The Role of Intermediaries in Facilitating Trade*

JaeBin Ahn†
Columbia University

Amit K. Khandelwal‡
Columbia Business School & NBER

Shang-Jin Wei §
Columbia Business School & NBER

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Abstract

Using a database that records the census of firm-level trade by Chinese firms, we provide systematic evidence that intermediaries play an important role in faciliating trade across borders. Intermediaries account for at least 20% of China's imports and exports in 2005. This implies that a large number of firms are able to engage in international trade without directly exporting or importing products. We modify a heterogenous firm trade model to allow firms to endogenously select their mode of export–either directly or indirectly through an intemediary. The model predicts that intermediaries play a relatively more important role in markets that are more difficult to penetrate. We provide empirical confirmation for this prediction as well as generate new facts regarding the activity of intermediaries.

Keywords: China, Intermediaries, Heterogeneous Firms, Middlemen, Fixed Costs
JEL classification: F1

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†Intl. Affairs Building, 420 West 118th St. New York, NY 10027. *email*: ja2264@columbia.edu.

‡3022 Broadway, Uris Hall, New York, NY 10027, *tel*: (2123) 854-7506, *fax*: (212) 316-9219, *email*: ak2796@columbia.edu

§3022 Broadway, Uris Hall, New York, NY 10027, *tel*: (212) 854-9139, *fax*: (212) 316-9219, *email*: shangjin.wei@columbia.edu

1. Introduction

Research using firm-level data has uncovered that only a fraction of firms export products to foreign markets. In the U.S., Bernard, Jensen, and Schott (2009) report that only 35 and 25 percent of firms in mining, agriculture and manufacturing sectors exported or imported at least one product in 2000. This fact, which has emerged across many countries, is now well-grounded in theoretical models featuring firm heterogeneity and fixed export costs (e.g., Melitz 2003 and Bernard et al. 2003). These empirical and theoretical findings, however, do not account for the role that intermediaries, wholesalers, and distributors play in facilitating international trade. The prominence of intermediaries appears in aggregate trade statistics; in the U.S., wholesale and retail firms account for 21 and 30 percent of non-service related exports and imports (Bernard, Jensen and Schott, 2009).

The use of intermediary firms has been even more pervasive in developing economies, particularly in Asia. In the early 1980s, 300 trading (non-manufacturing) Japanese firms accounted for 80 percent of Japanese trade, and the ten largest of these firms accounted for 30 percent of Japan's GNP (Rossman, 1984). During the early 1950s in China, only six firms engaged in international trade on behalf of domestic firms; by the time China embarked on market reforms in 1978, all international trade flowed through just sixteen trading firms (Lardy, 1993).[1] In China today, the setting of our study, our data indicate that *at least* 22 and 18 percent of total Chinese exports and imports flows through non-manufacturing firms.

The importance of intermediary firms in facilitating Chinese trade across borders indicates that existing models should be augmented to provide a more complete portrait of a country's imports and exports. In this paper, we introduce intermediation technology within a heterogenous firm model of international trade. As in Melitz (2003), firms can directly export to foreign markets buy incurring fixed costs of exports and trade costs. This implies that the least productive firms serve only the domestic market while the most productive firms directly export their varieties by paying a fixed export cost. We introduce an intermediation technology whereby firms can indirectly export their varieties by paying both an intermediary fixed cost, which is smaller than the fixed cost of direct exports, and an additional marginal cost. The introduction of this new entry margin creates a third type of firm: an *indirect* exporter. Firms at an intermediate level of productivity can incur the intermediation costs to forward their products to an intermediary who exports on their behalf. The presence of intermediary firms therefore provides a mechanism by which firms can access the export market even if they are not quite productive enough to set up their own distribution network.

[1] Of course, these early Japanese and Chinese statistics reflect government intervention which often prevented domestic firms from directly trading abroad. We discuss this issue and how we circumvent this problem in Section 3.

The model predicts that the share of exports handled by intermediary firms increases in both the variable and fixed costs of exporting. The reason is that as trade becomes more costly, firms need to possess high levels of productivity to overcome these costs to directly export. When barriers to trade are larger, a greater fraction of relatively less-productive domestic firms forward their varieties to the intermediary firms to export on their behalf. We therefore expect to observe the share of a total exports to a country facilitated by Chinese intermediaries to be increasing in the degree of difficulty in penetrating the market.

The model therefore predicts that less-productive firms are able to access foreign markets by relying on intermediary firms. This prediction is consistent with observations from the business literature (e.g., Peng and Ilinitch, 1998) and underpins government policy, such as the 1982 U.S. Export Trading Company Act, which explicitly encourages the formation of intermediary firms to export on behalf of the "tens of thousands" of small- and medium-sized U.S. businesses (Export Trading Company Act of 1982). The model also formalizes the well-known observation that intermediary trading companies have long played an important role in global trade. Grief (1993) documents the importance of the Maghribi traders coalition in establish trade across long distances during the 11th century. Other prominent trading companies throughout history include the Dutch East India Trading Company, large-scale Japanese trading firms (*sogo shosha*), and more recently, Li and Fung, the Hong Kong textile and apparel firm.

We verify the predictions of the model using a recently constructed database of firm-level Chinese international trade transactions. The data reveal many interesting stylized facts about Chinese intermediary firms and consequently, China's overall trade patterns. In 2005, Chinese intermediaries accounted for 22 and 18 percent of total exports and imports. Between 2000 and 2005, the number of intermediaries increased dramatically from about 9,000 to 22,000, suggesting that while the Chinese government relaxed the restrictions on direct trading right during this period (see discussion below), intermediaries still found it profitable to enter the trading market. Intermediary firms are also more likely to engage in importing and exporting and in stark contrast to direct exporters, their product mix span remarkably broad sectors. Interestingly, intermediary firms appear to have a relative "country" focus while firms that engage in direct exporting appear to have a relative "product" focus. That is, intermediary firms send relatively more products per country while direct exporters export to more countries per product. This finding is intuitive; manufacturing firms likely possess a core competent product line (Bernard, Redding and Schott, 2009), while in our model, intermediaries emerge precisely to overcome the fixed costs of market access.

The data are consistent with several predictions from the model; more distant, smaller countries, and countries that have more regulatory barriers to trade receive a larger fraction of exports through Chinese intermediaries. Intermediary firms play a relatively smaller role

in exporting to countries that have large Chinese-speaking population which is intuitive if common language represents a measure of fixed exporting costs. Finally, intermediary firms' export share increases with countries that levy higher tariffs on Chinese exports. Our point estimates imply that increasing a country's distance to China by one log point would increase the share of exports handled by intermediaries to that country by about 10 percent. Likewise, an increase in tariffs by 10 percentage points (roughly one standard deviation in our sample) is associated with a 15 percent increase in intermediary export shares.

Our theoretical and empirical findings offer another channel for why intermediaries arise in cross-border trade. Previous work has focused on the role of intermediaries in matching buyers and sellers by either reducing search costs (e.g., Rubinstein and Wolinsky 1987) or adverse selection costs by acting as gauranteers of quality (see Biglaiser (1993) and Spulber (1996)).[2] In a study of Hong Kong's entrepôt trade, consistent with the quality-sorting role of intermediaries, Feenstra and Hanson (2004) find that between 1988-1993, 53 percent of China's exports were shipped through Hong Kong, and the average markup of Hong Kong re-exports of Chinese goods was 24 percent. They find that Hong Kong intermediaries possess an informational advantage and therefore serve as well-placed brokers that aid the matching of Chinese suppliers with foreign buyers. The role of intermediaries in reducing search costs has also been explored by Rauch and Trindade (2002) who find that ethnic Chinese networks have a sizable impact on bilateral trade flows. More recent work by Blum, Claro, and Horstmann (2009) provides evidence that in the majority of importer-exporter matches between Colombian and Chilean firms, at least one firm is extremely large due to search costs. Rauch and Watson (2004) and Felbermayr and Jung (2008) focus on holdup problems that may arise between intermediaries and manufacturers. Our theoretical framework is closest to Felbermayr and Jung (2008) who also derive a sorting equilibrium with less productive firms choosing to export via intermediaries. However, their model focuses on potential holdup problems between intermediaries and manufactures and generates the prediction that intermediary shares are independent of market size, distance and variable and fixed export costs; these predictions are inconsistent with the data.

Moreover, the existing empirical work analyzing intermediary firms rely on product or industry-level data in their analysis. One exception is a Blum et al. (2009) who can observe matches between importers and exporters but do not identify if either party within the match are non-manufacturing intermediaries. Their analysis is also restricted to Chilean-Colombian trading partners. Here, we provide the first systematic evidence of the characteristics of intermediary firms and their overall importance in international trade for the third largest exporting economy, China, because we can directly observe the universe of transactions by intermediary and direct exporters. We are therefore able to analyze the

[2] A separate but related line of recent research has focused on the distribution of the gains from trade in the presence of intermediaries (Bardhan et al. (2009) and Antras and Costinot (2009)).

sources of variation in intermediary trade across products and markets.

The remaining paper is structured as follows. In section 2, we lay out the basic model and the predictions that we will very in the data. Section 3 describes the data. Section 4 presents stylized facts of intermediary firms and verifies the predictions from the model. We conclude in section 5.

2. A Model of Intermediary Firms

We introduce a heterogenous firm model that features intermediation technology. We assume that the home country has N asymmetric trading partners, and we focus on an open economy equilibrium because in autarky there is no role for intermediaries to export.[3]

Consumers in each country have identical CES preferences for differentiated varieties:

$$U = \left[\int_{\omega\in\Omega^j} q(\omega)^\rho d\omega\right]^{\frac{1}{\rho}},$$

where Ω^j is the set of total available varieties in the differentiated goods sector. The corresponding price index in each country is given by:

$$P^j = \left[\int_{\omega\in\Omega^j} p(\omega)^{1-\sigma} d\omega\right]^{\frac{1}{1-\sigma}},$$

where $\sigma = \frac{1}{1-\rho} > 1$ is the constant elasticity of substitution across varieties. Each consumer supplies one unit of labor inelastically and the home wage is set to 1. Total expenditure in each country is R^j.

The production technology assumes a continuum of firms in a monopolistically competitive market. Each firm manufactures a unit variety with constant marginal cost and a fixed per period overhead cost, f_d. Following Melitz (2003), firms are heterogeneous in productivity. The amount of labor required to produce q units for a firm with productivity level φ is

$$l = f_d + \frac{q}{\varphi}.$$

Firms enter the market by paying an entry cost, f_e, to draw their productivity from the distribution $g(\varphi)$. Conditional on its productivity draw φ, a firm has the option to exit the market. Incumbent firms face an exogenous probability of death, δ, in each period.

Conditional on remaining in the market, a firm must decide whether or not to export and additionally, its mode of export. There are two possible export modes; a firm can export its varieties to foreign markets either *directly* or *indirectly*. As in Melitz (2003), a firm that exports directly pays a per period bilateral fixed cost, f_x^j and incurs a standard

[3] We supress the subscripts for the home country for notational simplicity.

bilateral iceberg transportation costs $\tau^j > 1$. The fixed cost captures the costs of forming a distribution and service network in country j. Alternatively, a firm could incur an alternative pair of transactions costs to export its varieties indirectly using a domestic intermediary firm. We assume that the fixed costs of using this intermediation technology are lower than the exporting fixed costs, $f_i < f_x^j$, since presumably the costs of searching for a domestic firm are lower than the costs of an international search. The firm also incurs a variable cost $\gamma > 1$ to forward its varieties to the intermediary firm.

The indirect fixed and variable costs are home-country specific because they reflect the costs of finding and using an intermediary firm in the home country. One could interpret the fixed cost of intermediation (f_i) as the cost of searching and establishing a relationship with a domestic intermediary firm. One interpretation of the variable cost (γ) is that it captures intermediary firms' margins.[4]

Given our assumptions on consumer preferences and market structure, prices are a constant markup over marginal costs. A firm with productivity φ in the home market charges $p_d(\varphi) = \frac{1}{\rho\varphi}$. Firms that directly export to market j charge $p_x^j(\varphi) = \frac{\tau^j}{\rho\varphi}$. The price of varieties that are indirectly exported is $p_i^j(\varphi) = \frac{\tau^j\gamma}{\rho\varphi}$. Notice that varieties that are indirectly exported result in a double marginalization of consumers.

Firm revenues in the domestic market are given by

$$r_d(\varphi) = R^H \left(\frac{p_d(\varphi)}{P^H} \right)^{1-\sigma}, \tag{1}$$

where R^H and P^H are the home country's expenditure and price index. Additionally, if firms export, their revenues depend on their export mode. The revenues obtained from market j for indirect and direct export mode, respectively, are:

$$r_i^j(\varphi) = R^j \left(\frac{p_i^j(\varphi)}{P^j} \right)^{1-\sigma} \tag{2}$$

and

$$r_x^j(\varphi) = R^j \left(\frac{p_x^j(\varphi)}{P^j} \right)^{1-\sigma}. \tag{3}$$

The entry costs for each export mode and the revenue conditions in equation (1)-(3) yield cutoff conditions that induce sorting by firms according to their productivity. The

[4] We could have explicitly introduced symmetric intermediary firms, but this extension would yield qualitatively the same predictions as our model. In this case, the intermediaries would equally divide the total indirect export revenue. A free entry condition would determine the equilibrium number of intermediary firms. The intermediary firms would charge a markup over their price, and this markup would be analogous to the γ parameter. One could also imagine a model with heterogeneous producers matching with heterogeneous intermediaries. However, since we only observe the direct exporters and intermediary firms in our data, we chose not to introduce matching in our framework.

first cutoff (φ_d) defines the least productive firm that is active; this firm only sells to the home country and exactly offsets the fixed costs of production with its operating profits:

$$\pi_d(\varphi_d) = \frac{r_d(\varphi_d)}{\sigma} - f_d = 0. \tag{4}$$

The second cutoff (φ_i) is the marginal firm that is just indifferent between exporting indirectly its varieties to all markets.

$$\pi_i(\varphi_i) = \sigma^{-1} \sum_{j=1}^{N} R^j (\frac{\rho \varphi_i}{\tau^j \gamma} P^j)^{\sigma-1} - f_i = 0 \tag{5}$$

Equation (5) indicates that there is one cutoff in the home country that determines whether or not firms indirectly export to all markets. All firms with $\varphi > \varphi_i$ find it profitable to incur the indirect fixed cost and potentially use the intermediation technology. Once the indirect fixed cost has been paid, a firm then evaluates its net profits (operating profits less fixed direct export costs) from directly exporting to market j against the operating profits from indirectly exporting to j. If the net profits from direct export are sufficiently large, the firm chooses to export directly to market j, rather than use the intermediation technology to avoid double marginalization. Thus, if a firm directly exports to n countries, we assume that the firm finds it profitable to pay the indirect fixed cost to serve the remaining $N - n$ countries through the intermediation technology. This assumption enables us to derive a tractable expression for the total direct and indirect exports to each market. There are N cutoff conditions that determine the firms that are indifferent between direct and indirect exports to each market.

$$\pi_x(\varphi_x^j) = \frac{r_x^j(\varphi_x^j)}{\sigma} - f_x^j = \frac{r_i^j(\varphi_x^j)}{\sigma}. \tag{6}$$

The three entry margins result in a sorting of firms into export modes by productivity. Firms with $\varphi < \varphi_i$ are not productive enough to cover the fixed cost of intermediation; these firms serve only the domestic market. All firms that fall in the interval $[\varphi_i, \varphi_x^j]$ indirectly export to market j, and firms with $\varphi > \varphi_x^j$ direct serve market j. Across all destinations, firms that lie in the interval $[\varphi_i, \min\{\varphi_x^j\}]$ serve all markets using the intermediation technology only.

Combining equation (3) with (6) determines the direct export cutoff to market j:

$$\varphi_x^j = \frac{\tau^j}{\rho P^j} \left[\frac{\sigma f_x^j}{R^j \left(1 - \gamma^{1-\sigma}\right)} \right]^{\frac{1}{\sigma-1}}. \tag{7}$$

Since the indirect export cutoff, φ_i, which is implicitly defined in equation (5) is common across destination markets, we can define the ratio of indirect to direct exports to country j as:

$$\upsilon^j = \frac{\text{total indirect exports to country } j}{\text{total direct exports to country } j} = \left(\frac{Z(\varphi_i)}{Z(\varphi_x^j)} - 1 \right) \cdot \gamma^{1-\sigma}, \tag{8}$$

where $Z(a) = \int_a^\infty \varphi^{\sigma-1} g(\varphi) d\varphi$ with $Z^{'}(a) < 0$.

Proposition 1 *Assume that the home country is small and does not affect the aggregate price index P^j. All else equal, the share of exports via the intermediation technology will be larger in countries with (i) smaller market size, (ii) higher variable trade costs, or (iii) higher fixed costs of exporting.*

Proof. Differentiating equation (7), we get (i) $\partial \varphi_x^j / \partial R^j < 0$, (ii) $\partial \varphi_x^j / \partial \tau^j > 0$, and (iii) $\partial \varphi_x^j / \partial f_x^j > 0$. Since φ_i is common for all trading partners and because $Z^{'}(a) < 0$, we observe that $\partial \upsilon^j / \partial \varphi_x^j > 0$. Therefore, we conclude that (i) $\partial \upsilon^j / \partial R^j < 0$, (ii) $\partial \upsilon^j / \partial \tau^j > 0$, and (iii) $\partial \upsilon^j / \partial f_x^j > 0$. ■

The proposition states that the share of intermediary exports to market j are related to market j's characteristics.[5] We find that intermediary export shares will be larger in (i) smaller countries, (ii) countries that are geographically farther away from the home country, (iii) markets with higher tariffs, or (iv) countries with larger fixed export costs.[6] These predictions are intuitive. Unlike Helpman, Melitz and Yeaple (2004) who introduce foreign direct investment within a heterogeneous firm framework and find that the most productive firms choose this mode of "selling abroad", in our model, intermediation technology benefit the relatively less productive firms by providing access to export markets. Our model highlights that intermediaries facilitate trade because they avoid large trade costs. This provides an alternative explanation for the endogenous formation of intermediaries beyond those noted in prior work, such as adverse selection, hold up, and search costs.

Bernard et al. (2007) document that only a small fraction of U.S. firms export, a fact that has emerged across countries. Our model also demonstrates that customs-level data are likely to underestimate the fraction of firms that are globally engaged because less productive firms can use intermediary firms. For instance, Li and Fung, the large Hong-Kong based intermediary firm aggregates orders across 12,000 suppliers across the globe, including

[5] Our model is in stark constrast to the predictions by Felbermayr and Jung (2008) that the share of indirect exports is uncorrelated with any gravity-type variables. The difference occurs because our model allows domestic intermediaries to operate in multiple countries while their model uses intermediaries as importer country specific. As a result, they find that both the indirect and direct export cutoff covary with gravity variables and offsets any effect on the intermediary export share.

[6] Blum et al. (2009) predict that an increase in market size has a non-linear impact of intermediary trade and that an increase in trade costs will increase the relative share of intermediaries; our theoretical and, as shown below, empirical findings are at odds with their predictions.

China; it is likely that many of these firms would be unable to recover the fixed costs of setting up their own distribution center. Our model suggests that intermediaries become relatively more important as markets become more difficult to penetrate. The remainder of the paper will use data to verify the predictions of this model as well as generate previously unknown facts regarding the activity of intermediary firms using customs data from China.

Before turning to the data, we note that we analyze the welfare in this model with intermediaries in the appendix by assuming a symmetric, two-country, and pareto distribution. We demonstrate that there is a tradeoff in the intermediary model with varieties and efficiency. As the marginal cost of using intermediation technology (γ) declines, there is a less efficient allocation of resources because intermediation benefits firms of intermediate productivity. However, this is counterweighed against the increase in welfare because of the additional varieties that enter consumers' consumption basket.

3. Data

Our data analysis uses Chinese data that record the census of firm-level import and export transactions across products and countries.[7] Products are classified at the eight-digit HS level. We observe values and quantities for each firm-product-market transaction. The data do not contain information about domestic production or characteristics of the firms and so we cannot assign a primary industry to identify if the firm is a manufacturer or a wholesaler, distributer and/or intermediary. We therefore identify the set of intermediary firms based on Chinese characters that have the English-equivalent meaning of "importer", "exporter", and/or "trading" in the firm's name.[8] This assignment is of course imperfect, but we believe that we will underestimate the importance of intermediaries in operating in China for two reasons. First, intermediaries could have names that do not have these phrases in their names. Second, the direct exporters may rely on foreign intermediary partners in their transactions (e.g., see Feenstra and Hanson (2004)) who we cannot observe.

One issue that complicates our analysis is that the Chinese government directly controlled the set of firms with direct trading rights prior to China's entry into the WTO in December 2001. The WTO mandated that China liberalize the scope and availability of licenses so that within three years after accession, *all* enterprises would have the right to import and export all goods. At the time of the WTO entry, only wholly Chinese-invested firms with registered capital exceeding RMB 5 million could obtain direct trading rights. In

[7] Similar data has been used by Manova and Zhang (2009). One concern that inevitably arises with Chinese data is its quality. We checked the aggregate import and export values against those reported in the Comtrade data. The two datasets match remarkably well. Total exports in 2005 within the transactions data are $771.53 billion compared to $761.95 billion in Comtrade and at the HS2 level, the databases report similar values as well.

[8] Specifically, we search for Chinese characters that mean "trading" and "importer" and "exporter". In pingyin (romanized Chinese), these phrases are: "jin4chu1kou3", "jing1mao4", "mao4yi4", "ke1mao4" and "wai4jing1".

the second year after accession, the minimum capital requirement required for direct trading was RMB 3 million, and this fell to RMB 1 million by 2004. By 2005, any firm that wished to directly trade with foreign partners was free to do so. As a result of this complication, our analysis uses a single cross-section of the data in 2005 when direct trading licenses had been effectively removed.

4. Empirical Findings

4.1. Stylized Facts

We document a series of facts comparing the activity of intermediary and direct exporting firms. Table 1 reports the overall export values by firm type from 2000 to 2005. The figures illustrate China's phenomenal export growth during this period. Total exports originating from China grew 211 percent. In 2005, intermediaries accounted for 22 percent of total Chinese exports. Moreover, as discussed above, our identification of intermediaries is likely to understate the importance of intermediaries. These figures in the aggregate data alone highlight the importance of intermediary firms. We note that the table reports that the share of intermediaries in exports fell between 2000 to 2005. This fall could reflect the liberalization of the export licensing regime.

The bottom panel of Table 1 reports the total number of firms that export. This table also illustrates large increases in the number of globally engaged Chinese firms during this period. Total exporting firms more than doubled from approximately 63,000 firms in 2000 to 144,000 by 2005. Interestingly, the growth in the number of intermediary firms over this period *exceeded* the entry of direct exporters. This is suggestive evidence that despite the liberalization of direct trading rights, intermediary firms found it profitably to enter the market.[9]

Direct and intermediary firms differ along several notable and important dimensions. Intermediaries are more likely to engage in both importing and exporting relative to their counterparts that directly trade (table not shown). Table 2 reports overall firm-level summary statistics in 2005 in panel one, and statistics by firm type in panels two and three. Again, we choose this year because direct trading licenses had been abolished by this year. As is well known in transactions data, a small number of exceptionally large firms dominate trade statistics, and so we also report median statistics. Panel two shows that the median direct firm exports 3 products to 3 destination markets. In contrast, the median intermediary exports 11 products to 6 countries. In row 4, we classify HS codes into one of 16 unrelated sectors.[10] The idea is to identify a firm's *core* activity (e.g., animal products,

[9] The top panel of Table 1 reports that the intermediate share of exports declined over this period. This could reflect the liberalization of the export licensing regime discussed in Section 3.

[10] HS 01-05 "Animal and Animal Products"; HS 06-15 "Vegetable Products"; HS 16-24 "Foodstuffs"; HS 25-27 "Mineral Products"; HS 28-38 "Plastics/Rubbers"; HS 41-43 "Raw Hides, Skins, Leathers & Furs";

wood products, textiles, etc.). Not surprisingly, the median direct firm only exports products in one of these sectors. This is consistent with theoretical work in multiple-product firm models (e.g., Eckel and Neary (2009), Nocke and Yeaple (2006), or Bernard, Redding and Schott (2008)) who introduce core competencies in a model of multiple-product firms. Intermediary firms, however, handle products that span entirely unrelated sectors; the median intermediary exports products in 4 sectors.

These statistics are broadly suggestive that intermediaries have a relative "country" focus–compared to direct firms, they export more products per country. However, the final row of Table 2 reports that the average intermediary is larger than its direct exporting counterpart. It is therefore not surprising that the summary statistics indicate that traders export more products and to more destination markets. In order to verify if trading firms have a relative country focus, we need to condition on firm size. Column 1 of Table 3 report the average export varieties per country (column 1) by direct and intermediary firms, conditional on a flexible quartic polynomial in firm size (proxied by total export revenue).[11] The table shows that intermediary firms average 10.5 varieties per country compared to direct firms that export 8.3 varieties per country. In column 2, we include additional controls for ownership types and the results continue to hold–intermediary firms export more varieties per country than direct firms. These results are intuitive. Manufacturing firms are likely to possess a core competent product, while the model suggests that the role of intermediaries is to facilitate access to markets.

An alternative way of understanding how the distribution of export sales over countries and products differ across firm type is to consider the concentration of firms' export sales by products. For each firm, we compute its (normalized) herfindahl index by aggregating over the country dimension. We can then compute the firm's share of exports in each product, s_{hf}, as:

$$HI_f = \frac{\sum_{h=1}^{N_f} s_{hf}^2 - \frac{1}{N_f}}{1 - \frac{1}{N_f}}, \tag{9}$$

where N_f is the number of products that the firm exports. A higher HI implies that a firm's exports are more concentrated among its product mix. In column 3 of Table 3, we regress the HI measure on firm type controlling for a quadratic polynomial in firm size. The table indicates that intermediaries have lower herfindahls implying that their export sales are more evenly distributed across products compared to their direct exporting counterparts. The 4th column includes ownership type dummies (state-owned enterprises, private firms, and foreign invested firms) and the patterns hold. These results provide evidence that direct

HS 44-49 "Wood and Wood Products"; HS 50-63 "Textile"; HS 64-67 "Footwear/Headgear"; HS 68-71 "Stone/Glass"; HS 72-83 "Metals"; HS 84-85 "Machinery/Electrical"; HS 86-89 "Transportation"; HS 90-97 "Miscellaneous"; HS 98-99 "Service".

[11] The regression excludes the constant.

exporters, relative to intermediaries, have a relative "country" focus as their firm sales are more heavily skewed towards a concentrated number of products. Thus, intermediaries appear to be relative "specialists" of countries rather than products.

What types of products require intermediation? Figure 1 plots a histogram of the share of intermediary exports across the 5,034 HS6 codes. The histogram shows that virtually that intermediaries export virtually all products; thus, the overall numbers in Table 1 are not driven by certain sectors. The average intermediary share is 32.8% and only 6 percent of the HS6, or 302 codes, report intermediary shares of less than 1%. The two-digit HS sectors with the largest share of intermediary exports are: tobacco (HS 24, 99%), cereal (HS 10, 65%), ores (HS 26, 64%), live animals (HS 1, 63%) and explosives (HS 36, 56%). The five smallest are railway locomotives (HS 86, 3%), nickel (HS 75, 4%), nuclear reactors (HS 84, 9%) electrical machinery (HS 85, 9%) and semi-precious stones (HS 71, 11%). In Table 4, we correlate HS6 shares of intermediary exports with measures of product differentiation. Column 1 reports the correlation with the coefficient of price variation. The result shows that products that are more homogenous tend to have larger intermediary shares. The point estimates imply that increasing the coefficient of variation by one standard deviation lowers intermediary share by about 1.9 percentage points, or about 6 percent from the average share. In column 2, we report the correlation with the quality ladders proposed by Khandelwal (*forthcoming*), and while the result is not statistically significant, the correlation is consistent with column 1. Both measures suggest that intermediaries are more likely to handle relatively more homogenous, or "commoditized" products.

Our model predicts that the exports by intermediaries will be more expensive than direct exporters. This is because intermediation results in double marginalization and because firms with relatively higher unit costs endogenously select the intermediation technology. We use use the unit value information in the data to provide some evidence that the data are consistent with these predictions. Table 5 compares unit values between firm types. In this table, we regress (log) unit values on an intermediary dummy and country-HS8 product-ownership pair fixed effects. We include ownership type in the fixed effect because of evidence that foreign firms charge higher prices relative to domestic firms (Wang and Wei, 2008). Consistent with the model, column 1 indicates that exports by intermediaries are about 3.6 percent higher than direct exporters. This estimate is likely to contain information on both the markup and the fact that intermediaries are predicted to handle products from less efficient producers. While our model does not features heterogenous intermediary firms, in column 2, we control for firm which lowers the coefficient to 2.5 percent. If one views the firm size polynomials as controlling for the efficiency of firms, the estimate in column 2 could be a better measure of the average markup, although admittedly, this is quite crude. Nevertheless, the fact that intermediaries have higher unit values is consistent with the model's prediction. We note that this finding also contrasts with the predictions of the

model in Blum et al (2009) which does not imply double marginalization because the costs of using intermediation technology are all fixed. However, if unit values are a proxy for quality, this finding could also be consistent with the quality-sorting role of intermediary firms. For instance, Feenstra and Hanson (2004) have shown that re-exports of Chinese products by Hong Kong intermediaries have higher markups. In order to check against this alternative hypothesis, we interact the trader dummy with a product characteristics–the coefficient of price variation or the quality ladder measure from Khandelwal (forthcoming)–that captures heterogeneity in the scope for quality differentiation. If intermediaries mitigate adverse selection problems by acting as gauranteers of quality, we might expect their relative prices to increase in the scope for quality differentiation. However, as shown in columns 3 and 4, the interaction coefficient is not statistically different from zero. That is, the relative price difference between intermediary and direct exporters is statistically equivalent across products that span a broad range of product heterogeneity. The findings suggest that quality sorting may not be the dominant role among Chinese intermediaries. In the next section, we offer evidence that consistent with our model, Chinese intermediaries arise because of trade costs.

4.2. Facilitating Trade

Figures 2 and 3 plot overall intermediary shares by destination market against the market's characteristics. Figure 2 shows a negative relationship between intermediary export shares and the destination's market 2005 GDP; exports to smaller markets are more likely to be handled by intermediaries. In Figure 3, we average the share of intermediary exports by the number of documents required by the country's customs authorities (obtained from the World Bank's Doing Business Report). While admittedly crude, this variable, also used by Helpman, Melitz and Rubinstein (2008), potentially captures the fixed costs of exporting to a market. We see a strong positive relationship between intermediary export shares and the fixed cost of exports. The relationship in both figures are consistent with predictions from the model.

In Table 6, we more formally examine the main predictions of the model: the share of intermediary exports are increasing in the fixed and variable costs of exporting to markets. We construct the share of intermediary exports in country-HS6 observations and correlate the sahres with gravity-type proxies for trade costs. We use the following regression model

$$s_{ch} = \alpha + X'_{ch}\beta + \varepsilon_{ch} \tag{10}$$

where s_{ch} is the share of intermediary exports from China to country c in HS6 code h and the X's contain proxies for trade costs. In column 1, we regress country-HS6 intermediary share of exports on the distance to the country and the country's GDP. The coefficient on distance is positive, a variable cost, and the coefficient on GDP, a measure of market

size, is negative. This is intuitive and accords with the model's predictions. Countries that are smaller and more distant rely relatively more on intermediaries for their imports from China. The results imply that doubling distance to China increases intermediary shares by 3.2 percentage points. Doubling market size results in a 2.2 percentage point decline in intermediary export shares. To get a sense of the magnitudes, the average HS6-level intermediary share is about 30 percent; thus, doubling distance to China increases intermediary shares to that country by about 10 percent. In column 2, we include the fraction of ethnic Chinese population with the country and find that intermediaries export relatively more to countries with fewer ethnic Chinese populations, although the coefficient is not significant at conventional levels.[12] This finding is also intuitive: Chinese firms will find it easier to export directly to countries with larger Chinese populations. This finding is related to Rauch and Trindade (2004) who show that bilateral trade flows are larger among countries with larger ethnic Chinese populations. Here, the results indicate that the share of exports through intermediaries is smaller in these countries. Presumably trade costs, which also encompass information barriers, are smaller between China and countries with a large number Chinese emigrants.

In column 3, we include the proxy for the fixed costs. The coefficient on this variable is positive and statistically significant suggesting that more difficult to export markets are handled by relatively larger shares of intermediaries. The coefficients on market size and distance are also robust.

While our theoretical model provides an explanation for the endogenous entry of intermediary firms, there may be other explainations for why intermediary firms arise in equilibrium. For instance, if trade credit is scarce, intermediaries may export on behalf of financially constrained firms. However, the results in Table 6 include HS6 fixed effects and therefore control for product-level heterogeneity, such as differences in financing requirements. Thus, our results suggest that market characteristics are salient determinants of intermediary export shares.

In column 4, we add the country's HS6-level MFN tariff rates as an additional variable cost proxy. According to the model, higher trade costs reduce the likelihood that less productive firms can cover the fixed costs of exporting and therefore will indirectly export products. The correlation between intermediary shares and tariffs is positive indicating that intermediaries are more important in country-product pairs with higher tariffs. The magnitudes indicate that an 10 percentage point increase in tariffs (roughly one standard deviation in our sample), holding other variables constant, would increase intermediary shares by .59 percentage points.

Our baseline results in Table 6 are consistent with the predictions from the model. We

[12] Shares of ethnic Chinese populations are obtained from Ohio University's Shao Center Distribution of the Ethnic Chinese Population Around the World (http://cicdatabank.library.ohiou.edu/opac/population.php)

now assess the sensitivity of the results through a series of robustness checks in Table 7. In column 1, we include country fixed effects in the baseline regression. This specification is therefore an extremely flexible specification that controls for all country characteristic that were previously excluded in the baseline regressions, such as rule of law, level of financial development, etc. The regression identifies the coefficient on tariffs using only cross-product variation within a country. Consistent with the predictions from the model, the coefficient on tariffs remains positive and marginally significant (p-value is 11%), although not surprisingly, the magnitude attenuates.

Research on the nature of China's trade with Hong Kong has revealed that a large fraction of Hong Kong's exports originate from China, and these Hong Kong exporters are often intermediaries (Feenstra and Hanson, 2004). So for Hong Kong in particular our classification of intermediary trade may be imprecise. Moreoever, Fisman, Moustakerski and Wei (2008) present evidence that Hong Kong intermediaries that re-export Chinese are often used to evade tariffs, and that tariff evasion increases with tariff rates. Thus, we may observe a correlation between tariff rates and intermediary exports due to the incentive to evade tariffs. For these reasons, we introduce a sensitivity check that drops all exports to Hong Kong in column 2 of Table 7. The results continue to hold.

In column 3, we remove exports transactions of state-owned enterprises (SOEs). We exclude SOEs because the objective function of these firms may not be consistent with the model's assumptions. The magnitude on distance attenuates somewhat but the qualitative estimate remains similar to the previous columns. The correlations with the other country characteristics remain statistically signficicant and have the same sign as earlier. Thus, these sensitivity checks are consistent with the view that intermediaries handle a relatively larger share of exports in more "difficult-to-access" markets.

Finally, in column 4, we remove shipments that are classified as processing and/or assembly trade. We remove these transactions because the fixed and variable trade costs for these shipments are likely to differ from ordinary exports. The coefficients and patterns of signs remain as before.

Overall, the results identify stylized facts of intermediaries. First, although intermediaries span wide variety of products, conditional on size, intermediaries appear to adopt a relative country focus by having exports concentrated relatively within countries than within products. Second, intermediaries export varieties with higher unit values which is suggestive of the quality-sorting role of intermediaries. Finally, the aggregate shares indicate that intermediaries are more likely to export to "tougher" to access markets, where toughness is captured by measures fixed and variable costs. These results are consistent with the transaction costs role of intermediaries developed in the model.

5. Conclusion

This paper presents the first evidence of the role of intermediary firms in facilitating trade across the full spectrum of exporting firms in China. We find that non-manufacturing mediate a substantial fraction of firm trade; in 2005, they mediated about 20% of China's aggregate trade. Intermediaries appear to adopt a relative country focus by having exports concentrated relatively within countries than within products. This "country" specialization is reflected in aggregate statistics which suggest that intermediaries are more likely to export to "tougher" to access markets.

This paper demonstrates that further research on intermediary exporting and importing firms is warranted for several reasons. First, the recent literature on firm heterogeneity within international trade has largely ignored the role of intermediaries. From a welfare perspective, the introduction of intermediaries within heterogenous firm models can potentially alter the compositions of the gains from trade by placing a larger emphasis on varieties. Moreover, our model predicts that small firms endogenously choose to export via intermediaries; this implies that small firms can, and do, access foreign markets even though they are unable to cover the fixed costs of direct exporting. Thus, one implication of the model is that firms can benefit from importing products even if they do not directly import products. The presence of intermediaries implies that analyzing firm-level imports may understate the benefits from importing that arise at the sector-level because of intermediaries (see Goldberg et al. 2009).

Intermediaries could therefore serve as vehicles for small firms to learn their potential in foreign markets, either by learning about their own productivity, or about foreign demand. In subsequent periods, this may enable them to select directly in to the export market. Thus, the matching of firms to intermediaries may be important for understanding the growth of the extensive margin of trade. It could also explain why countries enact policies to encourage the formation of intermediaries (e.g., Japan and the U.S.). We believe that the model presented in this paper, as well as the new stylized facts, could be useful to further research on intermediaries.

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A. Welfare Analysis: Two Country Case

In this section, we use a symmetric two-country model to investigate welfare in the presence of intermediation. In this two country model, we can re-write the indifference conditions that define the cutoffs as

$$\pi_d(\varphi_d) = \frac{r_d(\varphi_d)}{\sigma} - f_d = 0. \tag{11}$$

$$\pi_i(\varphi_i) = \sigma^{-1} R^F (\frac{\rho\varphi_i}{\tau\gamma} P^F)^{\sigma-1} - f_i = 0 \tag{12}$$

$$\pi_x(\varphi_x) = \frac{r_x^F(\varphi_x)}{\sigma} - f_x = \pi_i(\varphi_i), \tag{13}$$

where F denotes the foreign market. In this case, we obtian a strict sorting condition with firms that lie in the interval $[\varphi_d, \varphi_i)$ serve only the domestic market, firms in $[\varphi_i, \varphi_x)$ incur the indirect fixed cost and use the intermediation technology and firms with $\varphi > \varphi_x$ directly export to the foreign market. We can explictly derive expressions for the cutoff productivities:

$$\varphi_d = \frac{(\sigma f_d)^{\frac{1}{\sigma-1}}}{\rho P^H R^{H\,\frac{1}{\sigma-1}}} \tag{14}$$

$$\varphi_i = \left(\frac{f_i}{f_d}\right)^{\frac{1}{\sigma-1}} \tau\gamma\varphi_d^* \tag{15}$$

$$\begin{aligned} \varphi_x &= \left(\frac{f_x - f_i}{f_d}\right)^{\frac{1}{\sigma-1}} \tau(1-\gamma^{1-\sigma})^{\frac{1}{1-\sigma}} \varphi_d \\ &= \left(\frac{f_x - f_i}{f_i}\right)^{\frac{1}{\sigma-1}} (\gamma^{\sigma-1} - 1)^{\frac{1}{1-\sigma}} \varphi_i \end{aligned} \tag{16}$$

We impose that $f_x > \gamma^{\sigma-1} f_i$ so that more productive firms choose to export directly their varieties.

The free entry condition requires that the present value of expected profit from entry must be equal to the entry cost, f_e:

$$V_j = \frac{[1 - G(\varphi_d)]}{\delta} \cdot \overline{\pi}_d + \chi_i \overline{\pi_i} + \chi_x \overline{\pi_x} = [1 - G(\varphi_d)] \cdot \frac{\overline{\pi}}{\delta} = f_e \ , \tag{17}$$

where $\overline{\pi}_d$ is the average profit across firms from domestic market, $\overline{\pi}_i$ is the average profit from indirect exporting, and $\overline{\pi}_x$ is the average profit from direct exporting. χ_i is the probability of indirect exporting, conditional on successful entry, and χ_x is the probability of direct exporting, conditional on successful entry. It then follows that $\frac{\overline{\pi}}{\delta}$ denotes the present value

of average expected profit of firms conditional on successful entry, while $1 - G(\varphi_d)$ is the probability of successful entry. In equilibrium, the goods market must be cleared in each country so that total expenditure is equal to total (domestic and foreign) firm revenue. The assumption that countries are symmetric implies:

$$M\left[r_d(\widetilde{\varphi}_d) + \chi_i r_i(\widetilde{\varphi}_i) + \chi_x r_x(\widetilde{\varphi}_x)\right] = R, \tag{18}$$

where M denotes the number of firms in each country. The tilde denotes weighted averages of firm productivities [13] and $r(\widetilde{\varphi})$ denotes the average revenue of firms within each group.

We define our welfare measure to be the country's real wage. When the nominal wage level is equalized across countries and normalized to one, the inverse of the price level is equivalent to real wage. The welfare level is then written from equation (14) as :

$$W = P^{-1} = \left[\left(\frac{R}{\sigma f}\right)^{\frac{1}{1-\sigma}} \frac{1}{\rho}\frac{1}{\varphi_d}\right]^{-1} \tag{19}$$

The expression for welfare in this model is identical to the welfare expression in Melitz (2003). The only difference is that the domestic cutoff level φ_d in the intermediary model now also depends on γ. To evaluate the welfare impact of intermediaries, we simply need to compare the equilibrium domestic cutoff productivity level in our model to the cutoff in Melitz (2003). We first rewrite free entry condition in equation (17) as:

$$f_e = \frac{f_d}{\delta}K(\varphi_d) + \frac{f_x}{\delta}K(\varphi_x) + \frac{f_i}{\delta}\left(K(\varphi_i) - K(\varphi_x)\right) \tag{20}$$

where $K(a) = \displaystyle\int_a^\infty \left[\left(\tfrac{\varphi}{a}\right)^{\sigma-1} - 1\right] g(\varphi)d\varphi$ is a decreasing function. Equations (20) and (16) jointly determine the the equilibrium domestic cutoff level. These two curves are illustrated in Figure 4 which shows that the free entry condition curve shifts upward and the cutoff condition curve rotates leftward in an economy with intermediaries (denoted by INT) compared to the Melitz economy (MTZ).[14] The figure shows that the export cutoff in the intermediary economy is always higher than in Melitz (2003), but difference between the domestic cutoffs is ambiguous. It is therefore difficult to predict the welfare impact of an economy with intertermediation technology in the general case. The presence of intermediaries generates a tradeoff between efficiency loss in resource reallocation and variety gains;

[13] Specifically, we define the weighted average productivities as $\widetilde{\varphi}_d = \left[\frac{1}{1-G(\varphi_d)}\int_{\varphi_d}^\infty \varphi^{\sigma-1}\cdot g(\varphi)d\varphi\right]^{\frac{1}{\sigma-1}}$ for all domestic varieties, $\widetilde{\varphi}_i = \left[\frac{1}{G(\varphi_x)-G(\varphi_i)}\int_{\varphi_i}^{\varphi_x} \varphi^{\sigma-1}\cdot g(\varphi)d\varphi\right]^{\frac{1}{\sigma-1}}$ for indirectly exported varieties, and $\widetilde{\varphi}_x = \left[\frac{1}{1-G(\varphi_x)}\int_{\varphi_x}^\infty \varphi^{\sigma-1}\cdot g(\varphi)d\varphi\right]^{\frac{1}{\sigma-1}}$ for directly exported varieties.

[14] Free entry condition and cutoff condition in the Melitz (2003) model are given by $f_e = \frac{f_d}{\delta}K(\varphi_d) + \frac{f_x}{\delta}K(\varphi_x)$ and $\varphi_x = \left(\frac{f_X}{f_d}\right)^{\frac{1}{\sigma-1}}\tau\varphi_x$, respectively. See Demidova (2008).

intermediaries enable less productive firms to access foreign markets, resulting in gains from variety, but this leads to a less efficient allocation of resources across manufacturers.

In the case that productivity is distributed Pareto, we can unambiguously compare the two models. We assume $G(\varphi) = 1 - \left(\frac{b}{\varphi}\right)^k$, where $k > \sigma - 1$, and the density function is given by $g(\varphi) = kb^k\varphi^{-k-1}$. Under this assumption, the equilibrium domestic cutoff level is obtained from free entry condition in equation (20) and the cutoff conditions, equation (15) and (16). Since

$$\int_a^\infty \left[\left(\frac{\varphi}{a}\right)^{\sigma-1} - 1\right] g(\varphi)d\varphi = \frac{(\sigma-1)b^k}{k-\sigma+1}a^{-k},$$

free entry condition becomes:

$$\begin{aligned} f_e &= \frac{f_d}{\delta}\frac{(\sigma-1)b^k}{k-\sigma+1}\varphi_d^{-k} + \frac{f_i}{\delta}\frac{(\sigma-1)b^k}{k-\sigma+1}\varphi_i^{-k} + \frac{f_x-f_i}{\delta}\frac{(\sigma-1)b^k}{k-\sigma+1}\varphi_x^{-k} \\ &= \frac{f_d}{\delta}\frac{(\sigma-1)b^k}{k-\sigma+1}\varphi_d^{-k}\left[1 + \left(\frac{f_i}{f_d}\right)^{\frac{-k+\sigma-1}{\sigma-1}}\tau^{-k}\gamma^{-k} + \left(\frac{f_x-f_i}{f_d}\right)^{\frac{-k+\sigma-1}{\sigma-1}}\tau^{-k}(1-\gamma^{1-\sigma})^{-\frac{k}{1-\sigma}}\right] \end{aligned}$$

which yields the equilibrium domestic cutoff productivity level:

$$\varphi_d = D \cdot \left[\begin{array}{c} 1 + \left(\frac{f_i}{f_d}\right)^{\frac{-k+\sigma-1}{\sigma-1}}\tau^{-k}\gamma^{-k} \\ + \left(\frac{f_x-f_i}{f_d}\right)^{\frac{-k+\sigma-1}{\sigma-1}}\tau^{-k}(1-\gamma^{1-\sigma})^{-\frac{k}{1-\sigma}} \end{array}\right]^{\frac{1}{k}}, \tag{21}$$

where $D = \left[\frac{(\sigma-1)b^k}{k-\sigma+1}\frac{f_d}{\delta}\frac{1}{f_e}\right]^{\frac{1}{k}}$. Therefore, welfare comparison between two models reduces to:

$$\begin{aligned} \varphi_d^{MTZ} &\lesseqgtr \varphi_d^{INT} \\ &\iff \overbrace{f_x^{\frac{-k+\sigma-1}{\sigma-1}}}^{E} \lesseqgtr \left[\overbrace{f_i^{\frac{-k+\sigma-1}{\sigma-1}}\gamma^{-k}}^{F} + \overbrace{(f_x-f_i)^{\frac{-k+\sigma-1}{\sigma-1}}\cdot(1-\gamma^{1-\sigma})^{-\frac{k}{1-\sigma}}}^{G}\right] \end{aligned} \tag{22}$$

because the domestic cutoff level in standard Melitz model (φ_d^{MTZ}) is:[15]

$$\varphi_d^{MTZ} = D \cdot \left[1 + \left(\frac{f_x}{f_d}\right)^{\frac{-k+\sigma-1}{\sigma-1}}\tau^{-k}\right]^{\frac{1}{k}}. \tag{23}$$

When $\gamma = (f_x/f_i)^{\frac{1}{\sigma-1}}$ such that $\varphi_x = \varphi_i$, no firms choose to export indirectly and the model collapses to standard Melitz model. As γ decreases from this level, the term F increases

[15] See Baldwin and Forslid (2006).

$(\frac{\partial F}{\partial \gamma} = -k\gamma^{-k-1} f_i^{\frac{-k+\sigma-1}{\sigma-1}} < 0)$ while the term G decreases $(\frac{\partial G}{\partial \gamma} = k\,(f_x - f_i)^{\frac{-k+\sigma-1}{\sigma-1}}\,(1 - \gamma^{1-\sigma})^{\frac{k-\sigma+1}{\sigma-1}}\gamma^{-\sigma} > 0)$. Since $f_x > \gamma^{\sigma-1} f_i$,we can establish the inequality $(f_x - f_i)^{\frac{-k+\sigma-1}{\sigma-1}}\,(1 - \gamma^{1-\sigma})^{\frac{k-\sigma+1}{\sigma-1}}\gamma^{-\sigma} < f_i^{\frac{-k+\sigma-1}{\sigma-1}}(\gamma^{\sigma-1} - 1)^{\frac{k-\sigma+1}{\sigma-1}}(1 - \gamma^{1-\sigma})^{\frac{k-\sigma+1}{\sigma-1}}\gamma^{-\sigma} = \gamma^{-k-1} f_i^{\frac{-k+\sigma-1}{\sigma-1}}$ and so changes in F term dominate changes in G term. In other words, as γ decreases, φ_d^{INT} becomes greater than φ_d^{MTZ}, implying that the presence of intermediaries brings welfare improvement to the economy.

Tables

Export Values and Firms

Year	Total Value ($ million)	Direct Export Value	Intermediary Export Value	Intermediary Value Share
	(1)	(2)	(3)	(9)
2000	249,234	163,047	86,187	35%
2001	290,606	198,003	92,603	32%
2002	325,632	230,740	94,892	29%
2003	438,473	323,541	114,931	26%
2004	593,647	450,813	142,835	24%
2005	776,739	608,926	167,813	22%

	Total Firms	Direct Exporting Firms	Intermediary Firms	Intermediary Firm Share
2000	62,768	53,759	9,009	14%
2001	68,487	58,672	9,815	14%
2002	78,612	67,750	10,862	14%
2003	95,688	81,724	13,964	15%
2004	120,590	100,172	20,418	17%
2005	144,027	121,928	22,099	15%

Notes: Table reports summary statistics from China's export transactions data. The values in the top panel are in millions of U.S. dollars. The bottom panel reports counts of the number of exporting firms. See text for definition of intermediary firms. Source: Authors' calculations from the China's transactions data.

Table 1: Total Export Values and Firms, 2000-2005

Firm-Level Summary Statistics

Export Data						
	All Firms (1)		Direct Firms (2)		Intermediary Firms (3)	
	Mean	Median	Mean	Median	Mean	Median
Firms	144,027		121,928		22,099	
Products	15.9	4	10.6	3	45.3	11
Countries	8.0	3	6.9	3	14.3	6
Sectors[a]	2.55	1	2.11	1	4.98	4
Total Export Value ($)	5,393,010	572,964	4,994,145	519,890	7,593,688	994,082

Notes: Table reports export statistics for 2005. [a]Sectors are classified as follows: HS 01-05 "Animal and Animal Products"; HS 06-15 "Vegetable Products"; HS 16-24 "Foodstuffs"; HS 25-27 "Mineral Products"; HS 28-38 "Plastics/Rubbers"; HS 41-43 "Raw Hides, Skins, Leathers & Furs"; HS 44-49 "Wood and Wood Products"; HS 50-63 "Textile"; HS 64-67 "Footwear/Headgear"; HS 68-71 "Stone/Glass"; HS 72-83 "Metals"; HS 84-85 "Machinery/Electrical"; HS 86-89 "Transportation"; HS 90-97 "Miscellaneous"; HS 98-99 "Service". Source: Authors' calculations from Chinese transactions data.

Table 2: Firm-Level Summary Statistics for Exporting Firms, 2005

Margins, by Firm Type

Firm Type	Varieties per Country	Varieties per Country	Product Herfindahl	Product Herfindahl
Direct Firms	8.34	10.03	0.48	0.44
Intermediary Firms	10.56	11.98	0.28	0.27
Quartic Firm-size controls	yes	yes	yes	yes
Ownership FEs	no	yes	no	yes
Adjusted R-squared	0.24	0.24	0.73	0.73
Observations	144,027	144,027	144,027	144,027

Notes: Column 1 regresses the firm-level products per country on firm type and a quartic polynomial of firm-size controls. Column 2 includes ownership dummies. The dependent variable in Column 3 and 4 regress firm's herfindahl index computed over products. All coefficients are statistically significant at the 1 percent level and so standard errors have been supressed.

Table 3: Margins, by Firm Type

Intermediary Share of Exports and Product Characteristics

	Intermediary Share of Exports	Intermediary Share of Exports
{Coefficient of Price Variation}	-0.003 ***	
	0.001	
$\{\text{Quality Ladder}\}_h$		-0.006
		0.004
Observations	5,034	3,254

Notes: Table regresses intermediary share of exports at the HS6 level on the HS6 coefficient of price variation (column 1) and the HS6-level quality ladder (column 2) taken from Khandelwal *(forthcoming)* . The loss of observations in column 2 is due to the fact that the quality ladder is not available for all HS6 codes. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 4: Intermediary Share of Exports and Product Characteristics

Unit Value Differentials				
$\{Intermediary\}_f$	0.036 ***	0.023 ***	0.025 ***	0.021 **
	0.005	0.004	0.006	0.010
$\{Intermediary\}_f$ X $\{Coef.\ of\ Variation\}_h$			0.000	
			0.002	
$\{Intermediary\}_f$ X $\{Quality\ Ladder\}_h$				0.000
				0.006
Non-parametric firm-size controls	no	yes	yes	yes
Country-HS8 Product-Ownership FEs	yes	yes	yes	yes
Adjusted R-squared	0.818	0.819		
Observations	4,594,598	4,594,598	3,914,954	3,697,495

Notes: Table regresses firms' (f) log unit values by country-product (cp) on intermediary dummy and controls in 2005. All regressions include country-HS product-ownership fixed effects. Standard errors are clustered by product. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 5: Unit Value Differentials

Intermediary Export Share and Country Characteristics

	(1)	(2)	(3)	(4)
{Log Distance}$_c$	0.032 ***	0.026 ***	0.028 ***	0.025 ***
	0.008	0.007	0.007	0.008
{Log GDP}$_c$	-0.022 ***	-0.021 ***	-0.021 ***	-0.019 ***
	0.002	0.002	0.003	0.003
{Log Chinese Population}$_c$		-0.002 *	-0.003 *	-0.004 ***
		0.001	0.001	0.001
{# of Importing Procs}$_c$			0.003 **	0.003 ***
			0.001	0.001
{MFN Tariff}$_{hc}$				0.059 **
				0.022
HS6 FEs	yes	yes	yes	yes
Adjusted R-squared	0.13	0.14	0.15	0.15
Observations	267,201	221,373	207,594	185,975

Notes: The dependent variable in each regression is the share of intermediary exports of total country-HS6 exports. Column 1 includes distance and market size as covariates. Column 2 adds the share of ethnic Chinese population, taken from Ohio University Shao Center's Distribution of the Ethnic Chinese Population Around the World. Column 3 includes the World Bank's Doing Business Report measure of the number of procedures required for importing a container. Column 4 includes the country's HS6 MFN tariff on Chinese products, obtained from WITS. All standard errors clustered at the country level. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 6: Intermediary Shares and Country Characteristics

Intermediary Export Share and Country Characteristics

	(1)	(2)	(3)	(4)
{Log Distance}$_c$		0.020 ***	0.012	-0.026 **
		0.008	0.009	0.012
{Log GDP}$_c$		-0.020 ***	-0.024 ***	0.020 ***
		0.003	0.003	0.003
{Log Chinese Population}$_c$		-0.003 **	-0.003 **	0.005 ***
		0.001	0.001	0.002
{# of Importing Procs}$_c$		0.003 ***	0.004 **	-0.004 ***
		0.001	0.002	0.001
{MFN Tariff}$_{hc}$	0.024	0.046 **	0.078 ***	-0.120 ***
	0.015	0.019	0.023	0.029
HS6 FEs	yes	yes	yes	yes
Country FEs	yes	no	no	no
Adjusted R-squared	0.15	0.15	0.15	0.40
Observations	223,282	181,612	163,044	185,975

Notes: The dependent variable in each regression is the share of intermediary exports of total country-HS6 exports. Column 2 excludes exports to Hong Kong. Column 3 excludes exports by state-owned enterprises and re-computes intermediary shares of country-HS6 exports. Column 4 removes all exports classified under processing and assembly trade and re-computes intermediary sahres of country-HS6 exports. All standard errors clustered at the country level. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 7: Robustness Checks

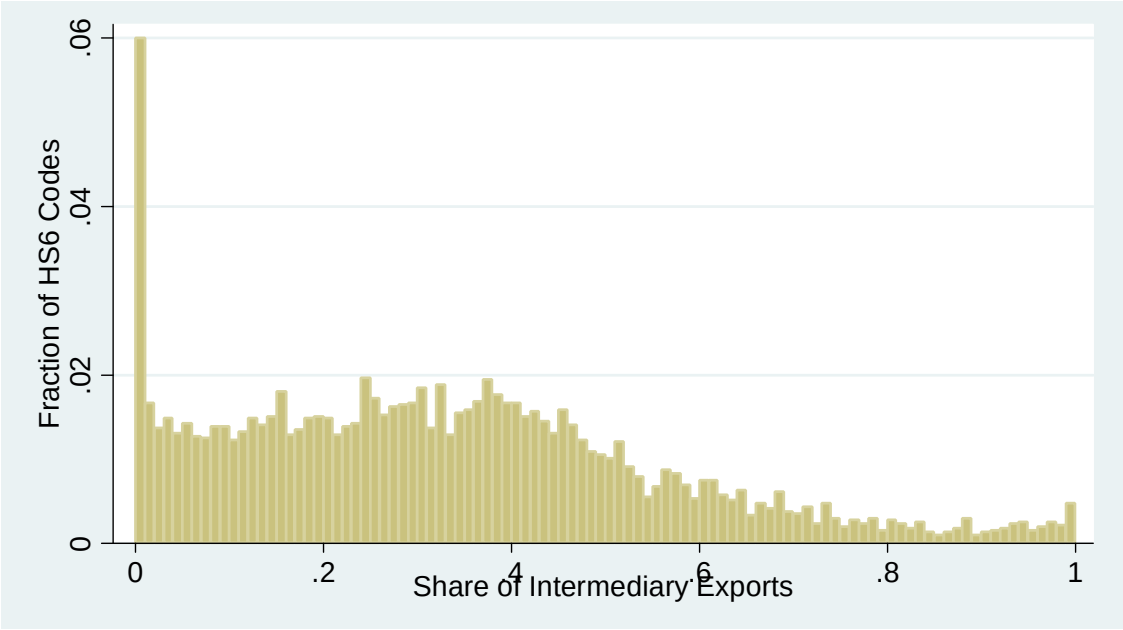


Figure 1: Distribution of Intermediary Export Shares, HS6 level

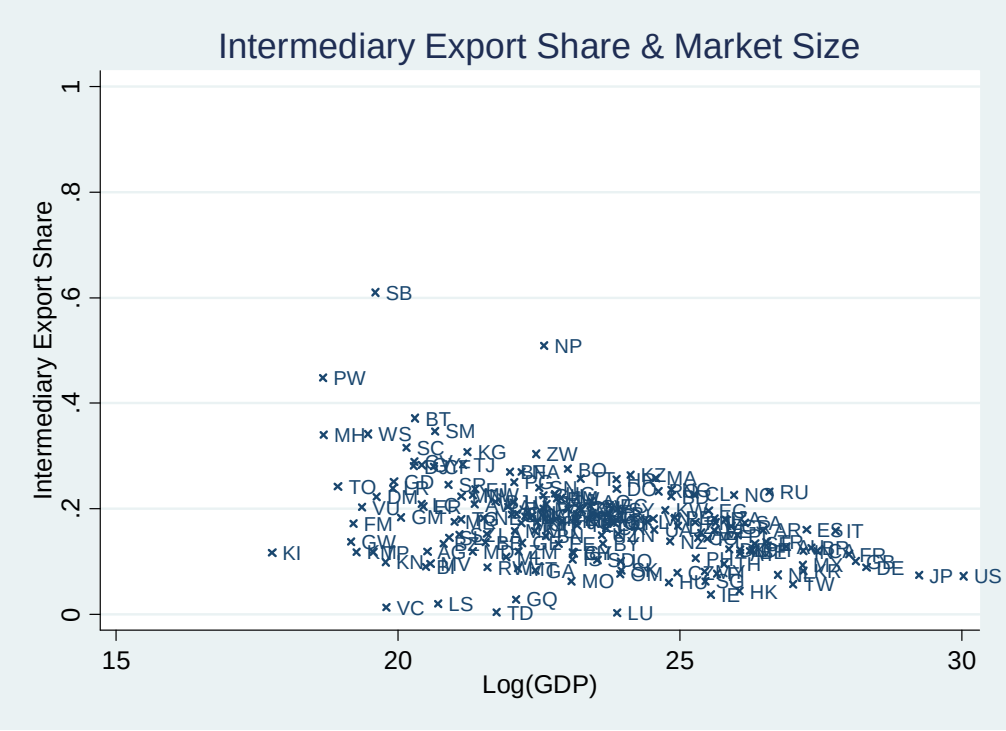


Figure 2: Intermediary export share and market size

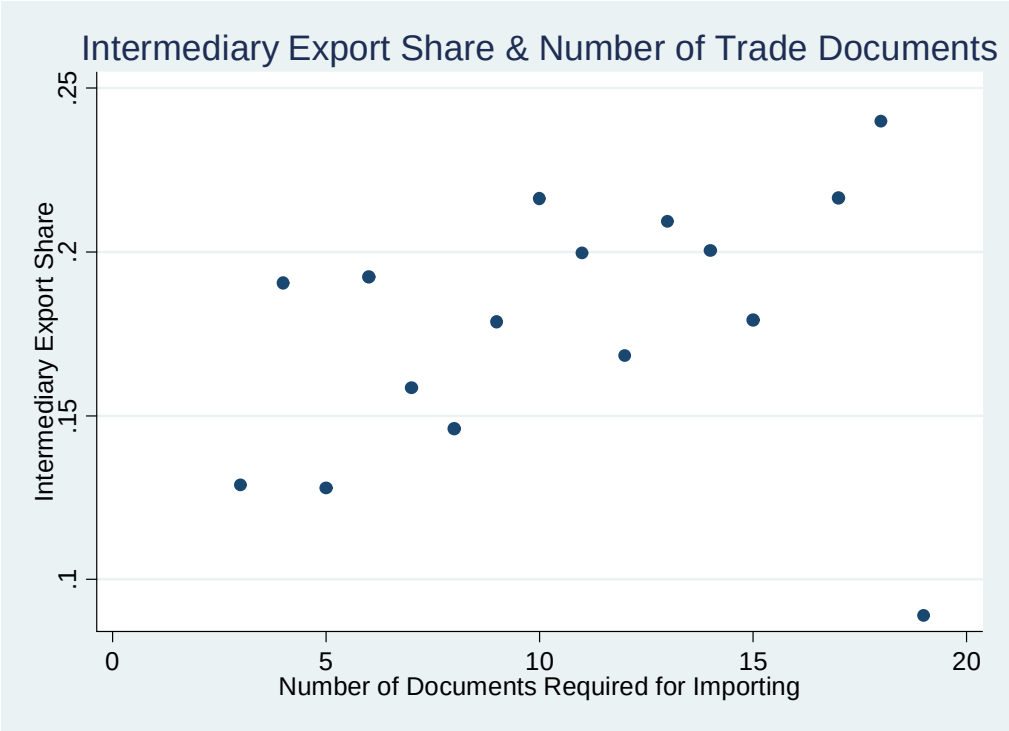


Figure 3: Average intermediary export share by number of documents required for importing

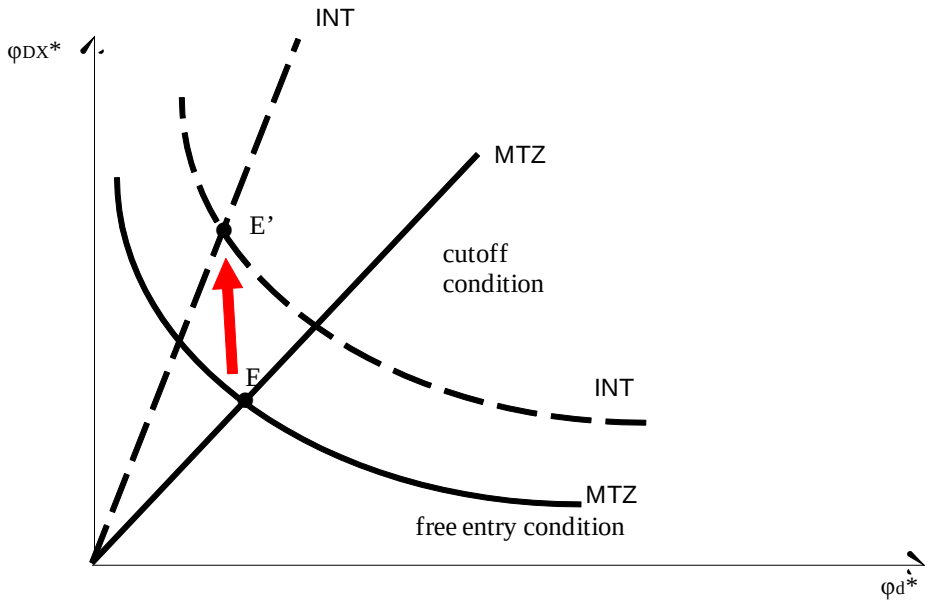


Figure 4: Welfare in the intermediary model and Melitz (2003)