# Internationalization modes of European firms

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**Abstract**

Using survey data from firms in France, Italy and Spain, we describe similarities and differences among firms by three types of internationalization: indirect trade, direct trade and FDI. Motivated by a heterogeneous firm international internationalization model allowing firms to choose from these three internationalization modes we analyze the prevalence of manufacturing firms choosing each category and the variables affecting this choice. As indirect traders are few and similar to non-traders we conclude that, contrary to exporting directly and conducting FDI, sorting models do not describe well this choice. We also find that the likelihood of direct exporting and FDI is positively correlated with being a member of a group, importing and innovation.

*Keywords:* Firm heterogeneity, export, FDI, international trade mode, multinomial logit

JEL code: F14, F23

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## 1. Introduction

International trade is carried out by various types of firms, such as manufacturers selling their own product to one or several clients and trade intermediaries buying from several manufacturers and selling 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 consumers will find imported goods from overseas plants of the manufacturer, such as GE light bulbs made in its Hungarian plants and exported worldwide.

The main motivation for studying firms' choice between different internationalization modes is that such research 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 choice can be 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. This strand of literature has shown that this sorting can affect trade patterns and reallocation following trade liberalization. Also, understanding how smaller firms can take advantage of internationalization modes requiring less sunk cost when entering export markets may provide important conclusions for the design of export-promoting policies.

Furthermore, understanding the role of intermediaries in international trade may prove important for empirical research, as it helps in understanding the possible uses and limitations of disaggregated trade data, which typically links transactions only to the firm conducting the deal, hence classifying firms exporting through intermediaries as non-exporters.

This paper uses such distinction to compare manufacturing firms, looking at differences for a set of European countries surveyed recently. The survey itself was conducted as part of the European Firms in a Global Economy (EFIGE) project. The questionnaire distinguished three modes of internationalization[1]. Firms can sell their products directly to corporate (such as intermediate goods) and final consumers (including retailers); this is *direct trade*. Second, they may sell to local or foreign intermediaries who will then sell it to consumers abroad; this is *indirect trade*. Finally, they may have foreign production, *FDI*.

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. According to the South United States Trade

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

Association[2], in the US for example, an "export merchant" buys and sells on his own account, purchasing goods from the manufacturer only to repackages and sell under its own brand. Similarly, indirect trade is by an export agent instead is the official representative of the producer promoting goods as manufactured. 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[3]. 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).

These firms are often specialized in goods and/or countries and have built up good contacts and networks. Jones (2002) discusses the features of multinational trading companies, and argues that pinpointing them is difficult as such firms are diversified and are sometimes classified as trading company, merchant bank or shipping company. Even larger companies often specialize by product or by region. At the same time, there are a few very large and complex trading house/distributor companies serving whole industries[4].

Besides definitional ambiguity, there are serious measurement problems with indirect trade in trade datasets. If the manufacturer uses an export trading or management company with an outlet in the home country, indirect export may be registered as domestic sale for the manufacturer and export for the intermediary. Should the intermediary be an export agent located in the foreign country or just serve as freight forwarder, the transaction will be registered as direct trade. A major advantage of the EFIGE database is that it explicitly asks about the export mode of each firm together with a number of important quantitative and qualitative questions. This allows us to

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

[3] 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 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).

[4] For instance, Ingram Micro Inc. is the world's largest "technology distributor and a leading technology sales, marketing and logistics company for the IT industry worldwide." As a vital link in the technology value chain, Ingram Micro creates sales and profitability opportunities for vendors and resellers through outsourced logistics services, technical support, financial services and product aggregation and distribution. The company supports global operations through an extensive sales and distribution network throughout the world with local sales offices and/or representatives in 26 countries, representing more than 1,300 vendors, serving more than 190,000 resellers in approximately 145 countries. Source: `www.ingrammicro.com`.

describe similarities and differences among firms by three types of internationalization mode. For data reasons we focus on three countries: Spain, Italy and France.

The final option 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. Sales from foreign production is directly asked in the EFIGE survey.

Our empirical contribution is that instead of comparing manufacturers and wholesalers, as it has been done in mostly in the previous literature, we compare manufacturers by their choice of export mode. Previously, for instance, Bernard, Grazzi and Tomasi (2011) differentiated firms by their sector classification and compared their features. Another option used by Thang and Zhang (2011) is to consider product-destination level data and explain the share of exports by the prevalence of intermediaries in each product destination pair. Instead, we focus on the export mode choice explicitly reported by manufacturers, hence our unit of observation is manufacturing firms itself, which reports its choice[5].

Our second contribution is that we interpret our findings in a simple internationalization 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 able to describe the choice between indirect and direct exporting than between 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 and present the data, followed by the description of our theoretical framework. Then, we compare firms choosing different internationalization modes, and describe what does it imply about their relative cost structure. Finally, we analyze how some variables may affect the relative marginal cost, and hence, affect the probability of a firm's choice. In the conclusion we discuss thel contributions of the paper.

## 2. Related literature

In this literature review, we consider four topics: why intermediaries exist, how prevalent is indirect export, is there a size or productivity sorting according to trade more and what may affect the cost structure of firms prompting them to choose one

[5]The dataset closest to ours is by the EBRD on Turkey used in Abel-Koch (2011).

mode or another. For each of these issues, we record empirical evidence as well.

*Why intermediaries may serve an important role in commerce?*

The international business literature (e.g., Peng and Ilinitch (1998)) has long emphasized that firms typically require their own wholesale affiliates or trade intermediaries in the foreign country to become successful exporters. Intermediary companies may cover any parts of the road from the producer's factory gate to the foreign consumer, including hauling, finding consumers, handling port transactions and legalities, financial transaction verification, insurance, etc. Spulber (1996) defines an intermediary as "an economic agent that purchases from suppliers for resale to buyers or that helps buyers and sellers meet and transact". In broader terms this means a service to manage shipments of goods (import-export companies) as well as matching the seller with consumers including search, compliance and distribution (wholesaler, distributor companies).

The primary role of intermediaries is to offer specialized trade transaction services. Regarding trade technology, in a number of recent models on intermediation, intermediaries represent such an alternative distribution technology. This choice involves a trade-off between sunk costs and marginal costs. For example Ahn and Wei (2011) argue that setting up a network requires a sunk cost but allows low cost operation as opposed to higher marginal cost asked by a third party. In Felbermayr and Jung (2011) intermediation similarly requires smaller fixed costs and larger marginal export costs are endogenously derived from extra hold-up problems generated by the intermediation process.

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.

*Share of intermediated trade*

Second, let us consider available empirical evidence on the share of intermediaries as well as the share of firms opting for indirect trade.

The main stylized fact is that while the majority of exports is conducted directly, indirect trade also plays a significant role in international trade. Ahn and Wei (2011) finds that 20% of China's export is carried out by intermediaries[6]. Blum et al. (2010) report that around 35% of imports into Chile are done through intermediaries. In Hungary about a 30% of imports is carried out firms in wholesale and retail sector

[6]In the literature, wholesaler is often used as a synonym, but in this paper we will always use intermediary even when the literature refers specifically to wholesalers.

(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.

Few authors report results about the share of manufacturing firms exporting indirectly. The only exception we know of is 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.

*Firm heterogeneity and internationalization mode choice*

Building on the seminal model of Melitz (2003) in which heterogeneous firms choose between exporting and non-exporting, a number of approaches has shown that firms follow similar sorting patterns in different dimensions of international trade. In particular, Helpman et al. (2004) (HMY) proposed that such sorting is present with respect to exporting and horizontal FDI: while each firm faces the same proximity-concentration trade-off, they react differently according to their productivity level. 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 cost charged by the intermediary. The main prediction of Felbermayr and Jung (2011) and 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 country data and finds that direct exporters have the highest productivity, followed by mixed (direct export and intermediary use) traders, indirect exporters, no traders. In relation to sorting by productivity, size is often used 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 EBRD 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 is implied by productivity sorting. When heterogeneity is two-dimensional, intermediates 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.

*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. This means that intermediaries can spread the fixed cost of exporting across multiple goods since they have to make only one investment in the basic fixed cost. As a result, sales per good will be lower for intermediaries than for direct exporters. Also, intermediaries export a wider scope of goods to countries with high fixed costs of entry. 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.

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. Akerman 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 (measures of the number of documents for importing, cost of importing and time to import).

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. 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 it or outsource it. 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 rule of law 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 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, internalization mode serves as a signaling device. In such a case, firms are more likely to invest in signaling and export directly if quality is high and hence, intermediated good quality may be lower than if exported directly. 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 dif-

ferentiation increases the share of direct exporters because in the case sales are more quality verification. 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. 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.

## 3. Theoretical framework and hypotheses

The aim of this section is to describe the theoretical framework of our empirical analysis. First, we sketch in a model in which firms 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.

*Productivity*

The theoretical framework is based on the on the heterogeneous firm models of and Helpman et al. (2004) and Ahn and Wei (2011). For simplicity, we consider a two country case when firms from the home country may or may not supply the destination market. One aim of our discussion is to provide formulae for the share and relative productivity of firms choosing different internationalization modes to help understand the cost structure of those internationalization modes.

The theoretical framework is based on the work Ahn and Wei (2011), which is described in detail in the Online Appendix of that paper. The basic setting of this model follows Melitz (2003). For simplicity, we consider only to 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 a monopolistically competitive market. The productivity of firm i is denoted by $\varphi_i$. 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 export and their export 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.

In such a framework, firms will sort according to their productivity level ($\varphi_i$): 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 $\phi$ 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:

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

while the profit from FDI is:

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

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 $\varphi_{dir}$ 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 advantage of indirect exporting (in terms of fixed costs), the smaller the share of indirect exporters. Second, a larger $\gamma$ 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 $\tau$ does not play a role as both internationalization modes include this part of the transportation cost.

One of the purposes of our theoretical framework is to provide rough estimates for the relative fixed and marginal costs of different internationalization modes. 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 $\sigma$, one can derive the cost parameters which can be reconciled with the observed share of indirect exporters.

Similarly, the share 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:

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

*Other factors affecting internationalization mode*

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. Theoretical models 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 decrease both 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 relative 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 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, 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.

## 4. Data and descriptive statistics

This section describes the dataset we use and present key 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 in the following countries: Austria, France, Germany, Hungary, Italy, Spain, and the United Kingdom. These items cover international strategies, R&D, innovation, employment, financing and the organizational activities of firms, before and after the financial crisis.

Data from EFIGE was merged with balance sheet information from Amadeus for three countries: France, Italy and Spain. This linked dataset is exceptionally suitable for studying the hypotheses about the role of intermediaries in the exporting activities of European firms, and hence we focus our investigation on these countries - with providing robustness tests for an extended sample when possible[7].

To set up our variable of interest, we used two questions from the EFIGE survey. Indirect and direct exporters were generated from the question asking whether firms exported (i) “directly from home country”, (ii) “through an intermediary based in home

[7]For more on EFIGE data, see Barba Navaretti et al. (2011).

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 or products are export directly and indirectly. A firm was considered having sales from a foreign production site if positively answered "Does the firm currently run at least part of its production activity in another country? - Yes, direct investments". Non traders are firms who answered no to all these questions. The table below desribes these trade modes.

Table 1: Number of observations

| | Full sample | Percent | Restricted sample* | Percent |
|---|---|---|---|---|
| No trade | 5998 | 40.6% | 3488 | 39.5% |
| Indirect only | 438 | 3.0% | 294 | 3.3% |
| Direct, no foreign prod. | 6916 | 46.9% | 4334 | 49.1% |
| Foreign production | 1408 | 9.5% | 710 | 8.0% |
| Total | 14760 | 100.0% | 8826 | 100.0% |

Note: Table contains the number of observations for full and restricted sample for the variable export mode. *Restricted sample contains only France, Spain and Italy: merged with Amadeus covering 90% of EFIGE firms in France, Spain and Italy.

### *4.1. Indirect exporters*

Based on the EFIGE survey, we can say that there are quite few firms who export only indirectly. In our sample, only 6% of exporters export only through intermediaries. When considering all indirect exporters - whether they also export directly or not - , this figure rises to 11%. It takes adding exports from third country operations to reach about 20% of firms. Thus, 80% of firms will only export directly in our sample[8]. There is only minor variation by countries, with fewer indirect traders in Italy and Spain and more in France[9].

Table 2: 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% |

[8]Note that very small and very large firms are missing. Thus, this figure may be much larger when we add many small firms with small sales abroad carried out by intermediaries.

[9]In the extended sample, the UK has the highest share of intermediated trade (10%) and Hungary the lowest (2.7%).

The second key observation is that indirect trade is not concentrated in a few industries: there are no large differences across manufacturing industries. In most industries, the share of indirect traders ranges between 3% (auto) and 9% (metal)[10].

Table 3: Exporters by industry

| | Restricted 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% |

The determinants of export mode choice seem to be largely independent from the technology of the industry. The similar share of indirect traders in each industry suggests that the difference between the fixed and variable costs of direct and indirect exporting are mainly determined by the characteristics of the wholesale and retail sectors rather than the attributes of the traded goods themselves.

## 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 cathegories based on their trade status. We checked the categorization where the foreign production is based on FDI only. Results are in the Appendix 1.

Productivity can be estimated from balance sheet data. The dataset we use is not ideal for TFP estimation (e.g. inputs are difficult to compare across countries) and hence, we also use size by employment as another sorting variable. To treat endogeneity of inputs, we estimate TFP with the method proposed by Wooldridge (2009). For unobserved productivity shocks we use materials and capital in a control function and estimate the equation for all country-industry pairs. We expand the estimation adding a control in the production function for international presence as a proxy for potentially different set of prices that may affect productivity. For further details see Appendix 2.

Besides balance sheet data, the EFIGE survey also includes data on firm size, export markets, exporting frequency and home country of the firm. Simple descriptive statistics by internationalization mode show that there are considerable differences in these dimensions across internationalization modes. This suggests that export mode

[10]Data with more detailed industry breakdown based on classification in the Amadeus database is available on request. Key features are unchanged.

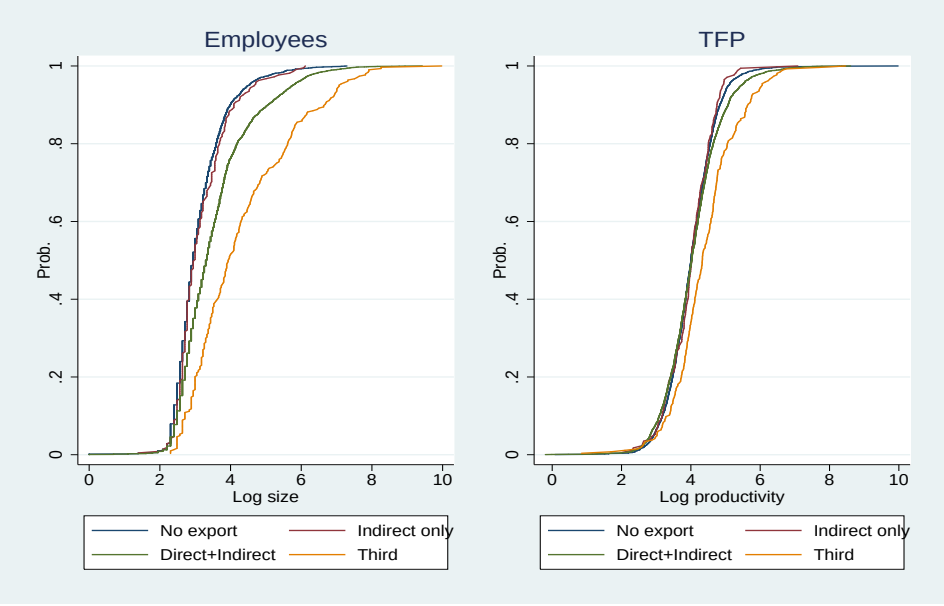
choice is systematically related to firm characteristics hence it can be approached by heterogeneous firms' international internationalization models.

Table 4: 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 |

Our results suggest that there is 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 shown by the cumulative density functions depicted on Graph 1. In contrast, indirect trading firms are not any different from non-traders in terms of TFP, while slightly larger in terms of size. Sorting is more pronounced by employment size than by TFP - especially regarding indirect trade-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. 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




We assume that firms maximize profits and make decision on which internationalization mode to choose subject to uncertainty and make decisions based on observable

Table 5: Kolmogorov-Smirnov tests for TFP, log(employment)

| | No v Indirect | | | Indirect v Direct | | | Direct v Foreign prod. | | |
|---|---|---|---|---|---|---|---|---|---|
| **Log(employment)** | | | | | | | | | |
| | D | P-value | Corrected | D | P-value | Corrected | D | P-value | Corrected |
| 0 | 0.063 | 0.232 | | 0.089 | 0.090 | | 0.170 | 0.000 | |
| 1 | -0.006 | 0.987 | | -0.050 | 0.467 | | -0.014 | 0.866 | |
| Combined | 0.063 | 0.459 | 0.422 | 0.089 | 0.180 | 0.155 | 0.170 | 0.000 | 0.000 |
| **TFP (modified)** | | | | | | | | | |
| | D | P-value | Corrected | D | P-value | Corrected | D | P-value | Corrected |
| 0 | 0.024 | 0.847 | | 0.169 | 0.000 | | 0.296 | 0.000 | |
| 1 | -0.057 | 0.373 | | -0.003 | 0.997 | | -0.001 | 0.999 | |
| Combined | 0.057 | 0.708 | 0.672 | 0.169 | 0.000 | 0.000 | 0.296 | 0.000 | 0.000 |

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 the maximisation procedure per se is 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 $Z$[11].

To test the sorting hypothesis, 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 as well as the year of establishment information from the EFIGE survey (this is used also by Abel-Koch (2011) ).

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

where $\mathbf{F}_{ijk}$ refers to firm level characteristics (productivity), and $\lambda_k$ are country dummies, $\nu_j$ are industry dummies. Our left hand side variable $XM_{ijk}$ is a categorical variable related to foreign sales mode choice $Z =$ 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 probability of a certain outcome thus allowing coefficients 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 6. 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 matters and TFP both matter for the choice between indirect and direct trade and direct versus foreign production sales, but indirect trade is no different from non-traders.

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

All results suggest that difference between sales via foreign production vs direct export is larger than exports vs indirect trade.

Table 6: 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, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Regarding the control dummies, we found that industry dummies are basically not significant, which is in line with the small across-industry differences shown by the descriptive statistics. 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 a relatively large number of both direct exporters and firms conducting FDI, and these two internationalization modes also reflect clear sorting patterns relative to each other as well as non-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 $\sigma$ is that it is between 3 and 6. In our calibration we will use $\sigma = 4$. Mayer and Ottaviano (2007) a number of estimates is provided for $k$, which are typically between 1.5 and 3.

Based on Equation 8, Table 7 shows the combinations of $\gamma$, $\frac{f_{dir}}{f_{ind}}$ and $\frac{f_{FDI}}{f_{ind}}$ which are in line with the observed frequencies, $P_{ind} = 0.06$ and $P_{FDI} = 0.1$. 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 is about 80 percent larger than the fixed cost of indirect exporting, while the fixed cost of FDI is 40.6 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 $\gamma$ or relatively high fixed cost of indirect exporting discourages most firms from choosing this internationalization mode.

At a more general level one may add that the idea of sorting based on productivity does not describe well the choice of firms between non-exporting, indirect exports and direct exporting. Other dimensions, for example one-time opportunities and chance may play a more important role in this choice than it is assumed in sorting models.

Table 7: Fixed cost values

| $\gamma$ | $\frac{f_{dir}}{f_{ind}}$ | $\frac{f_{FDI}}{f_{ind}}$ |
|---|---|---|
| 1 | 1.000 | 24.021 |
| 1.1 | 1.363 | 32.005 |
| 1.2 | 1.799 | 41.580 |
| 1.3 | 2.313 | 52.891 |
| 1.4 | 2.914 | 66.084 |
| 1.5 | 3.606 | 81.303 |
| 1.6 | 4.397 | 98.693 |
| 1.7 | 5.294 | 118.398 |
| 1.8 | 6.302 | 140.563 |
| 1.9 | 7.429 | 165.332 |
| 2 | 8.681 | 192.852 |

## 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. 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 and/or employment as controls.

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

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

First let us consider variables related to the firm's activities and relationships, as stronger ties with other firms may have a significant effect on the relative cost of different internationalization modes. 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, the variable *intra-group clients* measures the share of firms have clients who are affiliated (part of the same group).

The second factor we consider is importing which may be related to the firm's investment into international networks. We use the dummy variable *importer* for firms who are importer of raw materials and/or intermediate goods in 2008.

Table 8: Distribution of firms by internationalization mode

| | No trade | Indirect only | Direct, no foreign prod. | Foreign production |
|---|---|---|---|---|
| Importer | 25.4% | 35.4% | 51.9% | 74.2% |
| Share of within group clients | 7.2% | 10.2% | 11.1% | 24.5% |
| Controlling other firms | 16.9% | 19.4% | 22.4% | 39.2% |
| Controlled by others | 10.2% | 12.2% | 16.6% | 22.5% |
| Innovation success | 0.2 | 0.2 | 0.4 | 0.8 |
| Market access | 6.7 | 6.7 | 6.6 | 6.4 |

The discussed theoretical models also suggest that the export strategy of the firm may be strongly related to the knowledge intensity of the product; firms with more innovative products are more likely to export directly to defend their knowledge from copying. We capture this 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[12]. The innovation success is a variable collects four dummy variables, 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

[12]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.

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. 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. In regards to wholesalers, Akerman (2010) found significant negative coefficient for distance in a gravity model on Swedish data.

To test how firm features and product characteristics may affect the trade mode choice we extended our empirical model with the set of variables presented in Table 8. Multinomial logit regression results are presented in Table 9.

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) |
| 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) |
| 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) |
| 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) |
| 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, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

First, in line with the previous results, the coefficients of TFP and employment suggest the presence of sorting for direct exporting FDI. 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 exporting 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 sell some their products abroad[13].

Controlling other firms allows foreign production, 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 this is less related to production sales abroad. These findings suggest that owning other firms naturally decreases 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) as well as Corcos et al. (2012) consider intra-firm trade in France and finds that more productive and technology intensive firms are more likely to trade within the company/group

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 less likely to use intermediaries for the export of more knowledge-intensive or highe r 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.

Market access (proximity to Brussels) 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.

## 8. Conclusion

In this paper, we analyzed what affects the choice for a firm to select a mode of internationalization. Firms can sell their produce abroad by using an intermediary (e.g. a trade facilitator or a wholesaler) who helps sell goods abroad, 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, but sorting

[13]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.

is present into direct exporting and FDI. We calibrated a simple model to show that the frequency of various modes in our data suggest large differences in fixed costs. Furthermore, we found that features of firms and products such as innovative content will affect the trade mode choice - in line with theories of control and transaction costs.

## 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.

Barba Navaretti, G., Bugamelli, M., Schivardi, F., Altomonte, C., Horgos, D. and Maggioni, D. (2011), The global operations of european firms - the second efige policy report, Bruegel Blueprint 12.

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

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

Jones, G. (2002), Trading companies in theory and history, *in* G. Jones, ed., 'Merchants to Multinationals', Oxford University Press.

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.

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.

Peng, M. W. and Ilinitch, A. Y. (1998), 'Export intermediary firms: A note on export development research', *Journal of International Business Studies* **29**(3), 609–620.

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: Number of observations

| | 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 11: 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 12: 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, $\eta_i$ is the time invariant firm specific fixed effects and $\epsilon_{it}$ 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 endogeinity problem Levinsohn and Petrin (2003) offered a method where unobservable productivity shocks are a of 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 nonparametlically 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 advan-

Table 13: Internationalisation mode choice: sorting, probit

| Dep var: internationalization mode | Indirect v Direct | | | Direct v Foreign prod. | | |
|---|---|---|---|---|---|---|
| Log(employment) | 0.201*** | | 0.244*** | 0.312*** | | 0.316*** |
| | (0.044) | | (0.053) | (0.023) | | (0.025) |
| TFP (mod) | | 0.181*** | 0.121** | | 0.197*** | 0.076** |
| | | (0.058) | (0.062) | | (0.035) | (0.036) |
| Country, industry (d) | yes | yes | yes | yes | yes | yes |
| Constant | 0.767*** | 0.853*** | 0.210 | -2.305*** | -1.902*** | -2.700*** |
| | (0.201) | (0.261) | (0.306) | (0.152) | (0.187) | (0.204) |
| Observations | 3,358 | 3,040 | 3,040 | 3,630 | 3,315 | 3,315 |
| Log Likelihood | -723.3 | -613.2 | -601.1 | -1254 | -1224 | -1143 |
| Pseudo R-squared | 0.0389 | 0.0307 | 0.0498 | 0.1030 | 0.0531 | 0.1150 |

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

tages 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 separetaly for all country-industry pairs.

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 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.

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, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.