

# **Firms' Export Dynamics and Strategy: Births, Successes and Deaths**

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## Abstract

Using over 200,000 exporters in China with the firm-product-destination-year level export data, we study firms' export dynamics from 2000 to 2006. The contribution to the literature is that we focus on China's export dynamics at the firm level, firm-product level, firm-destination level, and firm-product-destination level. At each level, we examine the dynamics of a trade relationship through the lenses of births, successes and deaths, and calibrate their respective contributions to China's short-run and long-run export growth. We describe firms' product strategy and product mix; and their destination strategy and destination portfolio. The paper finds that firms maintain a core product and a top destination strategy, and they drop fringe products and unimportant destinations. China's annual export growth is primarily driven by the intensive margin, but the 7-year export growth is primarily by the extensive margin. Moving from the firm-level to firm-product, to firm-destination and to firm-product-destination levels reveals larger contributions to export growth by the extensive margins, both in the short-run and the long-run. In particular, extensive margin examined at the firm-product-destination level contributed 93% of the 7-year export growth. For *surviving* firms, their annual export growth is primarily by their *surviving* products' export increase, or by export increase in their *surviving* destinations.

Keywords: Products Mix, Market Expansion, Intensive Margin, Extensive Margin

JEL Codes: F1

## 1. Introduction

The availability of firm-product-destination export data in many countries has enabled researchers to uncover that a substantial portion of firms export many products, and/or to many destinations.<sup>1</sup> Exporting multi products to multi destinations is a complicated and dynamic process. The heart of exporters' decision making is to choose a product mix for a destination from one period to next. This joint and dynamic product-destination decision involves introducing new varieties, keeping popular ones, and dropping old products—i.e., the right product mix to a chosen destination; and discovering new markets, keeping existing destinations, and dropping nonworking ones for a given product. The process leads to firms' product strategy and product churning, and destination strategy and destination portfolio.

The study aims to shed light on firms' exporting dynamics and strategy at the firm-product-destination level. It uses data of over 200,000 exporters from China with close to 8000 HS (harmonized system) 8-digit level exported varieties to over 230 markets for 2000-2006.<sup>2</sup> We analyze exporters' product churning and their destination portfolio, and examine firms' product, destination and product-destination strategies. At the same time, we study the dynamics of entry and exit of a trade relationship, and to decompose their respective contributions to China's export growth. To that end, we tackle simultaneously and explicitly all three export entries: firm entry, product entry and destination entry, and define a new trade relationship respectively at the firm, firm-product, firm-destination, and firm-product-destination levels. For the most detailed firm-product-destination level, any new combination of firm, product, and destination is a new trade relationship. It occurs when: a firm becoming an exporter for the first time—firm entry (the number of a firm's new trade relationships equals to the number of introduced new products times the number of exported destinations); and existing firms' subsequent entry of: (a) exporting a new product to the same market—product entry, (b) exporting the same product to a new market—destination entry, or (c) exporting a new product to a new market—product and destination entry. For the 7-year period of 2000-2006 of our sample, with the over 200,000 exporters, China witnessed over 3.2 million unique firm-product pairs (the unique combinations of exporters and the exported HS8-digit products), 1.8 million unique firm-destination pairs (the unique combinations of

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<sup>1</sup> Wagner (2016) has an excellent review of 147 empirical studies for 39 countries, plus 8 studies for multiple countries, at the transaction level of imports and exports.

<sup>2</sup> The firm-product-destination-level data includes all firms with any trades, of which a special type of firms are trade intermediaries. We exclude these firms from our analysis as they are not producers of any product, but rather acting as trade agents for other manufacturing firms. These firms can often be easily identified from their firm names, as their names almost always have the “intermediary” word.

firms and markets), and near 7.6 million unique firm-product-destination trios (the unique combinations of firms, products and destinations).

The study builds on a vast trade literature on firm exports. It is now a known fact that more productive firms self-select into exporters (firm heterogeneity).<sup>3</sup> But since multi-product and multi-destination exporters dominate world trade flows, there has been a growing need to examine firm-product, firm-destination and firm-product-destination entry and exit in order to understand the product- and destination-level dynamics. This process itself is a realization from firm heterogeneity to product heterogeneity, and to destination heterogeneity, as products have different attributes, and destinations have different demands. The essence of product and destination heterogeneity is to explain exporters' product churning and geographic expansions. Responding to the needs, recent international trade theory development has increasingly focused on the heterogeneity within firms.<sup>4</sup> These models capture endogenous dynamics within firms to model that some products are being exported to many different destinations, while others only to a handful, and still others are being dropped. Product heterogeneity, indeed, has been well documented in a few other studies as well, including Bernard et al. (2007), Bernard et al. (2010, 2011) and Iacovone and Javorcik (2010), Arkolakis and Muendler (2010, 2013).<sup>5</sup> In particular, Bernard et al. (2010) documents firms' active and ongoing product churning, and Bernard et al. (2011) allows for heterogeneity in ability across firms and in product attributes within firms, generating endogenous entry and exit decisions and an optimal export portfolio for each market.

Exporters' geographic expansion is the twin engine in firms' export expansion, for which researchers have provided some very useful insights as well. Some studies document that certain markets might serve as "testing grounds" for new exporters (Eaton et al., 2007). Eaton et al. analyze Colombian firm level export data over the period 1996–2005, and find that cohorts of firms entering the export market either soon exit or expand foreign sales by entering additional destinations. New market expansion also reflects exports uncertainty by

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<sup>3</sup> Starting with theoretical analysis of Melitz (2003) and Helpman et al. (2004), empirical studies, as early as Bernard and Jensen (1995), have provided numerous cases that showed a clear linkage between a firm's productivity and its export decision. This evidence is also documented in surveys by Wagner (2007), Greenaway and Kneller (2007) and Bernard et al. (2012), among others.

<sup>4</sup> The list is long and growing. Starting with Nocke and Yeaple (2006) where they introduced product heterogeneity in firms' export decision, there is increasing evidence that exporters only export certain products, and send different products to different destinations, see contributions in Helpman (2006), Feenstra and Ma (2008), Eckel and Neary (2010), Arkolakis and Muendler (2010), Bernard et al. (2011) and Mayer et al., (2014). It is now a known fact that exporters treat their products differently.

<sup>5</sup> Iacovone and Javorcik (2010) observe intense product churning within firms in Mexican exporters and confirm the existence of within-firm product heterogeneity.

starting small (Ruhl and Willis, 2008): they find that new exporters begin exporting small amounts and, conditional on not exiting, gradually increase their exports over time. In a related study, Lawless (2009) shows that upon surviving, exporters enter other destinations in sequence: Irish exporters enter additional markets which are less popular than those already served. In the process of exporting, firms accumulate experience and gradually expand their product-market potentials (Alvarez et al., 2008).<sup>6</sup> This is somewhat also evidenced by Schmeiser (2012), which provides supporting evidence that the geographic expansion of firm exports occurs slowly, with the majority of firms initially entering just one destination, then gradually entering more.

What is still under discussed in the literature is the joint product-destination export decisions. Along firms' product churning, many questions can be asked and need to be answered. For instance, for firms to drop a product, do they drop it from certain destinations gradually or do they drop the product completely (without trying different destinations)? And similar questions can be asked regarding destination portfolios, because essentially firms' export growth depends on firms' ability to find the right product mix to the right market portfolio. While there are undeniably many challenges in bringing one more dimension into the existing firm-product or firm-destination modelling, we hope to provide some new stylized facts regarding firm-product-destination export decisions and dynamics, informative for developing a dynamic theory of multi-product and multi-destination exporters.

Using China's export data to uncover the firm-product-destination level stylized facts is particularly helpful, and potentially very insightful. China's exports have recorded the fastest annual growth in the world, especially around its entry into the WTO in 2001. Being a member of the WTO has provided China's firms a relatively stable export environment, by circumventing certain protective policies aiming to restrict China's exports to certain markets.<sup>7</sup> As a result, from 2000 to 2006, China's annual exports recorded respectively US\$249.2 billion, US\$266.1 billion, US\$325.6 billion, US\$438.2 billion, US\$593.3 billion, US\$762.0 billion and US\$968.9 billion (from the relevant Chinese Statistical Yearbooks).

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<sup>6</sup> Alvarez et al. (2008, using Chilean firm data, find that firms' experience from exporting a product to a market increases the probability of the firm exporting the same product to a new market.

<sup>7</sup> Chad (2007) did a specific case study revealing the historic foreign use of antidumping against China's exporters. Using a number of measures across virtually all of the major antidumping users in the WTO system, he finds that China's exporters faced substantial discriminatory treatment relative to other exporting country targets during the 1995-2001 period. These measures reveal one contributing explanation for China's desire to seek WTO entry. Although after 2001, there is evidence from antidumping and other new China-specific forms of contingent protection that policymakers are *increasing* discrimination against China's exporters under the provisions of transitional "China safeguards" and other use of safeguards and import restrictions.

This very impressive trade volume itself warrants a careful study of China's export dynamics. We do so at four levels of trade relationships, starting with firm-level, and then down to firm-product, firm-destination and finally to firm-product-destination levels. The gradual moving down to a more detailed level helps understand firms' export decision on products, destinations, the joint product-destination dimensions, and the dynamics involving firms' products, destinations and product-destination decisions.

While entry and exit and the analysis of the relative contribution of each margin has been examined for many economies (for instance, Bernard et al., 2009 for the US; De Lucio et al., 2011, and Amador and Oromolla, 2013 for Spanish exports; Fabling et al., 2012 for New Zealand), this study is particularly related with Monova and Zhang (2009). Monova and Zhang use the same dataset, but they focus on two years of 2003 and 2005. More importantly, Monova and Zhang construct their analysis around the relationship between importers and exporters, and emphasize the differences among exporters with different ownerships, and on different size spectrum. Complimentary to these perspectives, we focus on the dynamics of four levels of trade relationships, and both the short-run and long-run growth contributions at the intensive and extensive margins. In addition, we focus on firms' export strategy by analyzing their product mix and destination portfolio to highlight exporters' ongoing product churning and destination expansion, and the dynamics involving choosing a right product mix to a right destination. To that end, for each level of a trade relationship, based on the export history of every continuous three periods, we group them annually as *new* (or *births*), *continuing* (or *continued*) and *exiting* (or *dropped*). In order to emphasize the different life trajectory of new births, we also differentiate births as *successful* and *one-time* by tracking their export status after entry. In that process, we pay special attention to the scale and importance of *continuing* exporters' *continued* products and *continued* destinations.

In analyzing the above, we emphasize uncertainty in new trade entries.<sup>8</sup> Uncertainty in new trade relationships is reflected by smaller trade flows, a large-number of short-lived trade-relationships (the differentiation between *successful* and *one-time* births is a case in point), and only a fraction of new trade relationships growing into stable trade relationships. Understanding this uncertainty and its contribution to trade growth is helpful for firms to evaluate its potential in introducing *successful* products to *successful* destinations.

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<sup>8</sup> Uncertainty in new trade relationships can be caused by many factors, but primarily by information asymmetries, first contributed by Rauch and Watson (2003). The information asymmetries might be due to product-consumer taste mismatch, trade volume-market demand mismatch, price-consumer affordability mismatch, and others. A few studies have documented the important role of uncertainty in determining patterns of trade, such as Araujo and Ornelas (2007) and Albornoz et al. (2012).

Overall, a set of stylized facts is provided here. We find that *continuing* exporters account for over 60% of annual active exporters, and their annual export account for over 90%, reflecting their overwhelming importance in China's exports. Further, around 67-88% of China's annual export growth during the sample period is due to firms operating in both time periods—the intensive margin, while the 7-year export growth is primarily driven by new firm births net of firm deaths—accounting for 68%. Considering product and destination births/deaths within *continuing* and *exiting* firms at the firm-product, firm-destination and firm-product-destination, we find a shrinking intensive margin, and an expanding extensive margin in China's annual and 7-year period export growth. In fact, at the most-detailed firm-product-destination level, annual contribution from the two margins fluctuates around the 50% mark, while the extensive margin account for over 92% of the 7-year export growth, which can only be uncovered at this level of analysis—highlighting the active and massive dynamics of China's trade at the joint product-destination level. For *continuing* exporters, they maintain both a core product and a top destination strategy, and have an active dynamics to add, keep and drop products or destinations, and an ongoing strategy to send a product mix to their different destinations.

The remainder of the paper is organized as the following. Section 2 discusses data, Section 3 describes the dynamics of firms and product discovery made by firms; Section 4 talks about dynamics of firm-product, firm-destination, firm-product-destination trade relationships; Section 5 documents multi-product, and multi-destination exporters; Section 6 documents firms' export strategy to analyze their product mix and destination portfolio; Section 7 decomposes China's export growth for the four levels of trade relationships, and Section 8 concludes the paper.

## **2. Data Sources**

The analysis is made possible by the availability of a rich database that details exports and imports of firms operating in China across all ownership types of state-owned, foreign-owned, collectively owned and private owned. The database includes all monthly import and export transactions from 2000 to 2006. A transaction record documents firm identification number, firm name, firm location, HS 8-digit product code, firm ownership type, trade type (imports or exports), nature of trade (ordinary versus processing trade, for instance), export value, volume and year, port name and location. We focus on exports. Trade value is recorded as fob nominal US\$. For comparison purpose, we use US GDP deflator with base

year 2000 to convert the nominal value to constant 2000 US\$, and also aggregate the monthly transaction data to yearly at the firm-product-destination level.

The data include all firms engaging in trade in China, some of which are “trade intermediaries”—they do not produce products of their own, but act as export agencies for other firms. Trade intermediaries are of a special category, but trade theories developed over the years are based on production firms which produce and sell their own products. We exclude intermediary firms from our analysis, whose annual export share varies, but the 7-year average is 30.5%, leading to a remaining 70% of export value in our analysis.

The firms in the analysis during the sample period are over 200 thousands, and they have witnessed very fast growth, with trade value in constant 2000 US\$ as 153 billion, 168 billion, 211 billion, 291 billion, 396 billion, 516 billion, and 625 billion for 2000 to 2006 respectively, leading to an average annual growth rate of 27%. The number of unique exporting markets during the sample period is 236, while it is 220, 222, 224, 227, 228, 230 and 229 respectively for 2000-2006—reflecting the rather stable destinations for China’s firms. The number of exported HS 8-digit products exhibit larger fluctuations, with several thousands of products exported annually, along with new products discovered annually.

To capture the dynamics of trade relationships, we group active trade relationships into subsets of *new (birth, or added)*, *continuing (continued—success)* and *exiting (death or dropped)*. This categorization is applied to births, successes and deaths at the firm-level (F), firm-product (F-P), firm-destination (F-D) level, and firm-product-destination (F-P-D) level. For any given year  $t$ , *births* are defined as the trade relationships that did not exist prior to  $t$  and existed only in  $t$ . If births survived the entry year, and also survived at least one year after entry, we define them as “*successful*” new births. Those entrants which also die in the same year of birth are defined as “*one-time*” births. *Continuing* trade relationships in year  $t$  are those that existed before  $t$ , existed in  $t$ , and would exist at least one year after  $t$ .<sup>9</sup> *Exiting* trade relationships in  $t$  are those that existed prior to  $t$ , and in  $t$ , but stopped exporting completely thereafter after  $t$ . This definition is also applied to firms’ products and firms’ destinations when we focus on firms’ product dynamics and destination dynamics.

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<sup>9</sup> This definition does not require firms to be exporters to have exports consecutively in order to be classified in the middle years as “continuing”. Thus, continuing exporters here also include those firms that exported multiple years but not consecutively. For non-consecutive exporters, the dataset have cases such as the following. A firm exported in year  $t-1$ , and  $t$ , but did not export in year  $t+1$ , however re-emerged after year  $t+1$ . Wang (2015) gives it a special category of “occasional exporters”, but here, we do not make the differentiation, as the focus is on the dynamics of birth, success and death.



### 3. Firms and Product Discovery

We start by discussing the dynamics of firms, and then analyze product discoveries made by exporters, and their life trajectories after being discovered.

#### 3.1. Firms—*New is Sensational and Continuing Is Beautiful*

*Firm Births, Successes and Deaths.* During the 2000-2006 sample period, there are 204,739 unique exporting firms. Table 1 lists the number of active exporters by type in each year with their corresponding shares in parentheses. However, truncations in the beginning and the end years make it impossible to differentiate firm types as we do not know whether they were born in 2000 or died in 2006. Clearly, the massive active exporters offers us a unique perspective to discuss dynamics.<sup>10</sup>

It is evident that there is a very active dynamics (sorting) going on among exporters. Each year, there are many thousands of firms breaking into exporting (new exporters, *FN*), accounting for around 25% to 30%. Among the annual births, the majority survived their infant year (*successful* entrants); while the enter-and-die (*one-time*) entrants account for around 15% among births, but that death ratio is as high as 39.5% for year 2005.<sup>11</sup> The numbers of *one-time* and *successful* entrants reflect respectively entrants' failing and successful experimentation. For example, in 2001, there are 13,728 entrants, and 11,837 (*successful* entrants) or 86.22% would continue exporting after entering, indicating an infant mortality rate of 13.78%. This reflects uncertainty often discussed in the trade literature (Rauch and Watson, 2003) in that a portion of entrants do not survive.

In addition to one-time exporters, each year, many firms exit for good (*FE* firms) (around 10%), while *continuing* firms (*FC*) are the largest group, ranging from 60% to 68%. Taken together, there is a gross firm turnout rate of around 32 to 40% each year, and a net turnout rate of 10-15%—reflecting an impressive dynamics even at the firm level.

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<sup>10</sup> For instance, Amador and Opromolla (2013) work with below 7000 firms for Spanish exporters, while Iacovone and Javorcik (2010) below 2000 exporting firms each year for Mexico.

<sup>11</sup> It is for future analysis to see why year 2005 is drastically different from other years. It is one thing that stands out that year 2005 ushered in the Hu-Wen administration's reversal of some of Deng Xiaoping's reforms. The privileged state sector was the primary recipient of government investment, which under the new administration, promoted the rise of large "national champions" which could compete with large foreign corporations. Private and collective-owned firms did not enjoy these favorable treatments, and thus might not be able to endure the competition in the foreign market and stay as exporters. Monova and Zhang (2009) show that state-owned exporters are much larger, exporting more products and to more destinations than exporters of other ownership types.

*Changing Exporter Status from One Period to Next.* Table 2 lists the transition status of *successful* entrants from one year to next for all five years, as *successful* entrants enter and stay in the export stream. It shows that the majority, close to 85%, continue to export two years after birth, though around 10-12% would die in the second year, except in year 2005, which witnessed a dying rate of 20%. This suggests a rather successful transition at the firm level, signaling new exporters' resilience.

In addition to annual entry and survival of entrants, we are also interested in the changing of exporter status from one year to next of *FC* and *FE* firms, as that signals existing firms' transition of survival and death, which are integral parts of dynamics. Changes in the number of *FC* firms from year  $t$  to year  $t+1$  consist of: a) the number of successful entrants in  $t$  switching to *FC* firms in  $t+1$  (which is a plus); and b) the number of those *FC* firms in  $t$  that exited the export markets in  $t+1$  (which is a minus). *FE* firms in year  $t+1$  consist of: a) some successful entrants in  $t$  but exiting in  $t+1$ ; and b) some *FC* firms in  $t$  to cease exporting in  $t+1$ . Take year 2001 and 2002 to illustrate the dynamics. The net increase of *FC* firms is 5,702 (44,536-38,834), which means that the number of successful entrants in 2001 surviving exporting in 2002 and in 2003 is 5,702 more than that of *FC* firms in 2001 which exited in 2002. Similarly, the 5,534 exiting firms in 2002 indicates that there are altogether 5534 successful entrants in 2001 and *FC* firms in 2001 which exited exporting in 2002.

*FC Firms Are the Heavy-Weights.* Table 3 reports the average exports by firm type and by year. It shows that *FC* firms are the heavy weights in terms of average trade values, and the heavy lifters in terms of their export share in total exports. *FC* firms on average export annually US\$ several millions per firm, and they account for a rather steady export share of 90-92% annually. On the contrary, new exporters are much smaller, exporting only a small fraction of those of *FC* firms, reflecting other parts of uncertainty in Rauch and Watson (2003) that new starts small. Not surprisingly, larger entrants survive, and smaller ones die: on average, successful entrants exported around US\$ 1 million, several times larger than unsuccessful (*one-time*) entrants. Successful entrants on average are generally larger than exitors, except for 2005, but one-time entrants are the smallest exporters. Taken together, the data suggest that when firms exited exporting, their export volume decreased significantly, either these exitors are from previous years' successful entrants, or continuing firms. Combined with the statistics in Table 1, it is thus clear that *continuing* firms, absolutely the largest both number of exporters and in trade volume, are the overwhelmingly major driving force in China's annual exports.

### 3.2. Products—Varieties and Discovery

*Thousands of Products Exported by Firms Annually.* Here, we turn our attention to all the products exported by firms operating annually in China to show China's ability to discover new export varieties—product discovery. Consistent with our definition of *new (successful and one-time)*, *continuing* and *exiting*, a product discovery in year  $t$  is a product being exported in year  $t$  for the first time by China.

Table 4A lists the number of products in each category by year. Given China's enormous export volume, it is just fitting to see that its firms export annually thousands of products. Equally interesting, every year, firms added at times hundreds new products. From 2000 to 2006, a total of 7932 unique products were exported by China's firms. Clearly, product discovery is made annually in the lower hundreds, except in 2004, which account for from the lowest 1.32% in 2004 to the highest 8.69% in 2002. At the same time, some products are being dropped altogether by China, and also annually. Together, it says at the country level, gross product churning rate (the sum of product discovery rate and product dropping rate) is small, ranging from the smallest at around 3% to the highest at 10.5% (year 2001). The much higher product discovery and gross churning rates in years 2001 and 2002 might be related with the timing of China's WTO membership (December 11, 2001, China officially became a member of the WTO). Firms might anticipate this opportunity and thus ready themselves to export new products. Associated with this is a relatively high dropped rate in 2001. Overall, the relative low product churning rate at the country level signals that China's firms have already exported a relatively full range of products—not that many new discoveries to be made; but not many products to be dropped. Given that more products are discovered than dropped, there is still a steady increase in product varieties, reaching more than 6900 unique products exported for some years.

*Survival of Product Discoveries.* The survival of product discoveries indicates China's ability to retain those discoveries, which are then added to China's product stream. Here, we track new product discoveries, and tabulate their status in the following years in Table 4B. It reveals that once a new discovery is made successfully, it has a fairly good chance to stay in the years after. The data show that only around 2 to 3% of those discoveries which have survived their first year got dropped in the second year, except for 2004's discoveries, which nearly 18% got dropped in year 2005, which again speaks to the abnormality of 2005. The vast majority remain, and become continued exported products.

The discovery-stay phenomenon is so strong, that we would like to examine the types of firms making these discoveries, and how these discoveries are followed by other firms. Interestingly, every firm type is able to introduce brand new products into China's export varieties annually (Figure 1), though *continuing* firms are the major force, accounting for annually 70-75% (except in 2005, which falls to 59%). *Successful* entrants are a distant second, once again signaling their strong strength in entering exporting markets.

In addition, many firms introduce a same new product, and many a firm introduce multiple products. For instance, there are 1658, 764, 540, 409 and 2854 firms respectively which introduced a same new variety in the exporting market for 2001 to 2005. Among these firms who introduced multiple new varieties, the maximum number of new products a firm introduces is 16, 57, 36, 4 and 33 respectively for years 2001 to 2005.

The tendency to stay in the export stream of product discoveries is due to the quick spread by followers. In other words, the product lead a firm maintains for introducing a new variety is not long. For instance, we tracked the number of firms which exported a new product discoveries made in 2001. The average number of firms exporting these discoveries (the total number of firms each year divided by the number of product discoveries made in 2001) increases steadily over the years: 20 in 2001, 29 in 2002, 33 in 2003, 40 in 2004 and 56 in 2005. Similar trends are found for discoveries made in other years (Figure 2). In particular, followers cut across every firm type, although *continuing* firms and *successful* new entrants are the overwhelming agents in exporting these new products (93% for 2002, for instance).

#### **4. Firms' Product Churning and Destination Switching**

In this subsection, we add product and destination dimensions to the firm perspective to study firm-product and firm-destination trade relationships, and the associated dynamics.

##### **4.1. Firm-Product (F-P) Trade Relationships**

When a trade relationship is examined at the firm-product-year level, for any given year  $t$ , a new firm-product trade occurs when: a) a new entrant with a product (one firm with  $n$  products makes  $n$  new firm-product trade relationships, and b) a *continuing* or *exiting* firm introduces a new product. The first case is a firm-product relationship born to a new parent, and the latter to an existing (*continuing* or *exiting*) parent. Similarly, a *dropped* firm-product trade relationship occurs either a *continuing* firm or an *exiting* firm drops an old product. The first case is death to a *continuing* firm (product dropped, but the firm exists), and the second

one is death to an *exiting* parent (firms' products disappear with firms). To capture the dynamics of entry and exit, we define gross firm-product-year churning rate as the ratio of the number of new firm-product pairs *added* over total active firm-product relationships plus the ratio of the number of *dropped* firm-product pairs over total active firm-product relationships. The difference between the two is net firm-product churning rate.

*Over half of the active firm-product pairs are newly added each year.* For each year's firm-product trade relationships, according to their export history of three neighboring periods, we group them into three groups as *added*, *continued* and *dropped* according to the definitions in Section 2. For each group, when appropriate, we also subgroup them according to their parent firm types. Take the *added* firm-product pairs as an example. We subgroup them as added by *new* firms (*FNs*), by *continuing* firms (*FCs*) or by *exiting* firms (*FEs*). These further finer differentiations would reflect *continuing* firms' ongoing efforts to introduce new products and *exiting* firms' last attempt to keep exporting alive. Note that for any given year, only *continuing* firms have *continuing* firm-product pairs.

Table 5 lists the tabulation. A few facts emerge. First, annually, there are hundreds of thousands of active firm-product trading pairs, and the annual increase from one year to next is significant, except from 2005 to 2006. They increased annually from close to 375 thousands in 2000 to 1.33 million in 2005, and then slightly dropped to 1.12 million in 2006. During the sample period, there are over 3.2 million unique firm-product pairs in exports. This, once again, signals the very large nature of China's exporting activity. Second, over half of the annual active firm-product trading pairs are newly added, and that ratio reached 64% in 2005. Within these new firm-product trade relationships, *new* firms with new products account for around 18% in 2001, and that share increases annually to around 33% in 2005; around half are added by *continuing* firms—a strong suggestion that *continuing* firms are the cornerstones in introducing new products to markets. Somewhat surprisingly, even *exiting* firms keep introducing new products in the year they exit, though it is a small proportion in general. This undoubtedly reflects the very dynamic nature of firm trades: there is a constant and large stream of new entrants (firms), and existing firms' ongoing efforts in introducing new products. Third, *continued* firm-product pairs are only about 30% of total active firm-product pairs annually—indicating a gross firm-product churning rate of around 70% annually—this is much higher than the 30-40% turnover rate at the firm level, and 3-10% gross rate at the product level. Fourth, destruction of firm-product trading relationships account for around 10 to 15% of annual active firm-product pairs, and among which,

products dropped by *continuing* firms account for the majority. Taken all together, the net firm-product turnover rate stands at 40% to 50%, again much higher than the 10-15% at the firm level, and the not even 1% at the product level. Obviously, more detailed-level analysis reveals finer dynamics in reality. Overall, the data also show that *continuing* firms are the major players in introducing, keeping, and dropping products.

*New Firm-Product Exports Start Small.* Parallel with Table 5, Table 6 reports their corresponding average exports (total exports per year by group divided by the number of firm-product pairs in each group). It is clear that, one, new trade relationships start small, once again reflecting uncertainty in trade. The uncertainty exists across the board—even experienced exporters start new products with small export value. On average, *new* firm-product trade values are around US\$100K. What is also revealing is that, among the *added* F-P trade relationships, there is a difference: *new* firms start exporting *new* products with relatively larger scale than those introduced by *FC* firms—a stronger start ensures a better chance of survival for *new* firms. But on the other hand, these *added* firm-product pairs by *exiting* parents are the smallest in trade volume, which might suggest the underlying reasons why these firms exit—they might be too cautious in starting something new to find new chances for export survival. Two, *continued* firm-product pairs are the heavy exporters, exporting many times larger than the new starters: the average export value per firm-product is close to or more than US\$ 1million across the years. Three, *dropped* firm-product pairs export less on average than *continued* firm-product pairs, but are still much larger than those *added* ones. The comparison is especially startling for *FC* firms: those *dropped* still have very large trade value on average, several times larger than *added* F-P pairs. Even products dropped by *exiting* firms have a fairly large trade volume. The data here again signal a dynamic growth path of firm-product trade relationships, similar to the one at the firm-level: they start very small; but if they survive, they get much larger; when they are dropped, the export volume declined dramatically. Even within this observed phenomenon, there is heterogeneity across firm types at birth and at exit.

*FC Firms Adjust Their Products Annually and Substantially.* Given the active roles *FC* firms play in the dynamic firm-product trade relationships, we now restrict our attention to *FC* firms only. Complimentary to the above, we look at the number of *FC*s in any given year which added new products, kept continued products and dropped old products—product churning. From that, we calculated the associated ratios of *FC* firms which have done one,

two or all three aspects of the above among all active *FC* firms for a given year. Figure 3 plots the ratios for each of the five years of 2001 to 2005.

Figure 3 indicates that annually, around 65% of *FCs* introduce new products to export—it is a rather significant ratio, and it might also help explain that *FCs* can stay in exporting by annually adding new varieties into their product mix. Second, over 90% of *FC* firms kept their *continued* products, annually. Third, annually, about 35% to 45% of *continuing* firms also dropped their old products—a rather significant proportion. In fact, *FCs* might be doing more than one aspect annually. Indeed, around 30% of *continuing* firms annually both introduce new products and also drop old products; around 30% keep their *continued* products and also drop their old products; and around 25% do all three.

#### **4.2. Firm-Destination (F-D) Expansion**

At the country level, the number of markets exported to by China's firms are stable. Here, we analyze firm-destination (F-D) dynamics. A new firm-destination trade relationship occurs when: a) a new exporter sends its product(s) to a destination, and b) an existing exporter finds new destinations for its product(s). Similarly, a *dropped* firm-destination trade relationship occurs either when a *continuing* firm extracts from a destination, or an *exiting* firm stops exporting to a destination. Dropping a market would be a much bigger decision for a firm than dropping a product, as firms might be able to upgrade an old product to a new one before dropping the old form, but dropping a market would be costly, as it often involves large sunk costs for establishing a trade channel in a market. Uncertainty here is reflected in exports started small, and in firms' active search for a suitable market for its products.

For any given year, we follow the earlier definition and group firm-destination pairs as *added*, *continued* and *dropped*. When appropriate, we also subdivide them by firm types. Table 7 documents a vivid dynamic picture of firm-destination dynamics and (*continuing*) firms' entry into and exit from markets. It is clear that all three types of firms seek new markets for their products: *new* exporters send their products to new markets, so do *continuing* and even *exiting* firms. *Continuing* firms' efforts in searching for and exporting to new markets reflect their ongoing exporting dynamics by adding new destinations to their portfolios, while *exiting* exporters keep their last hope to remain exporters by sending their product(s) to new markets. Below, we describe a few observations.

First, the active firm-destination trade relationships are substantial and increase annually: from over 270 thousands in 2000 to more than 919 thousands in 2006, with the unique

number of firm-destination trade relationships at more than 1.83 million during the sample period. Second, roughly speaking, *added* trade relationships account for 45% of all active firm-destination combinations annually. Among them, new markets added by *continuing* firms are the majority, accounting for around 60% except in year 2005, which is 52%. It says that *continuing* firms constantly seek new markets for their product(s). New markets entered by *new* firms accounted for about a third of *added* firm-destination trade relationships, signaling the relative strength of entering exporters. Third, continuity is important. Annually, *continued* firm-destination pairs account for around 45%. And fourth, for the *dropped* firm-destination trade relationships, they are relatively small as a group, accounting about 10-15%. But within the group, those dropped by *continuing* firms accounted for about 70%—suggesting that *continuing* firms’ ongoing destination expansion—adding new ones, keep existing ones, and drop some old ones. The gross rate of firm-destination turnover rate is around 55% and the net creation rate is around one third, which signal (once again) the very dynamic nature of China’s trade.

*New Market Expansions Are Small.* On average, export value per *new* F-D trade is only about 10% of the *continued* ones (Table 8). When a market becomes the “*dropped*” status, exports in those markets become much smaller, compared with the *continued* firm-destination pairs. On average, an *added* firm-destination starts with around US\$150K, a *continued* one over US\$ a million, about 8 times as large, and a *dropped* firm-destination is down to around US\$170K. This confirms previous findings that new trade relationship starts with small export volume. However, there is also heterogeneity among firm types. Within the *added* firm-destination trade relationships, those added by *new* exporters tend to have a much larger trade value, at least one time larger than those added by *continuing* firms; and those added by *exiting* exporters are the smallest. This is rather consistent with the pattern in firm-product trade relationships. Also, in expanding into new destinations, the results might signal that *continuing* firms test out new destinations with caution, while *new* firms start relatively strong in order to survive the uncertainty. Finally, for the *dropped* firm-destination pairs, those dropped by *continuing* firms tend to be much smaller than those dropped by *exiting* firms—again reflecting the heterogeneity between *continuing* firms and *exiting* firms.

### **4.3. Firm-Product-Destination (F-P-D) Trade: Creation and Destruction**

In this subsection, we come down to the finest level of firm-product-destination-year export to study creation and destruction of trade relationships, rarely done by other studies.



Any combination of firm, product and destination which did not exist prior to year  $t$  is a new F-P-D trade relationship in  $t$ . A new F-P-D occurs when: a) a new firm introduces a new product to a new destination; and b) an existing firm introduces a new product to a new destination; exports an existing product to a new destination; and exports a new product to an existing destination.

Table 9 tabulates the status of active F-P-D trade relationships in years 2001 to 2005. It is expected that the joint dimensions of F-P-D trade relationships would reveal unparalleled richness of dynamics. First, the number of annual active F-P-D trade relationships are in the millions, and the annual increase is significant: from 0.77 million in 2000 to 2.88 million in 2006, implying an annual growth rate of about 46%. For the 7-year period, there are over 7.57 million unique F-P-D export relationships. Second, each year, *continued* F-P-Ds (*continuing* firms export their *continued* products to their *continued* destinations) only account for about 25% of all operating trios (and only 20% in 2005). That implies an annual gross churning rate about 75%. Third, *added* F-P-D trios account for the majority of annual trade relationships, at 60%—67%, which implies a remarkable proportion of *newness* in annual trade relationships. Equally remarkable, existing firms are an integral part of this *newness*: each year, F-P-Ds added by *new* exporters are only 15 to 25% in annual active F-P-Ds, and those added by *continuing* and by *exiting* firms are about 42-50%, accounting for at least two thirds among *added* F-P-Ds. This is understandably buried in firm level dynamics, and partially buried in firm-product or firm-destination trade relationships. Indeed, the increasingly smaller share of *continued* trade relationships each year (say 2001) when we move down to a finer level, from firm-level (66.18%), to firm-product level (31.09%) or firm-destination level (44.13%) to finally firm-product-destination level (24.99%) unequivocally signals the active product-, destination or product-destination dynamics within existing firms. Fourth, destruction of F-P-D trios is about 11-13% annually, either due to firm exit, or existing firms' dropping a product, or a destination or a product from a destination. The net creation rate of F-P-D trade relationships is around 50% annually—it reveals the true dynamic nature of China's trade.

As to their average volume of exports, Table 10 presents these statistics for each type of the trade relationships. It says that on average, when a *new* F-P-D relationship is established, the export value ranges from US\$55 to 84 thousands—a firm exports around US\$ 55-84K of a product to a destination. Unlike found previously for firm-product or firm-destination trades, there are no significant differences in trade volume between F-P-D births to *new*

parents, to *continuing* and to *exiting* parents. *Continued* F-P-Ds are the heavy exporters: on average, each exports US\$ .5 to .65 million annually, around 10 times as large as the *added* F-P-D trade relationships. Once again, the data reflect both uncertainty in newness and also experimentation. For *dropped* F-P-D trios, they are still large on average than *added*, but smaller than the *continued* ones. This is the pattern we have observed for all levels of trade relationships, suggesting a growth/decline path in trade from birth to success and to failure.

## 5. Multi-Product and Multi-Destination Exporters

Here, we study firms' export behavior in terms of the number of their exported products and their destinations. Consistent with our definition of *new*, *continuing* and *exiting*, we similarly group a firm's basket of exported products, as well as their destinations as *added*, *continued* and *dropped*. The difference from firm-product to firms' products is trivial—a *new* firm-product pair means a *new* product of any firm types, while a firm's new product is an existing firms' newly added product; while a *continued* firm-product means a *continuing* firms' *continued* product. Moving from firm-product perspective to firms' perspective can allow us to examine firms' exporting behavior, through the number of products/destinations they exported, and the product/destination mix in their export decision.

In the sample, some firms export their product(s) to as many as 170 markets, and some firms export as many as 2723 products. In fact, there are tens of thousands of firms which exported many products to many destinations—the so called multiple-product and multiple-destination exporters. In order to have a clear sense of these multi-product and multi-destination exporters, we follow the literature by defining an exporter as a multi-product multi-destination exporter if a firm exports at least 3 products (multi-product) and to at least 3 destinations (multi-destination). Given that hundreds of products exported, and tens of destinations some exporters have, in order to have a manageable but reasonable grouping of firms based on the number of products (destinations), we choose to group firms in the following manner. But first, the number of products (destinations) for each exporter is the number of unique products (destinations) exported (to) by the firm during the sample period.<sup>12</sup> For product dimension, we divide exporters into 8 groups: 1, 2, 3, 4-10, 11-25, 26-50, 51-100 and 101+. Having one, two and three products as separate groups is to account for the fact that there are many single product, two-product or three-product exporters as well.

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<sup>12</sup> For instance, Firm A exports 3 products in year 2001, and 4 products in year 2002 (adding one new product) and 6 products (adding three new products but drops one old product) in 2003. So, the number of unique products Firm A exports is 7.

For the destination dimension, we do similar groupings, but with 7 destination groups as 1, 2, 3, 4-10, 11-25, 26-50 and 51+.

For the 204,739 exporters, we tabulate them according to the combinations of product group and destination group, with results in Table 11. A few interesting observations emerge.

First, there are 21.5% single-product exporters (the first row), and 28% single-destination exporters (the first column). However, single-product and single-destination exporters are only about 14% (28,493 firms in total, the first cell). It means that some single-product exporters export the product to more than one market; and some single-destination exporters send more than one product to the destination. Second, the majority of exporters are either multi-products (exporting at least 3 products)—accounting for 65%, or multi-destinations (exporting to at least 3 destinations)—accounting for 59%. Further, 48% of all exporters are multi-product and multi-destination exporters. Third, there are some mighty exporters. There are about 2.5% of all exporters, which export more than 50 products to more than 25 destinations. At the extreme, there are 1476 exporters which exported at least 101 products to at least 51 markets (accounting for 0.72%).

To complete the picture, we calculate the corresponding export shares for the above groupings of exporters, reported in Table 12.<sup>13</sup> Clearly, the 14% single-product and single-destination exporters only account for 1.27% of total export value—implying that they are very light exporters in terms of volume. On the other hand, although small in percentage, the mighty few—exporting more than 101 products to more than 51 destinations—account for 10.5% of total exports, though with only 0.72% of exporters. Together Tables 11 and 12 indicate that China's exports are driven by its multi-product, or multi-destination firms, with multi-product and multi-destination firms leading the way.

*The Tradeoffs between the Number of Products (Destinations) and Average Exports.* For exporters, we have seen that they increase the number of exported varieties, or send their products to more destinations or both. In that sense, a firm's export value can increase both with export value in each product or destination (trade intensification) or in introducing more products for exporting (product expansion) or in sending products to more markets (market expansion). One interesting question is: does product or market expansion occur at the cost of decreasing export value of each existing product or market? If there is, there might be a

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<sup>13</sup> The corresponding export share for each group is calculated as the following. First, we get the average of a firm's export value (its total export value over the sample period divided by the number of years in exporting). Then, we add each firm's average export value together according to the product/destination grouping of firms to subgroup export sum. Finally, the share for each subgroup is derived as the ratio of subgroup sum divided by the sum of average exports over all exporters.

tradeoff between trade intensification and trade expansion, and the net effect on firms' trade value depends on which effect dominates. An attempt to answer that question is to plot the number of products exported versus the average export value for each product, with a similar plot done for the market dimension.

The left side in Figure 4 plots the average exports (in logs) per destination versus the number of destinations exported for exporters, and the right side for products. The left side graph suggests that firms' trade value increases both with market expansion (more destinations) and with trade intensification in each destination. The higher density of firms in the range of below 50 destinations reflects the higher density of firms which exported to less than 50 markets. Further out in the graph, it is more suggestive that firms send their products to more destinations and at the same time increase the export value in each destination.

For products, the trend is not very suggestive in the left corner, but gets clear on the further out. While not many firms export more than 50 products, it is quite clear that firms not only increase their exported varieties, but also export value per product. Taken together, there is no evidence suggesting that firms increase their product varieties or markets at the cost of decreasing trade value for existing ones, and thus exports increase both along trade intensification and trade expansion.

## **6. Firms' Export Strategy—Product Mix and Destination Portfolio**

Since multi-product or multi-destination firms account for the majority of exporters, we turn our attention to examine whether they have certain product and destination strategies.

### **6.1. Firms' Product Strategy**

*Product Mix.* We first look at firms' product mix. We do the analysis in terms of *added*, *continued* and *dropped* products in order to have a complete assembly of all types. That would require us to restrict our attention to *continuing* firms only.<sup>14</sup> Each year, we count the number of products exported by *FCs* in each product category, and then divide that by the number of *FCs* in that year. Table 13 lists the average number of products a *FC* firm exports in *added* (both *successful* and *one-time*), *continued* and *dropped* categories. On average, each *continuing* firm exports around 8-10 products. This product mix is rather comprehensive—including all product types, but with different weights.

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<sup>14</sup> This won't cause any serious concerns, as *continuing* firms account for around two thirds of exporters each year, and 90% of annual exports.

A few observations merit further discussions. First, the number of *continued* products is the largest—reflecting undoubtedly the important status these products possess.<sup>15</sup> Second, firms continue to add many new varieties to their product mix, among which, over half are kept for exports in the next period (*successfully added* products). *One-time* new products tend to reflect partly firms’ efforts in their experimentation with market tastes due to uncertainty. Third, some products are dropped annually. Therefore, it is evident that *continuing* firms routinely add new products and drop old products. Also, there is a slow but steady increase in *FCs*’ product varieties, which can partly explain the steady increase of China’s exports—firms are successful in introducing *new* products to expand their product basket.

*Core Product.* Given that 88.5% of firms export at least two products, and *FCs* have on average 10 products, we now examine whether these products have equal importance, or firms maintain core product/fringe product strategy. To quantify our argument, for each product, we compare its export share in its firm’s total exports.<sup>16</sup> The ranking of products are based on the magnitude of their export shares. We restrict our attention to the top 6 products exported (as around 60% of exporters exported less than six varieties). The relative export shares for each of the top 6 product are presented in Table 14.

Clearly, Table 14 shows that no matter how many products a firm exports, it always maintains a core product. For firms exporting three varieties or fewer, the core product accounts for the vast majority of firms’ exports, above 84%. The second product is not even close in importance. While it is understandably that the share of the core product decreases with the number of products exported, the export share of the product still accounts for at least 56% even for firms exporting 51-100 products. The data undoubtedly imply that firms maintain a core product export strategy. It will be of future research interest to see how firms expand their product lines around the core product: how they start producing and exporting others in related upstream and/or downstream industries.

*Firms Drop Fringe Products.* We know that *FCs* routinely drop products. Which products are being dropped? In order to examine which products are being dropped by *FCs* in period  $t+1$ , we construct a few control variables in period  $t$ , and run a simple logit model, as  $P(D_{ij,t+1} = 1) = P(X_{ij,t})$  ( $i$  for firm and  $j$  for product). The first is product  $j$ ’s export share

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<sup>15</sup> For export volume, *continued* products account for the majority of export volume, though not reported here.

<sup>16</sup> The share is calculated as the following. First, for each product, we calculate its annual export share within its firm. Then, we take the average of that product’s export share with a firm during the sample period, to take into consideration the different product mix across years. Finally, for that product, we average its export share across firms within that subgroup.

in firm  $i$ 's exports to capture the relative importance of product  $j$  for firm  $i$ ; the second is product  $j$ 's export value in year  $t$  to capture its absolute size; and the last is product  $j$ 's export share in China's total exports of  $j$  of firm  $i$  to capture firm  $i$ 's relative importance as an exporter for product  $j$  in China. In addition, we include firms' export experiences as years in exporting as another control.

Results are reported in Table 15. *FCs* drop their fringe products which are not important to them, whose export values are small, and which are not those to make firms important exporters in China. In addition, the more experienced the firms, the less likely they drop products, *ceteris paribus*.

## 6.2. Firms' Destination Strategy

There are 72.30% firms which exported their product(s) to at least two markets. We now examine firms' destination strategy.

*Firms' Destination Portfolio.* Parallel to the product analysis, we look at the destination portfolio for (*continuing*) firms, with destination types of *added*, *continued* and *dropped*. Each year, we count the number of markets exported to by *FCs* in each destination category, and then divide that by the number of *FCs* in that year. Table 16 lists the average number of destinations by type per *FC* per year. On average, each *FC* has 7 to 9 destinations: 2-3 *added* ones, 4-5 *continued* ones, and 1-2 *dropped* ones. Within the *added* destinations, some are kept (*successful*) for exports for the next period, and others are failed, but success rate is larger than failure. That signals *FCs*' continuing efforts in searching new markets for their product(s), and the uncertainty in markets and thus firms' associated experimentation to test out certain destinations.

Overall, *continued* markets are the cornerstone markets for *FCs*. They are absolutely largest in number.<sup>17</sup> Taken together with successfully *added* markets, we can conclude that the majority, around 70-80% of *FCs*' markets are kept for next year's exports. Also, there is a slow but steady increase in *FCs*' markets, which can also partly explain the steady increase of China's exports—firms are successful in finding new markets for their products.

*Top Destination.* Unlike fostering a core product, maintaining a top destination might be more challenging, given the relatively fixed size of destinations' market sizes. A destination can be maintained as a top one, either because the market is large enough so that a firm can increase its export volume (without much constraint), and/or firms can add new products to

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<sup>17</sup> They also account for the majority of *FCs*' exports (not reported here)

the destination. Regardless, using the similar metric as for product export shares, we calculate a destination's export share within a firm, reported in Table 17. For two-destination exporters, the top destination accounts for 93.5% of their exports. For three-destination exporters, the top destination accounts for 90%. When firms expand their markets, the top market's export share gets smaller, but it still maintains a commanding first place: for firms with 4-10 export markets, the top market accounts for 78%, and the second important market is not even close. Even for firms with over 50 destinations, the top market still accounts for around 37% of their total exports, two times as large as the second market. Clearly, firms maintain a top destination strategy.

*Firms Drop Unimportant Markets.* With a top destination strategy, we now turn our attention to which markets *FCs* drop, since on average they drop about 1-2 markets annually. In order to examine which markets are being dropped by *FCs* in period  $t+1$ , we employ the method as in product dimension and construct a few control variables in period  $t$  to run a simple logit model, as  $P(D_{id,t+1} = 1) = P(X_{id,t})$  ( $i$  for firm and  $d$  for destination). Similarly, we calculate destination  $d$ 's share in firm  $i$ 's exports to capture the relative importance of destination  $d$  for firm  $i$ ; destination  $d$ 's export value for firm  $i$  in year  $t$  and destination  $d$ 's export share for firm  $i$  in China's total exports to  $d$ . In addition, we include firms' export experiences as years in exporting as another control.

Results are presented in Table 18. The results imply that *FCs* drop those destinations which are not important to them, to which they export less, and which are not those to make firms important exporters in China, *ceteris paribus*.

### 6.3. Firms' Joint Product-Destination Strategy

At this joint level of analysis, we focus on the destination portfolio to keep products and the product mix to keep destinations. Newly *added* products (destinations) bring new venue for firms' export growth at the extensive margin, and *continued* products (destinations) guarantee export growth at the intensive margin. Since *continued* products (destinations) are the largest in number, and heavy contributors to firms' exports, here we only report product mix for *continued* destinations and the destination portfolio for *continued* products. As only *FCs* have *continued* products (destinations), our analysis here is naturally restricted for *FCs*. In either case, we look at the average product mix across firm-destination pairs or the average destination portfolio for firm-product pairs. To get product mix for each *continued* firm-destination pair each year, we first get the total number of products in *added*, *continued* and

*dropped* groups for that year across all *continued* firm-destination pairs, and then compute the group average by dividing the number of *continued* firm-destination pairs in that year. We do this for firm-product to get destination portfolios.

*Product Mix in Continued Destinations.* For *continued* firm-destination pairs, *FCs* send a whole spectrum of products (Table 19). First, every *continued* destination has on average 4 products. While *continued* products dominate in these markets (both in numbers—about 65%; and in trade values—larger, about 88%), *new* products also have their rightful place, about one product on average (around 10-15%), and 10% of total trade value. The different types of products reflect firms' respective strategies: firms keep their *continued* destinations by first and foremost exporting their *continued* products to them; but at the same time, using them as a testing ground for their *new* products. Even for *dropped* products, some *FCs* still export them to their *continued* destinations, indicating their last attempt to keep those products alive. The combination of *added*, *continued* and *dropped* products indicates *FCs*' ongoing product churning in these very important markets, and also their product strategy.

*Destination Strategy for Continued Products.* For *continued* firm-product pairs, *FCs* send their *continued* products to all types of markets (Table 20). First, every *continued* product is exported to four markets. While *continued* destinations are the major markets for these products (both in numbers—about 75%; and in trade values—larger, about 90%), *new* markets show their potential strengths: about one on average (around 20%), and around 6-7% of trade value. The different types of markets reflect firms' destination strategies to keep their *continued* products by exporting them to their *continued* markets, but at the same time, using the mature products to test out *new* markets. Even for the about to be dropped markets, some *FCs* still export their *continued* products as the last attempt to keep these destinations.

## **7. Decomposition of China's and Firms' Export Growth**

We have examined the various dynamics of firms' export. Here, we would decompose export growth at the intensive and extensive margins to examine their relative contributions. We dig deeper here than the often analyzed firm-level dynamics, by also examining what propels export growth at the firm-product, firm-destination and firm-product-destination levels. For any two periods, the intensive margin of trade growth is the trade value increase due to the surviving trade relationships, and the extensive margin of trade growth is the net of trade value increase from births in the second period, and trade value decrease from deaths in



the first period. In formula form, trade value changes between any two periods for a particular trade relationship between  $t$  and  $t+\Delta t$ , can be written as:

$$\Delta Y = \left\{ \sum_{trade \in Entering} \Delta Y_{trade} + \sum_{trade \in Death} \Delta Y_{trade} \right\} + \sum_{trade \in Surviving} \Delta Y_{trade}$$

Where *trade* indexes any level of the analyses (for instance, firm-level, or firm-product level); and *Entering*, *Death*, and *Surviving* are those trade relationships that existed only in the second period, only in the first period, and in both periods respectively. The bracket is the sum of changes of trade relationships belonging to *Entering* and *Death* groups—trade changes at the extensive margin, and the last item is the sum of changes belonging to the *Surviving* group—trade changes at the intensive margin. The contributions to total trade changes are the corresponding shares of changes from the extensive and intensive margins.

### 7.1. Intensive and Extensive Margins of Growth by Firm Types

Trade value changes by firm groups are reported in Table 21, together with their percentage contributions to export growth, between any two consecutive years and for the sample period.

It reveals a few interesting observations. First, annual trade value increase is significant, with a total increase from 2000 to 2006 of more than US\$471 billion. Second, for any two consecutive years, trade increases from *surviving* firms are much larger than trade increase from *entering* firms, except for 2000-2001 period, when China became a WTO member in 2001. Firm exits always register a negative contribution, but compared with new trade created by entrants, they are much smaller. Third, taken together, the intensive margin contributed about four fifths to annual export growth, and the extensive margin one fifth, except during 2000-2001 period, where the extensive margin is about a third to export growth. Fourth, for the 7-year sample period between 2000 and 2006, the extensive margin of the net effects of firm births and deaths contributed slightly more than two thirds to export growth, and the intensive margin only around one third.

This implies that where annual trade growth are largely driven by intensive margin—*surviving* firms operating in both periods, long term trade growth is primarily driven by the extensive margin—due to firm births (offsetting firm deaths). This result is consistent with Manova and Zhang (2009), where they reported a 70% intensive margin and 30% extensive margin between 2003-2005 (two years), and many other studies including Bernard et al.

(2009) where they find that short-term US trade change are primarily caused by intensive margins, but long-term export growth comes from extensive margin.

Given the importance of *surviving* firms in driving annual trade growth, we now examine the sources of growth for these firms, from the product dimension and also from the destination dimension. For any two periods of the analysis, we divide their products (destinations) as *entering* (existed only in the second time period), *surviving* in both periods, and *death* (exited only in the first period). The middle section of Table 21 reports the metrics at the product dimension, and the bottom part for destination dimension.

For *surviving* firms, their annual export growth primarily comes from the intensive margin—either from their *surviving* products or their *surviving* destinations. The intensive margin from *surviving* products fluctuates annually, but with a commanding majority in the range of 73-86%. For the 7-year period, the intensive margin contributes around 44% to *surviving* firms' export growth, and the extensive margin with an impressive 56%.

For *surviving* firms' *surviving* destinations, the importance to *surviving* firms' export growth is larger: the intensive margin contributes in the range of 73-89% for annual export growth, and 68% to the 7-year trade growth. The findings, facilitated by the product and destination level data, help us understand the firms' underlying export strategies and the driving forces in their export growth.

## 7.2. Margins of Growth from Firm-Product Duos

We now turn to a finer trade relationship at the firm-product level. Moving from firm level to firm-product level changes the scope of the extensive and intensive margins. For any two periods, new products introduced by *surviving* firms, and by *exiting* firms are now part of firm-product births. Similarly, dropped products by *surviving* firms, and those by *exiting* firms, are now counted as deaths. The scope for the intensive margin is now limited to *surviving* firms' *surviving* products—the *surviving* firm-product pairs, which obviously represent only a fraction of exports for *surviving* firms. We thus expect that the extensive margin of export growth to be larger, and the intensive margin smaller than those at the firm level. Table 22 reports the contributions to China's export growth by firm-product pairs at the intensive and extensive margins.

It is obvious that, increases in annual growth from *entering* firm-product trades are substantial. The larger trade increase from firm-product births than from firm births is precisely because of the addition in new products introduced by *surviving* and *exiting* firms.

Similarly, decreases in trade value from firm-product deaths are also larger than deaths by firm exits, as dropped products by *surviving* firms are now counted as deaths as well. It is of course the case that for any two consecutive years, increases in trade volume from *surviving* F-P pairs are smaller than increases in *surviving* firms only.

Even at this finer level, first, for any two consecutive years, trade growth is still largely caused by the intensive margin—*surviving* firms' *surviving* products, with about 55-70%, while the extensive margin accounts for about 30-45%. The exception is for 2000-2001. During 2000-2001, *entering* F-P trades were 151% of total changes, 3 times the change made by *surviving* F-Ps; but death caused large destruction as well. Overall, the extensive margin contributed to almost 48% of export growth from 2000 to 2001. This once again highlights the large influx of “*newness*” around China's entry to the WTO. Second, for the whole sample period of 7 years, it is clearly the case that, extensive margin is the major driver of long-term trade growth—intensive margin only contributed to 14% of export growth from 2000 to 2006, while extensive margin has the monster's share of 86%. The 7-year contribution from the intensive margin is much smaller than at the firm level, while the opposite is true for the extensive margin.

### **7.3. Margins of Growth from Firm-Destination Trade**

This subsection is parallel to 7.2. For any two periods, new destinations expanded by *surviving* firms, and by *exiting* firms are now part of firm-destination births. Similarly, dropped destinations by *surviving* firms are now counted as deaths, together with destinations dropped by exiting firms. Table 23 reports the growth decomposition.

First, for any two consecutive years, the intensive margin to China's trade growth is still the largest, accounting for 65-75%, while the extensive margin the remaining 25-35%, except 2000-2001 period, which is larger. Second, for the 7-year period of 2000-2006, export growth from the intensive margin—the same set of firm-destinations operated in both years only contributed to 22% of export growth, and the remaining 78% are from the extensive margin. It confirms earlier findings that long-term trade growth is primarily led by the extensive margins. Also, comparing the growth contribution from firm-product and firm-destination trade relationships, we conclude that product churning is more active than destination portfolio change, and thus the intensive margin of export growth from firm-destination is larger than that of firm-product for any appropriate comparisons.

#### **7.4. Growth Contribution from Firm-Product-Destination Trade**

At this level, the intensive margin of growth for any given two periods is only limited to trade increase from *surviving* firms' *surviving* products in *surviving* destinations. Everything else is included in the extensive margin. We would expect a smaller growth contribution at the intensive margin, and a larger contribution at the extensive margin, compared with firm-level, firm-product level or firm-destination level analysis. Table 24 documents the associated results.

For any two consecutive years, contribution to trade growth from the extensive margin is much larger than those analyzed before, and the opposite is true for the intensive margin. Overall, contribution to trade growth at the two margins are of similar magnitudes, though fluctuating across years. The exception is for the 2000-2001 period, where extensive margin is 72%, and intensive margin is only about 28%, due to the large entry and exit.

For the 7-year period, export changes are primarily caused new births (112% of total export growth); and after offsetting trade destruction from deaths, the extensive margin contributes over 92% of export increase. The intensive margin contributes to a mere 8%. The much larger contribution from the extensive margin reflects the real dynamics at the firm-product-destination level.

#### **8. Conclusions**

We study China's trade dynamics at the firm, product and destination levels, and the combinations of any two of the three and all three levels. Utilizing a very rich panel data on firms' export transaction data at the firm-product-destination level from 2000 to 2006, we decompose China's export growth at the intensive and extensive margins, emphasizing the roles of firms, products and destinations. To that end, we group firms, firms' products and firms' destinations into three categories as *new*, *continuing (continued)* and *exiting (dropped)*. We capture China's export annual growth from the perspectives of trade relationship created, survived, and destructed in terms of the extensive and intensive margins.

Along the many different levels of analysis, we find that short-term trade growth is primarily driven by the intensive margin, though new births always contributed a very large share to annual export changes. In the 7-year period, it is the extensive margin that drives China's export growth. For *surviving* firms, their *surviving* products, and their *surviving* destinations are the driving force in their annual export growth.

Exporters maintain exporting strategies. Product churning is an important part in firms' product strategy. Firms routinely introduce new products, and drop some old products in order to have a suitable product mix for their destination markets. In addition, we find that firms not only have a top product strategy, they also maintain an active product mix, including *added*, *continued* and *dropped* products. A similar pattern is observed for firms' destination strategy. During exporters' active product churning and destination shuffles, they only drop their fringe products, and their smaller/unimportant markets.

*Continued* products or destinations are the cornerstones for *continuing* exporters. Exporters send their *continued* products to all types of their destinations, and export all types of products to their *continued* destinations; while *continued* products or *continued* destinations are the largest in number and the heaviest in trade volume.

These stylized facts help uncover a true dynamic nature of firms' export relationships, which, hopefully, can help provide new empirical evidences to lead trade theory developments to fully incorporate firms' joint product-destination exporting strategy.

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**Table 1. A Steady Stream of Firm Births, Remarkable Successes and Some Deaths**

Year	New Firms (FN)			Continuers (FC)	Exitors (FE)	Total	Gross Entry and Exit Rate
	Successful	One-time	Subtotal				
2000						53,822	
2001	11,837 (20.17)	1,891 (3.22)	13,728 (23.40)	38,834 (66.18)	6,115 (10.42)	58,677	<b>(33.82)</b>
2002	15,399 (22.75)	2,227 (3.29)	17,626 (26.04)	44,536 (65.79)	5,534 (8.17)	67,696	<b>(34.21)</b>
2003	18,138 (22.27)	3,576 (4.39)	21,714 (26.66)	53,011 (65.08)	6,724 (8.26)	81,449	<b>(34.92)</b>
2004	24,763 (24.80)	4,176 (4.18)	28,939 (28.98)	62,651 (62.74)	8,264 (8.28)	99,854	<b>(37.26)</b>
2005	22,876 (18.22)	14,905 (11.87)	37,781 (30.09)	75,264 (59.94)	12,527 (9.98)	125,572	<b>(40.06)</b>
2006						131,248	
Number of unique exporters for 2000-2006						204,739	

Note: Numbers in parentheses are the corresponding percentages (%) in the annual total. Gross entry and exit rates each year are the sum of annual entry and exit rates.

**Table 2. Successful Entrants' Transition from Year ( $t-1$ ) to  $t$** 

	Entrants (successful) in $t-1$	Status in $t$		
		Continuers	Exitors	Others
2002	11,837	10,028 (84.72)	1,285 (10.86)	524 (4.43)
2003	15,399	13,176 (85.56)	1,619 (10.51)	604 (3.92)
2004	18,138	15,298 (84.34)	2,148 (11.84)	692 (3.82)
2005	24,763	19,235 (77.68)	4,956 (20.01)	572 (2.31)

Note: Numbers in parentheses are the corresponding shares in annual total. The table should be interpreted as the following (taking year 2002 as the case). There were 11,837 successful entrants in year 2001 (which also exported after year 2001). Among those, 84.72% exported at least in both 2002 and 2003—"continuers" in year 2002, 10.86% died in 2002—"exitors", and 4.43% did not export in 2002, but exported in other later years—"others".



**Table 3. Continuing Firms are Heavy-Lifters of China's Exports**  
(Unit: 2000 US\$ in millions)

year	New Firms ( <i>FN</i> )			Continuers ( <i>FC</i> )	Exitors ( <i>FE</i> )	Annual Total
	Successful	One-time	Subtotal			
						153,040
2001	0.831 (5.86)	0.156 (0.18)	(6.04)	3.971 (91.83)	0.587 (2.14)	167,610
2002	0.86 (6.29)	0.162 (0.17)	(6.46)	4.347 (91.88)	0.634 (1.67)	210,900
2003	0.983 (6.13)	0.158 (0.19)	(6.32)	5.059 (92.16)	0.659 (1.52)	291,015
2004	1.086 (6.78)	0.256 (0.27)	(7.05)	5.788 (91.42)	0.733 (1.53)	396,595
2005	1.05 (4.66)	0.76 (2.20)	(6.86)	6.198 (90.43)	1.117 (2.71)	515,500
2006						625,400

Note: The numbers are the average export values for each set of firms, calculated by total exports per group each year divided by the number of trade relationship per group. The last column is the annual total for firms in the sample. Numbers in parentheses their corresponding shares in the annual total.

**Table 4A: China's Export Discovery in the Hundreds**

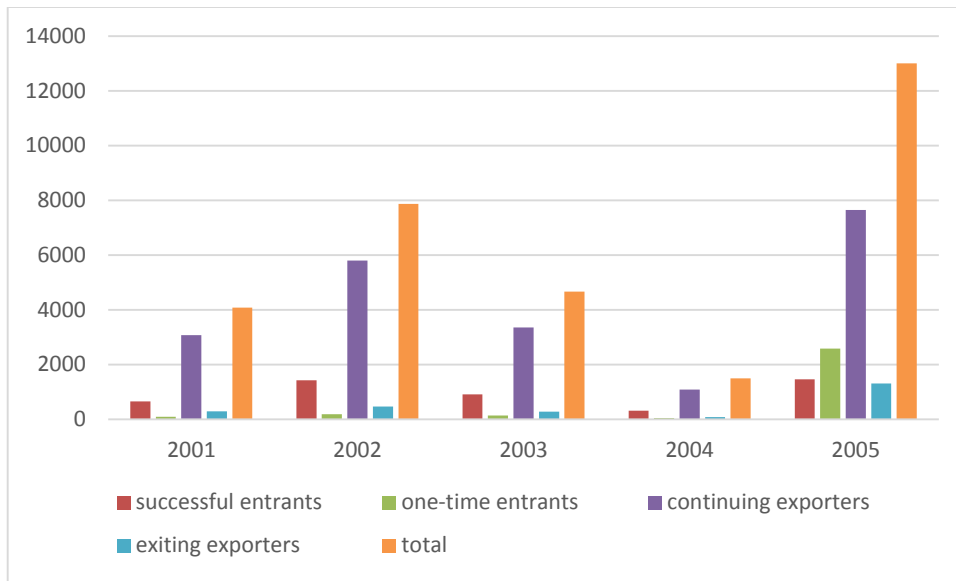
Year	<i>Added Products</i>		<i>Continued Products</i>	<i>Dropped Products</i>	Total	Gross Churning Rate
	<i>Successful</i>	<i>One-time</i>				
2000					6,357	
2001	313	37	5,743	321	6,414	0.105
2002	547	27	5,958	76	6,608	0.098
2003	230	16	6,434	53	6,733	0.044
2004	74	16	6,611	93	6,794	0.027
2005	134	46	6,586	192	6,958	0.053
2006					6,965	
Unique products exported for 2000-2006:					7,932	

**Table 4B: The Overwhelming Majority of Discovered Products Were Kept Exporting**

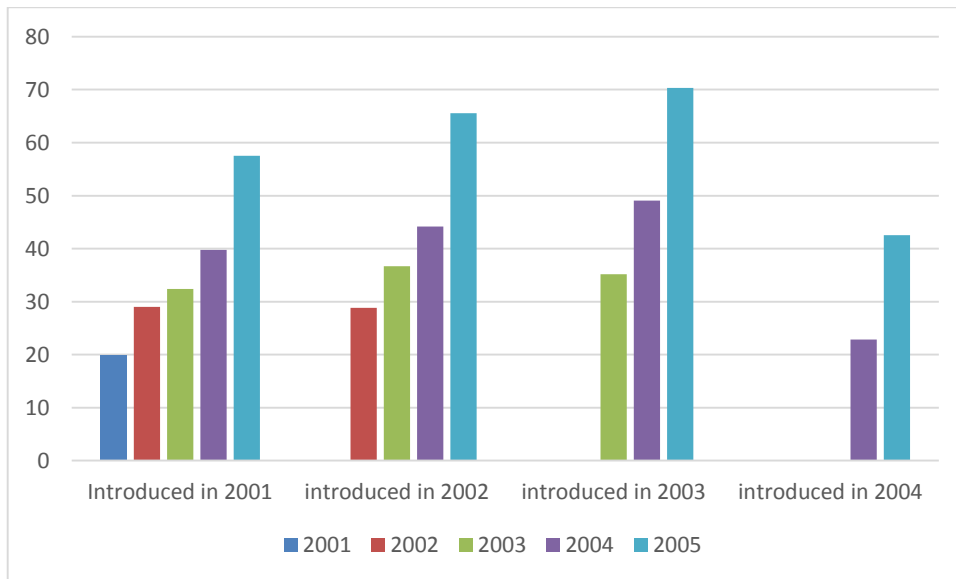
year	<i>Successful new products in year t-1</i>	Status in year <i>t</i>		
		<i>Continued</i>	<i>Dropped</i>	Others
2002	313 (100)	242 (77.32)	6 (1.92)	65 (20.77)
2003	547 (100)	478 (87.39)	14 (2.56)	55 (10.05)
2004	230 (100)	203 (88.26)	5 (2.17)	22 (9.57)
2005	74 (100)	52 (70.27)	13 (17.57)	9 (12.16)

Note: Numbers in parentheses are corresponding shares (%). It reads as the following: among the 313 successful new products introduced in 2001, 242 are kept exporting both in 2002 and 2003, 6 are dropped in 2002, and 65 are not exported in 2002, but in other remaining years in the sample.

**Figure 1: Number of Firms by Type Making Annual Product Discoveries**



**Figure 2: The Average Number of Firms Exporting a New Variety by Year**



Note: the figure can be explained as the following. Take product discoveries made in 2001 (“introduced in 2001” in the graph) to illustrate the point. In 2001, on average, there are 20 firms exporting one newly discovered product in 2001. But in 2002, the number of firms exporting 2001 discoveries increased to nearly 30, then to 32 in 2003, to 40 in 2004 and to nearly 58 in 2005.

**Table 5: Active Annual Trade Relationships at the Firm-Product Level: New Are Over Half**

year	<i>Added, by:</i>				<i>Continued, by:</i>	<i>Dropped, by:</i>			Total	Net adding rate
	<i>FN</i>	<i>FC</i>	<i>FE</i>	Subtotal		<i>FC</i>	<i>FC</i>	<i>FE</i>		
2000									374,475	
2001	75,335	158,716	9,843	243,894	133,073	36,824	14,247	51,071	428,038	
(%)	(17.60)	(37.08)	(2.30)	(56.98)	(31.09)	(8.60)	(3.33)	(11.93)		<b>(45.05)</b>
2002	105,036	196,845	11,517	313,398	169,856	47,336	16,089	63,425	546,679	
(%)	(19.21)	(36.01)	(2.11)	(57.33)	(31.07)	(8.66)	(2.94)	(11.60)		<b>(45.73)</b>
2003	126,191	217,577	14,547	358,315	221,682	64,889	20,618	85,507	665,504	
(%)	(18.96)	(32.69)	(2.19)	(53.84)	(33.31)	(9.75)	(3.10)	(12.85)		<b>(40.99)</b>
2004	206,048	247,639	14,666	468,353	259,600	93,416	26,055	119,471	847,424	
(%)	(24.31)	(29.22)	(1.73)	(55.27)	(30.63)	(11.02)	(3.07)	(14.10)		<b>(41.17)</b>
2005	440,903	327,719	81,867	850,489	293,628	131,919	53,079	184,998	1,329,115	
(%)	(33.17)	(24.66)	(6.16)	(63.99)	(22.09)	(9.93)	(3.99)	(13.92)		<b>(50.07)</b>
2,006									1,118,357	
Unique firm-product trading pairs for 2000-2006:									3,200,748	

**Table 6: New F-P Exports Are Small, Regardless of Birth Parents (Unit: 2000 US\$ in 000s)**

year	<i>Added, by:</i>				<i>Continued</i>	<i>Dropped, by</i>		
	<i>FN</i>	<i>FC</i>	<i>FE</i>	Group average		<i>FC</i>	<i>FE</i>	Group average
2,001	135	79	38	95	969	348	226	314
2002	129	131	41	127	901	315	189	283
2,003	146	171	47	157	1015	85	181	108
2,004	136	76	26	101	1263	166	218	177
2005	80	105	29	85	1410	138	219	161

Note: Average trade value for each F-P is obtained by total exports per year by group divided by the number of firm-product pairs in each group.

**Figure 3: Continuing Firms: Product Churning Is the Norm**



Notation: (1) introduced new products; (2) kept continued products; (3) dropped old products. The ratio is calculated as the number of firms falling in each category over the total number of *continuing* firms in that year.

**Table 7: Active Annual Trade Relationships at the Firm-Destination Level: New Firm-Market Expansion Is the Norm**

year	<i>Added, by:</i>				<i>Continued, by:</i>	<i>Dropped, by:</i>			Total	Net adding rate
	<i>FN</i>	<i>FC</i>	<i>FE</i>	Subtotal		<i>FC</i>	<i>FC</i>	<i>FE</i>		
2000									270,514	
2001	46,290	93,040	5,120	144,450	139,508	19,165	12,975	32,140	316,098	
(%)	(14.64)	(29.43)	(1.62)	(45.70)	(44.13)	(6.06)	(4.10)	(10.17)		<b>(35.53)</b>
2002	63,020	107,325	4,660	175,005	178,967	26,907	13,536	40,443	394,415	
(%)	(15.98)	(27.21)	(1.18)	(44.37)	(45.38)	(6.82)	(3.43)	(10.25)		<b>(34.12)</b>
2003	74,473	128,828	6,162	209,463	231,215	38,310	17,066	55,376	496,054	
(%)	(15.01)	(25.97)	(1.24)	(42.23)	(46.61)	(7.72)	(3.44)	(11.16)		<b>(31.06)</b>
2004	110,262	160,580	7,958	278,800	283,026	55,947	22,028	77,975	639,801	
(%)	(17.23)	(25.10)	(1.24)	(43.58)	(44.24)	(8.74)	(3.44)	(12.19)		<b>(31.39)</b>
2005	166,218	209,703	24,622	400,543	336,694	92,301	34,241	126,542	863,779	
(%)	(19.24)	(24.28)	(2.85)	(46.37)	(38.98)	(10.69)	(3.96)	(14.65)		<b>(31.72)</b>
2,006									919,375	
Unique firm-destination pairs for 2000-2006:									1,838,580	

**Table 8: Average F-D Exports Trade Value Per F-D by Year (unit: 2000 US\$ in 000s)**

year	<i>Added, by:</i>				<i>Continued, by:</i>	<i>Dropped, by:</i>		
	<i>FN</i>	<i>FC</i>	<i>FE</i>	Group average		<i>FC</i>	<i>FC</i>	<i>FE</i>
2,001	219	95	71	134	1025	123	249	174
2002	215	99	54	140	1006	118	241	159
2,003	247	106	54	154	1081	119	240	156
2,004	254	102	55	161	1198	131	255	166
2005	212	108	75	149	1283	122	353	185

Note: Average trade value for each F-D is obtained by total exports per year by group divided by the number of firm-destination pairs in each group..

**Table 9: New F-P-D Trade Relationships Are the Annual Majority**

year	<i>Added, by:</i>				<i>Continued, by:</i>	<i>Dropped, by:</i>			Total	Net adding rate
	<i>FN</i>	<i>FC</i>	<i>FE</i>	Subtotal		<i>FC</i>	<i>FC</i>	<i>FE</i>		
2000									766,681	
2001	136,103	427,229	20,853	584,185	229,060	83,352	19,929	103,281	916,526	
(%)	(14.85)	(46.61)	(2.28)	(63.74)	(24.99)	(9.09)	(2.17)	(11.27)		<b>(52.47)</b>
2002	180,940	546,800	24,771	752,511	301,452	111,312	22,628	133,940	1,187,903	
(%)	(15.23)	(46.03)	(2.09)	(63.35)	(25.38)	(9.37)	(1.90)	(11.28)		<b>(52.07)</b>
2003	213,842	641,503	31,555	886,900	408,298	152,922	28,701	181,623	1,476,821	
(%)	(14.48)	(43.44)	(2.14)	(60.05)	(27.65)	(10.35)	(1.94)	(12.30)		<b>(47.76)</b>
2004	345,022	762,702	35,574	1,143,298	495,326	224,739	40,220	264,959	1,903,583	
(%)	(18.12)	(40.07)	(1.87)	(60.06)	(26.02)	(11.81)	(2.11)	(13.92)		<b>(46.14)</b>
2005	712,238	1,038,423	174,136	1,924,797	571,256	314,797	64,909	379,706	2,875,759	
(%)	(24.77)	(36.11)	(6.06)	(66.93)	(19.86)	(10.95)	(2.26)	(13.20)		<b>(53.73)</b>
2,006									2,660,095	
Unique firm-product-destination trios for 2000-2006:									7,574,802	

**Table 10: Average F-P-D Exports Trade Value Per F-P-D by Year: Starting Small (unit: 2000 US\$ in 000s)**

year	<i>Added, by:</i>				<i>Continued, by:</i>	<i>Dropped, by:</i>		
	<i>FN</i>	<i>FC</i>	<i>FE</i>	Group Average		<i>FC</i>	<i>FC</i>	<i>FE</i>
2,001	74	57	34	60	502	182	145	175
2002	75	74	29	73	451	157	123	151
2,003	86	85	34	84	495	75	117	81
2,004	81	57	24	64	594	108	129	111
2005	50	65	22	55	642	101	156	111

Note: Average trade value for each F-P-D is obtained by total exports per year by group divided by the number of F-P-D trios in each group.

**Table 11: Multi-product (P), Multi-destination (D) Firms—Numbers of Firms**

P/D	1	2	3	4-10	11-25	26-50	51+	Subtotal
1	28,493 (13.92)	6,109 (2.98)	2,605 (1.27)	4,955 (2.42)	1,518 (0.74)	288 (0.14)	41 (0.02)	44,009 (21.50)
2	9,701 (4.74)	6,510 (3.18)	2,943 (1.44)	5,667 (2.77)	2,018 (0.99)	480 (0.23)	56 (0.03)	27,375 (13.37)
3	4,800 (2.34)	3,851 (1.88)	2,426 (1.18)	5,291 (2.58)	2,054 (1.00)	576 (0.28)	57 (0.03)	19,055 (9.31)
4-10	9,520 (4.65)	7,910 (3.86)	6,217 (3.04)	19,979 (9.76)	11,108 (5.43)	3,852 (1.88)	620 (0.30)	59,206 (28.92)
11-25	2,941 (1.44)	2,691 (1.31)	2,162 (1.06)	9,820 (4.80)	8,365 (4.09)	4,122 (2.01)	994 (0.49)	31,095 (15.19)
26-50	929 (0.45)	864 (0.42)	669 (0.33)	3,473 (1.70)	4,003 (1.96)	2,240 (1.09)	760 (0.37)	12,938 (6.32)
51-100	260 (0.13)	320 (0.16)	268 (0.13)	1,346 (0.66)	2,134 (1.04)	1,363 (0.67)	474 (0.23)	6,165 (3.01)
101+				426 (0.21)	1,018 (0.50)	1,808 (0.88)	1,476 (0.72)	4,892 (2.39)
Subtotal	56,707 (27.70)	28,303 (13.82)	17,343 (8.47)	50,957 (24.89)	32,218 (15.74)	14,729 (7.19)	4,478 (2.19)	204,735 (100.00)

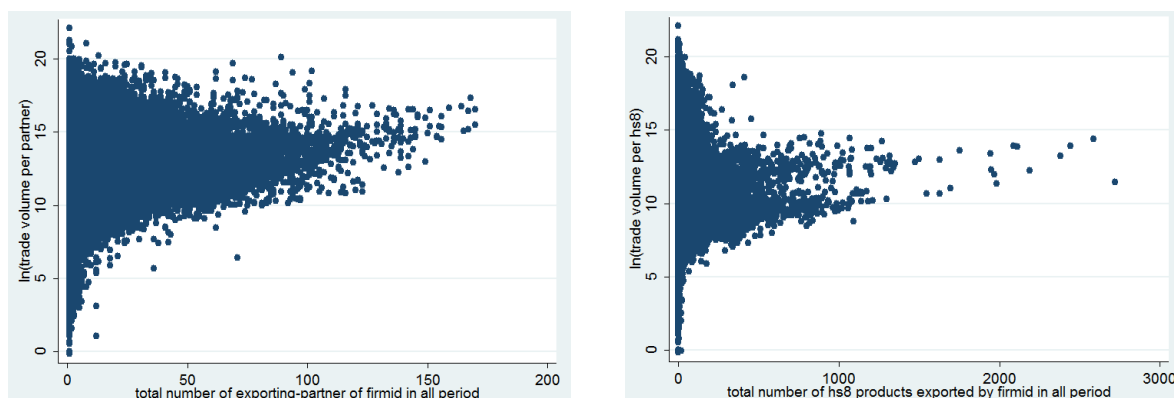
Note: A firm's number of products (destinations) exported is counted as the total number of unique products (destinations) exported during the sample period, not a particular year. Numbers in parentheses are the corresponding shares.

**Table 12: Multi-product, Multi-destination Firms—Export Shares by Group (%)**

P/D	1	2	3	4-10	11-25	26-50	51+	Subtotal
1	1.27	0.46	0.31	1.12	0.73	0.26	0.06	4.21
2	0.67	0.6	0.4	1.34	0.95	0.6	0.18	4.75
3	0.42	0.39	0.26	1.25	0.92	0.52	0.11	3.87
4-10	1.2	1.23	1.17	5.21	6.39	4.3	1.43	20.93
11-25	0.67	0.72	0.74	3.7	6.74	5.47	2.42	20.47
26-50	0.29	0.3	0.26	2.06	4.75	5.58	3.33	16.57
51-100	0.12	0.39	0.13	1.79	2.22	4.04	4.67	13.36
101+	0.08	0.03	0.05	0.47	1.27	3.45	10.5	15.84
Subtotal	4.72	4.13	3.32	16.95	23.97	24.23	22.69	100

Note: Export share for each firm group is calculated in two steps. First, we calculate average exports per firm during the sample period. Then, we add firms' average export values to get total, and also for each subgroup. The export share for each subgroup is obtained by dividing the subgroup sum over total.

**Figure 4: Average Exports (in lns) per Product (Destination) vs the # of Products (Destinations)**



**Table 13: Continuing Firms' Product Mix**

Year	<i>Added</i>			<i>Continued</i>	<i>Dropped</i>	Total
	<i>Successful</i>	<i>One time</i>	Subtotal			
2001	1.98	2.11	4.09	3.43	0.95	8.46
2002	2.11	2.31	4.42	3.81	1.06	9.30
2003	1.87	2.24	4.10	4.18	1.22	9.51
2004	1.64	2.31	3.95	4.14	1.49	9.59
2005	1.51	2.85	4.35	3.90	1.75	10.01

Note: The average number of products by type each year is obtained as the total number of products in each group by *continuing* firms in that year divided by the number of *continuing* firms in that year.

**Table 14: Firms' Product Rank: Export Shares of Firms' Top Products**

rank	1	2	3	4-10	11-25	26-50	51-100	101+
1	1	0.896	0.842	0.775	0.636	0.561	0.560	0.391
2		0.104	0.138	0.152	0.185	0.187	0.171	0.139
3			0.020	0.047	0.081	0.090	0.080	0.074
4				0.017	0.041	0.051	0.045	0.052
5				0.006	0.022	0.029	0.030	0.041
6				0.002	0.012	0.020	0.021	0.031

Note: The share is calculated as the following. First, for each product, we calculate its annual export share within a firm. Then, we take the average of that product's export share with a firm during the sample period, to take into consideration the different product mix across years. Finally, for that product, we average its export share across firms within that subgroup.



**Table 15: Continuing Firms Drop Fringe Products**  
**(Dependent variable: A Product being Dropped by a Continuing Firm  $i$  at  $t$ )**

	(1)	(2)	(3)	(4)	(5)	(6)
Product $j$ 's Export Share at (t-1) for firm $i$	-0.158** (-144.48)			-0.166** (-151.35)		
Product $j$ 's ln export value at (t-1) for firm $i$		-0.024** (-203.68)			-0.023** (-196.04)	
Firm $i$ 's Product $j$ 's export share in total exports of $j$ by China at (t-1)			-143.45** (-17.90)			-126.63** (-15.84)
Years of Exporting for firm $i$				-0.025** (-103.05)	-0.018** (-74.98)	-0.022** (-92.37)
$N$	1340667	1340666	1340667	1340667	1340666	1340667
$R^2$	0.002	0.010	0.000	0.028	0.031	0.024

Note: \*\* indicates a significance level of 1%, and figures in parentheses are t-statistics.

**Table 16: Average Number of Destinations Entered per Continuing Firm by Year**

Year	<i>Added</i>			<i>Continued</i>	<i>Dropped</i>	Total
	<i>Successful</i>	<i>One time</i>	Subtotal			
2001	1.61	0.79	2.40	3.59	0.95	6.48
2002	1.62	0.79	2.41	4.02	1.06	7.03
2003	1.57	0.86	2.43	4.36	1.22	7.52
2004	1.55	1.02	2.56	4.52	1.49	7.97
2005	1.42	1.36	2.79	4.47	1.75	8.49

Note: the average number of destinations in each category is obtained by summing these respective categories over all FCs for each year, and divided by the number of FCs firms in that year.

**Table 17: Firms' Destination Rank: Export Share of Firms' Top Destinations**

rank	1	2	3	4-10	11-25	26-50	51+
1	1	0.935	0.901	0.781	0.586	0.460	0.369
2		0.065	0.085	0.134	0.173	0.171	0.160
3			0.014	0.049	0.088	0.097	0.089
4				0.020	0.050	0.062	0.056
5				0.009	0.032	0.044	0.042
6				0.004	0.022	0.032	0.034

Note: The share is calculated as the following. First, for each destination, we calculate its annual export share within a firm. Then, we take the average of that destination's export share with a firm during the sample period, to take into consideration the different destination portfolio across years. Finally, for that destination, we average its export share across firms within that subgroup.

**Table 18: Continuing Firms Drop Unimportant Destinations  
(Dependent variable: A Destination being Dropped by Firm  $i$  at  $t$ )**

	(1)	(2)	(3)	(4)	(5)	(6)
Destination $d$ 's Export Share at (t-1) for firm $i$		-0.177** (-173.01)		-0.200** (-195.54)		
Destination $d$ 's ln export value at (t-1) for firm $i$			-0.033*** (-240.13)		-0.032** (-232.14)	
Firm $i$ 's Destination $d$ 's export share in total exports in $d$ by China at (t-1)				-279.45** (-34.60)		-248.96** (-31.04)
Years of exporting for Firm $i$				-0.041** (-169.41)	-0.031** (-129.52)	-0.035** (-142.18)
$N$		1402040	1402040	1402040	1402040	1402040
$R^2$		0.005	0.011	0.001	0.130	0.122

Note: \*\* indicates a significance level of 1%, and figures in parentheses are t-statistics.

**Table 19: Number of Products per *Continuing* Firm's per *Continued* Destination  
(Figures in Parentheses are Their Respective Export Shares; %)**

Year	<i>Added</i> Products			<i>Continued</i> Products	<i>Dropped</i> Products	Total
	<i>Successful</i>	<i>One time</i>	Subtotal			
2001	0.63 (0.060)	0.47 (0.027)	1.10 (0.087)	2.47 (0.858)	0.33 (0.055)	3.89
2002	0.63 (0.075)	0.47 (0.026)	1.10 (0.100)	2.57 (0.857)	0.32 (0.042)	3.99
2003	0.51 (0.064)	0.42 (0.022)	0.93 (0.085)	2.68 (0.884)	0.31 (0.031)	3.92
2004	0.41 (0.043)	0.41 (0.021)	0.82 (0.064)	2.65 (0.888)	0.40 (0.048)	3.87
2005	0.42 (0.057)	0.47 (0.022)	0.90 (0.079)	2.63 (0.881)	0.43 (0.040)	3.96

Note: The number of products by type each year is calculated as the total number of products in each type for all *continuing* firms' *continued* destinations in that year divided by the number of *continuing* firms' *continued* destinations in the same year.

**Table 20: Number of Destinations per *Continuing* Firm's per *Continued* Product  
(Figures in parentheses are their respective export shares)**

Year	<i>Added</i>			<i>Continued</i>	<i>Dropped</i>	Total
	<i>Successful</i>	<i>One time</i>	Subtotal			
2001	0.52 (0.049)	0.20 (0.014)	0.72 (0.064)	2.58 (0.917)	0.16 (0.020)	3.46
2002	0.47 (0.047)	0.18 (0.014)	0.65 (0.061)	2.71 (0.918)	0.18 (0.021)	3.54
2003	0.44 (0.044)	0.19 (0.015)	0.63 (0.058)	2.80 (0.919)	0.20 (0.023)	3.62
2004	0.44 (0.044)	0.24 (0.018)	0.68 (0.062)	2.89 (0.910)	0.25 (0.028)	3.83
2005	0.46 (0.051)	0.33 (0.024)	0.80 (0.075)	3.02 (0.889)	0.38 (0.036)	4.20

Note: The number of destinations by type each year is calculated as the total number of destinations in each type for all *continuing* firms' *continued* products in that year divided by the number of *continuing* firms' *continued* products in the same year.

**Table 21: Growth Decomposition to China's Trade by Firm Types**

	2000- 2001	2001- 2002	2002- 2003	2003- 2004	2004- 2005	2005- 2006	2000- 2006
<b>Total trade value Δ:</b>	<b>15.01</b>	<b>42.61</b>	<b>80.71</b>	<b>105.86</b>	<b>119.03</b>	<b>110.4</b>	<b>471.4</b>
—due to firm deaths	-5.09	-4.29	-4.29	-6.64	-7.47	-25.3	-45.6
—Δ in surviving firms	10	33	66	84	90	97	150
—due to firm births	10.1	13.9	19	28.5	36.5	38.7	367
<b>% Contribution to total change:</b>							
—due to firm deaths	-33.91	-10.07	-5.32	-6.27	-6.28	-22.92	-9.67
—Δ in surviving firms	66.62	77.45	81.77	79.35	75.61	87.86	31.82
—due to firm births	67.29	32.62	23.54	26.92	30.66	35.05	77.85
<b>Intensive Margin (%)</b>	<b>66.62</b>	<b>77.45</b>	<b>81.77</b>	<b>79.35</b>	<b>75.61</b>	<b>87.86</b>	<b>31.82</b>
<b>Extensive Margin (%)</b>	<b>33.38</b>	<b>22.55</b>	<b>18.23</b>	<b>20.65</b>	<b>24.39</b>	<b>12.14</b>	<b>68.18</b>
<b>Margin of Growth Contribution for Surviving Firms—Product Dimension (%)</b>							
—due to <i>dropped</i> products	-13.02	-53.69	-13.53	-35.94	-25.25	-26.00	-24.73
—Δ in <i>surviving</i> products	97.32	73.75	86.23	75.27	80.84	82.81	43.62
—due to <i>added</i> products	15.69	79.94	27.31	60.68	44.41	43.19	81.12
<b>Intensive Margin</b>	<b>78.43</b>	<b>73.75</b>	<b>75.27</b>	<b>86.23</b>	<b>80.84</b>	<b>82.81</b>	<b>43.62</b>
<b>Extensive Margin</b>	<b>21.57</b>	<b>26.25</b>	<b>24.73</b>	<b>13.77</b>	<b>19.16</b>	<b>17.19</b>	<b>56.38</b>
<b>Margin of Growth Contribution for Surviving Firms—Destination Dimension (%)</b>							
—due to <i>dropped</i> destinations	-4.21	-21.39	-11.06	-12.95	-16.45	-18.14	-7.93
—Δ in <i>surviving</i> destinations	45.03	85.44	86.36	89.07	83.89	84.46	68.00
—due to <i>added</i> destinations	59.18	35.95	24.70	23.87	32.56	33.68	39.93
<b>Intensive Margin</b>	<b>72.54</b>	<b>85.44</b>	<b>86.36</b>	<b>89.07</b>	<b>83.89</b>	<b>84.46</b>	<b>68.06</b>
<b>Extensive Margin</b>	<b>27.46</b>	<b>14.56</b>	<b>13.64</b>	<b>10.93</b>	<b>16.11</b>	<b>15.54</b>	<b>31.94</b>

Note: All changes are in US 2000 constant \$ in billion. The total change in each column here is not directly calculated as the difference between corresponding annual totals, but rather, the sum of changes of each component. As it will be shown in later tables, due to rounding, the total annual between any two years are not exactly the same, although the annual total are always matched up regardless of how we group the data. For any two periods of comparison, firm death (dropped products or destinations), surviving firms (products or destinations), and firm births (added products or destinations) are defined as exiting only in the first period, in both periods, and in the second period respectively.

**Table 22: Contribution to Export Growth by Firm-Product Trade**

	2000- 2001	2001- 2002	2002- 2003	2003- 2004	2004- 2005	2005- 2006	2000- 2006
<b>Total Trade Value</b>							
<b>Δ:</b>	<b>15.3</b>	<b>43.5</b>	<b>79.8</b>	<b>105.3</b>	<b>119.4</b>	<b>108.8</b>	<b>471.8</b>
Δ in F-P deaths	-15.8	-22.5	-27.7	-18	-30.2	-50.1	-82.8
Δ in continuing F- P pairs	8	25	49	72	73	79	65.6
Δ in F-D births	23.1	41	58.5	51.3	76.6	79.9	489
<b>% Contribution to total Δ:</b>							
Δ in F-P deaths	-103.27	-51.72	-34.71	-17.09	-25.29	-46.05	-17.55
Δ in continuing F- P pairs	52.29	57.47	61.40	68.38	61.14	72.61	13.90
Δ in F-P births	150.98	94.25	73.31	48.72	64.15	73.44	103.65
<b>Intensive Margin</b>	<b>52.29</b>	<b>57.47</b>	<b>61.40</b>	<b>68.38</b>	<b>61.14</b>	<b>72.61</b>	<b>13.90</b>
<b>Extensive Margin</b>	<b>47.71</b>	<b>42.53</b>	<b>38.60</b>	<b>31.62</b>	<b>38.86</b>	<b>27.39</b>	<b>86.10</b>

Note: All changes are in US 2000 constant \$ in billion. The total change in each column here is not directly calculated as the difference between corresponding annual totals, but rather, the sum of changes of each component. For any two periods of comparison, firm-product death, surviving firm-product pairs, and firm-product deaths are defined as exiting only in the first period, in both periods, and in the second period respectively.

**Table 23: Surviving Firm-Destinations are Stable Source of Export Growth Annually**

	2000- 2001	2001- 2002	2002- 2003	2003- 2004	2004- 2005	2005- 2006	2000- 2006
<b>Total Trade Value</b>							
<b>Δ:</b>	<b>14.7</b>	<b>43.4</b>	<b>80.8</b>	<b>105.9</b>	<b>119.7</b>	<b>109.3</b>	<b>471.8</b>
Δ in F-D deaths	-11.6	-11.6	-11.6	-17.6	-22.3	-42.7	-57.5
Δ in continuing F- D pairs	7	29	57	75	76	81	102.3
Δ in F-D births	19.3	26	35.4	48.5	66	71	427
<b>% Contribution to total Δ:</b>							
Δ in F-D deaths	-78.91	-26.73	-14.36	-16.62	-18.63	-39.07	-12.19
Δ in continuing F- D pairs	47.62	66.82	70.54	70.82	63.49	74.11	21.68
Δ in F-D births	131.29	59.91	43.81	45.80	55.14	64.96	90.50
<b>Intensive Margin</b>	<b>47.62</b>	<b>66.82</b>	<b>70.54</b>	<b>70.82</b>	<b>63.49</b>	<b>74.11</b>	<b>21.68</b>
<b>Extensive Margin</b>	<b>52.38</b>	<b>33.18</b>	<b>29.46</b>	<b>29.18</b>	<b>36.51</b>	<b>25.89</b>	<b>78.32</b>

Note: All changes are in US 2000 constant \$ in billion. The total change in each column here is the sum of changes of each component. For any two periods of comparison, firm-destination death, surviving firm-destination pairs, and firm-destination deaths are defined as exiting only in the first period, in both periods, and in the second period respectively.

**Table 24: F-P-D Trios: Extensive Margin is Key for Long-term Export Growth**

	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2000-2006
<b>Total Trade Value <math>\Delta</math>:</b>	<b>14.5</b>	<b>43.2</b>	<b>80.7</b>	<b>105.4</b>	<b>119.9</b>	<b>109.7</b>	<b>471.8</b>
$\Delta$ in F-P-D deaths	-24.6	-31.7	-38.4	-34.7	-52.1	-77.3	-94.2
$\Delta$ in continuing F-P-D trios	4	18	41	62	57	65	36
$\Delta$ in F-P-D births	35.1	56.9	78.1	78.1	115	122	530
<b>% Contribution to total <math>\Delta</math>:</b>							
$\Delta$ in F-P-D deaths	-169.66	-73.38	-47.58	-32.92	-43.45	-70.46	-19.97
$\Delta$ in continuing F-P-D trios	27.59	41.67	50.81	58.82	47.54	59.25	7.63
$\Delta$ in F-P-D births	242.07	131.71	96.78	74.10	95.91	111.21	112.34
<b><i>Intensive Margin</i></b>	<b><i>27.59</i></b>	<b><i>41.67</i></b>	<b><i>50.81</i></b>	<b><i>58.82</i></b>	<b><i>47.54</i></b>	<b><i>59.25</i></b>	<b><i>7.63</i></b>
<b><i>Extensive Margin</i></b>	<b><i>72.41</i></b>	<b><i>58.33</i></b>	<b><i>49.19</i></b>	<b><i>41.18</i></b>	<b><i>52.46</i></b>	<b><i>40.75</i></b>	<b><i>92.37</i></b>

Note: All changes are in US 2000 constant \$ in billion. The total change in each column here is the sum of changes of each component. For any two periods of comparison, firm-product-destination death, surviving firm-product-destination pairs, and firm-product-destination deaths are defined as exiting only in the first period, in both periods, and in the second period respectively.