China's Exporters and Importers: Firms, Products, and Trade Partners

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Abstract. This paper provides a detailed overview of China's participation in international trade using newly available data on the universe of globally engaged Chinese firms over the 2003-2005 period. We document the distribution of trade flows, product- and trade-partner intensity across both exporting and importing firms, and study the relationship between firms' intensive and extensive margins of trade. We also compare trade patterns across firms of different organizational structure, distinguishing between domestic private firms, domestic state-owned firms, foreign-owned firms, and joint ventures. We explore the variation in foreign ownership across sectors, and find results consistent with recent theoretical and empirical work on the role of credit constraints and contractual imperfections in international trade and investment. Finally, we examine the rapid expansion of China's trade over the 2003-2005 period, and decompose it into its extensive and intensive margins. We also use monthly data and study the frequent churning and reallocation of trade flows across firms and across products and trade partners within firms.

JEL Classification codes: F10, F14, F23.
Keywords: exporters, importers, multinational firms, margins of trade.

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Introduction

Since joining the World Trade Organization in December 2001, China has rapidly expanded its international trade participation and experienced a dramatic rise in multinational firm activity. In the two years between 2003 and 2005 alone, Chinese exports grew by 86% while imports increased by 66%, to reach $548.4 billion and $483.5 billion, respectively. Foreign-owned firms and joint ventures have steadily captured 75% of these trade flows, but the former have expanded faster. These aggregate patterns mask substantial reallocations and variation in activity across firms with different ownership structure, sector affiliation and trade profile.

This paper provides a detailed overview of China's participation in international trade using newly available data on the universe of globally engaged Chinese firms over the 2003-2005 period. These data make it possible to examine the activities of both exporting and importing firms, and study their product and trade partner intensity. It also allows the comparison of trade patterns across firms of different ownership structure, distinguishing between domestic private firms, domestic state-owned firms, foreign-owned firms, and joint ventures. Finally, the monthly frequency of the data permit the analysis of firm, product and trade partner dynamics.

This level of richness and detail in firm-level trade data has so far only been available for the U.S., and is unprecedented for other developed or developing countries. In particular, only one other recent study (Bernard, Jensen and Schott, 2007, henceforth BJS) has examined U.S. importing firms in addition to exporting firms, with the earlier literature focusing on exporters only. BJS also compare the performance of domestic firms to the affiliates of foreign companies, though they cannot distinguish between U.S.-owned and foreign-owned multinationals.[1] In contrast, we distinguish between joint ventures and the affiliates of foreign-owned multinationals, and separate domestic private from state-owned firms. By virtue of China's size, rapid trade expansion and range of institutional frictions, these data offer insight into firms' trade participation decisions in general and their salience in constrained environments.

We first document the distribution of trade flows, product- and trade-partner intensity across firms of different ownership type. Half of all trading firms both export and import goods and capture fully 90% of trade by value. Foreign-owned firms are substantially more likely to engage in two-way trade than joint ventures and state-owned firms, which are in turn more likely

[1] They can also distinguish between trade flows that occur at arm's length or between related parties, while our dataset does not contain this information.

to do so than privately held domestic firms. The distribution of trade flows across firms is extremely skewed, with firms at the 90th percentile exporting (importing) 200 (1,700) times more than firms at the 10th percentile. Thus, the top 1% of firms (in terms of trade flows) are responsible for 51% and 60% of all exports and imports, respectively, while the top 10% of firms conduct 80%-90% of all trade. These patterns appear independent of firm ownership type.

The lion's share of China's exports and imports are captured by a few multi-product firms that transact with a large number of destination or source countries. While 23% (19%) of all firms export (import) only one product, they capture a mere 5.6% (2.2%) of all exports (imports). By contrast, only 4.4% of exporters export more than 30 products, but they contribute 30% to all exports. Similarly, only 2.6% of importers import more than 100 products, but they account for 42% of all imports. The distribution of trade-partner intensity across firms exhibits similar patterns. On average, importers transact in more products than exporters, especially among foreign-owned firms. On the other hand, exporters engage in trade with more countries than importers do. This is consistent with the idea that the affiliates of foreign multinationals import intermediate products for further processing, final assembly and potentially re-exporting.

These results add to a growing empirical literature on firms' participation in international trade and the superior performance of exporting firms relative to non-exporters in terms of productivity, employment, wages, skill- and capital-intensity.[2] Our work is closest to that of BJS, who examine the universe of U.S. trading firms. They document a distribution of trade flows across U.S. firms that is even more skewed than the one we observe for China: the top 1% of trading firms (by trade flows) account for 81% of U.S. trade. Compared to our results for China, BJS also observe a fatter left tail in the distribution of product- and trade-partner intensity, and a more extreme concentration of trade among trading firms with the most trade partners and the broadest product scope.[3] Finally, a much smaller fraction of trading firms both export and import in the U.S. (17%) than in China (51%).

One possible explanation for these differences between the U.S. and China may be the role of credit constraints and access to external financing. A number of recent papers have argued that financial frictions limit firms' ability to become exporters and to export larger volumes (see

[2] See, for example, Bernard and Jensen (1995, 1999) for the U.S., Bernard and Wagner (1997) for Germany, Clerides, Lach and Tybout (1998) for Columbia, Mexico and Morocco, and Aw, Chung and Roberts (2000) for Korea and Taiwan among others.

[3] Eaton, Kortum and Kramarz (2004 a,b) find similar results for French manufacturing exporters' trade partners.

below). Given the stronger level of financial development in the U.S. and the evidence that smaller firms are more credit constrained[4], smaller firms may find it easier to start exporting from the U.S. than from China. By the same logic, it may be possible for firms that trade fewer products with fewer countries to survive in the U.S. but not in China. We find results consistent with this explanation by comparing the export and import performance of Chinese firms with different ownership structure. This comparison rests on the premise that foreign ownership allows affiliates to access internal financing from their parent company, while state-ownership provides easier access to financing from China's state banks relative to private ownership.

When we look at the relationship between the extensive and intensive margins of trade at the firm-level, interesting patterns emerge. Among domestic firms (both state-owned and privately-held), firms that trade more products trade less per product. Among foreign-owned firms and joint ventures, this relationship is non-monotonic and follows a U-shape: trade per product is lowest for firms with an intermediate level of product intensity. When we break down firms by trade partner intensity, trade profile becomes more important than ownership structure: Importers which source products from more countries import more per country regardless of ownership type. Exporters, on the other hand, exhibit a U-shape: average exports per destination are lowest for firms in the middle of the distribution by number of trade-partners.

These results contribute to an active recent literature on the operations of multi-product firms. Bernard, Redding and Schott (2006b) propose that firm productivity is a combination of firm-level ability and firm-product-level expertise. Since higher firm-level ability raises a firm's productivity across all products, their model predicts a positive correlation between a firm's product scope and exports per product.[5] More recently, Arkolakis and Muendler (2007) find a negative correlation between product scope and average *worldwide* exports per product in a panel of Brazilian manufacturing exporters. However, they show that this correlation is positive *within* a given destination country. They extend the Melitz (2003) model to a multi-product firm context, and introduce product-level fixed costs of exporting to any given country. They conclude that these costs need to strictly increase in product scope at the destination to rationalize their findings. Our results suggest that there may be important differences between the cost structure of exporting

[4] See, for example, Beck, Demirgüç-Kunt, Laeven and Levine (2005), Beck, Demirgüç-Kunt and Maksimovic (2005), and Forbes (2007).

[5] See also Chaney (2008) on the response of the extensive and intensive margins of trade to trade costs in the presence of single-product firms and firm heterogeneity.

and importing at the country-product level. In addition, firm ownership type may affect either the trade costs firms face or firms' ability to finance these costs.

In the second part of the paper, we establish some systematic patterns in the relative prevalence of foreign ownership across sectors. We find evidence consistent with recent theoretical and empirical work on the role of credit constraints and contractual imperfections in determining international trade and investment. For example, Manova (2007) shows that financially developed countries are more likely to become exporters and to export greater volumes and a broader range of products to more destination countries. Importantly, these patterns are more pronounced in financially vulnerable sectors that, for technological reasons, require more external finance or are endowed with fewer collateralizable assets.[6] There is also evidence that the affiliates of multinational firms benefit from access to internal financing from their parent company and thus have an advantage over domestic firms. For example, Desai, Foley and Forbes (2008) show that foreign affiliates respond faster and more effectively to profitable export opportunities than domestic firms. Following large real exchange rate devaluations, foreign affiliates receive more financing from their parent company which allows them to increase sales, assets and investment, while local firms contract or do not expand. However, Desai, Foley and Forbes (2008) are not able to observe firms' export levels directly.

The detailed nature of our data allows us to more directly examine the link between credit constraints, foreign ownership and trade. We find that foreign-owned firms capture a larger share of Chinese exports and imports in financially vulnerable industries. While joint ventures, state-owned and privately-held domestic firms are more common in financially less vulnerable sectors, the former exhibit a much more balanced cross-sectoral distribution. These results are consistent with a credit-constraints view of international trade whereby foreign ownership provides access to cheaper internal finance, while state ownership facilitates financing from local state-owned banks. Moreover, while the prior literature has focused on the effects of financial frictions on exporting, our results suggest they may play an equally important role in importing.

We also find evidence consistent with recent property-rights models of firms' decision to locate production abroad and keep it within firm boundaries. In a series of papers, Antràs (2003) and Antràs and Helpman (2004, 2008) have shown that in the presence of imperfect

[6] See also Beck (2002, 2003), Becker and Greenberg (2005) and Manova (2008) among others for evidence on the effects of credit constraints on aggregate country-level exports. Greenaway, Guariglia and Kneller (2007) show that U.K. exporters are less financially constrained than non-exporting firms.

contractibility, firms will choose to outsource or integrate their suppliers depending on the relative importance of the two parties' relationship-specific investments. In line with the predictions of these models, Antràs (2003) finds that a larger share of U.S. trade occurs intra-firm instead of arm's length in capital- and R&D-intensive sectors. Feenstra and Hanson (2005), Yeaple (2006), Nunn and Trefler (2008), and Bernard, Jensen, Redding and Schott (2008) have presented further evidence for the property-rights approach using alternative sector-level measures of input relationship-specificity and contractibility.[7]

While our data do not allow us to distinguish between intra-firm and arm's-length trade flows, we are able to document the cross-sector variation in the share of Chinese exports and imports conducted by the affiliates of foreign multinationals. We find that this share is relatively higher in more R&D-intensive sectors. By comparison, joint ventures are almost evenly represented in high- and low-R&D industries, while domestic firms (both private and state-owned) are substantially more active in sectors with low R&D intensity. A similar pattern emerges when we use product differentiation as a proxy for relationship-specificity (as in Nunn and Trefler, 2008): foreign affiliates and joint ventures mediate a larger share of trade flows in differentiated goods relative to homogeneous products. On the other hand, the variation in firm ownership across sectors with different levels of capital intensity exhibits some surprising patterns. The share of exports captured by foreign-owned (domestic) firms is highest (lowest) in sectors with medium levels of capital intensity. By contrast, foreign affiliates account for a larger fraction of imports in industries with low and medium capital-intensity, while domestic firms are more active in industries with high capital intensity.

In the last part of the paper, we examine the rapid expansion of China's exports and imports over the 2003-2005 period, and decompose trade growth into its extensive and intensive margins. Total exports (imports) increased by 86% (66%) over these two years, with more than 70% of this growth due to surviving firms expanding their trade flows. At the firm level, half of these gains reflect deepening in exports and imports of surviving products to existing trade-partners, while the other half comes from expansion in product scope and trade-partners. Aggregating across all firms, however, almost the entire growth in exports and imports can be attributed to the intensive margin: Average Chinese trade flows per product and average Chinese

[7] See Antràs, Desai and Foley (2007) for a model which endogenizes the integration decision of multinational firms in the presence of credit constraints, relationship specific investments and contractual imperfections.

trade flows per trade partner increased at roughly the same rate as overall Chinese trade. These results indicate that the biggest boost to Chinese trade came from firms expanding into products and destination / source countries that other firms were already tapping.

These aggregate trade patterns mask significant churning and reallocations across firms, as well as across products and trade partners within firms. Between January of 2003 and December of 2005, the number of exporters and importers grew by 45% and 22% respectively, with the number of private domestic and foreign-owned firms expanding and the number of state-owned firms and joint ventures contracting. Foreign-owned firms and joint ventures are substantially more likely to continue trading from one period to the next than state-owned companies, which have in turn better chances than domestic private firms. Trading firms are prone to exit from and re-enter into exporting or importing, and more than 20% of all firms do so more than once. Firms that trade continuously over the 36 months in our data frequently change their product composition, even within a given destination or source country. On average, roughly 40% of all bilaterally traded products are replaced with new ones from month to month, with this ratio negatively correlated with foreign ownership. The same is true of firms' trade partners.

These results complement evidence in the prior empirical literature on the importance of firm and product churning in exporting.[8] They also speak to the relevance of theoretical models of intra-industry firm dynamics and intra-firm product turnover (Melitz 2003, Bernard, Redding and Schott, 2006b,c, Costantini and Melitz, 2007).

The remainder of the paper is organized as follows. The next section describes the data on Chinese trading firms. Section 2 documents the distribution of exports and imports across firms of different ownership structure, and examines their product and trade partner intensity. Section 3 explores the relative prevalence of foreign ownership across sectors with different characteristics. Section 4 decomposes China's trade growth into its extensive and intensive margins, and reviews firm, product, and trade-partner dynamics. The last section concludes.

1. Data

We analyze a unique new database on the universe of globally engaged Chinese firms over the 2003-2005 period. These data have been collected by the Chinese Customs Office and made

[8] See Pavcnik (2002), Alessandria and Choi (2007), Bernard, Redding and Schott (2006a), Besedes and Prusa (2006a,b, 2007), BJS and Eaton, Eslava, Kugler and Tybout (2008).

available by the Chinese authorities. They report imports and exports for all Chinese firms which participated in international trade during this three year period. We observe firm-level trade values (in US dollars) by product and trade partner for 243 destination/source countries and 7,526 different products in the 8-digit Harmonized System classification. For each (firm, trade partner, product) triplet, the data also record the means of transportation (out of 19 possibilities such as air, ship, etc.), the customs office where the transaction was processed (out of 42 offices), the region or city in China where the product was exported from or imported to (out of 710 locations), and any potential transfer country or region (such as Hong Kong). The dataset also provides information on the quantities traded in one of 12 different units of measure (such as pieces, kilograms, square meters, etc.). Finally, each firm is assigned one of 7 potential ownership types, which we group into 4 categories: domestic state-owned firms, domestic privately-owned firms (including collectively-owned firms), fully foreign-owned affiliates and joint ventures (foreign ownership <100%). While the data is available at a monthly frequency, for most of the analysis we focus on annual trade values in the most recent year in the panel, 2005. We use higher-frequency data to examine firm, product and trade-partner dynamics in Section 5.

Some state-owned companies are pure "trading" companies which do not engage in manufacturing and serve exclusively as intermediaries between domestic producers (buyers) and foreign buyers (producers). In this paper, we focus on the operations of firms that both produce and trade goods, and leave the study of "trading" companies for future work. While the data does not classify such "trading" state-owned firms, we use key words in firms' names to identify them.[9] We can nevertheless not be sure that we have excluded all such enterprises and comment on this as appropriate. In the rest of the paper we refer to all firms remaining in our data as trading firms.

2. China's trading firms, traded products and trade partners

In this section we document the distribution of exports and imports across firms with different ownership type and examine their product and trade partner intensity. We also explore the relationship between the extensive margin (number of products or trade partners) and intensive margin (average trade per product or trade partner) of trade at the firm level. This part of the paper intentionally stays close to the structure in BJS to allow for easier comparison of the results for China and the U.S..

[9] We drop 23,073 "trading" firms which mediate a quarter of China's trade by value.

2.1 Exporting and importing firms

In 2005, 114,483 Chinese firms participated in international trade. As Table 1 shows, half of these firms engaged in both exporting and importing. However, this ratio varies significantly across firms with different ownership structure. Foreign-owned firms are substantially more likely to conduct two-way trade (67%) than joint ventures (53%) and state-owned firms (48%), which are in turn more likely to do so than privately held domestic firms (31%). These numbers are markedly higher than those BJS report for the United States: In 2000, 17.5% of all U.S. trading firms both exported and imported. Moreover, in the U.S. this share was very similar for domestic and multinational firms.

Most of the variation across Chinese firms of different ownership types comes from firms' decision to import in addition to exporting than the other way around. Thus, the fraction of firms that only import but do not export is roughly 15% in every ownership group, while the share of firms that only export decreases with foreign ownership.[10,11] This is consistent with the idea that multinational companies (MNCs) operating affiliates in China are likely to import intermediate inputs for further processing and/or final assembly before re-exporting to third destinations. By splicing the production chain into tasks with different factor intensities, MNCs can exploit cross-country differences in factor prices.

Table 2 shows the total value of Chinese trade flows and its breakdown by firm ownership type. In 2005, China's exports and imports amounted to $548.2 billion and $483.3 billion, respectively. Fully 90% of all trade was conducted by firms that both export and import. While foreign-owned firms were 38% of all trading firms, they captured half of all exports and imports. Joint ventures accounted for another quarter of aggregate trade flows. Privately-held domestic firms were more than five times as numerous as state-owned firms (see Table 1), but they traded much less on average and were much less likely to both export and import. For these reasons, private domestic companies contributed much less to exports (13%) than their numbers would suggest (32%), while state-owned firms (6.3%) claimed a larger than proportional share of exports (10.3%). This pattern is even more extreme for imports.

[10] Throughout the paper, when we say that a variable increases in foreign ownership, we will mean that it is higher for foreign-owned firms than for joint ventures, and in turn higher for joint ventures than for domestic firms.
[11] Note, however, that a similar share of state-owned firms and joint ventures only export.

In line with results in the prior empirical literature for other countries, we find that the distribution of trade flows across Chinese firms is extremely skewed. As Table 3 illustrates, firms at the 90th percentile by export value export over 200 times more than firms at the 10th percentile. This ratio is an astounding 1,700 for importing firms. This difference is mostly driven by a much fatter left tail in the distribution of imports than exports: While importers tend to import less than exporters export at any percentile level, this difference is greatest for the very small trading firms. This may indicate differences between the cost structure of importing and exporting (such as a lower fixed cost for the former) that make low levels of imports optimal for some importers but low levels of exports unfeasible for exporters.

Simple averages suggest that state-owned firms trade greater volumes than foreign owned firms, which have a slight advantage over joint ventures and a more pronounced lead over private domestic firms. These differences appear to be driven by the top 25% of state-owned firms and a generally longer and fatter right tail in their distribution of firm-level trade values. This speaks to the anecdotal evidence that a sizeable share of state-owned firms specialize in trading and serving as intermediaries between domestic and foreign buyers and producers, but do not conduct much manufacturing themselves. It is likely that the filter we used to exclude these firms has missed some of these big trading companies.

As these skewed distributions would imply, the vast majority of Chinese trade is conducted by a few very active firms (see Table 4). The top 1% of firms (in terms of trade flows) are responsible for 51% and 60% of all exports and imports, respectively, while the top 10% of firms capture 80%-90% of all trade. The bottom half of all exporters account for less than 2% of China's exports and the bottom 75% of all importers channel less than 3% of China's imports. Among private firms, the concentration of exports and imports in the top 1%-5% firms increases with foreign ownership. The distribution of trade values across state-owned firms does not fit neatly in this pattern as it is much more concentrated for imports than for exports. Of note, BJS report an even more skewed distribution for the United States, with the top 1% of firms performing 81% of U.S. trade. This suggests that there is a fringe of firms which can viably export and import at a small scale in the United States, but not in China.

2.2 Exporters' and importers' product intensity

There is tremendous variation in product and trade partner intensity across Chinese exporters and importers. There are also some systematic differences across firms of different ownership type.

On average, Chinese importers transact in more products than exporters, although the distribution of product intensity has a much longer right tail among exporters. As Table 5 shows, the average number of products traded is 9.3 for exporters and 17.1 for importers, where goods are classified according to the 8-digit HS system. This comparison, however, masks important differences across firms with different organizational structures. Note first that state-owned companies have a higher than average product intensity, and import and export roughly the same number of products on average (21.5 and 22.9 respectively). Some transact in the broadest range of goods observed across all firms, reaching a maximum of 1,610 products exported and 767 products imported.[12] These are likely trading companies that engage in little or no manufacturing.

Interesting patterns emerge among private firms. Foreign affiliates and joint ventures import roughly three times as many products on average as they export. In contrast, the average private domestic firm exports 50% more products than it imports. In absolute levels, average import product intensity is increasing in foreign ownership, while that of exports is decreasing. Similarly, the maximum number of products traded by any foreign-owned firm or joint venture is higher for importers than for exporters, while the converse holds for private domestic firms. Recall (Table 1) that a much bigger share of foreign firms than private domestic firms both export and import. The evidence on product intensity thus reinforces the idea that foreign firms are likely to engage in vertical and export-platform FDI in China, and to assemble (many) imported products into (fewer) final goods for re-exporting.

The lion's share of China's trade is conducted by a few firms that trade the broadest range of products. Table 6 reports the distribution of firms across different bins by product intensity (odd-numbered columns) and the percent share of total exports or imports firms in each bin capture (even-numbered columns). While 23% (19%) of all exporters (importers) trade only one product, they mediate only 5.6% (2.2%) of all exports (imports). By contrast, only 4.4% of exporters export more than 30 products, but they contribute 30% to all exports. Similarly, only 2.6% of importers import more than 100 products, but they account for 42% of all imports.

[12] The overall maximum number of products imported is 868, held by private domestic firms.

In comparison, BJS report a significantly more skewed distribution of firms across product-intensity bins for the United States. In 2000, 38% of all U.S. exporters and 32% of all U.S. importers traded exactly one product, but they captured a mere 0.7% of all trade. By contrast, 15% of all U.S. exporters and 21% of all U.S. importers transacted in more than 10 products, but they mediated more than 92% of all U.S. trade flows. Combined with the conclusion from the end of the previous section, this suggests that firms which trade small volumes in a few (or even only one) products may be viable in the United States but not in China.

2.3 Exporters' and importers' trade partner intensity

When we turn to the trade partner intensity of Chinese firms, we also find a very skewed distribution. On average, exporters sell in 7.5 destination markets, while importers source products from 4 origin countries (Table 8). This pattern is also reflected in the maximum number of trade partners among all exporters (144) and importers (67). It is also the case that, among firms with the same ownership structure, the average exporter transacts with more trade partners than the average importer. However, this difference is greatest for domestic firms (both state-owned and privately-held) and decreases with foreign ownership. Perhaps surprisingly, foreign owned firms on average export to fewer destination markets (6.0) than joint ventures (7.4), which in turn sell in fewer countries than private domestic firms (8.7). By contrast, the opposite ranking obtains for importing, with foreign firms sourcing products from more countries than private domestic firms. State-owned firms transact with the greatest number of destination markets (11.2) and source countries (5.6) on average.

These results may indicate that foreign-owned companies and joint ventures operate a more global production network than private domestic firms, and source intermediate inputs from more countries to minimize production costs. A number of explanations may account for foreign firms' relatively lower export trade partner intensity. Foreign affiliates and joint ventures may conduct intermediate stages of production in China, and re-export unfinished goods for further processing to affiliates in other countries. Since foreign firms likely do not maintain affiliates in all final consumer markets, they may record a lower trade partner intensity in China compared to domestic firms. In addition, foreign-owned firms may produce more specialized goods that fewer (more developed) countries demand or that require marketing and repackaging in entrepôt centers like Hong Kong. By contrast, domestic firms may specialize in serving as distribution networks

(state-owned firms) or in manufacturing standardized intermediate inputs for final good producers in many countries (private domestic firms). This explanation would be consistent with the property rights view of MNCs (see section 3.1 below).

As with firms' product-intensity, the bulk of China's trade is conducted by a few firms that transact with the greatest number of countries. Table 9 presents the distribution of firms across different bins by trade partner intensity (odd-numbered columns) and the percent share of total exports or imports firms in each bin capture (even-numbered columns). While 27% (35%) of all exporters (importers) trade with only one country, they account for only 6.2% (2.4%) of all exports (imports). By contrast, only 4.1% of exporters sell to more than 30 markets, but they mediate a third of all exports. The distribution of imports across firms is even more skewed: only 0.3% of importers source products from more than 30 countries, but they contribute almost a quarter of all imports. The 22% (8%) of exporters (importers) that trade with more than 10 countries channel two thirds of China's trade.

Combining the results for product- and trade-partner intensity, we conclude that China's exports and imports are concentrated in a few multi-product firms that transact with a large number of destination or source countries. The left half of Table 11 illustrates the joint distribution of firms by product intensity (rows) and trade partner intensity (columns), while the right half of the table records the percent share of total exports or imports firms in each bin capture. Most firms trade a few products with a few countries, and enter in the upper left corner of the table. However, the lion's share of trade is mediated by the few firms that are active in many products and countries in the lower right corner. For example, 12.3% (16.3%) of all exporters (importers) trade exactly one product with one country, but their trade amounts to only 1.4% (0.6%) of all exports (imports). In contrast, the 2.9% exporters and 5.4% importers who trade more than 30 products with more than 10 countries are responsible for 27% and 54% of total Chinese exports and imports, respectively.

Our results on firm trade partner intensity once again highlight important differences between Chinese and U.S. firms. BJS document a significantly more skewed distribution of trade flows across firms with different trade partner intensity in the United States. In 2000, more than half of all U.S. trading firms transacted with exactly one country, but they captured a mere 3-4% of all trade. By contrast, 8% (4%) of all U.S. exporters (importers) traded with more than 10 countries, but they conducted 78% (86%) of all U.S. exports (imports). Summarizing the evidence

so far, there are more firms which trade small volumes in a few products with a few countries in the United States than in China.

One possible explanation for the distinctions between the U.S. and China may be differences in firms' access to external financing in the two countries. A number of recent papers have argued that financial frictions limit firms' ability to become exporters and to export larger volumes. For example, Manova (2007) proposes a Melitz (2003) type model in which firms face credit constraints in the financing of export costs and financial contractibility varies across countries. In that framework, more productive firms have higher export revenues and find it easier to incentivize investors and obtain the necessary outside finance to produce and export. Hence the productivity cut-off for exporting will be lower in economies with better financial development. In addition, in the presence of destination-country specific fixed costs of exporting, firms will be able to sell in more markets when they have more access to external financing. At the same time, less productive, small firms which would optimally export to only the most profitable destinations will be more likely to survive in financially developed countries. While Manova (2007) doesn't explore multi-product firms, an extension of the model with product- or product-market specific fixed export costs could generate similar results for firms' product intensity. These predictions square well with evidence in the corporate finance literature that smaller firms are more credit constrained.[13] Finally, note that the trade literature has not proposed comparable firm-level models of importing. Nevertheless, the results for exporting would naturally translate if importing also entails fixed costs and importers are heterogeneous in marginal costs.

Given that the United States have much better developed loan and equity markets than China, smaller firms may find it easier to start exporting from the U.S. than from China. By the same logic, it may be possible for less productive firms that optimally trade fewer products with fewer countries to survive in the U.S. but not in China. This would explain the more skewed distributions BJS document for the United States than we record for China. Our results for the variation in trade patterns across firms with different ownership structure provide further evidence consistent with this explanation. Foreign affiliates, and to a lesser degree joint ventures, have access to internal financing from their parent or related foreign company. This can justify why foreign-owned firms tend to perform better (in terms of total firm trade flows, product and trade-

[13] See, for example, Beck, Demirgüç-Kunt, Laeven and Levine (2005), Beck, Demirgüç-Kunt and Maksimovic (2005), and Forbes (2007).

partner intensity) than joint ventures, which in turn lead private domestic firms. At the same time, state ownership facilitates access to local financing from China's state banks relative to private ownership. This may be why state-owned firms outperform private domestic firms, and are in some respects comparable to foreign firms. We examine the credit constraints hypothesis more carefully in section 3.2 below.

2.4 Firms' intensive and extensive margin of trade

We next study the relationship between the extensive and intensive margins of trade at the firm-level, and find that firm ownership and trade profile (exporter or importer) play an important role.

In Table 7, we first document how the average value of exports and imports per product (product scale) varies with product scope and organizational structure. The simple correlation between product intensity and product scale is close to zero for both for exporters and importers. These weak correlations mask important differences between Chinese-owned and foreign-owned firms. Among domestic firms (both state-owned and privately-held), firms that trade more products trade less per product. Among foreign-owned firms and joint ventures, this relationship is non-monotonic and follows a U-shape: trade per product is lowest for firms with an intermediate level of product intensity. This pattern describes both exporters and importers.

These results contribute to an active recent literature on the operations of multi-product firms. A few different opposing forces could generate either a positive or a negative relationship between the extensive and the intensive margin. Assume first that all products potentially available to a firm are identical in terms of cost structure and profitability. When firm-level economies of scale are more important than product-level economies of scale, larger firms should both produce/export more products and produce/export more per product. This would be the case if, for example, technological know-how, managerial control and marketing research for a specific destination market were easily deployable across products. On the other hand, firms may face limited managerial capacity and experience diminishing returns to scope but increasing returns to scale. When the latter effect dominates, the intensive and extensive margins would be negatively correlated.

In recent work, Bernard, Redding and Schott (2006b) propose that firm productivity is a combination of firm-level ability and firm-product-level expertise. In this framework, the products available to a firm differ in their cost structure and profitability. Since higher firm-level ability

raises a firm's productivity across all products, this model predicts a positive correlation between a firm's product scope and exports per product. BJS in fact observe such a positive correlation in their data for U.S. firms. On the other hand, an extension of the Manova (2007) model to multi-product firms could generate a negative relationship between scope and scale. If firms can export a variety of products with different levels of profitability, they would choose to export the most profitable goods subject to their credit constraint. Thus firms would optimally expand their product range in decreasing order of product profitability until they exhaust the external financing available to them. (More productive) firms that face less financial constraints will go further down this product ladder, record higher product intensity, and have lower product scale because they will sell smaller values of less profitable goods on the margin.

Our results suggest that the credit-constraints and limited managerial capacity effects may dominate in the case of domestic firms in China (both state-owned and privately-held). As for foreign affiliates and joint ventures, they appear subject to the same forces to a lesser degree, potentially because they have access to internal financing or higher-skilled management. The U-shape these firms exhibit suggests that they also experience powerful increasing returns to scale. One possible explanation for this distinction is that foreign-owned firms operate in sectors intensive in technological knowledge and generalizable firm-level ability that can be deployed across products. The results in section 3.1 below are consistent with this observation.

We also examine the relationship between firms' intensive and extensive margin by looking at their trade partner intensity and their average exports (imports) per country. As Table 10 shows, we no longer observe sharp differences across firm ownership types. Instead, firms' trade profile becomes important: Importers which source products from more countries import more per country regardless of ownership type. Exporters, on the other hand, exhibit a U-shape: average exports per destination are lowest for firms in the middle of the distribution by number of trade-partners.

In Table 12, we classify firms according to both their product- (rows) and trade partner intensity (columns). For each bin, we then report average firm sales by country-product. Looking at the first row and column in each panel is instructive. Among firms that only transact with one country, product scale is decreasing in product scope. Among firms that only trade one product, trade partner intensity and scale are positively correlated for importers and negatively correlated

for exporters. Less obvious patterns emerge in the rest of the matrix because of the complex underlying relationships we have seen in Tables 7 and 10.

These results add to recent evidence from a panel of Brazilian manufacturing exporters in Arkolakis and Muendler (2007). They find a negative correlation between product scope and average *worldwide* exports per product, but a positive correlation *within* a given destination country. They extend the Melitz (2003) model to a multi-product firm context, and introduce product-level fixed costs of exporting to any given country. They conclude that these costs need to strictly increase in product scope at the destination to rationalize their findings.[14] On the other hand, BJS report a positive correlation between trade partner intensity and average trade per country for U.S. exporters and importers.

Taken as a whole, this earlier evidence and our own results suggest that we have yet to understand a range of firm-level decisions in international trade. In particular, there may be important differences between the cost structure of exporting and importing at the country-product level. In addition, firms' organizational structure may affect their production/trade costs or their ability to finance these costs. Finally, the disparities across country studies highlight the importance of the institutional environment in which firms operate.

3. Foreign ownership across sectors

While the incentives for firms to relocate (parts of) their production process to a foreign country have been well understood for a while,[15] the decision to conduct foreign operations within the boundaries of the firm has only recently been examined. Understanding the location and integration decisions of multinational companies is important, not least because one third of world trade is intra-firm trade between affiliated parties and another one third is trade between an MNC affiliate and an unrelated party (Zeile, 1997).

There is substantial variation in MNC activity across sectors, which has proven very helpful in isolating key determinants of firms' organizational choices. In this section, we explore the relative prevalence of foreign ownership across industries with different characteristics. We find evidence consistent with recent theoretical and empirical work on the role of credit constraints and contractual imperfections in shaping international trade and investment.

[14] We plan to examine the correlation between product scope and trade per product within destinations in the future.
[15] See, for example, Brainard (1997), Markusen and Venables (2000) and Helpman, Melitz and Yeaple (2004) for models of horizontal FDI, and Helpman (1984) for a treatment of vertical FDI.

3.1 Foreign ownership and imperfect contractibility

In a series of papers, Antràs (2003) and Antràs and Helpman (2004, 2008) have shown that, in the presence of imperfect contractibility, firms will choose to outsource or integrate their suppliers depending on the relative importance of the two parties' relationship-specific investments. When ex ante contracts are not enforceable, final- and intermediate-good producers will bargain ex post, when any investment is sunk. If both agents need to make relationship-specific investments which offer a low outside option, there will be a two-sided hold-up problem, and both parties will underinvest. However, ownership provides residual rights of control, and can be used to align the incentives of the agent whose investment is relatively more important. Assuming that the headquarters of multinational firms are responsible for headquarter services (such as R&D and brand development) and capital investments, these models predict that we should see relatively more integration (FDI activity) and less outsourcing in capital- and R&D-intensive sectors.

In line with these predictions, Antràs (2003) and Yeaple (2006) find that a larger share of U.S. trade occurs intra-firm instead of arm's length in capital- and R&D-intensive sectors. Nunn and Trefler (2008) present further evidence for the property-rights approach using an alternative sector-level index of input relationship-specificity and contractibility. They use the Rauch (1999) classification and input-output tables to construct a measure of the share of inputs in a sector that are differentiated (i.e. not traded on an organized exchange or listed in reference-price publications).[16] Finally, Feenstra and Hanson (2005) study the organization of Chinese exporting firms by distinguishing between plant ownership and control over inputs (Chinese or foreign).

While our data do not allow us to separately identify intra-firm and arm's-length trade flows, we are able to document the cross-sector variation in the share of Chinese exports and imports conducted by the affiliates of foreign multinationals. As joint ventures balance foreign with domestic ownership, we expect that there distribution across sectors will fall between that of foreign affiliates and domestic companies.

We first show that foreign affiliates and joint ventures in China mediate a larger share of Chinese trade in differentiated goods relative to domestic companies.[17] Table 13 summarizes the

[16] Nunn (2007) uses a similar measure of relationship-specificity of inputs across sectors to show that in the presence of contractual frictions, country level contract enforcement becomes a source of comparative advantage. See also Bernard, Jensen, Redding and Schott (2008) who propose a different sector measure of product contractibility based on the degree of intermediation in the exports of that product.

[17] We use Rauch's (1999) methodology to classify HS-8 products in our data as differentiated or homogeneous.

distribution of trade flows by ownership structure and product type. Foreign firms capture 47% of all exports and 57% of all imports of differentiated goods, compared to 27% and 13% respectively for domestic firms (state-owned and privately-held combined). In contrast, only 18% (35%) of all exports (imports) of homogeneous goods are conducted by foreign firms. As expected, joint ventures fall in between these extremes and account for 27-30% of trade in both product categories.

We also find results consistent with the property rights model of MNC activity when we distinguish between sectors with low and high levels of R&D intensity (Table 14).[18] Foreign-owned firms account for 59% of all Chinese trade in high R&D intensity sectors, compared to 30% of all exports and 41% of all imports of low R&D intensity goods. By contrast, local firms are substantially more active in sectors with low R&D intensity (41% of exports and 31% of imports) relative to sectors intensive in R&D (15% and 16%). Perhaps not surprisingly, the share of trade flows captured by joint ventures always falls between that of foreign and domestic firms, and, at 25%-29%, does not vary significantly across sectors. Similar patterns obtain when we divide sectors into low, medium and high R&D intensity.

In contrast to these results for product differentiation and R&D intensity, the variation in firm ownership across sectors with different levels of capital intensity exhibits some surprising patterns. As Table 15 illustrates, the share of exports captured by foreign-owned firms is highest (60%) in sectors with medium levels of capital intensity. Moreover, that share is twice as high for low capital intensity industries (40%) as for high intensity sectors (22%). On the other hand, domestic firms (state-owned and privately-held combined) account for 51% of exports in high-, 14% in medium- and 34% in low- capital intensity industries. As for imports, foreign affiliates on average contribute 60% to trade in low and medium capital-intensity industries, but only 37% for very capital intensive goods. At the same time, domestic importers are most active in industries with the highest capital-to-labor ratios. Joint ventures are responsible for roughly the same fraction of exports and imports in all sectors (25%-30%).

There are a number of reasons why our findings for the relationship between capital intensity and foreign ownership may differ from those in the prior literature. Recall that we can only observe the sector in which firms export or import, but cannot distinguish between arms-

[18] The data on sectors' capital- and R&D intensity comes from Kroszner, Laeven and Klingebiel (2007). Although both variables are continuous, many sectors exhibit R&D intensity levels close to 0 so we only distinguish between low and high R&D intensity. On the other hand, we group sectors into low, medium and high capital intensity.

length and intra-firm trade. It may thus well be the case that the share of intra-firm trade in total Chinese trade is highest in the most capital intensive sectors. For this to be the case, however, there would have to be substantial differences between the share of intra-firm trade specifically among foreign firms in different sectors – differences big enough to overturn the ranking of foreign affiliates' share in total Chinese exports. An alternative explanation may be that these simple split-sample summary statistics mask important differences across firms and sectors that need to be controlled for. Finally, these results speak more to the scale at which firms operate than the efficiency or profitability of their capital investments. It is possible that institutional frictions and governmental support for certain industries may distort firm outcomes. These potential rationalizations remain speculative, and our results somewhat of a puzzle.

3.2 Foreign ownership and credit constraints

Standard international trade models emphasize cross-country differences in factor endowments and productivity levels as sources of comparative advantage, and tend to overpredict the volume of trade relative to what is observed in the data. While these classical models assume free reallocation of resources across sectors, a new and quickly growing literature examines the role of institutional frictions. In particular, a number of theoretical and empirical papers have shown that, in the presence of credit constraints, financial development becomes a source of comparative advantage.[19] For example, Manova (2007) shows that financially developed countries are more likely to become exporters and to export greater volumes and a broader range of products to more destination countries. Importantly, these patterns are more pronounced in financially vulnerable sectors that, for technological reasons, require more external finance or are endowed with fewer collateralizable assets.[20]

While local financial markets are important and may be the only option for many firms, foreign portfolio and direct investment provide an alternative source of financing. Manova (2008), for example, shows that countries which liberalize their equity markets experience a rise in their exports that is disproportionately greater in sectors intensive in outside finance and in sectors with few tangible assets. There is also evidence that the affiliates of multinational firms benefit from

[19] See Kletzer and Bardhan (1987), Beck (2002), Matsuyama (2005), Ju and Wei (2005), and Chaney (2005) for different models of credit constraints and international trade. For related empirical evidence see also Beck (2002, 2003), Becker and Greenberg (2005), and Greenaway, Guariglia and Kneller (2007).

[20] Rajan and Zingales (1998), Braun (2003), and Claessens and Laeven (2003) introduced these sectoral measures and used them to show that financially developed countries grow relatively faster in financially vulnerable sectors.

access to internal financing from their parent company and thus have an advantage over domestic firms. For instance, Desai, Foley and Forbes (2008) find that foreign affiliates respond faster and more effectively to profitable export opportunities than domestic firms. Following large real exchange rate devaluations, affiliates receive more financing from their parent company which allows them to increase sales, assets and investment, while local firms contract or do not expand.

The evidence in the prior literature suggests that multinational firms may have a comparative advantage and be more active in financially vulnerable sectors relative to domestic firms. Unfortunately, Desai, Foley and Forbes (2008) are not able to observe firms' export levels directly. In recent work, Antràs, Desai and Foley (2007) propose a model which endogenizes the integration decision of multinational firms in the presence of credit constraints, relationship specific investments and contractual imperfections. In their framework, multinational firms are more likely to integrate their foreign suppliers in financially less developed countries in order to incentivize local investors to finance these suppliers. Parent companies are also likely to partly fund their affiliates' operations. Using data on the activities of U.S. multinationals abroad, Antràs, Desai and Foley (2007) find support for these prediction. They do not, however, examine foreign affiliate exports, how they compare to those of domestic firms, or how they vary across sectors.

The detailed nature of our data allows us to more directly examine the link between credit constraints, foreign ownership and trade. In Table 16, we study the distribution of trade flows across firms with different organizational structure. We find that foreign-owned firms capture a larger share of Chinese exports and imports in industries which require more external finance.[21] For example, they channel 65% of all imports in sectors with the greatest need for outside capital, but only 48% of imports in the bottom third sectors. The corresponding numbers for exports are 53% and 42%. In contrast, state-owned and privately-held domestic firms are more common in industries with low and medium levels of external finance dependence. State enterprises have some advantage over private domestic firms and are relatively more active in sectors with moderate requirements for outside funds. As in the previous section, joint ventures fall between fully foreign-owned and fully domestic firms.

We obtain very similar results when we consider the relative prevalence of organizational structures across sectors at different levels of asset tangibility (Table 17). The share of exports and

[21] The data on sectors' external finance dependence and asset tangibility comes from Kroszner, Laeven and Klingebiel (2007), and is constructed following the methodology of Rajan and Zingales (1998) and Claessens and Laeven (2003).

imports mediated by foreign firms is strictly decreasing in sectors' endowments of collateralizable assets, while that of domestic firms is strictly increasing. Hence, while multinational affiliates are responsible for more than 60% of trade flows in industries with the lowest levels of asset tangibility, they capture only 23% of exports and 35% of imports in sectors with the highest asset tangibility. Conversely, domestic firms are much more active in the latter industries (48% of exports and 36% of imports) than in the former (13% of exports and 11% of imports).

These results are consistent with a credit-constraints view of international trade and investment, whereby foreign ownership provides access to cheaper internal finance, while state ownership facilitates financing from local Chinese state-owned banks. They also highlight the importance of better understanding the interaction between firms' location, integration and financing decisions. While the prior literature has focused on the effects of financial frictions on exporting, our findings suggest that they may play an equally important role in importing. In current work, Manova, Wei and Zhang (2008) pursue these questions and examine the role of credit constraints and foreign ownership in Chinese firms' trade participation.

4. Trade expansion and firm dynamics

4.1 China's trade expansion, 2003 – 2005

In 2003, China's aggregate exports and imports amounted to over $290 billion each. Over the next two years alone, the cumulative growth rate of trade was an astonishing 86% for exports and 66% for imports. Since China joined the World Trade Organization only in December 2001, this rapid trade expansion can be seen as China's fast convergence to a new steady state of integration in world markets. In the last part of the paper, we examine this process, and decompose China's trade growth into its extensive and intensive margins.

We first describe the evolution in the number of trading firms in China and the number of products and countries China as a whole traded in. As Table 18 indicates, the number of exporters almost doubled from 65.5 thousand in 2003 to 96.6 thousand in 2005, while the number of importing firms grew by a third, from 57.4 to 76.4 thousand. Exports and imports per firm expanded as well, at a more moderate rate of 25%. Aggregating across all firms, and focusing on the variety of products China exported and imported, almost the entire growth in trade flows can be attributed to the intensive margin: Average Chinese exports and imports per product increased

at roughly the same rate as overall Chinese trade, with only a 2-3% broadening of product scope. Similar results obtain for the number of China's trade partners and average exports/imports per country. Thus, the biggest boost to Chinese trade came from new and existing firms expanding into products and destination / source countries that other firms had already been active in.

This period of Chinese trade expansion provides an opportunity to understand firms' export and import decisions, and to examine how firms respond to trade liberalization. To that end, Table 19 provides a more detailed decomposition of China's trade growth by distinguishing between surviving exporters and importers (which traded in both 2003 and 2005), new firms (which did not trade in 2003 but did in 2005) and exiting firms (which stopped trading between 2003 and 2005). More than 70% of Chinese trade growth can be attributed to surviving firms expanding their trade flows. New exporters and importers contributed about 30%, while exiting firms slowed down trade growth by only 1%.

We also explore adjustments on the intensive and extensive margin at the firm level by focusing on the surviving firms that traded both in 2003 and 2005. Most of their expansion (60% for exporters and 70% for importers) reflects deepening in trade flows within existing trade partner relationships in surviving products. However, firms also reallocate a big proportion of their activity across products and trade partners. For example, the exports of new products that surviving firms start selling contributed 30% to total Chinese exports expansion, while exporters that discontinued some of their products cost 13% of China's total exports. Similarly, firm entry into new destination countries boosted overall export growth by 19%, while exit from some markets deducted 7%. Firms are also prone to change the products they sell within a given market even if they don't withdraw from it completely. The exports of new products to existing trade partners added 33% to China's exports expansion, but half of that gain was neutralized by firms discontinuing some products in these markets.[22] Similar numbers obtain for importers, and the adjustments they make to the products they import and the source countries they transact with.

These results speak to the relevance of theoretical models of intra-industry firm dynamics and intra-firm product turnover in general, and in response to trade liberalization in particular. For example, Melitz (2003) and Costantini and Melitz (2007) model firm-level adjustments to trade liberalizations, and emphasize the reallocation of market shares across firms with different

[22] Note that a firm need not start exporting an entirely new product, but simply introduce products it was already exporting to some countries in a new country.

productivity levels in the presence of fixed and sunk costs of exporting. Pavcnik (2002) and Bernard, Jensen and Schott (2006) document the importance of these reallocations in response to tariff reductions in Columbia and the U.S., respectively. Bernard, Redding and Schott (2006b) provide a model of multi-product firms, and examine the reallocation of trade flows both across firms and across products within firms. Goldberg, Khandelwal, Pavcnik and Topalova (2008) however find limited empirical support for this model using data on the behavior of Indian firms around trade reforms. In work in progress, Manova and Zhang study the response of multi-product firms in China to the removal of quotas under the Multi-Fiber Agreement.[23]

4.2 Firm, product and trade partner dynamics

The decomposition of China's trade expansion between 2003 and 2005 highlights the role of reallocations across and within firms in response to trade liberalization. At the same time, this two-year comparison masks much more frequent churning and reallocations across firms, products and trade partners. The monthly frequency of our data allows us to track firms over a 36-month period, and document the continuous adjustments they make to their product scope and trade partner intensity.

Between January of 2003 and December of 2005, the overall number of exporters and importers grew by 45% and 22% respectively (Table 20). These rates varied substantially across firms with different organizational structure, but were always higher for exporters than for importers. The number of private domestic firms that trade more than doubled, while the number of state-owned exporters (importers) contracted by 9% (14%). Foreign-owned affiliates became significantly more numerous (48% for exports and 32% for imports), while more joint ventures started exporting (6%) but some stopped importing (9%).

These net growth rates in firm numbers mask substantial reallocations across firms. Thirty-two percent of all exporters and 40% of all importers traded in January 2003 but not in December 2005, and were active in 15.6 and 13.5 of the 36 months, respectively. Overall, 12% of all exporters and 20% of all importers stop trading each month, but on average just as many new ones enter to replace them. Foreign-owned exporters and importers are more likely to survive from one

[23] See also Eaton, Eslava, Kugler and Tybout (2008) for evidence on reallocations across and within firms in Colombia.

month to the next (90% and 84% respectively) than joint ventures, which have in turn better chances than domestic firms.

Trading firms are prone to exit from and re-enter into exporting or importing. Only 40% of all exporters and 29% of all importers are active in all 36 months in 2003-2005, with these fractions increasing in foreign ownership. Less than 10% of all firms trade continuously over this period but for one spell of non-trading, while more than 20% switch their status more frequently. Survival rates are slightly higher and churning less common at a quarterly frequency, but firm dynamics exhibit otherwise similar patterns.

Firms that trade continuously over the 36 months in our data frequently change their product composition, even within a given destination or source country. We report summary statics about these firms' trade partner dynamics in Table 21. The average number of destination and source countries per firm increased by 26% for exporters and 13% for importers between January 2003 and December 2005, with little variation across ownership type. However, firms on average replace a third of their trade partners every month. This share is decreasing in foreign ownership, and is higher for private domestic firms than for state-owned companies. Only slightly less churning occurs at a quarterly frequency.

In the last table, Table 22, we study the product composition of firms that trade in all 36 months, and find frequent reallocations across products. In any given month, exporters (importers) are likely to replace 30% (35%) of their products with new ones. They also adjust the mix of products they sell in each country: On average, 45% (40%) of all bilaterally exported (imported) products are replaced with new ones from month to month. As with trade partner dynamics, foreign owned firms exhibit less product churning than joint ventures, which in turn maintain a more stable product composition than state-owned firms. Privately held domestic companies adjust their product scope most frequently.

A consistent pattern that emerges from these firm, product and trade partner dynamics is that foreign firms exhibit less churning. One possible explanation for this result is the role of profitability or cost shocks in the presence of credit constraints. Easier access to finance helps firms cover any continuation costs and increases their chance of survival. By the same logic, with product- or country-specific shocks, financially constrained firms may be more likely to discontinue some products or stop trading with some countries. Since foreign ownership provides access to internal financing and state ownership facilitates access to Chinese state-owned banks,

credit constraints offer one explanation for our results. Using bilateral trade data at the country-product level, Manova (2007) indeed finds that financially developed countries feature higher product survival rates and lower product turnover, especially in financially vulnerable sectors that require more external finance or are endowed with fewer tangible assets.[24]

These results complement the evidence in BJS, Bernard, Redding and Schott (2006a), Alessandria and Choi (2007), and Besedes and Prusa (2006 a,b) on the frequency and determinants of firm and product churning in exporting. These papers have emphasized the productivity gains associated with within-firms reallocations in activity across products. Further empirical evidence on firms' product and trade-partner adjustments over time will shed more light on firms' trade participation decisions and the cost structure of exporting and importing. In particular, the more frequent churning of products than trade partners suggests that trade may entail bigger sunk costs of entering into new markets or sourcing from new countries than trading new products with the same country.

5. Conclusion

This paper provides a detailed overview of China's participation in international trade using newly available data on the universe of globally engaged Chinese firms over the 2003-2005 period. The lion's share of Chinese exports and imports are mediated by a few multi-product firms which transact with many countries. Overall, the affiliates of foreign multinationals outperform joint ventures and state-owned enterprises in terms of trade flows, product- and trade partner intensity, which in turn lead private domestic companies. We compare our results to those for the United States reported in prior work, and propose that credit constraints and differences in the institutional environment across countries may explain the differences in trade patterns.

We also explore the variation in foreign ownership across sectors, and find results consistent with recent theoretical and empirical work on the role of credit constraints and contractual imperfections in international trade and investment. Finally, we decompose China's rapid trade expansion over the 2003-2005 period into its extensive and intensive margins, and find that almost half of the growth was due to surviving firms expanding their trade in surviving

[24] Note, however, that in the presence of sunk costs of trading, easier access to financing may increase churning because firms have a lower option value of staying in during a bad shock. Our results suggest that this effect is dominated by the liquidity shock effect which goes in the opposite direction.

products within the same trade partners. These aggregate patterns mask substantial churning across firms and across products and trade partners within firms. We provide some stylized facts on firm, product and trade partner dynamics using the monthly frequency in our data.

Our results contribute to the recent theoretical and empirical literature on multi-product heterogeneous firms in international trade, provide a number of novel stylized facts and raise some interesting questions. First, we document broadly similar patterns for exporting and importing. While most prior work has focused on exporting, our findings suggest that importers behave in similar ways. One aspect of firm-level trade flows that remains to be better understood is the relationship between firms' intensive and extensive margins. Our results also speak to the role of credit constraints and contractual imperfections, and suggest that such frictions have many implications that are yet to be examined. Finally, our findings highlight the importance of inter-firm dynamics and firm-level adjustments in product scope and trade partners, in general and in response to trade liberalization in particular.

The detailed nature of our dataset will allow us to address many of these questions in future work. These include the effects of credit constraints on firm level exporting and importing outcomes; the response of multi-product firms to the removal of quotas under the Multi-Fiber Agreement; firms' adjustments to real exchange rate shocks; and the location of multinational firms' affiliates and network effects among firms, among others.

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Table 1. Breakdown of Exporting and Importing Firms in China

This table shows the number of Chinese firms that participated in international trade in 2005, and provides a breakdown by firm ownership structure. It also shows what fraction of firms export only, import only or are both exporters and importers.

Firm Type	All Firms		State-Owned		Private Domestic		Joint Ventures		Foreign-Owned	
	# Firms	% Share	# Firms	% Share	# Firms	% Share	# Firms	% Share	# Firms	% Share
Exporters	38,090	33.3	2,370	32.7	19,605	53.3	8,357	30.8	7,758	17.9
Importers	17,893	15.6	1,411	19.5	5,654	15.4	4,296	15.8	6,532	15.1
Exporters & Importers	58,500	51.1	3,472	47.9	11,520	31.3	14,477	53.4	29,031	67.0
All Trading Firms	114,483	100.0	7,253	6.3	36,779	32.1	27,130	23.7	43,321	37.8

Table 2. The Value of Chinese Exports and Imports by Firm Type

This table shows the total value of Chinese exports and imports in 2005 (in billion US Dollars) and its breakdown by ownership structure and trade participation.

Firm Type	All Firms		State-Owned		Private Domestic		Joint Ventures		Foreign-Owned	
	Trade	% Share	Trade	% Share	Trade	% Share	Trade	% Share	Trade	% Share
Panel A. Exports										
Exporters	53.2	9.7	8.0	14.2	26.4	36.9	12.1	8.4	6.7	2.4
Exporters & Importers	495.0	90.3	48.3	85.8	45.3	63.1	132.2	91.6	269.5	97.6
All Exporting Firms	548.2	100.0	56.2	10.3	71.7	13.1	144.3	26.3	276.2	50.4
Panel B. Imports										
Importers	61.3	12.7	22.5	21.4	11.7	34.4	14.8	12.7	12.3	5.4
Exporters & Importers	422.0	87.3	82.4	78.6	22.4	65.6	101.6	87.3	215.8	94.6
All Importing Firms	483.3	100.0	104.9	21.7	34.1	7.1	116.4	24.1	228.1	47.2

Table 3. The Distribution of Trade Flows across Firms

This table shows the distribution of exports and imports (in US Dollars) across Chinese firms that participated in international trade in 2005, and its variation with firm ownership structure. Each cell reports the value of total exports or imports of a firm at the 10th, 25th, 50th, 75th, 90th or 100th percentile by trade value.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Panel A. Firm-level exports					
Mean	5,677,317	9,621,125	2,303,068	6,317,086	7,508,716
St Dev	74,172,824	49,378,092	15,050,603	51,094,776	110,589,112
10th Perc	35,723	35,044	34,038	43,896	33,134
25th Perc	165,934	176,501	144,832	218,029	159,387
50th Perc	723,689	973,417	583,599	944,885	724,572
75th Perc	2,590,207	4,820,230	1,946,048	3,206,937	2,673,028
90th Perc	7,601,900	16,600,000	4,952,105	8,830,213	8,375,859
# Firms	96,590	5,842	31,125	22,834	36,789
Panel B. Firm-level imports					
Mean	6,328,954	21,500,000	1,986,059	6,199,353	6,414,369
St Dev	120,759,304	392,063,968	16,147,931	48,215,912	93,968,248
10th Perc	3,662	5,000	870	4,419	10,395
25th Perc	38,309	61,785	7,570	39,961	67,392
50th Perc	282,177	556,014	97,852	288,518	385,702
75th Perc	1,500,663	3,988,448	659,679	1,573,545	1,776,972
90th Perc	6,270,819	21,100,000	2,919,052	6,783,525	6,687,268
# Firms	76,393	4,883	17,174	18,773	35,563

Table 4. The Concentration of Trade Flows in the Largest Trading Firms

This table demonstrates the skewed distribution of trade flows across trading firms in 2005. The table reports the percent share of total exports or imports captured by the top 1, 5, 10, 25, or 50 percent of all exporting or importing firms. These statistics are presented for all firms, as well as for each firm ownership structure, as indicated in the column heading.

Firm Type	All Firms		State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
	# Firms	% Total Exports or Imports	% Total Exports or Imports	% Total Exports or Imports	% Total Exports or Imports	% Total Exports or Imports
Panel A. Exports						
Top 1%	965	51%	36%	27%	47%	58%
Top 5%	4,829	71%	66%	50%	68%	76%
Top 10%	9,659	80%	78%	64%	78%	84%
Top 25%	24,147	92%	92%	84%	90%	94%
Top 50%	48,295	98%	99%	96%	98%	99%
Panel B. Imports						
Top 1%	763	60%	65%	46%	53%	60%
Top 5%	3,819	82%	84%	74%	80%	80%
Top 10%	7,639	89%	91%	85%	88%	88%
Top 25%	19,098	97%	98%	96%	96%	96%
Top 50%	38,196	99%	100%	99%	99%	99%

Table 5. Trading Firms's Product Intensity

This table shows the distribution of product intensity across exporting and importing Chinese firms in 2005, and its variation with firm ownership structure. Each cell reports the number of products exported or imported by a firm at the 10th, 25th, 50th, 75th, 90th or 100th percentile by product intensity.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Panel A. Number of products exported					
Mean	9.34	22.85	12.46	6.54	6.30
St Dev	30.98	74.55	41.22	10.06	9.29
10th Perc	1	1	1	1	1
25th Perc	2	2	2	2	2
50th Perc	3	4	4	3	3
75th Perc	8	12	8	7	7
90th Perc	17	46	20	15	15
Maximum	1,610	1,610	1,009	460	623
Panel B. Number of products imported					
Mean	17.06	21.52	8.45	16.92	20.68
St Dev	32.86	50.24	23.74	32.43	33.08
10th Perc	1	1	1	1	1
25th Perc	2	2	1	2	3
50th Perc	6	5	3	6	9
75th Perc	18	18	7	18	24
90th Perc	43	51	18	43	51
Maximum	868	767	868	576	710

Table 6. The Concentration of Trade Flows in Multi-Product Firms

This table demonstrates the skewed distribution of trade flows across trading firms in 2005. Odd-numbered columns report the percent share of firms by ownership structure and product intensity as indicated in the column and row heading, respectively. Even-numbered columns give the percent share of total exports or imports captured by those firms.

Firm Type	All Firms		State-Owned		Private Domestic		Joint Ventures		Foreign-Owned	
	% Firms	% Total Exports or Imports	% Firms	% Total Exports or Imports	% Firms	% Total Exports or Imports	% Firms	% Total Exports or Imports	% Firms	% Total Exports or Imports
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A. Exporter's share of total exports, by product intensity										
# Products Exported										
1	23.3	5.6	22.9	4.4	23.0	8.4	23.8	7.2	23.2	4.3
2	16.2	7.0	14.4	6.4	15.9	8.5	16.5	8.6	16.6	5.8
3-5	25.7	17.2	21.3	15.2	25.4	19.2	25.7	16.8	26.6	17.2
6-10	16.8	16.7	13.8	12.5	16.3	16.8	17.1	20.1	17.4	15.8
11-30	13.7	23.6	14.2	13.2	13.3	20.8	14.0	23.0	13.7	26.8
>30	4.4	29.9	13.4	48.3	6.2	26.3	2.8	24.2	2.4	30.0
31-50	2.2	9.1	4.0	6.7	2.4	6.9	2.1	9.5	1.8	10.0
51-100	1.1	11.5	4.4	8.8	1.6	7.5	0.6	13.0	0.5	12.2
>100	1.1	9.3	5.0	32.8	2.2	11.9	0.1	1.7	0.1	7.8
Panel B. Importer's share of total imports, by product intensity										
# Products Imported										
1	18.9	2.2	20.5	3.3	32.4	10.3	18.6	2.3	12.2	0.5
2	11.2	1.7	11.9	1.8	16.0	6.9	11.7	1.9	8.6	0.8
3-5	18.1	6.0	18.7	12.2	21.2	18.4	18.7	4.4	16.1	2.1
6-10	14.7	11.5	14.1	36.1	12.0	11.9	14.2	5.5	16.4	3.2
11-30	22.1	11.7	18.1	8.2	13.0	21.7	22.0	13.1	27.2	11.1
>30	15.0	66.8	16.8	38.4	5.4	30.8	14.9	72.7	19.5	82.3
31-50	7.1	8.6	6.5	4.8	2.7	10.8	7.0	10.6	9.4	8.9
51-100	5.3	15.9	5.5	8.6	1.9	8.5	5.4	16.5	6.9	20.2
>100	2.6	42.3	4.8	25.0	0.8	11.5	2.5	45.6	3.2	53.2

Table 7. Product Scope and the Value of Trade per Product

This table examines the relationship between the extensive and intensive margins of exports and imports at the firm level for all Chinese trading firms in 2005. Each cell reports the average value of exports or imports per product across all firms with a given product intensity and ownership structure, as indicated in the row and column headings, respectively. All values in US Dollars.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Panel A. Average exports per product (X/N)					
# Products Exported (N)					
1	1,375,422	1,865,143	840,992	1,914,894	1,402,473
2	1,220,623	2,157,305	619,283	1,638,878	1,319,577
3-5	996,328	1,802,955	457,520	1,089,044	1,273,775
6-10	746,074	1,145,174	312,622	981,375	895,527
11-30	578,283	508,419	211,949	611,828	871,578
31-50	605,699	410,420	166,033	741,936	1,093,171
51-100	870,250	272,819	158,438	2,228,917	2,868,129
>100	201,779	236,791	50,731	753,208	7,265,480
Corr (N , X/N)		-0.036	-0.054	-0.023	-0.001
Panel B. Average imports per product (M/N)					
# Products Imported (N)					
1	749,381	3,490,068	633,573	780,394	243,740
2	485,963	1,589,683	429,457	508,923	310,589
3-5	547,528	3,633,080	454,010	379,594	215,105
6-10	639,366	7,123,663	258,162	314,092	162,270
11-30	183,093	541,986	191,426	203,460	140,977
31-50	195,806	407,946	201,973	241,030	156,837
51-100	274,966	481,167	131,475	274,610	270,934
>100	618,424	556,258	152,508	666,399	680,603
Corr (N , M/N)		-0.013	-0.024	-0.006	0.057

Table 8. Firms's Trade Partner Intensity

This table shows the distribution of trade partner intensity across exporting and importing Chinese firms in 2005, and its variation with firm ownership structure. Each cell reports the number of trade partners that firms export to or import from, for firms at the 10th, 25th, 50th, 75th, 90th or 100th percentile by trade partner intensity.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Panel A. Number of countries firms export to					
Mean	7.51	11.24	8.74	7.41	5.95
St Dev	10.41	16.21	11.13	10.04	8.33
10th Perc	1	1	1	1	1
25th Perc	1	2	2	1	1
50th Perc	3	5	4	3	3
75th Perc	9	13	11	9	7
90th Perc	19	30	22	19	15
Maximum	144	128	140	144	128
Panel B. Number of countries firms import from					
Mean	3.96	5.61	3.03	3.98	4.17
St Dev	4.59	6.70	3.72	4.45	4.60
10th Perc	1	1	1	1	1
25th Perc	1	1	1	1	1
50th Perc	2	3	2	2	2
75th Perc	5	7	3	5	5
90th Perc	9	14	7	9	10
Maximum	67	58	56	57	67

Table 9. The Concentration of Trade Flows in Firms with Many Trade Partners

This table demonstrates the skewed distribution of trade flows across trading firms in 2005. Odd-numbered columns report the percent share of firms by ownership structure and trade partner intensity as indicated in the column and row heading, respectively. Even-numbered columns give the percent share of total exports or imports captured by those firms.

Firm Type	All Firms		State-Owned		Private Domestic		Joint Ventures		Foreign-Owned	
	% Firms	% Total Exports or Imports	% Firms	% Total Exports or Imports	% Firms	% Total Exports or Imports	% Firms	% Total Exports or Imports	% Firms	% Total Exports or Imports
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A. Exporter's share of total exports, by trade partner intensity										
# Export Destination Countries										
1	26.8	6.2	21.6	2.5	21.0	5.8	26.3	7.1	32.9	6.6
2	14.6	5.1	12.2	2.5	13.2	5.2	14.6	6.4	16.1	4.9
3-5	21.2	10.1	19.7	6.4	21.9	12.3	21.4	12.4	20.8	9.1
6-10	15.5	11.8	15.7	13.8	17.3	13.6	16.1	12.3	13.6	10.7
>10	21.8	66.8	30.7	74.7	26.6	63.1	21.6	61.8	16.6	68.8
11-30	17.7	34.3	20.8	27.0	21.3	33.6	17.7	34.5	14.2	35.9
31-50	3.1	15.0	6.1	13.6	4.0	14.5	3.0	12.8	2.0	16.5
>50	1.0	17.6	3.8	34.1	1.2	15.0	0.8	14.5	0.4	16.4
Panel B. Importer's share of total imports, by trade partner intensity										
# Import Origin Countries										
1	35.1	2.4	28.1	0.9	45.9	8.6	33.3	2.3	31.9	2.3
2	18.4	3.1	16.4	1.6	18.9	9.2	18.6	3.0	18.2	2.9
3-5	25.3	10.7	23.2	5.7	21.6	20.4	26.6	12.3	26.6	10.8
6-10	13.4	16.8	17.1	14.0	9.4	21.0	13.6	22.3	14.7	14.6
>10	7.8	66.9	15.3	77.7	4.2	40.9	7.9	60.0	8.6	69.3
11-30	7.5	43.7	14.0	32.7	4.0	34.1	7.6	47.5	8.3	48.4
31-50	0.3	18.2	1.2	36.9	0.2	6.4	0.2	11.9	0.3	14.7
>50	0.02	4.9	0.08	8.1	0.02	0.4	0.02	0.7	0.01	6.2

Table 10. Trade-Partner Intensity and the Value of Trade per Trade Partner

This table examines the relationship between the extensive and intensive margins of exports and imports at the firm level for all Chinese trading firms in 2005. Each cell reports the average value of exports or imports per trade partner across all firms with a given trade partner intensity and ownership structure, as indicated in the row and column headings, respectively. All values in US Dollars.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Panel A. Average exports per destination country (X/N)					
# Export Destination Countries (N)					
1	1,312,629	1,112,655	638,528	1,704,474	1,503,589
2	988,325	1,000,183	457,360	1,375,134	1,136,222
3-5	708,558	821,674	335,533	963,848	864,904
6-10	562,461	1,099,952	234,094	625,836	773,660
11-30	626,482	696,909	206,096	700,358	1,095,532
31-50	712,785	559,749	216,395	708,266	1,660,235
>50	1,526,657	1,192,206	437,335	1,666,299	4,619,913
Corr (N , X/N)		-0.010	-0.032	-0.017	0.011
Panel B. Average imports per source country (M/N)					
# Import Origin Countries (N)					
1	441,016	651,656	370,566	428,775	471,302
2	536,973	1,062,818	485,089	499,769	518,195
3-5	716,321	1,403,476	504,739	763,338	690,723
6-10	1,056,604	2,334,468	595,964	1,355,056	847,031
11-30	2,369,403	3,010,060	1,096,598	2,520,676	2,433,065
31-50	10,934,249	17,491,016	2,046,076	9,170,684	10,196,721
>50	28,401,504	39,194,544	619,885	4,814,958	61,708,348
Corr (N , M/N)		0.126	0.065	0.159	0.145

Table 11. The Correlation between Product- and Trade-Partner Intensity

This table demonstrates the skewed distribution of trade flows across trading firms in 2005. Each cell reports the percent of all exporters or importers that trade a given number of products with a given number of trade partners (left half of the table) OR the share of the value of exports captured by such firms (right half of the table). Rows indicate the number of products firms trade, while columns indicate the number of trade partners. No firms are active in cells marked with "-".

	% Firms							% Total Exports or Imports						
# Trade Partners	1	2	3-5	6-10	11-30	31-50	>50	1	2	3-5	6-10	11-30	31-50	>50
Panel A. Breakdown of exporting firms and their exports by product and trade-partner intensity														
# Products														
1	12.31	3.74	3.80	1.92	1.37	0.12	0.01	1.36	0.73	1.07	0.94	1.29	0.22	0.03
2	5.00	3.38	3.76	2.10	1.79	0.16	0.02	1.05	0.62	1.18	1.20	2.29	0.48	0.15
3-5	5.18	4.04	6.71	4.75	4.40	0.51	0.09	1.61	1.37	2.55	3.10	6.53	1.39	0.61
6-10	2.37	1.96	3.89	3.44	4.26	0.71	0.14	1.03	1.00	2.05	2.39	6.99	2.56	0.69
11-30	1.62	1.26	2.68	2.75	4.29	0.85	0.24	0.75	0.71	2.09	3.09	10.01	3.34	3.63
31-50	0.23	0.15	0.28	0.39	0.86	0.25	0.07	0.21	0.34	0.28	0.62	3.05	2.67	1.97
51-100	0.07	0.05	0.08	0.13	0.44	0.23	0.09	0.16	0.26	0.71	0.22	3.49	2.09	4.53
>100	0.02	0.01	0.03	0.05	0.31	0.31	0.33	0.02	0.05	0.16	0.26	0.64	2.20	5.95
Panel B. Breakdown of importing firms and their imports by product and trade-partner intensity														
# Products														
1	16.28	1.71	0.76	0.09	0.02	-	-	0.63	0.53	0.75	0.23	0.10	-	-
2	5.02	4.23	1.64	0.27	0.05	-	-	0.22	0.34	0.73	0.31	0.12	-	-
3-5	5.48	4.76	6.47	1.19	0.16	-	0.00	0.34	0.47	1.72	2.09	1.34	-	0.02
6-10	3.47	2.92	5.70	2.32	0.33	0.01	0.00	0.29	0.36	1.50	1.82	0.95	6.59	0.02
11-30	3.83	3.48	7.37	5.60	1.84	0.00	0.00	0.51	0.66	2.46	4.14	3.88	0.00	0.04
31-50	0.74	0.80	1.96	2.06	1.54	0.01	-	0.20	0.34	1.23	2.15	4.60	0.06	-
51-100	0.28	0.40	1.11	1.37	2.09	0.05	0.00	0.21	0.31	1.11	2.29	11.21	0.80	0.01
>100	0.03	0.06	0.26	0.49	1.50	0.23	0.01	0.04	0.11	1.25	3.78	21.54	10.79	4.79

Table 12. Product Intensity, Trade-Partner Intensity, and the Value of Trade per Product-Trade-Partner Relationship

This table examines the relationship between the extensive and intensive margins of exports and imports at the firm level for all Chinese trading firms in 2005. Each cell reports the average value of exports or imports across all exporters or importers that trade a given number of products with a given number of trade partners. Rows indicate the number of products firms trade, while columns indicate the number of trade partners. No firms are active in cells marked with "-". All values in US Dollars. * indicates that two very large outliers were removed from this cell.

	Average Exports or Imports per Product-Trade Partner, All Firms						
# Trade Partners	1	2	3-5	6-10	11-30	31-50	>50
Panel A. Average exports per product-destination							
# Products							
1	627,044	554,613	430,847	364,755	324,995	296,438	214,804
2	593,549	383,509	375,914	353,179	376,611	399,251	581,329
3-5	476,338	413,879	325,037	314,816	339,490	286,836	388,161
6-10	330,993	326,614	268,843	233,568	278,239	284,757	233,298
11-30	153,742	167,365	198,942	215,196	252,181	209,450	461,046
31-50	137,702	300,547	114,824	151,639	229,816	371,828	532,285
51-100	211,233	384,033	601,627	97,990	346,261	251,989	711,324
>100	46,781	135,750	159,419	115,900	38,878	98,275	110,104
Panel B. Average imports per product-source country							
# Products							
1	245,922	972,645	1,777,525	2,285,860	1,945,648	-	-
2	140,892	225,419	715,016	853,635	1,007,532	-	-
3-5	104,564	153,213	317,677	1,094,412	2,593,753	-	1,765,708
6-10	69,140	93,136	175,320	369,246	770,064	155,352*	1,502,714
11-30	48,455	62,573	97,050	174,462	322,277	10,430	2,058,920
31-50	44,206	67,271	86,941	123,541	254,481	487,726	-
51-100	72,260	69,838	83,780	119,567	273,726	319,651	218,391
>100	75,437	91,759	214,579	273,216	330,376	481,575	1,642,473

Table 13. Variation in Ownership Structure Across Sectors: Product Specificity

This table examines the distribution of trade flows across firm with different ownership structure and across products with different levels of differentiation. Products are classified as homogenous if they are traded on organized exchanges or have reference prices, and as differentiated otherwise. All data for 2005. The trade values in the first column are in billion US Dollars.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Product Type			Exports		
Homogenous	31.71	26.8	26.6	29.0	17.6
Differentiated	223.13	9.8	17.2	26.6	46.5
All Products	254.84	11.9	18.4	26.9	42.9
Product Type			Imports		
Homogenous	43.79	22.7	15.2	27.5	34.6
Differentiated	141.86	8.6	4.7	29.6	57.1
All Products	185.65	11.9	7.2	29.1	51.8

Table 14. Variation in Ownership Structure Across Sectors: R&D-Intensity

This table examines the distribution of trade flows across firm with different ownership structure and across sectors with different levels of R&D intensity. All data for 2005. The trade values in the first column are in billion US Dollars.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Sector R&D-Intensity			Exports		
Low	156.18	18.1	23.1	28.4	30.4
High	376.54	6.5	8.7	25.4	59.4
All Products	532.72	9.9	12.9	26.3	50.9
Sector R&D-Intensity			Imports		
Low	79.58	23.0	7.6	28.6	40.7
High	321.83	9.2	6.6	25.0	59.1
All Products	401.41	11.9	6.8	25.8	55.5

Table 15. Variation in Ownership Structure Across Sectors: K-Intensity

This table examines the distribution of trade flows across firm with different ownership structure and across sectors with different levels of capital intensity. All data for 2005. The trade values in the first column are in billion US Dollars.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Sector K-Intensity			Exports		
Low	119.59	10.7	22.9	26.1	40.4
Medium	345.13	5.6	7.9	26.2	60.3
High	68.01	30.0	20.9	27.4	21.7
All Products	532.72	9.9	12.9	26.3	50.9
Sector K-Intensity			Imports		
Low	23.79	5.3	6.7	30.1	58.0
Medium	270.80	8.6	4.3	24.6	62.5
High	106.82	21.8	13.3	27.8	37.1
All Products	401.41	11.9	6.8	25.8	55.5

Table 16. Variation in Ownership Structure Across Sectors: External Finance Dependence

This table examines the distribution of trade flows across firm with different ownership structure and across sectors with different levels of external capital dependence. All data for 2005. The trade values in the first column are in billion US Dollars.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Sector External Finance Dependence			Exports		
Low	38.40	9.6	19.9	28.3	42.2
Medium	260.06	12.1	13.1	24.3	50.5
High	234.27	7.5	11.6	28.1	52.7
All Products	532.72	9.9	12.9	26.3	50.9
Sector External Finance Dependence			Imports		
Low	17.23	10.4	10.9	30.6	48.1
Medium	163.84	18.4	11.1	27.3	43.2
High	220.34	7.2	3.4	24.2	65.2
All Products	401.41	11.9	6.8	25.8	55.5

Table 17. Variation in Ownership Structure Across Sectors: Asset Tangibility

This table examines the distribution of trade flows across firm with different ownership structure and across sectors with different levels of asset tangibility. All data for 2005. The trade values in the first column are in billion US Dollars.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Sector Asset Tangibility			Exports		
Low	363.95	5.0	8.4	24.6	62.0
Medium	102.16	16.5	23.4	30.7	29.4
High	66.62	26.4	21.6	28.9	23.1
All Products	532.72	9.9	12.9	26.3	50.9
Sector Asset Tangibility			Imports		
Low	254.28	7.2	4.0	22.9	65.9
Medium	52.75	15.7	7.6	35.2	41.5
High	94.38	22.4	14.0	28.3	35.3
All Products	401.41	11.9	6.8	25.8	55.5

Table 18. China's Trade Expansion, 2003-2005

This table examines the substantial expansion in Chinese exports and imports over the 2003-2005 period. Panel A documents the total value of exports in 2003 and in 2005, as well as the percent change over these three years. It also shows these statistics for different decompositions of the total value of exports: the number of firms exporting and average exports per firm; the number of countries China exports to and average exports per destination; and the number of products China exports and average exports per product. Panel B repeats the exercise for Chinese imports. All trade values in millions of US Dollars.

Firm Type	2003	2005	% Growth 2003-2005
Panel A. The expansion of China's exports, 2003-2005			
Total Exports	294,641	548,372	86.1%
# Firms Exporting	65,494	96,590	47.5%
Avg Exports per Firm	4.5	5.7	26.2%
# Trade Partners	225	231	2.7%
Avg Exports per Trade Partner	1,310	2,374	81.3%
# Products Exported	6,692	6,915	3.3%
Avg Exports per Product	44.0	79.3	80.1%
Panel B. The expansion of China's imports, 2003-2005			
Total Imports	290,955	483,488	66.2%
# Firms Importing	57,351	76,393	33.2%
Avg Imports per Firm	5.1	6.3	24.8%
# Trade Partners	194	202	4.1%
Avg Imports per Trade Partner	1,500	2,394	59.6%
# Products Imported	6,769	6,876	1.6%
Avg Imports per Product	43.0	70.3	63.6%

Table 19. The Extensive and Intensive Margins of China's Trade Expansion, 2003-2005

This table examines the substantial expansion in China' trade over the 2003-2005 period. "New firms" did not trade in 2003 but did in 2005; "exiting firms" traded in 2003 but not in 2005; and "surviving firms" traded both in 2003 and 2005. The trade flows of surviving firms are decomposed into new, exiting, and surviving products and destinations. The top row in each panel reports the change in the value of total exports (Panel A) or imports (Panel B) between 2003 and 2005 in levels. The rest of each panel shows the value of exports for given firm/product/destination category and its percent contribution to total trade expansion. All values in billions of US Dollars.

Firm Type	Value	% Total Expansion
Panel A. The expansion of China's exports, 2003-2005		
Δ Total Exports$_{2003\text{-}2005}$	253.7	
Δ Total Exports of Surviving Firms$_{2003\text{-}2005}$	177.7	70.1%
Total Exports of New Firms	78.6	31.0%
Total Exports of Exiting Firms	2.7	1.1%
Surviving Firms		
Δ Exports of Surviving Products$_{2003\text{-}2005}$	134.6	53.0%
Exports of New Products	76.1	30.0%
Exports of Discontinued Products	33.0	13.0%
Surviving Firms		
Δ Exports to Surviving Destinations$_{2003\text{-}2005}$	147.4	58.1%
Δ Exports of Surviving Products to Surviving Destinations	107.2	42.2%
Exports of New Products to Surviving Destinations	82.9	32.7%
Exports of Discontinued Products to Surviving Destinations	42.7	16.8%
Exports to New Destinations	48.9	19.3%
Exports to Discontinued Destinations	18.5	7.3%
Panel B. The expansion of China's imports, 2003-2005		
Δ Total Imports$_{2003\text{-}2005}$	192.5	
Δ Total Imports of Surviving Firms$_{2003\text{-}2005}$	140.1	72.8%
Total Imports of New Firms	54.8	28.5%
Total Imports of Exiting Firms	2.4	1.2%
Surviving Firms		
Δ Imports of Surviving Products$_{2003\text{-}2005}$	117.0	60.8%
Imports of New Products	75.2	39.0%
Imports of Discontinued Products	52.1	27.1%
Surviving Firms		
Δ Imports from Surviving Source Countries$_{2003\text{-}2005}$	124.4	64.6%
Δ Imports of Surviving Products from Surviving Source Countries	97.6	50.7%
Imports of New Products from Surviving Source Countries	84.3	43.8%
Imports of Discontinued Products from Surviving Source Countries	57.5	29.9%
Imports from New Source Countries	33.9	17.6%
Imports from Discontinued Source Countries	18.3	9.5%

Table 20. Firm Dynamics: Entry and Exit from Exporting and Importing

This table examines firm entry and exit from exporting and importing over the 2003-2005 period. Odd-numbered columns report the number of firms that trade in the beginning and in the end of the period, while even-numbered columns give the percent share of these firms of all firms with that ownership type in Jan 2003. Panels A and B decompose firms into surviving firms (which traded in Jan 2003 and Dec 2005), exiting firms (which traded in Jan 03 but not in Dec 05), and entering firms (which traded in Dec 05, but not in Jan 03). The bottom two rows report the probability that firms trading in month *t* also trade in *t+1*, as well as the firm entry rate. Panels C and D repeat the analysis with quarterly data over the 2003-2005 period.

Firm Type	All Firms		State-Owned		Private Domestic		Joint Ventures		Foreign-Owned	
	# Firms	% Firms	# Firms	% Firms	# Firms	% Firms	# Firms	% Firms	# Firms	% Firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A. Firm dynamics in exporting, monthly data, Jan 2003 - Dec 2005										
Firms in Jan 2003	49,644	100%	4,371	100%	9,286	100%	16,249	100%	19,738	100%
Firms in Dec 2005	72,219	145%	3,970	91%	21,931	236%	17,185	106%	29,133	148%
Surviving Firms	33,771	68%	2,355	54%	5,835	63%	10,473	64%	15,108	77%
In all 36 mos.	19,679	40%	1,368	31%	2,965	32%	6,177	38%	9,169	46%
Switch only once	3,950	8%	257	6%	794	9%	1,182	7%	1,717	9%
Switch > once	10,142	20%	730	17%	2,076	22%	3,114	19%	4,222	21%
Avg. # mos. in	33.7		33.3		33.2		33.8		34.0	
Exiting Firms	15,873	32%	2,016	46%	3,451	37%	5,776	36%	4,630	23%
Avg. # mos. in	15.6		14.1		15.1		16.0		16.3	
Entering Firms	38,448	77%	1,615	37%	16,096	173%	6,712	41%	14,025	71%
Avg. # mos. in	17.6		17.5		16.6		18.6		18.3	
Monthly Survival Rate		88%		86%		85%		89%		90%
Monthly Entry Rate		13%		14%		17%		11%		11%
Panel B. Firm dynamics in importing, monthly data, Jan 2003 - Dec 2005										
Firms in Jan 2003	37,248	100%	3,096	100%	3,926	100%	11,747	100%	18,479	100%
Firms in Dec 2005	45,480	122%	2,670	86%	7,748	197%	10,660	91%	24,402	132%
Surviving Firms	22,360	60%	1,475	48%	1,579	40%	6,341	54%	12,965	70%
In all 36 mos.	10,708	29%	638	21%	412	10%	3,019	26%	6,639	36%
Switch only once	2,699	7%	144	5%	187	5%	731	6%	1,637	9%
Switch > once	8,953	24%	693	22%	980	25%	2,591	22%	4,689	25%
Avg. # mos. in	32.4		31.3		29.0		32.3		33.0	
Exiting Firms	14,888	40%	1,621	52%	2,347	60%	5,406	46%	5,514	30%
Avg. # mos. in	13.5		12.9		11.0		13.8		14.4	
Entering Firms	23,120	62%	1,195	39%	6,169	157%	4,319	37%	11,437	62%
Avg. # mos. in	16.4		16.6		13.2		16.4		18.1	
Monthly Survival Rate		80%		78%		67%		79%		84%
Monthly Entry Rate		21%		22%		34%		20%		17%

Table 20. Firm Dynamics: Entry and Exit from Exporting and Importing

Firm Type	All Firms		State-Owned		Private Domestic		Joint Ventures		Foreign-Owned	
	# Firms	% Firms	# Firms	% Firms	# Firms	% Firms	# Firms	% Firms	# Firms	% Firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel C. Firm dynamics in exporting, quarterly data, Q1 2003 - Q4 2005										
Firms in Q1 2003	59,478	100%	5,280	100%	11,860	100%	19,086	100%	23,252	100%
Firms in Q4 2005	83,698	141%	4,744	90%	26,555	224%	19,601	103%	32,798	141%
Surviving Firms	42,207	71%	3,000	57%	7,870	66%	12,945	68%	18,392	79%
In all 12 quarters	36,508	61%	2,471	47%	6,477	55%	11,215	59%	16,345	70%
Switch only once	2,542	4%	208	4%	649	5%	778	4%	907	4%
Switch > once	3,157	5%	321	6%	744	6%	952	5%	1,140	5%
Avg. # quarters in	11.7		11.5		11.6		11.7		11.7	
Exiting Firms	17,271	29%	2,280	43%	3,990	34%	6,141	32%	4,860	21%
Avg. # quarters in	5.5		5.2		5.3		5.6		5.7	
Entering Firms	41,491	70%	1,744	33%	18,685	158%	6,656	35%	14,406	62%
Avg. # quarters in	6.3		6.3		6.2		6.5		6.4	
Quarterly Survival Rate		92%		88%		89%		92%		94%
Quarterly Entry Rate		11%		11%		17%		8%		9%
Panel D. Firm dynamics in importing, quarterly data, Q1 2003 - Q4 2005										
Firms in Q1 2003	49,121	100%	4,044	100%	6,161	100%	15,389	100%	23,527	100%
Firms in Q4 2005	57,643	117%	3,496	86%	11,234	182%	13,703	89%	29,210	124%
Surviving Firms	30,841	63%	2,132	53%	2,667	43%	8,842	57%	17,200	73%
In all 12 quarters	23,879	49%	1,515	37%	1,594	26%	6,709	44%	14,061	60%
Switch only once	2,506	5%	208	5%	328	5%	774	5%	1,196	5%
Switch > once	4,456	9%	409	10%	745	12%	1,359	9%	1,943	8%
Avg. # quarters in	11.3		11.1		10.7		11.3		11.5	
Exiting Firms	18,280	37%	1,912	47%	3,494	57%	6,547	43%	6,327	27%
Avg. # quarters in	4.9		4.9		4.3		5.0		5.2	
Entering Firms	26,802	55%	1,364	34%	8,567	139%	4,861	32%	12,010	51%
Avg. # quarters in	6.0		6.0		5.1		6.0		6.6	
Quarterly Survival Rate		83%		81%		72%		83%		88%
Quarterly Entry Rate		18%		18%		32%		16%		14%

Table 21. Trade Partner Dynamics

This table examines the dynamics of firms' trade partner intensity over the 2003-2005 period. Panel A documents the average number of destination countries exporting firms sold to in the beginning of and in the end of the period. It also shows the percent of all trade partner relationships that are discontinued or initiated from *t* to *t+1* as a share of the number of trade partners in period *t*, where a period is a month or a quarter as indicated in the table. Panel B repeats the exercise for all importing firms and their source countries. The table explores the trade partner dynamics for firms of different firm ownership structure, as indicated in the column heading.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Panel A. Changes in the number of export destinations					
Monthly Data					
# Trade Partners in Jan 03	3.4	6.4	3.8	3.1	2.9
# Trade Partners in Dec 05	4.3	7.3	5.3	4.0	3.7
% Trade Partners Dropped	38.5%	40.7%	47.5%	37.6%	31.5%
% New Trade Partners	39.4%	40.7%	48.8%	38.1%	32.6%
Quarterly Data					
# Trade Partners in Q1 03	4.5	8.6	5.3	4.3	3.7
# Trade Partners in Q4 05	6.0	9.9	7.7	5.6	4.9
% Trade Partners Dropped	33.4%	40.3%	45.8%	34.0%	29.3%
% New Trade Partners	33.9%	40.1%	46.7%	34.0%	30.1%
Panel B. Changes in the number of import source countries					
Monthly Data					
# Trade Partners in Jan 03	3.0	4.5	2.7	3.0	2.8
# Trade Partners in Dec 05	3.4	4.4	2.9	3.3	3.4
% Trade Partners Dropped	32.7%	34.0%	39.7%	31.7%	26.7%
% New Trade Partners	35.8%	34.2%	44.4%	33.5%	30.2%
Quarterly Data					
# Trade Partners in Q1 03	3.4	5.3	3.1	3.4	3.3
# Trade Partners in Q4 05	3.8	5.3	3.3	3.7	3.8
% Trade Partners Dropped	29.9%	35.9%	41.7%	30.7%	25.3%
% New Trade Partners	31.3%	35.3%	44.6%	30.5%	27.6%

Table 22. Trading Firms' Product Dynamics

This table examines the dynamics of the product composition of firms' exports and imports over the 2003-2005 period. Panel A documents the number of products that firms stop exporting or start exporting from month *t* to *t+1* as a share of all products exported in month *t*. It also reports the average net monthly growth rate of firms' export product intensity, as well as the average duration spell (in months) of an export product. The top half of Panel A studies product churning in worldwide exports and focuses on products that firms export to at least one destination. The bottom half of Panel A documents product churning in bilateral trade, i.e. destination by destination. Panel B repeats the exercise for the product composition of all importing firms. The table explores the product dynamics for firms of different firm ownership structure, as indicated in the column heading. All data for the set of firms that export or import in all 36 months in the 2003-2005 period.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Panel A. Changes in the product composition of exports					
Worldwide Exports					
% Exiting Products	29.4%	40.6%	37.2%	25.0%	21.6%
% Entering Products	29.9%	40.7%	37.7%	25.5%	22.3%
% Net Growth Rate	11.4%	12.7%	13.1%	10.2%	9.4%
Avg. # Months Traded	7.7	5.8	6.1	9.1	10.0
Bilateral Exports					
% Exiting Products	44.4%	55.4%	54.9%	41.0%	35.8%
% Entering Products	45.2%	55.7%	55.7%	41.9%	36.8%
% Net Growth Rate	14.3%	21.2%	15.3%	10.3%	10.3%
Avg. # Months Traded	5.1	3.7	3.9	5.9	6.8
Panel B. Changes in the product composition of imports					
Worldwide Exports					
% Exiting Products	34.8%	47.6%	39.9%	34.7%	32.9%
% Entering Products	35.2%	47.5%	40.4%	35.1%	33.3%
% Net Growth Rate	19.7%	21.5%	21.5%	18.1%	17.8%
Avg. # Months Traded	6.8	4.7	5.6	6.8	7.2
Bilateral Exports					
% Exiting Products	39.0%	53.8%	45.6%	39.1%	36.7%
% Entering Products	39.6%	53.8%	46.3%	39.6%	37.4%
% Net Growth Rate	21.8%	28.7%	21.5%	19.2%	18.0%
Avg. # Months Traded	5.5	3.5	4.4	5.6	6.0