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Andrew B. Bernard
Esther A. Bøler
Swati Dhingra

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ABSTRACT

The vast majority of world trade flows is between firms. Only recently has research in international trade started to emphasize the importance of the connections between exporters and importers both in aggregate trade flows and in the negative relationship between trade and geographic distance. This chapter documents the role of firm-to-firm connections in trade flows and the formation and duration of these importer-exporter relationships. Using customs data from Colombia for 1995-2014, we are able to identify both the Colombian importing firm and the foreign exporter in every Colombian import and export transaction. We document both the nature of these bilateral trading relationships and their evolution over time.

Andrew B. Bernard
Tuck School of Business at Dartmouth
100 Tuck Hall
Hanover, NH 03755
and CEPR
and also NBER
Andrew.B.Bernard@dartmouth.edu

Esther A. Bøler
Imperial College Business School
South Kensington Campus
London
SW7 2AZ, UK
and CEPR
e.boler@imperial.ac.uk

Swati Dhingra
Department of Economics and CEP
London School of Economics
Houghton Street
London WC2A 2AE
UK
and CEPR
s.dhingra@lse.ac.uk

1 Introduction

Aggregate trade flows are composed of transactions between individual buying (importers) and selling (exporters) firms. The rise of the large literature on heterogeneous firms has recognized the importance of variation across exporters, and to a lesser extent across importers, in determining aggregate trade flows. However, even in that firm-focused research, the detailed trade transaction data are usually aggregated to the level of individual firms, summed across all buyers for exporters, or conversely, summed across all sellers for importers, before being used by researchers. Naturally, both empirical and theoretical work on international trade has also focused on firms on either side of the market, exporters in Melitz (2003) or importers in Antràs et al. (2014). In this paper, we explore the individual matches between exporters and importers and examine the evolution of these microeconomic relationships.

During the decades since the end of WWII, the world has seen both immense progress on the reductions of tariffs and other barriers to international trade in goods as well as dramatic reductions in transport and communication costs. The rise of containerization, the successful multilateral rounds of the GATT and the WTO and the exponential increase in telecommunications capabilities have combined to allow the fragmentation of production across borders and have driven increases in the volume of global trade far faster than those for GDP (see Baldwin (2017)). However, in spite of these advances, estimates of trade costs between distant locations remained largely unchanged (Head and Mayer (2014)), suggesting that other forms of trade costs continue to be substantial impediments to global integration. This chapter explores the role of firm-to-firm connections in international trade both in the cross-section and over time as a first step towards a greater understanding of the firm-level costs of trade.

We have access to a rich data set for Colombian firms where the identities of both the exporter and the importer are known, and where each import transaction can be linked to a specific seller in a source country, and each Colombian firm's annual export transactions can be linked to specific buyers in every destination country. This allows us to develop a set of basic facts about sellers and buyers across markets at a point in time as well as the evolution of those buyer-seller relationships over time. We contribute to this nascent literature by confirming and extending previous findings on the importance of the extensive and intensive margins of trade.

The emergence of research examining firms on both sides of trade transactions has potentially important implications for policy and academic work on the origins of international trade. While substantial progress has been made on reducing tariffs on manufactured goods, especially for flows between higher income nations, empirical evidence suggests that substantial costs remain. Estimates of fixed and variable costs of trade are large, even as technology and policy have reduced costs of transport, communication and tariffs. To engender another round of global integration with its attendant increases in income, consumption and welfare, research must refocus attention on the nature of the trade costs between the firms that engage in trade.

This paper contributes to that agenda by documenting the relationships between Colombian firms and their foreign suppliers. We find evidence that the extensive margin of importer-exporter connections is strongly correlated with aggregate country-level trade flows. In addition, there is

substantial heterogeneity across both importers and exporters in terms of the numbers of partners and the levels of trade flows. Again, the extensive margin is crucial in explaining the variation in import levels across firms. Large importers do not import more from each partner but rather have many more partners than smaller importers.

International trade involves firms trading with each other, rather than directly with final consumers. Even domestic economies are comprised of a large network of buyers and sellers. The continuing revolution in international trade transaction data is opening up the black box of firm-to-firm connections across borders. One temptation is to think of this as just another extensive margin of trade. However, firm behavior is important on both sides of any international trade relationship and existing frameworks largely ignore the interaction between buyers and sellers each of whom may have market power (Bernard and Dhingra (2015)). Evidence in this chapter and elsewhere shows that the extensive margins of trade, including that of foreign partners, are important both in the aggregate and within firms. In addition variation in the extensive margins is one of the forces underlying the power of the gravity model in explaining aggregate trade volumes.

At a basic level we are still learning how firms structure their global supply and customer networks and know little about a range of important questions: do firms have multiple suppliers of the same product, how frequently do importers change their suppliers, do importers switch partners to replace one supplier of a product with another, what determines successful trade partnerships and what differences are there between the big, dominant global firms and the large number of smaller firms engaged in trade. This chapter will provide evidence on these questions for Colombian importers.

2 Literature

Before turning to the Colombian trade data, we briefly review the literature on firms and trade. The role of heterogeneous firms in exporting has been the subject of a large literature, see surveys by Tybout (2003), Bernard et al. (2007), Redding (2011), Melitz and Redding (2012), and Bernard et al. (2012). However, it is important to note that in that large theoretical and empirical literature the role of partner importing firms is largely left unmentioned. The exporting firm is heterogeneous and "interesting" while the destination market is typically modeled as populated by a representative consumer. Similarly in the smaller and more recent literature on importing and global sourcing, the exporting firms are also largely "uninteresting". Our focus is on the role of firms on both ends of the trade transaction; we will first briefly review the emerging research on importing and then survey the smaller body of work looking at importer-exporter pairings.

2.1 Firms and Importing

There has been substantial recent work examining the characteristics and choices of importing firms. Work on the characteristics of importers for the US (Bernard et al. (2007) and Bernard et al. (2009)), Belgium (Muuls and Pisu (2009)), and Italy (Castellani et al. (2010)) shows that importers share many of the characteristics of exporting firms in terms of their larger size and higher productivity.

In addition these papers find similar heterogeneity across importing firms with the largest importers sourcing many products from many countries. In fact, large importers and large exporters tend to be the same firms, (Bernard et al. (2007)), as well as the most likely to have foreign affiliates and be embedded in global production networks (Bernard et al. (forthcomingb)). Our work extends this research by examining the connections between importers and exporters and exploring the link to firm size.

The causal nature of the relationship between importing and productivity has been examined by a number of authors. Amiti and Konings (2007) find large productivity gains from reductions in input tariffs on imported intermediate goods for Indonesian firms. Goldberg et al. (2010) also examine trade liberalization and imported inputs. They find substantial gains from trade through access to new imported inputs driven by increased firm access to new input varieties. Halpern et al. (2015) attribute one-quarter of Hungarian productivity growth during 1993-2002 to increases in imported inputs. Bøler et al. (2015) find that cheaper R&D stimulates imports of intermediates and that improved access to imported inputs promotes technological change. Our work contributes to this stream of research by examining the firm linkages underlying the import of intermediate inputs.

A different approach to importing firms examines the decision to source from abroad. Feenstra and Hanson (2005), Nunn and Trefler (2008), Bernard et al. (2010) consider contracting and contractability in the decision to offshore inside or outside the firm. Antràs et al. (2014) study the extensive and intensive margins of firms' global sourcing decisions, while Fort (2017) examines the interaction of technology and industry characteristics and shows substantial differences in the effects on domestic versus foreign outsourcing.

2.2 Firm-to-firm Connections

One of the earliest authors to consider the role of networks and firm-to-firm connections in trade is Rauch (1999) who introduces the idea that information frictions might dampen trade and that the customer or supplier network might help reduce those frictions. Arkolakis (2010) provides an early model of the costly acquisition of consumers and while he does not model firm-to-firm connections, his framework is strongly linked to the emerging work on production and sales networks. Rauch and Watson (2004), Antràs and Costinot (2011), Petropoulou (2011), Chaney (2014) model intermediaries as agents that facilitate matching between sellers/exporters and foreign buyers.

Work on firm-to firm connections is not limited to international trade. Additional theoretical and empirical contributions, often examining the role of production networks in the propagation of shocks, include Oberfeld (2013), Acemoglu et al. (2012), Carvalho et al. (2014), Magerman et al. (2016) and Bernard et al. (2017).

Recent work has started exploring the cross-section of trading relationships between exporters and importers. Blum et al. (2010; 2012) examine characteristics of trade transactions for the exporter-importer pairs of Chile-Colombia and Argentina-Chile while Eaton et al. (2014) consider exports of Colombian firms to specific importing firms in the United States. Using Norwegian data, Bernard et al. (forthcominga) find support for a model where exporters vary in their efficiency in

producing differentiated intermediate goods and pay a relation-specific fixed cost to match with each buyer. Eaton et al. (2014) develop a model of search and learning to explain the dynamic pattern of entry and survival by Colombian exporters and to differentiate between the costs of finding new buyers and to maintaining relationships with existing ones. Monarch (2013) estimates switching costs using a panel of U.S importers and Chinese exporters and Dragusanu (2014) explores how the matching process varies across the supply chain using U.S.-Indian data. Sugita et al. (2014) study matching patterns in U.S.-Mexico trade while Benguria (2014) estimates a trade model with search costs using matched French-Colombian data. Carballo et al. (2013) focus on the role of importer heterogeneity across destinations, using data on exporters from Costa Rica, Ecuador and Uruguay.

Some stylized facts are emerging from this literature. The buyer margin accounts for a large fraction of the variation in aggregate trade, and is, in fact, as large or larger than the firm or product margins in accounting for cross-country trade flows. Bernard et al. (forthcominga) show this using Norwegian data. They also find that a firm's number of customers is significantly higher in larger markets and smaller in remote markets, i.e. importers per exporter vary systematically with GDP and distance. This response of the buyer margin to gravity variables is also shown by Carballo et al. (2013).

The population of sellers and buyers are extremely concentrated. Bernard et al. (forthcominga) find that the top 10 percent of exporters to an OECD country typically account for more than 90 percent of aggregate exports to that destination. At the same time, the top 10 percent of buyers from an OECD country are as dominant and also account for more than 90 percent of aggregate purchases. This concentration of imports and exports in a small set of firms is similar to that found by Bernard et al. (2009) and Bernard et al. (forthcomingb) for the US and Mayer and Ottaviano (2008) for other European countries. Although a handful of exporters and importers account for a large share of aggregate trade, these large firms are matching with many partners; one-to-one matches are typically not important in the aggregate. Many-to-many matches, i.e. where both exporter and importer have multiple connections, make up almost two thirds of aggregate trade. Using trade data for Chile and Colombia as well as Argentine and Chile, Blum et al. (2012) similarly point to the dominance of large exporter - large importer matches among the total number of trading pairs.

The distributions of buyers per exporter and exporters per buyer are characterized by many firms with few connections and a few firms with many connections. Bernard et al. (forthcominga) plot the number of exporters per buyer in a particular market against the fraction of buyers in this market who buy from at least that many exporters. The distributions appear to be largely consistent with a Pareto distribution as the cdfs are close to linear except in the tails, consistent with the findings by Blum et al. (2010; 2012) and Carballo et al. (2013). Within a market, exporters with more customers have higher total sales, but the distribution of exports across customers does not vary systematically with the number of customers. Firms with more buyers typically export more: in the Norwegian data, the average firm with 10 customers in a destination exports more than 10 times as much as a firm with only one customer.

In looking at the nature of the connections between firms, there is negative degree assortativity

among sellers and buyers: the better connected a seller, the less well-connected is its average buyer. In recent work by Bernard et al. (2014), negative degree assortativity is found for buyer-seller links among Japanese firms. Their Japanese dataset covers close to the universe of domestic buyer-seller links and therefore contains information about the full set of buyer linkages (not only the linkages going back to the source market). Negative degree assortativity does not mean that well-connected exporters only sell to less-connected buyers; instead it suggests that well-connected exporters typically sell to *both* well-connected buyers and less-connected buyers, whereas less-connected exporters typically *only* sell to well-connected buyers. Degree assortativity is only a meaningful measure in economic environments with many-to-many matching. Moreover, negative degree assortativity can coexist with positive assortative matching on the intensive (export value) margin. Using the Colombian import data, we corroborate these main stylized facts and examine the nature of the evolution of trading partnerships over time.

3 Data

Our primary data source is the customs records of Colombia and includes a complete history of Colombian import and export transactions from 1995-2014. This period includes dramatic changes in the Colombian economy, periods of external liberalization and domestic reforms as well as several economic crises.

The data include all the available information on the customs forms. We focus on a subset of the data. On the import side this includes the name of foreign firm i in country s selling quantity q of product p to Colombian firm j for x USD on date d. Products are defined at the HS 10-digit level using the Colombian classification matching the tariff line for Colombian imports. Colombian importers are identified by their national identification number, NIT, while foreign firms have alphanumeric names in the data. The foreign firm name data are very noisy. Using the information on the customs forms with no cleaning results in 1,847,822 foreign firms. We clean the foreign firms' names first by dropping or correcting typical prefixes and suffixes (e.g. "inc", "co.", "spa" etc), dropping non alpha numeric characters and then employing machine learning algorithms to group likely common spelling variants or misspellings. We vary the parameters on the machine learning algorithms to create sets of firms' names that are likely overmatched and under-matched. Throughout this paper we use the overmatched set to avoid overemphasizing the extensive firm-to-firm margin.[1] After cleaning we are left with 432,156 unique foreign firms across the 20 years.

There are 3,023,055 million import transactions across 146,896 importer-exporter pairs in 2014. 27,927 Colombian firms imported while there were 82,762 foreign suppliers (see column 1 of table 2).[2]

[1] While there is also information on foreign addresses and telephone numbers, it is missing in many cases and subject to even more variation so we to date have not employed this in grouping transactions.

[2] We retain all Colombian importers in our analysis including manufacturing and service firms. The latter group includes retailers, wholesalers and other service firms.

3.1 Colombian Trade Over Time

Figure 1 about here

Figure 2 about here

From 1995 to 2014, Colombia experienced a boom in international trade, both exports and imports. As shown in Figure 1, total imports into Colombia expressed in terms of US$ increased more than 450 percent during the period. The data show clearly the effects of several crises in the Colombian and world economies. In 1999, following large devaluations and crises in Brazil and Russia, Colombia experienced its first recession in 60 years and was also forced to allow its exchange rate to float, resulting in a 30 percent devaluation against the dollar. The reduction in imports from both the economic crisis and devaluation is apparent in the 27.5 percent reduction in imports. The number of Colombian importers and foreign exporters fell far less during the same period, 10.7 and 8.6 percent respectively. Import declines occurred again in 2001–2002 (0.9 percent) and 2008-2009 (16.2 percent) as a result of external economic shocks in Colombia's primary trading partners. Again the adjustments of the extensive margins of the number of trading firms was much lower, suggestive of the costs needed to create the relationships in the first place.

In Figure 2, we show the evolution of the mean number of exporters, products, and source countries per importer. The average number of foreign partners and source countries have been stable over time while the number of imported products rose steadily until the onset of the Great Recession and has been stable since.

4 Cross Section

In this section, we examine the nature of firm-to-firm connections at a point in time. Whereas the emerging literature has documented facts from data on exports as described above, we document the firm-firm connections from the Colombian importing perspective.

4.1 Margins of Trade

We start by decomposing aggregate country-level trade flows into their constituents parts, i.e the roles of exporting firms, importing firms, products and average value per exporter-importer-product per year. This already represents an aggregation from the raw transaction level data which includes the additional dimensions of the number of transactions per exporter-importer-product during the year. With this decomposition, total imports from country j into Colombia in any given year can be represented as

$$m_j = s_j p_j b_j d_j \bar{x_j}.$$

with s_j , the number of sellers (exporters) in country j, p_j, the total number of products shipped by all sellers in country j, b_j, the number of Colombian firms that import from country j, $\bar{x}_j$, average value per buyer-seller-product, and d_j (or density), the fraction of actual *sbp* triples out of all possible exporter-importer-product combinations.

We regress each of the margins on total imports (in logs) using data from 2014 to assess the contribution of each of the three extensive margins (buyers, sellers, products) and the intensive margin (average imports per buyer-seller-product) in this decomposition. This set of regressions gives us a relatively simple way to examine the role of different microeconomic components of trade to aggregate trade flows. While previous research has examined the role of the number of exporters and the number of exported products, we are able to examine both the buyer and seller contribution to the variation of Colombian imports across source countries.[3]

Given that OLS is a linear estimator and its residuals have an expected value of zero, the coefficients for each set of regressions sum to unity, with each coefficient representing the share of overall variation in trade explained by the respective margin.[4]

Table 1 about here

The results in Table 1 confirm earlier work on extensive margin contributions to the cross-country variation in aggregate trade volumes. Both the number of importers and the number of products increase rapidly as total trade volumes rise. However, here we see that the role of the number of foreign partners, in this case exporters, is equally large. Large trade volumes between pairs of countries are associated with large numbers of firms on both sides of the border as well as large numbers of products. The intensive margin also covaries positively with total trade across countries but accounts for just under 40 percent of the total variance.[5] Bigger trade volumes are associated with higher shipments per importer-exporter-product and particularly with increases in the extensive margins of more importers, more exporters and more products.

4.2 Connections

Table 2 about here

In 2014, there are 146,896 trading relationships involving 27,927 Colombian importing firms and 82,762 foreign exporters. As shown in Table 2, the distribution of the value in these partnerships is highly skewed with the mean more than 15 times larger than the median. Similarly, the distributions of exporters per importer and importers per exporter reflect the presence of large trading firms. The mean importer has 5.26 foreign partners while the median has two. These distributions confirm that the findings of prior research on the importance of large firms in international trade flows also hold in Colombia, see Bernard et al. (2009), Mayer and Ottaviano (2008), and Bernard et al. (forthcomingb).

Looking at individual source countries, the US is by far the largest source for imports into Colombia, accounting for roughly one third of the trading partnerships and import value. Among Colombian importers, 49 percent bought from at least one US partner. The relative lower cost of

[3]It is possible to examine the margins one at a time using the results from this analysis. For example, a decomposition into the number of importers and average imports per importer would correspond to column (1), importers, and the sum of columns (2)-(5), average importers per importer, in Table 1.

[4]The coefficient on the density term is expected to be negative as the fraction of active importer-exporter-product triples from a country is decreasing as the total possible number of triples increases.

[5]To see this consider the decomposition into the number of active importer-exporter-products which corresponds to the sum of columns (1)-(4) and the average shipments per importer-exporter-product, column (5).

trading with the US is also reflected in the lower value imports for the median partnership, i.e. relatively smaller transactions with the US are profitable. Across all the major source countries, the median Colombian importer has just one partner.

Figure 3 about here

Figure 3 plots the distributions of exporters per Colombian importer and importers per foreign exporter across all relationships. The sub-figures are double log distributions with discrete steps, for example the upper panel has the number of suppliers per importer against the cumulative fraction of Colombian firms with at least x foreign suppliers. In both cases, the distribution is very close to a power law except in the extreme tails. There is a small number of firms, either Colombian importers or foreign exporters, with many partners and a large number of firms with a small number of partners.

Figure 4 about here

The log linearity of the distributions appears at the country level as well for importers per exporter. This captures the stylized fact that a few firms, either exporters or importers, have large numbers of connections while large numbers of firms have just one or two foreign partners. For all five of the top source countries the distribution is indistinguishable from log-linearity.[6]

4.3 Matching

Table 3 about here

The preceding results suggest that most Colombian importing firms have few partners while only a few are connected to many foreign exporters. However, we can group trading relationships and trade value by types of firms according to their number of partners. In Table 3 we place firms in two groups, one where the firm has only a single foreign partner and the other where the firm has multiple foreign partners.[7]

Table 3 confirms the important role for large, well-connected firms in international trade flows. Firms with more than one foreign partner appear in the vast majority, 88 percent of partnerships in 2014. Those partnerships in turn account for the preponderance of Colombian import value, 91 percent. In fact, more than half of Colombian imports by value are conducted between exporting and importing firms that each have multiple partners, i.e. there are large, well-connected firms on both sides of the transaction. These results are perhaps unsurprising given previous research that has emphasized the role of large, global firms in international trade.

Figure 5about here

[6]Bernard et al. (forthcominga) develop a model with Pareto distributed productivity for importers and exporters that results in the log-log linear relationships shown in Figures 3 and 4.

[7]For the foreign firms we can only see their Colombian exports, so the two groups are foreign exporting firms with one Colombian import partner and foreign firms with multiple Colombian importers.

The link between the number of foreign partners and total firm imports can be seen clearly in Figure 5. The vertical axis shows log imports, normalized such that log imports are relative to the average imports for one-supplier firms. On the horizontal axis is the number of suppliers. Log firm imports are strongly positively and linearly related to the number of foreign partners of the Colombian importer. Big importers import from many firms.

Figure 6 about here

However, while large importers import from many exporters, they do not import more from each partner. Figure 6 shows the log value of imports for suppliers at the 80th, 50th and 20th percentiles of the supplier distribution for importers with 5 or more suppliers.[8] The vertical axis is log imports in the partnership, normalized by source to be 1 for importers with a single foreign partner. The horizontal axis is the log number of foreign suppliers for the Colombian importer.

Sales from the median foreign supplier to the Colombian importer (the middle line) are invariant across firms, regardless of the number of foreign partners shipping to the Colombian firm. In addition, the value of shipments from the median exporter are the same as average purchases by Colombian firms with a single foreign partner. The same invariance holds for larger partners (80th percentile) and smaller partners (20th percentile). Large importers have more foreign suppliers but they do not purchase more from each of those suppliers.

This result is confirmed by work on Norwegian exports (Bernard et al. (forthcominga)) and on the domestic firm-to-firm production network in Belgium (Bernard et al. (2017)) and is of substantial significance for future research on firm size and aggregate export flows. Export volumes are large because of large numbers of partnerships, especially with a large firm on one or both sides of the relationship, and because large firms have many partners.

4.4 Assortativity

Figure 7 about here

The literature on firm-to-firm connections in trade has many points of contact with the larger existing literatures on social and economic networks. One striking difference is in the assortativity of connections and the relationships between well-connected and poorly connected firms. Social networks display a common strong tendency for the best connected people (nodes) to be more likely to be connected to other well-connected people (nodes). This feature means that the average connectedness of one's connections increases in your own number of connections, i.e. popular people are connected to other popular people.

Firm-to-firm connections systematically display negative assortativity. Figure 7 shows the number of suppliers per Colombian firm from a given source country j, a_j, on the x axis and the average number of Colombian connections among those suppliers, $s_j(a_j)$, on the y axis. The axes scales are in logs and both variables are demeaned at the source country level.

[8] For a Colombian firm with 10 suppliers this represents the imports from foreign exporters with the 2nd 5th, and 8th largest sales to the Colombian importer.

While there is a large amount of dispersion, as in many other studies of international trade and domestic connections, we find a significant negative relationship. Colombian firms that have large numbers of suppliers in a source country (to the right along the x axis) on average are connected with suppliers that have fewer Colombian partners. This finding suggests again that there is typically a large firm on one side of most Colombian import relationships. It does not mean that well-connected Colombian firms only connect with small (less well-connected) foreign firms. Rather, well-connected Colombian firms connect with large, medium and small foreign partners while small (less well-connected) Colombian firms are more likely to only match with a well-connected partner. Bernard et al. (forthcominga) document this finding in Norwegian export data and propose a model with match-specific fixed costs. In that framework small firms cannot profitably match with other small firms, while large firms can. In general this finding means that models designed to explain importer-exporter pairings cannot mirror the framework in the social network literature that often features preferential matching yielding positive assortativity.

4.5 Gravity and Connections

Table 4 about here

The importance of distance and market size (gravity) in explaining international trade flows is the subject of a vast literature (see Head and Mayer (2014)). However, only recently have these forces been linked to the extensive margins of trade. In Table 4 we estimate a simple gravity regression for each of the margins discussed earlier including log distance and log GDP of the source country. As expected, distance and GDP are negatively and positively correlated with the margins respectively. The distance coefficient has similar magnitude for each of the extensive and intensive margins although it is not statistically significant in any single regression. The aggregate coefficient on distance is 0.74.[9] GDP is positive and significant for each margin and the magnitude of the relationship is stronger for the various extensive margins.

Table 5 about here

In Table 5 we look at the importance of distance and market size for import volume variation within importing firms. The Table reports regressions for the number of foreign partners, the average value per partner and total firm imports on source country log distance and log GDP. Distance is negatively related to the number of foreign partners in a source and the average value of purchases from the country with the magnitudes of the effects roughly equal. GDP, however, is much more strongly linked to the number of connections with the effect on the extensive margin almost five times larger than the effect on the average value of importer per partner. These results using the gravity framework in the aggregate and within firms point to the importance of understanding the barriers to making foreign connections.

[9]Running the same regression on aggregate imports at the country level yields a significant coefficient.

5 Connections over time

The existing work on firm-to-firm connections has emphasized the differences across trading firms in terms of the number and value of their partnerships. We now explore the evolution of these importer-exporter connections over time.

5.1 Margins of Trade Over Time

Table 6 about here

We start by examining the importance of the different margins, both extensive and intensive, in the growth of country-level shipments to Colombia. Similar to the decomposition for import levels done earlier, we regress the log differences of the margin of imports on the log difference in aggregate imports from each source country in Table 6. As before the coefficients sum to unity and the regressions allow us to assess the contribution of each margin to the variance in annual (and long-run) country growth rates. Panel A is an annual regression with no fixed effects; panel B includes country fixed effects in the annual growth rate regression, and Panel C runs a cross-section of long (19 year) differences.

The results are quite similar across the three specifications and are quite different from the cross-section decomposition of import levels reported above. The three extensive margins each contribute between 9 and 16 percent to aggregate growth rate variation. Accordingly, the intensive margin is much more important in the growth rate decomposition than in the levels specifications. The variation in the growth of imports across source countries is strongly correlated with the variation in the growth in average imports per exporter-importer-product.

5.2 Adding and Dropping Suppliers

Table 7 about here

While the recent round of research on firm-to-firm relationships in trade has documented a set of stylized facts that are robust across countries and years, there is less research on the evolution of importer-exporter connections over time. Table 7 divides importing firms into three mutually exclusively groups: those that increase the number of their suppliers, those that reduce the number, those that leave the number of their suppliers unchanged at annual and five-year horizons.[10] Less than a third of importers leave the number of suppliers unchanged from one year to the next, while over five year intervals more than 95 percent of firms adjust the count of suppliers up or down. Over short and longer intervals, most Colombian importing firms are changing their supplier mix.

Table 8 provides a different perspective on the changing buyer-supplier connections by reporting the fractions of Colombian importers that only add suppliers, only drop, both add and drop or leave their supplier mix unchanged. From year to year, only 13 percent of importing firms maintain all their existing connections without adding or dropping. More than three quarters of firms add at least one supplier or drop at least one supplier while two thirds of firms both add and drop on an

[10] In each case the actual suppliers may have changed.

annual basis. Over five-year intervals almost every firm is changing their supplier mix with more than 90 percent of firms both adding and dropping.

Table 8 about here

Table 9 about here

Supplier churning is widespread among importing firms over short and especially longer horizons. Table 9 examines the importance of new and dropped partners in the overall number of connections and the share of import value for the firm. The four columns of the top panel report (i) the fraction of the value of firm imports accounted for by new foreign partners, (ii) the fraction of connections accounted by new foreign partners, (iii) the fraction of import value at continuing partnerships, and (iv) the fraction of connections at continuing partnerships. The rows give the fractions for one year and five year intervals.[11] While the majority of suppliers are new to the importer each year (52 percent) those relationships are smaller on average accounting for 20 percent of import value. Relationships begun before the previous year are, on average, more than four times larger than partnerships begun in the past year. Looking at five year intervals, we see a similar pattern. The vast majority of connections are formed in a typical five-year interval but the older relationships are much larger.

The bottom panel considers a similar breakdown, reporting the fraction of this year's imports and connections that are accounted for by partnerships that will stop and those that will continue. Again more than half of today's suppliers will no longer be matched to the importer next year. Over a five year horizon, three quarters of the connections will disappear. The relationships that will continue one year into the future represent more than 80 percent of today's import value, and those that will continue for five years represent half of today's import value.

These findings suggest that the typical importing firm is engaged in a substantial amount of churning of their supplier mix. Firms frequently add and drop partners which is at least suggestive of relatively low costs of matching. More research is needed to examine how this churning varies across importer and exporter industries.

Figure 8 about here

Figure 8 shows the distribution of match length and match value for all importer-exporter pairs across all twenty years in the data. As reported by Eaton et al. (2008), more than half of all matches last only one year and are quite small in value. Aside from the big drop between matches of length one and two years, the distribution of match length suggests a relatively stable attrition rate of about 20 percent annually. Match numbers fall off much more quickly than value, confirming that long-lived relationships are relatively more important in total import value and providing some additional evidence on the role of the intensive margin.

[11] The five year intervals throughout the table represent averages for 1995-2000, 2002-2007, and 2009-2014.

5.3 The 1997 Cohort of New Connections

In this and the next subsection, we focus on a single cohort of relationships starting in 1997.[12] First, we look at all new importer-exporter pairs in 1997 at new and continuing importers and then we consider only firms that were new to importing in the same year.

64,432 importer-exporter connections were begun in 1997 across all importers. This includes connections at new importers as well as new connections at firms that had previously imported from other partners. Of those new cross-border relationships 6,360 (2,916) were still active five (ten) years later.[13] Considering all the importer-exporter connections that started in 1997, we find that they account for almost 30 percent of total import value and more than 60 percent of all importer-exporter connections in that first year. Over time the share of this cohort of new connections in total importer-exporter relationships falls both because specific matches end and because total Colombian imports, and thus the total number of connections, are growing. As we found earlier, the share of value falls less quickly than the share of connections and by their second year the surviving connections from the 1997 cohort are larger than average (value share is greater than the connection share).

Table 10 about here

Table 11 gives a similar path for that cohort of new partnerships in 1997 from the perspective of the importing firm. On average the new connections account for 74 percent of connections and 58 percent of import value for the importing firms that had at least one new connection. For those firms that continue to import a decade later, that set of initial connections still accounts for more than a third of the firm imports although it represents just 13 percent of their foreign supply relationships.

Table 11 about here

Figure 9 about here

Figure 9 reports the exit rate for these new matches for the subsequent 17 years. As we saw earlier, match disintegration rates are highest in the early years of a match. For new importers the disintegration rate is higher, 61.3 percent, than for new connections at all importing firms, 51.3 percent, i.e. the age of the importer predicts the success of the match. Disintegration rates are high and declining for the first several years of the match and then stabilize between 10-15 percent per year.

5.4 The 1997 Cohort of New Importers

Figure 10 about here

[12] Choosing 1997 gives us the longest continuous set of new importing relationships.

[13] New connections in 1997 are defined as an import transaction in an importer-exporter pair in 1997 that did not transact in either 1995 or 1996.

6854 Colombian firms started importing in 1997 of whom 929 (550) were still active five (ten) years later and 309 survived as importers to 2014.[14] Importer failure rates also start quite high, two thirds of this entering cohort imported only once and an additional 17 percent imported for only 2-3 years. After stabilizing the annual exit rate for Colombian importers is 7 percent.

Except for the start year, three quarters of continuing importers start a new connection each year. Those new connections cover more than 1400 products from more than 65 countries. First year connections for continuing importers in this cohort average 1.22 suppliers per product. Total value of imports increases at an average rate of 9 percent per year, while value per importer increases at 34 percent per year as smaller importers exit and continuing importers increase their transactions. For 1997 starting importers that continue for at least 10 years, 20 percent have relationships that lasted the full period.

5.5 Match Failure

Table 12 about here

In this section we look at factors that are correlated with the probability of failure of matches between importers and exporters. A match is defined between two firms and can potentially include multiple products. We consider characteristics of the importer and those of the exporter as well as match-specific variables. As before we are limited in the extent of firm characteristics to those available in the Colombian import data.

For Colombian importers we know the number of years the firm has been an importer since 1995 and the number of foreign partners from the particular source country. For the foreign exporter we know how long it has exported to Colombia, and the number of Colombian import partners. For the match itself, we include the current length of the match between the exporter and importer, the value in the current year and whether or not it is a multi-product relationship. Finally we consider the role of traditional gravity variables for the source country including GDP per capita, population and distance.

Table 12 reports results of linear probability models for the failure of the match in year t+1; the columns respectively include year fixed effects, importer and year fixed effects, importer-year fixed effects and match and year fixed effects. In column 1, including only year fixed effects, we find that the probability of match failure is lower the longer the Colombian firm has been importing and the greater the number of foreign partners in the source country. Similarly match failure is reduced if the foreign firm has been exporting for a longer time to Colombia and if it is connected to more Colombian importers. Unconditionally, and perhaps unsurprisingly, "better" firms, those that survive longer and have more partners, have lower rates of match failure. The "quality" of the match is also negatively correlated with match failure. The length of the match, the value of the match and multi-product matches all are associated with lower failure probabilities.

Gravity variables enter with perhaps unexpected coefficients. Unconditionally one would expect matches to be harder to sustain at greater distances or in smaller markets. However, we find that

[14] New importers in 1997 are those who imported in 1997 but had not imported in either 1995 or 1996.

conditional on the value and characteristics of the partners, distance is negatively associated with match failure. While the number of connections and the value of connections is negatively related to distance, as shown earlier, the survival of individual matches increases with distance. This is suggestive of the possibility that the sunk costs of a match increase with distance and thus firms are less willing to break a match at longer distances. Market size, however, works in the opposite direction. Match failure rates are higher for markets with larger populations and higher GDP per capita.

Including importer, or importer-year, fixed effects does not substantially alter the findings of the match failure regressions. All the variables that potentially proxy for match quality are again negatively related to match failure. Years of importing for the Colombian firm are negatively correlated with match failure although the number of exporters in the source country now is positive and significant. Exporter age is positive but insignificant. The gravity-related source country variables are again negative for distance and positive for GDP per capita and population. Conditioning on match fixed effects, the results are largely unchanged, although we now find match length is positively related to failure.

6 Products

Table 13 about here

In this section we examine the relationship between importing firms and products. Table 13 reports summary statistics on products for all source countries, and for the top five sources of Colombian imports. As with other trade-related variables the number of products per importer is highly skewed. The mean number of products is 14.7 while the median is 4. A few firms are importing large numbers of products but most importers import multiple products. This contrasts with the evidence on the numbers of foreign partners and sourcing countries in Table 2 which showed that most importers sourced from a single partner in a single country. This supports evidence from numerous studies that document the prevalence of multi-product exporters in cross-border trade flows. On the other side of the transactions, the mean number of products exported by a foreign firm to Colombia is 6.3 and the median is 2 with relatively little variation across source countries. Within an importer-exporter pair, the mean number of products is 4.4 and the median is 1, again with modest variation across countries.

In their work modeling and documenting foreign sourcing by US manufacturing firms, Antràs et al. (2014) report that the vast majority of firms source products from a single country. Looking at Colombian imports, we see that 38 percent of importer-product combinations have more than one supplier. However, only 9 percent of importer-product combinations source from multiple countries. When firms have multiple suppliers, three quarters of the time those suppliers are in the same source country. This provides some confirmatory evidence that there are substantial country-specific sourcing costs along with the sunk costs within an exporter-importer relationship suggested by the results in the previous section.

Table 14 about here

Looking at changes in sourcing partners over time, in Table 14, we calculate the fraction of product drops for single supplier relationships in year t that are replaced by a new supplier in year t+1. This excludes all importer-products with multiple suppliers in year t. Surprisingly very few product drops appear to be associated with churning of suppliers, on average fewer than 4 percent of dropped products are imported in the following year from a different foreign firm. The second column shows that within the set of replaced suppliers, most changes remain within the same source country. More than two thirds of the new suppliers are from the same source country.

Table 15 about here

Over time, importers deepen their relationship with their suppliers. Within an importer over time, the number of products per supplier rises three percent per year, see Table 15. We can see the growing importance of long-time suppliers in Table 16 which follows the product characteristics of matches started in 1997. As with other characteristics of the partnership such as import value, the distribution of the number of products supplied by foreign partners is highly skewed. In the first year of the match the mean products per supplier is close to 11 while the median is just 3. Over time the number of products traded within a match rises dramatically; the annual increase for the average surviving match is 20 percent per year (24 percent excluding the recession years), while the increase at the median surviving firm is 23 percent per year (25 percent excluding the recession years). The average partnership from this cohort involves more than 40 products after five years and more than 80 products after a decade.

Table 16 about here

While surviving importers increase the number of suppliers, the last two columns of Table 16 show that the long-lived partnerships take on increasing significance for importers over time. Products from importer-exporter connections that started in 1997 and survived for five years account for 35-41 percent of all imported products. After 10 years, these relationships supply 41-48 percent of the foreign products bought by the Colombian firm.

7 Conclusions

This chapter has explored a new comprehensive datasest of detailed firm-to firm Colombian import transactions covering the period 1995-2014. The results shows that the extensive margin of foreign partner firms plays an important role in both aggregate and especially firm-level trade flows. Large importers are bigger precisely because they have many foreign partners and not because they trade more with each partner. Gravity relationships that do well in explaining aggregate trade flows are successful in part because they capture extensive margins effects.

Looking at importers and import partnerships over time, the findings are striking that most firms see substantial changing in their supplier mix over both annual and, especially, longer time horizons. Most importer-exporter pairs end within the first year or two, but those that survive grow rapidly. Also firms do not appear to be dropping foreign suppliers to replace them with new providers of

the same product. The vast majority of changes are towards partners supplying different products than those dropped.

The results presented here suggest a path forward for future research. The ability of firms to create profitable and productive matches across borders is a key ingredient in aggregate trade flows and their growth. Large firms have more matches and thus larger trade volumes. However, the underlying sources of the frictions that prevent these matches, or cause them to be short-lived, are still unknown. Continued work using detailed firm-level trade transaction data with information on both the importer and exporter is needed to develop a deeper understanding of the barriers to trade in order to reduce them.

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Table 1: Country-level regressions (2014)

VARIABLES	(1) Buyers	(2) Sellers	(3) Products	(4) Intensive	(5) Density
Imports (log)	0.49[a]	0.48[a]	0.51[a]	0.39[a]	-0.87[a]
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
Constant	-4.20[a]	-4.08[a]	-3.75[a]	4.85[a]	7.18[a]
	(0.31)	(0.33)	(0.30)	(0.37)	(0.55)
N	174	174	174	174	174
R^2	0.78	0.74	0.80	0.60	0.77

Source: Authors calculations. [a] indicates significance at the 1 percent level.

Table 2: Summary stats 2014 – All & Top 5 sources

VARIABLES	All	US	China	Mexico	Germany	Brazil
Total value in USD (millions)	55,199	19,229	3,728	3,254	1,820	1,691
# Colombian importers	27,927	13,680	9,278	2,851	2,831	2,829
# foreign exporters	82,762	24,557	16,076	2,431	3,501	2,641
Mean value per importer-exporter ($'000s)	375.77	405.71	138.93	687.27	295.76	308.71
Median value per importer-exporter ($'000s)	24.68	17.06	26.60	41.23	22.76	31.76
Mean exporters per importer	5.26	3.46	2.89	1.66	2.17	1.94
Median exporters per importer	2.00	1.00	1.00	1.00	1.00	1.00
Mean importers per exporter	1.78	1.93	1.67	1.95	1.76	2.07
Median importers per exporter	1.00	1.00	1.00	1.00	1.00	1.00
Log max/median import value		11.39	8.29	8.55	8.64	7.84

Source: Authors calculations

Table 3: Match types

	1995		2004		2014	
Importer-Exporter	Count	Value	Count	Value	Count	Value
1-1	0.09	0.04	0.11	0.07	0.13	0.09
1-many	0.17	0.11	0.16	0.14	0.17	0.16
many-1	0.29	0.18	0.29	0.24	0.28	0.21
many-many	0.45	0.66	0.43	0.54	0.42	0.54

Source: Authors calculations

Table 4: Gravity and Margins - Colombian Imports (2014)

	(1) Importers	(2) Exporters	(3) Products	(4) Intensive	(35) Density
Distance	-0.37	-0.31	-0.38	-0.30	0.62
GDP	0.96^a	0.91^a	0.99^a	0.67^a	-1.7^a
N	60,671	60,671	60,671	60,671	60,671
R^2	0.28	0.25	0.31	0.25	0.28

Source: Authors calculations. ^{a} indicates significance at the 1 percent level.

Table 5: Within-firm gravity regression, 2014

	(1) Foreign Sellers	(2) Average Imports	(3) Imports
Distance (log)	-0.16[a]	-0.14[a]	-0.29[a]
GDP (log)	0.19[a]	0.04[a]	0.23[a]
Importer FE	Yes	Yes	Yes
N	65,866	65,746	65,746
R^2	0.47	0.55	0.54

Source: Authors calculations. [a] indicates significance at the 1 percent level.

Table 6: Import Growth Decompositions -Country level regressions

VARIABLES	(1) ΔBuyers	(2) ΔSellers	(3) ΔProducts	(4) ΔIntensive	(5) ΔDensity
			(A) annual Δ log imports (w/o country fe)		
ΔImports (log)	0.13[a]	0.12[a]	0.16[a]	0.82[a]	-0.23[a]
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.03[a]	0.03[a]	0.04[a]	-0.05[a]	-0.05[a]
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
N	2812	2812	2812	2812	2812
R^2	0.19	0.16	0.13	0.80	0.17
			(B) annual Δ log imports (w country fe)		
ΔImports (log)	0.13[a]	0.12[a]	0.16[a]	0.83[a]	-0.23[a]
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.03[a]	0.03[a]	0.04[a]	-0.05[a]	-0.05[a]
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Country FE	Yes	Yes	Yes	Yes	Yes
N	2,812	2,812	2,812	2,812	2,812
R^2	0.19	0.16	0.13	0.80	0.17
			(C) long difference Δ log imports		
	Δ_{19}Buyers	Δ_{19}Sellers	Δ_{19}Products	Δ_{19}Intensive	Δ_{19}Density
Δ_{19}Imports (log)	0.14[a]	0.15[a]	0.09[c]	0.88[a]	-0.25[a]
	(0.03)	(0.03)	(0.05)	(0.05)	(0.06)
Constant	-867.24	416.03	-2271.04	2147.14	575.10
	(2921.60)	(2849.81)	(4467.46)	(4299.15)	(5250.49)
N	93	93	93	93	93
R^2	0.18	0.21	0.04	0.80	0.18

Source: Authors calculations. [a] indicates significance at the 1 percent level.

Table 7: Fraction of surviving firms that increase suppliers, reduce suppliers, unchanged

Year	Increase	Reduce	Unchanged
Annual	0.36	0.35	0.29
5-year	0.47	0.50	0.03

Source: Authors calculations

Table 8: Fraction that add at least one new supplier, drop at least one old supplier, do both, do neither

Year	Add	Drop	Both	Neither
Annual	0.77	0.76	0.66	0.13
5-year	0.94	0.97	0.92	0.01

Note: The annual numbers are the averages calculated across all pairs of years from 1995-1996 through 2013-2014 inclusive. The 5-year numbers are the averages calculated across 1995-2000, 2002-2007, and 2009-2014. Source: Authors calculations

Table 9: Supplier and import value shares at new, dropped, and continuing suppliers

	New		Continuing	
Year	Value	Connections	Value	Connections
Annual	0.20	0.52	0.80	0.48
5-year	0.57	0.86	0.43	0.14
	Dropped		Continuing	
Year	Value	Connections	Value	Connections
Annual	0.17	0.52	0.83	0.49
5-year	0.46	0.75	0.54	0.25

Note: The annual numbers are the averages calculated across all pairs of years from 1995-1996 through 2013-2014 inclusive. The 5-year numbers are the averages calculated across 1995-2000, 20002-2007, and 2009-2014. Source: Authors calculations

Table 10: New importer-exporter connections in 1997

Years	Connections	Value
1	0.63	0.29
2	0.17	0.19
3	0.10	0.12
4	0.06	0.09
5	0.04	0.08
6	0.03	0.06
7	0.02	0.05
8	0.02	0.04
9	0.01	0.03
10	0.01	0.03
11	0.01	0.03
12	0.01	0.03
13	0.01	0.02
14	0.00	0.02
15	0.00	0.02
16	0.00	0.02
17	0.00	0.02
18	0.00	0.02

Source: Authors calculations

Table 11: New importer-exporter connections in 1997 - importing firm

Years	Connections	Value
1	0.74	0.58
2	0.34	0.43
3	0.26	0.37
4	0.20	0.35
5	0.18	0.35
6	0.17	0.35
7	0.16	0.37
8	0.16	0.36
9	0.14	0.35
10	0.13	0.35
11	0.13	0.32
12	0.12	0.32
13	0.12	0.33
14	0.12	0.30
15	0.11	0.30
16	0.11	0.31
17	0.11	0.37
18	0.11	0.40

Source: Authors calculations

Table 12: Linear probability model of match failure

VARIABLES	(1)	(2)	(3)	(4)
Importer age	-0.005^a	-0.012^a		
Log # of exporters per importer-source country	-0.001^a	0.008^a		-0.010^a
Exporter age	-0.001^a	0.000	0.0002^c	
Log # of importers per exporter	-0.026^a	-0.046^a	-0.047^a	-0.024^a
Length of match	-0.023^a	-0.016^a	-0.018^a	0.051^a
Multi-product match dummy	-0.094^a	-0.101^a	-0.101^a	-0.035^a
Log match value	-0.048^a	-0.049^a	-0.049^a	-0.037^a
Log GDP per cap source country	0.001	0.004^a	0.006^a	0.141^a
Log population source country	0.008^a	0.004^a	0.006^a	0.419^a
Log distance to source country	-0.042^a	-0.021^a	-0.023^a	
Year FE	Yes	Yes	No	Yes
Importer FE	No	Yes	No	No
Importer-year FE	No	No	Yes	No
Match FE	No	No	No	Yes
N	2,183,257	2,183,257	2,183,257	2,183,257
R^2	0.19	0.26	0.29	0.42

Source: Authors calculations. ^{a}and ^{c} indicates significance at the 1 and 10 percent level respectively.

Table 13: Product summary statistics, 2014

	All	US	China	Mexico	Brazil
Mean products per importer	14.73	11.31	8.18	5.85	6.32
Median products per importer	4.00	3.00	3.00	2.00	2.00
Mean products per exporter	6.30	7.17	5.16	5.68	5.89
Median products per exporter	2.00	2.00	2.00	2.00	2.00
Mean no of products per importer-exporter	4.43	4.61	3.71	3.78	3.71
Median no of products per importer-exporter	1.00	1.00	1.00	1.00	1.00
Share of importer-products $>$ 1 supplier	0.38	0.13	0.11	0.05	0.07
Share of importer-products $>$ 1 source country	0.09				

Source: Authors calculations

Table 14: Product replacements

	Replacements	Same country
1995	0.03	0.69
1996	0.04	0.77
1997	0.03	0.77
1998	0.02	0.77
1999	0.03	0.77
2000	0.03	0.78
2001	0.02	0.78
2002	0.03	0.76
2003	0.03	0.74
2004	0.03	0.72
2005	0.02	0.67
2006	0.02	0.68
2007	0.03	0.67
2008	0.02	0.65
2009	0.03	0.67
2010	0.03	0.66
2011	0.03	0.65
2012	0.03	0.65
2013	0.03	0.61

Source: Authors calculations

Table 15: Relative evolution of imported products and foreign partners

VARIABLES	(1) #products/#suppliers
Age of importer	0.03[a]
	(0.00)
Importer FE	Yes
Year FE	Yes
N	393,888
R^2	0.60

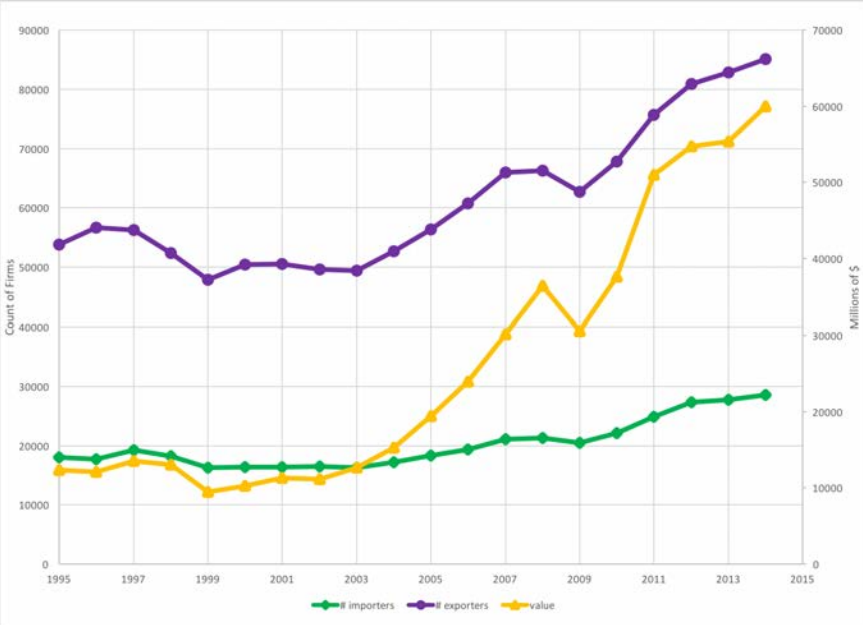
Source: Authors calculations. [a] indicates significance at the 1 percent level.

Table 16: Products per connection and share of total imported products - 1997 match cohort

	# of Products		Share of Total	
Years	(mean)	(median)	(mean)	(median)
1	10.95	3.00	0.33	0.18
2	29.51	9.00	0.39	0.30
3	28.48	10.00	0.39	0.30
4	35.31	13.00	0.40	0.30
5	40.75	16.00	0.41	0.35
6	46.18	18.00	0.43	0.36
7	52.89	20.00	0.45	0.43
8	62.10	27.00	0.46	0.43
9	79.22	31.00	0.47	0.46
10	82.31	35.00	0.48	0.41
11	82.50	40.00	0.46	0.43
12	89.37	35.00	0.48	0.44
13	65.83	40.00	0.46	0.39
14	76.41	35.00	0.46	0.43
15	83.75	42.00	0.46	0.45
16	99.91	46.00	0.49	0.50
17	131.09	52.00	0.53	0.63
18	125.27	53.00	0.53	0.47

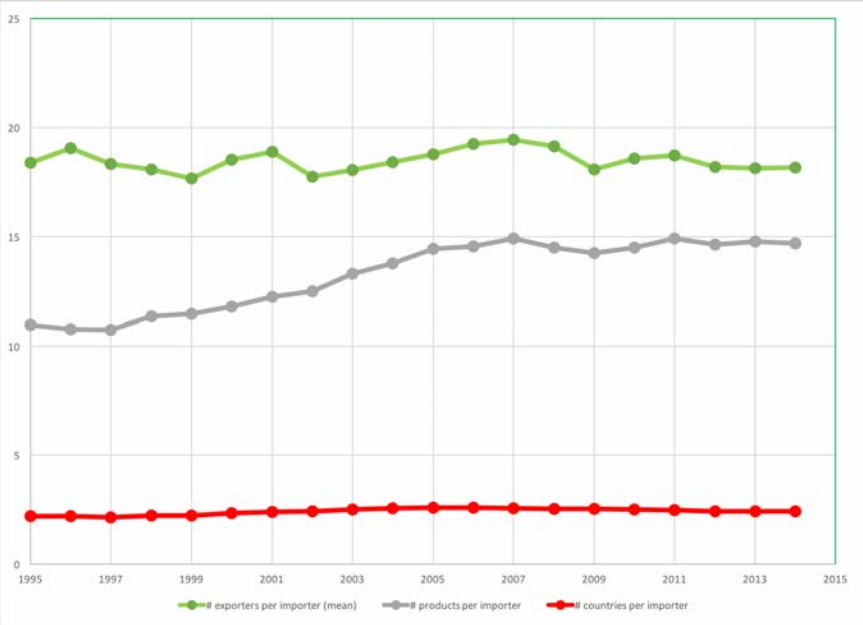
Source: Authors calculations

Figure 1: Colombian Importers, Foreign Exporters, Total Import Value



Source: Authors calculations

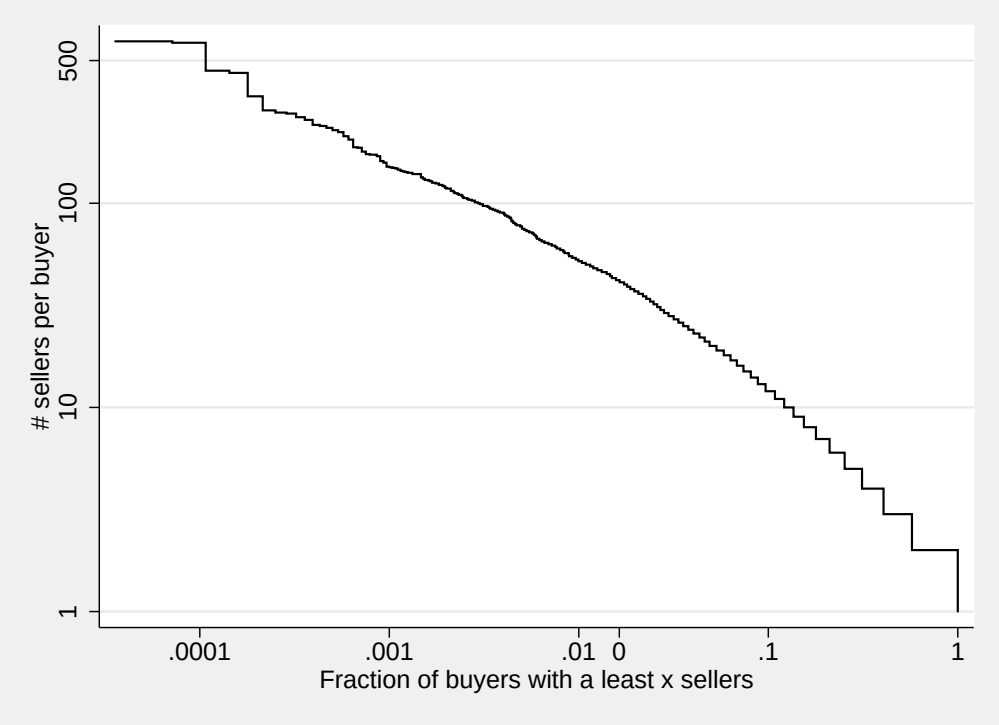
Figure 2: Foreign Exporters per Colombian Importer, Imported Products, and Source Countries



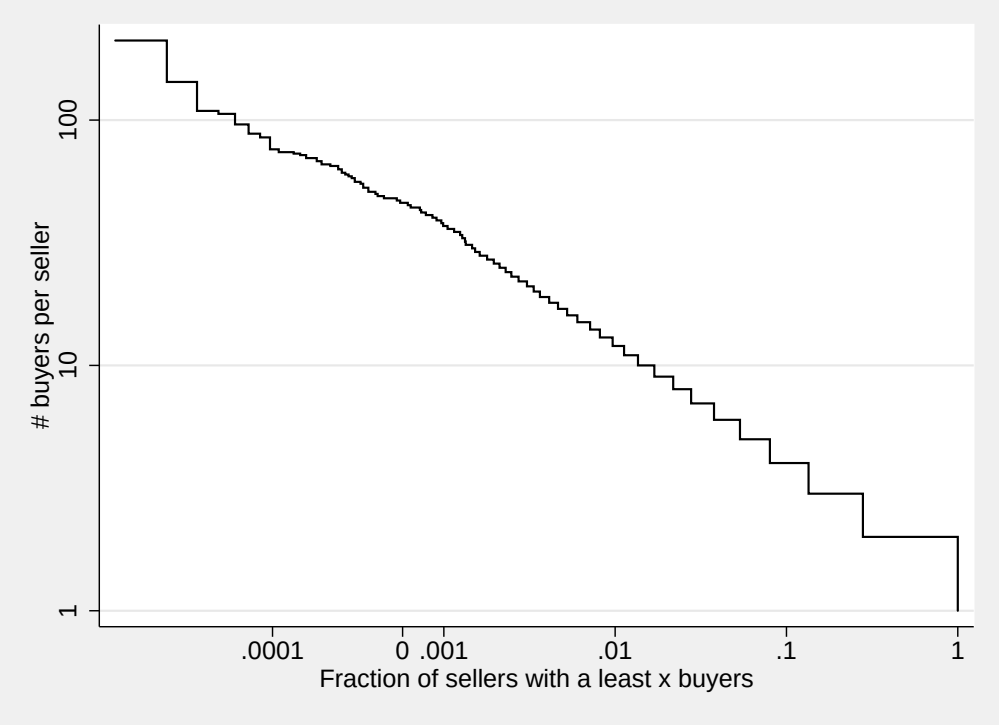
Source: Authors calculations

Figure 3: Suppliers per Importer and Importers per Supplier - All Countries, 2014

(a) Suppliers per Importer



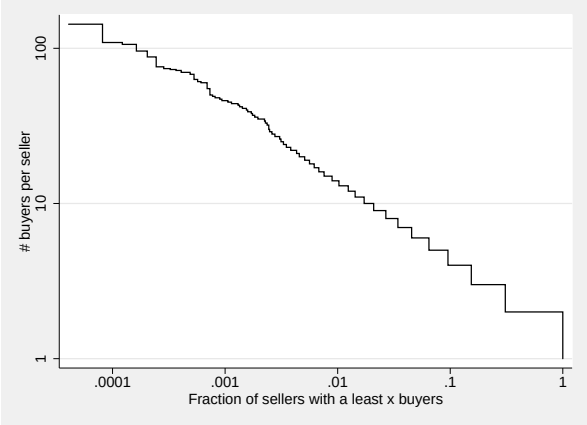
(b) Importers per supplier



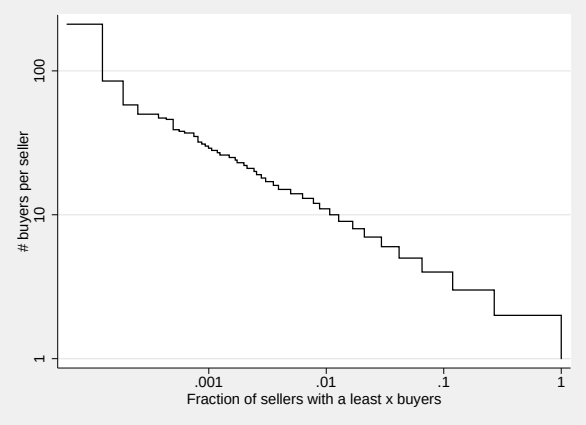
Source: Authors calculations

Figure 4: Importers per Supplier - Top Source Countries, 2014

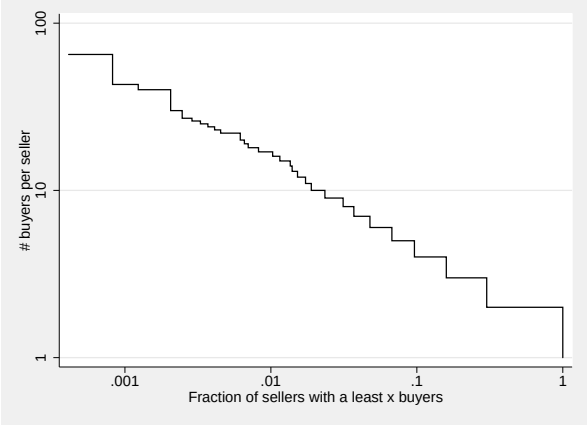
(a) US



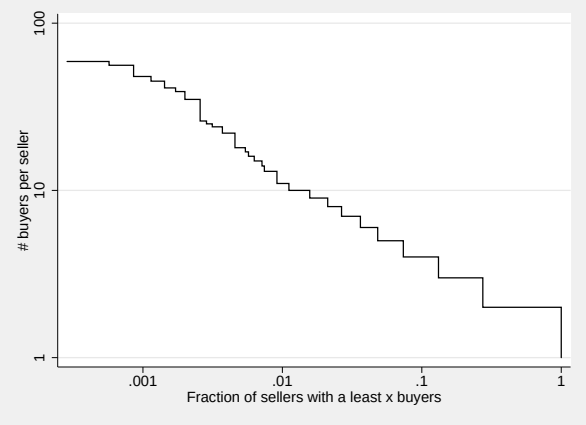
(b) China



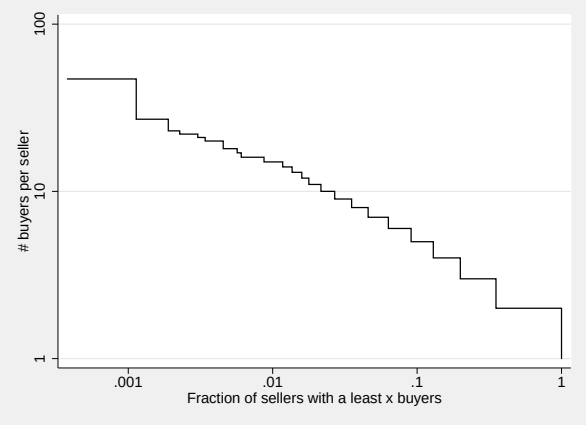
(c) Mexico



(d) Germany

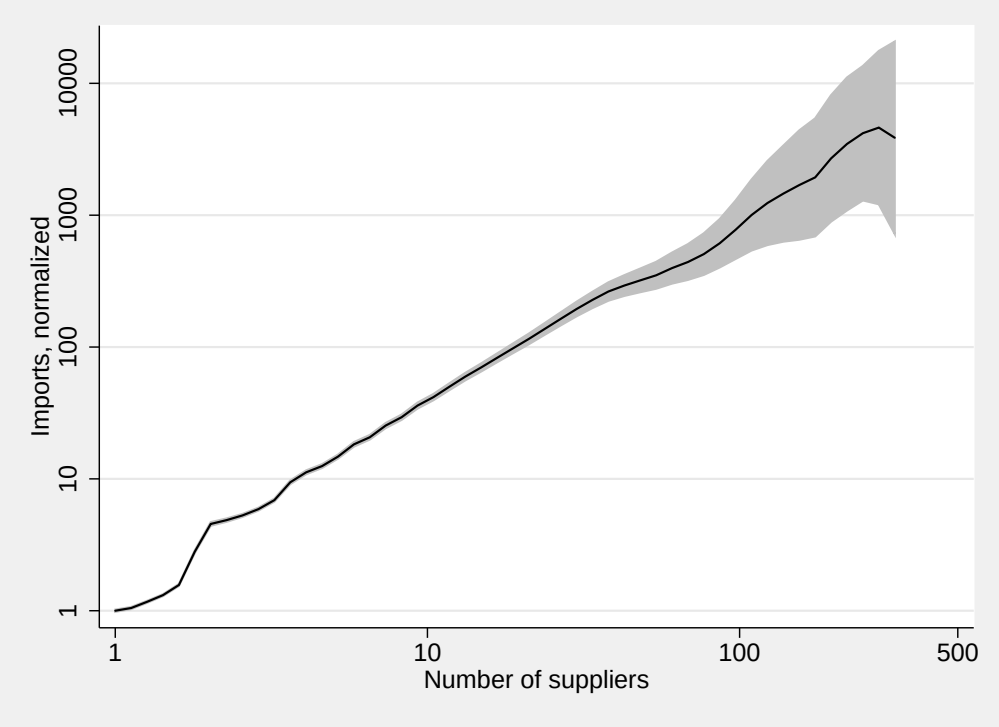


(e) Brazil



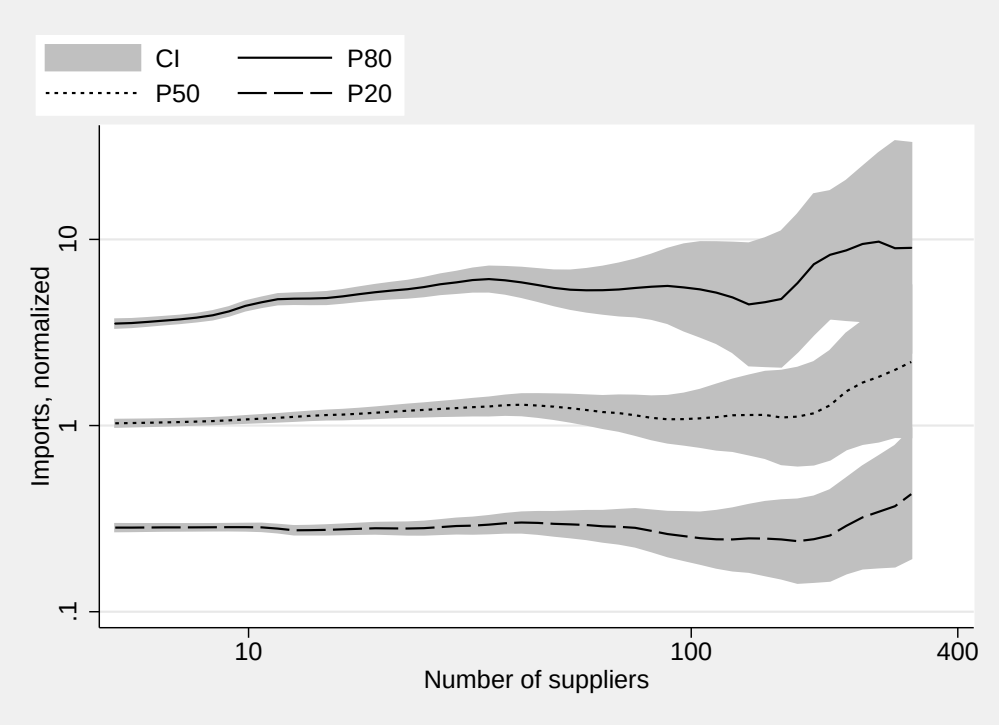
Source: Authors calculations

Figure 5: Log imports and the number of suppliers



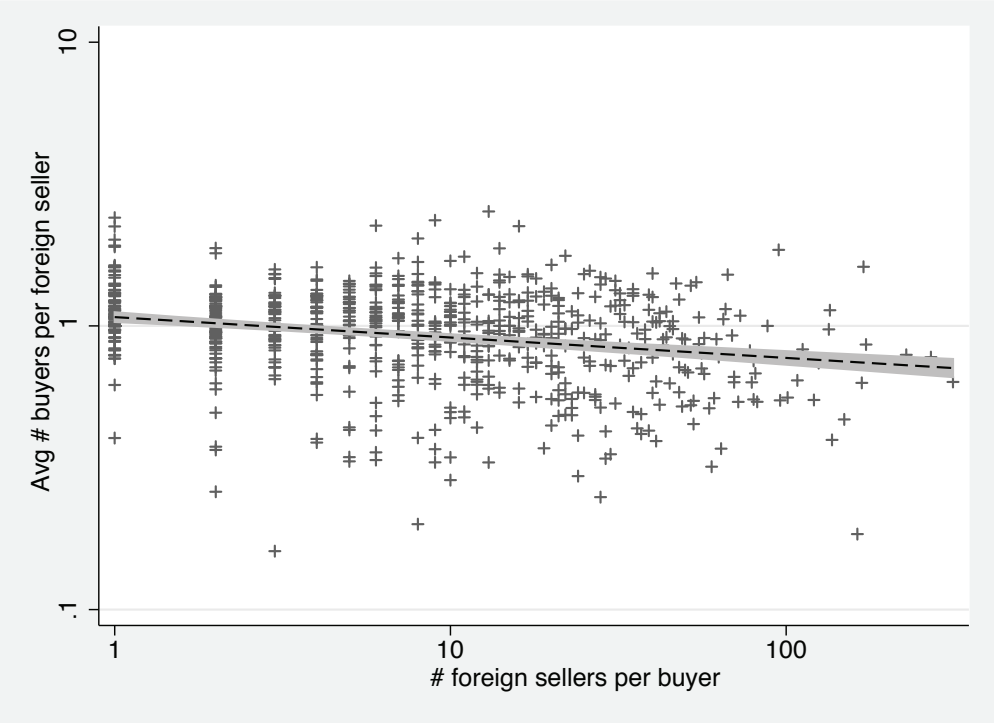
Source: Authors calculations

Figure 6: Log imports of 80th, 50th (median), and 20th percentile suppliers and the number of suppliers



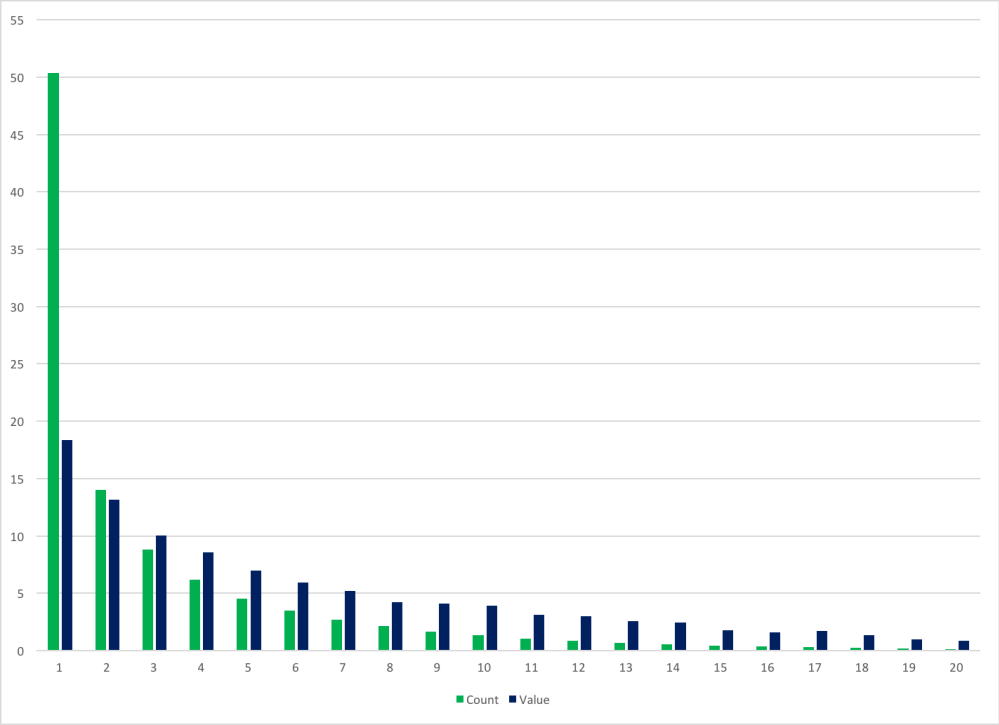
Note: Log imports (vertical axis) are normalized so average log imports for single-supplier importers equal 1. The horizontal axis is the the number of suppliers for the firm. Source: Authors calculations

Figure 7: Degree assortativity



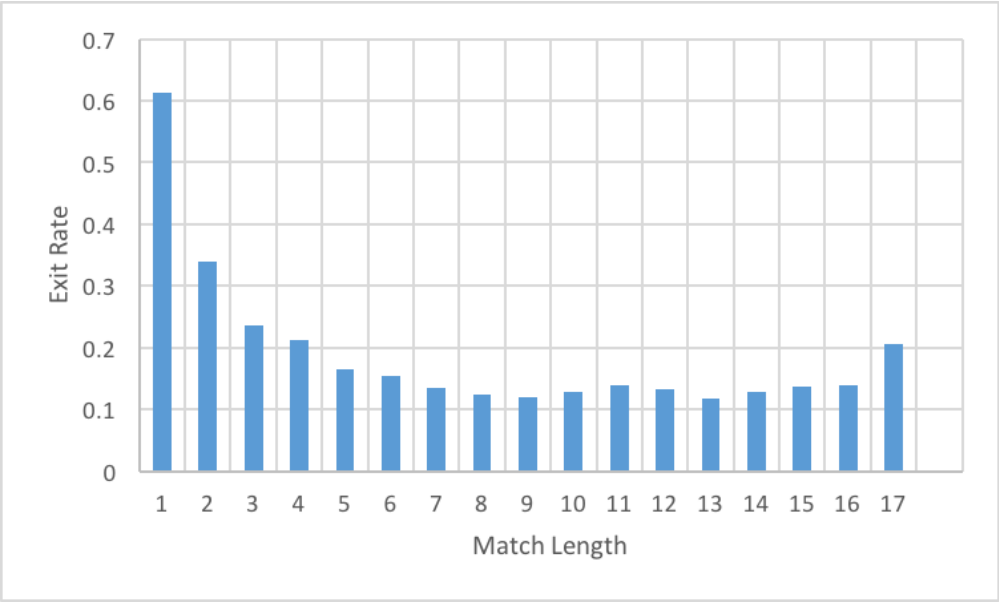
Source: Authors calculations

Figure 8: Importer-Exporter Match Length



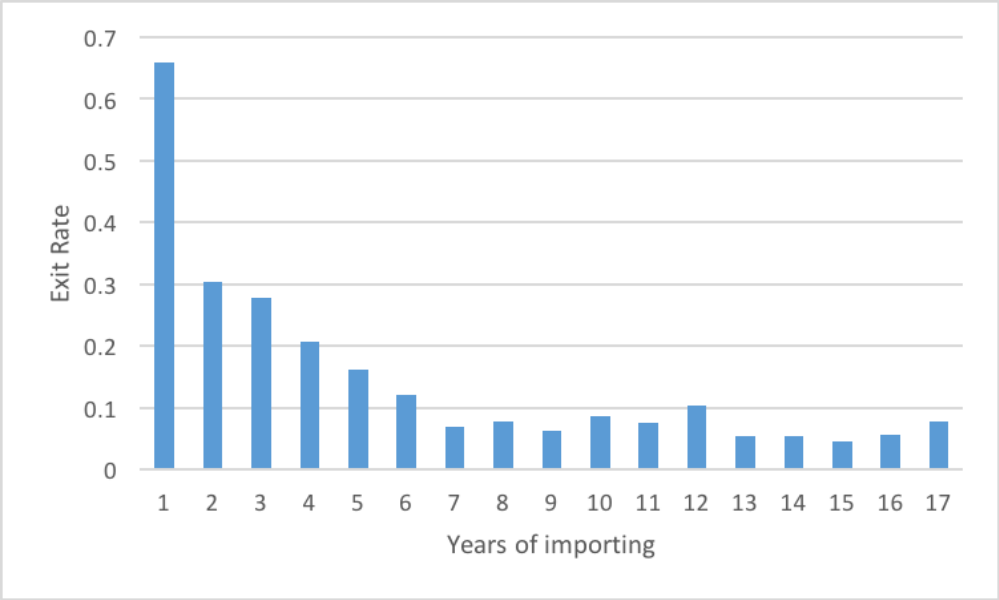
Source: Authors calculations

Figure 9: Importer-Exporter (Match) Exit Rates



Source: Authors calculations

Figure 10: Importer Exit Rates - 1997 Cohort



Source: Authors calculations