Import Intermediaries and Trade: Theory and Evidence*

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Abstract

Case study evidence suggests that import distribution systems play an important role in facilitating trade. Yet, little sytematic evidence or modeling has been provided on the importer side of trading activity. This paper uses matched exporter-importer data to motivate a model of trade in which the key trade cost is creating exporter - foreign customer matches. An import distribution system arises as part of the model's equilibrium. This system features import intermediaries who serve as an efficient means of creating matches between small exporters and small foreign customers. The model's many predictions are shown to be consistent with the data.

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1 Introduction

The answer to the question,"How does an exporting firm get its product into the hands of foreign market customers?" has potentially important implications for assessing the impact of trade policy. To illustrate, in a case study by Ernst and Young (1992) of exports from the US into Canada, it was found that a set of sheets produced in the US, and sold in both the US and Canada, retailed for a considerably higher price in Canada than in the US. The explanation for the price difference was not high tariffs or other trade barriers but the fact that distribution of the sheets involved both a longer supply chain in Canada, due to the use of Canadian importing agents, and significantly higher markups throughout. As a consequence, even were tariffs zero, costs created by the longer supply chain, that are then marked-up substantially throughout the supply chain, result in significantly higher prices for imported products relative to similar domestic ones. An implication is that, unless free trade were also to alter the distribution system, imported products would have to land at costs significantly lower than domestically produced ones in order to be competitive. Taken to the extreme, if there is no efficient system for getting foreign products across the border and into the domestic distribution system, trade does not occur.

In spite of this fact and the fact that the exporter side of trade transactions has been extensively studied – we know that the distribution of export firms is skewed, with many small exporters and a few large ones, that the large export firms sell many products to many countries and export on an on-going basis while the small exporters sell fewer products to fewer countries and export irregularly – we know surprisingly little about the importer side of trade transactions. If, as the above study indicates, importers play a key role in getting products into the hands of foreign market customers, then our failure to understand the importer side of trade transactions must raise significant concerns about our understanding of trading behavior and trade policy.

This lack of emphasis on the importer side of trade transactions is not due so much to lack of interest but lack of data. Until now, except for case studies like the one above, systematic evidence on what happens to export products once they leave the exporting country has not been available. As a result, trade models have treated the import side of any trade

transaction as a black box. Traditionally, these models assumed that exporting firms have access to a competitive, constant returns-to-scale distribution sector that moves products from exporters' hands into the hands of foreign customers. Distribution is one of many per-unit trade costs incurred in exporting. More recently, trade models have adopted various non-constant returns trading cost assumptions as means of understanding new, export firm-level trade data (see Melitz (2003), Hanson and Xiang (2011), Arkolakis (2010)). What import distribution technologies generate these costs is unspecified and there is no importing data that could support a particular assumption. Importantly, in all cases, the import distribution technology itself, and its associated trade cost, is unaffected by the trading environment, including trade policies. As a result, these models will miss a potentially important source of benefits from trade liberalization; namely, enhancements to import distribution activities that result in reduced trade costs. To this extent, they fall prey to the Lucas critique.

In this paper, we provide evidence from two large-scale data sets that match export firms with the importers with which they transact. These data allow us to document characteristics of both importers and exporters, as well as characteristics of importer-exporter pairs. Based on this evidence, we develop a model of trade in which there are multiple import distribution technologies and exporter-importer matches occur as part of the trading equilibrium. In this way, the model generates characteristics of both the exporter and importer side of the market. With import distribution activities and importer-exporter matches being endogenous, the model also generates an endogenous "cost of foreign market access" (the trading costs of previous models) that varies with the trading environment, including with trade reforms. As a result, we can address the issues of how import distribution occurs and how the import side affects trade outcomes and we provide micro structure for the trade cost specifications in the literature. Finally, we provide evidence in support of the mechanism and predictions of our trade and import distribution model.

The two data sets we build to document the basic facts about exporter-importer transactions are: i) a data set that matches all Chilean exporters with their Colombian importers over the period 2004-2006 and ii) a data set that matches all Argentinean exporters with their Chilean importers over the 2005–2007 period. These matched data sets provide the most comprehensive information available on international trade between exporters and matched

importers, all at the transaction level. The data analysis reveals at least three new interesting patterns of trade transactions. First, as in many other data sets, there is a large number of small exporters, both in Chile and in Argentina, and a few very large ones. Interestingly, we find the same pattern on the importer side of the distribution system, with a large number of small Colombian importers from Chile and Chilean importers from Argentina, and a few large ones. Second, in virtually every Chilean exporter-Colombian importer pair and Argentinean exporter-Chilean importer pair, at least one of the parties is a large international trader. Third, on average exporters sell to few importers but the distribution of importers per exporter is very skewed: More than half of the Chilean and the Argentine exporters sell to 1 importer only; at the 99^{th} percentile these exporters sell to almost 20 importers. Moreover, exporters that sell to few importers are small traders – they sell relatively small amounts and few HS codes to Colombia, to Chile and to the world – but sell relatively large amounts and more HS codes per importer. These exporters sell to large and diversified importers in the sense that the importer purchases many HS codes from many exporters.

While many models of trade generate the highly skewed exporter distribution found in the data, there are no trade models that also provide the highly skewed importer distribution, or the other features, we find in our matched data**.** Rather, existing models of trade with heterogeneous exporters assume a homogeneous "importer" sector. In Melitz-type models, for instance, firms sell directly to consumer-importers. Each consumer-importer purchases all imported products, all are the same size and match with the same number of exporters (all of them) so sales per consumer-importer are identical. A similar pattern holds in Arkolakis, although any given consumer only matches with a subset of exporting firms. In this way, existing trade models fail to capture key features of the trading and distribution system.

To remedy this situation, we develop a heterogeneous firm trade model that re-produces many of the above features of both exporters and importers. The model takes as its starting point the idea that the main cost of selling abroad is a distribution cost: the cost of identifying and matching up export firms with import market customers. The challenge for exporters and their import market customers is how to economize on these costs. In the model, there are two potential distribution technologies that can be used to match exporters to foreign market customers. One technology is a "direct-to-market" distribution technology, the cost

of which is decreasing in the sizes of the exporter and its foreign market customers. Under this distribution technology, large exporting firms sell, not by finding buyers in the foreign market, but by buyers finding them; similarly, large foreign market customers import, not by finding sellers abroad, but by sellers finding them. In essence, by being large international traders, the trading partners can economize on the cost of creating trades. Small exporters and small customers, by contrast, find it costly to identify each other and create trades. An alternative distribution technology available to them (as well as to the large traders) is an "intermediated trade" distribution technology in which the parties trade indirectly by pairing-up with an import intermediary. Under this technology, intermediaries match with many small exporters and many small foreign market customers and so are themselves large importers, easily found by both foreign customers and exporters. The intermediaries economize on distribution costs by spreading these costs over many exporting firms and many foreign market customers.

In the equilibrium of the model, the large, more productive export firms choose the direct-to-market distribution technology and sell directly to customers in the foreign market. The less productive export firms use the intermediated trade technology to reach foreign customers. The least productive firms do not export at all. Under this equilibrium, there will be a large number of smaller importers buying directly from large exporters and a few large importers, the distribution intermediaries, carrying the products of multiple exporters. In contrast to existing models, it is the fact of these import intermediaries, arising endogenously to resolve a distribution problem, that generates a skewed distribution of importers. Further, due to economizing behavior in creating matches on the part of exporters and their foreign market customers, every trade relationship has at least one large trader: large exporters deal with multiple smaller importers and small exporters sell to few (large) import intermediaries. By matching with many small exporters, these large import intermediaries carry a relatively large number of products.

At its heart, our model has a simple message: Direct trade between small foreign market customers and small exporters does not occur both because it is costly for the exporter to identify and sell to small foreign market customers and also costly for small foreign market customers to identify and buy from a small exporter. Import intermediaries arise to facilitate

trade in these cases. By being located in the foreign market and consolidating the products of many exporters, import intermediaries can cheaply identify foreign market customers and cheaply create trades between small exporters and their small customers.

This distribution mechanism has several implications. First, within a product category, exporter size affects the choice of distribution mode in the importing country, with small exporters choosing to sell via import intermediaries. Second, given that smaller exporters are found in a broad set of products, import intermediaries should be observed in a broad set of products also. Third, because a key role of intermediaries is to cheaply identify foreign consumers, import, as opposed to export, intermediaries should feature significantly in international trading activities. Using a subset of our data in which the importer's main activity can be identified, we show that the model's implications are confirmed by the data. Specifically, we find that import intermediaries play an important role in trade; they account for large shares of trade in virtually all product categories imported into Chile and account for a significant share of total imports. Moreover, the export firms that sell via intermediaries are, on average, smaller than those that sell directly. Further, the vast majority of exporting is carried out by very large manufacturing firms; intermediaries are not important exporters, accounting for only a small fraction of total export value (See Bernard et al (2011) and Akerman (2010) for similar evidence using Italian and Swedish data). In fact, except for agricultural and food products, export intermediaries carry virtually zero of Chile's exports.

The model also provides a number of other predictions about importing activity. First, markets having large numbers of customers demanding small amounts of the export product are more costly to serve than those having small numbers of customers demanding large amounts of the export product: low entry cost markets are those for which the firm can sell large amounts to few importers. As a result, there is a non-linearity in the pattern of distribution across product markets. Specifically, as a destination market becomes more costly to serve, initially the value of exports sold via import intermediaries declines relative to the value sold via direct-to-market selling; once the market becomes sufficiently costly to serve, the value of exports sold via import intermediaries increases. Second, markets for more homogeneous products should be observed to have a smaller share of trade undertaken via import intermediaries than markets for less homogeneous products. Third, lower variable

trade costs – either due to lower unit transportation costs or lower tariffs – induce existing export firms to switch from using import intermediaries to direct selling. These lower costs also induce entry by smaller firms into exporting via import intermediaries. In the end, exports sold both via import intermediaries and via direct-to-market selling will be larger but the relative value of exports sold via these two means will be the same. Finally, a trade reform in one country can have external benefits for another, non-reforming country by reducing the cost of direct-to-market selling in the non-reforming country. With the exception of the last prediction, we provide evidence from our data in support of these predictions.

The insight that trade costs arise from the need to match exporters with foreign market customers is not new to this paper. Papers by Rauch (2001), Rauch and Watson (2004), Antras and Costinot (2011) and Petropoulou (2007) also adopt a search and matching approach to trade. Relative to this paper, these papers develop more explicit matching models of trade and can be seen as providing micro foundations for our reduced-form matching approach. Unlike these papers, our paper focuses on the characteristics of matched importer-exporter pairs and tries to understand how the combination of heterogeneity on the exporter side and matching costs on the import side induces both heterogeneity among importers and particular types of matches between the heterogeneous exporters and importers. On the empirical side, with the exception of Blum et al (2010), this paper is the only one that characterizes exporter - importer matches and the international distribution systems arising under these matches.[1] We see our work as complementing the work of Ahn et al (2011), Akerman (2010) and Bernard et al (2011) who characterize the role of export intermediaries in international trade and Bernard et al (2010) who look at the roles that US wholesalers and retailers play in both export trade and import trade. Our paper is also related to Eaton et al (2008) who use matched Colombian exporter-American importer data to study export dynamics at the micro level.

[1] In contrast to this paper, Blum et al focuses on patterns of specialization among import intermediaries and the ways that import intermediaries become large.

2 Data and Evidence

This paper uses two data sets of matched importers and exporters. The first one combines confidential transaction-level export data from Chile and import data from Colombia for the years 2004, 2005, and 2006; the second combines confidential transaction-level import data from Chile and firm-level export data from Argentina for the years 2005, 2006, and 2007. For each data set, both the import and export data are compiled by the respective countries' customs office and their key characteristic is that they contain information on the importing parties with which each exporter transacts in foreign markets and the exporting parties from abroad with which each importer transacts. This information allows us to match Chilean exporters with their Colombian importers (Chilean importers with their Argentine exporters) to create transaction-level data sets with bilateral and global trade information for each exporter/importer pair.

The Data Appendix describes the data sets and the procedure used to match exporters and importers. What is important for our analysis is that we are able to match over 90% of the trade transactions in both data sets. Moreover, the collection of matched importers and exporters retain the main characteristics of the universe of Chilean importers from Argentina and exporters to Colombia, Colombian importers from Chile and Argentinean exporters to Chile. Lastly, to provide some perspective on the trading relationships, around 10% of all Chilean exporters sell to Colombia and Colombia is the 9th most popular destination for Chilean exporters. In terms of value, sales to Colombia represented only slightly more than 1% of all Chilean exports during the years in the sample. On the other side, almost 20% of all Chilean importers buy from Argentina, and Argentina is the second most popular source of Chilean imports, behind only the U.S., accounting for 14% of all Chilean imports.

Table 1 provides summary statistics on the trade between Chile and Colombia and between Argentina and Chile in our matched samples. There were 548 Chilean firms that exported to Colombia in 2005; these firms sold a combined US$ 292 million. The distribution of exports of Chilean firms confirms that a large fraction of exporting firms sell small amounts to Colombia.[2] On the importing side, our data show that 791 Colombian importers

[2]The distribution of exports of the universe of Chilean firms confirms that a large fraction of Chilean

purchased products from Chile in 2005; these importers bought, on average, US$ 382 thousand from Chile. The import value distribution of Colombian importers reveals a large share of small importers from Chile, with 25% of importers having bought less than US$ 22 thousand in 2005. The skewness of the import value distribution is, to our knowledge, a new piece of evidence.

In the same year, there were 3,479 Argentine firms that exported to Chile, selling a total of slightly under US$ 3.8 billion. The distribution of export values for Argentine exporting firms confirms that a large fraction of these firms also sell small amounts to Chile. On the importing side, there were 4,033 Chilean firms that imported from Argentina in 2005, buying, on average, almost US$ 1 million. The Chilean imports distribution also reveals a large share of small importers from Argentina and from the world, with 25% of importers having bought less than US$ 6.8 thousand from Argentina (Table 1) and less than US$ 1.1 thousand from the world (Appendix Table B1) in 2005.

Table 2 provides some characteristics of the exporter-importer pairs in our sample. The 548 Chilean exporters in the matched data set traded on average with 2.3 importers to create a total of 1,266 importer-exporter pairs in 2005; the 3,479 Argentine exporters traded on average with 2.3 Chilean importers to create 8,158 importer-exporter pairs in the same year. More interesting is that, in both data sets, the distribution of the number of importers per exporter is skewed to the right and shows significant heterogeneity in the number of importers with which exporters deal. More than half of the exporters sell to one importer only, both in Chile and in Colombia, while, at the 99^{th} percentile of the distribution, Chilean exporters sell to 18 Colombian importers and Argentine exporters sell to 14 Chilean importers. The distribution of the number of exporters per importer is also skewed to the right and shows heterogeneity, although not as much as in the importer per exporter data.

The bottom part of Table 2 shows the distribution of bilateral trade by exporter-importer pair. Column 2, panel 3 is generated by summing, for each exporter - importer pair, total export sales by the Chilean exporter to importers in Colombia and total import purchases by

exporting firms sell small amounts worldwide (Appendix Table A1), a feature documented in other countries' export data as well (see Bernard and Jensen 1995, Eaton et al 2004, 2010, and Eaton et al 2008, among others).

the Colombian importer from exporters in Chile; column 2, panel 4 shows a similar calculation for worldwide export sales by the Chilean exporter and worldwide import purchases by the Colombian importer. Column 4 provides similar information for the Argentine exporter - Chilean importer matched pairs. As a basis for comparison, the 25^{th} percentile, by exporter, of the distribution of Chilean export sales to Colombia in the matched data set is US $17,400 and the 25^{th} percentile of the distribution of Colombian purchases from Chile by importer is US$ 21,900. In the matched Argentine exporter-Chilean importer data the numbers are US $10,900 and US $6,800. When we look at the distribution of bilateral and worldwide trade at the exporter – importer pair level, the 25^{th} percentile is US$ 216,000 and US$ 3.9 million respectively in the Chile-Colombia data, and US$ 94,400 and US$ 652,700 respectively in the Argentina-Chile data. This indicates that, even though there are many *small* importers and exporters, there are very few importer-exporter pairs where both parties are *small*. We have verified this fact for both matched data sets.

Figure 1 examines more closely the finding that small traders tend to match with large traders, and shows that, rather than a tendency, the presence of a large trader seems to be a necessity. In Panel A, the series marked with circles shows the share of Chilean exporters to Colombia that sell less than the "Cutoff Value" – shown in the x-axis – in 2004. The vertical lines indicate that almost 20% of the Chilean exporters sold less than US$ 10,000 to Colombia in 2004 while around 35% of them sold less than US$ 30,000 to Colombia in the same year. The series marked with triangles shows the share of Chilean exporters that sold less than the "Cutoff Value" to Colombia and traded exclusively with Colombian importers that bought less than the "Cutoff Value" from Chile in 2004. These are the Chilean exporters that are in importer- exporter pairs that are small (i.e., trade less than the cutoff value) in a bilateral sense. For the cutoff point of US$ 30,000, this is the case for 20% of the Chilean exporters to Colombia. The series marked with squares shows the share of Chilean exporters to Colombia that, in addition to meeting the two previous conditions, sold exclusively to Colombian importers that bought less than the "Cutoff Value" from the World in 2004. For the US$30,000 cutoff point, around 5% of the Chilean exporters fall in this category. Finally, the series marked with diamonds shows the share of Chilean exporters that satisfy the three previous conditions and sold less than the "Cutoff Value" to the World. These

are the ones where the importer-exporter pair is small in a global sense. As we can see, virtually no Chilean exporter – Colombian importer pair falls into this category, even when the cutoff value is as large as US$ 200,000. Panel B shows analogous evidence for Argentinean exporter-Chilean importer pairs, and reaches similar findings.

The analysis in Table 3 provides a more detailed examination of the characteristics of exporter - importer pairs. It shows the results of regression analysis that looks at the differences between exporters that deal with many importers versus those that deal with few. Panel A shows evidence on Chilean exporter-Colombian importer pairs and Panel B shows evidence on Argentinean exporter-Chilean importer pairs. Panel A shows that, after controlling for year and industry (2-digit HS code) fixed effects, Chilean exporters that sell to few Colombian importers have smaller sales and sell fewer HS8 codes to Colombia and to the world, and sell to fewer destination countries (columns 1–5). However, they have significantly higher sales and sell more HS8 codes per importer (columns 6 and 7). Also, the importers they sell to in Colombia have larger purchases from the world, and are average size importers from Chile, but they buy significantly more HS10 codes from Chile (column 10) and buy from more Chilean exporters (column 11). Panel B shows similar findings for Argentinean exporter-Chilean importer pairs. Argentinean exporters that sell to few Chilean importers are small exporters that sell more per importer (columns 1-5), and the importers they sell to in Chile are more diversified, buying more HS8 codes from Argentina and the world (columns 8 and 9) and buying from more Argentinean exporters (column 10).

3 A Model of Trade and Distribution

The evidence from the matched data reveals three basic features that a model of importer - exporter trading must account for: i) both the distribution of exporters and importers is highly skewed and at least one of the trading partners in any match is a large, international trader; ii) most exporters sell to few – typically one – importer while a few exporters sell to many importers; iii) exporters that sell to few importers export smaller amounts and fewer HS codes in total but export more *per importer;* further, these exporters sell to importers that import large amounts in total and are much more diversified, importing more HS codes

and dealing with more exporters. In what follows, we develop a model of international trade and distribution that captures these features of the data. We use this model to generate additional predictions about trading behavior and then provide supporting evidence for these predictions.

To simplify the presentation of the model and analysis, we present first a closed economy model that serves to lay out the basic environment and concepts. We then provide a model of trade with a single distribution technology. This analysis allows us to draw analogies with existing literature and to provide motivation for our two-technology model. Finally, we present the model with two distribution technologies that captures the main features of the data and we draw out the implications of this model for trading behavior.

3.1 The Closed Economy

The basic model is very much in the spirit of the Melitz (2003) model of trade. Specifically, in any country, k, there are 2 final goods sectors, a perfectly competitive sector producing a homogeneous good, X, and a monopolistically competitive sector with a continuum of firms producing differentiated products indexed by ω. There is a single input, labor, used in the production of both goods. The endowment of labor in Country k is denoted by $\overline{L}_k$.

3.1.1 Production

Good X is produced with a constant returns to scale technology and with units defined so that one unit of labor produces one unit of X. We assume that X is the numeraire good with price normalized to 1. Together, these assumptions imply that the wage rate is also 1.

In the monopolistically competitive sector, a firm producing a positive amount incurs a fixed cost, measured in units of labor, of f. This cost is identical across firms. Firm's are heterogeneous in labor productivity, with the output of a firm with productivity ϕ given by $y(\phi) = \phi\ell(\phi)$, where $\ell(\phi)$ is the labor utilization in production of a productivity ϕ firm. The productivity parameter is an independent draw from the distribution $G(\phi)$ with support $[\underline{\phi}, \overline{\phi}]$ and density $g(\phi)$. Upon paying a sunk entry cost, f_e, a firm obtains a productivity draw from $G(\phi)$. If a firm with productivity draw ϕ choose to produce a positive amount, the firm

incurs production costs of $c(\phi) = f + y(\phi)/\phi$. There is free entry into the monopolistically competitive sector so that expected profits in this sector are zero.

3.1.2 Consumer preferences

All consumers in Country k are identical, with preferences given by the utility function $U = Y^{\alpha}X^{(1-\alpha)}$, where Y is a CES aggregator defined as $Y = \left[\int y(\omega)^{\rho}d\omega\right]^{1/\rho}$ and $y(\omega)$ is the quantity consumed of variety ω. We assume that $\alpha \in (0,1)$ and $\rho \in (0,1)$. Given the Cobb-Douglas preference structure, consumption of X in Country k is given by $(1-\alpha)I_k$, where I_k is aggregate income in k.

The remaining αI_k is spent on the differentiated products. Given the CES preference structure for Y and given a total measure N_k of sellers of the differentiated product in Country k, demand for a variety ω produced by a firm with productivity ϕ is given by the expression $y(\phi) = \alpha I_k p(\phi)^{-\sigma}P^{\sigma-1}$. In this demand expression $P = \left[\int p(\phi)^{1-\sigma}N_k\nu(\phi)d\phi\right]^{1/1-\sigma}$ is the CES price index, $p(\phi)$ is the price of a variety produced by a firm with productivity parameter ϕ, $\nu(\phi)$ is the distribution of firms producing in Country k, and $\sigma = 1/(1-\rho) > 1$.

3.1.3 The autarky equilibrium

As in Melitz, the profit maximizing price for a firm with productivity ϕ selling domestically is given by $p(\phi) = 1/\rho\phi$. In autarky, this implies that $P = N_k^{1/(1-\sigma)}/\rho\widetilde{\phi} = N_k^{1/(1-\sigma)}p(\widetilde{\phi})$, where $\widetilde{\phi} = \left[\int {\phi_i}^{\sigma-1}\nu_k(\phi)d\phi\right]^{1/(\sigma-1)}$. Letting R_k be aggregate expenditures in the differentiated products sector in Country k, (i.e., $R_k = \alpha I_k$), firm revenues are given by $R(\phi) = (R_k/N_k)(\phi\,/\,\widetilde{\phi})^{\sigma-1}$ and firm profits by $\pi(\phi) = R(\phi)/\sigma - f$. The firm with productivity parameter ϕ^* such that $\pi(\phi^*) = 0$ will define the marginal producer and so $\nu_k(\phi) = g(\phi)/(1-G(\phi^*))$. As shown in Melitz, there is a unique ϕ^* that satisfies the free-entry and zero profit conditions. In the equilibrium, the value of I_k is given by $I_k = \overline{L}_k$. The mass of firms, N_k, is given by the equation $N_k = R/R(\widetilde{\phi}) = \alpha\overline{L}_k/\sigma(f + \pi(\widetilde{\phi}))$, where $\pi(\widetilde{\phi}) = f\left[(\widetilde{\phi}/\phi^*)^{\sigma-1} - 1\right]$.

3.2 The Open Economy: one distribution technology

Consider now an international trade setting. As in Melitz, we suppose that firms in the differentiated products sector incur a variable trade cost for transactions between countries k and k'. These costs are of the iceberg variety and are such that a firm requires $\tau_{kk'} > 1$ units of production of variety ω to deliver 1 unit from Country k to Country k'. These costs are assumed symmetric between country pairs and the same for all varieties. This means that the marginal cost of an export for a producer with productivity parameter ϕ is $\tau_{kk'}/\phi$. We also assume that markets are segmented internationally. Together, these assumptions imply that the profit maximizing export price for a Country k firm with productivity ϕ exporting to Country k' is $\tau_{kk'}/\rho\phi$. The profit maximizing domestic price for this firm continues to be $1/\rho\phi$.

In Melitz (and others) a producer of any variety must bear a fixed cost of exporting for each country to which it exports. This cost is the same for all varieties and is given exogenously. The activities responsible for this cost are left unspecified. What they are should determine how one might model exporting costs. For instance, if the cost of exporting is the processing of all paperwork associated with the movement of products from one country to another, then there are likely (cross-country) scale economies in this activity, as in Hanson and Xiang (2011). If, on the other hand, exporting costs are associated with the direct cost of getting the product across any given country's border – the time and hassle costs of processing the products through customs – then perhaps a fixed, per-country cost is appropriate. If exporting costs are associated with identifying customers in the foreign country, then a per customer cost, as in Arkolakis, may be appropriate. Whatever the case, a micro model of the exporting activity is needed to structure exporting costs and to confront the transactions level data on trading activity. Such a model also lets one determine how the distribution system and international trade are impacted by changes to the trading environment.

3.2.1 The distribution technology

The stance we take here is that the significant, non-transportation cost of trade is a distribution cost associated with matching customers in Country k' with firms in Country k. In

essence, the ultimate problem that any exporter has is identifying and selling to customers in the foreign country. This problem is highlighted in Rauch (2001). Rauch and Watson (2004), Petropoulou (2007), and Antras and Costinot (2011) model this distribution problem as a random matching procedure. Here we take a somewhat simpler approach that is based on a model by Townsend (1983). We flesh the model out in what follows.

We start with what we consider the simplest specification and one that delivers an exporting environment very similar to that in Melitz. Specifically, we assume that a resource cost of $m > 0$ must be incurred in order to match an exporter of variety ω from k to a single consumer in k' and to sell to that consumer. For simplicity, we assume that this cost is the same for all varieties and for all exporter/consumer pairs. The cost may be borne either by the consumer, by the exporter or shared between the two agents. We assume that there is no cost of matching producers and customers within a country (this is the implicit assumption in Melitz).

Since an exporter only ever captures a fraction of the total surplus generated by the export of its variety, an efficient (surplus maximizing) distribution system in this setting requires the consumer to bear some of the match cost. That is to say, were the exporter to bear the full cost of creating a match with consumers, as is the case in Melitz and others, the exporter that is marginal – the ϕ_x^* exporter of Melitz – generates a surplus that is larger than the match cost. As a result, consumers in Country k' will be willing to bear some of the cost of matching in order to obtain certain varieties produced in Country k from firms with productivities less than ϕ_x^*. Therefore, the efficient exporting solution involves consumers in Country k' sharing some fraction of the matching cost in order to obtain exports from low productivity producers in Country k.

To define the marginal exporter for this case, we need to define total surplus – consumer surplus plus profits – for the marginal exporter. For simplicity of presentation, we assume that $\tau_{kk'} = \tau$ for all k, k' pairs. Since exporters set price equal to $\tau/\rho\phi$, consumer surplus for an individual in Country k' purchasing a variety exported by a firm with productivity ϕ is given by

$$\begin{aligned} CS^{kk'}(\phi) &= \alpha P_{k'}^{\sigma-1} \int_{\tau/\rho\phi}^{\infty} p_{k'}(\phi)^{-\sigma} dp \\ &= \frac{\alpha}{\sigma-1} P_{k'}^{\sigma-1} (\tau/\rho\phi)^{1-\sigma}. \end{aligned}$$

Profit for the exporter to Country k' with productivity ϕ from a customer match is given by

$$\pi_x^{kk'}(\phi) = \alpha P_{k'}^{\sigma-1}(1-\rho)(\tau/\rho\phi)^{1-\sigma}.$$

Total surplus generated by the match is then

$$\begin{aligned} TS_x^{kk'}(\phi) &= \alpha P_{k'}^{\sigma-1}(\tau/\rho\phi)^{1-\sigma} \frac{2\sigma-1}{\sigma(\sigma-1)} \\ &= \frac{r_x^{kk'}(\phi)}{\sigma \overline{L}_{k'}} \frac{2\sigma-1}{(\sigma-1)} \end{aligned}$$

where $r_x^{kk'}(\phi)$ is revenues from exporting to Country k' for a firm in Country k with productivity ϕ and is defined as in Melitz.

The marginal exporter will be the firm with productivity ϕ'_x such that the per customer total surplus from exporting – $TS_x^{kk'}(\phi'_x)$ – is just equal to the cost of creating the export match – m. From the definition of $TS_x^{kk'}(\phi)$ above, the marginal exporter is the one for which $r_x(\phi'_x)/\sigma = \overline{L}_j m \times (\sigma-1)/(2\sigma-1)$. Note that, if the exporter were to bear the full cost of exporting, the marginal exporter would be the one for which profit from exporting equals the cost of creating a match. In this case, the marginal exporter would be defined by the condition $r_x^{kk'}(\phi^*_x)/\sigma = \overline{L}_{k'} m$, implying that $\phi'_x < \phi^*_x$. Thus, the marginal exporter under cost sharing will have lower productivity, higher prices and smaller export sales. Welfare of the importing country will also be higher.

As is likely clear from this analysis, this distribution technology shares various features of the Melitz exporting model: exporting firms either sell to all customers in Country k' or none and the cost of exporting to Country k' is $f_{ex} = \overline{L}_{k'} m \times (\sigma-1)/(2\sigma-1)$. As such, the trading equilibrium will be defined as in Melitz. Note, however, that unlike Melitz, export costs here vary with the size of the foreign country market and the elasticity of substitution

among varieties. These features of the import distribution technology, and its associated trade costs, will be explored subsequently.

Perhaps unsurprisingly, this simple import distribution technology cannot, by itself, explain the data on exporting and importing. Under the technology, all "importers" are the same size, all exporters match with the same number of "importers" and all "importers" match with the same number of exporters (as in Melitz and others). As noted earlier, the data are strikingly at odds with this prediction. In particular, recall that our data show that the vast majority of export firms match with a small number of importers (many just 1) while a small fraction of exporters match with many importers. Further, those that match with a small number of importers export relatively small amounts but export relatively large amounts per importer. The importers to which these exporters match import large amounts in total, import more total HS codes and deal with more exporters. Those that match with many importers sell relatively large amounts but export relatively small amounts per importer. Finally, there are virtually no small importer-small exporter matches: small exporters match with large importers and small importers match with large (typically global) exporters.

The above discussion indicates that, if we are to understand the trade data, we need a model that has heterogeneity both on the exporter side of the market and on the importer side. Further, some part of the importer-side heterogeneity must capture the feature that the many small exporters in the data each typically match with 1 large importer who imports large numbers of products. This feature suggests the existence of a set of importers who consolidate the products of many small exporters, thereby allowing these exporters to share the significant costs of distributing in the foreign market. These are the import intermediaries. The data also indicate that the model must allow for the possibility that, in any given trading pair, the cost of distributing is affected by the sizes of the importer and exporter. Below we flesh out a model of this sort and analyze its implications fro trading systems.

3.3 A two-technology model of distribution

We consider a model in which there are two possible distribution modes. One is similar to the above in that selling occurs directly between an exporting firm and a foreign market customer. We call this technology the "direct-to-market selling technology". The other involves intermediated trade in the sense that the exporting firm sells to a (foreign) importing intermediary who is not the final consumer and the foreign consumer buys from the import intermediary. We call this technology the "intermediated trade technology". Implicit in this latter technology is the assumption that it is cheaper to create matches with foreign customers via an intermediary located in the importing country than one located in the exporting country (an export intermediary). This assumption is in keeping with the assumption that there is no cost of creating matches between domestic producers and consumers.[3] We describe each technology in detail below.

3.3.1 The direct-to-market selling technology

This technology is similar to the one in the previous section in that selling occurs directly between an exporting firm and a foreign market customer. Unlike the above technology, however, the cost of creating a firm-customer match under the direct-to-market technology is assumed to depend on the sizes of the exporting firm and its matched importing customer.[4] One can think of this technology as either a customer in Country k' expending resources to find an exporting firm in Country k or an exporting firm in Country k finding a foreign market customer in Country k'. In the former case (customer finding exporting firm), the resource cost of creating the match depends on the Country k firm's global export sales, $s_x^k = \sum_{k'} s_x^{kk'}$, where $s_x^{kk'} = p_x^{kk'} y_x^{kk'}$ gives export sales by a Country k firm to each Country k'. We assume that this match cost relationship is given by the step function

[3] The idea here is that, by being local, import intermediaries know the final goods market and its customers better than would an intermediary located in the exporting country.

[4] This matching technology is analogous to one used in the labor matching literature. There an employer (a worker) can be either small or large depending on the amount of job postings (search activity) that the employer (worker) undertakes. The larger is the employer or worker, the higher the match probability and so the lower the costs of creating a match (see Pissarides (1984) and Howitt and McAfee (1987) as examples).

$$m_D(s_k^x) = \begin{cases} \overline{m} & \text{if} \quad 0 \leq s_x^k \leq \widehat{s} \\ \underline{m} & \text{if} \quad s_x^k > \widehat{s} \end{cases}$$

implying that globally large exporting firms are cheap for the customer to identify while globally small ones are expensive to identify. In the latter case (exporting firm finding customer), the resource cost of creating a match depends on the Country k' customer's global imports, $s_I^{k'}$. We assume an analogous cost function, with match cost $\overline{m}$ if the customer is a small global importer and $\underline{m}$ if the customer is a large global importer. The resource cost of creating a match is given by the lower of the two possible costs; that is, the resource cost of the match is $\underline{m}$ if one of the matched pairs is large globally and $\overline{m}$ if both are small global players.

The basic idea behind this structure is that, if export firms are large enough global players, they are so well known that foreign customers need expend few if any resources to identify them. As a result, the resource cost of selling in the foreign country is small in this case. If an export firm is small globally, then this firm is not well known and so is hard for the customer to find. If the customer is also "small" globally, it is also hard for the exporter to find. In this case, the cost of creating the match is high both for the firm and the consumer. Effectively, there are global scale economies in market entry, similar to the global marketing cost assumption of Hanson and Xiang.

3.3.2 The intermediated trade technology

The second technology involves intermediated trade. Under this technology, the export firm does not sell directly to a final customer. Instead, the export firm matches with an import intermediary in the foreign market and the import intermediary matches with final customers. The potential value of this technology is that, if both the export firm and its customers are small but the intermediary large, then it may be relatively cheap both for the export firm to match with the intermediary and for the final customers to match with the intermediary. As long the cost of intermediation is not too large, this technology may be efficient relative to the direct-to-market selling technology.

To model this sort of intermediation, we assume that a consumer in the foreign country,

k', can pay a fixed, set-up fee, f_I, that gives the consumer access to an efficient technology for creating a network of foreign exporting firms. One might think of this as the cost of establishing an intermediation firm, buying a data base of producers in some industry, investments in industry contacts and the like. The technology allows the intermediation firm to develop its network of foreign exporting firms at some variable cost that depends on the number of firms that the intermediary seeks to identify.

Specifically, if we let $n_{kk'}$ be the measure of varieties/firms from countries other than k' identified by an intermediary in Country k', then the cost of creating a network of size $n_{kk'}$ is given by $m_I(n_{kk'}) > 0$, with $m_I'(n_{kk'}) > 0$. The idea here is that the more firms/varieties that the intermediary seeks to identify, the more trade shows the intermediary must attend, the more data bases the intermediary must acquire, etc. so that the intermediary's costs are higher. This assumption is consistent with the matching structure proposed by Rauch and Watson, who assume that the cost to the intermediary of maintaining a certain size network of potential matches is increasing with network size. We also assume that $m_I''(n_{kk'}) > 0$, so that the marginal cost of adding varieties is increasing in varieties. This could be because of overlap in attendees at trade shows, reduced values of connections, increasing time costs and the like. Together, these assumption imply that average cost of variety acquisition is U-shaped. We let the average cost minimizing number of varieties for any intermediary be given by $\widehat{n}$ defined such that $\widehat{n}m_I'(\widehat{n}) = f_I + m_I(\widehat{n})$.

In addition to these direct intermediation costs (the costs for the intermediary of creating its network of export firms), Country k' customers and Country k exporting firms incur some cost to match with the intermediary. To maintain consistency, we model these matching costs as being identical to the direct-to-market costs specification above. Specifically, we assume that the resource cost for a customer to identify and match with an intermediary having global purchases of $s_I^{k'}$ is $m_D(s_I^{k'})$; similarly, the resource cost for an exporting firm to identify and match with the same intermediary is also $m_D(s_I^{k'})$. As in the case of the direct-to-market selling technology, this matching cost assumption is consistent with the labor matching models referenced above.

3.3.3 The distribution equilibrium

In order to focus attention on the link between the distribution technologies and trading behavior, as well as to provide a simple benchmark analysis, we assume in what follows that the structure of distribution is determined to maximize total surplus net of distribution costs; that is, we assume that the efficient distribution system is implemented, subject to export firm pricing decisions. Proceeding in this way guarantees that, if multiple distribution technologies arise in equilibrium, they are a fundamental feature of the transaction process and not simply due to some pricing (or other) distortion in the trading transaction that might be avoided under an alternative contracting process. This is in keeping with practice in the literature on vertical arrangements, of which this distribution model is an example (see, for instance, Mathewson and Winter (1984) and Bernheim and Whinston (1998)). In this case, since all distribution costs are fixed costs, the efficient intermediation contract has the intermediary buying output from exporting firms of productivity ϕ that use the intermediary for a price $\tau/\rho\phi$ and selling to consumers at the same price. The intermediary charges fixed fees to both its exporting firm customers and consumers to cover the fixed costs.

To further simplify the exposition of the distribution equilibrium, we assume in what follows that intermediaries specialize in the exporters of a particular country. Since intermediation costs $m_I(\cdot)$ depend only on the value of $n_{kk'}$ and not on the country of origin of the exporting firm or the exporting firm's productivity, this is without loss of generality as long as there are sufficiently many exporting firms from each country that employ intermediaries. We will be more precise about this idea below. Also, we focus on symmetric intermediation outcomes in which the distribution of outputs and prices for firms exporting from Country k – the distribution of ϕ's for Country k exporters using intermediaries in Country k' – is the same across all intermediaries in Country k' that deal with Country k exporters.

In these circumstances, if we let $N_I^{kk'}$ be the measure of intermediaries in Country k' dealing with Country k exporting firms and $[\underline{\phi}_I^{kk'}, \overline{\phi}_I^{kk'}]$ the support of exporting firm productivity types in Country k that use an intermediary in k' to export, then $N_I^{kk'}$ is

defined by $\int_{\underline{\phi}_I^{kk'}}^{\overline{\phi}_I^{kk'}} N_k \nu_k(\phi) d\phi = N_I^{kk'} n_{kk'}$. The sales for an intermediary are then given by: $s_I^{kk'} = \int_{\underline{\phi}_I^{kk'}}^{\overline{\phi}_I^{kk'}} (\tau/\rho\phi) y_{kk'}(\phi)(N_k/N_I^{kk'})\nu_k(\phi)d\phi$, where $y_{kk'}(\phi)$ are export sales to Country k' of a firm of productivity ϕ in Country k.

How does intermediation work? A measure $n_{kk'}$ of exporting firms from Country k with productivities on the interval $[\underline{\phi}_I^{kk'}, \overline{\phi}_I^{kk'}]$ match with an intermediary in Country k'. Each exporting firm match results in a resource cost of $m_D(s_I^{kk'})$. There are $N_I^{kk'}$ identical intermediaries that import from Country k. The establishment of each intermediary requires a resource cost of $f_I + m_I(n_{kk'})$. Consumers in Country k' match with each intermediary, resulting in a resource cost of $m_D(s_I^{kk'})$ per consumer, per intermediary match. Each consumer buys all $n_{kk'}$ varieties from each intermediary and pays price $\tau/\rho\phi$ for the variety produced by an exporting firm with productivity ϕ. There is also a fixed fee that is allocated between exporting firms and consumers to cover the fixed costs of $f_I + m_I(n_{kk'})$ and matching costs. The total surplus, gross of the fixed resource costs, generated from the transaction with a given intermediary is $TS_I^{kk'} = \int_{\underline{\phi}_I^{kk'}}^{\overline{\phi}_I^{kk'}} \overline{L}_{k'} TS_x^{kk'}(\phi)(N_k/N_I^{kk'})\nu_k(\phi)d\phi$. Intermediation costs for each intermediary are $n_{kk'}m_D(s_I^{k'}) + (f_I + m_I(n_{kk'}) + \overline{L}_{k'}m_D(s_I^{k'}))$.

From the above, for fixed $[\underline{\phi}_I^{kk'}, \overline{\phi}_I^{kk'}]$, the value of $N_I^{kk'}TS_I^{kk'}$ is independent of $N_I^{kk'}$ (and so $n_{kk'}$). As a result, the value of $n_{kk'}$ is defined simply as the one for which the per-variety cost of intermediation is minimized; that is, $n_{kk'}$ is such that $m_D(s_I^{k'}) + (f_I + m_I(n_{kk'}) + \overline{L}_{k'}m_D(s_I^{k'}))/n_{kk'}$ is minimized. Since both $N_I^{kk'}$ and $m_D(\cdot)$ are (weakly) decreasing in $n_{kk'}$, the number of varieties carried by any intermediary, $n_{kk'}^*$, is greater than $\widehat{n}$. As long as there are sufficiently many exporters from any country that the intermediaries specializing in that country achieve the cost minimizing value $n_{kk'}^*$, then our specialization assumption is without loss of generality. We assume that this value is achieved in what follows.

Finally, should the intermediation technology be adopted, then the values of $\underline{\phi}_I^{kk'}$ and $\overline{\phi}_I^{kk'}$ are determined as follows. Since total surplus and export sales for any individual firm are

increasing in ϕ while $m_D(\cdot)$ is decreasing in sales, it must be that the marginal exporter uses the intermediation technology, if it is used at all. Further, if the intermediation technology is used, $\underline{\phi}_I^{kk'}$ must be such that

$$\overline{L}_{k'} T S_x^{kk'}(\underline{\phi}_I^{kk'}) = m_D(s_I^{k'}) + (f_I + m_I(n_{kk'}) + \overline{L}_{k'} m_D(s_I^{k'}))/n_{kk'}. \tag{1}$$

This condition guarantees that the gain in total surplus from adding the least productive exporters is just equal to the added cost of intermediation. Additionally, it must be the case that

$$m_D(s_I^{k'}) + (f_I + m_I(n_{kk'}) + \overline{L}_{k'} m_D(s_I^{k'}))/n_{kk'} \leq \overline{L}_{k'} m_D(s_x^k(\phi_I)) \;\forall\; \underline{\phi}_I^{kk'} \leq \phi_I \leq \overline{\phi}_I^{kk'} \tag{2}$$

that is, it must be that the cost of the intermediated trade technology for any exporting firm using it is less than the cost of the direct-to-market selling technology. Similarly, it must be that

$$m_D(s_I^{k'}) + (f_I + m_I(n_{kk'}) + \overline{L}_{k'} m_D(s_I^{k'}))/n_{kk'} > \overline{L}_{k'} m_D(s_x^k(\phi_I)) \quad \forall \quad \phi_I > \overline{\phi}_I^{kk'}; \tag{3}$$

that is, the cost of the direct-to-market selling technology is less than the cost of the intermediated trade technology for any firm employing direct selling.

The structure of the distribution equilibrium can now be determined. Consider, first, a case in which customers in importing Country k' are small (the resource cost of a an exporting firm in Country k finding a customer in Country k' is $\overline{m}$). In this case, it is always weakly cheaper for customers to identify sellers than sellers to identify customers. As a result, one or both of the above intermediation technologies is employed. If conditions (2) and (3) are both satisfied, then $[\underline{\phi}_I^{kk'}, \overline{\phi}_I^{kk'}]$ is non empty and both technologies are used. In particular, the large export firms use the direct-to-market technology while smaller export firms use the intermediated trade technology. The smallest (least productive firms) – those with productivity indices $\phi < \underline{\phi}_{Ik'}$ – don't export. If one of (2) or (3) is violated, then only one of the distribution technologies is employed. In particular, if $m_D(s_I^{k'}) + (f_I + m_I(n_{kk'}^*) + \overline{L}_{k'} m_D(s_I^{k'}))/n_{kk'}^* < \overline{L}_{k'} m_D(s_x^k(\phi))$ for all ϕ, then only the intermediated trade technology

is employed; if $m_D(s_I^{k'}) + (f_I + m_I(n_{kk'}^*) + \overline{L}_{k'} m_D(s_I^{k'}))/n_{kk'}^* > \overline{L}_{k'} m_D(s_x^k(\underline{\phi}_I^{k'k}))$, then only the direct-to-market selling technology is employed. If, by contrast, customers in importing Country k' are large (the resource cost of a an exporting firm in Country k finding a customer in Country k' is $\underline{m}$), then it is always weakly cheaper for exporters to find customers than customers to find exporters. In this case, the outcome is as described in the one distribution technology section above. Specifically, all selling is direct-to-market selling and all exporters match with all customers.

What can we say about exporters and importers in the case in which there is both direct-to-market selling and selling via import intermediaries? First, the existence of import intermediaries allows small firms to export that would not be able to export if direct-to-market selling were the only option. There are two reasons: 1) the larger size of the intermediary makes matching cheaper – $m_D(s_I^{k'}) < \overline{m}$ – and 2) intermediation and matching costs can be spread over a collection of exporters and customers thus reducing the cost that any single exporter or customer bears. Because of this fact, the equilibrium results in a (relatively) small number of large importers – the import intermediaries – matching with the numerous small exporters and a large number of small importers – the consumers – matching with a relatively small number of large, global exporters. In short, the equilibrium produces a skewed distribution for importers that results, via agent economizing on matching costs, with at least one trading party in any match being a large, global trader. Finally, note that an exporter that uses the direct-to-market selling technology sells to each of the $\overline{L}_{k'}$ consumers in the destination country k'. An exporter that uses the intermediated trade technology exports to a single intermediary who then sells to consumers. As a result, export firms that sell large amounts to Country k' (and globally) will have more exporting partners than export firms that sell small amounts to Country k' (and globally); each import partner of a large export firms will tend to import less from that firm than the single intermediary partner of any small export firm imports from that firm. Because these intermediaries consolidate the products of many small exporters, they are highly diversified.

4 Patterns of Trade and Distribution

The key insight of the above model is that import intermediaries arise as an efficient means of facilitating trade between small exporters and their (small) foreign market customers. By both being located in the foreign market and consolidating the products of many exporters, import intermediaries are able cheaply to identify foreign market customers and create trades between small exporters and these customers. Because they consolidate many export products they gain scale and contribute to the observed skewed distribution of importers.

The mechanism for trading that the model identifies has several implications for observed patterns of trade and distribution. First, the model implies that, within a product category, the mode of import distribution is related to exporter size, with small exporters choosing to export through intermediaries. Second, given that smaller exporters are found in a broad set of products, the model implies that import intermediaries should be observed in a broad set of products also. Third, because a key role of intermediaries is to cheaply identify foreign consumers, import, as opposed to export, intermediaries should feature significantly in international trading activities. In the next section, we examine how well these predictions hold up in data.

The model also has a number of predictions for the ways that trade and distribution patterns are affected by transportation costs, country size and the extent of product differentiation. To develop these predictions, note that, because all matching costs are fixed costs, the trading equilibrium of the model will be defined as in Melitz. Given this, we need only to take some stand on the way that these fixed distribution costs are shared between customers and exporting firms in order to close the model.[5] In this regard, recall from section 4.2.1 that, for the marginal exporting firm, this sharing rule is pinned down: the exporting firm bears a share $(\sigma - 1)/(2\sigma - 1)$ of the exporting cost and the consumer bears the rest. For simplicity, we assume that this sharing rule is applied to all exporters. We note that none of our results on the relative amounts of trade intermediated by the different technologies depend on this assumption. Finally, to make the analysis interesting, we assume that $\widehat{s}$ is

[5] This is necessary to define the free-entry condition for firms and so pin down the value of ϕ_k^* (the lowest productivity producer in Country k').

sufficiently small that there exists some productivity level for which the direct-to-market technology generates costs of $\underline{m}$.

If both distribution technologies are employed in equilibrium, then from (2) and (3) above, it must be that i) $s_x^k(\phi_I) \leq \widehat{s}$ ($m_D(s_x^k(\phi_I)) = \overline{m}$) for all $\underline{\phi}_I^{kk'} \leq \phi_I \leq \overline{\phi}_I^{kk'}$ and ii) $s_x^k(\phi_I) > \widehat{s}$ for $\phi_I > \overline{\phi}_I^{kk'}$. As a result, the productivity cut-off for direct-to-market selling versus intermediated trade is given by the value $\overline{\phi}_I^{kk'}$ such that $s_x^k(\overline{\phi}_I^{kk'}) = \widehat{s}$. We assume for simplicity that $s_I^{kk'} \geq \widehat{s}$ for all k', k so that the matching costs for an intermediary is $\underline{m}$. In this case, (2) and (3) imply that, if both distribution technologies are employed, then i) $\overline{L}_{k'}\underline{m} < \underline{m} + (f_I + m_I(n_{kk'}^*) + \overline{L}_{k'}\underline{m})/n_{kk'}^* \leq \overline{L}_{k'}\overline{m}$ and ii) intermediated trade is preferred to direct-to-market selling for $\underline{\phi}_I^{kk'} \leq \phi_I \leq \overline{\phi}_I^{kk'}$ while the opposite is true for $\phi_I > \overline{\phi}_I^{kk'}$. Finally, the productivity cut-off for exporting at all (condition (1) above) is given by the condition $\overline{L}_{k'} T S_x^{kk'}(\underline{\phi}_I^{kk'}) = \underline{m} + (f_I + m_I(n_{kk'}) + \overline{L}_{k'}\underline{m})/n_{kk'}$.

With both distribution technologies active, we have from above that the marginal exporter uses the intermediated trade technology and so is defined by the value $\underline{\phi}_I^{k'k}$. For this exporter, it *must be* that $r_x^{kk'}(\underline{\phi}_I^{kk'})/\sigma = \pi_x^{kk'}(\underline{\phi}_I^{k'k}) = [(\sigma-1)/(2\sigma-1)] \times [\underline{m} + (f_I + m_I(n_{kk'}^*) + \overline{L}_{k'}\underline{m})/n_{kk'}^*]$; that is, the share of total intermediation costs, $F_{int} = [\underline{m} + (f_I + m_I(n_{kk'}^*) + \overline{L}_{k'}\underline{m})/n_{kk'}^*]$, borne by the exporter is $(\sigma-1)/(2\sigma-1)$. The remaining share is borne by the consumer and just exhausts consumer surplus.[6] The lowest productivity producer in Country k that is active, ϕ_k^*, is defined such that $\pi_d(\phi_k^*) = r_d(\phi_k^*)/\sigma - f = 0$, where $r_d(\phi_k^*)$ is revenues from domestic sales in Country k for the ϕ_k^* type. Finally, as in Melitz, the profit from exporting to Country k' for the $\underline{\phi}_I^{kk'}$ type can be written as $\pi_x^{kk'}(\underline{\phi}_I^{k'k}) = [r_x^{kk'}(\underline{\phi}_I^{kk'})/r_d(\phi_k^*)] \times r_d(\phi_k^*) - [(\sigma-1)/(2\sigma-1)]F_{int}$, so that $[\underline{\phi}_I^{kk'}/\phi^*\tau]^{\sigma-1} \times \sigma f = [(\sigma-1)/(2\sigma-1)]F_{int}$. This implies that

$$\underline{\phi}_I^{kk'} = \phi_k^* \tau \left[\frac{\sigma-1}{\sigma(2\sigma-1)} \frac{F_{int}}{f} \right]^{1/(\sigma-1)}. \tag{4}$$

We analyze the pattern of trade and distribution for two settings: a symmetric, two-country setting and an asymmetric three-country setting. In both cases we assume that

[6] While we have assumed this sharing rule for all exporting firms, we note this fact here to emphasize that our results on relative amounts of trade intermediated by different technologies will hold regardless of the assumption on cost sharing for firms other than the marginal exporter.

the distribution of ϕ is the same across all countries and is Pareto on the interval $[1, \infty)$, implying that $G(\phi) = 1 - \phi^{-\theta}$.

4.1 The symmetric, two-country case

In the two-country symmetric case, $\overline{\phi}_I^{12} = \overline{\phi}_I^{21} = \overline{\phi}_I$ and, from above, the common value of $\overline{\phi}_I$ is defined by the condition $r_x(\overline{\phi}_I) = \widehat{s}$. From the definition of $r_x(\overline{\phi}_I)$, we have that the value of $\overline{\phi}_I$ is given by

$$\overline{\phi}_I = \phi^* \tau \left[\frac{\widehat{s}}{\sigma f} \right]^{1/(\sigma-1)}. \tag{5}$$

In the same way, we have that $\underline{\phi}_I^{12} = \underline{\phi}_I^{21} = \underline{\phi}_I$ and the common value is defined by equation (4) above.

We define the relative shares of trade distributed via intermediaries versus via direct-to-market selling, $RS_x = \int_{\underline{\phi}_I}^{\overline{\phi}_I} r_x(\phi) g(\phi) d\phi / \int_{\overline{\phi}_I}^{\infty} r_x(\phi) g(\phi) d\phi$, as our measure of import distribution activity. In this expression, the numerator gives total sales by intermediaries and the denominator total direct-to-market sales. Given productivity is distributed Pareto and assuming that $\sigma < \theta + 1$, we have that when both distribution technologies are active

$$RS_x = \left[\frac{\underline{\phi}_I}{\overline{\phi}_I} \right]^{\sigma-\theta-1} - 1; \tag{6}$$

otherwise, RS_x is either 0 or 1.

Now, consider the impact of a symmetric decrease in the variable trade costs, τ. As in Melitz, a reduction in variable trade costs increases ϕ^* and lowers $\underline{\phi}_I$. If both distribution technologies are employed, the impact on the structure of distribution can be seen by noting that, from (4) and (5),

$$\frac{\overline{\phi}_I}{\underline{\phi}_I} = \left[\frac{\widehat{s}(2\sigma - 1)}{(\sigma - 1) F_{int}} \right]^{1/(\sigma-1)}. \tag{7}$$

The prediction then is that changes in τ have no impact on the relative market shares of the two importer types. Obviously, the same is true if only one of the distribution technologies is used. These results are summarized below:

Result 1 *In a symmetric trading equilibrium in which both distribution technologies are active, a reduction in variable trade costs results in a reduction in both* $\underline{\phi}_I$ *and* $\overline{\phi}_I$*. As a result, some firms that initially employed intermediaries switch to direct-to-market selling. The reduction in variable trade costs also results in i) a larger fraction of firms exporting ii) a larger absolute amount of exports being undertaken via intermediaries and iii) the relative share of trade undertaken by intermediaries being unchanged. Result iii) also holds if only one of the distribution technologies is used.*

What happens in this case is that, with lower variable trade costs, global sales of the large exporters expand. As a result, some firms that were previously too small to use the direct-to-market selling technology effectively expand enough to switch. The lower variable trade costs also allow firms that previously did not export to begin exporting. Because these firms are small, they sell via intermediaries and so this sector expands in absolute size.[7]

A similar analysis can be applied to the impact of changes in σ – the degree of product differentiation – and in $\overline{L}$. For σ, its impact on ϕ^*, and so on export activity, is unclear. However, one can determine the impact of changes in σ on distribution patterns. Specifically, when both distribution technologies are used we have from (7) that a symmetric increase in σ decreases the value of $\overline{\phi}_I/\underline{\phi}_I$. As a result, the relative share of exports sold via intermediaries declines. Thus, when both distribution technologies are used, direct-to-market selling gains in market share relative to sale via intermediaries as goods become closer substitutes.[8] When only one distribution technology is active, changes in σ have no impact on relative share or average number of importers.

Result 2 *In a symmetric trading equilibrium with both distribution technologies employed, the share of trade undertaken via intermediaries declines as goods become closer substitutes in consumption. There is no impact on the share of trade undertaken via intermediaries if only one technology is active.*

Basically, what happens in this case is that an increase in the degree of substitutability

[7] This result is different than the one in Ahn et al (2011) who argue that intermediation increases with trade costs. Of course, the intermediation mechanism in Ahn et al is very different from the one here.

[8] For a proof of this result, see the appendix to the text.

between varieties causes an increase in the advantage that productive exporting firms have over less productive firms. As a result, the large firms expand at the expense of the smaller firms. This causes the intermediation sector to shrink relative to the direct-to-market trade sector. The prediction is that more homogeneous sectors should see less intermediated trade and more direct selling.

For $\overline{L}$, a symmetric increase in $\overline{L}$ raises F_{int} and so, as in Melitz, leads to a decrease in ϕ^* and an increase in $\underline{\phi}_I$. From (7) and (6), an increase in $\overline{L}$ lowers $\overline{\phi}_I/\underline{\phi}_I$ and so reduces RS_x; that is, an increase in $\overline{L}$ increases the share of exporting done via direct-to-market selling as long as both technologies are viable. The reason is that an increase in $\overline{L}$ raises the cost of exporting by increasing the matching costs that are incurred in exporting. This results in the least productive exporters, who export via intermediated trade, exiting. As a result, $\underline{\phi}_I$ rises. The exit of these exporters also results in entry by less efficient domestic firms – ϕ^* falls. The substitution of less efficient domestic firms for more efficient exporters results in the inframarginal exporters increasing export sales, causing $\overline{\phi}_I$ to fall.

This result holds, however, only if both export technologies are utilized. Since utilization of both requires that $\overline{L}\underline{m} < \underline{m} + (f_I + m_I(n^*) + \overline{L}\underline{m})/n^* \leq \overline{L}\overline{m}$, if $\overline{L}$ increases enough, then $\overline{L}\underline{m}$ will become greater than $\underline{m} + (f_I + m_I(n^*) + \overline{L}\underline{m})/n^*$ and so only the intermediation technology will be used. This means that there is a non-linearity in the impact of country size on the form of distribution.

Result 3 *In a symmetric trading equilibrium, a symmetric increase in country size, $\overline{L}$, that leaves both distribution technologies operative results in export firms switching from intermediated trade to direct-to-market selling. This results in a decline in the relative share of trade via intermediaries. For a sufficiently large increase in $\overline{L}$, direct-to-market selling becomes cost dominated and all trade is via intermediaries: $RS_x = 1$.*

These results contrast with those in Melitz. In the Melitz model, $\overline{L}$ has no impact on trading patterns. Each firm exports the same amount and does so by selling to more individuals but selling less to each one. In the current model, the cost of exporting is the cost of identifying individuals. As a result, it is cheaper for a firm to sell a large amounts to a few individuals than to sell a little to many individuals. An increase in $\overline{L}$ increases

exporting costs by causing firms to sell less to more individuals. When both technologies are used, the impact on distribution activities is as described above. However, because the impact of an increase in $\overline{L}$ on intermediation costs is larger for direct-to-market selling than for intermediated trade – the cost of selling to individuals can be spread over n^* varieties for intermediated trade – ultimately direct-to-market selling becomes sufficiently expensive relative to intermediated trade that the former technology is not used. The non-linearity results. We will have more to say about this point below.

4.2 The three country case

Consider next a three country setting and consider exports by firms in Country 1 to Countries 2 and 3. Consider also two situations: i) $\overline{L}_2 = \overline{L}_3 = \overline{L}$ but $\tau_{21} > \tau_{31}$ and ii) $\overline{L}_2 > \overline{L}_3$ but $\tau_{21} = \tau_{31} = \tau$. In other respects, the countries are assumed identical. We also assume initially that, in both countries, $\overline{L}_{k'}\underline{m} < \underline{m} + (f_I + m_I(n^*_{kk'}) + \overline{L}_{k'}\underline{m})/n^*_{kk'} \leq \overline{L}_{k'}\overline{m}$. This guarantees that both forms of export selling occur initially.

For this three country setting, the values of the intermediation cutoffs will depend on the countries to which the firms are exporting. Analogous to (4) above, the lowest productivity Country 1 firm that exports to Country k' is given by

$$\underline{\phi}_I^{1k'} = \phi_1^* \tau_{1k'} \left[\frac{\sigma - 1}{\sigma(2\sigma - 1)} \frac{F_{int}}{f} \right]^{1/(\sigma-1)}. \tag{8}$$

Since the cost of direct-to-market selling depends on global sales, the value of the highest productivity producer in Country 1 that uses intermediation to Country k' is given by the condition

$$r_x^{12}(\overline{\phi}_I) + r_x^{13}(\overline{\phi}_I) = \widehat{s}$$

where $r_x^{1k'}(\overline{\phi}_I)$ gives the export revenues from selling to Country k' of a firm of productivity $\overline{\phi}_I$. Analogous to the derivation in (5), the value of $\overline{\phi}_I$ is then defined as

$$\overline{\phi}_I = \phi_1^* \left[\frac{\widehat{s}}{\sigma f(\tau_{21}^{1-\sigma} + \tau_{31}^{1-\sigma})} \right]^{1/(\sigma-1)}. \tag{9}$$

Finally, the value of $\overline{\phi}_I/\underline{\phi}_I^{1k'}$ is given by

$$\frac{\overline{\phi}_I}{\underline{\phi}_I^{1k'}} = \frac{1}{\tau_{k'1}}\left[\frac{\widehat{s}(2\sigma-1)}{(\sigma-1)F_{int}(\tau_{21}^{1-\sigma}+\tau_{31}^{1-\sigma})}\right]^{1/(\sigma-1)}. \tag{10}$$

For case i) ($\tau_{21} > \tau_{31}$), $\underline{\phi}_I^{13} < \underline{\phi}_I^{12}$; that is, more exporting occurs to the country with the lower trade cost. In addition, $\overline{\phi}_I/\underline{\phi}_I^{12} < \overline{\phi}_I/\underline{\phi}_I^{13}$ so that more of the trade to Country 3 occurs through intermediation. For case ii) ($\overline{L}_2 > \overline{L}_3$), $\underline{\phi}_I^{13} < \underline{\phi}_I^{12}$ since $F_{in2} = [\underline{m} + (f_I + m_I(n_{12}^*) + \overline{L}_2\underline{m})/n_2^*] > F_{in3} = [\underline{m} + (f_I + m_I(n_{13}^*) + \overline{L}_3\underline{m})/n_3^*]$. Thus, there will be more trade to Country 3 than to Country 2. It will also then be that $\overline{\phi}_I/\underline{\phi}_I^{12} < \overline{\phi}_I/\underline{\phi}_I^{13}$ so that, again, more of the trade to Country 3 occurs through intermediation. Again, this last result can be reversed if $\overline{L}_2$ is sufficiently large that $\overline{L}_2\underline{m} > \underline{m} + (f_I + m_I(n_{12}^*) + \overline{L}_2\underline{m})/n_{12}^*$. These results are summarized below.

Result 4 *In a three-country trading world with both distribution technologies active in Countries 2 and 3 and $\tau_{21} > \tau_{31}$, then more Country 1 firms export to Country 3 than to Country 2. Further, a larger fraction of the Country 3 trade occurs via intermediaries. If $\overline{L}_2 > \overline{L}_3$ and both intermediation technologies are active in Countries 2 and 3, more Country 1 firms will export to Country 3 than to Country 2 and a larger share of trade with Country 3 will be through intermediaries. If $\overline{L}_2$ is large enough, all trade with Country 2 is via intermediaries.*

An implication of these results is that a low variable trade cost in Country 3 allows export firms in Country 1 to become large. Importers in Country 2 take advantage of this fact and adopt the direct-to-market selling technology as a low cost means of creating imports. In this way, the lower trade costs in Country 3 bestow an external benefit on Country 2. A further implication is that very large countries find intermediation a low cost means of importing and so very large countries engage in much more intermediation than do very small countries.

This last point is worth additional consideration. In the model, a large country is a high cost place to export because exporting requires the identification of customers and the large country has more customers. Basically, the disadvantage of exporting to a large country is that the firm sells a small amount to a large number of customers. This problem suggests that, as countries become large, there are incentives for intermediaries to arise between the

final consumer and the importing intermediaries / firms. These "retail" intermediaries reduce the number of agents that need to match up with the importing "wholesale intermediary" (or importing firm) and so reduce the costs of exporting to large countries. Retail intermediaries are efficient if the cost to these firms of matching with final consumers is low relative to that of the importing firm or intermediary. The creation of retail intermediaries for large countries can reverse the above results and exporting to large countries can be inexpensive relative to exporting to smaller countries without retail intermediaries.

5 Evidence on the Model

While our model is designed to capture some of the basic features of the data detailed in Section 2, it is clear from the above that it has a number of other implications about trading behavior and import distribution systems. In this section, we investigate these predictions with our data.

5.1 Evidence on the message of the model

The main message of our model is that the significant cost of selling abroad is finding foreign consumers, or being found by them, and this "matching" cost depends on the size of the parties involved. This (size-based) cost of matching means that exporter size heterogeneity leads to heterogeneity in distribution mode, with smaller exporters of any given product selling via import intermediaries. We show in what follows that the data support this trading mechanism in two ways: i) within HS 8-digit products exported from Argentina to Chile, importing typically occurs both via direct selling and import intermediaries and; ii) the Argentine exporters that sell to Chilean import intermediaries are the smaller global exporters.

To document these facts, we use the matched Chilean importer-Argentinean exporter data. These data allow us to identify precisely the main line of business of each Chilean importer, as defined by the Chilean Revenue Agency. Examples of lines of businesses in the sample are: "wholesaler of machinery for working with textiles and leather", or "manufac-

turer of machinery for processing food, beverages, or tobacco". Broadly speaking, Chilean importers can be classified as one of 4 types: individuals, manufacturers or service providers, wholesalers and retailers. According to the data, in 2005 manufacturers and service providers accounted for 68% of all Chilean imports from Argentina, while wholesalers and retailers accounted for 27% and 4% respectively. Individuals accounted for the remaining less than 1%. Excluding oil and natural gas products, which are largely imported by manufacturers and service providers and account for slightly over 50% of Chilean imports from Argentina, individuals, manufacturers or service providers accounted for 50% of all Chilean imports from Argentina in 2005, while wholesalers and retailers accounted for 42% and 8% respectively.

We start by investigating whether, within HS 8-digit categories, we observe imports into Chile both by final customers and by import intermediaries, as our model predicts. The data indicate that, of the 3,608 HS 8-digit products exported from Argentina to Chile in 2005, 25.1% were imported only by either individuals, manufacturers or service providers, a group of importers that we define collectively as end-users of the imported products. Another 25.7% were of products imported only by wholesalers or retailers, firms that we define as import intermediaries. The remaining 49.2% were imported by both groups of importers so that about half of all products were imported both via direct selling and import intermediaries. In terms of value, the HS 8-digit products imported only by end users – individuals, manufacturers or service providers – amounted to US $ 1.8 billion in imports from Argentina. The products imported only by wholesalers or retailers amounted to US $ 194 million, while products imported by both end users and intermediaries amounted to US $ 1.9 billion. Among the top one hundred HS 8-digit products exported from Argentina to Chile, which account for a total of 82% of all Argentine exports to Chile in 2005, we find that 77 of these product categories were imported by both end users and intermediaries. For the HS 8-digit products sold to both end-users and intermediaries, Figure 2 shows, for all products (Panel A) and for the top 100 imported products (Panel B), the distribution of export sales carried via intermediaries. Altogether the evidence indicates that, within product categories, a significant share of Chile's imports from Argentina features importing both via end-users (direct selling) and intermediaries.

Next, we investigate whether, as predicted by the model, import intermediaries facilitate

trade for small exporters. In our matched data, almost 40% of the 3,479 Argentine exporters that sell to Chile in 2005 deal exclusively with wholesalers or retailers, another 35% deal exclusively with individuals, manufacturers, or service providers, and the remaining 25% or so sell to both groups of importers. The first group of exporters account for US $421 million in Argentine exports to Chile, while the second and third ones account for US $1.4 billion and US $1.9 billion respectively, showing that the average exporter that sells exclusively to intermediaries is smaller than the average exporter that sells to end-users. It also shows that the larger exporters sell to both, intermediaries and end-users.

Table 4 provides more systematic evidence on the size of Argentine exporters that sell to different types of importers, controlling for HS 8-digit and year fixed effects. The results reported use the sample of the top 100 HS 8-digit codes imported from Argentina into Chile, although results from trade weighted regressions including all products show similar results (not reported to conserve space). The first and second columns of Table 4 use exporter sales to the world and exporter sales to Chile as measures of exporter size. The two measures of exporter size confirm that, within HS 8-digit products, firms that sell exclusively to intermediaries in Chile are smaller global and bilateral exporters than exporters that sell to end-users. The last two columns in the same table distinguish between exporters that sell exclusively to end-users and exporters that sell to both, intermediaries and end-users. They show that exporters that sell only via intermediaries are the smallest, the ones that sell only to end-users are between 30 and 50 log-points larger and the largest exporters sell both to end-users and intermediaries.

The finding that import intermediaries facilitate trade for small exporters implies also that: i) these intermediaries should be observed in a broad set of products, given that smaller exporters are found in a broad set of products; and ii) import intermediaries, rather than export intermediaries, should be observed to dominate intermediary trade. This last implication follows from the fact that the ability to match small exporters with small import market customers presumably comes from the intermediaries' knowledge of the import market. This should be an advantage that the import intermediary has over the small export firms and, presumably, over export intermediaries. We show that both of these implications hold on

the universe of Chilean export and import transactions in 2005.[9] Table 5 shows the share of Chilean exporters that are wholesalers or retailers and the share of exports these firms account for each of the top 30 HS 4-digit non-copper export categories. Only in agricultural products do export intermediaries have any significant share of exports. Table 6 shows the share of importers that are wholesalers or retailers and the share of imports these firms account for, again for the top 30 HS 4-digit import categories. With the exception of oil products and coal and molybdenum, import intermediaries account for a significant share of imports in all these product categories.[10]

Finally, it is worth noting that our model makes the simplifying assumption that there are only two types of importers: small individuals and large intermediaries. Table 7 gives the size distribution of Chilean importers from Argentina by broad line of business and shows that there is more importer heterogeneity than assumed. Consistent with our model, wholesalers and retailers are among the largest importers: the size distribution, in terms of imports from the world, of wholesale importers is shifted to the right relative to the distribution of the other types of importers and, at the top percentile of the importer size distribution, retailers are the largest importers. However, import intermediaries are by no means the only large importers and not every import intermediary is a large importer. Indeed, there is a significant share of wholesalers and retailers that are small global importers; there are also manufacturers and service providers that are among the largest importers in Chile.

Although these last two features of the data are not captured by our model, we do not see them as refuting the main message of the model. As the model predicts, import intermediaries contribute to the skewness of the distribution of importer size and they match with the smallest exporters, thereby facilitating trade for these firms. In the Conclusion we discuss how our model could be extended to include both heterogeneous manufacturers that import the product as an intermediate good and final consumers. Such a model would

[9] In these data we can identify the main line of business of each Chilean exporter and of each Chilean importer (see the Data Appendix for description of these data).

[10] The finding that export intermediaries account for small export shares is also found by Akerman (2010) in Sweeden data, Bernard et al (2011) in Italian data, and Ahn et al (2011) in Chinese data. Bernard et al (2012) find, in Belgium data, that large manufacturing firms that export tend to carry products that they do not produce, what may indicate that they play the role of trade intermediaries.

generate both manufacturers and intermediaries as large importers. Further, one might imagine that intermediaries, especially retailers, become large via total trade, both domestic and international trade. If this is the case, intermediaries may be small importers provided they have scale in the domestic market. We make the assumption that size depends only on international trade for practical reasons: we have no data on domestic trade.

5.2 The impact of transport costs, country size and differentiation

Results 1–3 in section 4.1 provide predictions on the effects of variable trade costs, country size, and product differentiation on the share of trade distributed via import intermediaries. For ease of reference, we summarize the predictions here. Recall, first, that if it is costly for exporters to identify final customers ($m = \overline{m}$) and the measure of final customers, $\overline{L}$, is not too large, then distribution occurs both via import intermediaries and direct-to-market selling. In this case, the share of Chilean imports from country c in a given HS 8-digit category that is transacted through intermediaries, $S^I_{hs8,c,t}$, is less than 1 and is decreasing in $\overline{L}$.[11] This is the pattern in area A of Figure 3. When $\overline{L}$ becomes sufficiently large, only intermediaries are used, and the share of Chilean imports from country c transacted through intermediaries equals one. This is the pattern in area B of the figure. When it is cheap for exporters to identify final customers ($m = \underline{m}$), then only direct-to-market selling is used and the share of exports transacted by intermediaries is zero. This is the substance of Result 3. From Result 2 we have that, when both distribution technologies are active, the value of $S^I_{hs8,c,t}$ is smaller the larger is σ (the more homogenous goods are); when only intermediation or direct-to-market selling is used, σ does not affect $S^I_{hs8,c,t}$. In terms of Figure 3, σ does not affect $S^I_{hs8,c,t}$ in area B, while $S^I_{hs8,c,t}$ and σ are negatively correlated in area A. Finally, from Result 1, variation in variable trade costs should have no impact on distribution modes and thus on the share of exports carried out by intermediaries.

Because these predictions are purely about the import distribution mode, and not about characteristics of the importer-exporter match, we can evaluate them by looking at cross-

[11] Note that the variable $S^I_{hs8,c,t}$ is a monotonic transformation of RS_x, defined in section 4, and thus all the results derived for the latter hold for the former as well.

product, cross-country variation in Chilean transaction-level import data only. For this reason, we can utilize the universe of Chilean import transactions from 2000-2008.[12] We start with Result 3, relating distribution mode to market size. Ideally, we would test this prediction using variation in the number of Chilean customers for a given product. Since these data are not available, however, we proxy for market size using a Chilean Central Bank classification of HS8 products as either consumer goods, intermediate goods or capital goods. The classification uses the guidelines for National Accounts published by the United Nations. Consumer products are defined as those products that are used, without any further transformation, by households, government institutions and non-profit organizations for direct satisfaction of their needs. Intermediate goods are products used as intermediate inputs in production processes, with the exception of goods that could be considered assets (used many times to produce), which are categorized as capital goods. Given these definitions, we think it is reasonable to assume that consumer products are ones for which: i) it is costly for exporters to identify directly final consumers in foreign markets ($m = \overline{m}$) and ii) the number of final customers is large. In this case, the model predicts that consumer products should be ones for which intermediaries dominate the import market. As a result, consumer products should fall in area B of Figure 3. By contrast, we expect that intermediate goods and capital goods are products for which either i) it is relatively cheap for exporters to identify foreign customers (($m = \underline{m}$) or ii) the number of final customers is relatively small. The former case results in direct-to-market selling, the latter locates capital and intermediate goods in area A of Figure 3, where both distribution technologies are used.

The top panel of Table 8 shows the share of Chilean imports of consumer, capital, and intermediate products carried out by different types of importers for the period 2000–2008. It confirms that a disproportionately large amount of trade in consumer goods is done through import intermediaries. The bottom panel of Table 8 shows the same information for goods distinguished by their Rauch classification. It shows that a disproportionately large amount of trade in differentiated goods is done through import intermediaries. For more systematic evidence we estimate the relationship between $S^I_{hs8,c,t}$ and d^c_{hs8}, where $d^c_{hs8} = 1$ if the product

[12] In these data we can identify the importers' main line of business, as defined by the Chilean Revenue Agency, and thus distinguish import intermediaries from end users.

is a consumer good and zero otherwise:

$$S^I_{hs8,c,t} = \mu + \delta_t + \delta_c + \delta_{hs2} + \lambda * d^c_{hs8} + \xi^1_{hs8,c,t} \tag{11}$$

with δ_t, δ_c, δ_{hs2} being year, origin country, and HS 2-digit category fixed-effects respectively. [13]

Table 9 shows that the estimated parameter $\widehat{\lambda}$ is positive and statistically significant in the specification 11 (column 1 of the table). Column 2 of the table shows parameter estimates for a regression that includes a control for the degree of product heterogeneity in consumption (σ). We use the Rauch classification of homogeneous, differentiated, and referenced priced goods (Rauch 1999) as a proxy for σ, with $d^h_{hs6} = 1$ if the hs6 product is classified as a differentiated product and zero otherwise. Controlling for σ, consumer goods (large $\overline{L}$) are more likely traded via import intermediaries. These results are exactly what one would expect if consumer products are predominantly (all) in area B of Figure 3 – if consumer product distribution is dominated by import intermediaries – while intermediate and capital goods distribution is predominantly direct-to-market selling or uses both distribution technologies.

We turn next to Result 2 that relates distribution mode to product heterogeneity in consumption. It states that, for products that are imported via both distribution technologies, import intermediaries should carry out a larger share of imports for heterogeneous goods than for homogeneous ones. To check this prediction, we estimate the following equation:

$$S^I_{hs8,c,t} = \alpha + \delta_t + \delta_c + \delta_{hs2} + \theta * d^h_{hs6} + \xi^2_{hs8,t} \qquad \text{for } \; 0 < S^I_{hs8,c,t} < 1 \tag{12}$$

on the sample of HS 8-digit products that are imported from source country c at year t by both intermediaries and end-users. As before, $d^h_{hs6} = 1$ in the above equation if the HS 6-digit product is classified as a differentiated product and zero otherwise. Column 3 in Table 9 confirms that, as predicted by the model, differentiated products are more likely to be traded

[13] Country fixed-effects to control, for instance, for the possibility that firms from source country c are more/less likely to use trade intermediaries. In our model this would be case, for instance, if the distribution of firm sizes in country c is shifted to the left/right relative to other countries.

via import intermediaries.[14] Column 4 of the table reports results when we also control for product type – a consumer, intermediate, or capital good. It confirms that differentiated products are more likely traded via import intermediaries. These results provide additional evidence for the model's predictions.

Finally, we can use product, source country, and time variation in our data to check the prediction that variable trade costs (τ) do not affect the share of trade carried out via import intermediaries (Result 1). We estimate directly the variable trade cost of importing a given $HS4$ category from country c at time t in two steps. First we estimate the equation:

$$\left(F^{hs4}_{i,hs8,c,t} + I^{hs4}_{i,hs8,c,t}\right) = \delta^{hs4}_t + \delta^{hs4}_c + \varphi^{hs4}_t * FOB^{hs4}_{i,hs8,c,t} + \phi^{hs4}_t * FOB^{hs4}_{i,hs8,c,t} * dist_c + \xi^{hs4}_{i,hs8,c,t} \quad (13)$$

where $F^{hs4}_{i,hs8,c,t}$ and $I^{hs4}_{i,hs8,c,t}$ are the freight and insurance costs of transaction i importing a given HS8 product from country c at year t, and $FOB^{hs4}_{i,hs8,c,t}$ is the fob value of the same import transaction. The variable $dist_c$ measures the great-circle distance, in kilometers, between country c and Chile's capital, Santiago. In the equation above, country fixed-effects allow for the fact that Chilean importers may face higher/lower fixed costs when importing from some countries, while time fixed-effects and time-varying coefficients allow variable trade costs to vary with time, and with time/distance. The equation above is estimated separately for each of the 1,250 HS 4-digit categories that have at least 15 transactions with freight and insurance cost information for unique HS 8-digit codes.[15]

Our estimated measure of the variable trade cost is then computed as:

$$\widehat{\tau}^{hs4}_{c,t} = \frac{\partial\left(F+I\right)}{\partial\left(FOB\right)} = \varphi^{hs4}_t + \phi^{hs4}_t * dist_c \quad (14)$$

The median value for $\widehat{\tau}^{hs4}_{c,t}$ is 0.046, and the range of estimates goes from 0.007 to 0.214.[16] The full distribution of the 141,253 estimated values for $\widehat{\tau}^{hs4}_{c,t}$ is not reported to conserve

[14] We estimate the equation above using a less strict criterion for products that are traded via both distribution technologies ($0.1 < S^I_{hs8,c,t} < 0.9$) and find similar results.

[15] Some HS8 products appear only in transactions with other HS8 codes, making it impossible to disentangle the part of freight and insurance costs due to each product. Therefore, we estimate the value of τ using only the subsample of transactions for which a single HS8 product is shipped.

[16] These estimates are very much in line with the ones in the literature (see, for instance, Hummels (2007)).

space but is available upon request.

Using our estimates for $\widehat{\tau}_{c,t}^{hs4}$ we investigate the correlation between variable trade costs and the share of trade transacted via intermediaries:

$$S_{hs8,c,t}^{I} = \alpha + \delta_t + \delta_c + \delta_{hs2} + \pi * \widehat{\tau}_{hs4,c,t} + \xi_{hs8,t}^{3} \tag{15}$$

Column 5 of Table 9 shows that the share of trade carried out via intermediaries is not correlated with variable trade cost in a statistically significant way. Finally, for completeness Column 6 of the same table reports regression results using the full set of controls, and confirms the findings discussed in the previous paragraphs.[17]

6 Concluding Remarks

Although our model of the distribution sector is simple, it provides predictions that fit well with our data. There are a number of obvious extensions to the model that one might make that would allow for additional predictions. For instance, by adding internal trade costs one could allow for import distributors that serve subsets of the population in a country. In this case, export firms would have to decide on the number of import intermediaries to employ. This variation allows trade policy to impact the number of customers an exporter serves (a la Arkolakis) and permits predictions on the way that population density impacts import activity. With internal trade cost, domestic and export firms may also share distribution networks, allowing predictions on the impact of domestic market size on import activity. Two factors of production would allow for differences in factor intensity across manufacturing and distribution sectors and allow for trade cost differences between rich and poor countries. By moving away from perfect competition in the intermediation sector, one could have cross-country differences in the extent of competition within distribution sectors and examine the role this plays in trade liberalization.

Finally, as noted above, our model fails to capture two features of the data: i) there are many large exporter - large importer trading pairs and ii) even large exporters often sell some

[17] Bootstrapped standard errors for the regressions reported in columns 4 and 5 confirm the same findings.

fraction of their exports via import intermediaries. These features fall out naturally from an extended model in which i) the import sector consists both of consumers for whom the export goods are final consumption goods and heterogeneous firms for whom the export goods as intermediates goods and ii) the cost of matching consumers with export firms is always $\overline{m}$, regardless of the size of the export firm. Assumption i) produces large exporter - large importer trading pairs that adopt the direct-selling distribution system while assumption ii) produces trade via import intermediaries even for large export firms.

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Proof for Result 2 in the Text

Result 2 in the text claims that, if both distribution technologies are active, then the relative share of trade via intermediation declines and the average number of importers per exporter increases. The proof for this claim follows from the proposition below.

Proposition 5 *If both distribution technologies are active, then* $\overline{\phi}_I/\underline{\phi}_I$ *is decreasing in* σ*.*

Proof. Recall from equation (8) in the text that

$$\frac{\overline{\phi}_I}{\underline{\phi}_I} = \left[\frac{\widehat{s}(2\sigma-1)}{(\sigma-1)F_{int}}\right]^{1/(\sigma-1)}, \tag{16}$$

where $F_{int} = [\underline{m} + (f_I + m_I(n^*_{k'k}) + \overline{L}_{k'}\underline{m})/n^*_{k'k}]$ and the value of $n^*_{k'k}$ depends only the parameters $\underline{m}, \overline{m}, f_I$, and $\overline{L}$ and the form of the function $m_I(n)$. We can write equation (16) as

$$\ln\overline{\phi}_I - \ln\underline{\phi}_I = \frac{1}{\sigma-1}[\ln\widehat{s}(2\sigma-1) - \ln(\sigma-1)F_{int}].$$

The derivative of this equation with respect to σ is

$$\frac{d[\ln\overline{\phi}_I - \ln\underline{\phi}_I]}{d\sigma} = -\frac{1}{(\sigma-1)^2}[\ln\widehat{s}(2\sigma-1) - \ln(\sigma-1)F_{int}] + \frac{1}{\sigma-1}[\frac{2}{2\sigma-1} - \frac{1}{\sigma-1}].$$

From (16) and given $\overline{\phi}_I > \underline{\phi}_I$, it must be that $\widehat{s}(2\sigma-1) > (\sigma-1)F_{int}$, implying that both terms are negative and the result is proved. ■

TABLES

Table 1: Summary Statistics of Matched Exporter-Importer Data -- 2005

Sample: matched Chilean exporter-Colombian importer		**Sample: matched Argentine exporter-Chilean importer**	
Exports to Colombia (US$ Mill)*	292	Exports to Chile (US$ Mill)*	3,737
Number of Exporters to Colombia	548	Number of Exporters to Chile	3,479
Exports per Exporter (Mean; US$ Mill.)	0.53	Exports per Exporter (Mean; US$ Mill.)	1.07
Distribution of Colombian Sales of Chilean Exporters (Percentiles; US$ Th.)*		Distribution of Chilean Sales of Argentine Exporters (Percentiles; US$ Th.)*	
1%	1.5	1%	0.7
10%	5.6	10%	3.0
25%	19.9	25%	9.3
50%	79.5	50%	36.5
75%	339.6	75%	159.1
90%	1,240.9	90%	763.7
99%	8,068.5	99%	18,898.1
Imports from Chile (US$ Mill)**	302	Imports from Argentina (US$ Mill)*	3,932
Number of Importers	791	Number of Importers	4,033
Imports per Importer (Mean; US$ Mill.)	0.38	Imports per Importer (Mean; US$ Mill.)	0.97
Distribution of Chilean Purchases of Colombian Importers (Percentiles; US$ Th.) **		Distribution of Argentine Purchases of Chilean Importers (Percentiles; US$ Th.)*	
1%	0.6	1%	0.4
10%	6.1	10%	2.4
25%	22.0	25%	8.0
50%	75.0	50%	34.2
75%	339.3	75%	156.7
90%	854.2	90%	694.5
99%	5,603.6	99%	14,377.4

Notes: Statistics presented for matched importers and exporters based on importers' and exporters' names using the conservative criterion. See the online appendix for a detailed description of the matching procedure. * Information based on Chilean customs data; ** Information based on Colombian customs data.

Table 2: Summary Statistics of Matched Exporter-Importer Pairs – 2005

Matched Chilean exporter-Colombian importer		Matched Argentine exporter-Chilean importer	
# Chilean Exporters to Colombia	548	# Argentine Exporters to Chile	3,479
# Colombian Importers from Chile	791	# Chilean Importers from Argentina	4,033
# Exporter-Importer Pairs	1,266	# Exporter-Importer Pairs	8,158
Importers per Exporter	2.3	Importers per Exporter	2.3
Exporters per Importer	1.6	Exporters per Importer	2.0
Panel 1: Distribution of Importers per Exporter (Percentiles; #)			
1%	1	1%	1
10%	1	10%	1
25%	1	25%	1
50%	1	50%	1
75%	2	75%	2
90%	5	90%	5
99%	18	99%	14
Maximum	29	Maximum	95
Panel 2: Distribution of Exporters per Importer (Percentiles; #)			
1%	1	1%	1
10%	1	10%	1
25%	1	25%	1
50%	1	50%	1
75%	2	75%	2
90%	3	90%	4
99%	8	99%	13
Maximum	18	Maximum	46
Panel 3: Distribution of Bilateral Trade by Importer-Exporter Pair (Percentiles; US$ Th.)*			
1%	4.1	1%	3.5
10%	45.8	10%	24.6
25%	216.4	25%	94.4
50%	1,146.2	50%	445.8
75%	2,716.1	75%	2,846.1
90%	6,867.7	90%	15,200.1
99%	15,899.1	99%	127,000.1
Panel 4: Distribution of Worldwide Trade by Importer-Exporter Pair (Percentiles; US$ Th.)**			
1%	64.5	1%	12.8
10%	1,005.5	10%	142.4
25%	3,922.9	25%	652.7
50%	15,199.1	50%	3,395.9
75%	39,299.1	75%	18,800.1
90%	11,999.1	90%	72,201.0
99%	875,999.1	99%	1,311,020.1

Notes: Sample using the Conservative criterion as defined in the Data Appendix. * Distribution of total exports to Colombia plus total imports from Chile by importer-exporter pair (column 2); and distribution of total exports to Chile plus total imports from Argentina by importer-exporter pair (column 4). ** Distribution of total exports to the world plus total imports from the world by importer-exporter pair.

Table 3: Trade Patterns and Exporters' Characteristics of Matched Exporters.

Panel A: Matched Chilean Exporter-Colombian Importer data.

	Dependent Variable										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Log (Sales to Colombia)	HS8 Codes Exported to Colombia	Log (Sales to the World)	HS8 Codes Exported to World	Number of Destination Countries	Log (Sales to Col.) per Importer	HS8 Codes Exported to Colombia per Importer	Log (Purchases from World) by Importer	Log (Purchases from Chile) by Importer	HS10 Codes Imported from Chile by Importer	# of Exporters the Importer deals with
D=1(Exporter sells to 1 Importer)	-4.9	-3.9	-4.5	-27.2	-26.7	9.9	2.0	0.86	-0.15	4.4	1.48
	[0.48]	[1.14]	[0.58]	[4.80]	[2.84]	[0.48]	[0.94]	[0.2]	[0.2]	[0.9]	[0.3]
D=1(Exporter sells to (1,5] Importers)	-3.2	-2.1	-3.1	-24.5	-21.1	4.3	0.9	0.52	-0.03	2.98	1.22
	[0.48]	[1.14]	[0.58]	[4.81]	[2.84]	[0.48]	[0.94]	[0.2]	[0.2]	[0.8]	[0.3]
D=1(Exporter sells to (5,19] Importers)	-1.4	-1.5	-1.8	-21.5	-16.6	1.1	-0.1	0.19	-0.17	1.14	0.15
	[0.50]	[1.18]	[0.60]	[4.97]	[2.94]	[0.50]	[0.98]	[0.2]	[0.2]	[0.8]	[0.3]
Constant	12.7	5.6	16.8	32.4	31.5	-2	-0.2	12.0	8.42	-2.71	-0.66
	[0.83]	[1.94]	[0.99]	[8.22]	[4.85]	[0.83]	[1.61]	[1.4]	[0.9]	[1.2]	[0.4]
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HS2 Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1666	1666	1666	1666	1666	1666	1666	3864	3864	3864	3864
R2	.45	.21	.40	.20	.38	.80	.21	.15	.26	.20	.31

Notes: Standard errors in parenthesis. Regressions in columns (1)-(7) are estimated at the exporter-year level while regressions in columns (8)-(11) are estimated at the exporter-importer-year level. Standard errors in columns (8)-(11) are clustered at the exporter-year level. The omitted category includes exporters that sell to 19 or more Colombian importers and thus are at the top 1% of the importers per exporter distribution.

Panel B: Matched Argentine Exporter-Chilean Importer data.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Log (Sales to Chile)	HS8 Codes Exported to Chile	Log (Sales to the World)	Log (Sales to Chile.) per Importer	HS8 Codes Exported to Chile per Importer	Log (Purchases from World) by Importer	Log (Purchases from Argentina) by Importer	HS8 Codes Imported from World by Importer	HS8 Codes Imported from Argentina by Importer	# of Exporters the Importer deals with
D=1(Exporter sells to 1 Importer)	-4.6	-11.6	-4.3	9.5	2.7	-0.007	-0.04	4.4	3.4	0.7
	[0.18]	[0.76]	[0.22]	[0.17]	[0.57]	[0.14]	[0.10]	[3.80]	[0.58]	[0.22]
D=1(Exporter sells to (1,4] Importers)	-3.2	-9.6	-3.1	4	1.2	-0.02	-0.06	7.8	2.9	1.3
	[0.18]	[0.76]	[0.22]	[0.17]	[0.57]	[0.14]	[0.10]	[3.67]	[0.55]	[0.22]
D=1(Exporter sells to (5,14] Importers)	-1.5	-7.2	-1.6	1.2	0.1	0.2	0.08	5.7	1.8	1.2
	[0.19]	[0.80]	[0.23]	[0.18]	[0.60]	[0.14]	[0.11]	[3.77]	[0.58]	[0.24]
Constant	14.8	12.6	17.3	0.7	-1.8	14.2	10.5	28	-2.1	0.7
	[1.04]	[4.35]	[1.24]	[0.96]	[3.28]	[1.19]	[0.74]	[24.3]	[0.73]	[0.36]
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HS2 Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,529	10,529	10,529	10,529	10,529	24,640	24,640	24,640	24,640	24,640
R2	.32	.17	.29	.78	.16	.10	.17	.06	.08	.11

Notes; Standard errors in parenthesis .Regressions in columns (1)-(5) are estimated at the exporter-year level while regressions in columns (6)-(9) are estimated at the exporter-importer-year level. Standard errors in columns (6)-(9) are clustered at the exporter-year level. The omitted category includes exporters that sell to 14 or more Colombian importers and thus are at the top 1% of the importers per exporter distribution

Table 4: Characteristics of Argentinean Exporters that choose Different Distribution Modes when selling to Chile - 2005-2007.

	(1)	(2)	(3)	(4)
	Log (Exporter Sales to World – All HS 8 Codes)	Log (Exporter Sales to Chile – All HS 8 Codes)	Log (Exporter Sales to World – All HS 8 Codes)	Log (Exporter Sales to Chile – All HS 8 Codes)
D1=1(Exporter sells to intermediaries. only)	-1.165	-1.172	-1.700	-1.695
	[0.0795]	[0.0724]	[0.189]	[0.176]
D2=1(Exporter sells to end-users only)			-1.409	-1.377
			[0.227]	[0.206]
Constant	16.09	13.91	16.40	14.22
	[0.278]	[0.253]	[0.233]	[0.22]
Year Fixed Effects	Yes	Yes	Yes	Yes
HS8 Fixed Effects	Yes	Yes	Yes	Yes
Test (D2>D1)*	-	-	0.11	0.08
Observations	5083	5083	5083	5083

Notes: Standard errors in parenthesis are clustered at the exporter level. Omitted category is composed by exporters that sell to both intermediaries and end-users. Results in this table use the sample Argentine exporters that sell at least one of the top 100 HS 8-digit categories exported from Argentina to Chile.

Table 5: Intermediaries in Chilean Exports – 30 largest HS 4-digit categories in Chilean exports in 2005.

HS4 Code	HS 4-digit Description	Number of Exporters	FOB Export value (Million USD)	Share of total exports (%)	Share of exporters that are intermediaries* (%)	Share of exports value carried by intermediaries* (%)
7403	Refined copper and alloys	27	10,160	26.3	11.1	0.0
2603	Copper ores and concentrates	10	6,041	15.7	0.0	0.0
2613	Molybdenum ores and concentrates	5	2,800	7.3	20.0	0.2
4703	Chemical wood pulp, Soda or Sulfate, …	6	1,205	3.1	33.3	0.0
0304	Fish fillets & Other fish meat, fresh, chill or frozen	204	1,164	3.0	43.1	6.4
7402	Unrefined copper; copper anodes	5	1,147	3.0	20.0	0.0
2204	Wine of fresh grapes, …	330	883	2.3	23.3	7.0
2710	Oil (not crude) from petrol & bitum mineral	58	776	2.0	48.3	1.1
0806	Grapes, fresh or dried	354	740	1.9	50.6	76.3
4407	Wood sawn or chipped length, sliced etc.	171	714	1.9	29.8	13.0
0303	Fish, frozen (no fish fillets or other fish meat)	211	705	1.8	38.4	9.7
2905	Acyclic alcohols & halogenat, sulfonated etc.	22	626	1.6	31.8	0.0
0016	Fuel or lubricants for international travel or shipping	110	576	1.5	13.6	0.6
2301	Flour, meal etc. of meat etc., …	30	459	1.2	10.0	0.5
7202	Ferroalloys	6	457	1.2	50.0	0.2
0808	Apples, Pears and Quinces, fresh	241	365	0.9	61.8	74.4
7108	Gold (incl put plated)	10	338	0.9	0.0	0.0
2601	Iron ores & concentrates, including roast pyrites	2	305	0.8	0.0	0.0
0203	Meat of swine (pork), fresh, chilled or frozen	16	295	0.8	56.3	64.0
0025	Services considered exports	234	263	0.7	17.1	8.2
4409	Wood, continuously shaped	80	262	0.7	28.8	3.5
2801	Fluorine, Chlorine, Bromine & Iodine	16	247	0.6	31.3	0.4
4411	Fiberboard of wood or other ligneous materials	22	235	0.6	31.8	2.2
2825	Hydrazine and other inorganic materials	10	223	0.6	40.0	0.0
0809	Apricots, Cherries, Peaches, Plums & Sloes, fresh	210	212	0.5	68.1	74.8
4412	Plywood, Veneered panels & similar laminated wood	28	208	0.5	21.4	0.1
7408	Copper wire	11	192	0.5	0.0	0.0
0810	Fruit nesoi, fresh	181	177	0.5	70.2	87.9
2834	Nitrites, Nitrates	7	161	0.4	42.9	0.0
4401	Fuel wood in logs, wood in chips, etc	21	161	0.4	42.9	28.4

Note: * Intermediaries are defined as firms in the wholesale or retail businesses.

Table 6: Intermediaries in Chilean Imports – 30 largest HS 4-digit categories in Chilean Imports in 2005.

HS4 Code	HS4 Description	Number of importers	FOB import value (Million USD)	Share of total imports (%)	Share of Importers that are Intermediaries* (%)	Share of import value carried by Intermediaries* (%)
2709	Crude oil from petroleum	2	3,614	13.1	0.0	0.0
2710	Oil (not crude) from petrol	594	1,412	5.1	47.3	16.4
8703	Motor cars & vehicles	1796	1,138	4.1	3.1	53.7
8704	Motor vehicles for transport of goods	179	954	3.5	22.9	50.7
2613	Molybdenum ore	2	718	2.6	0.0	0.0
2711	Petroleum Gases	39	687	2.5	43.6	24.3
8525	Trans. apparatus for radio-telephony	976	602	2.2	41.9	30.8
8471	Automatic data process machines	1941	571	2.1	37.0	84.0
8702	Public-transport motor vehicles	75	423	1.5	18.7	28.2
8439	Machinery for making pulp	74	380	1.4	24.3	0.2
8429	Self-propelled bulldozers	114	358	1.3	27.2	74.7
201	Meat of bovine animals	58	308	1.1	69.0	72.8
3901	Polymers of ethylene	203	299	1.1	16.3	35.6
3004	Medicaments	263	283	1.0	36.9	52.0
4011	New pneumatic tires	455	224	0.8	31.4	12.8
8517	Electrical apparatus for line telephony	956	199	0.7	41.5	29.3
8701	Tractors	128	195	0.7	28.1	34.5
8708	Parts for motor vehicles	1803	195	0.7	22.9	42.1
2701	Coal, briquettes, etc	26	192	0.7	19.2	6.4
8431	Parts for machinery	820	180	0.7	32.2	62.1
8528	Television receivers	549	177	0.6	39.2	81.6
7208	Flat-roll iron and steel	83	163	0.6	36.1	37.5
8603	Self-propelled railway coaches	3	156	0.6	0.0	0.0
8438	Machinery for preparation of food	461	153	0.6	26.9	5.8
8413	Pumps for liquids, elevators, and parts	1986	151	0.5	40.7	43.1
8473	Parts for typewriters and office machines	922	149	0.5	45.6	78.5
3808	Insecticides, rodenticides, fungicides	211	147	0.5	48.8	38.2
8481	Taps, cocks, valves for pipes	2335	147	0.5	41.5	51.4
1517	Margarine, edible vegetable fats and oils	79	140	0.5	50.6	54.1
8421	Centrifuges, filter machinery for liquids	1941	138	0.5	39.9	36.3

Note: * Intermediaries are defined as firms in the wholesale or retail businesses.

Table 7: Size Distribution of Chilean Importers from Argentina by Line of Business – 2005.

	Wholesalers	**Retailers**	**Manufacturers & Services Providers**	**Individuals**
	Distribution of World Imports (Percentiles; US$ Th)			
1%	1.2	0.9	0.7	0.0
10%	14.8	3.9	7.4	1.1
25%	69.2	15.4	40.7	3.0
50%	358.9	108.4	318.1	12.7
75%	1,759.8	590.8	1,854.2	58.9
90%	7,293.7	2,109.1	7,340.1	184.3
99%	62,711.0	96,210.1	56,211.0	1,340.0
Observations	1,323	356	2,026	390

Table 8: Share of Chilean Imports by Importer and Product Type (2000 - 2008)

	Central Bank of Chile Goods Usage Classification			
Importer Line of Business	Consumer	Capital	Intermediate	Other
Individuals	1.8	0.7	0.6	0.8
Manufacturers and Service Providers	25.4	41.8	71.5	56.2
Wholesalers and Retailers	73.0	57.3	27.9	42.8
Total	100	100	100	100

	Rauch (Conservative) Goods Classification		
Importer Line of Business	Differentiated	Reference Priced	Homogeneous
Individuals	1.3	0.4	0.3
Manufacturers and Service Providers	39.5	66.9	85.4
Wholesalers and Retailers	59.2	32.8	14.2
Total	100	100	100

Note: The shares reported are averages across the years in the sample. Importers' line of business is determined by Chile's Internal Revenue Service (SII).

Table 9: Determinants of the Share of Chilean Imports Transacted by Intermediaries (2000-2008)

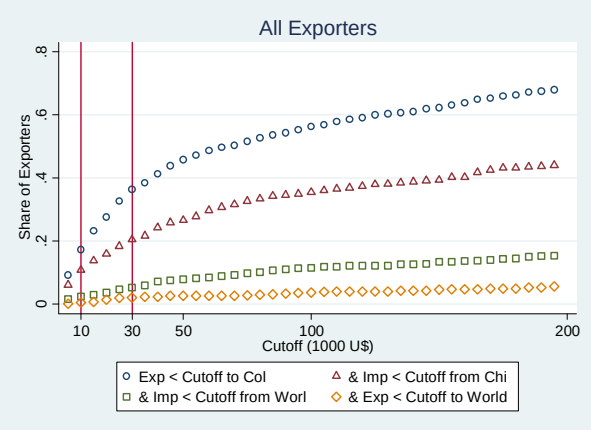
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	$s^i_{hs8,c,t}$	$s^i_{hs8,c,t}$	$s^i_{hs8,c,t}$	$s^i_{hs8,c,t}$	$s^i_{hs8,c,t}$	$s^i_{hs8,c,t}$
I(Consumer Good=1)	9.77	9.67		10.62		10.67
	[0.79]	[0.82]		[0.84]		[1.21]
I(Different. Prod=1)		4.87	4.45	3.96		4.94
		[1.09]	[1.33]	[1.19]		[2.16]
$\tau_{hs4,c,t}$					13.66	2.51
					[10.77]	[11.14]
Constant	49.495	10.648	11.03	7.20	36.45	47.31
	(2.676)	(5.140)	[9.80]	[9.57]	[9.42]	[4.48]
Year FE	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES
HS2 FE	YES	YES	YES	YES	YES	YES
Std. Err. Clusters	HS6	HS6	HS6	HS6	HS4	HS4
Observations	565,889	461,325	196,927	182,270	500,023	377,647
R2	0.092	0.085	0.066	0.074	0.086	0.085
Sample	Full Sample	Full Sample	$0 < s^i_{hs8,c,t} < 100$	$0 < s^i_{hs8,c,t} < 100$	Trade Cost Sample	Trade Cost Sample

Notes: Robust Standard errors in parenthesis. The dependent variable is the share of Chilean imports transacted by intermediaries for each HS 8-digit product category, source country, and year, defined over the interval [0,100]. Standard errors are clustered at the HS4 level for the regressions that include τ_{hs4}, and clustered at the HS6 level for regressions that include the dummy variable for differentiated products. The dummy variable $d^c_{hs8}=1$ if the HS8 product is classified as a consumer good and zero otherwise; the dummy variable $d^h_{hs6}=1$ if the HS6 product is classified as a differentiated product (Rauch 1999) and zero otherwise. The variable τ_{hs4} is the estimated variable trade cost by HS4 category.

FIGURES

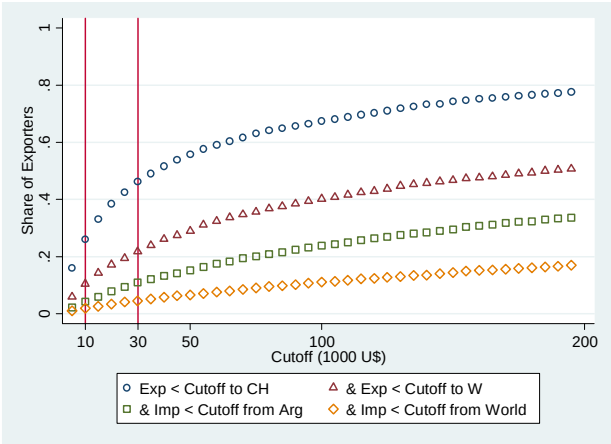
Figure 1: Characteristics of Importer - Exporter Pairs.

Panel A: Matched Chilean exporters – Colombian Importers



Notes: Series marked with circles shows the share of Chilean exporters to Colombia that sell less than the "Cutoff Value" -- shown in the x-axis -- in 2005. Series marked with triangles shows the share of Chilean exporters meeting first criterion and that traded exclusively with Colombian importers that bought less than the "Cutoff Value" from Chile. Series marked with squares shows the share of Chilean exporters to Colombia meeting the first two criteria and that sold exclusively to Colombian importers that bought less than the "Cutoff Value" from the World in 2005. Series marked with diamonds shows the share of Chilean exporters that satisfy the first three criteria and that sold less than the "Cutoff Value" to the World.

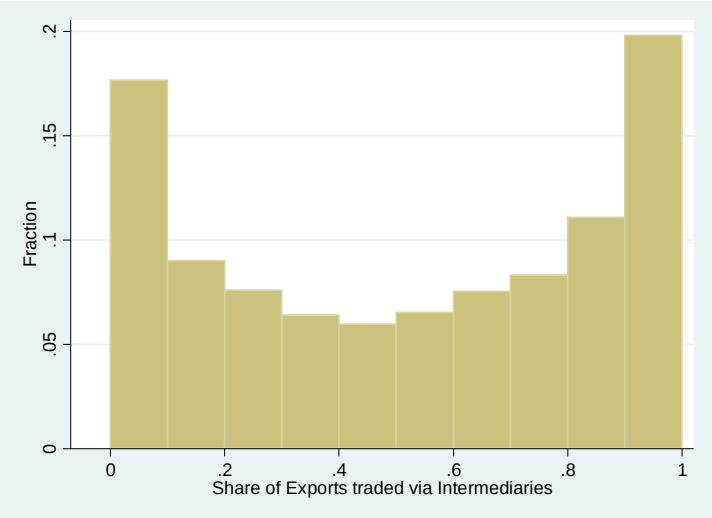
Panel B: Matched Argentinean exporters – Chilean Importers



Notes: Series marked with circles shows the share of Argentinean exporters to Chile that sell less than the "Cutoff Value" -- shown in the x-axis -- in 2005. Series marked with triangles shows the share of Argentinean exporters meeting first criterion and that sold less than the "Cutoff Value" to the World. Series marked with squares shows the share of Argentinean exporters to Chile meeting the first two criteria and that traded exclusively with Chilean importers that bought less than the "Cutoff Value" from Argentina. Series marked with diamonds shows the share of Argentinean exporters that satisfy the first three criteria and that sold exclusively to Chilean importers that bought less than the "Cutoff Value" from the World in 2005.

Figure 2: Share of Argentinean Exports to Chile traded via Import Intermediaries in 2005 by HS 8-digit Categories

Panel A: All HS 8-digit Categories



Panel B: Top 100 HS 8-digit Categories Exported from Argentina to Chile

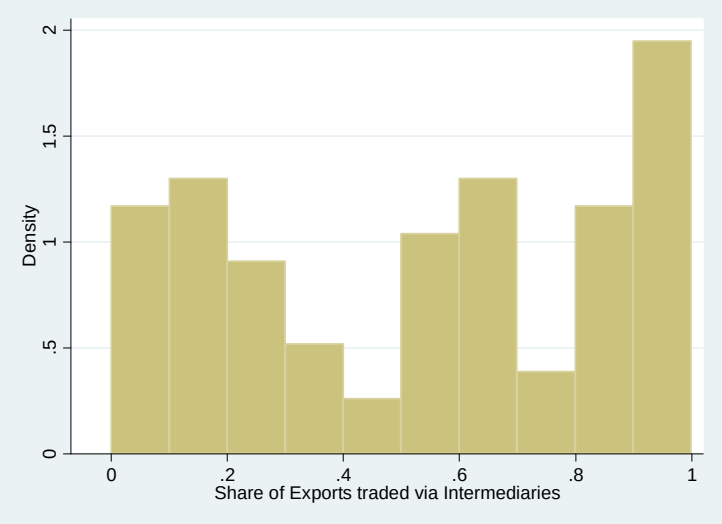


Figure 3: Patterns of Use of Intermediation Technologies.