observations	5,570	5,570	5,570	6,184	6,184	6,184
Log Likelihood	-5117	-5117	-5117	-5650	-5650	-5650
Pseudo R-squared	0.0918	0.0918	0.0918	0.101	0.101	0.101
TFP test		23.97***	10.10***			
Lab prod test					2.807*	4.191**
Emp test		20.56***	161.4***		16.17***	170.0***

Notes: Multinomial logit. Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Furthermore we are dealing with firms that may be active at international markets so given trade status (importer, various export modes) might affect the firm's input choices and prices it faces, and thus drive part of the simultaneity bias in productivity estimation. In the spirit of suggestion made by Amiti and Konings (2007), we made a small change in the original GMM methodology proposed by Wooldridge (2009), adding a trade status dummy as control variable into the production function. Our modified TFP is based on this estimation. The trade status dummy is one if the firm is active as importer and/or exporter of any sorts and zero otherwise. Note that this modification makes little quantitative effect and no qualitative impact on our results.