# Selling Ability in Export Market

Zhe Chen Kai Li *

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**Abstract**

Motivated by two facts: (1) indirect exporters and carry-along exporters have the same productivity distribution. While indirect exporters export through trade intermediaries, carry-along exporters do not only export its own goods, but also carry goods for other indirect exporters. (2) direct exporters have the highest average productivity. However, they only export their own goods but do not carry goods for others. We propose the selling ability to rationalize the two facts together by building a model with two dimensional heterogeneities: production ability(productivity) and selling ability. Both productivity and selling ability are substitutes in export performance. We then identify the existence of selling ability that are consistent with model implications and investigate policy implications on elimination of direct trading rights restriction.

**Keywords:** selling ability, productivity, carry-along exporter, indirect exporter, direct exporter, trade company

**JEL Classification:** F12, F14, L25, M30

*Zhe Chen, School of International Economics and Trade, UIBE, Email: salingerchen@outlook.com. Corresponding Author: Kai Li, School of Economics (SOE) and Wang Yanan Institute for Studies in Economics (WISE), Xiamen University. Email: likai501@gmail.com First Draft: Nov. 2015. Thanks for discussion with Mark Roberts.

# Introduction

Productivity is an important determinant in a firm's export decision. However, a firm with high productivity that is able to efficiently convert input into output does not necessarily deliver its goods to foreign customers. In China, many firms only specialize in production so that trade intermediaries, play a key role in delivering products to foreign customers. The production activity and sales activity are not necessarily carried out by the same firm.

Based on the way of participation in international market in different production and sales modes, there are four types of exporters that are prevalent: (1) a direct exporter, which is a firm that produces and only exports its own products. (2) an indirect exporter, which refers to a firm that produces and exports through trade intermediaries. (3) a trade company that does not engage in production yet only plays as a middleman for indirect exporters. (4) a carry-along exporter (CA exporter) that does not only produce and export its own products, but also carry over goods for indirect exporters. Current researches investigates either production firms or trade intermediaries.

Interestingly, two empirical facts regarding productivity distribution of different exporters stand out: (1) carry-along exporters and indirect exporters have the same productivity distribution. (2) direct exporters that only export their own products have the highest average productivity. Two questions strikes: First, why do some firms become carry-along exporters while others export through trade intermediaries, even though their productivities are very similar? Second, why do some firms that have very high productivity only export their own products?

Another dimension of heterogeneity, other than productivity, is necessary to explain these patterns. Most of literature that interprets such heterogeneity as demand(quality) at product level (Kugler and Verhoogen, 2012; Roberts, et al. 2016). However, product-level demand does not justify that why some exporters carry goods for others products. Rather than product demand, it is the characteristic at firm level that generate spillovers to other firms' products — selling ability. Selling ability is an important determinant on product demand.

Motivated by the two empirical regularities, we propose the selling ability to rationalize two facts together and build a model with two dimensions of heterogeneity: production

ability(productivity) and selling ability to explain different export modes together: indirect exporter, direct exporter, carry-along exporter and trade company. The export mode a firm selects into depends on the combination of selling ability and productivity. The productivity and selling ability are substitutes in determining firms' performance. The paper attempts to offer a unified framework to accommodate four types of exporter together.

What is the selling ability? The selling ability mainly represents the ability to successfully deliver goods to foreign buyers. The factors, such as the span of distribution network or the experience of exposure in foreign market, contribute to a firm's selling ability. While demand(quality) rationalizes the discrepancy between productivity and firms' export sales of their own products, selling ability can explain the existence of trade intermediaries that carry products for other firms. Selling ability is modeled as the demand shifter at firm level that does not only boost demand for all products carried by this firm, but also carry other firms' products at low cost.

Unlike productivity that can be recovered from data, there is no way to direct observe selling ability. We also provide a series of evidence to show the existence of selling ability that are consistent with the model. The model allows us to investigate the policy implication on a relevant policy: elimination of direct trading rights restriction in 2004. The empirical evidences are in line with model prediction.

It is the first paper to accommodate all types of exporters together in a unified framework. In addition, even though current literature on firm export studies extensively on upstream activity on productivity and exports, such as R&D, few addresses the downstream activity, such as sales. The paper is the first one that attempts to supplement the literature.

The paper is organized as follows: Section 2 summarizes relevant literature. Section 3 presents a empirical evidences and discuss the possible explanations. Section 4 outlines a model driven by the empirical evidences with two dimensional heterogeneities: productivity and selling ability. A couple of empirical regularities are presented to show the existence of heterogeneous selling ability in section 5, which are consistent with the model. We then apply the model to study a policy that are relevant with firms' selling ability, the elimination of direct trading rights restriction in 2004. We also find consistent empirical evidence to support model predictions. The last section concludes.

# Literature Review

Two strands of literature are relevant.

The first strand of literature addresses the export mode choice in production firms. In particular, does a firm exports through trade intermediary or export by itself? (Ahn and Wei, 2011; Bai, Krishna and Ma, 2014; Crozet et al., 2013). Ahn and Wei (2011) propose the model and incorporate the choice of firms export through trade intermediary and find the sorting pattern between productivity and export modes because different export modes are associated with different fixed costs. In similar vein, Bai and Krishna (2014) set up a structural model and quantify the productivity evolution and fixed cost in different export modes. Based on Ahn and Wei(2011), Crozet et al. (2013) contributes by allowing both quality-sorting and productivity-sorting in intermediary export firms. In this strand of literature, trade intermediaries are not explicitly integrated into the model, these studies overlook a large proportion of firms in the export market: carry-along exporter.

Complement to the literatures that studies exclusively on production firms. Another strand of literature explicitly focus on wholesaler or carry-along exporter. Akerman (2014) introduces the wholesaler in the heterogeneous firm model and explain the existence of wholesaler. However, it does not distinguish between the wholesaler and exporter that only export goods produced by itself. Bernard et al. (2014) exclusively studies the exporter conducting carry-along trade and find the negative relationship between the carry-along-trade sales and firm productivity. It does not take into account of the indirect exporters to explain why, under same productivity distribution, some firms conduct carry-along trade while others export through trade intermediary. The paper supplements the literatures by providing a framework to incorporate four types of exporters together that are prevalent and inclusive of all types of firms in export market.

Another strand of relevant literatures discusses the demand side heterogeneity. Most of the literatures focuses on production firms and emphasizes on the quality differences (Kugler and Verhoogen, 2012; Roberts et al. 2016). In addition to quality that is a important determinant in demand, some researches points out the importance of customer base on demand (Fitzgerrald et al. 2015). But what determines customer base? Arkolakis(2011) investigates firm's intensive margin conditional on exporting by introducing market penetration cost so that exporters can costly reach out customers. Since productiv-

ity and selling(marketing) ability are not orthogonal to each other, it also implies that high productivity firms access large proportion of markets. However, data rejects the positive correlation between productivity and export sales, especially when carry-along exporter is considered (Bernard, 2016). We also find similar evidence in Chinese data. The paper also supplements the literatures on selling ability and emphasize on the distinction between productivity and selling ability.

# Empirical Regularities

Two sets of firm-level data are used: manufacturing data and customs data. Manufacturing data documents the firm's production variables, including the capital, labor, intermediate inputs and export value at year level. The export value in manufacturing data denotes the export value of goods produced by the firm. Productivity is recovered from the manufacturing data.

The other dataset is the customs data recorded at the transaction level. In order to match the two datasets at the firm-year level, customs data is aggregated up to year level. The excessive export value in customs data relative to manufacturing data represents the volume of carry-along trade. Only 2% of export value in the manufacturing data can be matched precisely with export value in customs data, around 93% of exporter have larger exports sales in customs data than manufacturing data.[1]

First, we present the way to identify four types of exporters and examine their characteristics. The method to identify exporter in the table might generate a caveat for direct exporter[2], who export part of their products through trade intermediary and conduct carry-along for other firms' products to compensate up to similar value. To allow errors in the export values, $\eta$ is defined as the tolerance between export value in manufacturing data and customs data, $\eta \geq 1$.

[1]The two datasets are merged using characteristics, such as CEO name, zipcode, telephone, location etc. For example, the ABC firm has two separate companys: ABC manufacuturing firm and ABC trade company. Both of them share the same key characteristics, including CEO, location etc. The export sales in trade company is not documented in manufacuturing data.

[2]Because product information is unavailable in manufacturing data, it is impossible to track the source of production.

Table 1: Identification of Exporters

| type of exporter | manufacturing data | customs data | relationship |
|---|---|---|---|
| Trade company | N.A | $exp^c > 0$ | N.A |
| Carry-Along exporter | $exp^m > 0$ | $exp^c > 0$ | $\eta * exp^m < exp^c$ |
| Direct exporter | $exp^m > 0$ | $exp^c > 0$ | $exp^c \leq \eta * exp^m$ |
| Indirect exporter | $exp^m > 0$ | N.A | N.A |

$exp^m$ and $exp^c$ denote the export sales in manufacturing and customs data, respectively

After defining the four types of exporters, we examine the associated statistics on their characteristics, especially in productivity. Two observations regarding productivity are salient: (1) carry-along exporters and indirect exporters have the same productivity distribution. (2) Direct exporters that only export its own products have the highest average productivity.

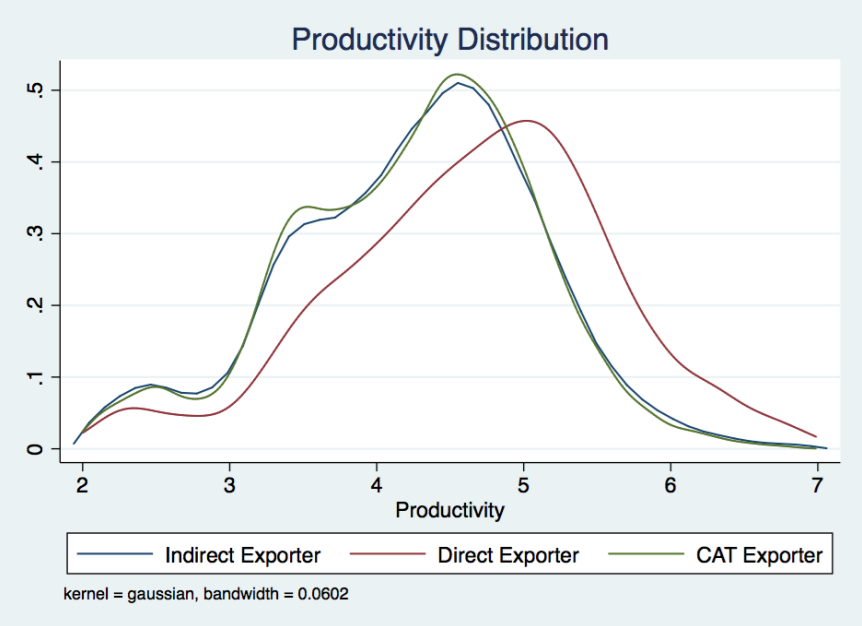


Figure 1: Empirical Distribution of Productivity

In addition, one might argue that the productivity difference might come from industry-specific effect, for example, high productivity of exporters are clustered in certain industries. Even though the number of exporters in each industry varies substantially [3], Figure 2 shows that productivity for direct exporters are consistently higher than both indirect exporters and CA exporters within each 2-digit industry.

[3] Appendix I

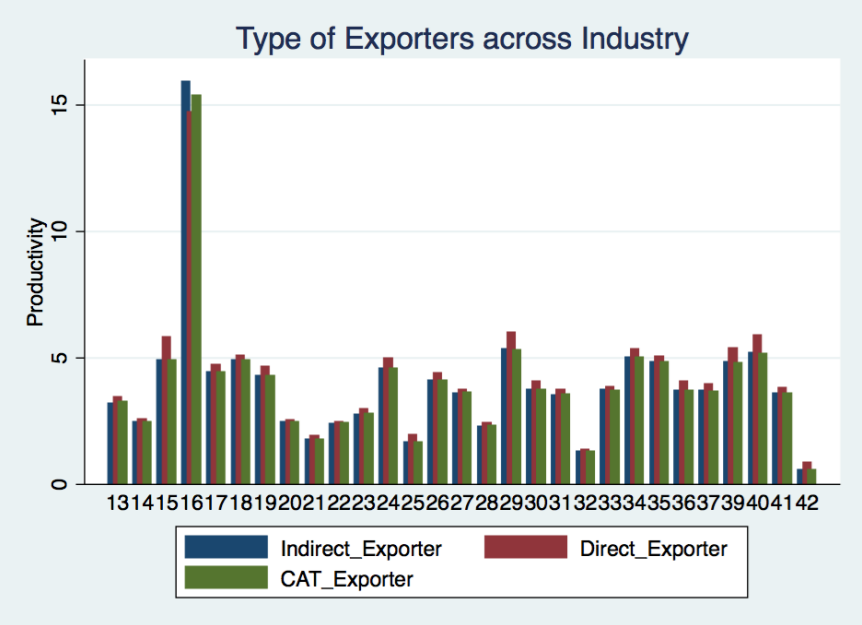


Figure 2: Productivity of Exporters across Industry

The following table shows that the productivity ranking for different exporters are robust even after controlling the industry effect. The benchmark firms in column (1) and (2) are domestic firms. The coefficients for indirect exporters and CAT exporters are very similar with each other. The productivity of them are consistently lower than that of direct exporters. In column (3) and (4), the benchmark firms are indirect exporter, the productivity of CAT exporters are the same, regardless of whether the industry fixed effect is controlled or not.

The caveat about industry-specific effect is also excluded.

Table 2: Robust Check on Industry-specific Effect

| | $\omega_{it}$ | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| indirect exporter | 0.49** | 0.20** | | |
| | (0.002) | (0.001) | | |
| direct exporter | 0.92** | 0.54** | 0.43** | 0.34** |
| | (0.02) | (0.009) | (0.02) | (0.009) |
| CAT exporter | 0.47** | 0.20** | 0.01 | -0.00 |
| | (0.006) | (0.003) | (0.01) | (0.00) |
| industry FE | No | Yes | No | Yes |
| obs. | 1346253 | | 388113 | |

* and ** denote 5% and 1% significance level, respectively

In addition, the patterns are robust to sample that only contains the observations of first year exports into the export market, in order to eliminate the learning by exporting effect. In addition, the two observations are invariant to $\eta$[4].

Based on the observation, two questions arise: first, why do indirect exporters and carry-along exporters have the same productivity but carry-along exporters do not only export their own goods but also carry goods for others? second, why do direct exporters that have the highest productivity do not carry exports for others?

Table 3: Statistics ($\eta = 1.2$, whole sample)

| | domestic firm | indirect exporter | direct exporter | CA exporter |
|---|---|---|---|---|
| log(export sales) | N.A | 11.62 | 11.78 | 16.24 (11.56) |
| log(domestic sales) | 11.91 | 11.58 | 12.27 | 11.55 |
| log(productivity) | 3.64 | 4.14 | 4.57 | 4.14 |
| log(capital) | 10.4 | 10.94 | 11.90 | 10.83 |
| log(labor) | 4.54 | 5.25 | 5.92 | 5.15 |
| Foreign Ownership | 0.08 | 0.38 | 0.48 | 0.37 |
| $\frac{\text{ordinary trade value}}{\text{export value}}$ | N.A | N.A | 0.85 | 0.64 |
| # of observation | 868757 | 346672 | 2998 | 38443 |

Note: 11.56 in parenthesis denotes the export sales of its own goods

Table 3 presents statistics on four types of exporters.

Two potential explanations are excluded: (1) Size. Because export activity is costly, larger firms are more likely to overcome the cost. Even though direct exporters are larger in size, both in terms of capital and labor, indirect exporters and CA exporters are similar in size. (2) Foreign ownership. Because foreign ownership brings intangible connection to foreign market, it is not surprise to see the high share in foreign ownership for direct exporters compared with indirect exporters. However, the explanation is not so convincing if CA exporters is taken into account because CA exporter have similar foreign ownership share with indirect exporters. The difference, either in size or ownership, only explain the exports between indirect exporters and direct exporters. However, it cannot jointly justify when CA exporters are taken into consideration.

After ruling out the two prevalent explanations, what is the underlying determinant?

[4]See Appendix 1 for other cases: (1) first year exporter. (2) $\eta = 1.5$

We propose an important yet missing determinant: selling ability. While productivity measures the efficiency to convert input into output, the selling ability measures the ability to successfully deliver output to customers. It might include the ability to quickly identify the potential customers and efficiently deliver products to them. The size of sales network, experiences of exposure in foreign markets contribute to selling ability.

In the next section, a model with heterogeneous productivity and selling ability is established to explain four types of exporters: indirect exporter, direct exporter, trade company and carry-along exporter in a unified framework.

# A Model with Selling Ability

The goal of the model is to incorporate both productivity and selling ability in a heterogeneous model to accommodate both trade intermediary and production firms in a unified framework. By doing so, the model can generate implications on productivity that are consistent with the empirical regularities.

The intuition is straightforward: each firm is endowed with the pair of characteristics $(s, \phi)$ that jointly determines firms' performance. When a firm is endowed with high selling ability, it plays as the middleman, either as trade company or as CA exporter(carry-along exporter). Whether such a firm engages in production depends on its productivity. In contrast, a firm endowed with low selling ability only chooses one of the following depending on productivity: non-export, indirect export, direct export. Direct exporters have to be very superb in production to compensate their low selling ability in penetrating foreign market. That is why the direct exporters that only export their own products have the highest average productivity.

Two types of abilities determine a firm's export modes: the selling ability $s$ and production ability (productivity) $\phi$. While productivity measures production efficiency to convert input into output, selling ability measures firm's ability to efficiently deliver products to more customers.

Each firm is endowed with sales ability $s$ and production ability (productivity) $\phi$: $(s, \phi) \in S \times \Phi$. Under the CES demand, the quantity consumed:

$$q = sp^{-\sigma}\mathbb{E}$$

where $s$ is the selling ability and $\mathbb{E} = IP^{\sigma-1}$ denotes the aggregate demand index. The distribution of productivity $\phi \sim G(.)$, where $G(\overline{\phi}) = 1; G(\underline{\phi}) = 0$. In contrast to productivity, sales ability $s$ is a precious ability among firms that follows binomial distribution: $s \in \{s_H, s_L\}$.

$$s = \begin{cases} s_H & \text{w.p.} \quad \theta \\ s_L & \text{w.p.} \quad (1-\theta) \end{cases}$$

Under the specification, selling ability is independent of productivity. This is the critical specification that differs from Arkolakis (2010), in which productivity also determines market share.

A firm chooses to become one of the following types: (1) a trade company that only plays the role of middleman and does not produce (2) a carry-along exporter that produces and exports its own products, as well as exports other firms' products (3) an indirect exporter that only takes care of production and exports through trade intermediary and (4) a direct exporter that produces and only exports its own products.

In addition to the production cost of the firm: $\frac{q}{\phi}$, each export mode is associated with different fixed cost. $f_i$ and $f_d$ denote the fixed cost of indirect export and direct export, respectively. While $f_i$ mainly embodies the cost to search a trade company/carry-along exporter to use as an intermediary, $f_d$ includes the cost to actively reach out and deliver goods to foreign market: $f_i < f_d$. In addition to the fixed cost, there is an additional convex cost for trade intermediary: $\frac{h(m)}{s}$, where $m$ denotes the number of varieties. The term is associated with varieties of products: $h'(m) > 0, h''(m) > 0$ and $h(1) = 0$. Since all firms, if engaged in production, are single-variety producers, $h(1) = 0$ implies no extra cost is incurred in addition to fixed cost, if the firm only export its own good. Exporting through trade intermediary, a firm enjoys the selling ability of the trade intermediary at the cost of being charged with proportion $\lambda$ of its export sales by the trade intermediary. $\lambda$ characterizes the commission rate, which is assumed to be constant in the following analysis.

Before we start the model, assumption 1 is made to simplify the analysis.

**Assumption 1**: For large enough $m$, $\frac{h'(m)}{s_H} < \frac{h'(1)}{s_L}$.

The assumption characterizes the relationship between $h(m)$ and $\{s_L, s_H\}$ to exclude the situation where a firm with $s = s_L$ becomes trade intermediary (either trade company or

carry-along exporter). A firm with $s = s_L$ that lacks of selling ability can only specialize on production and chooses one of the following modes: (1) non-export; (2) indirect export through trade intermediary and (3) direct export by itself. In contrast, a firm endowed with $s = s_H$ utilizes its good sales ability and becomes either (1) trade intermediary or (2) carry-along trade. In the following part, I will discuss the two cases when $s = s_L$ and $s = s_H$, separately.

**1.** $s = s_L$

A firm with $s = s_L$ that lacks of selling ability becomes one of the following: (1) non-exporter; (2) indirect exporter and (3) direct exporter.

(1) If a firm with $s = s_L$ chooses to export through indirect export, $\lambda$ of export sales is charged by trade intermediary in exchange of utilizing the selling ability $s_H$. The payoff: $\pi(s_L, \phi|\text{indirect export})$

$$\max_p \pi(s_L, \phi|\text{indirect export}) = (1-\lambda)pq - \frac{q}{\phi} - f_i \qquad s.t \quad q = s_H p^{-\sigma}\mathbb{E}$$

$$p = \frac{\sigma}{\sigma-1}\frac{1}{\phi(1-\lambda)}$$

$\pi(s_L, \phi|\text{indirect export}) \geq 0$ pins down the productivity cutoffs $\underline{\phi_1}$ between non-export and indirect export:

$$\underline{\phi_1} = \frac{\sigma}{\sigma-1}\left(\frac{\sigma f_i}{s_H(1-\lambda)^\sigma \mathbb{E}}\right)^{\frac{1}{\sigma-1}} \tag{1}$$

(2) If productivity of a firm is high, the firm can also penetrate foreign market directly by paying the large upfront cost $f_d$, even if the firm is endowed with low selling ability $s_L$:

$$\max_p \pi(s_L, \phi|\text{direct export}) = pq - \frac{q}{\phi} - f_d \qquad s.t \quad q = s_L p^{-\sigma}\mathbb{E}$$

Similarly, $\pi(s_L, \phi|\text{direct export}) \geq \pi(s_L, \phi|\text{indirect export})$ pins down the productivity cutoff $\underline{\phi_2}$ between indirect export and direct export:

$$\frac{1}{\sigma}s_L\left(\frac{(\sigma-1)\phi}{\sigma}\right)^{\sigma-1}\mathbb{E} - f_d \geq \frac{1}{\sigma}s_H(1-\lambda)^\sigma\left(\frac{(\sigma-1)\phi}{\sigma}\right)^{\sigma-1}\mathbb{E} - f_i$$

$$\underline{\phi_2} = \frac{\sigma}{\sigma-1}\left(\frac{\sigma(f_d - f_i)}{(s_L - s_H(1-\lambda)^\sigma)\mathbb{E}}\right)^{\frac{1}{\sigma-1}} \tag{2}$$

**Assumption 2**: For large enough $\lambda$, $\frac{s_L}{s_H(1-\lambda)^\sigma} < \frac{f_d}{f_i}$

The assumption implies $\underline{\phi_2} > \underline{\phi_1}$, which guarantees the existence of the indirect exporter. The above productivity cutoffs provide the sorting pattern between productivity and export modes in the following way:

$$\text{export mode} = \begin{cases} \text{non-export} & if \quad \phi \in [\underline{\phi}, \underline{\phi_1}) \\ \text{indirect export} & if \quad \phi \in [\underline{\phi_1}, \underline{\phi_2}) \\ \text{direct export} & if \quad \phi \in [\underline{\phi_2}, \overline{\phi}] \end{cases}$$

When $s = s_L$, it is similar to Ahn and Wei (2011). However, the environment becomes different when $s = s_H$.

**2.** $s = s_H$

A firm endowed with high selling ability: $s = s_H$ becomes trade intermediary in either one of the two, depending on the productivity $\phi$: (1) trade company or (2) carry-along exporter.

While some trade companies are born to conduct foreign trade, most CA exporters are already established in domestic market with production. Among all firms that are about to become trade company, they have to pay fixed cost $f_t$ that comprises of two parts: the domestic cost, such as the cost to process administrative works; and the foreign cost, such as the cost to set up distribution networks overseas. Unlike trade companies, CA exporters have to pay $f_d$ to export their own products. In general, $f_d > f_t$.

Each firm, endowed with $s_H$ has similar cost structure in carrying other varieties: $h(m)$ and same selling ability $s_H$. The setup assumes away the heterogeneity among trade intermediaries.

(1) If a firm becomes trade company, it determines the number of varieties $m$ to carry

along. The payoff to become trade company is:

$$\max_{m} \pi(s_H, \phi|\text{trade company}) = m \int_{\underline{\phi_1}}^{\phi_2} \lambda(p(\phi)q(\phi))dG(\phi) - (f_t + \frac{h(m)}{s_H})$$

The first part $\int_{\underline{\phi_1}}^{\phi_2} \lambda(p(\phi)q(\phi))dG(\phi)$ denotes the expected revenue from each indirect exporter. The second part $(f_t + \frac{h(m)}{s_H})$ denotes the total cost, which is comprised of fixed cost $f$ and cost associated with span of export $\frac{h(m)}{s_H}$. Trade companies only choose the number of varieties $m$. The commission fee is determined in equilibrium. Since there is no heterogeneity of selling ability among all firms with $s_H$, no sorting pattern occurs between indirect exporter and trade intermediary.

The optimal number of varieties $m^*$, given $\lambda$, is:

$$\int_{\underline{\phi_1}}^{\phi_2} \lambda(p(\phi)q(\phi))dG(\phi) = \frac{h'(m^*)}{s_H} \tag{3}$$

(2) If a firm is born with high selling ability and relatively high productivity, it also carries the same number of varieties $m^*$ because of the same cost function on varieties: $h(m)$. In order to distinguish the different fixed cost for later analysis, the fixed cost for carry-along exporter is denoted as $f_d$.

The difference between trade company and CA exporter is whether to engage in production and export its own products:

$$\max_{p,m} \pi(s_H, \phi|\text{CA}) = p(\phi)q(\phi) - \frac{q(\phi)}{\phi} + m \int_{\underline{\phi_1}}^{\phi_2} \lambda(p(\phi)q(\phi))dG(\phi) - (f_d + \frac{h(m+1)}{s_H})$$

For a certain $\phi$, a firm is indifferent between becoming a trade intermediary and CA exporter. The condition pins down the productivity cutoff $\underline{\phi_3}$: $\pi(s_H, \phi|\text{CA}) = \pi(s_H, \phi|\text{trade company})$

$$\underline{\phi_3} = ([(f_d - f_t) + \frac{h'(m)}{s_H}]\frac{\sigma}{s_H \mathbb{E}})^{\frac{1}{\sigma-1}} \frac{\sigma}{\sigma-1} \tag{4}$$

**Assumption 3**: For large enough $m$ and $\lambda$, $(f_d - f_t) + \frac{h'(m)}{s_H} \leq \frac{f_i}{(1-\lambda)^\sigma}$.

The assumption 3 indicates $\underline{\phi_3} < \underline{\phi_1}$.

In equilibrium, the number of varieties that indirect exporter would like to export through trade intermediary is equal to total number of varieties that trade intermediary are able to carry. Recall that $\theta$ denotes the proportion of firms with $s_H$:

$$(1-\theta)\int_{\underline{\phi_1}}^{\underline{\phi_2}} dG(\phi) = m\theta \tag{5}$$

The left hand side and right hand side denote the total varieties of indirect exporter and total varieties carried through trade intermediary, respectively.

The equations (1)-(5) characterize the exporters' productivity cutoff for different type of firms.

To close the model, there is still one condition that need to be satisfied:

$$\pi(s_H, \phi \leq \underline{\phi_3}|\text{trade company}) = m^* \int_{\underline{\phi_1}}^{\underline{\phi_2}} \lambda(p(\phi)q(\phi))dG(\phi) - (f_t + \frac{h(m^*)}{s_H}) > 0$$

The condition guarantees the existence of trade company. Under this condition, all firms born with $s = s_H$ become either trade intermediary or CA exporters. As long as $\underline{\phi_3} < \underline{\phi_1}$, the payoff with $s = s_H$ is always higher than $s = s_L$. In the model, the trade company is the firm that is endowed with high selling ability $s_H$ and low productivity $\phi$. Figure 4 illustrates the payoff and productivity cutoffs for different export modes:

The mean productivity for indirect exporter:

$$\overline{\phi}^{\textbf{indirect exporter}} = \int_{\underline{\phi_1}}^{\underline{\phi_2}} \phi dG(\phi)$$

Similarly, the mean productivity for direct exporter and CA exporter:

$$\overline{\phi}^{\textbf{direct exporter}} = \int_{\underline{\phi_2}}^{\overline{\phi}} \phi dG(\phi) \qquad \overline{\phi}^{\textbf{CA exporter}} = \int_{\underline{\phi_3}}^{\overline{\phi}} \phi dG(\phi)$$

Because $\underline{\phi_3} < \underline{\phi_1} < \underline{\phi_2}$, we know $\overline{\phi}^{\textbf{direct exporter}} > max\{\overline{\phi}^{\textbf{indirect exporter}}, \overline{\phi}^{\textbf{CA exporter}}\}$. It replicates the data pattern that some firms with superb production ability only export its own products.

Since $\underline{\phi_3} < \underline{\phi_1}$ and $\overline{\phi} > \underline{\phi_2}$, both CA exporter and indirect exporter have the similar average productivity, even though the productivity distribution of CA exporter might be

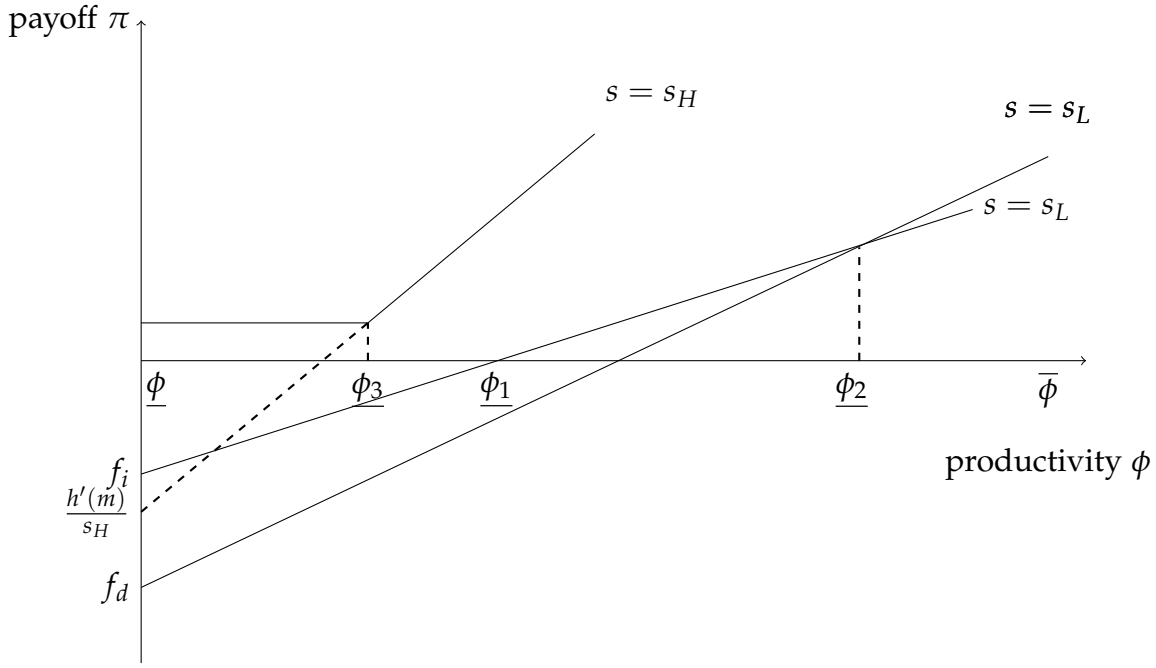


Figure 3: payoff and productivity

slightly dispersed than indirect exporter. The model exactly recovers the two empirical regularities on productivity.

As $\lambda$ increases, there are two effects competing with each other. The direct effect is that commission fee charged by each variety increases. However, the indirect effect that total number of varieties exporting through trade intermediary becomes less, which indirectly lower $\lambda$.

**Proposition**: Under the assumption that the payoff to carry each variety is monotonic increasing in $\lambda$,

$$\frac{\partial \int_{\underline{\phi}_1}^{\phi_2} \lambda(p(\phi)q(\phi))dG(\phi)}{\partial \lambda} > 0$$

The pair of $(\lambda^*, m^*)$ is uniquely determined by (3) and (5).

Proof: Under the additional assumption, LHS of (3) is increasing in $\lambda$. RHS of (3) is increasing in $m$. Therefore $\lambda$ is increasing in $m$ from (3).

From (1) and (2), $\phi_2(\lambda)$ and $\phi_1(\lambda)$ are monotonic decreasing and increasing w.r.t $\lambda$, respectively. LHS of (5) is decreasing in $\lambda$. Therefore $m$ is decreasing in $\lambda$ in equation (6). (3) and (6) uniquely determines the pair: $(\lambda^*, m^*)$. Q.E.D

There is a unique equilibrium determined in the model. In the following section, a couple of evidences of selling ability are presented that are in line with the model.

# Evidences on Selling ability

Even though selling ability is unobservable, we explore the data and find three pieces of evidences to show the selling ability that are consistent with the model: (1) selling ability determines number of products carried out, number of destinations exported and export sales on each destination. (2) selling ability determines product demand that are not only on its own products, but also on other firms' products being carried out. (3) while spending in R&D increases firms' productivity, spending in advertisement is positively associated with selling ability.

## Evidence I

Selling ability is reflected in the following three aspects: (1) number of exporting products (2) number of export destinations and (2) average export sales in each destination. Compared with direct exporter, CA exporters carry more products, reach out more destinations and achieve higher average sales on each destination.

In particular, the average number of products(HS8) carried by each direct exporter is 2.17. However, the number of products carried by CA exporters is 7.28. In terms of export destination, CA exporters reach out 8.8 countries as opposed to 2.2 countries for direct exporters. In addition, the average export sales on each destination is higher for CA exporters than direct exporters.

One concern is about the export composition (Ordinary vs. Processing trade) that leads to the difference. The sample that only includes ordinary trade also preserves the observations.

## Evidence II

In addition to the previous evidence, selling ability also applies to goods produced by themselves and carry-along goods. Figure 3 illustrates the positive correlation between export sales of carry-along and export sales of its own products.

Table 4: Statistics ($\eta = 1.2$)

| | direct exporter | CA exporter |
|---|---|---|
| | Whole Sample | |
| No. of Product (HS4) | 1.78 | 4.48 |
| No. of Product (HS8) | 2.17 | 7.28 |
| No. of Destinations | 2.22 | 8.88 |
| Ave sales in each Dest. | 11.29 | 14.65 |
| | Sample with Ordinary Trade | |
| No. of Product (HS8) | 1.87 | 5.29 |
| No. of Destinations | 1.93 | 6.81 |
| Ave sales in each Dest. | 11.22 | 13.69 |

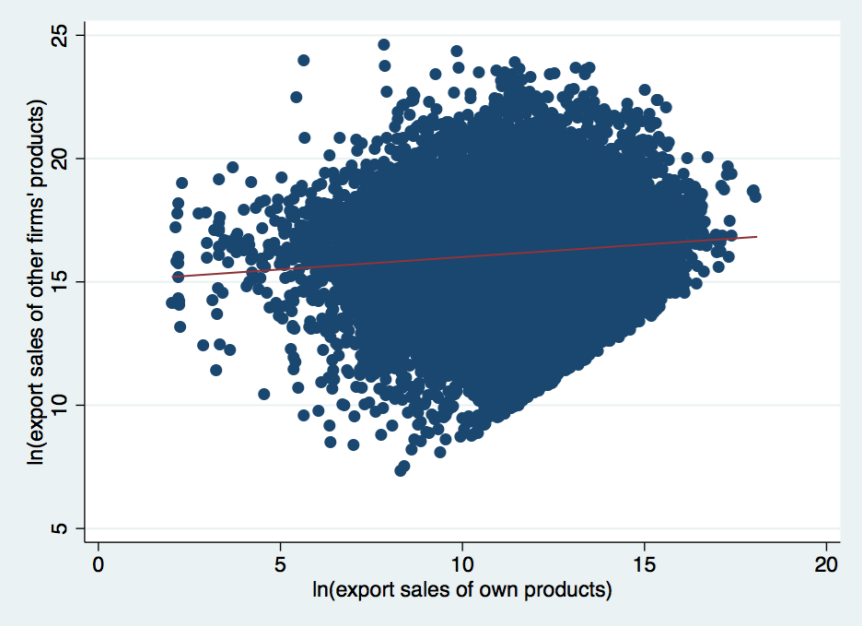


Figure 4: Export Sales of Own vs. Other Products for Carry-along Exporter

To further validate the relationship, I examine the correlation between firm characteristics and export sales. In particular, $lnr^d_{it}$, $lnr^f_{it}$ and $lnr^c_{it}$ denote the domestic, export sales of its own products and export sales of carry-along trade, respectively.

Both domestic sales $lnr^d_{it}$ and export sales of its own products $lnr^f_{it}$ are positively correlated with variables of production capacity: capital $lnk_{it}$, labor $lnl_{it}$ and productivity $\omega_{it}$. However, the export sales of carry-along trade (export sales of other firm's products) $lnr^c_{it}$ are uncorrelated with characteristics on production capacity: $lnk_{it}$, $lnl_{it}$ and $\omega_{it}$, but is correlated with its own exports $lnr^f_{it}$. The estimates show that there appears to have some common factor that determines both $lnr^f_{it}$ and $lnr^c_{it}$, but not included in production charac-

Table 5: Sales and Firm Characteristics

| | $lnr^d_{it}$ | $lnr^f_{it}$ | $lnr^c_{it}$ | $lnr^c_{it}$ | $lnr^c_{it}$ |
|---|---|---|---|---|---|
| $lnk_{it}$ | 0.19** | 0.11** | -0.01 | -0.01 | -0.01 |
| $lnl_{it}$ | 0.20** | 0.32** | 0.02 | -0.01 | 0.02 |
| $\omega_{it}$ | 1.29** | 1.03** | 0.04 | 0.02 | -0.01 |
| $lnr^f_{it}$ | | | | 0.03** | 0.03** |
| trade rights removal | | | | | 0.76** |
| year/ind dummies | Yes | Yes | Yes | Yes | Yes |
| obs. | 1146148 | 388111 | 38726 | 38726 | 26749 |

* and ** denote 5% and 1% significant level, respectively

teristics. If product demand is independent across own products and other firms' products, the positive correlation implies the existence of selling ability.

Before we make claim on the existence of selling ability, we should carefully address one concern. China's direct trading rights restriction are removed at 2004. Before 2004, only firms granted with license are allowed to export directly and engage in carry-along trade. In order to eliminate the possibility that CA exporters' carry-along trade might come from the trade right grant rather than selling ability, we examine the effect of trade right removal on carry along trade volume. If exporters' carry-along trade comes from the exclusive trade right, instead of selling ability, the coefficient is expected to be negative, since the removal of trade right restriction leads to decrease of carry along trade. However, the last column in Table 5, which include all exporters conducting carry along trade before 2004, precludes the concern on trade right restriction.

## Evidence III

While firms' spending on R&D increase productivity, expenditure on advertisement fosters selling ability. The following table illustrates firms' type and their expenditures on R&D and advertisement.

The benchmark are the firms that only serve domestic market. Compared with other firms(exporters), direct exporters, which have the highest productivity, associate with the highest level of R&D expenditure. The pattern is consistent with the mechanism that R&D expenditure increases productivity. Similarly, CA exporters, which is supposed to have the highest selling ability among all firms in the sample[5], spend most on advertisement that also increases firms' selling ability. Such patterns are robust regardless of controlling either

[5]in the sample, trade companies are not included

Table 6: R&D and Advertisement Expenditure

| | $\ln(E^{R\&D})$ | | $\ln(E^{Ad})$ | |
|---|---|---|---|---|
| | (1) | (2) | (1) | (2) |
| Indirect Exporter | 0.09** | 0.17** | 0.13** | 0.31** |
| Direct Exporter | 0.51** | 0.70** | 0.34** | 0.80** |
| CA Exporter | 0.23** | 0.48** | 0.38** | 0.83** |
| Firm Characteristics | Yes | Yes | Yes | Yes |
| Fixed effect | industry | firm | industry | firm |

* and ** denote 5% and 1% significant level, respectively.
Firm characteristics include productivity, capital and labor.

industry or firm fixed effect.

The above three evidences shed light on the existence of selling ability. While indirect and direct exporters are those exporters with relatively low selling ability so that they do not carry exports for others, CA exporters are equipped with relatively high selling ability.

In the next section, we apply the model to briefly examine a policy that are relevant to firms' selling ability.

# Model Application

The model generate rich implication on different type of exporters and their export modes. In this section, we study the policy: elimination of trading rights restriction in 2004. The model prediction is consistent with empirical evidence from data.

## Elimination of Trading Rights Restriction

Before July 2004, only firms granted with licenses are allowed to conduct business as trade intermediary for a certain range of goods. Many firms without license have to export through those with export license.

The policy allows firms to register as trade company without requirement on registered capital, which was highly restricted before 2004. Moreover, most of export varieties carried out through trade intermediaries are liberalized in 2004. That is, the policy generate implications on the following two aspects associated in the model:

(1) First, the policy decrease fixed costs, in particular for trade companies. The fixed cost reduction for CA exporters is not significant because they export their own products that

also needs to finish loads of administrative work. Therefore, $f_t$ decreases after the policy was carried out.

(2) Second, the policy allows firms to carry goods for other industries without administrative approval. With same cost, a trade intermediary is able to carry more goods. Alternatively, $h(m)$ becomes $g(m)$, which is less convex than $h(m)$. In particular, $g'(m) > 0$ and $g''(m) > 0$. For any $m$, $g'(m) < h'(m)$ and $g''(m) < h''(m)$.

The policy to eliminate the trading rights is defined as the following:

Table 7: Policy Experiment

| | No Treatment | Treatment |
|---|---|---|
| Treatment | year $\leq$ 2003 | year $\geq$ 2004 |

The endogenous variables are: $\underline{\phi_1}$, $\underline{\phi_2}$, $\underline{\phi_3}$, $m$ and $\lambda$. All those variables, except $\lambda$, are observable.

**Claim**: The policy of elimination of trading restriction leads to a decrease in both $\underline{\phi_1}$ and $\lambda$, and an increase in $\underline{\phi_2}$ and $\underline{\phi_3}$, as well as increase in $m$.

Proof: The policy leads to two changes in exogenous variables: $f_t$ decreases and $h(m)$ becomes less convex. Since $f_t$ only determines $\underline{\phi_3}$, we first consider the change in $h(m)$.

Suppose $m^{**}$ such that $g'(m^{**}) \geq h'(m^*)$, $m^{**} > m^*$ because $g(m)$ is less convex. Since $m^{**}$ increases, $\lambda^{**}$ increases as well according to (3). Because $\lambda^{**}$ increases, $\underline{\phi_2}$ decreases and $\underline{\phi_1}$ increases as well. However, both a decrease in $\underline{\phi_2}$ and an increase in $\underline{\phi_1}$ leads to the decrease in LHS of (5), which contradicts with the increase in RHS of (5). Therefore, $m^{**}$ leads to $g'(m^{**}) < h'(m^*)$.

Suppose $m^{**} < m^*$, $\lambda^{**}$ decreases as well. Because $\lambda^{**}$ decreases, $\underline{\phi_2}$ increases and $\underline{\phi_1}$ decreases as well. However, both a decrease in $\underline{\phi_1}$ and an increase in $\underline{\phi_2}$ leads to the increase in LHS of (5), which contradicts with the increase in RHS of (5).

To combine the two cases, $m^{**}$ increases such that $g'(m^{**}) < h'(m^*)$. Therefore, $\lambda^{**}$ decreases as well.

In addition, $f$ decreases and $h'(m^*)$ decreases in (3). If $f$ decreases to the extent that increase in $(f_d - f_t)$ dominates the decrease in $h'(m)$, then $\underline{\phi_3}$ increases. Q.E.D

With the elimination of direct trading rights restriction, the cost to carry exports de-

creases, which leads to the low commission fee. On the one hand, the low commission fee in turn induces more firms to export through trade intermediary. On the other hand, the reduction in fixed cost benefits trade companies so that more firms that would have become CA exporter turns into trade companies.

The elimination of direct trading rights restriction decreases both fixed cost to become trade company and cost to carry more goods. In response to the policy, more firms becomes trade companies to specialize in sales, which also go along with more firms export through trade intermediaries.

Under the assumption that distribution of firms are constant overtimes, the policy generates following testable implications for different type of exporters: (1) an indeterminate in the average productivity of indirect exporter because of an increase in $\underline{\phi_2}$ and a decrease in $\underline{\phi_1}$. (2) an increase in the average productivity of direct exporter because of an increases in $\underline{\phi_2}$. (3) an indeterminate in the average productivity of CA exporter (most likely to be an increase) because of an increase in $\underline{\phi_3}$. (4) an increase in product scope for CA exporters and (5) a decreases in commission fee. Since (5) is unobservable, we can only test (1)-(4).

## Data Evidence

Since we do not explicitly model firms in domestic market, domestic firms are set as the benchmark to control productivity for different types of firms. We examine the productivity to test implications (1)-(3) on productivity. Two specifications are adopted. We first estimate the following regression:

$$\phi_{it} = \alpha_0 + \sum_j \alpha_1^j + \beta_{treatment} + \sum_j \alpha_2^j D_{j,treatment} + \gamma_i + \epsilon_{it}$$

where $\alpha_2^j$ controls the exporter type fixed effects, $j \in \{\text{indiret, direct, CA}\}$ and $\beta_{treatment}$ denotes the treatment effect of elimination of trading rights restriction in year 2004 and $\beta_{treatment} = 1$ if year is from year 2004 onward. $D_{j,treatment} = 1$ if exporter is type $j$ and time is from year 2004 onward. $\alpha_2^j$ is the interested coefficients that measure the relative change in average productivity of type $j$ exporter to the domestic firms. $\gamma_i$ absorbs the firm(industry) fixed effect.

Column (1) and (2) control industry and firm fixed effect, respectively. The coefficients

Table 8: Policy Effects on Productivity $\phi$

| | productivity | |
|---|---|---|
| | (1) | (2) |
| $\alpha_1^{\text{indirect}}$ | 0.130** | 0.024** |
| | (0.001) | (0.002) |
| $\alpha_1^{\text{direct}}$ | 0.247** | 0.120** |
| | (0.012) | (0.019) |
| $\alpha_1^{\text{CA}}$ | 0.141** | 0.021** |
| | (0.004) | (0.007) |
| $\beta$ | 0.103** | 0.108** |
| | (0.001) | (0.001) |
| $\alpha_2^{\text{indirect}}$ | -0.011** | 0.081** |
| | (0.001) | (0.003) |
| $\alpha_2^{\text{direct}}$ | 0.029* | 0.080** |
| | (0.014) | (0.021) |
| $\alpha_2^{\text{CA}}$ | 0.010* | 0.126** |
| | (0.004) | (0.007) |
| Fixed Effect | Industry | Firm |
| observation | 1256870 | |

** and * denote the 1% and 5% significance level.

$\alpha_2^{indirect}$ is ambiguous in the sense that $\alpha_2^{indirect} > 0$ when industry fixed effect is controlled and $\alpha_2^{indirect} < 0$ when firm fixed effect is controlled. $\alpha_2^{direct} > 0$ and $\alpha_2^{CA} > 0$, regardless of either industry fixed effect or firm fixed effect, are consistent with model predictions that treatment indeed increases the average productivity of both direct and CA exporters relative to domestic firms.

In addition to evidence regarding productivity, another implication comes from the product scope $m$. Since the product scope is unobserved for domestic and indirect exporters, the direct exporters are used as the benchmark. In particular, we investigate both the direct and carry-along exporters. The specification is set as follows:

$$m_{it} = \theta_0 + \theta_1 + \psi_{treatment} + \theta_2 E_{CA,treatment} + \gamma_i + \epsilon_{it}$$

Similarly, (1) and (2) control industry fixed effect and firm fixed effect, respectively. As the model predicts, evidences from product scope $m$ are consistent with the dominant effect on reduction of $f_t$ upon elimination of trading rights restriction. In particular, $\theta_1 > 0$ indicates that CA exporters carry more products as opposed to direct exporter. The

Table 9: Policy Effect on Product Scope $m$

| | # of Products | | | |
|---|---|---|---|---|
| | HS4 | | HS8 | |
| | (1) | (2) | (1) | (2) |
| $\theta_1$ | 1.303** | 0.870** | 2.319** | 1.511** |
| | (0.139) | (0.153) | (0.252) | (0.273) |
| $\psi$ | -0.316* | -0.299 | -0.483 | -0.382 |
| | (0.153) | (0.167) | (0.277) | (0.299) |
| $\theta_2$ | 0.899** | 0.972** | 1.464** | 1.539** |
| | (0.205) | (0.173) | (0.287) | (0.309) |
| Fixed Effect | Industry | Firm | Industry | Firm |
| observation | 41441 | | | |

** and * denote the 1% and 5% significance level.

insignificance of $\psi$ indicates the policy has no effect on direct exporter. The interested parameter, $\theta_2 > 0$ tells that CA exporter carries more goods in response to the policy, relative to direct exporters. All the evidence on product category are robust when we examine at both HS4 and HS8 product level.

The model with four types of exporters unveil rich and robust evidence that are consistent with model prediction.

# Conclusion

Motivated by the two empirical facts, we build a model with two dimensional heterogeneities: production ability(productivity) and selling ability. While a firm with low selling ability chooses to become one of the following: non-exporter, indirect exporter and non-carry-along exporter, a firm with high selling ability can either becomes trade intermediary or carry-along exporter. Selling ability and productivity are substitutes in firms' choice. The model supplements the literatures on heterogeneous firms, especially on demand side heterogeneity. Under the framework with selling ability, all types of exporters are included in a unified framework. We also provide evidences of selling ability to support the model and investigate a policy using the model prediction.

There are two future research directions. One direction of future research is to examine the importance of selling ability, in particular when a firm suffers negative shocks. Intuitively, firms with high selling ability are more resilient to negative shock, by shifting exports to other destinations. However, firms without selling ability are more likely to

stop exporting upon receiving the negative shock. The conjecture partly explains what happened in 2008 financial crisis: most exporting firms that only specialized in production went bankrupt.

The second direction of future research is to study the dynamics of selling ability and carry-along trade decision, which may generate different long-run implications compared with productivity on firm's performance.

# Appendix I

Table 10: Statistics on Productivity

| | Domestic Firm | Indirect Exp. | Direct Exp. | CA Exp. |
|---|---|---|---|---|
| $\eta = 1.2$, first year | 3.54 | 3.97 | 4.31 | 3.94 |
| $\eta = 1.5$, first year | 3.54 | 3.97 | 4.31 | 3.94 |
| $\eta = 1.5$, whole sample | 3.64 | 4.14 | 4.56 | 4.14 |

# Appendix II

The following graph shows the variation in different type of exporters among all firms within 2-digit industry. There are huge variation of exporting firms in each industry.

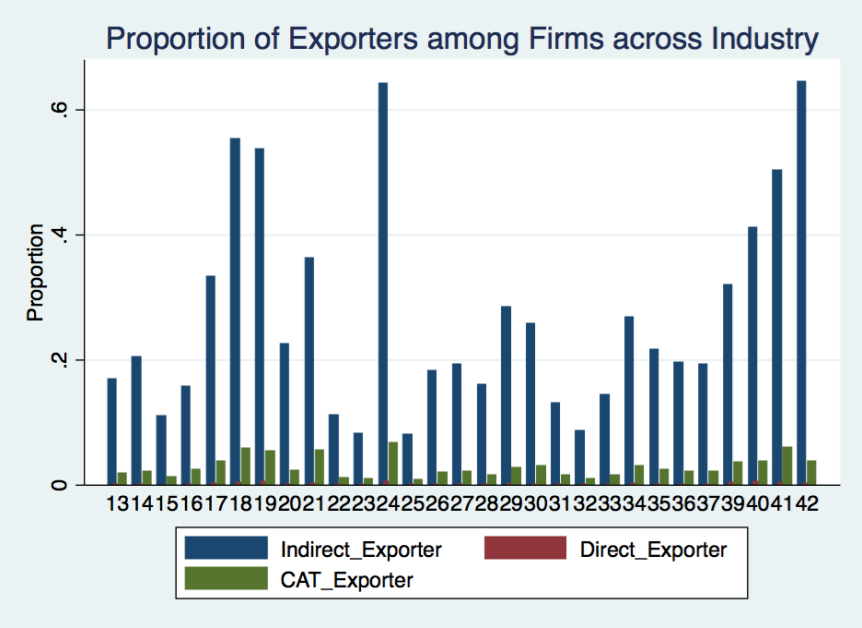


Figure 5: Proportion of Firms across Industries

The following industries have high proportion of exporting firms: textile industry (industry code 17), clothing industry (industry code 18), toy industry (industry code 24), equipment-making industry (industry code 40) and craft-making industry (industry code 42).

Interestingly, the proportion of indirect exporter, direct exporter and carry-along exporter are constant across industries.

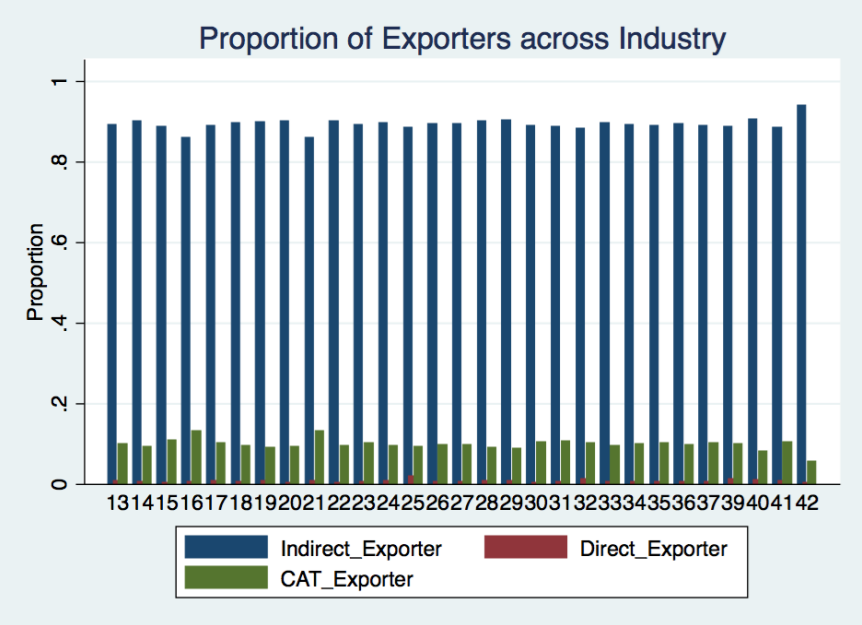


Figure 6: Proportion of Exporters across Industries

## Appendix III

According to the model, trade intermediaries' export price is $p = \frac{\sigma}{(\sigma-1)\widehat{\phi}(1-\lambda)}$ whereas direct exporters' price $p = \frac{\sigma}{(\sigma-1)\phi}$. In general, $\widehat{\phi} < \phi$ and $\lambda \in (0,1)$, the average export prices of trade intermediaries (both trade company and carry-along exporters), according to the model setup, are expected to be higher than direct exporters. The following test is based on product-destination level.

Table 11: FOB price between trade intermediary and direct exporter

| | $\ln(price)$ | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| $\mathbb{I}$(Trade Intermediary) | 0.027** | 0.027** | 0.030** |
| | (0.001) | (0.001) | (0.001) |
| Fixed Effect | year | year/ destination | year/production mode /ownership/destination |
| # of obs. | 17444812 | | |

The results confirm the model setup that export prices through trade intermediaries are indeed higher than direct exporters'. It is also consistent with findings in Ahn and Wei(2011).

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