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HOHENHEIMER DISKUSSIONSBEITRÄGE

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Nr.309/2009

Institut für Volkswirtschaftslehre (520)
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ISSN 0930-8334

Trade Intermediation and the Organization of Exporters *

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April 2009

Abstract

The business literature shows that exporting firms typically require the help of foreign trade intermediaries or need to set up own foreign wholesale affiliates. In contrast, conventional trade theory models assume that producers can directly access foreign consumers. This paper models the endogenous emergence of intermediaries in an international trade model where producers differ with respect to productivity as well as regarding their varieties' perceived quality and tradability. We assume that trade intermediation is prone to frictions due to the absence of enorceable cross-country contracts while own wholesale subsidiaries require capital investment. We derive the sorting pattern of firms according to their degree of competitive advantage and show how the relative prevalence of intermediation depends on the degree of heterogeneity among producers, on the importance of market-specificity of goods, or on expropriation risk. We use US export data for 50 sectors and 133 destination countries to check the empirical validity of this predictions and find robust empirical support.

Keywords: Trade intermediation, international trade, heterogeneous firms, incomplete contracts.

JEL-Codes: F12, F23.

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*Part of this work was undertaken when Benjamin Jung was visiting the University of Nottingham. We are grateful to Alan Deardorff, Joe Francois, David Greenaway, Wilhelm Kohler, Horst Raff, Farid Toubal, and seminar participants at the ETSG Meetings 2006 in Vienna and 2007 in Athens, workshops at the University of Nottingham, Tübingen University, and at the Austrian National Bank for comments and discussion. All remaining errors are ours.

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1 Introduction

The international business literature (e.g., Peng and Ilinitch, 1998) stresses that firms typically require an own wholesale affiliate or a trade intermediary in the foreign country to become successful exporters of final goods. The optimal organizational choice between these two major *export modes* is an important issue for firms' internationalization strategies. However, conventional trade models assume that exporters sell directly to foreign end-clients. This may be an innocuous assumption for many important questions. However, it is clearly questionable empirically. And it bars a more profound understanding of components of international trade costs which are unrelated to trade policy or geographical distance but are endogenously determined through the interaction of firms in the presence of frictions.[1]

In this paper, we suggest a simple theoretical framework in which exporters face a choice of *how to export* to foreign markets. That is essentially an organizational choice as domestic producers can either provide distribution services abroad through an own foreign wholesale affiliate, or through a specialized firm: a trade intermediary. In our model, due to the lack of enforceable cross-border contracts, intermediation entails a distortion that leads to lower export revenues. This is a disadvantage compared to the use of an own wholesale affiliate; however, intermediaries make capital investments of producers in the foreign country redundant, thereby offering savings in fixed distribution costs.

Our paper innovates along three lines: First, we cast the above choice of export modes in a Melitz (2003)-type model where firms differ with respect to the idiosyncratic components of variable distribution costs or preferences as well as with respect to their labor productivity. We derive a sorting pattern of monopolistic firms over different export modes. Second, embedding the organizational choice of producers into a multi-country trade model with trade-cost asymmetries, we show how the *relative prevalence of intermediation* depends on various exogenous variables. Third, we use US census data to provide an *empirical check* of our results.

We focus on the *endogenous emergence* of trade intermediaries as important institutions

[1] Trade costs beyond transportation and tariffs are estimated to be substantial despite recent progress in transportation and communication technologies. For example, Anderson and van Wincoop (2004) report that retail and wholesale distribution costs are equivalent to an *ad valorem* tax of 55 percent, thereby dwarfing other types of trade costs.

in the operation of real-world international business. Trade intermediaries enjoy easier access to foreign markets due to better local knowledge and the exploitation of economies of scope. However, new advances in the literature on the boundaries of the firm (e.g., Antras and Helpman, 2004) stress the lack of enforceable contracts in international transactions. In the context of our model, the trade intermediary can hold-up the producer as customizing goods for foreign markets implies relationship-specific investment. Prices and quantities are determined in a game between producers and intermediaries: the optimal response of the producer is to restrict output for the export market, which drives up consumer prices and lowers transaction volumes. The trade-off between fixed-cost savings and lower revenue pins down the producers' optimal organizational mode of exporting.

Facing a hold-up problem, producers may wish to internalize sales activities by setting up an own wholesale affiliate. Internalization forgoes the fixed-cost savings available with intermediation, but avoids relationship-specific distortions. We derive an interesting sorting pattern: firms with highly marketable goods, strong brand reputation, and high productivity internalize foreign sales activities, while those with medium realizations of those variables prefer to use trade intermediaries. The relevant firm characteristics correlate with firm size, so that the paper predicts selection of firms along their sizes.

Besides the predicted sorting pattern, our framework has additional testable implications. Thanks to the general equilibrium nature of our model, we can derive structural relationships that can be tested econometrically in a consistent way. First, and in contrast to the concentration-proximity trade-off, the prevalence of sales through trade intermediaries relative to sales through own wholesale affiliates does not depend on variable trade costs between two countries like tariffs or freight rates. Second, relative prevalence decreases in the strength of contractual imperfections (which may be good/sector-specific) but it increases in the (country-specific) risk of expropriation of physical capital in the foreign country. Third, relative prevalence increases as firms become more homogeneous in terms of their underlying characteristics (productivity, brand reputation, marketability of goods). We test these predictions on US export data for 50 sectors and 133 destination countries.

Our work is related to at least three important strands of literature. First, as in Grossman and Helpman (2002) or Antras and Helpman (2004, 2008) we allow for the lack of enforceable cross-country contracts to affect the boundaries of firms while within-country or within-firm transactions are not subject to similar frictions. Whereas their focus is on a sourcing decision which involves the location of *input* production, we analyze the pattern of sourcing *distribution services*.[2] As in the afore-mentioned papers, we use a property-rights approach to contractual imperfections. Other authors have proposed agency-based mechanisms, see for example Horstmann and Markusen (1995). Intermediaries may possess better information on their markets than foreign producers which opens the possibility for the existence of informational rents as they required additional incentives to incur sales efforts. As in our setup, agency-based frictions would imply that intermediation pushes up prices in the foreign markets so that heterogeneous firms would sort into distribution modes much in the same way that is predicted by our model. The property-rights approach with its focus on contractability has the advantage that for many of its determinants empirically meaningful and established proxy variables exist.

Second, a number of recent papers discusses the endogenous sorting of firms into different modes of serving foreign markets. In Helpman, Melitz, and Yeaple (2004) [henceforth: HMY] firms either *produce locally* and export to a foreign market, or they engage in horizontal FDI and *produce abroad*.[3] In contrast to the standard proximity-concentration trade-off, in our model no trade cost savings arise.

Third, the theoretical model provided by HMY has been tested by HMY themselves and other authors using different data sources. Another related empirical study is the one by Bernard, Jensen, Redding, and Schott (2008) who provide evidence that products' revealed contractability plays a role in explaining the intra-firm share of imports.[4] We also draw on Nunn (2007) who computes a measure that can be viewed as product specificity at a disaggregated level.

The remainder of the paper is organized as follows. Section 2 introduces the model and solves the game between the trade intermediary and the producer. Section 3 derives the key propositions of the paper: it shows how firms sort into different export modes according to their

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[2]Lafontaine and Slade (2007) survey theory and evidence on the sourcing decision, and on retailing. Note that we do not explicitly model a retail sector but rather focus on organization of exports.

[3]Krautheim (2008) proposes a similar model where firms can also engage in export-supporting FDI.

[4]The paper is marked "Preliminary".

attributes and derives predictions on the relative prevalence of either export modes and the trade-FDI relationship in general equilibrium. Section 4 provides tentative empirical evidence, and Section 5 concludes. Proofs of our results, intermediate steps of calculations, and a number of supplementary tables are contained in the Appendix.

2 Model setup

In this section we describe a model with heterogeneous firms akin to Melitz (2003) in which we introduce the endogenous emergence of trade intermediaries. Besides its focus on firms' choice of export mode, our model differs from existing treatments in that it allows for a broader characterization of firm heterogeneity. Our general equilibrium approach has the advantage that it generates closed-form relationships between the relative prevalence of export modes and its observable exogenous determinants, thereby allowing for econometric validation of the model's predictions.

The world consists of N countries, indexed $j = 1, ..., N$, who may differ according to the size of their labor forces. In each country, heterogeneous firms produce varieties of a differentiated good and interact under conditions of monopolistic competition. We allow for exogenous firm turnover, so that in a stationary environment at each instant of time a measure $\bar{\delta} > 0$ of firms dies and enters. Firm death is the only source of discounting.

2.1 Demand structure

Each country j is populated by a representative household who inelastically supplies L_j units of labor to a perfectly competitive labor market. Preferences are a CES aggregate of differentiated goods, each indexed by ω:

$$U_j = \left[\int_{\omega \in \Omega_j} \left[\zeta\left(\omega\right) x_{ij}\left(\omega\right) \right]^{\rho} \mathrm{d}\omega \right]^{1/\rho} . \quad (1)$$

The parameter $\rho \in (0, 1)$ describes the degree of substitutability between any pair of varieties. Ω_j is the set of available varieties in country j. The quantity $x_{ij}\left(\omega\right)$ denotes consumption of a variety produced in country $i, i = 1, ..., N$. Our specification slightly generalizes the standard

CES case in that it adds the parameter $\zeta(\omega) \geq 0$ which captures the *brand reputation* of variety ω as perceived by the household.[5] The larger $\zeta(\omega)$, the bigger is the contribution of variety ω to overall utility.[6]

Each variety is produced by a single firm. Despite the existence of operational profits of successful firms, ex ante expected profits are driven to zero by free entry. In equilibrium, aggregate operational profits are exactly matched by firms' total setup costs. Thus, labor is the only source of income.

Maximizing (1) subject to the respective budget constraint, we find the following demand function for a variety ω from country i

$$x_{ij}(\omega) = H_j \frac{\zeta(\omega)^{\sigma-1}}{p_{ij}(\omega)^{\sigma}}, \tag{2}$$

where $H_j \equiv w_j L_j P_j^{\sigma-1}$. $P_j = \left(\int_0^{n_j} [p_{ij}(\omega)/\zeta(\omega)]^{1-\sigma} d\omega\right)^{1/(1-\sigma)}$ is the price index dual to (1), n_j is the measure of the set Ω_j, $\sigma \equiv 1/(1-\rho) > 1$ is the elasticity of substitution between varieties, and w_j denotes the wage rate.

2.2 Product heterogeneity and exporting via own wholesale affiliates

Monopolistically competitive producers differ with respect to a vector of characteristics $\{\zeta(\omega), \tau(\omega), a(\omega)\}$, where $\zeta(\omega)$ is the parameter for brand reputation introduced above, $a(\omega) > 0$ denotes the labor input requirement for producing one unit of variety ω, and $\tau(\omega) \geq 1$ refers to variety-specific variable distribution costs of the iceberg type, which measure the ease at which a variety is brought to the consumer (marketability). Realistically, we assume that this cost occurs regardless of whether a good is traded internationally or not. However, in international transactions, total variable trade costs are $\tau_{ij}(\omega) = \bar{\tau}_{ij}\tau(\omega)$, where $\bar{\tau}_{ij} \geq 1$ accounts for transportation costs from country i to country j and may be thought of as a function of distance. We refer to $\bar{\tau}_{ij}$ as

[5] Combes, Lafourcade, and Mayer (2005) introduce a similar weighting factor in their representation of utility.

[6] In principle, our setting allows to read equation (1) as a CES production function of a competitive final output good producer. Then, we study trade in inputs rather than in final goods. The predictions of the model do not hinge on the interpretation. This conceptual flexibility facilitates the empirical exercise of Section 4, since the data do not allow to dissect trade in final goods from trade in inputs.

to the *systematic* component of trade costs, and of $\tau(\omega)$ as the *idiosyncratic* component.[7]

Firm ω's variable cost function in country i is given by $c_i(\omega) = y(\omega)\, a(\omega)\, w_i$ where $y(\omega)$ is the quantity of output. Regarding their cost structure, firms do not differ across countries. We map the vector of firm characteristics $\{\zeta(\omega), \tau(\omega), a(\omega)\}$ into a scalar measure of effective firm-level productivity $\Phi(\omega) \equiv \zeta(\omega) / [a(\omega)\, \tau(\omega)]$. It turns out that $Q \equiv \Phi^{\sigma-1}$ is a measure of *competitive advantage* which fully characterizes firm behavior.

Following the structure of the entry process introduced by Hopenhayn (1992) and simplified in Melitz (2003), prospective entrants are uncertain about their respective values of Φ. Only after entry, which requires sinking the cost f^E, Φ is revealed and remains constant afterwards. We assume that Φ follows the Pareto distribution. More precisely, we let the c.d.f. be $G(\Phi) = 1 - \Phi^{-k}$, with a shape parameter $k > \max\{2, \sigma - 1\}$ and the support $[1, +\infty)$.[8] Note that we need not restrict in any way the stochastic processes that govern the components of $\Phi(\omega)$.

Along with variable distribution costs $\tau(\omega)$, there are also fixed distribution costs. These costs are associated to warehousing, the maintenance of customer relations, or regulatory burdens. Without loss of generality, given perfect capital markets, we can express investment costs as flow costs. Flow fixed distribution costs are expressed in terms of labor and are given by $f_j = f w_j$, where f is the labor requirement that is constant over all countries. We assume, that a firm from country i has to pay f_i when selling to its home market, but that the cost of an own foreign representation is given by $f_{ij} = \phi_{ij} f_j$, with $\phi_{ij} > 1$ for $i \neq j$, and $\phi_{ii} = 1$, so that firms' fixed distribution costs in the foreign country are higher than in the home economy. In contrast, trade intermediaries are assumed to originate in country j so that they enjoy cheaper access to foreign markets than foreign producers. Whenever $i \neq j$, we call f_{ij} wholesale FDI.[9]

The fact that producers face higher fixed distribution costs abroad may have two reasons.

[7] Bergin and Glick (2007) also discuss variety-specific trade costs.

[8] The Pareto assumption has been made in a large number of related papers (e.g., Helpman, Melitz, and Yeaple (2004), Chaney (2008), Helpman, Melitz, and Rubinstein (2008), Bernard, Redding, and Schott (2006)). The Pareto allows for closed form solutions. The assumption $k > 2$ makes sure that the variance of the productivity distribution is well-defined, and $k > \sigma - 1$ guarantees that the equilibrium distribution of firm sizes has a finite mean. The dispersion of firms' competitive advantages is inversely related to the shape parameter.

[9] In principle, the sales representative could also be located domestically. However, our preferred interpretation allows to view f_{ij} as wholesale FDI. Krautheim (2007b) uses the term *export-supporting FDI* instead of wholesale FDI. Essentially, this is just a reinterpretation of the fixed costs of exporting in the original Melitz (2003) model.

First, trade costs may simply have a firm-specific fixed component which is larger in foreign markets due to additional costs associated to linguistic, legal or informational issues. Second, ϕ_{ij} may represent the risk that a foreign government expropriates the affiliate (i.e., its offices, warehouses, etc.). To see this, let δ_{ij} denote the Poisson rate of expropriation, and assume that $\delta_{ii} = 0$ for the sake of simplicity and without loss of generality. Then, ϕ_{ij} would be equal to $\left(\bar{\delta} + \delta_{ij}\right) / \bar{\delta}$ which is a strictly increasing function of δ_{ij}. Hence, the risk of expropriation works just as a higher depreciation rate on foreign assets.

We want to understand how differences in terms of competitive advantage Q across producers determine their choice of foreign market entry mode: through wholly owned foreign sales affiliates or through trade intermediaries. For that purpose, we first briefly show how profits achieved through foreign sales affiliates depend on Q. Discussion of profits through intermediation is less standard and discussed in more detail in the next section.

The monopolist generates non-negative profits from *exporting via an own wholesale affiliate*, if export revenues suffice to cover additional variable production costs and the annuitized costs of foreign investment $\phi_{ij} f_j$.[10] Profits from exporting through an own wholesale affiliate are $\tau_{ij}(\omega) \cdot H_j \left[\tau_{ij}(\omega) p(\omega)\right]^{-\sigma} \zeta(\omega)^{\sigma-1} \cdot \left[p(\omega) - a(\omega) w_i\right] - \phi_{ij} f_i$. Using the monopolist's optimal pricing rule, this gives

$$\pi_{ij}^{A}(Q) = \left(w_i \bar{\tau}_{ij}\right)^{1-\sigma} B_j Q - \phi_{ij} f_j, \qquad (3)$$

where the systematic part of trade costs $\bar{\tau}_{ij}^{1-\sigma}$ appears as a determinant of variable profits, along with the measure of foreign market size B_j, and the costs of investing abroad, $\phi_{ij} f_j$. Profits increase in the degree of competitive advantage Q and market size B_j; they fall in effective unit costs $w_i \bar{\tau}_{ij}$, additional costs associated to linguistic, informational, or legal issues ϕ_{ij}, and the fixed costs of maintaining the foreign distribution network f_j.[11]

[10] Recall the assumption of perfect capital markets.

[11] Note that domestic sales are nested with $\bar{\tau}_{ii} = \phi_{ii} = 1$.

2.3 Trade intermediation

Assumptions. An intermediary is "*...an economic agent who purchases from suppliers for resale or who helps sellers and buyers to meet and transact*" (Spulber, 1996). We view trade intermediaries as wholesale agents that facilitate transactions between producers and consumers from different countries. Trade intermediaries benefit from *economies of scale* since there are fixed distribution costs. Being incorporated in the foreign country, they have the same fixed distribution costs than producers in that country would have, $f_j = fw_j$.[12] We do not explicitly model a retail sector; our assumption of variable trade costs accruing also for domestic sales capturing in a parsimonious way the cost of retailing when there are no specific contractual or strategic interactions between wholesellers and retailers (which we rule out in this paper).

Our model accommodates trade intermediaries that have *diversified product portfolios*. Under general circumstances, the pricing and the product range choice of intermediaries interact in a complicated way due to a cannibalization effect. However, under monopolistic competition, intermediaries do not internalize the effect of an additional variety on demand of the other varieties, such that pricing and product-range decisions are independent; see Bernard, Redding, and Schott (2006) for a related model of multi-product producers. We may also reconcile our model with *economies of scope*. When fixed costs of distribution depend on the number of varieties sold, intermediaries determine their product range such that those costs are minimized. Assuming an interior solution to this problem, we may think of f as the minimum fixed distribution cost. As intermediaries are identical in our model, they all share the same fixed costs.[13]

Finally, we assume that producers and intermediaries cannot write enforceable *cross-country* contracts on quantities and prices and that the variety to be exchanged features some export market specificity. This might be the case if the product has to meet some specific technical standards that prevent it from being fully 'recycled' on a different market.[14] The lack of *ex*

[12] The intermediary's specific knowledge could also translate into lower variable (distribution) costs. However, the largest portion of variable distribution costs such as transportation services, taxes, etc. are the same across export modes.

[13] Felbermayr and Jung (2009) study fixed market access costs which depend on the tightness of the matching market between producers and intermediaries.

[14] This 'recycling' process may be, of course, a metaphor for many things: sales in the foreign market may require market-specific adjustments, so that selling a shipment elsewhere requires undoing these changes; one

ante contracts exposes the producer to potential hold-up: the intermediary can deny the order *ex post*, i.e., after production has taken place. This assumption is crucial in that it provides an endogenous rationale for lower variable revenues when the producer opts for the intermediated export mode. Variants of this assumption have been used by Helpman and Grossman (2002) or in Antras and Helpman (2004, 2008) in the context of vertical relations between final goods and intermediate inputs producers (outsourcing).

The game between producers and trade intermediaries. As in Antras and Helpman (2004), there is an infinitely elastic supply of trade intermediaries in every country. Each producer P who finds it optimal to search for a trade intermediary M, makes a take-it-or-leave-it offer, which specifies an upfront-fee for participation $T(\omega)$ in the relationship that has to be paid by M. This fee can be positive or negative, and may be interpreted as a franchising fee paid by M to P or as a down-payment of P to M towards financing fixed foreign distribution costs. There is full information on product characteristics ω, so that prospective intermediaries would know that a variety offered by some producer is already sold by another intermediary. In that case, both intermediaries would see their operative profits driven to zero by Bertrand competition and would thereby not be able to recover T. It follows that all producer-dealer relationships in equilibrium must be *exclusive dealership* arrangements in that each producer is matched to at most one intermediary in every market.

With the supply of M infinitely elastic, M's profits from the relationship net of the participation fee in equilibrium are equal to its outside option, which we have set zero. Hence, $T(\omega)$ will indeed differ across varieties: the higher the competitive advantage of a variety, the larger the fee that the producer can extract from the trade intermediary. However, while perfect competition for producers leaves trade intermediaries without rents ex post, they can still hold up the producers. Due to the lack of enforceable contracts, the producer cannot be sure to receive adequate payment for the output delivered to the trade intermediary. The latter can refuse delivery until the price is low enough. We assume that the countervailing incentives of producers and intermediaries are sorted out via the usual asymmetric Nash bargaining process,

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could also think about a situation where, in case of disagreement, a delivery needs to be shipped back from the foreign country to the producer, thereby causing additional transportation costs.

where $\bar{\beta}_{ij} \in [0, 1]$ is the bargaining power of a producer from country i with a trade intermediary located in country j. At the bargaining stage, the producer is particularly vulnerable since production costs are sunk at the time of bargaining. If bargaining fails, the producer can recycle the goods that were meant for exports, thereby partly recovering a fraction $\lambda_{ij} \in [0, 1]$ of the inputs used in production.[15]

We may summarize the sequencing of the game between the intermediary M and the producer P. First, the producer P effectively auctions an exclusive dealership relationship with a trade intermediary. Second, if some M has accepted the offer, P decides about the quantity $\tau_{ij}(\omega) x_{ij}^M(\omega)$ to produce for the purpose of exports.[16] Finally, P delivers the goods to M, M sells the goods, and P and M bargain about sharing of revenues (and, thereby, implicitly, about a transaction price).

As usual, the game is solved by backward induction. The joint surplus generated on the foreign market is given by

$$J_{ij}(\omega) = p_{ij}^M(\omega) x_{ij}^M \left[p_{ij}^M(\omega)\right] - \tilde{\pi}_{ij}^P(\omega) - f_j, \tag{4}$$

where $x_{ij}^M \left[p_{ij}^M(\omega)\right]$ is the level of foreign demand at a c.i.f. price $p_{ij}^M(\omega)$ and $f_j = f w_j$ is fixed foreign costs of distribution incurred by M.

The producer's outside option $\tilde{\pi}_{ij}^P(\omega)$ is the amount of the numeraire input that firm ω can recover when bargaining fails

$$\tilde{\pi}_{ij}^P(\omega) = \lambda_{ij} \tau_{ij}(\omega) x_{ij}^M(\omega) a(\omega) w_i, \tag{5}$$

where $\tau_{ij}(\omega) x_{ij}^M(\omega)$ is the amount of production required to deliver the quantity x_{ij}^M to the foreign market. If $\lambda_{ij} = 0$, there is no alternative use for the goods delivered to the foreign market; if $\lambda_{ij} = 1$, production can be entirely and costlessly unwinded.

The Nash solution of the bargaining problem between the producer and the intermediary

[15] Note that λ_{ij} measures how specific the product is to the respective export market.

[16] $x_{ij}^M(\omega)$ is the quantity demanded by foreign consumers, which implies the production of $\tau_{ij}(\omega) x_{ij}^M(\omega)$ units due to loss in transit.

requires that M receives a pay-off $\left(1-\bar{\beta}_{ij}\right) J_{ij}(\omega)$, while the producer gets $\bar{\beta}_{ij} J_{ij}(\omega)+\tilde{\pi}_{ij}^{P}(\omega)$. Predicting its share of the surplus at the bargaining stage, the producer chooses the optimal quantity to supply to the intermediary. She solves

$$\max_{x_{ij}^{M}(\omega)} \bar{\beta}_{ij} J_{ij}(\omega)+\tilde{\pi}_{ij}^{P}(\omega)-x_{ij}^{M}(\omega)\,\tau_{ij}(\omega)\,a(\omega)\,w_{i} \tag{6}$$

subject to the demand function (2). The quantity choice of the producer finally determines the price that the consumer in the foreign country ends up paying. The following lemma states that price.

Lemma 1 (Pricing behavior) *The c.i.f. price charged for imports from country i into the foreign market j is given by*

$$p_{ij}^{M}(\omega)=\frac{1}{\beta_{ij}}\frac{1}{\rho}\tau_{ij}(\omega)\,a(\omega)\,w_{i}, \tag{7}$$

where $\frac{1}{\beta_{ij}}=\frac{1-\lambda_{ij}\left(1-\bar{\beta}_{ij}\right)}{\bar{\beta}_{ij}}\geq 1$ is an additional markup over marginal costs. $\frac{1}{\beta_{ij}}$ measures the severity of the distortion caused by the lack of contracts.

The foreign price is determined as effective marginal costs $\tau_{ij}(\omega)\,a(\omega)\,w_{i}$ multiplied by a *total* markup $1/(\beta_{ij}\rho)\geq 1$ over effective marginal costs $\tau_{ij}(\omega)\,a(\omega)\,w_{i}$. The markup $1/\rho$ usually arises in a model with monopolistic competition and CES preferences. However, it is magnified by an additional factor $1/\beta_{ij}$ that arises due to the export market specificity of the product and lack of enforceable contracts. It is endogenously pinned down by the parameters governing the bargaining process and by the ease at which products can be recycled. The intuition for the additional markup is the following: At the bargaining stage, the producer appropriates only a share $\bar{\beta}_{ij}$ of the surplus. Therefore the firm optimally restricts the output below the level that would be optimal without intermediation.

If the producer has all the bargaining power (i.e., $\bar{\beta}_{ij}=1$) or if she can recycle the output at no costs, then the additional markup vanishes. If output, however, is totally specialized, the additional markup factor is only driven by the bargaining power.[17] In the limiting case where the producer has no clout in the bargaining, the additional markup goes to infinity regardless

[17]These statements immediately follow from the definition of β_{ij}.

of the recycling rate. [18] Moreover, the additional markup is decreasing in the bargaining power $\bar{\beta}_{ij}$ and in the recycling rate λ_{ij} for any given $\lambda_{ij} \in [0, 1)$ and $\bar{\beta}_{ij} \in (0, 1)$, respectively.

If the producer has incomplete bargaining power (i.e., $\bar{\beta}_{ij} > 1$) or her products are not fully recyclable, the c.i.f. price charged for imports via trade intermediaries is larger than the one for imports via wholesale affiliates: $p_{ij}^{M}(\omega) > p_{ij}^{A}(\omega)$.[19] One may relate the pricing rule (7) to the *double marginalization* problem that appears in vertical relationships of monopolistic firms. Both, higher trade costs $\bar{\tau}_{ij}$ and the hold-up problem imply a higher consumer price. However, there is a crucial difference between iceberg-type trade costs and the effect of frictions $1/\beta_{ij}$. The former drives up the c.i.f. price as the delivery of a good to a foreign market requires the use of specific services which require resources in proportion to the price of the good. In contrast, the holdup problem drives up the c.i.f. price because producers optimally reduce supply, thereby moving up the demand schedule.

Finally, potential intermediaries compete for contracts with producers, so that they end up bidding their entire ex post profits $\left(1 - \bar{\beta}_{ij}\right) J_{ij}(\omega)$ as participation fees $T(\omega)$. The profits that a producer P makes on the foreign market using an intermediary are given by the optimal value of (6) plus the participation fee $T(\omega)$ that the producer receives. The producer's pay-off from the bargaining stage, plus income from the participation fee, minus variable production costs, all evaluated at the optimal price $p_{ij}^{M}(\omega)$, give her total profit from exporting via a trade intermediary as

$$\pi_{ij}^{M}(Q) = \left(\frac{w_i \bar{\tau}_{ij}}{\tilde{\beta}_{ij}}\right)^{1-\sigma} B_j Q - f_j, \tag{8}$$

where we have replaced the firm index ω with Q. The term $\tilde{\beta}_{ij} \equiv \left[\beta_{ij} + (1 - \beta_{ij})\,\sigma\right]^{\frac{1}{\sigma-1}} \beta_{ij} \in [\beta_{ij}, 1]$ is endogenously determined as a function of effective bargaining power $\beta_{ij}\left(\bar{\beta}_{ij}, \lambda_{ij}\right)$ and the elasticity of substitution σ.

In general, the lack of complete contracts reduces the slope of the profit function $\pi_{ij}^{M}(Q)$ in a similar way than an increase in iceberg trade costs $\bar{\tau}_{ij}$ would. For given Q, the variable component of profits is always smaller when the producer chooses a trade intermediary than

[18] $\lim_{\bar{\beta}_{ij} \to 0} \beta_{ij} = 0$.

[19] In Grossman and Helpman (2002), a similar pricing rule emerges in the context of outsourcing with homogeneous firms.

when the producer establishes an own wholesale affiliate. Despite the fact that the producer does not directly lay out the fixed cost expenditure f_j in the foreign market, those costs are nevertheless entirely deducted from the producer's profit. This is due to the fact that the producer extracts all profits from the intermediary when setting the participation fee T. Hence, fixed distribution costs are fully rolled-over from the intermediary to the producer.

3 The choice of export modes

3.1 Sorting of firms

Firms partition endogenously into different modes along their degree of competitive advantage. The weakest firms do not even take up domestic production as they generate insufficient revenue to cover fixed domestic distribution costs f_i. The firm that is exactly indifferent between serving the domestic market or not is identified by the condition $Q_i^D = w_i^{\sigma-1} f_i / B_i$. Firms may export and do so using different export modes. The producer that is indifferent between exporting through a trade intermediary and selling on the domestic market only is given by the condition $\pi_{ij}^M \left(Q_{ij}^M \right) = 0$, which can be solved for the cutoff value Q_{ij}^M:

$$Q_{ij}^M = \left(\frac{w_i \bar{\tau}_{ij}}{\tilde{\beta}_{ij}} \right)^{\sigma-1} f_j B_j^{-1}. \tag{9}$$

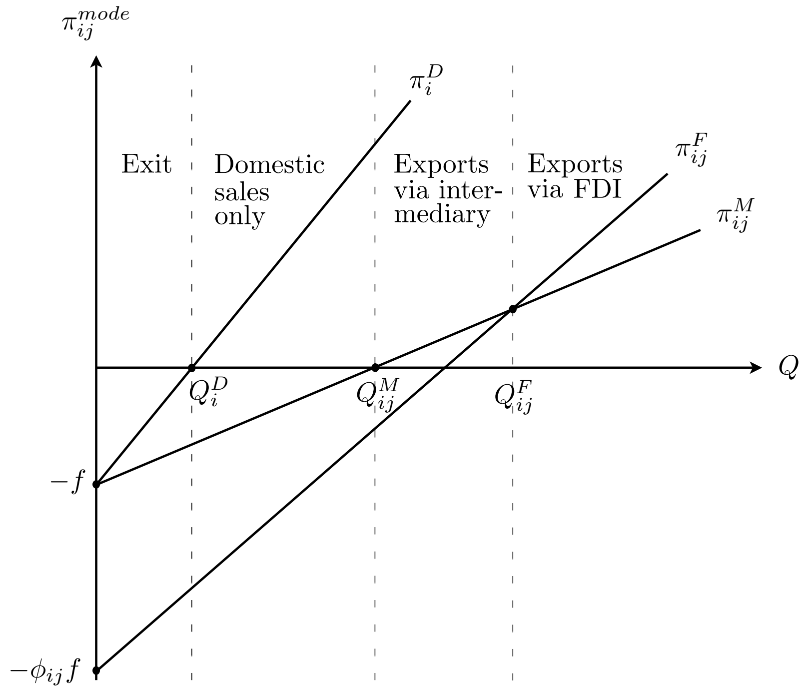
Finally, the producer with competitive advantage Q_{ij}^F achieves identical profits from serving the foreign market in either export modes: $\pi_{ij}^M \left(Q_{ij}^F \right) = \pi_{ij}^F \left(Q_{ij}^F \right)$. This indifference condition pins down a second cutoff level

$$Q_{ij}^F = \left(w_i \bar{\tau}_{ij} \right)^{\sigma-1} \left(\frac{\phi_{ij} - 1}{1 - \tilde{\beta}_{ij}^{\sigma-1}} \right) f_j B_j^{-1}. \tag{10}$$

Figure 1 relates the firms' sorting pattern to their degree of competitive advantage.[20]

[20]This picture is related to Figure 1 in Helpman, Melitz and Yeaple (2004) [HMY], where the sorting of firms into exporters and firms producing abroad also involves a trade-off between fixed and variable costs, in their case the proximity-concentration trade-off. In the present context, the trade-off is between variable revenue and fixed costs of foreign market access. And, importantly, the slope of the profit functions shown in Figure 1 is endogenously determined as a function of the producers' bargaining power $\bar{\beta}_{ij}$, the technology parameter λ_{ij}, and

Figure 1: Firms sort into different export modes according to competitive advantage Q



If the foreign market becomes larger, firms with low competitiveness start exporting through trade intermediaries. Moreover, it becomes attractive for some of the existing exporters to set up own wholesale affiliations. Hence, both cutoffs Q_{ij}^M and Q_{ij}^F move into the same direction. The same holds true if the fixed costs of exporting f_j, the wage rate w_j, or variable transport costs $\bar{\tau}_{ij}$ decline. In contrast, an increase in the risk of expropriation does not affect entry into exporting through a trade intermediary, but makes exporting through an own wholesale affiliate less attractive. When the bargaining power of the producer $\bar{\beta}_{ij}$ is higher in some export market or her outside option better, the loss of revenue implied by intermediation is smaller.[21] Hence, Q_{ij}^M shifts to the left. However, an increase in $\bar{\beta}_{ij}$ makes an own wholesale affiliate less attractive, shifting Q_{ij}^F in the opposite direction.

We can now use Figure 1 and state the first proposition of our paper.

Proposition 1 *Intermediaries and wholesale affiliates coexist and are both used by strictly positive non-overlapping masses of producers from country i for their exports to country j if*

the elasticity of substitution σ.

[21] Technically, this comes from $\partial\tilde{\beta}_{ij}/\partial\bar{\beta}_{ij} > 0$ and $\partial\tilde{\beta}_{ij}/\partial\lambda_{ij} > 0$.

$\tilde{\beta}_{ij}^{1-\sigma} < \phi_{ij}$. *Under this condition, producers endogenously select into export modes along their degree of competitive advantage. Firms with low marginal costs, easily tradeable variants, or a strong brand reputation establish own wholesale affiliates. Those with intermediate values of the above characteristics make use of a trade intermediary.*

The existence condition $\tilde{\beta}_{ij}^{1-\sigma} < \phi_{ij}$ is intuitive:[22] Trade intermediation only arises as a viable alternative to wholesale FDI if the distortion associated to it, $\left(\tilde{\beta}_{ij}^{1-\sigma}\right)$, is small enough relative to the cost savings that the avoidance of wholesale FDI implies (ϕ_{ij}). If $\tilde{\beta}_{ij} < 1$, for any finite ϕ_{ij}, there is a positive mass of firms that wish to establish a foreign sales affiliate. Note the role of the elasticity of substitution between different varieties: if σ is very small, even a small (effective) cost disadvantage implied by intermediation reduces export revenue by a large amount, making wholesale FDI comparably attractive.

3.2 The prevalence of export modes

Changes in the prevalence of export modes do not only depend on movements along the extensive margin, but also on changes along the intensive margin. Sales of firm Q in either mode are simple log-linear functions of firms' competitive advantage

$$s_{ij}^{M}(Q) = \sigma \left(\frac{w_i \bar{\tau}_{ij}}{\beta_{ij}}\right)^{1-\sigma} B_j Q \quad \text{and} \quad s_{ij}^{S}(Q) = \sigma \left(w_i \bar{\tau}_{ij}\right)^{1-\sigma} B_j Q \ . \tag{11}$$

Clearly, in each mode, sales are larger the greater is the degree of competitive advantage (Q), the smaller are systematic transportation costs $(\bar{\tau}_{ij})$ and the more income the foreign market has (B_j). The more severe the frictions caused by the hold-up problem $1/\beta_{ij}$ are, the lower sales per firm channeled through intermediaries, whereas exports per firm via wholesale affiliates is not affected by the lack of enforceable cross-country contracts.[23]

[22] The condition does not suffice to make sure that there always exists a positive measure of firms that do not serve the foreign market at all, i.e, that $Q_i^D < Q_{ij}^M$. This inequality holds for some firms if $\frac{w_j}{w_i}\left(\frac{\bar{\tau}_{ij}}{\tilde{\beta}_{ij}}\right)^{\sigma-1} B_i > B_j$, where w_i, w_j, B_i, and B_j are endogenous objects which can be solved using the labor market clearing and balanced trade conditions for all countries. As the focus of the present paper is not on whether firms export but rather on how they do it, we refrain from determining these objects. We can derive our main theoretical results without solving for w_i, w_j, B_i, and B_j.

[23] These observations relate to *direct* effects only; $\sigma, \bar{\tau}_{ij}, \beta_{ij}$ also affect sales through B_j.

We can compute the value of total export sales of country i to country j that are facilitated by trade intermediaries $S_{ij}^{M} = M_i^E \int_{\Phi_{ij}^M}^{\Phi_{ij}^F} s_{ij}^M(\Phi)\, dG(\Phi)$, where M_i^E is the mass of entrants in country i. Similarly, we can derive total exports of i into j through own wholesale affiliates S_{ij}^F.

The severity of the hold-up problem $1/\beta_{ij}$ affects intermediated export sales in several ways. First, taking wages and market size as given, for any firm, a lower degree of contractual imperfections increases sales through intermediaries, see (11). Second, contractual imperfections affect the selection of producers into the intermediated distribution mode. As $1/\beta_{ij}$ goes down, more firms find it optimal to export through trade intermediaries and either choose to establish an own wholesale affiliate abroad or stop exporting to market j completely; see (9) and (10). Hence, a reduction of contractual imperfections has a positive effect on total intermediated export sales both on the *intensive* and on the *extensive* margin. Ignoring general equilibrium effects, the derivative of S_{ij}^M with respect to β_{ij} is positive.[24]

The risk of expropriation (ϕ_{ij}) only affects the extensive margin. Clearly, a higher risk of expropriation is associated with higher sales through trade intermediaries relative to sales through own wholesale affiliates.

Moreover, we can establish a link between the dispersion of the distribution of the comparative advantage Q and the relative prevalence of export modes. A higher dispersion gives more mass to firms with high values of Q, therefore shifting relative sales in favor of own wholesale affiliates.

With Φ distributed according to the Pareto distribution, as assumed above, aggregate export sales of country i to country j via intermediaries are given by

$$S_{ij}^M = \Psi_{ij} \beta_{ij}^{\sigma-1} \left[\tilde{\beta}_{ij}^{k-(\sigma-1)} - \left(\frac{1-\tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij}-1} \right)^{\bar{k}} \right], \tag{12}$$

where $\bar{k} \equiv \frac{k}{\sigma-1} - 1$ is a constant, and Ψ_{ij} is a shifting factor.[25] Looking at the first order effect only, intermediated exports from i to j increase when both countries involved are larger or systematic trade costs $\bar{\tau}_{ij}$ are smaller. Intermediated exports also fall in f, the fixed costs

[24] This follows immediately from the considerations on the intensive and extensive margin above.

[25] The term Ψ_{ij} is endogenously determined and given by $\Psi_{ij} = \frac{\sigma k}{k-(\sigma-1)} M_i^E B_j^{\frac{k}{\sigma-1}} (w_i \bar{\tau}_{ij})^{-k} (f w_j)^{-\bar{k}}$

that any foreign market presence entails.

Similarly, we can derive total exports of i into j through own wholesale affiliates S_{ij}^F. Evaluating $S_{ij}^F = M_i^E \int_{\Phi_{ij}^F}^{\infty} s_{ij}^F(\Phi)\, dG(\Phi)$, we have

$$S_{ij}^F = \Psi_{ij} \left(\frac{1 - \tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij} - 1} \right)^{\bar{k}}. \tag{13}$$

A rise in $1/\beta_{ij}$ now does not affect sales of each single exporter in the FDI mode directly, see (11). Total sales to affiliates, however, increase as some firms switch from using intermediaries to establishing own affiliates so that the cut-off value Q_{ij}^F falls; see (10).

We can can now express the relative prevalence of export modes as a function of exogenous variables only.

Proposition 2 *If the sorting condition holds and if firms' degree of competitive advantage follows the Pareto distribution, the prevalence of export sales via trade intermediaries relative to sales through affiliates, $\chi_{ij} \equiv S_{ij}^M / S_{ij}^F$, is*

$$\chi_{ij} = \beta_{ij}^{\sigma-1} \left[\left(\frac{\phi_{ij} - 1}{\tilde{\beta}_{ij}^{1-\sigma} - 1} \right)^{\bar{k}} - 1 \right].$$

This measure increases in the additional costs associated to linguistic, informational, or legal issues ϕ_{ij} and decreases in the severity of contractual problems $1/\beta_{ij}$. It decreases in the degree of dispersion of competitive advantage $1/k$ and falls in the elasticity of substitution σ. Moreover, χ_{ij} decreases in the dispersion of domestic sales, given by $1/[k - (\sigma - 1)]$. It is independent from the size of the export market as given by B_j, the wage rates in either country, and from transportation costs $\bar{\tau}_{ij}$.

Not surprisingly, when the strength of contractual imperfections increases trade intermediation becomes more expensive relative to the use of an own wholesale affiliate; hence relative prevalence of intermediation (χ_{ij}) falls. On the other hand, sales through intermediaries are more prevalent if the protection of property against expropriation is low (i.e., ϕ_{ij} is high).

More interestingly, χ_{ij} does not depend on the systematic component of transportation costs

($\bar{\tau}_{ij}$). This is due to the fact that sales in both distribution modes are affected by systematic transportation costs in the same way. Approximating $\bar{\tau}_{ij}$ with bilateral geographical distance, it follows that the relative prevalence of intermediation does not depend on geographical distance. This is a prediction of our framework that is testable given adequate data. Also, relative prevalence χ_{ij} increases as firms become more homogeneous ($\bar{k} \to \infty$). In the extreme case, the distribution of Q has a mass point at the lower bound of its support (here: normalized to unity). If the condition in Proposition 2 is met, most firms cluster in the neighborhood of the lower bound of the support and therefore export through intermediaries. As $\bar{k}$ falls, more firms find it optimal to establish own subsidiaries and χ_{ij} falls.

4 Empirical evidence

In this section we put Proposition 2 to an empirical check.

4.1 Data

In official data, exports to wholesale affiliates for the purpose of selling to foreign consumers appear as within-firm trade. Hence, we use data on related-party and non-related party exports, as collected by the U.S. Census.[26] The data are based on export declarations and are publicly available at 6-digit NAICS level. A "related party" is associated to an ownership share of at least 10 percent. Trade between U.S parents and foreign affiliates is not distinguished from trade between foreign production units in the U.S. and foreign parents.

While in the theoretical part of the paper we focus on trade in final goods, exports to affiliates not only include final output goods but also intermediate inputs. This problem is common to the literature. For example, the empirical analysis in HMY relies on export data from Feenstra (1997) that do not distinguish final goods from imports either. However, as we have pointed out in footnote 6, our setting is flexible enough to nest also trade in inputs without altering the testable implications of the model.[27]

[26]Strictly spoken, non-related party trade also comprises exports directly to the consumer. Survey evidence from different countries suggests that this mode is unimportant quantitatively (see, e.g., Trabold, 2002).

[27]Data provided by the Bureau of Economic analysis (BEA) show that about 35% of sales to foreign affiliates

Using data on related and non-related party imports, Bernard, Jensen, Redding, Schott (2008) analyze the sourcing of *imported* inputs rather than the choice of *export* mode. While sales dispersion is expected to determine both sourcing of inputs and choice of export mode, the set of other controls differs substantially. In particular, our theoretical model stresses the risk that a wholesale affiliate is confiscated by the foreign government. In order to test this hypothesis, we have to allow for variation in destination country characteristics. We thus focus on U.S. exports rather than U.S. imports.

The U.S. Census data do not contain zero trade flows but several missing values. We aggregate the from the 6-digit NAICS level to match the BEA 3-digit industry classification. We do so in order to make our dependent variable comparable to our industry sales dispersion measure, which we take from HMY.[28] Their measure relates to the mid of 1990s. Our analysis thus focuses on the first year the trade data are publicly available, namely 2000. The sales dispersion measure is expected to negatively affect the relative prevalence of trade intermediation.

Our model predicts that the relative prevalence of trade intermediation is affected by the *effective* bargaining power of the exporter which presumably depends on the specificity of her product. If the product is specifically tailored to a foreign market, the hold-up problem becomes more severe which lowers effective bargaining power. We re-interpret the measure of contract intensity developed by Nunn (2007) as a measure of product specificity. He uses input-output tables for 1997/98 to measure the proportion of inputs that are exchange-traded, reference priced, or differentiated. We aggregate the value of incorporated inputs data from the 6-digit IO-industry classification level to match the BEA 3-digit industry classification. Then, we compute the product specificity as a share of incorporated inputs that are not exchange-traded for each BEA industry. Our model predicts a negative relationship between product specificity and the relative prevalence of trade intermediation.

Our measure for the risk of expropriation of physical assets by governments comes from the Heritage Foundation. Higher levels of expropriation risk are expected to increase the relative

are "goods for resale without further processing". A comparable statistic on final good trade of unrelated parties is not available. Moreover, the BEA data do not provide extensive product detail.

[28]They construct measures on the basis of different data sources for the US and Europe for 52 BEA 3-digit manufacturing industries.

prevalence of intermediation. We also include a dummy for common language to account for linguistic, cultural or more general informational problems that may be related to the setting up of an own wholesale affiliate and hence drive up ϕ_{ij}. Then, we expect a negative relationship between the dummy and the relative prevalence of trade intermediation.

As an additional covariate, we include freight rates provided by Feenstra, Romalis, Schott (2002) at a very disaggregate level. This data features both country and industry variation and needs to be aggregated up to our level of sectoral detail. In our model the relative prevalence of trade intermediation does not depend on trade costs. This is the case because trade costs affect total sales through trade intermediaries and through own wholesale affiliates equiproportionally. Hence, we do not expect a significant relationship between trade costs and the relative prevalence of export modes. We also use geographical distance as an additional proxy for trade costs.[29] Furthermore, we include a NAFTA dummy. NAFTA not only addresses tariffs, but also fosters business relationships. The net effect on the relative prevalence of export modes is therefore *a priori* ambiguous. In our regressions, we also consider country size measured by population.[30] Whereas our model contains no predictions about country size, population is a common control in the related literature.

Tables 4 and 5 in the Appendix summarize cross-country and cross-industry variation in the data. In principle, information is available for 133 destination countries and 50 industries.[31] Both tables reveal that exports are mostly channeled through trade intermediaries. Exceptions are African countries like Angola (AGO), Benin (BEN), Cameroon (CMR), Niger (NER), and Suriname (SUR), and small European countries like Moldova (MDA), Malta (MLT), Slovakia (SVK). Moreover, industries 205 (Bakery Products), 371 (Motor Vehicles), and 386 (Optical and Photographic Equipment) report relatively more trade through related parties. Western European countries seem to have the lowest risk of expropriation. Product specificity is relatively low in food manufacturing industries.

[29] Distance and common language come come from the CEPII.

[30] Population data are taken from the World Development Indicators.

[31] There are no trade data available for industries 271 (Newsprint) and 272 (Other publishing).

4.2 Estimation strategy and results

We use a battery of regressions to address the theoretical predictions outlined in Proposition 2 on the relative prevalence of trade intermediation and its determinants. We exploit both the country and the industry dimension of our data. Our dataset contains information for 3461 country-and-industry pairs.

Our empirical strategy is related to HMY. However, we discuss a different issue (the choice of export mode versus the choice of location of production) and stress a different mechanism (contractual imperfections versus concentration-proximity). While HMY study sales *of* foreign affiliates versus export sales, our dependent variable relates export sales to intermediaries versus those *to* foreign affiliates. Hence, our exercise is not subject to the criticism, that it is essentially unknown where (and by whom) products sold by foreign affiliates have been produced.

Naive regressions. First, we run 'naive' regressions without controls for *unobserved* industry or country characteristics. In order to address the endogeneity of the measure of firm size dispersion to the relative prevalence of export modes, we instrument the US dispersion measure by the similar measure for Western European firms. This strategy has been first proposed by HMY.[32]

[32] Unlike HMY we do not instrument the US dispersion measure by all four available European measures to avoid overdidentification problems. Our strategy passes a number of crucial econometric tests. However, the exact choice of instruments is not important for our empirical results.

Table 1: Relative prevalence of export modes. 'Naive' regressions

Dependent variable: Relative prevalence of trade intermediation	Industry characteristics				Country characteristics				Both	
	(1) IV	(2) OLS	(3) IV	(4) IV	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) IV	(10) IV
Dispersion	−0.816***		−0.899***	−0.850***					−0.903***	−0.917***
	(0.184)		(0.182)	(0.192)					(0.180)	(0.189)
Specificity		−0.495***	−0.526***	−0.489***					−0.545***	−0.589***
		(0.164)	(0.167)	(0.166)					(0.167)	(0.167)
ln(Freight)				0.623				0.762		−0.124
				(0.542)				(0.530)		(0.555)
Expropriation risk					0.009***		0.008***	0.008***	0.008***	0.009***
					(0.001)		(0.001)	(0.001)	(0.001)	(0.001)
Common language						−0.374***	−0.310***	−0.294***	−0.313***	−0.289***
						(0.061)	(0.062)	(0.063)	(0.063)	(0.064)
ln(Distance)								0.026		0.036
								(0.055)		(0.056)
NAFTA								−1.106***		−1.127***
								(0.160)		(0.161)
ln(Population)								−0.083***		−0.089***
								(0.019)		(0.020)
RMSE	1.637	1.615	1.638	1.635	1.607	1.610	1.602	1.582	1.623	1.603
R^2	.	0.003	.	.	0.012	0.010	0.019	0.045	.	0.017
First stage F statistic	1873		1893	1688					1892	1666
First stage R^2	0.258		0.260	0.265					0.260	0.266
First stage partial R^2	0.258		0.259	0.245					0.259	0.245
Score test (p value)	0.000		0.000	0.000					0.000	0.000
Regr. test (p value)	0.000		0.000	0.000					0.000	0.000

$N = 3461$ country-and-industry pairs. Robust standard errors in parentheses. *** indicate significance at 1%. All regressions include a constant (not shown). European dispersion measure used as instrument for US dispersion measure in IV regressions. Robust Wooldridge score test and regression-based test reject the hypothesis that endogenous regressor is exogenous.

Table 1 presents the results. As predicted by the model, a higher sales dispersion is statistically significantly associated with lower relative prevalence of trade intermediaries; see IV regression in column (1).[33] The relationship remains intact when controlling for product specificity, freight rate, and additional country-specific controls; see columns (3), (4), (9), and (10). Similarly, product specificity is statistically negatively correlated with the relative prevalence of trade intermediaries; see columns (2), (3), (4), (9), and (10).

We now turn to country-specific variables. The risk of expropriation is statistically significantly positively correlated with the relative prevalence of trade intermediaries; see columns (5) and (7)-(10). The dummy variable common language as proxy for linguistic problems in setting up an own wholesale affiliate is statistically significantly negatively related to the relative prevalence of trade intermediaries; see columns (6)-(10). Both results are in line with our theoretical predictions.

Additionally, we include a control for freight rate as a proxy for trade costs.[34] As expected, freight rate does not enter significantly; see columns (4), (8), and (10). Moreover, the distance coefficient turns out to be insignificant; see columns (8) and (10). This result allows to distinguish our model from the proximity-concentration trade-off analyzed by HMY. The NAFTA dummy is negatively correlated with the relative prevalence of trade intermediaries. This reveals that NAFTA does not only affect trade costs but also enhances the business environment. Country size measured by population enters negatively. While this result is not in line with our theory, it is common in the related empirical literature.[35]

Robustness checks. We check robustness of the results by controlling for unobserved country and industry characteristics. If the Hausman test does not reject that the random effects estimator (RE) is appropriate, we omit results obtained from the fixed effect estimator (FE).

Controlling for unobserved country characteristics does not change the picture; see Table 2.

[33]Robust score test and Wooldridge regression test jointly signal that exogeneity of US dispersion has to be rejected. Moreover, the first-stage F-statistic, the first-stage R^2, and the first-stage partial R^2 indicate validity of the instrumentation strategy.

[34]Recall that this variable features country-and-industry variation.

[35]Bernard et al. (2008) find a positive effect of population size on intra-firm imports; see their Table 7.

Table 2: Relative prevalence of export modes. Controlling for unobserved country characteristics

Dependent variable: Relative prevalence of trade intermediation						
	(1)	(2)	(3)	(4)	(5)	(6)
	IV-RE	RE	IV-FE	IV-RE	IV-FE	IV-RE
Dispersion	-0.814^{***}		-0.926^{***}	-0.910^{***}	-0.976^{***}	-0.948^{***}
	(0.168)		(0.168)	(0.168)	(0.175)	(0.175)
Specificity		-0.557^{***}	-0.606^{***}	-0.585^{***}	-0.648^{***}	-0.614^{***}
		(0.154)	(0.134)	(0.134)	(0.136)	(0.136)
ln(Freight)					-0.728^{*}	-0.510
					(0.415)	(0.404)
Within R^2	0.000	0.006	.	0.000	.	0.000
Between R^2	0.002	0.012	0.006	0.006	0.020	0.016
Overall R^2	0.000	0.003	0.000	0.000	0.000	0.000
Hausman (p value)	0.254	0.151		1.000		1.000

N = 3461 country-and-industry pairs. Standard errors in parentheses. *** and * indicate significance at respectively 1% and 10%. All regressions include a constant (not shown). European dispersion measure used as instrument for US dispersion measure in IV regressions. Hausman tests do not reject that RE estimator is appropriate.

Dispersion and product specificity are still statistically significantly negatively correlated with the relative prevalence of trade intermediaries. The estimated coefficients are of the same size as compared to Table 1. Also the freight rate remains statistically insignificant.

Similarly, controlling for unobserved industry characteristics (Table 3) leaves the results reported in Table 1 unchanged; see Table 3. All coefficients are of the same size and level of statistical significance.

Finally, we run a regression where we include both country and industry fixed effects. Given the dimensionality of our data, we can only address the relationship between the relative prevalence of trade intermediaries and the freight rate. As expected, there is no statistically significant correlation.[36]

Summarizing, our empirical results are in line the key predictions of our model. They support the view that the choice of export mode reflects a trade-off between the costs associated to contractual frictions in the case of intermediation and to the cost of FDI in the case of internalization.

[36] The coefficient on the freight rate is -0.481 with a robust standard error of 0.549. R^2 is 0.305.

Table 3: Relative prevalence of export modes. Controlling for unobserved industry characteristics

Dependent variable: Relative prevalence of trade intermediation				
	(1)	(2)	(3)	(4)
	RE	RE	RE	RE
Expropriation risk	0.009***		0.008***	0.009***
	(0.001)		(0.001)	(0.001)
Common language		−0.377***	−0.310***	−0.290***
		(0.059)	(0.060)	(0.061)
ln(Freight)				0.163
				(0.568)
ln(Distance)				0.043
				(0.053)
NAFTA				−1.105***
				(0.156)
ln(Population)				−0.096***
				(0.019)
RMSE	1.547	1.549	1.541	1.519
Within R^2	0.014	0.011	0.021	0.051
Between R^2	0.002	0.005	0.001	0.004
Overall R^2	0.012	0.010	0.019	0.044
Hausman (p value)	0.509	0.884	0.825	0.294

$N = 3461$ country-and-industry pairs. Standard errors in parentheses. *** indicate significance at 1%. All regressions include a constant (not shown). Hausman tests do not reject that RE estimator is appropriate.

5 Conclusions

In this paper, we have discussed the choice between two different modes of exporting to a foreign market: a producer can either use a foreign trade intermediary, who enjoys a fixed cost advantage but – due to the lack of enforceable cross-country contracts – exposes the producer to a hold-up problem, or they can establish an own wholesale affiliate, avoiding the threat of hold-up at the cost of increased investment. This trade-off produces an interesting sorting pattern of producers into the two export modes. Firms with high perceived quality of their products, low variable production costs, and strong marketability of goods prefer to establish affiliates; firms with low realizations of those characteristics prefer to use trade intermediaries. The reason is that contractual frictions reduce variable revenues proportionally, while the fixed-cost disadvantage of affiliates does not depend on sales. Hence, firms with high sales opt for wholesale subsidiaries in the foreign country.

Importantly, in our model, variable trade costs are endogenously determined in the game between the producer and the intermediary. However, the contractual frictions are not isomorphic to the usual iceberg-type trade costs, since they do not lead to a loss of output. Rather, they imply an additional restriction of production by monopolistically competitive firms, so that the markup goes up. Hence, our model warns against modeling differences across modes as exogenous differences in iceberg-type variable trade costs.

Under the assumption of the Pareto distribution, we show that the relative prevalence of intermediation does not depend on transportation costs between the source and the destination country, on market size or on wage rates. It increases with the risk of expropriation of physical assets and in the degree of heterogeneity of producers. It falls with the severity of contractual problems.

Our paper is related to Helpman, Melitz, and Yeaple (2004). While we discuss a different issue (the choice of export mode versus the choice of location of production) and stress a different mechanism (contractual imperfections versus concentration-proximity), we can use a related empirical strategy on US census data to assess the predictions of the model. We find that most predictions of our theory are in line with the data.

We close the paper with a brief outlook on further research. First, while capturing an important trade-off between contractual frictions and the cost of internalization through wholesale FDI, our model of endogenously arising trade intermediation is only a first pass at a complex issue. In order to improve our understanding of trade costs further, one may want to develop a more realistic model of multi-product trade intermediaries. Second, our empirical analysis draws on sectoral data; a firm-level analysis would be preferable. As soon as data on firms' choices of export modes becomes available, one can put a wider array of implications of our model to a test.

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A Additional tables

Table 4: Characteristics of U.S. exports by destination country

ISO	χ	Risk	Freight	ISO	χ	Risk	Freight	ISO	χ	Risk	Freight
AGO	0.98	70	0.07	GIN	1.57	70	1.34	NPL	53.73	50	0.98
ALB	1.07	70	6.52	GNB	6.07	90	1.58	NZL	2.05	10	6.79
ARE	4.85	10	6.96	GNQ	1.46	90	25.80	OMN	14.55	50	1.11
ARG	2.32	30	5.69	GRC	5.67	30	7.97	PAK	4.12	70	6.27
ARM	16.04	50	0.97	GTM	9.64	50	3.41	PAN	4.63	50	4.53
AUS	1.84	10	5.70	GUY	11.64	50	10.97	PER	6.22	50	3.97
AUT	2.65	10	4.22	HKG	3.84	10	4.52	PHL	1.19	30	3.41
AZE	1.27	70	7.20	HND	2.85	50	2.30	PNG	1.43	50	3.58
BDI	1.44	70	0.21	HRV	9.03	70	2.11	POL	2.50	30	6.61
BEL	1.13	10	2.02	HTI	9.48	90	2.33	PRT	3.05	30	3.68
BEN	0.90	50	2.45	HUN	2.87	30	2.10	PRY	5.35	70	8.83
BGD	14.84	70	7.77	IDN	3.25	50	7.96	QAT	24.60	50	7.86
BGR	5.73	50	5.00	IND	5.52	50	5.31	ROM	9.70	70	7.12
BHR	8.30	40	9.66	ISL	12.24	10	4.24	RUS	3.21	50	4.67
BHS	3.13	10	5.09	ISR	5.57	30	1.67	RWA	14.77	90	0.06
BLR	15.09	70	5.53	ITA	2.45	30	4.09	SAU	7.28	50	7.50
BLZ	1.67	50	4.17	JAM	6.12	30	3.50	SEN	4.18	50	11.13
BOL	2.98	50	4.12	JOR	15.70	30	6.78	SGP	1.58	10	1.68
BRA	2.79	50	6.45	JPN	1.43	10	2.73	SLE	3.35	70	1.69
BRB	5.72	30	2.60	KAZ	4.39	70	6.87	SLV	7.69	30	2.55
CAN	1.12	10	1.46	KEN	1.76	50	5.88	SUR	0.80	50	2.86
CHE	3.65	10	1.92	KGZ	93.13	70	50.16	SVK	0.97	50	6.18
CHL	5.57	10	9.23	KHM	8.31	70	3.57	SVN	3.27	30	4.86
CHN	5.00	70	7.47	KOR	7.82	10	3.17	SWE	4.51	30	2.80
CMR	0.85	70	6.58	KWT	6.59	10	9.98	SYR	6.08	70	7.89
COL	4.20	50	3.70	LBN	19.10	50	3.07	TCD	12.87	70	3.96
CRI	1.98	50	1.84	LKA	21.56	50	6.55	TGO	1.67	70	22.18
CYP	18.13	30	2.90	LTU	23.60	50	5.86	THA	1.28	30	5.51
CZE	4.44	30	4.19	LVA	6.69	50	8.92	TKM	1.27	70	7.10
DEU	1.72	10	2.48	MAR	12.94	50	0.86	TTO	3.91	10	13.63
DNK	4.97	10	3.57	MDA	0.19	50	14.31	TUN	4.63	50	6.53
DOM	2.76	70	1.90	MEX	1.08	50	0.82	TUR	4.97	30	5.54
DZA	5.42	50	2.95	MLI	11.45	50	0.74	TZA	13.83	50	33.99
ECU	3.78	50	8.25	MLT	0.13	30	0.23	UGA	3.67	50	10.93
EGY	7.36	50	6.17	MMR	2.71	70	1.83	UKR	19.35	70	15.45
ESP	3.44	30	5.76	MNG	26.14	50	2.71	URY	6.42	30	5.28
EST	17.07	30	6.14	MOZ	7.87	70	5.34	UZB	3.42	70	72.11
ETH	0.96	70	18.33	MUS	14.35	30	0.83	VEN	3.07	50	8.63
FIN	2.99	10	4.20	MWI	76.02	50	0.56	VNM	8.66	90	7.62
FJI	3.10	50	5.01	MYS	1.12	30	2.63	YEM	4.33	70	16.00
FRA	1.85	30	3.18	NER	0.35	70	1.68	ZAF	2.70	50	5.19
GAB	4.48	50	7.02	NGA	4.26	70	5.44	ZMB	15.75	50	5.27
GBR	2.02	10	2.29	NIC	3.85	70	3.16	ZWE	10.22	70	3.29
GEO	5.92	70	3.45	NLD	1.13	10	3.65				
GHA	3.44	50	6.68	NOR	3.82	10	5.34				

Risk of confiscation takes scores between 0 (lowest) and 100 (highest). Freight rates in %.

Table 5: Characteristics of U.S. exports by industry

BEA	Description	χ	Dispersion	Specificity	Freight
201	Meat Products	11.5	2.2	40.3	3.7
202	Dairy Products	2.4	1.8	57.5	4.3
203	Vegetables, Preserves	2.9	2.0	75.3	9.6
204	Grain Mill Products	5.0	1.4	57.5	7.4
205	Bakery Products	0.5	2.0	78.2	3.7
208	Beverages	4.4	1.9	81.2	5.4
209	Other Food	2.2	1.7	77.5	5.7
210	Tobacco	1.1	2.6	48.3	1.3
220	Textiles	2.2	1.8	81.6	4.8
230	Apparel	3.1	1.6	96.2	4.2
240	Wood, Lumber	5.5	1.5	70.8	6.2
250	Furniture	2.3	1.7	92.2	8.8
262	Pulp, Paper	3.7	1.3	77.8	4.7
265	Processed Paper	1.9	1.3	99.4	5.2
275	Commercial Printing	3.4	1.3	99.7	4.3
281	Industrial Chemicals	2.7	1.3	76.0	5.2
283	Drugs	1.0	2.1	98.0	1.0
284	Soap/Cleansing Prod.	1.5	1.9	94.8	3.6
287	Agricultural Chemicals	2.4	1.6	78.7	7.7
289	Other Industr. Chemicals	1.5	1.4	87.7	5.2
305	Rubber	2.1	1.6	94.7	3.6
308	Miscellaneous Plastics	1.4	1.6	98.5	6.3
310	Leather	2.2	1.7	89.8	5.8
321	Glass	1.1	1.2	96.0	3.9
329	Stone, Minerals, Ceramics	2.3	1.5	94.6	5.6
331	Ferrous metals	4.2	1.9	85.1	8.2
335	Non-Ferrous metals	1.6	1.5	56.7	2.6
341	Metal Cans, Fabricated Metal	2.2	1.9	94.1	4.7
342	Cutlery	1.8	1.7	95.9	3.9
343	Heating/Plumbing Equipment	2.4	1.8	95.9	3.3
349	Metal Services	1.8	1.6	95.5	4.3
351	Engines and Turbines	2.3	2.6	98.7	2.3
352	Farm Machinery	1.1	1.8	98.2	2.9
353	Construction Machinery	2.5	1.7	97.5	3.3
354	Metalworking Machinery	2.8	1.4	96.4	2.8
355	Special Industrial Machinery	3.1	1.6	97.3	2.2
356	General Industrial Machinery	2.9	1.7	96.8	3.0
357	Computers	1.4	2.0	99.4	2.1
358	Refrigeration Equipment	1.5	1.9	98.3	2.9
359	Other Industrial Equipment	2.6	1.3	95.8	3.0
363	Household Appliances	1.4	2.5	97.3	5.5
366	Audio/Video/Communic. Equipm.	2.4	2.0	99.4	1.1
367	Electronic Components	1.4	1.9	94.7	1.3
369	Other Electronics	2.5	1.9	83.9	1.9
371	Motor Vehicles	0.2	2.2	99.6	1.6
379	Other Transport Equipment	2.9	1.7	97.2	2.2
381	Scientific/Measuring Equipm.	5.1	2.3	99.5	1.0
384	Medical Equipment	1.4	1.7	98.6	1.6
386	Optical/Photographic Equipm.	0.5	1.8	98.2	2.5
390	Miscellaneous Manufacturers	3.7	1.5	95.6	4.2

Dispersion taken from HMY. Specificity and Freight rates in %.

B Proofs and detailed derivations (not to be published)

Proof of Lemma 1 (pricing behavior). The producer maximizes her expected profits from exporting via a trade intermediary subject to the demand function to choose her optimal quantity to supply in the match. Using optimal demand to substitute out the c.i.f price and inserting (5) the solves

$$\begin{aligned}
& \max_{x_{ij}^M(\omega)} \bar{\beta}_{ij} J_{ij}(\omega) + \tilde{\pi}_{ij}^P(\omega) - x_{ij}^M(\omega)\,\tau_{ij}(\omega)\,a(\omega)\,w_i \\
= & \max_{x_{ij}^M(\omega)} \bar{\beta}_{ij} p_{ij}^M(\omega)\,x_{ij}^M(\omega) + \left[\left(1-\bar{\beta}_{ij}\right)\lambda_{ij} - 1\right] x_{ij}^M(\omega)\,\tau_{ij}(\omega)\,a(\omega)\,w_i \\
= & \max_{x_{ij}^M(\omega)} \bar{\beta}_{ij} \left(H_j\right)^{1/\sigma} \zeta(\omega)^{(\sigma-1)/\sigma} \left[x_{ij}^M(\omega)\right]^{(\sigma-1)/\sigma} + \left[\left(1-\bar{\beta}_{ij}\right)\lambda_{ij} - 1\right] x_{ij}^M(\omega)\,\tau_{ij}(\omega)\,a(\omega)\,w_i
\end{aligned}$$

The first order condition is

$$\rho\bar{\beta}_{ij}\left(H_j\right)^{\frac{1}{\sigma}} \zeta(\omega)^{\frac{\sigma-1}{\sigma}} \left[x_{ij}^M(\omega)\right]^{-\frac{1}{\sigma}} = \left[\left(1-\bar{\beta}_{ij}\right)\lambda_{ij} - 1\right] \tau_{ij}(\omega)\,a(\omega)\,w_i.$$

Substituting $x_{ij}^M(\omega)$ yields the pricing rule stated in Lemma 1

$$p_{ij}^M(\omega) = \frac{\tau_{ij}(\omega)\,a(\omega)\,w_i}{\beta_{ij}\rho},$$

where $\beta_{ij} = \beta_{ij}\left(\bar{\beta}_{ij}, \lambda_{ij}\right) = \bar{\beta}_{ij} / \left[1 - \lambda_{ij}\left(1-\bar{\beta}_{ij}\right)\right] \geq \bar{\beta}_{ij}$.

Comparative statics related to Lemma 1. The additional markup is inverse proportional to the degree of contractual imperfections β_{ij}. $\beta_{ij}\left(\bar{\beta}_{ij}, \lambda_{ij}\right)$ is increasing in the bargaining power $\bar{\beta}_{ij}$ and the recycling rate λ_{ij}

$$\begin{aligned}
\frac{\partial\beta_{ij}\left(\bar{\beta}_{ij}, \lambda_{ij}\right)}{\partial\bar{\beta}_{ij}} &= \frac{1-\lambda_{ij}}{\left(1-\lambda_{ij}\left(1-\bar{\beta}_{ij}\right)\right)^2} > 0, \\
\frac{\partial\beta_{ij}\left(\bar{\beta}_{ij}, \lambda_{ij}\right)}{\partial\lambda_{ij}} &= \frac{\left(1-\bar{\beta}_{ij}\right)\bar{\beta}_{ij}}{\left(1-\lambda_{ij}\left(1-\bar{\beta}_{ij}\right)\right)^2} > 0.
\end{aligned}$$

The term $\tilde{\beta}_{ij} = \tilde{\beta}_{ij}\left(\beta_{ij}, \sigma\right) \equiv \left[\beta_{ij} + \left(1-\beta_{ij}\right)\sigma\right]^{\frac{1}{\sigma-1}} \beta_{ij} \geq \beta_{ij}$ is closely related to our measure of contractual imperfections β_{ij}. We have $\tilde{\beta}_{ij}(0,\sigma) = 0$ and $\tilde{\beta}_{ij}(1,\sigma) = 1\tilde{\beta}_{ij}$ is strictly increasing in β_{ij} for $\beta_{ij} \in (0,1)$

$$\frac{\partial\tilde{\beta}_{ij}\left(\beta_{ij}, \sigma\right)}{\partial\beta_{ij}} = \frac{\tilde{\beta}_{ij}}{\beta}\left(1 - \frac{\beta_{ij}}{\beta_{ij} + \left(1-\beta_{ij}\right)\sigma}\right) > 0,$$

since $\beta_{ij} / \left[\beta_{ij} + \left(1-\beta_{ij}\right)\sigma\right] < 1$.

The derivative with respect to σ is given by

$$\frac{\partial\tilde{\beta}_{ij}}{\partial\sigma} = \tilde{\beta}_{ij}\left(-\frac{\ln\left[\beta_{ij}+(1-\beta_{ij})\,\sigma\right]}{(\sigma-1)^2}+\frac{1-\beta_{ij}}{\left[\beta_{ij}+(1-\beta_{ij})\,\sigma\right]}\right)$$

$$\frac{\partial\tilde{\beta}_{ij}}{\partial\sigma} = \frac{\tilde{\beta}_{ij}}{\sigma-1}\frac{\beta_{ij}+(1-\beta_{ij})\,\sigma-1-\left[\beta_{ij}+(1-\beta_{ij})\,\sigma\right]\ln\left[\beta_{ij}+(1-\beta_{ij})\,\sigma\right]}{(\sigma-1)\left[\beta_{ij}+(1-\beta_{ij})\,\sigma\right]}<0.$$

$\tilde{\beta}_{ij}$ is strictly decreasing in σ, since $\frac{x-1}{x}<\ln x$, where $x=\beta_{ij}+(1-\beta_{ij})\,\sigma$.

Moreover, $\tilde{\beta}_{ij}$ is well behaved in the limiting cases

$$\begin{aligned}
\lim_{\sigma\to1}\tilde{\beta}_{ij}(\beta_{ij},\sigma) &= \beta_{ij}\exp\left[\lim_{\sigma\to1}\left(\frac{\ln\left(\beta_{ij}+(1-\beta_{ij})\,\sigma\right)}{\sigma-1}\right)\right]\\
&= \beta_{ij}\exp\left[\lim_{\sigma\to1}\left(\frac{1-\beta_{ij}}{\beta_{ij}+(1-\beta_{ij})\,\sigma}\right)\right]\\
&= \beta_{ij}e^{1-\beta_{ij}},\\
\lim_{\sigma\to\infty}\tilde{\beta}_{ij}(\beta_{ij},\sigma) &= \beta_{ij}\exp\left[\lim_{\sigma\to\infty}\left(\frac{\ln\left(\beta_{ij}+(1-\beta_{ij})\,\sigma\right)}{\sigma-1}\right)\right]\\
&= \beta_{ij}\exp\left[\lim_{\sigma\to1}\left(\frac{1-\beta_{ij}}{\beta_{ij}+(1-\beta_{ij})\,\sigma}\right)\right]\\
&= \beta_{ij}.
\end{aligned}$$

Proof of Proposition 1 (Sorting). The cutoff Q^M_{ij} immediately follows from rearranging (8)

$$Q^M_{ij}=\left(\frac{w_i\bar{\tau}_{ij}}{\tilde{\beta}_{ij}}\right)^{\sigma-1}f_jB_j^{-1}.$$

Q^F_{ij} is determined by solving $\pi^M_{ij}\left(Q^F_{ij}\right)=\pi^F_{ij}\left(Q^F_{ij}\right)$ for Q^F_{ij}

$$\begin{aligned}
(w_i\bar{\tau}_{ij})^{1-\sigma}B_jQ^F_{ij}-\phi_{ij}f_j &= \left(\frac{w_i\bar{\tau}_{ij}}{\tilde{\beta}_{ij}}\right)^{1-\sigma}B_jQ^F_{ij}-f_j\\
Q^F_{ij} &= (w_i\bar{\tau}_{ij})^{\sigma-1}\left(\frac{\phi_{ij}-1}{1-\tilde{\beta}_{ij}^{\sigma-1}}\right)f_jB_j^{-1}\\
&= Q^M_{ij}\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right)
\end{aligned}$$

Sorting exists, if Q^F_{ij} is strictly larger than Q^M_{ij} :

$$\begin{aligned}
(w_i\bar{\tau}_{ij})^{\sigma-1}\left(\frac{\phi_{ij}-1}{1-\tilde{\beta}_{ij}^{\sigma-1}}\right)f_jB_j^{-1} &> \left(\frac{w_i\bar{\tau}_{ij}}{\tilde{\beta}_{ij}}\right)^{\sigma-1}f_jB_j^{-1}\\
\phi_{ij}-1 &> \tilde{\beta}_{ij}^{1-\sigma}\left(1-\tilde{\beta}_{ij}^{\sigma-1}\right)\\
\phi_{ij} &> \tilde{\beta}_{ij}^{1-\sigma}.
\end{aligned}$$

Derivations of equations (12) **and** (13) **(Export sales per mode).** Sales per firm from exporting via a trade intermediary are given by

$$\begin{aligned} s_{ij}^{M}(\omega) &= p_{ij}^{M}(\omega)\, x_{ij}^{M}\left[p_{ij}^{M}(\omega)\right] \\ &= H_j \left[\frac{p_{ij}^{M}(\omega)}{\zeta(\omega)}\right]^{1-\sigma} \\ s_{ij}^{M}(Q) &= \sigma \left(\frac{w_i \bar{\tau}_{ij}}{\beta_{ij}}\right)^{1-\sigma} Q B_j. \end{aligned}$$

Using $Q = \Phi^(1-\sigma)$ and the Pareto distribution, total exports via intermediaries can be calculated as

$$\begin{aligned} S_{ij}^{M} &= M_i^E \sigma \left(w_i \frac{\bar{\tau}_{ij}}{\beta_{ij}}\right)^{1-\sigma} B_j k \int_{\Phi_{ij}^{M}}^{\Phi_{ij}^{F}} \Phi^{\sigma-k-2} d\Phi \\ &= M_i^E \left(w_i \frac{\bar{\tau}_{ij}}{\beta_{ij}}\right)^{1-\sigma} B_j \frac{\sigma k}{k-(\sigma-1)} \left[\left(\Phi_{ij}^{M}\right)^{\sigma-k-1} - \left(\Phi_{ij}^{F}\right)^{\sigma-k-1}\right] \\ &= M_i^E \sigma \left(w_i \frac{\bar{\tau}_{ij}}{\beta_{ij}}\right)^{1-\sigma} B_j \frac{\sigma k}{k-(\sigma-1)} \left(\Phi_{ij}^{F}\right)^{\sigma-k-1} \left[\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right)^{\frac{k-(\sigma-1)}{\sigma-1}} - 1\right] \\ &= M_i^E \left(w_i \bar{\tau}_{ij}\right)^{-k} B_j^{\frac{k}{\sigma-1}} f_j^{-\bar{k}} \frac{\sigma k}{k-(\sigma-1)} \beta_{ij}^{\sigma-1} \left(\frac{\phi_{ij}-1}{1-\tilde{\beta}_{ij}^{\sigma-1}}\right)^{\frac{\sigma-k-1}{\sigma-1}} \left[\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right)^{\frac{k-(\sigma-1)}{\sigma-1}} - 1\right] \\ &= \Psi_{ij} \beta_{ij}^{\sigma-1} \left[\tilde{\beta}_{ij}^{k-(\sigma-1)} - \left(\frac{1-\tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij}-1}\right)^{\bar{k}}\right]. \end{aligned}$$

The last expression is equivalent to (12) in the text. Analogously, sales per firm from exporting via a wholesale affiliate take the form

$$\begin{aligned} s_{ij}^{F}(\omega) &= p_{ij}(\omega)\, x_{ij}\left[p_{ij}(\omega)\right] \\ s_{ij}^{F}(Q) &= \sigma \left(w_i \bar{\tau}_{ij}\right)^{1-\sigma} Q B_j, \end{aligned}$$

and

$$\begin{aligned} S_{ij}^{F} &= M_i^E \sigma \left(w_i \bar{\tau}_{ij}\right)^{1-\sigma} B_j k \int_{\Phi_{ij}^{F}}^{\Phi_{ij}^{\infty}} \Phi^{\sigma-k-2} d\Phi \\ &= M_i^E \left(w_i \bar{\tau}_{ij}\right)^{1-\sigma} B_j \frac{\sigma k}{k-(\sigma-1)} \left(\Phi_{ij}^{F}\right)^{\sigma-k-1} \\ &= \Psi_{ij} \left(\frac{1-\tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij}-1}\right)^{\bar{k}}. \end{aligned}$$

which corresponds to (13) in the text. Note that

$$\bar{k} = \frac{k}{\sigma-1} - 1.$$

Proof of Proposition 2 (Relative prevalence). The relative prevalence of export modes $\chi_{ij} \equiv S_{ij}^M / S_{ij}^F$ follows immediatly from (12) and (13)

$$\begin{aligned}
\chi_{ij} &= \frac{\beta_{ij}^{\sigma-1}\left[\tilde{\beta}_{ij}^{k-(\sigma-1)} - \left(\frac{1-\tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij}-1}\right)^{\bar{k}}\right]}{\left(\frac{1-\tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij}-1}\right)^{\bar{k}}} \\
&= \beta_{ij}^{\sigma-1}\left[\tilde{\beta}_{ij}^{k-(\sigma-1)}\left(\frac{\phi_{ij}-1}{1-\tilde{\beta}_{ij}^{\sigma-1}}\right)^{-\bar{k}} - 1\right] \\
&= \beta_{ij}^{\sigma-1}\left[\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right)^{\bar{k}} - 1\right].
\end{aligned}$$

Comparative statics results are derived as follows:

$$\frac{d\chi_{ij}}{d\phi_{ij}}\frac{\phi_{ij}}{\chi_{ij}} = \bar{k}\frac{\phi_{ij}}{\phi_{ij}-1}\frac{\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right)^{\bar{k}}}{\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right)^{\bar{k}}-1} > 0$$

$$\frac{d\chi_{ij}}{d\beta_{ij}}\frac{\beta_{ij}}{\chi_{ij}} = (\sigma-1)\left[1 + \frac{\frac{\tilde{\beta}_{ij}^{1-\sigma}}{\tilde{\beta}_{ij}^{1-\sigma}-1}}{\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right)^{\bar{k}}-1}\bar{k}\frac{d\tilde{\beta}_{ij}}{d\beta_{ij}}\frac{\beta_{ij}}{d\tilde{\beta}_{ij}}\right] > 0,$$

since $\frac{d\tilde{\beta}_{ij}}{d\beta_{ij}}\frac{\beta_{ij}}{d\tilde{\beta}_{ij}} > 0$ and $\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1} > 1$ (Lemma 2).

$$\frac{d\chi_{ij}}{d\bar{\tau}_{ij}}\frac{\bar{\tau}_{ij}}{\chi_{ij}} = 0$$

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