Heterogeneous Firms and Trade: The Determinants of Exporters' Performance in Destinations, Varieties, and Quality

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Abstract

This paper investigates what kinds of exporters perform better in three aspects: export to more destinations, export more varieties of products, and export products of higher quality. Using a comprehensive firm-level panel data of Chinese electronics industry during 2003-2006 which is compiled from firm survey and Custom dataset, this study provides, one of the first systematically studies, the firm-level panel evidence to deal with this issue. We find that firm productivity matters not only in the two extensive margins in export destinations and varieties of products as expected, but also in export quality, so far novel in the existing heterogeneous-firm trade literature. Moreover, exporters' financing ability is found to be influential in all three aspects of performance. To deal with the sample selection as well as endogenous problems, we adopt also various datasets and variable measurement to implement empirical estimations. Most evidences support the importance of productivity on export performance.

JEL Classification: F1, F14
Key words: Firm heterogeneity, Export quality, Financing ability, productivity

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1. Introduction

Research on international trade has provided a number of insightful empirics in recent years. Among them, one of the most important issues is what determines firms' performance in the export extensive margins of products and destinations as well as in the product quality of export,[1] because these are vital for countries who heavily depend on export for economic growth in different development stages.

For example, along with the wave of trade liberalization, many emerging countries have experienced rapid economic growth over the past three decades. One common feature of these economies is that they mostly follow the mode of export-led economic development. The object in the initial phase of adopting the export-led strategy is to sufficiently take advantage of the export capacity for expanding the market share in world export, which implies that for these export-led countries, it is in nature that the export extensive margins of products and markets will increase with the growth of trade volume. For instance, by exporting to the world, China, now the biggest developing country, has experienced an annual 9% growth rate after it implemented the open-door policy in 1978, and her market share in world export increased from 2.9% to over 10% during 1995 to 2011.

After a period of steady economic growth, however, these export-led economies almost inevitably face challenges of structural transformation in their export sector, which suggests that purely pursing the growth of trade volume cannot guarantee the future competitiveness of export. Therefore, for now, the point should shift to concern how to improve the quality of the export goods, since this is one way to enhance the value-added of the export goods and thus raise the profits of exporting firms on the one hand. On the other hand, without quality improvement the senior emerging economies will face severe competition from junior ones

[1] The export extensive margins of products and markets refer to the number of products exported and the number of markets served.

because of the advantage in cost of production factor of the latter. The literature finds that the export quality, i.e. the quality of export goods, is significantly associated with the economic growth. Krishna and Maloney (2011) use the unit value of product as the proxy for product quality and find that the quality growth of the OECD countries is higher than that of non-OECD ones. Their finding is consistent with that of Hausmann *et al*. (2007) that the export quality of a country is statistically correlated with its own economic growth.

Although, there are some theoretical studies examining firm's export performance (we will discuss below), the empirical research is quite few. In this paper, we use a compiled firm-product level data for Chinese electronics firms to investigate what determinants affect exporters' performance in three aspects, including the two types of extensive margins in the number of export destinations and varieties of export products, as well as the quality of export goods. This unique compiled dataset enables us to characterize the exporting behavior of heterogeneous firms, providing evidence to theoretical research regarding the firm heterogeneity – exporting nexus.

This paper aims to contribute to the literature mainly in the following two aspects. First, we investigate the effect of firms' characteristics on their two types of extensive margins in terms of export destinations and varieties of export products. In particular, we try to clarify what kinds of firms are able to export to more markets and ship more varieties of products. Second and more importantly, we enrich the current literature by taking into account the determinants on firm's attributes for the quality of exporting products, given that the existing researches on this topic mostly concentrates on the determinants in country level. Our work not only may shed some light on the theoretical studies in the future, but also may offer some directions for policy making in terms of international trade.

The remainder of the present paper is organized as follows. Section 2 describes information on data and several important stylized facts presenting the exporting firm heterogeneity in China's electronics industry. Section 3 introduces the measurement of productivity and model specifications. Section 4 reports and analyzes the estimation results. The final section concludes the paper and provides policy implications.

2. Related Literature

The relation between firm heterogeneity and export is being studied under the both theoretical and empirical two dimensions. The strand of theoretical articles has used more sophisticated modeling frameworks to explore this issue, obtaining consistent predictions. Melitz (2003) develops a dynamic industry model with heterogeneous, by incorporating firm level productivity differences, to analyze the intra-industry effects of international trade. As entry into the export market is costly, only the more productivity firms decide to exposure to trade. Yeaple (2005) develops a general equilibrium trade model in which homogeneous firms choose a technology from a set of competing technologies and choose employees from a set of workers of heterogeneous skill. The choice gives rise to firm heterogeneity in term of productivity distribution. The model generates a prediction that the superiority of firms that engage in international trade relative to those that do not.

Extending Melitz's (2003) model, Bernard et al. (2006) develop a theoretical model of multi-product and analyzes their behavior during trade liberalization. They model firm productivity in a given product as a combination of firm-level "ability" and firm-product-level "expertise", both of which are stochastic and unknown prior to the firm's payment of a sunk cost of entry. The model predicts a positive correlation between a firm productivity and firm's intensive (output per product) aw well as and extensive (number of products) margins. More

recently, an emerging line of theoretical literature use the model of multi-product firms to explores the relation between firm heterogeneity and international trade. Nocke and Yeaple (2006) and Eckel and Neary (2010) model how globalization affects the distribution of firm size, and scale and scope of firms, respectively. Some studies, such as Feenstra and Ma (2008) and Mayer et al. (2011) focus on exploring the influence of market size on product scope of multiproduct exporters.[2] Specifically, Hallak and Sivadasan's (2009) model explains the non-monotonic relation between firm size and export status. They predict also that, conditional on size, exporters sell products of higher quality and at higher prices. Arkolakis and Muendler (2010) develop a model of firm-product heterogeneity with entry costs that barriers mght determine the choice of products and the span of exporters. It implies that more productive firms can endure the entry cost and then export more products.

Benefited from accessibility of micro data in recent years, the research on firms' participation in international trade has offered fruitful empirical regularities for their exporting behaviors. Tybout (2003) and Greenaway and Kneller (2007) offer a comprehensive survey on this topic and find that the exporters are more productive, larger, more capital- and skill-intensive than non-exporters. These empirical regularities apply to US firms (Bernard and Jensen, 2004), European firms (Mayer and Ottaviano, 2008), and Asian firms (Aw et al. 2000).

However, compared with emerging theories relating multiproduct firms to international trade, empirical studies remain rare due to the limitation of available firm-product level data. Bastos and Silva (2010) use Portuguese firm-level data in 2005 to study what factors affect export quality of these firms. They find that unit values within narrow product categories, the measure for product quality in their paper, will increase systematically with distance, and more productive firms can export product with high quality.[3] Johnson (2012) exploits the export data

[2] Redding (2010) provides a comprehensive review for theories of heterogeneous firms and trade.
[3] Prior researches on export quality mostly base on the analytical structure of country attributes. For example, the

in U.S. 3-digit manufacturing sector to 125 countries during 1985-1995 to estimate the trade model of heterogeneous-firms. The empirical results show that high productivity firms choose to produce high quality goods and charge high prices.

Manova and Zhang (2012) utilize the rich export data in China Customs Dataset to establish several stylized facts about the export prices, the measure of product quality, of heterogeneous firms. Their important findings relevant here are as follows. First, exporters selling goods of higher-quality tend to import inputs of higher-quality. Second, within a firm-product, the product quality is higher in destinations with larger market size, higher income, longer geographic distance, and overall less remote countries.[4] On the basis of these studies focusing mostly on the country level determinants of export quality, we will focus more on exploring the determinants at the firm level.

3. Data and Stylized Facts

3.1 Data

To investigate what kinds of firms export to more destinations, export more varieties of goods, and export goods with higher quality, we use the within-firm-product panel data merged from two Chinese databases of (1) the Customs data and (2) the National Bureau of Statistics (NBS) Enterprise Data Set during 2003-2006. The rule of matching is to identify the same company in the two databases by exactly the same company name (in Chinese). The Customs data provides detailed information on the 8-digit HS product code, exporter/importer identity, product unit, quantity, unit value, total value, type of ownership, origin, destination, and type of

literature points out that higher quality product will be shipped to more distant and richer markets (see Verhoogen, 2008; Baldwin and Harrigan, 2009; Bernard et al., 2006; Hallak, 2006). Furthermore, export unit values will increase with countries with higher human capital, physical capital and GDP per capita (see Schott, 2004; Hummels and Klenow, 2005).

[4] Alternatively, using Colombian manufactures census, Kugler and Verhoogen (2012) provide evidence of differences in product quality and highlight the relationship between firm export decision. They find a positive correlation between output prices and export status.

trade, etc. The NBS survey covers almost all state-owned enterprises (SOEs) and the large and medium-sized non-SOEs (with sales of over RMB 5 million). The survey questionnaire consists of three parts: basic information such as the company name, the etsablishment date, the industry code, and the main products, financial information related to the financial statements, and production information like the sales, the output, and the export volume.

We focus our analysis on the electronics industry, with the two-digit code of 40 and official name "manufacture of electronic and telecommunication equipment", which consists of nine three-digit sub-industries.[5] The firms being surveyed in this industry may vary in different years since the NBS survey only includes firms with sales higher than 5 million RMB. Therefore we need to drop those firms that do not exist in some years and finally we obtain a balanced data in the period of 2003-2006.

In addition, the ownership may also plays an important role in affecting the decisions and behaviors of businesses in China. Considering of this, we thus divide the firms selected into three ownership types according to Yang *et al*. (2010). They are (1) SOEs (state-owned enterprises): including state-owned and collectively-owned enterprises; (2) FOEs (foreign-owned enterprises): including Hong Kong-owned, Macau-owned, Taiwan-owned and other foreign-owned enterprises; (3) POEs (private-owned enterprises): including shareholding and private enterprises.

3.2 Stylized Facts of Export Heterogeneity in China's Electronics Industry

[5] The nine three-digit sub-industries are: telecommunications equipment (401), radar and peripheral equipment (402), broadcast and television equipment (403), electronic computer (404), electronic apparatus (405), electronics components (406), household audiovisual equipment (407), electronic and telecommunication equipment repair (408) and other electronics equipment (409).

In this subsection, we document several stylized facts mainly for two aspects of heterogeneity in firms' exporting behavior: their exporting destinations and the variety of goods they export.

We start with the export destinations. Table 1 shows the exporting distributions sorted by transaction in China Customs. The Customs data contains, for each year, all transactions of exports and imports by or Chinese firms. For each transaction of export, the exporting destination is also recorded. We therefore are able to calculate the ratios of transactions exporting to different destinations. As shown in Table 1, for the years of 2003 through 2006 and except for the destinations of Hong Kong and ASEAN-6 countries, the first and second largest markets where China's firms in electronics industry export to are Europe and the U.S., accounting for approximately 17% and 11%, respectively.[6] We further calculate export destinations sorted by value in Table 2. Compared with Table 1 and again Hong Kong and ASEAN-6 are excluded, we find that though Europe and the U.S. still rank the first two largest destinations, the total value being exported to the U.S. now accounts for about 20%, substantially higher than the ratio of about 11% exported to Europe. The two tables together may indicate that the unit value of one transaction of export to the U.S. is on average higher than that of one transaction of export to Europe.

Table 1 Distribution of Export Destinations (by Transaction in China Customs).

=Insert Table 1 approximately here=

Table 2 Distribution of Export Destinations (by Value).

=Insert Table 2 approximately here=

[6] We exclude Hong Kong and ASEAN-6 countries in our discussion since these destinations play yet somewhat different roles in China's export sector. Displaying the functions of transship and entrepot, Hong Kong is usually not the final destination in most China's exports. Besides, ASEAN-6 countries are often regarded as a partner in the supply-chain for China instead of a final destination exports (Athukorala, 2005; Athukorala, 2009).

We next shift our focus to the export destinations and varieties of export products on the firm level. Table 3 depicts the firm distribution in terms of the number of export destinations per Chinese firm in the electronics industry. We can see that in 2003, 29.81% of firms exported to only one destination, while 37.13% of firms exported to more than five foreign destinations, and the shares of other firms exporting to in-between numbers of destinations are relatively smaller. This kind of extreme distribution of destination numbers that exporters concentrate in either single or more than five destinations remains in the period of 2003-2006. Besides, we also find that for these two groups of exporters, the share of single-destination exporters steadily falls from 29.81% to 25.37% over 2003-2006, while that of more-than-five-destinations exporters rises steadily from 37.13% to 43.31% in this period, probably indicating that China's electronics exporters are more capable of running business overseas.

Table 3: Number of Exporting Destinations per Firm.

=Insert Table 3 approximately here=

Table 4, instead, reports the firm distribution in terms of product variety number per Chinese firm in the electronics industry. The pattern in Table 4 is fairly similar to that in Table 3: More firms concentrate in the extremes of the distribution that the exporters who exports less than two kinds of products account for 58.93% to 50.46% from the year of 2003 to 2006, showing a decreasing trend, while the exporters who ship more than five varieties account for 21.50% to 25.80% in this period, exhibiting a slightly increasing trend.

Table 4: Number of Exporting Products per Firm.

=Insert Table 4 approximately here=

We further still observe the export destinations and varieties of export products on the firm level, but within different ownership types. Let us first look at the exporters of SOEs. As shown in Table 5, 38.4% of exporters of SOEs export to single market and they create 18.14% of

export value in all exporters of SOEs. The majority of the export value of SOEs is, instead, created by the two groups of exporters who ship to two and more than seven destinations, with contributions of 26.73% and 23.87% in total exports of SOEs, respectively. This seems to suggest that SOEs exporters tend to export to low number of destinations, yet the SOEs total exports are contributed by the two extremes of exporters who export to either low or high number of destinations. FOEs exporters, however, exhibit different pattern. In Table 5, we see that relatively more FOEs exporters of 27.06% export to more than seven destinations (three times of that for SOEs exporters), and they contribute to FOEs total export value by 60.84%. Compared with SOEs exporters, FOEs exporters tend to export to more destinations, and these firms contribute much more than their SOEs counterparts to total exports, implying that they might be equipped with more operating knowledge in running business overseas such as collection of market information, marketing experience, and management ability. The pattern of POEs is similar to that of FOEs.

Table 5: Number of Exporting Destinations per Firm by Ownership Types.

=Insert Table 5 approximately here=

Table 6 shows the varieties of export products on the firm level within different ownership types. Let us still look at the SOEs exporters first. Most SOEs exporters export few products to the world but their contribution to export value is limited. For example, 66.74% of SOEs exporters ship within two products, making up a minor share of 23.11% of export value of SOEs. As of FOEs exporters, the majority of export value (46.6%), however, is contributed by a relatively few firms (13.48%) who export more than seven varieties, implying that these exporters actually play an important role in the export value. As for POEs exporters, on the one hand, similar to SOEs exporters, a majority of them (66.81%) export within two varieties, and they contribute 35.31% to export value; on the other hand, similar to FOEs exporters, a small

group of POEs exporters who export more than seven products (4.36%) yet contribute a large share of 26.93% to export value.

Table 6: Number of Exporting Products per Firm by Ownership Types.

=Insert Table 6 approximately here=

4. Empirical Model and Measurement of Productivity

To investigate the determinants of firm performance in the three aspects of destinations, varieties, and quality, this study proposes the following two empirical models. In particular, equation (1) is for either exporting destination number or varieties of exporting products, while equation (2) is for export quality.

$$EX_{it} = \alpha_0 + \beta_1 \ln PRO_{it} + \beta_2 \ln SIZE_{it} + \beta_3 AGE_{it} + \beta_4 LEVERAGE_{it} + \beta_5 \ln KL_{it} + \beta_6 \ln WAGE_{it} + \delta \cdot Ownership\_dummy + \gamma \cdot Location\_dummy + \varepsilon_{it} \quad (1)$$

$$\ln UV_{it} = \alpha_0 + \beta_1 \ln PRO_{it} + \beta_2 \ln SIZE_{it} + \beta_3 AGE_{it} + \beta_4 LEVERAGE_{it} + \beta_5 \ln KL_{it} + \beta_6 \ln WAGE_{it} + \delta \cdot Ownership\_dummy + \gamma \cdot Location\_dummy + \varepsilon_{it} \quad (2)$$

In equation (1), the dependent variable EX_{it} represents either the number of destinations or varieties of products *i*th firm exports to in year *t*. In equation (2), we use each firm's export unit value $\ln UV_{it}$, the unit value of *p*th product *i*th firm exports in year *t*, as the proxy variable for export quality, which is widely used in the literature (e.g., Schott, 2004; Bastos and Silva, 2010; Krishna and Maloney, 2011; Johnson, 2012; Manova and Zhang, 2012).[7]

As of the independent variables, *PRO* stands for firm productivity and it is the key variable we concern. Theoretical studies, e.g., Melitz (2003) and Yeaple (2005), have emphasized the critical role of firm heterogeneity on affecting exporting behavior and they generally modeled

[7] There is another way to measure product quality. For example, Wang (2011) considers quality of goods is a latent variable which can be regarded as the residual term in the demand function of product.

firm heterogeneity using the distribution of productivity. To test the theoretical argument by using robust estimates, we adopt two measures of productivity. The first one is labor productivity (*LP*) which is measured by value added per employees. While most existing studies use labor productivity for examining the determinants of different aspects of firm performance, we further apply a strict and widely used methodology to calculate the total factor productivity (TFP) proposed by Levinsohn and Petrin (2003) in this study. Adopting Solow's (1957) concept, the conventional computation of TFP views the technological change as the residual in the production function after excluding the shares of physical capital and labor inputs. This method, however, suffers from the problems of endogeneity and selection bias and thus results in serious estimation biases (Olley and Pakes, 1996; Levinsohn and Petrin, 2003; Vahter and Masso, 2007). Therefore, the TFP measure estimated using semi-parameter estimators developed by Levinsohn and Petrin (2003) provides a more adequate TFP measure.[8] The literature finds that more productive firms seem to be able to export more products, enter more markets, and have higher export quality by well taking advantage of their operative efficiency (Bastos and Silva, 2010; Bernard et al., 2023). We thus expect the sign of *PRO* in equations (1) and (2) to be positive.[9]

Term *SIZE* denotes the firm size and we use total employment of a firm as its proxy. Firms in bigger size are in general easier to achieve their economies of scale and thus are more inclined to participate in export market (Wakelin, 1998; Bernard and Jensen, 1999; Bernard and Jensen, 2004a; Roper *et al*., 2006; Bernard *et al*., 2007). We expect in this study that such advantage of

[8] The STATA code of TFP estimation is available in Petrin *et al*. (2004).

[9] It is worth noting that according to the prominent research of Melitz (2003), the competitiveness of firm count on price; only the cheapest goods are the most competitive. This implies the relationship between firm's productivity and product price could be negative. However, if consumers really care about product quality, goods with the highest observed prices will be the most competitiveness since the quality-adjusted price is lower (Baldwin and Harrigan, 2010). This implies that if firm's productivity is positive association with product price, which not only suggests more productive firm is able to provide high quality goods, but also indicates that unit price of export is indeed a sound proxy variable for product quality.

economies of scale will be positively related to firms' performance as well. *AGE* represents the total years since a firm was founded. The effect of age on a firm's export performance is still inconclusive in the literature. For example, Roper (2006) finds that elder firms sell more in domestic market, while Gumede (2004) obtains an opposite conclusion. Hence, we have no prior expectation on the sign of this variable.

Another variable of our particular interest is a firm's financing ability, denoted as *LEVERAGE*. It symbolizes the ratio of total liabilities to total assets of a firm, a proxy for a firm's financial ability. In this paper, we consider firms with higher ratio of debts to assets represent that they have better financing ability because firms in China in general are not easy to obtain the external finance due to the immature capital market and banking system. Manova (2012) extended the Melitz's model and emphasized the role of financial constraint in determining firm's export status. With the assumption of imperfect capital market, liquidity constraint might makes it difficult for high productivity firms to cover the upfront fixed costs, even though expected future profits from exporting are sufficiently large. Since exporters usually need to bear higher expenditures than non-exporters, the accessibility of funds thus becomes a key factor in production and in running international businesses. For instance, Minetti and Zhu (2011) figure out that firms with higher leverage ratio (total liabilities to total equity) are likely to export; Manova (2012) finds that financially advanced economies export a wider range of products and their exports experience less product turnover, suggesting the importance of the financial environment. We therefore include this variable and expect that firms with better financing ability also perform better.[10]

The next two independent variables are the firm-level average wage expenditure, *WAGE*, and the capital labor ratio, *KL*. As mentioned, the literature has confirmed that exporters are able to

[10] Compared with financial constraint, there exists another line research focus on the finance health in explaining the firm's export behavior. For example, Bellone *et al*. (2010) use the liquidity variable as the proxy for finance health and point out that firm with higher liquidity is likely become exporter.

pay higher wages and are more capital-intensive. The effects of the two variables on exporters' performance, however, are yet clear. On the other hand, the average wage can denote the quality of human resources. Haltiwanger *et al*. (1999) point out the critical role played by human capital investment undertaken by firms in terms of improving productivity, suggesting that this variable might have an indirect effect on exporting behavior. In addition, the production of electronics products transforms from labor-intensive toward more capital-intensive, suggesting that the degree of capital intensity might matter to exporting behaviors for electronics firms. As such, we expect the signs of the two variables possibly to be positive.

The last two independent variables we introduce are ownership types and location dummy variables, due to China's unique economic system, especially in terms of its various ownership types and centralized economic planning on regional development (details to be discussed in next section). In this study, we control three ownership types: *SOE*, *FOE* and *POE* (reference group); and two location dummies: Beijing (*BEJ*) and Yangtze River Delta (*YZRDELTA*), and take the location of Guangdong province (i.e. Pearl River Delta) as well as other districts as the reference group. Lastly, α, β, δ, and γ are coefficients to be estimated, and ε is an error term. All independent variables are in logarithmic form except *AGE*, *LEVERAGE*, and dummy variables. Since the dependent variables in equation (1) are all positive integer, we estimate this equation using the fixed effect count-panel-data model with the dependent variable assumed to follow Poisson distribution. We list the detailed variable definitions and basic descriptive statistics in Table 7.[11]

Table 7: Variable Definitions and Basic Statistics.

=Insert Table 7 approximately here=

[11] The correlation matrix of each variable is shown in the appendix table.

5. Empirical Results

5.1 The Determinants of the Two Types of Export Extensive Margins

We report the estimation results drawn from equations (1) and (2) in this subsection. Before the statistical results, we start by observing the correlation between TFP and the two extensive margins in export destinations and varieties of products in Figure 1 and 2, respectively. In the two figures, we see that there exists positive relationship between TFP and either the number of markets severed or the varieties of products exported, which is consistent with our expectation mentioned earlier in section 3.

Figure 1: Extensive Margins of Exporting Markets and TFP

=Insert Figure 1 approximately here=

Figure 2: Extensive Margins of Exporting Products and TFP

=Insert Figure 2 approximately here=

To further rigorously confirm these two relationships, as well as other determinants of the two types of extensive margins, we statistically estimate equation (1) and report the results in Table 8 (for export destinations) and Table 9 (for varieties of products). In Table 8, we have four specifications. In specification (1) and (2), we use LP as the productivity measure (and thus add *KL* ratio as well), while in (3) and (4) we use TFP instead. The difference between (1) and (2), and also between (3) and (4), is just that we add location dummy variables in (2) and (4).

Table 8: Panel Poisson Model: Number of Markets Served (Fixed Effect).

=Insert Table 8 approximately here=

As shown in Table 8 with the dependent variable being the number of markets served by a firm, the coefficients for the two measures of productivity *LP* and *TFP* are both positive with significance at 1% statistical level, implying that more productive firms can serve more foreign markets.

For the estimation results of other regressors, we are in particular interested in that of the financing ability (*LEVERAGE*) of a firm. In Table 8, all coefficients on *LEVERAGE* are positive and significant at 1% statistical level, indicating that firms facing less financial constraints export to more destinations which is consistent with finding in Bellone *et al*. (2010) and Manova (2012). The effect of firm size (*SIZE*) is significantly positive at 1% statistical level in all specifications, suggesting that bigger firms are able to ship to more destinations. It is so probably because firms with bigger size are more likely to achieve scale economies to overcome the costs associated with international trade, and thus export to more destinations. The effect of the degree of capital-intensity (*KL*) is significantly positive, implying that more capital intensive firms can serve more markets.

Neither age of a company (AGE) nor the average wage expenditure (WAGE) affects the extensive margin of export destinations, probably due to the following reasons. First, most of electronics firms in China are newly founded and young, as reported in Table 7, with an average age of 11 years. Second, given that the electronics industry tends to be physical capital intensive, the expenditure on physical capital should be more influential on the number of exporting markets than the wage payment is.

As of the ownership dummy variable, the effects of *SOE* and *FOE* are indifferent from that of *POE*, suggesting that ownership types are irrelevant to the extensive margin of export destinations. Lastly, both location dummy variables are significant and negative in model (4), indicating that firms located in Beijing and Yangtze River Delta serve fewer destinations than those in Guangdong province and other regions. This is perhaps because Guangdong province (i.e. Pearl River Delta) is the earliest planned economic and trade special zone in China.

Let us turn to the estimation results for the second type of extensive margin of varieties in products in Table 9, with the four model specifications the same as those in Table 8. First, the

effect of firm productivity on the varieties of product exported is significantly positive in all model specifications, suggesting that more productive firms are capable of exporting more varieties of products. Second, firm size (*SIZE*) is still a key factor that affects how many types of products a firm exports. We still find that firms in bigger size export more varieties of products.

Table 9: Panel Poisson Model: Number of Products Exported (Fixed Effect).

=Insert Table 9 approximately here=

The age of a firm (*AGE*), on average, significantly affects the varieties of products it chooses to export in models (1) and (3), but does not in models (2) and (4) after the locations are controlled. The financing ability is a significant factor affecting a firm's extensive margin in varieties of products exported since all coefficients of *LEVERAGE* are significant and positive. It again supports Manova's (2012) theoretical argument. The average wage payment (*WAGE*) and the degree of capital-intensity (*KL*), unlike their effects on the extensive margin in export destinations, have on average no significant effects on how many varieties of products a firm exports. There may be two explanations. One is that the physical capital plays more important role than the wage payment in the electronics industry. The other is that thus far China's firms in this industry mostly export relatively low value-added products that are relatively low capital intensive as well.

As for the dummy variables of ownership types and locations, we find in Table 9 that SOE exporters export a wider variety of products than POE ones do, probably because they enjoy more privilege from China's authority in running business such as funding and policy support. Finally, the location variables of *BEJ* and *YZRDELTA* are significantly positive and negative, respectively. It suggests that firms located in Beijing and Yangtze River Delta serve more and fewer products than those in Guangdong province and other regions.

5.2 The Determinants of Export Quality

We now shift our focus to the issue of export quality. Again, by looking at Figure 3, we also observe a positive relationship between TFP and export unit value, which might give us a hint that there exists a statistical positive relationship between the two variables. We next apply equation (2) to explore the how firm attributes affect the export quality. Notice that the dataset we use here is balanced panel data in the form of within-firm-product, which not only allows us to control for the heterogeneity of firms, but also the varieties of products.[12]

Figure 3: Export Unit Price and TFP

=Insert Figure 3 approximately here=

Table 10 summaries the estimation results with the labor productivity selected as the productivity measure, and the firm-product fixed effect controlled. There are four models: in model (1) we add only the ownership dummies; in model (2) we include only location dummies; in model (3) we add both ownerships and locations; and finally in model (4) we contain all dummies of ownerships, locations, and trade types.

For labor productivity (*LP*), we find that in all model specifications, it has positive and significant effect on export quality, namely more productive firms export products with higher quality. Firm size (*SIZE*) and the age of an enterprise (*AGE*) are also found to be influential to export quality in all models, implying that bigger and older firms are able to export products with higher quality. This is probably because on the one hand bigger firms may have more resources in improving their product quality, and on the other hand, older firms may take more advantage of the effect of learning by doing. As of the financing ability (*LEVERAGE*) of our particular interest, the coefficients are all significantly positive in all models, suggesting that firms with better financing ability are more able to export product with higher quality. This

[12] To prevent the interference of the extreme observations (i.e. outliers), we trim our data following the way of Johnson (2012) that drops observations greater than 10 times or less than 1/10 the median unit price in the sample.

again indicates the importance of the role of firms' financing ability in their exporting behaviors, supporting Manova's (2012) theoretical prediction.

Table 10: Determinants of Export Quality (LP; Firm-Product Fixed Effect).

=Insert Table 10 approximately here=

Similar to the findings in Table 9, both the capital-intensity (*KL*) and the average wage payment (*WAGE*) are found to be insignificantly related to export quality. For the wage payment, it is so probably because: first, compared to traditional industries such as textile or apparel, production factors in electronics industry relatively heavily count on physical capital instead of labor, and thus wage payment is relatively less important. Second, the studying period of 2003-2006 was earlier than the implementation of the Labor Contract Law (January 2008), suggesting that payment of health care and unemployment insurance for employees are not compulsory. As the insurance expenditure can be treated as part of wage compensation and not all firms have this expenditure, the nominal wage might not reflect the real wage.

For the capital-intensity (*KL*), again, it is not significant related to export quality. One probably reason is that a large share of China's electronic products are low value-added that do not essentially require costly capital equipment in production. The other reason is that their export quality may rely more on foreign technologies, as most Chinese electronics firms undertake the production mode of OEM (Original Equipment Manufacturer) or ODM (Original Design Manufacturer).

As for the dummy variables, other than previous two types of variables of ownership types and locations, here since the data is of firm-product form, we add additional types of exports with two dummies: ordinary export and processing export.[13] Let us report in turn as follows. First, the effects of the two ownership type variables (*SOE* and *FOE*) are both insignificant,

[13] Ordinary export refers to product of export is made from domestic inputs, while processing export means the exporting product is made from foreign inputs. In addition, since both export types are highly correlated, we only put the processing export in our empirical estimations.

implying that the average export quality of the firms in three types of ownerships is statistically the same.

Second, the effects of the two location dummies are both significant and positive, suggesting that firms located in Beijing and Yangtze River Delta export higher quality product than those in Guangdong province (i.e. Pearl River Delta) and the other districts. The firms in Beijing, on average, are found to export products of the highest quality, since the estimated coefficients are the highest. We think that this might be mainly due to the fact that the special economic zones in Beijing and the Yangtze River Delta were planned and developed after those in the Pearl River Delta. As a result, most electronics firms in Pearl River Delta and the other districts produce relatively conventional and low value-added products, compared with their counterparts in Beijing and Yangtze River Delta who produce mostly software and high-technology products. Lastly, the significantly positive coefficient on processing export indicates that the processing export is in better quality than the other types of exports are, implying that the export quality of Chinese electronic firms could partially be contributed by high quality inputs imported abroad.

For robustness check, we also use Levinsohn and Petrin's (2003) TFP measure instead of labor productivity and report the empirical results in Table 11. All variables in Table 11 have the same results in terms of signs and significance as those in Table 10 except firm size (*SIZE*). Firm size has no more significant and positive effect on export quality, probably because of its relatively high correlation with TFP

Table 11: Determinants of Export Quality (TFP; Firm-Product Fixed Effect).

=Insert Table 11 approximately here=

Crucially, all the estimated coefficient of TFP variable is positive and significant at the 1% statistical level, suggesting that firms with higher productivity tend to export higher quality

products, *ceteris paribus*. It lends supportive view to Melitz's (2003) theoretical argument that firm heterogeneity in terms of productivity matters to export behavior.

5.3 Robustness Check

The well known self-selection hypothesis in the trade literature states that, if fixed costs of selling in a foreign market are higher, only high productivity firms will find it profitable to enter international markets (Roberts and Tybout, 1997). It implies that the above analyses based on only exporters may encounter the sample selection bias. Thus, we adopt also all electronics firms during 2003-2006 to implement empirical estimations. On estimating the determinants of firm performance in terms of destinations and product varieties (equation 1), there is a high frequency of extra zeros being observed. Thus, we adopt the popular approach of Zero-Inflated Poisson (ZIP) model, to handle zero-inflation problem. A score test is presented to test whether the number of zeros is too large for a Poisson distribution to fit the data well. Table 12 displays various estimates.

Table 12: Panel ZIP Model: Number of Markets Served or Products Exported (Fixed Effect).

=Insert Table 12 approximately here=

As all the statistics of Vuong tests are significant at the 1% statistical level, suggesting that the use of panel ZIPD model is appropriate. Compared with results in Tables 8 and 9, the results are very similar overall, while several important points are worth noting. First, firm heterogeneity measured by labor productivity of TFP serves a key factor that significantly positive relate to market served and product exports. Second, wage turns to be positive and significant in all estimates. It suggests that firms with higher quality of human resources export more products as well as to more markets. Third, both ownership variables of SOE and FOE become significantly negative at the 1% statistical level in all estimates. This result suggests that, compared with private firms, SOE and foreign firms tend to serve less foreign markets and

export less number of products. Why the estimates on ownership variables change substantially? One possible interpretation is that, as ownership structure is rarely changed for firms, the estimates on rarely changing variables obtained from fixed effect model inconsistent (Plümper and Troeger, 2007). When adding a extremely large of non-exporters, it increases the variability of ownership variables, thereby inducing different results. This situation applies to the regional variables in models (2) and (4) that BEJ turns to be significantly positive. That is, exporters located in Beijing serve more foreign markets compared with their counterparts located in Pearl River Delta.

As for the estimation of export quality equation, we use the two-step Heckman selection model to implement empirical estimations. Tables 13 and 14 display the second-step estimations on export quality by including the estimated inverse Mill's ratio obtained from the first-step export propensity equation.[14].

Tables 13 and 14: Determinants of Export Quality – Heckman Two-step Model

(TFP; Firm-Product Fixed Effect).

=Insert Tables 13 and 14 approximately here=

Compared with results in Table 10 (11), the results in Tables 13 (14) are very similar overall. As some estimates on LP in Table 13 and all estimates on TFP in Table 14 remain significantly positive, lending a supportive view that firms with higher productivity are more able to export product with higher quality.

Again, estimates on ownership dummies change significantly. In Tables 10 and 11, both SOE and FOE associate with an insignificant coefficient. However, SOE and FOE turns to be significant positive and negative, respectively. It is surprising to observe a lower price of exporting product for FOE compared with their private counterparts. For example, the largest

[14] Due to the space limitation, the results of the first-step estimations are not shown here.

Taiwanese MNE in China, Foxconn, produce i-series products for Apple, implying the price of exporting products should be higher. One point worth noting is that most electronics FOEs aim to utilize cheaper labor and conduct assembly-export in China and the coefficient on processing export remains significantly positive in all estimates. Thus, the real effect of FOE on export quality needs further clarifying.

6. Concluding Remarks

Firm's export performance in terms of number of export destinations, varieties of products and export quality is one of the most important issues in the literature of international trade in recent years; however, the empirical studies for this issue are quite few, which is probably due to data limitation. In this paper, we aim to empirically explore the determinants affecting firms' export extensive margins and export quality, using the detailed firm-product level panel data of China's exporters in the electronics industry. More specifically, we attempt to answer the question of what kinds of firms perform better in terms of three aspects: more exporting destinations, more variety of export products, and higher export quality. This paper, to the best of our knowledge, may be the first study to systematically provide the firm-level evidence to deal with this question.

We find that: First, firms with higher productivity perform better in all three aspects. Namely they export to more markets, export more varieties, and export higher quality of products. This is consistent with the predictions of existing theoretical and empirical heterogeneous firm trade literature that more productive firms outperform less productive ones in various aspects. Second, firms in bigger size tend to take advantage of their scale economies to export more markets and more varieties, while such effect of firm size on export quality is ambiguous. Third, older firms are capable of exporting more varieties and products with higher quality than younger ones.

Forth, the wage payment is not a statistically significant factor for all three aspects of firms' performance. Fifth, the capital intensity is a significant factor for the number of markets exported, but not for the product varieties and quality. Lastly, the financing ability of firms plays a significant role in all three aspects of exporters' performance, which might shed some light on the policy implications for those emerging economies adopting export-led strategy where the financial environment is usually immature. That is, to construct a relatively more friendly and complete financial industry is not only important for economic development, but also for enhancing the competitiveness of exporters.

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Figure 1: Extensive Margins of Exporting Markets and TFP

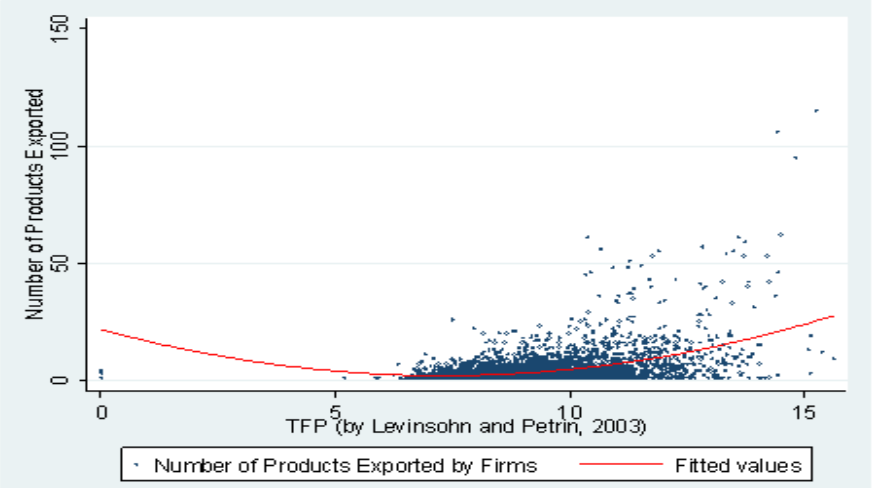

Figure 2: Extensive Margins of Exporting Products and TFP

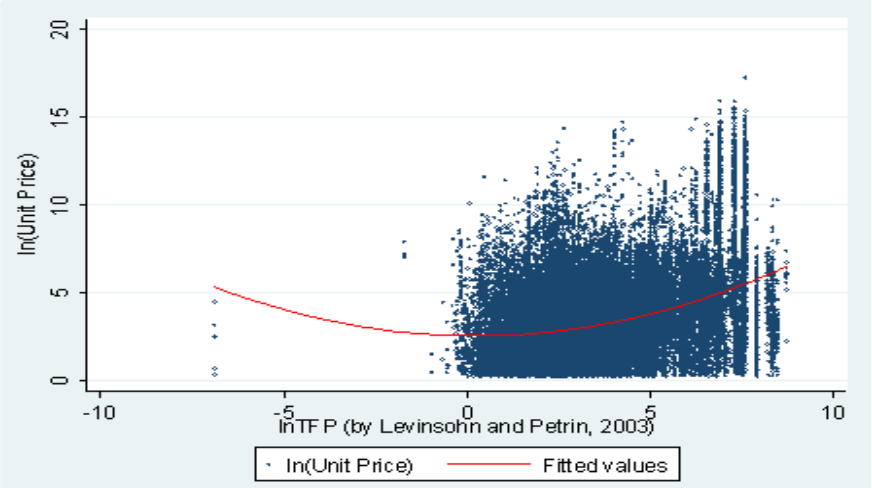

Figure 3: Export Unit Price and TFP

Table 1 Distribution of Export Destinations (by Transaction in China Customs)

	World	Hong Kong	US	Europe	Taiwan	S. Korea	Japan	ASEAN-6	ROW
2003	100	13.37	11.24	17.15	4.57	5.90	9.80	11.44	26.53
2004	100	13.07	11.49	17.02	4.41	5.52	9.20	10.92	28.36
2005	100	12.32	10.99	17.32	3.99	5.30	8.97	11.50	29.61
2006	100	12.13	11.15	16.58	4.29	5.39	8.82	11.23	30.41

Notes: ASEAN-6 includes Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam; Europe countries are Denmark, Finland, France, Germany, Hungary, Italy Netherlands, Poland, Spain, Sweden, and Switzerland.

Table 2 Distribution of Export Destinations (by Value)

	World	Hong Kong	US	Europe	Taiwan	S. Korea	Japan	ASEAN-6	ROW
2003	100	20.06	21.31	14.62	2.53	8.04	12.18	11.95	9.32
2004	100	28.69	23.07	10.14	1.55	7.85	7.04	9.70	11.98
2005	100	43.34	17.13	11.21	1.43	4.25	5.48	6.57	10.60
2006	100	28.74	22.12	10.67	1.90	5.10	6.76	10.27	14.44

Notes: ASEAN-6 includes Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam; Europe countries are Denmark, Finland, France, Germany, Hungary, Italy Netherlands, Poland, Spain, Sweden, and Switzerland.

Table 3: Number of Exporting Destinations per Firm.

Number of destinations	2003	2004	2005	2006
	% of firms			
1	29.81	28.77	26.76	25.37
2	15.00	13.78	13.67	14.13
3	9.67	9.50	9.34	10.50
4	8.39	8.29	8.47	6.69
More than 5	37.13	39.66	41.76	43.31
Total	100	100	100	100

Table 4: Number of Exporting Products per Firm.

Number of products	2003	2004	2005	2006
	% of firms			
1	37.76	34.15	33.64	30.44
2	21.17	20.05	19.82	20.02
3	11.52	14.02	13.74	14.06
4	8.04	8.15	8.58	9.68
More than 5	21.5	23.64	24.23	25.8
Total	100	100	100	100

Table 5: Number of Exporting Destinations per Firm by Ownership Types.

Number of Destinations	State-Owned Enterprise		Foreign-Owned Enterprise		Private-owned Enterprise	
	percent of firms (value)					
1	38.40	(18.14)	26.54	(13.30)	29.58	(10.34)
2	16.03	(26.73)	13.38	(5.54)	16.29	(9.81)
3	10.97	(7.20)	9.57	(2.97)	10.53	(4.46)
4	9.28	(3.35)	7.76	(4.88)	8.59	(2.20)
5	5.06	(13.11)	6.33	(5.26)	6.00	(7.54)
6	6.75	(5.66)	4.45	(2.67)	4.21	(13.10)
7	3.80	(1.94)	4.90	(4.52)	3.32	(2.38)
More than 7	9.70	(23.87)	27.06	(60.84)	21.47	(50.16)
Total	100	(100)	100	(100)	100	(100)

Note: Observations are Chinese exporting firms in the period of 2003-2006. All numbers are in percentage.

Table 6: Number of Exporting Products per Firm by Ownership Types.

Number of Product Exported	State-Owned Enterprise		Foreign-Owned Enterprise		Private-owned Enterprise	
1	45.31	(15.00)	28.94	(10.67)	44.64	(16.24)
2	21.43	(8.11)	19.80	(8.27)	22.17	(19.07)
3	17.97	(38.39)	13.61	(5.46)	12.59	(9.36)
4	5.86	(6.29)	9.69	(6.31)	7.08	(12.96)
5	3.52	(1.32)	6.35	(7.06)	3.65	(2.83)
6	2.34	(1.13)	4.76	(5.21)	3.51	(3.28)
7	1.95	(26.06)	3.37	(10.35)	2.00	(9.33)
More than 7	1.56	(3.70)	13.48	(46.67)	4.36	(26.93)
Total	100	(100)	100	(100)	100	(100)

Note: Observations are Chinese exporting firms in the period of 2003-2006. All numbers are in percentage.

Table 7: Variable Definitions and Basic Statistics.

Variable	Definition	Mean (S.D.)
LP	Labor productivity (in logarithm)	6.13 (1.26)
TFP	Index of TFP developed by Levinsohn and Petrin (2003) (in logarithm)	3.75 (1.86)
LEVERAGE	Ratio of total liabilities over total assets	0.69 (8.88)
Wage	Average wage expenditure of per person (in logarithm)	3.07 (0.69)
AGE	Years since company established	11.05 (5.87)
SIZE	Firm size: total employment (in logarithm)	6.93 (1.46)
KL	Capital intensive: Ratio of fixed assets to total employment (in logarithm)	4.07 (1.34)
SOE	Ownership dummy: a state-owned enterprise	0.04 (0.18)
FOE	Ownership dummy: a foreign-owned enterprise	0.76 (0.43)
BEJ	Location dummy: a firm located in Beijing	0.02 (0.16)
YZRDELTA	Location dummy: a firm located in Shanghai or Jiangsu (Yangtze River Delta)	0.10 (0.30)
ORDINARY EXPORT	Export type dummy: product of export is made from domestic inputs	0.40 (0.49)
PROCESSING EXPORT	Export type dummy: product of export is made from import inputs	0.58 (0.49)

Table 8: Panel Poisson Model: Number of Markets Served (Fixed Effect).

	(1)	(2)	(3)	(4)
LP	0.246***	0.241***		
	(7.59)	(7.36)		
TFP			0.183***	0.178***
			(5.86)	(5.69)
SIZE	0.321***	0.308***	0.145***	0.136***
	(8.74)	(8.14)	(3.73)	(3.46)
AGE	0.002	0.001	0.004	0.002
	(0.74)	(0.38)	(1.16)	(0.79)
LEVERAGE	0.004***	0.004***	0.003***	0.003***
	(7.72)	(7.42)	(7.77)	(7.37)
WAGE	-0.026	-0.031	0.002	-0.004
	(-1.21)	(-1.42)	(0.09)	(-0.18)
KL	0.027**	0.027**		
	(2.49)	(2.50)		
Ownership Dummies				
SOE	-0.027	-0.016	-0.035	-0.024
	(-0.43)	(-0.26)	(-0.56)	(-0.38)
FOE	-0.031	-0.029	-0.042	-0.039
	(-0.61)	(-0.58)	(-0.78)	(-0.74)
Location Dummies				
BEJ		-0.092		-0.123*
		(-1.35)		(-1.77)
YZRDELTA		-0.063**		-0.069**
		(-2.27)		(-2.51)
Log-Likelihood	-5272.75	-5276.10	-5251.04	-5253.79
Wald Test	109.51	94.10	134.01	119.92
P-Value	0.00	0.00	0.00	0.00
Fixed Effect	Firm-level			
Observations	4,294			
Firms	1,219			

Note: t statistics in parentheses are based on robust standard errors clustered by firm.

* p < 0.10, ** p < 0.05, *** p < 0.01.

Table 9: Panel Poisson Model: Number of Products Exported (Fixed Effect).

	(1)	(2)	(3)	(4)
LP	0.118***	0.107***		
	(3.19)	(2.89)		
TFP			0.087***	0.076**
			(2.77)	(2.45)
SIZE	0.237***	0.208***	0.153**	0.133**
	(3.31)	(2.73)	(2.42)	(2.02)
AGE	0.009**	0.005	0.009**	0.006
	(2.14)	(1.42)	(2.27)	(1.58)
LEVERAGE	0.003***	0.002***	0.002***	0.002***
	(4.44)	(3.85)	(4.38)	(3.73)
WAGE	0.007	-0.003	0.019	0.007
	(0.30)	(-0.15)	(0.75)	(0.29)
KL	0.012	0.013		
	(1.09)	(1.14)		
Ownership Dummy				
SOE	0.110**	0.144***	0.109**	0.143***
	(2.55)	(3.23)	(2.47)	(3.16)
FOE	0.050	0.055	0.048	0.053
	(0.66)	(0.72)	(0.62)	(0.68)
Location Dummy				
BEJ		0.275***		0.267**
		(2.71)		(2.39)
YZRDELTA		-0.191***		-0.193***
		(-3.54)		(-3.58)
Log-Likelihood	-5040.81	-5057.43	-5036.64	-5052.87
Wald Test	72.31	41.90	70.03	39.13
P-Value	0.00	0.00	0.00	0.00
Fixed Effect	Firm-level			
Observations	4,648			
Firms	1,325			

Note: t statistics in parentheses are based on robust standard errors clustered by firm.

* p < 0.10, ** p < 0.05, *** p < 0.01.

Table 10: Determinants of Export Quality (LP; Firm-Product Fixed Effect).

	(1)	(2)	(3)	(4)
CONS	1.974***	1.798***	1.806***	1.74***
	(4.77)	(4.14)	(4.19)	(4.01)
LP	0.118***	0.124***	0.124***	0.123***
	(3.71)	(3.77)	(3.81)	(3.79)
SIZE	0.071*	0.086**	0.083**	0.085**
	(1.83)	(2.21)	(2.09)	(2.11)
KL	-0.001	-0.001	-0.001	-0.001
	(-0.27)	(-0.34)	(-0.29)	(-0.34)
AGE	0.011***	0.013***	0.013***	0.014***
	(2.74)	(2.99)	(3.00)	(3.043
LEVERAGE	0.001**	0.001**	0.001**	0.001**
	(2.25)	(2.50)	(2.43)	(2.49)
WAGE	0.021	0.025	0.024	0.024
	(0.68)	(0.85)	(0.82)	(0.83)
Ownership Dummies				
SOE	0.044		0.031	0.031
	(1.29)		(0.93)	(0.90)
FOE	0.026		0.024	0.023
	(0.59)		(0.54)	(0.52)
Location Dummies				
BEJ		0.229***	0.230***	0.224***
		(2.88)	(2.89)	(2.60)
YZRDELTA		0.081***	0.078**	0.078**
		(2.62)	(2.53)	(2.54)
Trade-Type Dummies				
PROCESSING TRADE				0.110***
				(2.57)
Adj. R-square	0.88	0.88	0.88	0.88
Wald Test	4.74	4.86	3.79	5.11
(P-Value)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	54,465			
Firms	1,341			
Products	1,212			

Note: *t* statistics in parentheses are based on robust standard errors clustered by firm. * * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 11: Determinants of Export Quality (TFP; Firm-Product Fixed Effect).

	(1)	(2)	(3)	(4)
CONS	2.879***	2.745***	2.751***	2.674***
	(11.12)	(10.28)	(10.29)	(9.84)
TFP	0.094***	0.099***	0.09***	0.099***
	(3.77)	(3.83)	(3.85)	(3.84)
SIZE	-0.0104	0.001	-0.001	1.703e-4
	(-0.31)	(0.04)	(-0.04)	(0.00)
AGE	0.012***	0.014***	0.014***	0.015***
	(2.80)	(3.02)	(3.04)	(3.06)
LEVERAGE	7.96e-4*	9.3e-4**	9.03e-4**	9.29e-4**
	(1.92)	(2.21)	(2.13)	(2.19)
WAGE	0.0265	0.031	0.031	0.031
	(0.87)	(1.03)	(1.02)	(1.02)
Ownership Dummy				
SOE	0.043		0.031	0.029
	(1.24)		(0.88)	(0.85)
FOE	0.023		0.021	0.019
	(0.52)		(0.47)	(0.44)
Location Dummy				
BEJ		0.212***	0.212***	0.206***
		(2.90)	(2.91)	(2.60)
YZRDELTA		0.079***	0.078**	0.078**
		(2.59)	(2.50)	(2.50)
Trade-Type Dummy				
PROCESSING TRADE				0.111***
				(2.59)
Adj. R-square	0.88	0.88	0.88	0.90
Wald Test	5.68	4.35	5.29	5.46
(P-Value)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	54,465			
Firms	1,341			
Products	1,212			

Note: *t* statistics in parentheses are based on robust standard errors clustered by firm.

* p < 0.10, ** p < 0.05, *** p < 0.01.

Table 12 Panel ZIP Model: Number of Markets Served or Products Exported (Fixed Effect).

	Dep.=Number of Market Served				Dep.=Number of Product Exported			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LP	0.124***	0.128***			0.124***	0.128***		
	(140.72)	(144.86)			(140.72)	(144.86)		
TFP			0.125***	0.129***			0.125***	0.129***
			(141.32)	(145.71)			(141.32)	(145.71)
SIZE	0.302***	0.298***	0.241***	0.236***	0.302***	0.298***	0.241***	0.236***
	(472.52)	(464.35)	(306.40)	(297.44)	(472.52)	(464.35)	(306.40)	(297.44)
AGE	0.00183***	0.00208***	0.00185***	0.00212***	0.00183***	0.00208***	0.00185***	0.00212***
	(11.96)	(13.46)	(12.04)	(13.72)	(11.96)	(13.46)	(12.04)	(13.72)
LEVERAGE	0.144***	0.150***	0.116***	0.119***	0.144***	0.150***	0.116***	0.119***
	(40.61)	(42.71)	(32.99)	(33.82)	(40.61)	(42.71)	(32.99)	(33.82)
WAGE	0.00871***	0.00343*	0.0390***	0.0377***	0.00871***	0.00343*	0.0390***	0.0377***
	(4.89)	(1.91)	(23.49)	(22.61)	(4.89)	(1.91)	(23.49)	(22.61)
KL	-0.00130	0.00260***			-0.00130	0.00260***		
	(-1.41)	(2.81)			(-1.41)	(2.81)		
SOE	-0.254***	-0.237***	-0.245***	-0.228***	-0.254***	-0.237***	-0.245***	-0.228***
	(-41.35)	(-38.47)	(-39.91)	(-37.08)	(-41.35)	(-38.47)	(-39.91)	(-37.08)
FOE	-0.0947***	-0.0789***	-0.0900***	-0.0752***	-0.0947***	-0.0789***	-0.0900***	-0.0752***
	(-44.19)	(-36.58)	(-42.14)	(-34.99)	(-44.19)	(-36.58)	(-42.14)	(-34.99)
YZRDELTA		-0.122***		-0.112***		-0.122***		-0.112***
		(-54.65)		(-50.45)		(-54.65)		(-50.45)
BEJ		0.0727***		0.0718***		0.0727***		0.0718***
		(15.07)		(14.90)		(15.07)		(14.90)
cons	-0.0364***	-0.0230***	0.0104*	0.0278***	-0.0364***	-0.0230***	0.0104*	0.0278***
	(-5.95)	(-3.76)	(1.73)	(4.64)	(-5.95)	(-3.76)	(1.73)	(4.64)
Observation	126,369	126,369	126,912	126,912	126,369	126,369	126,912	126,912
Vuong test	127.53***	127.79***	132.48***	132.27***	72.48***	71.87***	79.19***	78.46***

Note: *t* statistics in parentheses are based on robust standard errors clustered by firm. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 13 Determinants of Export Quality (TFP; Firm-Product Fixed Effect)

Heckman two-stage estimation

	(1)	(2)	(3)	(4)
	Dep.=lnPrice			
CONS	3.11***	-3.08***	3.19***	3.11***
	(5.69)	(-69.47)	(5.74)	(5.67)
LP	0.05	0.39***	0.04	0.05
	(1.58)	(61.26)	(1.36)	(1.60)
SIZE	0.16***	0.18***	0.16***	0.15***
	(13.97)	(41.18)	(14.01)	(12.97)
KL	0.01	0.004	0.007	0.006
	(0.65)	(0.81)	(0.47)	(0.40)
AGE	-0.02***	-0.02***	-0.02***	-0.02***
	(-8.85)	(-19.13)	(-8.47)	(-8.56)
LEVERAGE	0.38***	0.08***	0.38***	0.38***
	(4.86)	(3.31)	(4.88)	(4.85)
WAGE	0.91***	0.95***	0.90***	0.91***
	(26.87)	(75.88)	(25.95)	(26.53)
Ownership Dummies				
SOE	0.94***		0.95***	0.96***
	(8.03)		(7.97)	(8.18)
FOE	-3.25***		-3.29***	-3.31***
	(-11.45)		(-11.41)	(-11.64)
Location Dummies				
BEJ		0.58***	0.60***	0.61***
		(15.59)	(5.96)	(6.16)
YZRDELTA		0.08***	0.10**	0.09**
		(5.54)	(2.35)	(2.36)
Trade-Type Dummies				
PROCESSING TRADE				0.13***
				(3.60)
Mills λ	-6.65***	0 .98***	-6.75***	-6.65***
	(-10.08)	(29.77)	(-10.08)	(-10.06)
Censored obs	28292			
Uncensored obs	104995			
Wald Test	3458.43	27900.09	3389.31	3500.73
(P-Value)	(0.00)	(0.00)	(0.00)	(0.00)

Note: *t* statistics in parentheses are based on robust standard errors clustered by firm.
* p < 0.10, ** p < 0.05, *** p < 0.01.

Table 14 **Determinants of Export Quality (TFP; Firm-Product Fixed Effect)**

Heckman two-stage estimation

	(1)	(2)	(3)	(4)
	Dep.=lnPrice			
CONS	-1.46***	-3.31***	-1.46***	-1.51***
	(-12.8)	(-63.59)	(-12.82)	(-13.28)
TFP	0.30***	0.44***	0.29***	0.31***
	(28.25)	(62.02)	(27.91)	(28.64)
SIZE	0.006	0.01**	0.01**	-0.001
	(1.23)	(2.28)	(2.18)	(-0.29)
AGE	-0.02***	-0.01***	-0.02***	-0.02***
	(-20.96)	(-17.45)	(-20.41)	(-20.30)
LEVERAGE	0.05**	-0.07***	0.06**	0.05**
	(2.08)	(-2.78)	(2.33)	(2.03)
WAGE	1.04***	1.04***	1.02***	1.03***
	(87.8)	(88.36)	(86.10)	(86.75)
Ownership Dummy				
SOE	0.41***		0.41***	0.43***
	(11.3)		(11.32)	(11.79)
FOE	-0.61***		-0.61***	-0.66***
	(-16.6)		(-16.8)	(-18.03)
Location Dummy				
BEJ		0.59***	0.59***	0.61***
		(15.72)	(15.65)	(16.00)
YZRDELTA		0.11***	0.11***	0.11***
		(6.91)	(7.47)	(7.40)
Trade-Type Dummy				
PROCESSING TRADE				0.15***
				(10.77)
Mills λ	-0.58***	1.02***	-0.58***	-0.54***
	(-6.05)	(27.66)	(-6.15)	(-5.67)
Censored obs	28171			
Uncensored obs	105439			
Wald Test	23558.98	22864.84	23894.79	24087.64
(P-Value)	(0.00)	(0.00)	(0.00)	(0.00)

Note: *t* statistics in parentheses are based on robust standard errors clustered by firm.
* p < 0.10, ** p < 0.05, *** p < 0.01.

Appendix Table: Correlation Matrix of Empirical Variables.

	PRICE	LP	TFP	SIZE	KL	AGE	LEVERAGE	WAGE	BEJ	YZRDELTA	SOE	FOE	ORDINARY EXPORT	PROCESSING EXPORT
PRICE	1.00													
LP	0.36	1.00												
TFP	0.36	0.82	1.00											
SIZE	0.24	0.32	0.79	1.00										
KL	0.24	0.38	0.19	0.10	1.00									
AGE	0.11	0.00	0.09	0.17	0.06	1.00								
LEVERAGE	-0.01	-0.05	-0.06	-0.05	-0.04	-0.01	1.00							
WAGE	0.43	0.55	0.47	0.25	0.37	0.22	-0.05	1.00						
BEJ	0.05	0.01	-0.07	-0.13	0.03	0.01	0.00	0.08	1.00					
YZRDELTA	0.05	0.10	-0.01	-0.09	0.15	-0.10	0.00	0.01	-0.06	1.00				
SOE	0.18	0.05	0.09	0.11	0.08	0.22	0.00	0.21	0.06	0.02	1.00			
FOE	-0.11	0.08	0.10	0.07	-0.03	-0.26	0.01	-0.08	-0.08	0.10	-0.31	1.00		
ORDINARY EXPORT	0.06	-0.02	-0.13	-0.19	0.03	0.08	0.01	0.12	0.12	-0.01	0.19	-0.44	1.00	
PROCESSING EXPORT	-0.06	0.00	0.12	0.19	-0.04	-0.07	-0.01	-0.13	-0.11	0.01	-0.19	0.43	-0.98	1.00