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Trade Intermediaries, Incomplete Contracts, and the Choice of Export Modes *

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Abstract

The business literature suggests that exporters either use trade intermediaries or own foreign sales representations. Standard trade models are silent about this choice. We develop a model where producers differ with respect to competitive advantage and where trade intermediaries arise endogenously. Intermediaries allow producers to access a foreign market at lower fixed costs, but the lack of enforceable cross-country contracts reduces variable revenue. Producers select into different export modes along their characteristics. Relative prevalence of trade intermediation is stronger the bigger the risk of expropriation in the foreign country and the lower the severity of contractual frictions, the degree of heterogeneity amongst producers, and the elasticity of substitution between varieties. The volume of bilateral trade and the stock of FDI appear as complements in the model. Tentative empirical evidence confirms the main predictions.

Keywords: International trade, trade intermediation, heterogeneous firms, incomplete contracts.

JEL-Codes: F12, F15

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1 Introduction

Conventional trade models usually ignore *how firms export* to foreign markets.[1] The traditional assumption that producers sell directly to consumers in foreign countries may be innocuous for many important questions. However, taken at face value, it is plainly unrealistic. The international business literature (e.g., Peng and Ilinitch, 1998) makes clear that selling to a foreign market usually requires either a foreign partner or a wholly owned foreign sales affiliate. The optimal choice between these two major *export modes* is an important strategic issue for any exporting firm.

Anderson and van Wincoop (2004) report that retail and wholesale distribution costs are equivalent to an ad valorem tax of 55 percent. Hence, in order to understand trade costs in general, we need a better comprehension of distribution costs in particular. In this paper, we suggest a simple theoretical framework in which exporters face a choice in how to distribute their goods to a foreign market: either through a local partner or through an own wholesale affiliate.

We model the endogenous emergence of an important institution usually neglected in standard analysis: *trade intermediaries*. Those firms enjoy easier access to foreign markets. However, as international transactions involve at least two jurisdictions, contracts are particularly hard to enforce, so that interaction with an intermediary exposes the producer to a hold-up problem. The optimal response of the producer is to restrict output for the export market, which lowers average variable revenue. The trade-off between fixed-cost savings and lower variable revenue pins down the producers' optimal choice of export mode.

Clearly, as arms-length transaction between the producers and the intermediaries are subject to hold-up problems, producers may wish to internalize sales activities by setting up a foreign sales affiliate. Internalization forgoes the fixed-cost savings available with intermediation, but avoids relationship-specific distortions. We embed this trade-off in a setup akin to Melitz (2003), 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 an interesting sorting pattern: firms with low distribution costs, strong brand reputation, and high productivity

[1] Recent models study the question *whether* firms export or produce abroad. This paper instead focuses on the choice of export modes.

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.

There is massive systematic and anecdotal evidence on the importance of trade intermediaries. Peng, Zhou and York (2006) find for the U.S. that more than 45 percent of export sales in 68 out of 97 product categories are handled by export intermediaries (see their Tables 4 and 5 for 1998, pp. 296f).[2] Our model also stresses the role of foreign wholesale affiliates. Buch, Kleinert, Lipponer and Toubal (2005) report that about 39% of all German subsidiaries abroad are active as wholesellers. They make up a substantial share – about 30% – of the total stock of German foreign direct investment (FDI). In the proposed model, to the extent that exports are channeled through sales affiliates, FDI and trade are complements. This may rationalize the finding discussed by Neary (2007) that bilateral FDI stocks seem to decrease with bilateral distance, much as bilateral trade does. Note that Neary's observation is in conflict with the standard *proximity-concentration* view of FDI, where trade and investment are substitutes.

Bernard, Jensen, and Schott (2006) show that about 13% of all U.S. exporters sell to own foreign affiliates (related parties), and that their combined export market share is about 30%. It follows that the average firm exporting to own wholesale affiliates has larger export revenue than the average firm selling through an alternative channel. This pattern is fully consistent with the evidence (e.g., surveyed by Helpman, 2006) that only the largest firms engage in FDI. Business literature (e.g., Ellis, 2000) suggests that exports that are not channeled via intermediaries or an own foreign subsidiary are only a negligible share of of total exports. Those 'direct' exports typically stem from unsolicited orders, often through direct contact of a buyer via phone or mail. This is is an opportunity that almost any producer with some international visibility has at some point in time; hence, the number of concerned firms may be fairly large while the role of direct exports for total trade is small. Bringing the available evidence together, it seems very likely that firms sort according to their size in line with the pattern predicted in this paper.[3]

Besides the predicted sorting pattern, our framework has additional testable implications.

[2] Trabold (2002) provides evidence for France.

[3] Available firm-level data usually does not provide information on the mode of serving a foreign market ('directly', through an intermediary, or via an own affiliate). Hence, direct evidence for the proposed sorting pattern is hard to come by. There are several international attempts to improve the availability of data so that a full-fledged empirical analysis should become possible in the near future.

First, the prevalence of sales through trade intermediaries relative to sales through own affiliates does neither depend on geographical distance between two countries nor on their respective market sizes. 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 in the foreign country. Third, relative prevalence increases as firms become more homogeneous in terms of their underlying characteristics (productivity, quality, tradability of goods). Fourth, when systematic trade costs go up, both the stock (and flow of) wholesale FDI between two countries and the volume of bilateral trade (in both modes) fall. Hence, in this scenario, trade and FDI appear as complements.

At present, data on export modes in the sense of our model is not available. However, when using the ratio of related-party over non-related-party trade reported by the US Census at the industry level as a proxy for the relative prevalence of intermediation we find support in favor of our hypotheses. Fortunately, in several countries there are initiatives to improve the data situation so that formal testing should be possible in the medium-run.[4]

Our work is related to at least four important strands of literature. First, as in Grossman and Helpman (2002) or Antras and Helpman (2004, 2008) we allow for incomplete contracts to affect the boundaries of firms.[5] Bernard, Jensen, Redding, and Schott (2007) provide empirical evidence that products' revealed contractability plays a role in explaining the intra-firm share of imports.[6] We set up a theoretical model to reproduce the set of stylized facts discussed above, and assume that contractual imperfections arise when legal entities of two different countries (a producer and the foreign trade intermediary) interact, but that the relation between wholesale agents and retailers is free from frictions. There is an interesting literature that analyzes falling trade costs trade when producers and retailers interact strategically (see, e.g., Raff and Schmitt, 2005 or 2006). We abstract on strategic issues and rather focus on the endogenous emergence of trade intermediaries, the sorting of producers across export modes and the role of contractual frictions as determination of trade costs.

Second, our work is related to existing literature on trade intermediaries. Hanson and Feen-

[4]See, i.a., the initiative coordinated by Bruegel and CEPR www.bruegel.org/Public/SimplePage.php?ID=1720.

[5]Whereas their focus is on a sourcing decision which involves the location of input production, we analyze the pattern of sourcing distribution services.

[6]The paper is marked "preliminary and uncomplete".

stra (2001) study the role of Hong-Kong as a center of trade intermediation. Schröder, Trabold and Trübswetter (2005) discuss trade intermediation in a simple two-country monopolistic competition model of international trade. However, in their model, there is no endogenous choice of export modes, and firms are identical. The business economics literature on trade intermediation, that we have cited before, is strongly empirical in nature and does not offer general equilibrium modeling.

Third, a growing number of papers model the distribution to foreign markets in more detail. Rauch (1999) or Krautheim (2007a) analyze the role of networks; Arkolakis (2006) models exporters' marketing decisions on foreign markets.

Fourth, 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. Krautheim (2007b) develops an interesting generalization of that model, allowing firms to use an additional mode of selling to the foreign market, namely via *export supporting FDI.* His model allows to address the facts discussed by Neary (2007), but does not address import intermediation.

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 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 and intermediate steps of calculations are contained in the Appendix.

2 Model setup

In this section we describe a model with heterogeneous firms in which we introduce the endogenous emergence of trade intermediaries. We build on HMY who offer a simple way to discuss the prevalence of export modes in an environment with asymmetric countries and bilateral trade costs. Our model differs from existing treatments in that it allows for a broader characterization of firm heterogeneity.

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:

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

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 $x_{ij}(\omega)$ 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.[7] The larger $\zeta(\omega)$, the bigger is the contribution of variety ω to overall utility.[8]

Each variety is produced by a single firm. Since there is free entry, in equilibrium firms do not make profits. Thus, labor is the only source of income, and the budget constraint reads

$$w_j L_j \geq \int_{\omega \in \Omega_j} p_{ij}(\omega) \, x_{ij}(\omega) \, \mathrm{d}\omega, \tag{2}$$

where w_j denotes the wage rate that is determined endogenously in equilibrium.

Maximizing (1) subject to (2), we find the following demand function for a variety ω from country i

$$x_{ij}(\omega) = H_j \frac{\zeta(\omega)^{\sigma-1}}{p_{ij}(\omega)^{\sigma}}, \tag{3}$$

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

[8] 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 feature is highly welcome for the empirical exercise of Section 4, since the data do not allow to dissect trade in final goods from trade in inputs.

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

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 taste parameter 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 (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 exporting from country i to country j and may be thought of as a function of distance. We refer to $\bar{\tau}_{ij}$ as to the *systematic* component of trade costs, and of $\tau(\omega)$ as the *idiosyncratic* component.[9]

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, is Φ 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 $[1, +\infty)$.[10] Note that we

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

[10] 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 shape parameter can be interpreted as an inverse measure of productivity dispersion; see Helpman, Melitz, and Yeaple (2004).

need not restrict in any way the stochastic processes that govern the components of $\Phi(\omega)$.

Along with variable distribution costs $\tau(\omega)$, any firm has to sink fixed distribution costs in all markets in which it wishes to be active. These costs are associated to the establishment of a wholesale affiliate and may take the guise of various costs of logistics (warehousing, etc.). Let $f_j = fw_j$ be the flow fixed costs of entry paid in foreign labor, and assume that $f_{ij} = \phi_{ij} f_j$, 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. 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 (henceforth: WFDI).[11]

The fact that producers face higher fixed distribution costs abroad may have two reasons. 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 higher foreign expropriation risk (e.g., because of ill-defined property rights). To see this, let δ_{ij} denote the Poisson rate of expropriation and assume that $\delta_{ii} = 0$ for the sake of simplicity. 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, expropriation risk works just as a higher depreciation rate on foreign assets.

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

Domestic sales. Operating profits from *domestic sales* are $\tau(\omega) \cdot H_i [\tau(\omega) p(\omega)]^{-\sigma} \zeta(\omega)^{\sigma-1} \cdot [p(\omega) - a(\omega) w_i] - f_i$. The presence of the term $\tau(\omega)$ reflects the presence of non-zero variable distribution costs also for domestic sales. The term $H_i [\tau(\omega) p(\omega)]^{-\sigma} \zeta(\omega)^{\sigma-1}$ describes a household's level of demand for a variety ω. The term $[p(\omega) - a(\omega) w_i]$ refers to the per unit margin of the price over marginal cost. Monopolistic producers in country i set their ex factory price

[11] Krautheim (2007b) uses the term *export-supporting FDI* instead of WFDI. Essentially, this is just a reinterpretation of the fixed costs of exporting in the original Melitz (2003) model.

as $p_i(\omega) = a(\omega) w_i/\rho$ so that domestic profits per period are

$$\pi_i^D(Q) = w_i^{1-\sigma} B_i Q - f_i. \tag{4}$$

Domestic profits are an increasing function of competitive advantage Q. The components of Q (marketability, brand reputation, and productivity) do not matter separately for profits. The term $B_i \equiv (1-\rho) H_i \rho^{\sigma-1}$ is an aggregate magnitude which captures the size of the market and is taken as exogenous by producers. Domestic profits increase in the size of the home market B_i reflecting larger demand at constant profit margins; obviously, they fall in fixed costs of production, f, and in the domestic wage rate w_i.

Foreign sales through affiliate. The monopolist generates non-negative profits from *exporting via an own affiliate*, if export revenues suffice to cover additional variable production costs and the annuitized costs of foreign investment $\phi_{ij} f_j$.[12] Profits from exporting through an own sales affiliate are $\tau_{ij}(\omega) \cdot H_j [\tau_{ij}(\omega) p(\omega)]^{-\sigma} \zeta(\omega)^{\sigma-1} \cdot [p(\omega) - a(\omega) w_i] - \phi_{ij} f_i$. Using the monopolist's optimal pricing rule, this gives

$$\pi_{ij}^F(Q) = (w_i \bar{\tau}_{ij})^{1-\sigma} B_j Q - \phi_{ij} f_j, \tag{5}$$

where the systematic part of trade costs $\bar{\tau}_{ij}^{1-\sigma}$ appears as an additional determinant of variable profits, along with the foreign measure of market size B_j and the costs of investing abroad, $\phi_{ij} f_j$. Again, profits increase in the degree of competitive advantage Q and market size B_j; they fall in effective unit costs $w_i \bar{\tau}_{ij}$, the expropriation risk ϕ_{ij} and the fixed costs of maintaining the foreign distribution network f_j.

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, 1999, p. 3). We view trade intermediaries as wholesale agents that facilitate transactions between producers and consumers from different countries. In particular, we postulate that trade intermediaries have superior knowledge of foreign market conditions, legal institutions, idiosyncratic consumer preferences, etc. than the producer herself. Being incorporated in the foreign country, they have the same

[12] Recall the assumption of perfect capital markets.

fixed distribution costs than producers in the same country, $f_j = fw_j$.[13] We do not explicitly model a retail sector; our assumption of variable trade costs accruing also for domestic sales may be thought of a very parsimonious way to capture the resource use of retailing when there are no specific contractual or strategic interactions between wholesellers and retailers.

We assume that trade intermediaries, just like producers, are *single product firms*. While this is in line with most existing trade models, in reality, many trade intermediaries have diversified product portfolios. In some circumstances, this may alter their pricing behavior due to a cannibalization effect (Feenstra and Hong, 2007). Under the assumption of monopolistic competition, however, this effect does not materialize (Bernard, Redding, and Schott, 2006). If intermediaries may sell a range of varieties and the fixed costs of distribution rise less than proportionally with the number of varieties, then intermediation gives rise to *economies of scope*. Fixed costs of market access are then endogenous, but constant over all intermediaries (which are homogeneous in our model). Our main mechanisms are, however, robust to endogenizing the fixed costs of market access.[14]

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'.[15] The lack of *ex 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.

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

[14]In Felbermayr and Jung (2008) we study endogenous fixed market access costs..

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

The game between producers and intermediaries. As in Antras and Helpman (2004), there is an infinitely elastic supply of 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 involve *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. Following Grossman and Helpman (2002) or Antras and Helpman (2004), we assume that the countervailing incentives of producers and intermediaries are sorted out via the usual asymmetric Nash bargaining process, where $\bar{\beta}_{ij} \in [0, 1]$ is the bargaining power of a producer from country i with an 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.[16]

We may summarize the sequencing of the game between the trader 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 $\tau_{ij}(\omega) x_{ij}^M(\omega)$

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

to produce for the purpose of exports.[17] Finally, P delivers the goods to M, M sells the goods, and P and M bargain about sharing of revenues.

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

$$J_{ij}(\omega) = p_{ij}^M(\omega)\, x_{ij}^M\left[p_{ij}^M(\omega)\right] - \tilde{\pi}_{ij}^P(\omega) - f_j, \tag{6}$$

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 $f_j = fw_j$ 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

$$\tilde{\pi}_{ij}^P(\omega) = \lambda_{ij}\tau_{ij}(\omega)\, x_{ij}^M(\omega)\, a(\omega)\, w_i, \tag{7}$$

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 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

$$\max_{x_{ij}^M(\omega)} \bar{\beta}_{ij} J_{ij}(\omega) + \tilde{\pi}_{ij}^P(\omega) - x_{ij}^M(\omega)\, \tau_{ij}(\omega)\, a(\omega)\, w_i \tag{8}$$

subject to the demand function (3). 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*

$$p_{ij}^M(\omega) = \frac{\tau_{ij}(\omega)\, a(\omega)\, w_i}{\beta_{ij}\rho}, \tag{9}$$

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

[17] $x_{ij}^M(\omega)$ 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.

The foreign price is determined as effective marginal costs $\tau_{ij}(\omega)\, a(\omega)\, w_i$ multiplied by a markup $1/(\beta_{ij}\rho) \geq 1$. 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, and that is endogenously pinned down by the parameters governing the bargaining process and by the ease at which products can be recycled. At the bargaining stage, the producer appropriates only a share $\bar{\beta}_{ij}$ of the surplus, and therefore optimally restricts the output below the level that would be optimal without intermediation.

If the intermediary has no clout in the bargaining stage, i.e., if $\bar{\beta}_{ij} = 1$, or if the producer can recycle the output meant for exports at no costs, i.e., if $\lambda_{ij} = 1$, then the additional markup vanishes, i.e., $1/\beta_{ij} = 1$.[18] In the case where output is totally specialized for the respective foreign market, i.e., if $\lambda_{ij} = 0$, the additional markup factor is only driven by the bargaining power, $1/\beta_{ij} = 1/\bar{\beta}_{ij}$. In the limiting case where the producer has no bargaining power, we have $\beta_{ij} \to 0$ regardless of the recycling rate. Moreover, $\partial\beta_{ij}\left(\bar{\beta}_{ij}, \lambda_{ij}\right)/\partial\bar{\beta}_{ij} > 0$ for all $\lambda_{ij} \in [0, 1)$ and $\partial\beta_{ij}\left(\bar{\beta}_{ij}, \lambda_{ij}\right)/\partial\lambda_{ij} > 0$ for all $\bar{\beta}_{ij} \in (0, 1)$.

If λ_{ij} and $\bar{\beta}_{ij}$ both lie strictly below unity, then $p_{ij}^{M}(\omega) > p_{ij}^{F}(\omega)$. Grossman and Helpman (2002) use a similar setup in the context of outsourcing with homogeneous firms. They relate the pricing rule (9) to the *double marginalization* problem that appears in vertical relationships of monopolistic firms.[19] Both, higher trade costs $\bar{\tau}_{ij}$ and contractual frictions 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, contractual frictions drive up the c.i.f. price because producers optimally reduce supply, thereby moving up the demand schedule. Trade costs are a technological feature while the double marginalization phenomenon is due to imperfect markets.

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

[18]Note that domestic sales are nested by our model of intermediation with $\bar{\tau}_{ii} = \lambda_{ii} = 1$, or alternatively (and less realistically), $\bar{\beta}_{ii} = 1$.

[19]Note that in our setting there is no chain of monopolies so that the term double marginalization may not be taken literally. Still, the pricing behavior looks *as if* double marginalization were present.

a producer P makes on the foreign market using an intermediary are given by the optimal value of (8) 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

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

Given our assumptions, we can replace the firm index ω with Q. The term $\tilde{\beta}_{ij} = \tilde{\beta}_{ij}(\beta_{ij}, \sigma) \equiv \left[\beta_{ij} + (1-\beta_{ij})\sigma\right]^{\frac{1}{\sigma-1}} \beta_{ij} \in [\beta_{ij}, 1]$ is endogenously determined as a function of bargaining parameters $\beta_{ij}(\bar{\beta}_{ij}, \lambda_{ij})$ and the elasticity of substitution σ. We have $\tilde{\beta}_{ij}(0,\sigma) = 0$, $\tilde{\beta}_{ij}(1,\sigma) = 1$, $\lim_{\sigma\to 1} \tilde{\beta}_{ij}(\beta_{ij},\sigma) = \beta_{ij} e^{1-\beta_{ij}}$, and $\lim_{\sigma\to+\infty} \tilde{\beta}_{ij}(\beta_{ij},\sigma) = \beta_{ij}$. Moreover, $\partial\tilde{\beta}_{ij}(\beta_{ij},\sigma)/\partial\beta_{ij} > 0$ for all $\beta_{ij} \in [0,1)$ and $\sigma > 1$, and $\partial\tilde{\beta}_{ij}(\beta_{ij},\sigma)/\partial\sigma < 0$.[20]

Hence, incomplete contracts reduce 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 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

[20] The latter follows from $\frac{x-1}{x} < \ln x$, where $x = \beta_{ij} + (1-\beta_{ij})\sigma$.

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 gives

$$Q_{ij}^M = \left(\frac{w_i \bar{\tau}_{ij}}{\tilde{\beta}_{ij}}\right)^{\sigma-1} f_j B_j^{-1}. \quad (11)$$

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 translates into

$$Q_{ij}^F = (w_i \bar{\tau}_{ij})^{\sigma-1}\left(\frac{\phi_{ij}-1}{1-\tilde{\beta}_{ij}^{\sigma-1}}\right) f_j B_j^{-1}. \quad (12)$$

Clearly, for $Q_{ij}^F > 0$ we require that $\phi_{ij} > 1$; since variable revenues are lower when the firm chooses the intermediary, there must be an off-setting gain in lower fixed market access costs for the intermediated regime to be viable. As β_{ij} rises, $\tilde{\beta}_{ij}$ goes up as the producer can appropriate a larger portion of the surplus, and the cut-off level Q_{ij}^F moves rightwards, reflecting the loss of attractivity of establishing an own affiliate.

We may now state the condition under which intermediaries and own wholesale affiliates coexist within some bilateral trade relationship ij.[21]

Lemma 2 (Existence of intermediaries) *If the inequality*

$$\tilde{\beta}_{ij}^{1-\sigma} < \phi_{ij}$$

holds, then a strictly positive non-overlapping mass of producers from country i exports to country j in each of the two available export modes (intermediation and own foreign sales affiliates).

The condition required for complete partitioning is fairly intuitive: 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 FDI implies $\left(\phi_{ij}\right)$. 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

[21]The following lemma 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.

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.

We have $\partial\tilde{\beta}_{ij}/\partial\bar{\beta}_{ij} > 0$ and $\partial\tilde{\beta}_{ij}/\partial\lambda_{ij} > 0$. Hence, 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.

Note that the partitioning of producers into different export modes neither depends on variable transport costs $\bar{\tau}_{ij}$ nor on the (endogenous) size of the export market, as proxied by B_j, or the wage rate. These variables affect both modes in similar fashion.

Figure 1 relates the firms' sorting pattern to their degree of competitive advantage. This picture is a modified version of figure 1 in Helpman, Melitz and Yeaple (2004), 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 the elasticity of substitution σ.

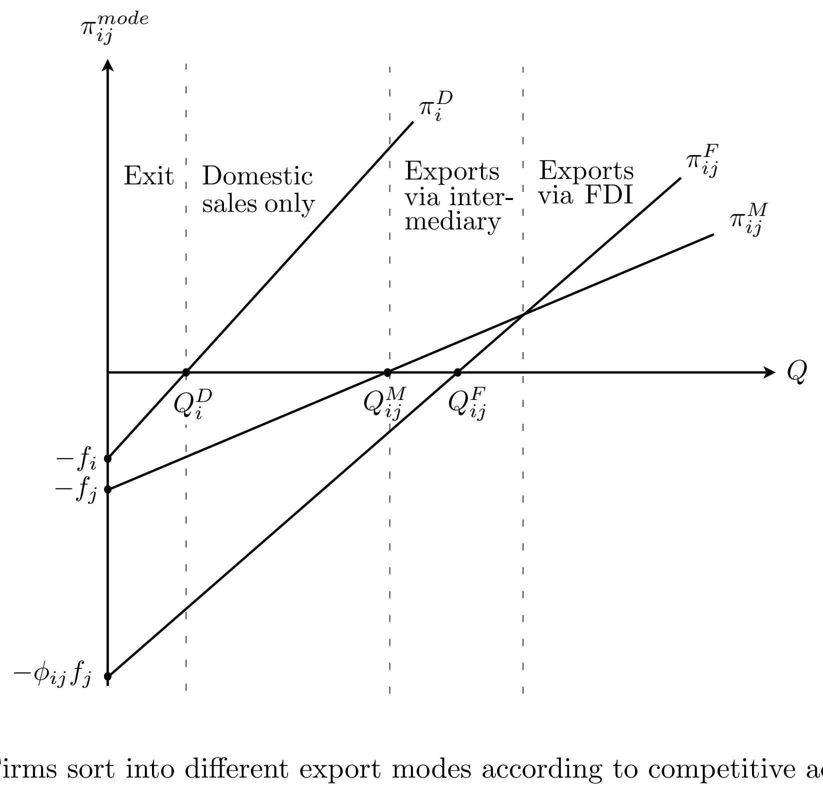

Figure 1: Firms sort into different export modes according to competitive advantage Q.

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

Proposition 1 *Under the condition stated in Lemma 2, producers endogenously select into export modes as a function of their degree of competitive advantage. Firms with high levels of productivity, easily tradable variants, or a strong brand reputation, establish own subsidiaries, while those with intermediate values of the above characteristics search for intermediaries. Firms with low values of the above characteristics do not export.*

Proof. Directly follows from Lemma 2 and Figure 1. ■

Proposition 1 implies that – as an export market grows in size (i.e., B_j increases) – medium-size producers switch from using trade intermediaries to establishing own foreign sales affiliates, while smaller firms start exporting via an intermediary.

3.2 The prevalence of export modes

Sales of firm Q in either mode are simple log-linear functions of firms' competitive advantage

$$s_{ij}^{M}(Q) = \sigma \left(\frac{w_i \bar{\tau}_{ij}}{\beta_{ij}} \right)^{1-\sigma} B_j Q \quad \text{and} \quad s_{ij}^{F}(Q) = \sigma \left(w_i \bar{\tau}_{ij} \right)^{1-\sigma} B_j Q \ . \tag{13}$$

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). Sales per firm also increase in σ as the markup goes down and the firm has to sell larger quantities to amortize fixed costs. The more severe contractual imperfections $1/\beta_{ij}$ are, the lower sales per firm channeled through intermediaries, whereas exports per firm via wholesale affiliates in not affected by the contracting environment.[22]

We can compute the value of total export sales of country i to country j that are facilitated by trade intermediaries S_{ij}^{M}.[23] 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

$$S_{ij}^{M} = \Psi_{ij} \beta_{ij}^{\sigma-1} \left[\tilde{\beta}_{ij}^{k-(\sigma-1)} - \left(\frac{1-\tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij}-1} \right)^{\bar{k}} \right] , \tag{14}$$

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

[23]We have $S_{ij}^{M} = M_i^{E} \int_{\Phi_{ij}^{M}}^{\Phi_{ij}^{F}} s_{ij}^{M}(\Phi)\, dG(\Phi)$, where M_i^{E} is the mass of entrants in country i.

where $\bar{k} \equiv \frac{k}{\sigma-1} - 1$ is a constant, and Ψ_{ij} is a variable that will turn out constant over export modes.[24] 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 that any foreign market presence entails.

Contractual frictions $1/\beta_{ij}$ affect 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 (13). 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 sales affiliate abroad or stop exporting to market j completely; see (11) and (12). 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.[25]

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

$$S_{ij}^F = \Psi_{ij} \left(\frac{1 - \tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij} - 1} \right)^{\bar{k}}. \tag{15}$$

A rise in $1/\beta_{ij}$ now does not affect sales of each single exporter in the FDI mode directly, see (13). 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 (12).

Without explicitly solving for Ψ_{ij}, we can can now state the following proposition on the relative prevalence of export modes:

Proposition 2 *If the condition stated in Lemma 2 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*

$$\chi_{ij} = \beta_{ij}^{\sigma-1} \left[\left(\frac{\phi_{ij} - 1}{\tilde{\beta}_{ij}^{1-\sigma} - 1} \right)^{\bar{k}} - 1 \right]. \tag{16}$$

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

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

This measure increases in the risk of expropriation ϕ_{ij} and decreases in the severity of contractual problems $1/\beta_{ij}$. 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 $\bar{\tau}_{ij}$. 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 $1/[k-(\sigma-1)]$.

The above expression (16) is formally very similar to equation (7) in HMY, with $1/\beta_{ij}$ playing a role similar to transportation costs. However, recall that the additional markup reflects a distortion that does not involve the use of resources while transportation costs do imply the use of resources as part of the transported items are lost in transit. Moreover, the underlying model mechanisms are different: our model replaces the proximity-concentration trade-off of HMY by the tension between the costs of internalization (wholesale FDI) and the efficiency loss caused by incomplete contracts in the case of intermediation.

Not surprisingly, when the strength of contractual imperfections increases (i.e., β_{ij} drops) 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 Lemma 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.

3.3 The trade-FDI relation

Total exports of country i to country j over all possible distribution modes are $X_{ij} \equiv S_{ij}^M + S_{ij}^F$. Hence,

$$X_{ij} = \Psi_{ij}\beta_{ij}^{\sigma-1}\tilde{\beta}_{ij}^{k-(\sigma-1)}\left(\left(\frac{\tilde{\beta}_{ij}^{1-\sigma}-1}{\phi_{ij}-1}\right)^{\bar{k}}\left(\beta_{ij}^{1-\sigma}-1\right)+1\right). \tag{17}$$

This expression is the bilateral trade flow (gravity) equation associated to our model. It is a somewhat generalized version of the one derived by Chaney (2008): Due to the presence of an extensive margin (selection of firms into exporting), the *first order effect* of transportation costs $\bar{\tau}_{ij}$, which in the expression above is part of Ψ_{ij}, has an elasticity of k and not $|1-\sigma|$ as in models with homogeneous firms. This result of Chaney still holds in the present context, where firms have a choice of export mode since transportation costs affect both modes similarly.

Moreover, we can express the total volume of foreign direct investment of firms headquartered in country i into wholesale affiliates in country j as $F_{ij} = \phi_{ij} f_j M_i^E \left[1 - G\left(\Phi_{ij}^F\right)\right] = \phi_{ij} f_j M_i^E \left(\Phi_{ij}^F\right)^{-k}$, where the second equality follows from the Pareto assumption. The stock of wholesale FDI from country i invested in country j is[26]

$$F_{ij} = \phi_{ij}\Psi_{ij}\rho\frac{\bar{k}}{k}\left(\frac{1-\tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij}-1}\right)^{\frac{k}{\sigma-1}}. \tag{18}$$

This expression is related to (15) and features similar comparative statics. In particular, the elasticities of FDI and exports, both taken with respect to the systematic component of transportation costs, are identical. The comparative statics with respect to the cost of FDI ϕ_{ij} is more involved. A higher cost of wholesale FDI has a negative effect on the extensive margin (fewer firms engage in wholesale FDI), but a positive effect on the intensive margin (firms who export through an affiliate have to invest more). However, ignoring general equilibrium effects through Ψ_{ij} one can show that the extensive margin dominates. On the other hand, higher cost of wholesale FDI also reduce total exports.

More generally, one can state the general equilibrium relationship between total exports and the stock of bilateral wholesale FDI as follows:

Proposition 3 *Wholesale FDI (F_{ij}) and total exports (X_{ij}) are identically affected by changes in the systematic component of trade costs so that they appear as complements.*

[26] Note that $\left(\bar{\delta} + \delta_{ij}\right) F_{ij}$ is the flow of FDI in a stationary state.

Proof. Totally differentiating (17) and (18) immediately reveals that $\frac{\hat{F}_{ij}}{\hat{\bar{\tau}}_{ij}} = \frac{\hat{X}_{ij}}{\hat{\bar{\tau}}_{ij}}$ (where we use the usual hat notation, i.e. $\hat{x} = dx/x$.) Hence, any change in $\bar{\tau}_{ij}$ makes WFDI and exports move in tandem. ■

In contrast to the results reported in the present paper, statements on the comparative statics of WFDI or exports with respect to the risk of expropriation ϕ_{ij} and contractual imperfections $1/\beta_{ij}$ would require a solution of the model in general equilibrium. However, models with asymmetric countries and bilateral trade costs are close to the frontier of analytical tractability, see HMY. Moreover, we do not expect additional testable implications from such an exercise, whose theoretical exploration we relegate to future research.

4 Tentative empirical evidence

The present paper has a number of predictions that are – in principle – testable empirically. In this section, we show that existing evidence using US Census data on related versus non-related party trade and data on German foreign plants is compatible with the main results of the present paper. Clearly, it would be worthwhile to use detailed firm-level data. We are not aware of a data set that contains at the same time information about firms' characteristics, their choice of export modes by export country, and export volumes. The data situation is improving quickly; hence, we are confident that the predictions of the present paper can be put to systematic econometric scrutiny soon. For the time being, we are confident that the available data plus other empirical results do allow a rough yet meaningful empirical check.

4.1 Relative prevalence

In official data, exports to wholesale affiliates for the purpose of selling to foreign consumers appear as within-firm trade. Hence, one may use data on related-party and non-related party exports, as collected by the US Census, to see whether sectoral and cross-country variation in the incidence of intermediation is in line with the predictions of our paper.[27] While in the theoretical part of the paper we mainly focus on trade in final goods, exports to affiliates not

[27] A detailed description on the firm-level version of the data can be found in Bernard, Redding, Schott (2007). Strictly spoken, non-related party trade also comprises exports directly to the consumer.

only include final output goods but also intermediate inputs.[28] Unfortunately, this problem is common to the literature. The empirical analysis in HMY relies on export data from Feenstra (1997) that do not distinguish between final goods and imports either.[29] However, as we have pointed out in footnote 8, our setting is flexible enough to nest also trade in inputs without altering the testable implications of the model.

Compared to HMY, 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). However, we can use a similar empirical strategy on US census data to assess the predictions of the model. 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 (as HMY), that it is essentially unknown where (and by whom) products sold by foreign affiliates have been produced.

Relative prevalence and product characteristics. We strive at checking the signs of the partial derivatives as derived in Proposition 2. For that purpose, we show unconditional and conditional correlations. Starting with the cross-industry perspective, we need comparable proxies for the relative prevalence of export modes, the dispersion of sales, and contractual imperfections.

Data on related party and non-related party trade is taken from the US Census.[30] To make the export data comparable to the dispersion measures reported by HMY,[31] we aggregate the US Census data from the 6-digit NAICS level to match the BEA 3-digit industry classification.[32] Since exports on that very disaggregated level in either mode may be driven by only very few transactions, we average over the years 2000 to 2003. Finally, we restrict our analysis to the (wide) sample of countries as considered in HMY.[33] This choice makes sure that we focus on

[28]Using BEA data on majority owned US affiliates, Borga and Zeile (2004) find that finished goods make up only about 20% of exports to affiliates. While we could back out the exports of finished goods to related parties, we cannot do so for non-related party trade.

[29]Note that HMY is short for Helpman, Melitz, and Yeaple (2004).

[30]The data can be downloaded from `http://sasweb.ssd.census.gov/relatedparty`.

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

[32]The correspondence table can be found in the Appendix.

[33]The 38 countries in the sample are Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia*,

countries with strictly positive exports in both modes.

According to Proposition 2, we expect the following signs in our analysis. The relative prevalence of export sales decreases in the dispersion of the sales distribution. Variation in the dispersion measure derives from variation in the shape parameter of the Pareto distribution k, and from variation in the elasticity of substitution σ. However, the latter is not only related to sales dispersion, but also affects the strength of the intermediation impeding effect of contractual problems $1/\beta_{ij}$. Thus, as stated in Proposition 2, the relative prevalence of export modes decreases in σ. Moreover, there might be a countervailing effect running via the recycling rate λ_{ij}. If goods are very specialized (σ low), λ_{ij} may be lower so that producers are more vulnerable and contractual problems $1/\beta_{ij}$ are stronger. There is then a negative correlation between $1/\beta_{ij}$ and σ. The total effect of σ is therefore unclear.

Our theory differs from the proximity-concentration trade-off as proposed in HMY with regard to the role of variable trade costs: While they drive the decision between exporting and producing abroad, they should not play a role for the relative prevalence of export modes. In order to check this prediction of our model, we add the freight rate as a control.

Data on σ and freight rates are taken from Hanson and Xiang (2004). We match their product classification into the BEA industry classification and are left with 27 manufacturing industries (see Appendix C for the industry concordance). It turns out that for Motor Vehicles (BEA industry 371) exports via an own affiliates is the most prevalent mode, while Wood and Lumber (240) Non-Ferrous Metals (336), and Pulp and Paper (262) are prevalently exported via intermediaries; see Appendix B for a detailed description of the data).

The analysis falls into two parts. First, we aggregate over all countries in our sample and plot the log of relative prevalence of export modes separately against industry dispersion, the log of elasticity of substitution, and the log of freight rate (see Figure 2). As expected, there is a negative unconditional correlation between the relative prevalence and industry dispersion. However, there is no clear correlation between χ and σ. This confirms our hypothesis that contractual problems reduce the prevalence of intermediated exports. Moreover, as predicted by

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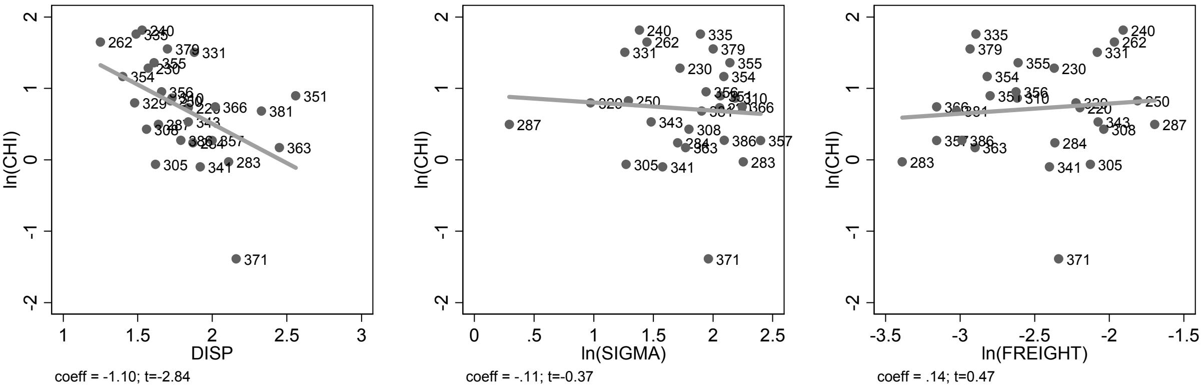
Denmark, Finland*, France, Germany, Greece*, Hong Kong, Indonesia*, Ireland, Israel*, Italy, Japan, Malaysia*, Mexico, Netherlands, New Zealand, Norway, Peru, Philippines, Portugal*, Singapore, South Africa*, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand*, Turkey, United Kingdom, and Venezuela. An asterisk indicates countries excluded in the narrow sample.

Figure 2: Unconditional correlations. Cross-industry variation



our model, variable transport costs do not drive the relative prevalence of export modes. Hence, the concentration proximity argument indeed does not play a role in determining the choice of export modes.

Second, in order to get closer to an empirical test of the relationship proposed in Proposition 2, we run a regression of the type

$$\ln \chi_{sj} = \alpha_0 + \alpha_1 DISP_s + \alpha_2 \ln \sigma_s + \alpha_2 \ln FREIGHT_s + \nu_j + u_{sj}, \tag{19}$$

where s denotes an industry and j a partner country. With respect to the estimation strategy, we follow HMY. First, we include country fixed effects to control for unobserved heterogeneity, e.g. systematic trade costs (distance from the US), market size, and investment risk. Moreover, the country fixed effect controls for multilateral resistance, thereby addressing the issue that some countries like the Netherlands, Hong Kong, or Singapore may act as intermediaries in entrepôt trade. Second, in order to address potential endogeneity bias in the US dispersion measure, we instrument the US measure by those of four European countries (also estimated by HMY). Finally, we cluster standard errors within BEA industries to control for correlation of residuals due to omitted industry characteristics. The regression is based on a balanced sample of $27 \times 38 = 1026$ observations.

As expected, the sign of α_1 is negative ($\widehat{\alpha}_1 = -1.8$, t-value: -2.58), while $\widehat{\alpha}_2$ and $\widehat{\alpha}_3$ are not significantly different from 0. This result is in line with our prediction that contractual problems–that are negatively correlated with σ–hampers exports via intermediaries. It also confirms our hypothesis that relative prevalence is not driven by variable trade costs. Our results are robust to restricting the sample to the 27 countries used by HMY and referred to as the narrow sample.[34]

Relative prevalence and destination country characteristics. The US Census data also allow a rough impression on the relative prevalence of export modes with respect to destination country characteristics like geographical distance, country size, and the degree of property rights protection. For that purpose, we include geographical distance of country j to the USA, $DIST_j$, and the size of population, POP_j in our dataset.[35] Moreover, we include a measure, $RISK_j$ from the International Country Risk Guide (ICRG) that captures the risk of expropriation and confiscation of productive assets by the state or other actors in country j. According to our model, firms use an intermediary instead of setting up an own wholesale affiliation if this risk is high.[36]

We aggregate the trade data over all of our 27 industries and find that Austria and the NAFTA trading partners Canada and Mexico are mainly served via own affiliates, while countries like Peru, Indonesia, and South Korea are prevalently exported to via intermediaries; see Appendix N for a detailed summary statistic.[37]

Turning to the unconditional effects of our explanatory variables, Figure 3 suggests that higher risk of confiscation or expropriation ($RISK_j$), leads to relatively higher exports via intermediaries. This result is well in line with our theory. Relative prevalence and geographical distance seem to correlate positively, while our model would predict that distance as a proxy for variable trade costs does not affect the prevalence of export modes. However, the result is obviously driven by trade within NAFTA (Canada and Mexico). If we omit NAFTA trading partners, there is no significant relation. Finally, Figure 3 shows that market size, measured in terms of population, does not affect the choice of export mode as predicted by our model.

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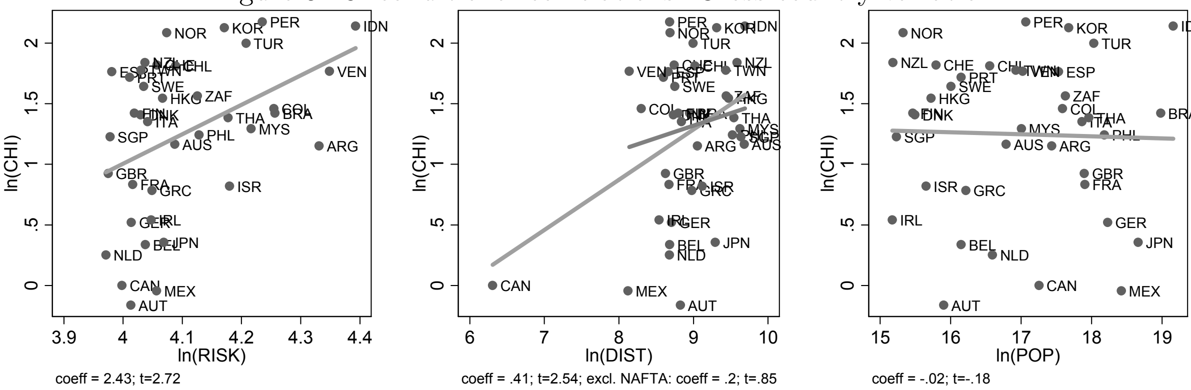
[34]The coefficient of dispersion slightly increases in absolute values ($\widehat{\alpha}_1 = -1.9$).

[35]The distance data is provided by Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) in Paris on their website `www.cepii.fr/francgraph/bdd/distances.htm`; population (for year 2000) comes from the World Development Indicators (WDI) provided by the World Bank.

[36]The variable *investment profile* in the ICRG attaches high scores to low risk. However, we invert the values to obtain our measure $RISK_j$.

[37]The high level of exports to Austria channeled through sales affiliates may point to its role as re-exporter to neighboring countries. We will control for that by including a measure of multilateral resistance into the cross-country regressions.

Figure 3: Unconditional correlations. Cross-country variation



We also run a regression of the type

$$\ln \chi_{sj} = \beta_0+\beta_1 \ln RISK_j+\beta_2 \ln DIST_j+\beta_3 NAFTA_j+\beta_4 \ln MR_j+\beta_5 \ln POP_j+\nu_s+u_{sj}, \quad (20)$$

where MR_j measures the multilateral resistance of country j, which is related to the price index P_j in our model.[38] As expected, the relative prevalence increases in $RISK$ ($\widehat{\beta}_1 = -.32$, t-value: 2.11). Moreover, we find that distance and multilateral resistance have no significant impact on the relative prevalence of export modes.

Interestingly, while in the plot of Figure 3 market size measured by POP_j seemed unrelated to the relative prevalence of intermediation, it appears significant in the conditional regression where χ_{sj} decreases in country size ($\widehat{\beta}_5 = -0.22$, t-value: -2.71). This means that firms tend to serve larger markets via own sales affiliates and smaller markets via intermediaries. This is not in line with the predictions of our model, where larger markets attract more exports through a proportional expansion of both modes.[39]

One can rationalize the empirical finding by assuming a relation between fixed foreign market access costs and country size. If those costs depend positively on country size, e.g., because more sales agents need to be hired, but increase less strongly in the case of wholesale FDI, e.g., because the foreign firm loses some of its initial cost disadvantage relative to domestic firms as it grows larger, then relative prevalence of intermediation declines in population. Another explanation may involve the fact that firms are risk averse, so that the hold-up problem implicit in the

[38]Following the literature, multilateral resistance is the GDP weighted distance of country j to all other countries than the US.

[39]This phenomenon seems to be common to the literature: Bernard, Jensen, Redding, Schott (2007) find a negative relationship between the share of intra-firm imports and country size as measured by log population.

intermediated mode becomes fiercer when the profits at stake are larger (which is the case in a larger country). Finally, the Pareto assumption, while found realistic in many empirical studies of firm size distributions, may not be adequate. In this case, the expression describing relative prevalence is no longer independent (amongst other things) from country size.

Our empirical exercise is in line with a number of predictions of the model, supporting our view that the choice of export mode reflects a trade-off between the costs of contractual frictions in the case of intermediation and the cost of FDI in the case of internalization. The fact that the data show a negative relationship between the prevalence of intermediation and market size suggests an interesting research agenda in which fixed costs of foreign market access are modeled with more detail.

4.2 The FDI-distance nexus

Citing various empirical studies, Neary (2007) points out that – in the cross-section of countries – distance is negatively correlated to the stock and flow of foreign direct investment (FDI). In other words, destination countries that are farther away from the source country receive less FDI. This seems inconsistent with the concentration-proximity trade-off in the standard model of horizontal FDI, where producers overcome the cost of distance by establishing foreign production plants. Buch, Kleinert, Lipponer, and Toubal (2005) provide a nice example for German data; controlling for destination country size and similarity with the source country, they find that distance reduces sales of foreign affiliates, regardless of whether these subsidiaries are active in production or wholesale activities. HMY present evidence that is in line with concentration-proximity, but focus on cross-industry variance in trade costs.

Our paper predicts that sales of wholesale affiliates decline in distance, exactly for the same reason that this is true for traditional exports. Also, the number of firms engaged in running foreign wholesale affiliates declines with distance. Hence, the very rudimentary theory of FDI present in our paper fits the data. If wholesale activities are sufficiently important for total FDI, then it may well be that aggregate data exhibit a negative relationship between affiliate sales and distance as well. In Germany, for example, in 2005, about 27 percent of the total value of foreign FDI was in the wholesale sector.[40]

[40] The total stock of FDI used as a base does not include the financial sector (in particular holding companies and off-shore investment vehicles).

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 foreign assets and in the degree of heterogeneity of producers. It falls with the severity of contractual problems and the elasticity of substitution between varieties.

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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APPENDIX

A Proofs and detailed derivations

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 (7) the solves

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

The first order condition is

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

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

$$
\begin{aligned}
\frac{\partial\tilde{\beta}_{ij}}{\partial\sigma} &= \tilde{\beta}_{ij}\left(-\frac{\ln\left[\beta_{ij}+\left(1-\beta_{ij}\right)\sigma\right]}{(\sigma-1)^2}+\frac{1-\beta_{ij}}{\left[\beta_{ij}+\left(1-\beta_{ij}\right)\sigma\right]}\right)\\
\frac{\partial\tilde{\beta}_{ij}}{\partial\sigma} &= \frac{\tilde{\beta}_{ij}}{\sigma-1}\frac{\beta_{ij}+\left(1-\beta_{ij}\right)\sigma-1-\left[\beta_{ij}+\left(1-\beta_{ij}\right)\sigma\right]\ln\left[\beta_{ij}+\left(1-\beta_{ij}\right)\sigma\right]}{(\sigma-1)\left[\beta_{ij}+\left(1-\beta_{ij}\right)\sigma\right]}<0.
\end{aligned}
$$

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

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

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

Proof of Lemma 2 (Existence of intermediation. The cutoff Q_{ij}^M immediately follows from rearranging (10)

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

Q_{ij}^F is determined by solving $\pi_{ij}^M\left(Q_{ij}^F\right)=\pi_{ij}^F\left(Q_{ij}^F\right)$ for Q_{ij}^F

$$
\begin{aligned}
\left(w_i\bar{\tau}_{ij}\right)^{1-\sigma}B_jQ_{ij}^F-\phi_{ij}f_j &= \left(\frac{w_i\bar{\tau}_{ij}}{\tilde{\beta}_{ij}}\right)^{1-\sigma}B_jQ_{ij}^F-f_j\\
Q_{ij}^F &= \left(w_i\bar{\tau}_{ij}\right)^{\sigma-1}\left(\frac{\phi_{ij}-1}{1-\tilde{\beta}_{ij}^{\sigma-1}}\right)f_jB_j^{-1}\\
&= Q_{ij}^M\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right)
\end{aligned}
$$

Sorting exists, if Q_{ij}^F is strictly larger than Q_{ij}^M :

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

Derivations of equations (14) **and** (15) **(Export sales per mode).** Sales per firm from exporting via a trade intermediary are given by

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

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

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

The last expression is equivalent to (14) in the text. Analogously, sales per firm from exporting via a wholesale affiliate take the form

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

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 (15) in the text. Note that

$$
\begin{aligned}
\bar{k} &= \frac{k}{\sigma-1} - 1 \\
\frac{d\bar{k}}{\sigma} \frac{\sigma}{\bar{k}} &= -\frac{\sigma}{\sigma-1} \frac{k}{k-(\sigma-1)} < 0.
\end{aligned}
$$

Proof of Proposition 2 (Relative prevalence). The relative prevalence of export modes $\chi_{ij} \equiv S_{ij}^M / S_{ij}^F$ follows immediatly from (14) and (15)

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

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).

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

$$\frac{d\chi_{ij}}{d\sigma}\frac{\sigma}{\chi_{ij}} \equiv \zeta = \sigma \ln \beta_{ij} + \bar{k} \frac{\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right)^{\bar{k}} \left(\frac{d\bar{k}}{d\sigma}\frac{\sigma}{\bar{k}} \ln\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right) + \frac{\tilde{\beta}_{ij}^{1-\sigma}}{\tilde{\beta}_{ij}^{1-\sigma}-1}\left(\sigma \ln \beta_{ij} + (\sigma-1)\frac{d\tilde{\beta}_{ij}}{d\sigma}\frac{\sigma}{\tilde{\beta}_{ij}}\right)\right)}{\left(\frac{\phi_{ij}-1}{\tilde{\beta}_{ij}^{1-\sigma}-1}\right)^{\bar{k}} - 1} < 0$$

since $\frac{d\bar{k}}{d\sigma}\frac{\sigma}{\bar{k}} < 0, \frac{d\tilde{\beta}_{ij}}{d\sigma}\frac{\sigma}{\tilde{\beta}_{ij}} < 0, \ln \beta_{ij} < 0.$

Once you assume $\lambda_{ij} = f(\sigma)$ with $f\prime > 0, \frac{d\beta_{ij}}{d\sigma}\frac{\sigma}{\beta_{ij}} > 0$, and we have

$$\frac{d\chi_{ij}}{d\sigma}\frac{\sigma}{\chi_{ij}} = \zeta + (\sigma-1)\frac{d\beta_{ij}}{d\sigma}\frac{\sigma}{\beta_{ij}},$$

the sign of which is unclear.

Derivation of equation (18)**.** The stock of wholesale FDI is given by

$$\begin{aligned}
F_{ij} &= \phi_{ij} f_j M_i^E \left[1 - G\left(\Phi_{ij}^F\right)\right] \\
&= \phi_{ij} f_j M_i^E \left(\Phi_{ij}^F\right)^{-k} \\
&= \phi_{ij} f_j M_i^E \left((w_i \bar{\tau}_{ij})^{\sigma-1} \left(\frac{\phi_{ij}-1}{1-\tilde{\beta}_{ij}^{\sigma-1}}\right) f_j B_j^{-1}\right)^{-\frac{k}{\sigma-1}} \\
&= \phi_{ij} M_i^E (w_i \bar{\tau}_{ij})^{-k} B_j^{\frac{k}{\sigma-1}} f_j^{-\bar{k}} \left(\frac{1-\tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij}-1}\right)^{\frac{k}{\sigma-1}} \\
&= \phi_{ij} \Psi_{ij} \frac{k-(\sigma-1)}{\sigma k} \left(\frac{1-\tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij}-1}\right)^{\frac{k}{\sigma-1}} \\
&= \phi_{ij} \Psi_{ij} \rho \frac{\bar{k}}{k} \left(\frac{1-\tilde{\beta}_{ij}^{\sigma-1}}{\phi_{ij}-1}\right)^{\frac{k}{\sigma-1}}.
\end{aligned}$$

B Summary statistics

Cross-industry

BEA	Description	χ	DISP	SIGMA	FREIGHT
371	Motor Vehicles	0.2	2.2	7.1	0.10
305	Rubber	0.9	1.6	3.6	0.12
341	Metal Cans, Fabricated Metal	0.9	1.9	4.9	0.09
283	Drugs	1.0	2.1	9.5	0.03
363	Household Appliances	1.2	2.5	5.9	0.06
386	Optical and Photographic Equipment	1.3	1.8	8.1	0.05
357	Computers	1.3	2.0	11.0	0.04
284	Soap and Cleansing Products	1.3	1.9	5.5	0.09
308	Miscellaneous Plastics	1.5	1.6	6.0	0.13
287	Agricultural Chemicals	1.6	1.6	1.3	0.18
343	Heating and Plumbing Equipment	1.7	1.8	4.4	0.13
381	Scientific and Measuring Equipment	2.0	2.3	6.7	0.05
220	Textiles	2.1	1.8	7.8	0.11
366	Audio,Video,Communications Equipment	2.1	2.0	9.4	0.04
329	Stone, Minerals, and Ceramics	2.2	1.5	2.7	0.11
250	Furniture	2.3	1.7	3.6	0.16
310	Leather	2.4	1.7	8.9	0.07
351	Engines and Turbines	2.5	2.6	7.9	0.06
356	General Industrial Machinery	2.6	1.7	7.0	0.07
354	Metalworking Machinery	3.2	1.4	8.1	0.06
230	Apparel	3.6	1.6	5.6	0.09
355	Special Industrial Machinery	3.9	1.6	8.5	0.07
331	Ferrous metals	4.5	1.9	3.5	0.12
379	Other Transport Equipment	4.7	1.7	7.4	0.05
262	Pulp and Paper	5.2	1.3	4.3	0.14
335	Non-Ferrous metals	5.8	1.5	6.7	0.06
240	Wood and Lumber	6.1	1.5	4.0	0.15

Note: Ranked by prevalence of export sales via related relative to non-related parties

Cross-country

ISO	Name	χ	RISK	DIST	POP
AUT	Austria	0.9	55.3	6.8	8.1
MEX	Mexico	1.0	57.8	3.4	100.0
CAN	Canada	1.0	54.5	0.5	31.1
NLD	Netherlands	1.3	53.0	5.9	16.1
BEL	Belgium	1.4	56.7	5.9	10.3
JPN	Japan	1.4	58.5	10.9	127.0
GER	Germany	1.7	55.4	6.0	82.4
IRL	Ireland	1.7	57.3	5.1	3.9
GRC	Greece	2.2	57.3	7.9	11.0
ISR	Israel	2.3	65.4	9.1	6.3
FRA	France	2.3	55.5	5.8	59.7
GBR	United Kingdom	2.5	53.3	5.6	59.2
ARG	Argentina	3.2	76.0	8.5	37.3
AUS	Australia	3.2	59.6	16.0	19.6
SGP	Singapore	3.4	53.4	15.4	4.1
PHL	Philippines	3.5	62.1	13.7	78.7
MYS	Malaysia	3.6	67.8	15.1	24.3
ITA	Italy	3.9	56.9	6.9	57.3
THA	Thailand	4.0	65.2	13.9	63.2
DNK	Denmark	4.1	56.3	6.2	5.4
FIN	Finland	4.1	55.7	6.6	5.2
BRA	Brazil	4.1	70.6	7.7	175.0
COL	Colombia	4.3	70.5	4.0	43.5
HKG	Hong Kong	4.7	58.4	13.0	6.7
ZAF	South Africa	4.8	61.9	12.6	45.3
SWE	Sweden	5.2	56.5	6.3	8.9
PRT	Portugal	5.6	55.2	5.4	10.3
ESP	Spain	5.8	53.6	5.8	41.1
VEN	Venezuela	5.9	77.4	3.4	24.7
TWN	Taiwan	5.9	56.3	12.5	22.5
CHL	Chile	6.1	59.7	8.3	15.5
CHE	Switzerland	6.2	57.8	6.3	7.2
NZL	New Zealand	6.3	56.7	14.5	3.9
TUR	Turkey	7.4	67.2	8.1	67.8
NOR	Norway	8.0	58.8	5.9	4.5
KOR	South Korea	8.4	64.8	11.1	47.5
IDN	Indonesia	8.5	80.9	16.2	209.0
PER	Peru	8.8	69.1	5.9	25.8

Note: Ranked by prevalence of export sales via related relative to non-related parties; RISK takes scores between 0 (lowest) and 100 (highest); DIST in thousands; POP in millions;

C Industry concordance

BEA	Description	SITC	NAICS
220	Textiles	65	313, 314
230	Apparel	84	315
240	Wood and Lumber	63	321
250	Furniture	82	337
262	Pulp and Paper	64	3221
283	Drugs	54	3254
284	Soap and Cleansing Products	55	3256
287	Agricultural Chemicals	56	3253
305	Rubber	62	3262
308	Miscellaneous Plastics	57,58	3261
310	Leather	61	316
329	Stone, Minerals, and Ceramics	66	3271
331	Ferrous metals	67	3211
335	Non-Ferrous metals	68	3314
341	Metal Cans, Fabricated Metal	69	3321,3324,3363
343	Heating and Plumbing Equipment	81	3323,3334
351	Engines and Turbines	71	3336
354	Metalworking Machinery	73	3335
355	Special Industrial Machinery	72	3332
356	General Industrial Machinery	74	3339
357	Computers	75	3341
363	Household Appliances	77	3352
366	Audio,Video,Communications Equipment	76	3342,3343
371	Motor Vehicles	78	3361
379	Other Transport Equipment	79	3362,3364-3366,3369
381	Scientific and Measuring Equipment	87	3345
386	Optical and Photographic Equipment	88	333314,333315

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