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ABSTRACT

We provide systematic evidence that intermediaries play an important role in facilitating trade using a firm-level the census of China's exports. Intermediaries account for around 20% of China's exports in 2005. This implies that many firms engage in trade without directly exporting products. We modify a heterogeneous firm model so that firms endogenously select their mode of export - either directly or indirectly through an intermediary. The model predicts that intermediaries will be relatively more important in markets that are more difficult to penetrate. We provide empirical confirmation for this prediction, and generate new facts regarding the activity of intermediaries.

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1. Introduction

Research using firm-level data has uncovered that only a fraction of firms export products to foreign markets (Bernard, Jensen, and Schott 2009). This fact is now well-grounded in theoretical models featuring firm heterogeneity and fixed export costs (e.g., Melitz 2003). These empirical and theoretical findings, however, do not account for the activity of intermediary firms. The prominence of intermediaries appears in aggregate trade statistics; in the U.S., wholesale and retail firms account for approximately 11 and 24 percent of exports and imports (Bernard, Jensen, Redding and Schott 2009), respectively.[1] The use of intermediary firms has been especially 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). Li and Fung, the 100 year old trading company, is a prominent example of an intermediary firm that connects clients with thousands of apparel suppliers in low-wage countries. In China today, the setting of our study, 22 and 18 percent of total Chinese exports and imports, respectively, are handled by Chinese intermediaries.

The importance of intermediary firms in facilitating trade across borders indicates that existing models, and empirical works should account for intermediary activity in order to provide a more complete portrait of a country's imports and exports. In this paper, we introduce intermediation technology within an otherwise standard heterogenous firm model of international trade and document their importance using Chinese data that record all international transactions at the firm level. We demonstrate that intermediaries play an important role in facilitating trade and their behavior can be rationalized through a simple and straightfoward extension of the basic heterogenous firm model of international trade

In the model, and as in Melitz (2003), firms can directly export to foreign markets by 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 additionally allow for 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. Analogous to Helpman, Melitz and Yeaple (2006), this new entry margin creates a third type of firm: an *indirect* exporter. However, unlike in Helpman et al. (2006), the intermediation technology here benefits *less* productive firms. The presence of intermediation technology provides a mechanism by which firms can access the export market even if they are not quite productive enough to establish their own distribution network.

This simple extension has important aggregate predictions. The model predicts that the share of exports handled by intermediary firms increases with variable and fixed costs of

[1] The estimates are conservative since a large fraction of U.S. trade is done by firms with employment in both production and wholesale/retail (see Bernard et al. 2009).

exporting and decreases with market size. 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 large, a larger fraction of less-productive (e.g., small) firms use intermediaries to export. The share of aggregate exports handled by intermediaries therefore increases with the difficulty of accessing destination markets. 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 highlights a particular mechanism–trade costs–that influences firms' decisions to use intermediary firms.

We verify the predictions of the model using a recently constructed database of firm-level international trade transactions from China. The data reveal several stylized facts about the behavior of 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. Intermediaries' exports increase with product homogeneity which suggests that they "aggregate" orders of relatively homogenous goods across firms. Intermediary firms tend to engage in both importing and exporting and, in stark contrast to direct exporters, their product mix span remarkably broad sectors. Interestingly, intermediaries 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 behave in an opposite manner. This finding is intuitive; manufacturing firms likely possess a core competent product line (Bernard, Redding and Schott, 2009), while according to our framework, intermediaries emerge precisely to overcome the market-specific costs of international trade.

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.

The literature suggests two broad explanations to explain why intermediaries arise in an economy: faciliating matching of buyers and sellers (e.g., Rubinstein and Wolinsky 1987) and mitigating adverse selection by acting as gauranteers of quality (e.g., Biglaiser 1993 and Spulber 1996). While latter explanation is certainly important, our findings suggest that intermediaries, at least in China, arise predominantly due to the former reason. This is consistent with Rauch and Trindade (2002) who document the importance of ethnic Chinese networks in facilitating trade. In constrast, Feenstra and Hanson (2004) find a quality-sorting role for intermediaries; 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. Our evidence more strongly supports the idea that intermediaries facilitate trade by helping to overcome trade costs. We observe that intermediaries are more likely to be present in relatively homogenous goods where quality issues may be less salient. Furthermore, while we observe that intermediaries export higher unit values than direct exporters, there is no systematic difference according to product characteristics. In our framework, intermediaries will export higher unit values because they aggregate orders from less-effecient firms and because they charge a markup for their services.

The two papers most closely related to ours are recent work by Felbermayr and Jung (2009) and Blum, Claro, and Horstmann (2009). Felbermayr and Jung (2009) use a similar theoretical framework and find that less-productive firms will use intermediary technology, but they use their model to focus on hold up issues. They also do not predict a systematic relationhip between intermediary exports and country characteristics, which is not consistent with our empirical findings. Blum et al. (2009) find that in the majority of importer-exporter matches between Colombian and Chilean firms, at least one firm is extremely large due to search costs, yet do not identify if the large firm is in fact a non-manufacturing intermediary firm. 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 trade for the second largest exporting economy, China, because we can directly observe the universe of transactions by intermediary and direct exporters.

The remaining paper is structured as follows. In section 2, we lay out the basic model and the predictions that we will verify 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

In this section, we modify Melitz (2003), in the simplest way possible, to introduce 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.[2] We use this model to fix ideas and to generate predictions that we can verify in the data in the subsequent section.

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 heterogenous firms in a monopolistically competitive market (Melitz 2003). Each firm manufactures a unit variety with constant marginal cost and a fixed per period overhead cost, f_d. 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 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 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 a different 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.

We assume that the indirect fixed costs paid by firms is independent of number of countries to which these firms export via intermediaries because they reflect the costs of finding and using an intermediary firm in the home country. So once a firm pays the fixed cost of using an intermediary, the firm obtains access to all export markets. One could interpret the fixed cost of intermediation (f_i) as the cost of searching and establishing a

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

relationship with a domestic intermediary firm. One interpretation of the variable cost (γ) is that it captures intermediary firms' margins.[3]

Given our assumptions on consumer preferences and market structure, the price is a constant markup over marginal cost. 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.

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 equations (1)-(3) yield cutoff conditions that induce sorting by firms according to their productivity. The 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:

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

[3] 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.

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. 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 below. 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 $\varphi > \varphi_x^j$ directly serve market j . Combining equations (2) and (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 each destination market's price index P^j is fixed. 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.[4] 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.[5] These predictions are intuitive. Unlike Helpman, Melitz and Yeaple (2006) 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.

Bernard et al. (2009) document that only a small fraction of U.S. firms export, a fact that has emerged across countries. Our model 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 China; it is likely that many of these firms would be unable to recover the fixed costs of setting up their own distribution center. The remainder of the paper will use customs data from China to verify the predictions of this model as well as generate previously unknown facts regarding the activity of intermediary firms.[6]

[4] Our model is in stark constrast to the predictions by Felbermayr and Jung (2009) 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 assumes destination-specific intermediaries. 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. As shown below, the data clearly show that intermediary export shares covary with country characteristics, which is not consistent with Felbermayr and Jung (2009).

[5] Blum et al. (2009) predict that an increase in market size has a non-linear impact of intermediary trade and that higher trade costs will decrease the relative share of intermediaries in a three-country setting; our theoretical and, as shown below, empirical findings are at odds with their predictions. Their model also predicts that intermediary and direct exporters will export varieties at the same unit values, while in our model, intermediaries export more expensive varieties because of the double marginalization and because they export on behalf of relatively higher-cost manufactures.

[6] In unreported results (available upon request), we use a symmetric two-country model to analyze welfare. We find that there is a tradeoff between varieties and efficiency. As the marginal cost of using intermediation technology (γ) declines, there is a less efficient allocation of resources because intermediation benefits less-productive firms. However, this is counterweighed against the increase in welfare because of the additional varieties that enter consumers' consumption basket. In the special case of pareto distribution, the presence of intermediaries results in larger welfare gains compared to a model without intermediaries. This implies that the costs of relatively inefficient resource allocation are outweighed by the benefits of variety.

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; we therefore cannot assign a primary industry to identify if the firm is a manufacturer or a wholesaler, distributer and/or intermediary. We 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. We likely 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 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 the second year after accession, the minimum capital requirement 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

[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 pinyin (romanized Chinese), these phrases are: "jin4chu1kou3", "jing1mao4", "mao4yi4", "ke1mao4" and "wai4jing1".

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 or a fall in trade costs that enabled firms to switch towards direct exporting.

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.

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 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 2, we correlate HS6 shares of intermediary exports with product characteristics that capture variation in 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). While the result is not statistically significant, the correlation is consistent with column 1. In column 3, we observe a similar finding using elasticities of substitution estimated by Broda and Weinstein (2006). All three measures suggest that intermediaries are more likely to handle relatively more homogenous or "commoditized" products. These results contrast with Feenstra and Hanson (2004), who find that Hong Kong intermediaries' re-exports of Chinese products tend to be in more differentiated products.[9]

Another role for intermediaries, which is not discussed in the model, is to finance the

[9] This conflicting finding can be reconciled by product selection. The data indicate that relative to other countries, intermediaries account for a relatively small fraction of exports *to* Hong Kong, and China's exports to Hong Kong are relatively concentrated in more differentiated products.

manufacturing firms with whom they have contracts. If this activity is prevalent, we should expect intermediaries to be relatively more important in products that require a high degree of external financing. In column 4, we correlate intermediary export shares with the Rajan and Zingales (1998) measure of external finance. We observe a negative relationship which does not appear consistent with the financing role of intermediaries. If this measure of external finance, however, also captures a degree of product differentiation (such as capital and/or skill intensity), then the negative coefficient is consistent with the previous columns. Table 2 therefore suggests that intermediaries aggregate orders of relatively more homogenous products.

Further insights on the activity of intermediary firms can be learned from examining their unit values vis-a-vis direct exporters. The 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 to use the intermediation technology. We use the unit value information in the data to provide some evidence that the data are consistent with these predictions. Table 3 compares unit values between firm types. In this table, we regress (log) unit values on an intermediary dummy and 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 6.7 percent higher than direct exporters. In column 2, we control for firm size (proxied by total export revenue) using a flexible quartic polynomial. This lowers the relative difference in unit values to 5.1 percent. In column 3, we include country-HS8-ownership fixed effects and the systematic difference remains. These results are 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.

If unit values are a proxy for quality, our findings in Table 3 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 product characteristics–the coefficient of price variation, the quality ladder, and the elasticities of substituion. 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 3-5, 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. Together with finding that intermediary exports are relatively larger in more homogenous products, this table further suggests that

quality sorting may not be the dominant role among Chinese intermediaries.

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 4 reports overall firm-level summary statistics in 2005 in panel one, and statistics by firm type in panels two and three. 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 15 unrelated sectors.[10] The idea is to identify a firm's *core* activity (e.g., animal products, 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 (forthcoming), Nocke and Yeaple (2006), or Bernard, Redding and Schott (2009)) 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 4 reports that the average intermediary is larger than its direct exporting counterpart. It is perhaps not too surprising, then, 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 control for firm size. Column 1 of Table 5 report the average export varieties per country (column 1) by direct and intermediary firms, conditional on a quartic polynomial in firm size.[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. Again, these results are intuitive if manufacturing firms possess a core competency in a single line of business. In contrast, the model suggests that intermediaries arise to facilitate products to destination 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,

[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"; 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.

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 5, 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 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. In the subsequent section, we examine the aggregate implication of the differences in the activities of intermediaries and direct exporters.

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 shares 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, a variable cost, is positive 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 increasing distance to China by one log point increases intermediary shares by 3.2 percentage points. Increasing market size by one log point 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, increasing distance to China raises 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.

[12] Shares of ethnic Chinese populations are obtained from Ohio University's Shao Center Distribution of the Ethnic Chinese Population Around the World.

We 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 (the 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). Our classification of intermediary trade to Hong Kong, in particular, 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, and the results continue to hold.

In column 3, we remove export 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 significant and have the same sign as earlier.

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 may differ from ordinary exports. The coefficients and patterns of signs remain as before. The overall message of these tables is consistent with the prediction that intermediaries facilitate exports to relatively "difficult-to-access" markets.

Finally, in Table 8, we compare the sensitivity of exports to country characteristics between intermediaries and direct exporters. We regress the (log) HS6-country export value on a HS6 fixed effect and interact country characteristics with a dummy for exports by intermediaries. The results indicate that exports by intermediaries are *less* sensitive to country characteristics, such as distance and market size, than exports by direct exporters. For instance, a one log point increase in distance implies a 26 percent decline in exports by direct exporters, compared to just a 14 percent decline of intermediary exports. Likewise, increasing market size by one log point increases direct exports by 34 percent compared to just 27 percent for intermediaries. We observe a similar difference with ethnic chinese population, but not the measure of fixed costs. These results are similar to Bernard et al. (2009) who also find that exports by U.S. wholesale firms are less sensitive to market size

and distance relative to manufacturing firms. And consistent with earlier results, as well as the predictions of the model, the evidence here further suggests that intermediaries play an important role in faciliating trade by overcoming trade costs.

5. Conclusion

This paper presents the first evidence of the role of intermediary firms in facilitating trade across the entire universe of of exporting firms in China. We find that non-manufacturing trading firms mediate a substantial fraction of firm trade. In 2005, they accounted for 22% of China's aggregate exports, or $171 million. The activity of intermediaries behave in systematically different ways than their direct exporting counterparts. They export a wide variety of products that tend to be relatively more homogenous than those exported by direct expoters. Intermediaries appear to adopt a relative country focus by having exports concentrated relatively within countries than within products. The aggregate implications of this difference in activity is that intermediaries are more likely to export to markets that have higher trade costs and are smaller. This finding is consistent with intermediaries being used by relatively smaller firms who find it difficult to enter the export market on their own.

This paper demonstrates that further research on intermediary exporting and importing firms is warranted for several reasons.[13] First, the recent literature on firm heterogeneity within international trade has largely ignored the role of intermediaries. Our framework 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. One implication 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). It could also explain why countries enact policies to encourage the formation of intermediaries.

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, as well as uncovering new channels (e.g., learning) through which the gains from trade are distributed within an economy.

[13] 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)).

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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

Intermediary Share of Exports and Product Characteristics

	(1)	(2)	(3)	(4)
{Coefficient of Price Variation}	-0.010 ***			
	0.002			
$\{\text{Quality Ladder}\}_h$		-0.004		
		0.005		
$\{\text{BW Elasticity of Substitution}\}_h$			0.005	
			0.006	
$\{\text{External dependence}\}_h$				-0.089 ***
				0.028
Observations	4,958	3,261	5,033	3,956

Notes: The depedent variable in each regression in the share of intermediary exports. The covariate in column 1 is the coefficient of price variation. Column 2 reports the coefficient on the HS6-level quality ladder 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. Column 3 uses the elasticity of substitution measured from Broda and Weinstein (2006). Column 4 uses the measure for external finance from Rajan and Zingales (1998). Standard errors are clustered at the 3-digit HS level in column 3 and at the ISIC level in column 4 since these are the respective levels of variation in each column, respectively. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 2: Intermediary Share of Exports and Product Characteristics

Unit Value Differentials

	(1)	(2)	(3)	(4)	(5)	(6)
$\{\text{Intermediary}\}_f$	0.067 ***	0.051 ***	0.023 ***	0.030 ***	0.021 **	0.014
	0.005	0.004	0.004	0.007	0.010	0.033
$\{\text{Intermediary}\}_f$ X $\{\text{CV}\}_h$				-0.002		
				0.002		
$\{\text{Intermediary}\}_f$ X $\{\text{Ladder}\}_h$					0.000	
					0.006	
$\{\text{Intermediary}\}_f$ X $\{\text{Elasticity}\}_h$						0.003
						0.010
Quartic Firm-size controls	no	yes	yes	yes	yes	yes
Fixed effectrs	po	po	cpo	cpo	cpo	cpo
Adjusted R-squared	0.79	0.79	0.82	0.82	0.83	0.82
Observations	4,594,598	4,594,598	4,594,598	4,594,598	3,697,495	4,583,207

Notes: Table regresses firms' (f) log unit values (at the country-product level) on intermediary dummy and controls in 2005. Row 2 interacts an intermediary dummy with the coefficient of variation of unit values. Row 3 includes the interactions with the quality ladder taken from Khandelwal (forthcoming). Row 4 uses the elasticity of substitution from Broda and Weinstein (2006). The symbols for the pair fixed effects are product (p), ownership (o) and country (c). Standard errors are clustered by product. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 3: Unit Value Differentials

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 4: 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 (equation 9). All coefficients are statistically significant at the 1 percent level and so standard errors have been supressed.

Table 5: Margins, by Firm Type

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	0.022 ***
		0.008	0.009	0.007
{Log GDP}$_c$		-0.020 ***	-0.024 ***	-0.016 ***
		0.003	0.003	0.002
{Log Chinese Population}$_c$		-0.003 **	-0.003 **	-0.003 **
		0.001	0.001	0.001
{# of Importing Procs}$_c$		0.003 ***	0.004 **	0.003 **
		0.001	0.002	0.001
{MFN Tariff}$_{hc}$	0.024	0.046 **	0.078 ***	0.038 *
	0.015	0.019	0.023	0.021
HS6 FEs	yes	yes	yes	yes
Country FEs	yes	no	no	no
Adjusted R-squared	0.15	0.15	0.15	0.13
Observations	223,282	181,612	163,044	181,793

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 shares of country-HS6 exports. All standard errors clustered at the country level. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 7: Robustness Checks

Sensitivity to Gravity, Intermediaries vs. Direct Exporters

	(1)	(2)	(3)
{Log Distance}$_c$	-0.261 ***	-0.271 ***	-0.282 ***
	0.063	0.043	0.041
X Intermediary	0.117 ***	0.107 ***	0.116 ***
	0.028	0.037	0.035
{Log GDP}$_c$	0.341 ***	0.314 ***	0.324 ***
	0.015	0.016	0.018
X Intermediary	-0.068 ***	-0.045 ***	-0.047 ***
	0.007	0.010	0.011
{Log Chinese Population}$_c$		0.030 ***	0.030 ***
		0.008	0.008
X Intermediary		-0.021 ***	-0.020 ***
		0.005	0.005
{# of Importing Procs}$_c$			0.005
			0.010
X Intermediary			0.009 *
			0.005
HS6 FEs	yes	yes	yes
Adjusted R-squared	0.32	0.33	0.32
Observations	425,396	357,902	338,956

Notes: The dependent variable in each regression is total country-HS6 export value for intermediaries and direct exporters. Column 1 includes distance and market size as covariates. Column 2 adds the share of ethnic Chinese population. Column 3 includes the measure of the number of procedures required for importing a container. Column 4 includes the country's HS6 MFN tariff on Chinese productsEach covariate is interacted with a dummy for trade by intermediaries (the coefficient on intermediaries is supressed). All standard errors clustered at the country level. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 8: Sensitivity to Gravity, Intermediaries vs Direct Exporters

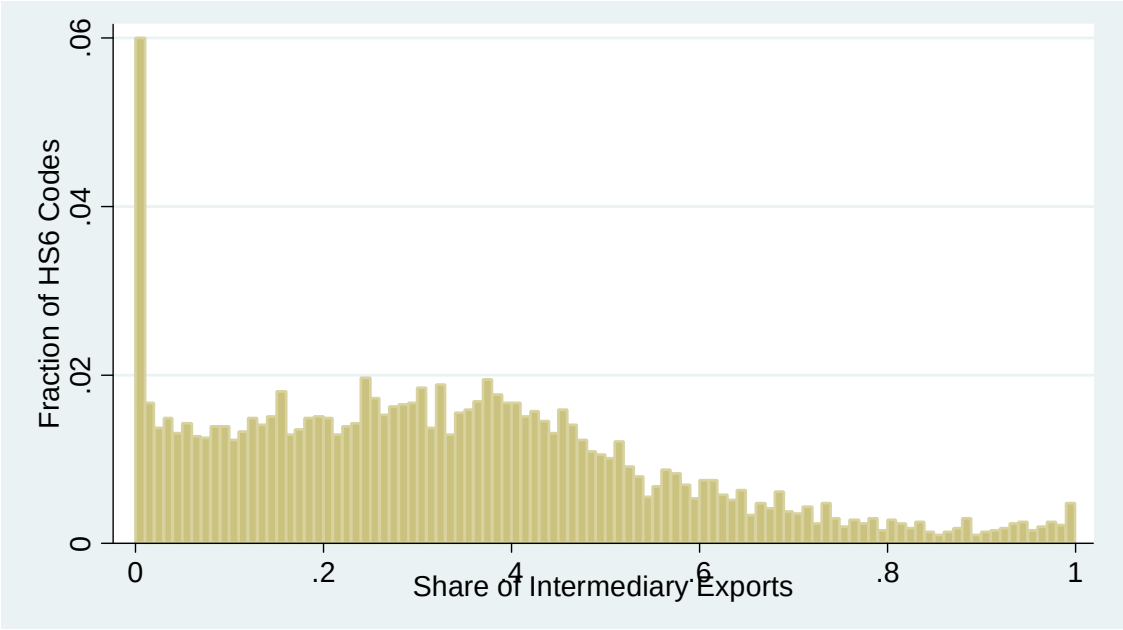

Figure 1: Distribution of Intermediary Export Shares, HS6 level

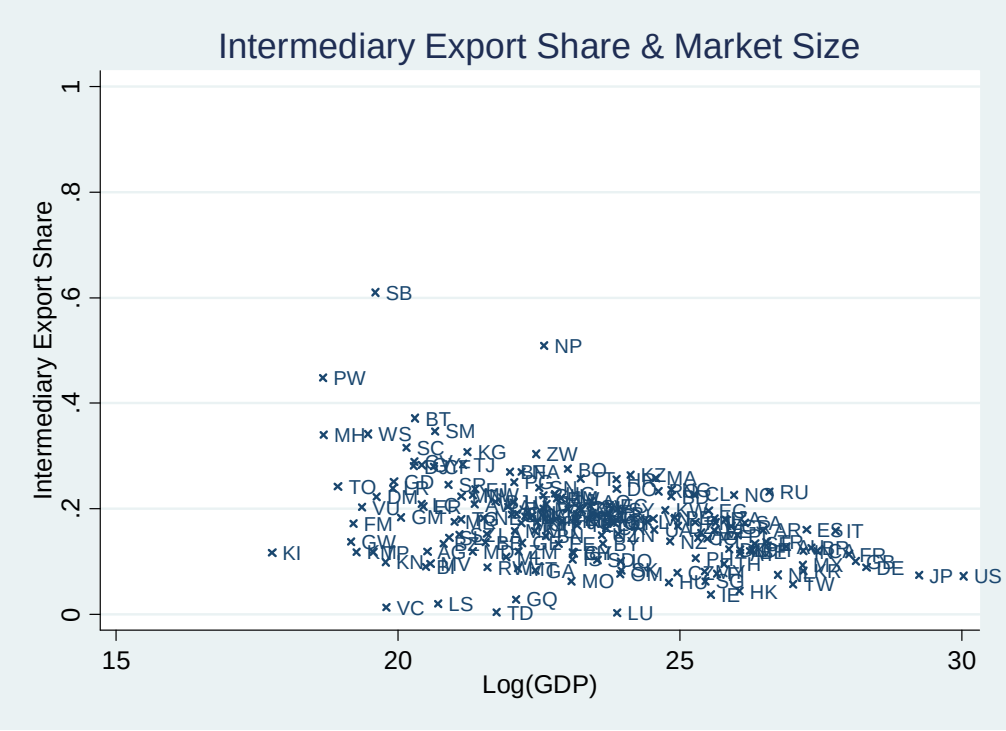

Figure 2: Intermediary export share and market size

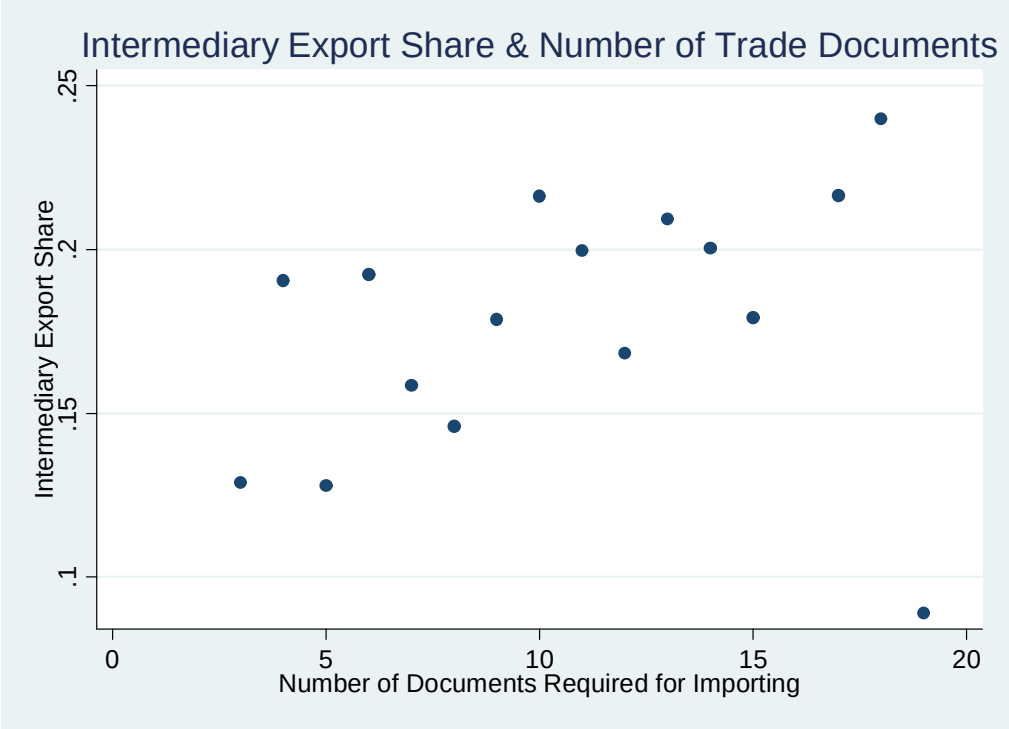

Figure 3: Average intermediary export share by number of documents required for importing