Intermediaries, Firm Heterogeneity, and Exporting Behavior

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Abstract

Using a data set of 12,679 firms in 29 developing economies during the period of 2002-2004, we present the direct evidence regarding what types of firms export through intermediaries rather than directly by themselves. It is found that the most productive firms have sales in the home country and also exporting directly to foreign countries, followed by those with sales in the home country and exporting both directly and through intermediaries, then those with sales in the home country and exporting through intermediaries, and finally, those with sales in the home country only. To understand the trade-off in using these different methods of exporting, we then build a theoretical model à la Melitz (2003) and Cheney (2009) by incorporating the role of intermediaries, the predictions of which can explain our empirical findings.

Keywords: Intermediaries, Exporting Behavior, Firm Heterogeneity
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1 Introduction

The new trade literature has uncovered the importance of firm-level variations, particularly firm productivity, in determining exporting behavior. A dominant theoretical explanation for exporters being generally more productive than non-exporters in this literature is the assumption of a fixed cost of exporting, under which the more productive firms self-select to become exporters.\footnote{For empirical evidence, see Bernard and Jensen (1995, 1999, 2004), Bernard and Wagner (1997), Clerides, Lach, and Tybout (1998), etc; for theoretical analysis, see Melitz (2003), Bernard, Eaton, Jensen, and Kortum (2003), etc.} What is implicitly assumed in this literature is that firms export directly by themselves to foreign countries. In reality, many firms export through intermediaries,\footnote{For example, about 80% of Japanese export and import in the early 1980s was handled by 300 trade intermediaries (Rossman, 1984). In China, at least 22% and 18% of its exports and imports, respectively, in 2005 flew through intermediaries (Ahn, Khandelwal, and Wei, 2010). In Sweden, about 15% of export came through intermediaries in 2005 (Akerman, 2010).} which may significantly reduce the costs of exporting and consequently have radical implications for predictions of the new trade theory.

Recently, intensive effort has been made to investigate the role of intermediaries. While much understanding has been gained regarding how intermediaries facilitate trade (e.g., Feenstra and Hanson, 2004; Antras and Costinot, 2010) and how they differ from direct exporters (e.g., Rauch and Watson, 2004; Ahn, Khandelwal, and Wei, 2010), a fundamental question remains unanswered, that is, what types of firms export through intermediaries and what types of firms export directly by themselves. To the best of our knowledge, this paper is among the first few studies presenting direct evidence on the relation between firm productivity and methods of exporting.\footnote{The only exception is that of McCann (2010) which uses a firm-level data from the Eastern Europe.} We then offer an empirically-grounded theoretical analysis of exporting behavior in the presence of intermediaries and firm heterogeneity.

The data for our empirical analysis comes from Private Enterprise Survey of Productivity and the Investment Climate (PESPIC), which is a standardized data based on a series of The World Bank Enterprise Surveys (WBESs) conducted by the Enterprise Analysis Unit of the World Bank. There are a total of 12,679 firms in 29 developing economies during the period of 2002-2004. PESPIC contains unique information about firms’ methods of exporting, including direct exporting, exporting through intermediaries, and both. It is found that 27% of exporters use intermediaries and 11% of exporters export both directly and through intermediaries, which indicate the importance of...
intermediaries for exporting.

To uncover what types of firms use which exporting methods, we first compare firms along six dimensions (that is, output, employment, capital, output per worker, capital per worker, and total factor productivity). It is found that firms with both sales in the home country and direct exporting always have the highest mean value, followed by those with sales in the home country and exporting both directly and through intermediaries, then those with sales in the home country and exporting through intermediaries, and finally, those with sales in the home country only.

To further establish the relation between firm productivity and methods of exporting, we conduct a regression analysis. It is found that along with the increase in productivity, a firm switches from having sales in the home country only to having sales in the home country and exporting through intermediaries, then to having sales in the home country and exporting both directly and through intermediaries, and finally to having sales in the home country and direct exporting. The regression results are robust to a number of sensitivity checks, such as exclusion of outlying observations, inclusion of firm size as an additional control variable, and a subsample of domestic firms only.

We then carry out a theoretical analysis of exporting behavior in the presence of intermediaries to account for the above empirical findings. Our theoretical analysis is built upon a standard trade framework: a home country plus \( N \) foreign countries, two sectors (i.e., a homogeneous good and a continuum of differentiated goods), and one production factor (i.e., labor). Production takes place in the home country, and firms can directly export to \( N \) foreign countries by incurring a fixed cost (Melitz, 2003). As in Cheney (2008), we assume that the fixed cost of direct exporting differs across foreign countries.

The departure of our model from the literature is that firms can also use intermediaries to export to foreign countries. Intermediaries can facilitate trade by helping firms search for their trading partners and by alleviating the problem of information asymmetries between the trading parties (Rubinstein and Wolinsky, 1987; Biglaiser, 1993). In this paper, we focus on how firms make exporting decision in the presence of intermediaries, instead of how intermediaries work, which has been studied in the literature (for a survey of this literature, see, for example, Spulber, 1996). Following Rauch and Watson (2004) and Ahn, Khandelwal, and Wei (2010), we assume that when using intermediaries to export, firms need to share a portion of their exporting revenue with intermediaries. Meanwhile, based on the findings of Blum, Claro, and Horstmann (2009), we assume that when using intermediaries to export, firms do not need to incur the fixed cost of direct exporting but a
lower fixed cost of dealing with the intermediaries.\footnote{We also discuss alternative arrangements between exporters and intermediaries, but find that the resulting theoretical predictions regarding the relation between firm productivity and methods of exporting are not supported by the empirical regularities. See Section 4.4 for details.}

Under this model setup, we can show that as a firm’s productivity increases, it switches from having sales in the home country only to having both sales in the home country and exporting. Regarding the methods of exporting, as a firm’s productivity increases, it starts with exporting through intermediaries, then proceeds to both direct exporting and exporting through intermediaries, and finally, to direct exporting. Moreover, as a firm’s productivity increases, it starts with exporting to some foreign countries, and finally, to all foreign countries. These theoretical predictions are highly consistent with our empirical findings as well as those reported in the literature. Meanwhile, they contain some new predictions to be tested in future studies when the finer data is available.

The remainder of this paper is structured as follows. The literature review is presented in Section 2. We present empirical evidence on the relation between firm productivity and methods of exporting in Section 3, while in Section 4 we offer a theoretical analysis of exporting behavior in the presence of intermediaries. The paper concludes with Section 5.

## 2 Literature Review

Our paper is related to an emerging literature on intermediaries and international trade.

Some studies focus on how intermediaries can facilitate international trade by helping firms search for their trading partners or by alleviating the problem of information asymmetries between the trading parties (Feenstra and Hanson, 2004; Antras and Costinot, 2010). The focus of this paper is exporting behavior in the presence of intermediaries, rather than how intermediaries work.

Rauch and Watson (2004) examine the supply of intermediaries in international trade and find that agents endowed with a large size of network become intermediaries, whereas those with a small network choose to be producers. Ahn, Khandelwal, and Wei (2010) compare the exporting behavior of intermediaries and producers who directly export to international markets, and find that in the context of China, the share of export by intermediaries to an international market is bigger when that market is more distant, smaller, or has more regulatory barriers to trade. Similar results are also found for
the case of Sweden (Akerman, 2010). Meanwhile, Bernard, Jensen, Redding, and Schott (2010) use U.S. data to compare intermediaries, producers, and mixed types, and find that they specialize in different sets of goods and markets. Our paper departs from these studies by investigating what types of producers export directly and what types of producers use intermediaries for exporting, rather than comparing producers with intermediaries.

Felbermayr and Jung (2009) study the trade-off between saving the fixed costs of exporting and facing the holdup risks when using intermediaries to export. However, due to data limitation, they could only use sectoral data to examine the prevalence of exporting by intermediaries into different international markets and for different types of goods. Using Chilean exporter-Colombian importer pair data, Blum, Claro, and Horstmann (2009) find that at least one of the trading parties is large. To explain this finding, they present a model in which there is an economy of scale in international trade and show that in equilibrium, large producers export directly, while small producers resort to intermediaries for exporting. To the best of our knowledge, this paper is among the first few studies presenting direct evidence on the relation between firm productivity and methods of exporting. Specifically, both McCann (2010) and this study find that, as a firm’s productivity increases, it switches from non-exporting to exporting through intermediaries, and finally to direct exporting. Unlike McCann (2010), we consider the possibility of a firm using both direct and indirect exporting. Moreover, we present a model à la Melitz (2003) and Cheney (2008) to investigate how firm heterogeneity (in terms of productivity) influences the choice among the three types of arrangement for exporting (i.e., direct exporting only, direct exporting and exporting through intermediaries, and exporting through intermediaries only).

3 Empirical Evidence

3.1 Data

Our empirical study draws on a data from the Private Enterprise Survey of Productivity and the Investment Climate (PESPIC). It is a standardized data based on a series of The World Bank Enterprise Surveys (WBESs) conducted by the Enterprise Analysis Unit of the World Bank in cooperation with local business organizations and government agencies in 68 developing economies during the period of 2002-2006.

The PESPIC is a cross-sectional data with limited time-series aspects. It is composed of two parts. One is a general questionnaire directed at the
senior management seeking information about the firm, sales and suppliers, investment climate constraints, infrastructure and services, finance, business-government relations, conflict resolution and legal environment, crime, capacity and innovation, and labor relations. The other questionnaire is directed at the accounting manager, and covers various financial measures such as production, sales, expenses, total assets, and total liabilities.\footnote{More information about the data set can be found at http://www.enterprisesurveys.org/}

Of particular interest to our study is that this data contains information about methods of exporting, including specifically direct exporting and exporting through intermediaries, which allows us to uncover the relation between firm productivity and methods of exporting. However, as PESPIC was compiled from a series of WBESs, which used different questionnaire designs and survey methodologies in different countries, the information about methods of exporting is only available in 29 countries. After deleting observations without valid information about the exporting method, we have a final sample of 12,679 firms in 29 developing countries (see the Appendix for a list of the countries covered in the sample).

3.2 Descriptive Statistics

As shown in Table 1, 71.05\% of firms sell only in the home country, 4.60\% of firms have both sales in the home country and exporting through intermediaries, 3.32\% of firms have sales in the home country and exporting both directly and through intermediaries, and 21.03\% of firms have sales in the home country and direct exporting.

Table 1 also provides some preliminary comparison of the above four types of firms in terms of output, employment, capital, output per worker, capital per worker, and total factor productivity (TFP).\footnote{As information about intermediate inputs is not included in 12 of the 29 countries (i.e., Benin, Ecuador, Ethiopia, Kyrgyzstan, Mali, Moldova, Montenegro, Poland, Senegal, Serbia, Tajikistan, and Uzbekistan), the sample size for estimating TFP is reduced to 7,499 firms.} In estimating TFP, we allow for the existence of unobservable productivity shocks. Specifically, following Levinsohn and Petrin (2003), we use intermediate inputs as a proxy for unobservable productivity shocks (denoted by $TFP_{LP}$).\footnote{An alternative method for dealing with the endogeneity problem is Olley and Pakes (1996)'s method, which uses investment as a proxy for unobservable productivity shocks. However, the data set does not include information about investment, which precludes the use of Olley and Pakes (1996)'s method in our case.} For robustness check, we also use an alternative estimation method (denoted by $TFP_{FE}$),

\footnote{In estimating TFP, we allow for the existence of unobservable productivity shocks. Specifically, following Levinsohn and Petrin (2003), we use intermediate inputs as a proxy for unobservable productivity shocks (denoted by $TFP_{LP}$). For robustness check, we also use an alternative estimation method (denoted by $TFP_{FE}$),}
that is, the panel fixed-effect estimation, which effectively controls for all
time-invariant unobservable productivity shocks.\footnote{For a detailed discussion on the differences among various methods for estimating TFP, please see Van Biesebroeck (2007, 2008).}

Along each of these seven indicators, firms with both sales in the home
country and direct exporting always have the highest mean value, followed by
those with sales in the home country and exporting both directly and through
intermediaries, then those with sales in the home country and exporting
through intermediaries, and finally those with sales in the home country
only.

3.3 Regression Results

To further establish the relation between firm productivity and methods of
exporting, we estimate the following equation:

\[
y_{\text{fict}} = \alpha + \beta \cdot IX_{\text{fict}} + \gamma \cdot DIX_{\text{fict}} + \theta \cdot DX_{\text{fict}} + \delta_{i} + \eta_{ct} + \varepsilon_{\text{fict}},
\]

(1)

where $f$, $i$, $c$ and $t$ stand for firm, industry, country and year respectively;
$y_{\text{fict}}$ is the measure of firm productivity (i.e., Logarithm of Output per Worker,
$\text{TFP LP}$, or $\text{TFP FE}$); $IX_{\text{fict}}$ is a dummy variable having value of one if firm $f$
has sales in the home country and exporting through intermediaries, and
zero otherwise; $DIX_{\text{fict}}$ is a dummy variable having value of one if firm $f$
has sales in the home country and exporting both directly and through inter-
mediaries, and zero otherwise; $DX_{\text{fict}}$ is a dummy variable having value of
one if firm $f$ has sales in the home country and exporting directly, and zero
otherwise; $\delta_{i}$ and $\eta_{ct}$ are industry dummy and country-year dummy, respec-
tively; and $\varepsilon_{\text{fict}}$ is the error term. To deal with the possible heteroskedasticity
problem, we use the White-robust standard error clustered at country-year
level.

Regression results for equation (1) are reported in Table 2. We use Log-
arithmetic of output per worker as the dependent variable in Column (1), TFP
estimated using Levinsohn and Petrin (2003)’s method as the dependent vari-
able in Column (2), and TFP estimated using panel fixed-effect method as
the dependent variable in Column (3). It is clear that in all these regres-
sions the estimated coefficients for the three dummy variables on exporting
methods are all positive and statistically significant, indicating exporters are
more productive than non-exporters. More importantly, the size of coefficient
for $DX_{\text{fict}}$ is the highest, followed by that for $DIX_{\text{fict}}$ and finally by
that for $IX_{\text{fict}}$. These results imply that the most productive firms have
sales in the home country and also exporting directly to foreign countries,
followed by firms with sales in the home country and exporting both directly and through intermediaries, then those with sales in the home country and exporting through intermediaries, and finally those with sales in the home country only.

In the remaining part of this subsection, we conduct three robustness checks. In each of these checks, we use three alternative dependent variables as in Table 2: Logarithm of output per worker, TFP estimated using Levinsohn and Petrin (2003)’s method, and TFP estimated using panel fixed-effect method.

First, to address the concern that our results could be driven by some outlying observations, we exclude the top and bottom 1% observations in our sample and repeat the analysis. Results shown in Table 3 demonstrate clearly that our findings in Table 2 remain robust.

Second, to make sure that our findings are not entirely driven by firm size, we incorporate Firm Size (defined as the logarithm of employment) in the regression analysis. Results reported in Table 4 reveal that our findings remain robust to the inclusion of Firm Size.

Third, as Lu, Lu, and Tao (2010) shows that foreign-owned firms behave differently from domestic firms in the relation between firm productivity and exporting behavior, we restrict our analysis to the sub-sample of domestic firms (based on the reply to the survey question on the ownership type). As shown in Table 5, our findings on the relation between firm productivity and methods of exporting in Table 2 remain robust to this sub-sample.

4 Theoretical Analysis

In the previous Section, from a sample of 12,679 firms in 29 developing countries, we find the importance of intermediaries for exporting. Moreover, we uncover the relation between firm productivity and methods of exporting. In what follows, we provide a theoretical analysis to account for these empirical regularities.

4.1 Model Setup

Our model is a standard trade model. There are $N + 1$ countries (i.e., a home country and $N$ foreign countries), two sectors (i.e., a homogeneous good ($X$) produced with a constant returns to scale technology and a continuum of differentiated goods ($Y$) produced with an increasing returns to scale technology), and one production factor (i.e., labor).
Demand. Following the literature, we take the homogeneous good \((X)\) as a numéraire and assume the utility function for the differentiated goods \((Y)\) to be a constant elasticity of substitution function. Then the demand function for variety \(\omega\) of the differentiated goods \(Y\) in country \(l\) can be derived as

\[
y_l(\omega) = \alpha^{\frac{1}{1-\sigma}} I_l(p_l(\omega))^{\frac{1}{1-\sigma}}
\]  

(2)

where \(l \in \{0, i\}\) is the country index, with 0 indicating the home country and \(i \in \{1, \ldots, N\}\) indicating a foreign country; \(I_l \equiv M_l(Y_l)^{\frac{\mu}{\mu-\alpha}}\) is the measure of market size in country \(l\), where \(M_l\) is the number of consumers, \(Y_l\) is the index of aggregate consumption of differentiated goods in country \(l\), and \(\mu\) is the weight that the consumers put on the differentiated goods \(Y\) relative to the homogeneous good; and \(p_l(\omega)\) is the price of variety \(\omega\) of differentiated goods \(Y\) in country \(l\). The elasticity of substitution between any two differentiated goods is \(\sigma \equiv 1/(1 - \alpha) > 1\). The variety parameter \(\omega\) is left out hereon as all differentiated goods are symmetric.

Production. The production of the differentiated goods \((Y)\) takes place only in the home country (Melitz, 2003). The fixed cost of production is given by \(f\). The unit production cost is given by \(w/\theta\), where \(w\) is the wage rate in the home country and normalized to 1 hereon, and \(\theta \in [0, \theta_{\text{max}}]\) is the firm-specific productivity measure drawn from a common distribution \(g(\theta)\) and a cumulative distribution \(G(\theta)\).

Domestic Sales and Exporting. As in Melitz (2003), sales in the home country does not involve any fixed cost so that any firms with positive production always sell in the home country. Meanwhile, firms can choose to export to foreign country \(i\) either directly by themselves or through intermediaries. For the case of direct exporting, we assume that there is a fixed cost of exporting to each of the foreign countries, denoted by \(f_i\) where \(i \in \{1, \ldots, N\}\), as in Cheney (2008).

For the case of exporting through intermediaries, firms do not need to incur the fixed cost of direct exporting \((f_i)\). However, it is assumed that in this case firms have to share a portion (denoted by \(1 - \beta_i\), where \(\beta_i \in (0, 1)\)) of their exporting revenue with intermediaries.\(^9\) Meanwhile, there is a fixed

\(^9\)The share of exporting revenue for the intermediaries can be a result of the negotiation between firms and intermediaries as in Rauch and Watson (2004). It can also be interpreted as the forwarding charges by the intermediaries as in Ahn, Khandelwal, and Wei (2010).
cost of dealing with the intermediaries, which is assumed to be lower than the fixed cost of direct exporting. For ease of exposition, the fixed cost of dealing with the intermediaries is written as $\gamma_i f_i$ where $\gamma_i \in (0, 1)$. While our main analysis below is carried out under the above cost structure of using intermediaries for exporting (i.e., $\beta_i \in (0, 1)$ and $\gamma_i \in (0, 1)$), other possible cost structures will be considered in Section 4.4 as a robustness check.

Moreover, the transport cost for exporting the differentiated goods to a foreign country $i$ takes the form of an iceberg cost, that is, one needs $t_i > 1$ units of final product in order to ship 1 unit to the foreign country.

Firm Entry and Exit. As in Melitz (2003), there is a large pool of potential entrants into the differentiated goods sector. While firms are ex ante identical, they will draw their productivity from the common distribution $g(.)$ after paying a fixed cost of entry $f_e$, and decide whether to produce or exit. If they decide to produce, in every period, there is a probability $\delta$ that firms are forced to exit.

4.2 Preliminaries

Home Country. The profit from serving the home country can be shown as

$$\pi_0 = (1 - \alpha)I_0\Theta - f,$$  \hspace{1cm} (3)

where $\Theta \equiv \theta^{\alpha-\pi}$ is a monotonic transform of productivity $\theta$. Therefore, the cutoff point of productivity is given as

$$\Theta_0 = \frac{f}{(1 - \alpha)I_0},$$  \hspace{1cm} (4)

where firms with $\Theta \geq \Theta_0$ have positive production and sales in the home country.

Foreign Country. To serve foreign country $i$, a firm can export either directly by itself or through intermediaries. The profit from direct exporting

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10 The lower fixed costs of dealing with the intermediaries relative to those of direct exporting can be due to the economy of scale in exporting enjoyed by the intermediaries as documented and modeled by Blum, Claro, and Horstmann (2009).

11 Here, we do not explicitly model how intermediaries work, because the focus of this study is on how firms make exporting decisions in the presence of intermediaries. For the modeling of intermediaries, see, for example, Rubinstein and Wolinsky (1987), Biglaiser (1993), and Antras and Costinot (2010).
to foreign country $i$ can derived as

$$\pi_i^{dx} = \frac{(1 - \alpha)I_i}{T_i} \Theta - f_i,$$

(5)

where $T_i \equiv t_i^{\frac{\alpha}{1-\alpha}}$ is a monotonic transform of transport cost $t_i$, whereas the profit from exporting to foreign country $i$ through intermediaries is

$$\pi_i^{ix} = \beta_i \frac{(1 - \alpha)I_i}{T_i} \Theta - \gamma_if_i.$$

(6)

Consequently, the cutoff points of productivity for direct exporting and exporting through intermediaries are, respectively,

$$\left\{ \begin{array}{c} \Theta_i^{dx} = \frac{f_iT_i}{(1-\alpha)I_i} \\ \Theta_i^{ix} = \frac{\gamma_if_iT_i}{\beta_i(1-\alpha)I_i} \end{array} \right.,$$

(7)

where firms with $\Theta \geq \Theta_i^{dx}$ ($\Theta_i^{ix}$) earn positive profits from serving foreign country $i$ by direct exporting (exporting through intermediaries).

It is assumed

$$\min \{\Theta_i^{dx}, \Theta_i^{ix}; i \in {1, .., N} \} > \Theta_0.$$  \hspace{1cm} (A1)

Note that if this condition is not satisfied, any firms with positive production will always have positive export (either directly by itself or through intermediaries) and sales in the home market. This contradicts the empirical observation that majority of firms only serve the home country and only a small portion of firms have both sales in the home country and export (Bernard, Jensen, Redding, and Schott, 2007, for the case of the United States; and Mayer and Ottaviano, 2008, for the case of seven European countries).

Notably, $\Theta_i^{ix}$ and $\Theta_i^{dx}$ are decreasing in $I_i$ but increasing in $f_i$ and $T_i$. In other words, the cutoff points of productivity for both direct exporting and exporting through intermediaries become lower when the market size is bigger and the exporting costs are lower, which is consistent with the empirical findings in the literature (e.g., Bernard et al., 2003 and 2007; Eaton, Kortum, and Framarz, 2004; Ahn, Khandelwal, and Wei, 2010).

Hence, we have the following lemma:

**Lemma 1** Firms are more likely to export to a foreign country with a bigger market size, but to a foreign country with lower fixed costs of exporting and lower transport costs.
To analyze whether and how a firm exports to foreign market $i$, we introduce another cutoff point of productivity, the one above which the profit from direct exporting is higher than that from exporting through intermediaries,

$$\Theta^x_i = \frac{(1 - \gamma_i) I_i}{(1 - \beta_i)(1 - \alpha)I_i}. \quad (8)$$

There are two exhaustive and mutually exclusive cases depending on the comparison of the two cutoff points of productivity $\Theta^x_i$ and $\Theta^{ix}_i$: (i) $\Theta^x_i > \Theta^{ix}_i$, and (ii) $\Theta^x_i \leq \Theta^{ix}_i$. It can be shown that $\Theta^x_i > \Theta^{ix}_i$ if and only if

$$\beta_i > \gamma_i. \quad (A2)$$

When Assumption (A2) holds (i.e., the case of $\Theta^x_i > \Theta^{ix}_i$), the optimal choice regarding whether and how to export to foreign market $i$ is illustrated in Figure 1a. Note that in this case, we have $\Theta^x_i > \Theta^{dx}_i > \Theta^{iz}_i$ (see Figure 1a). For a firm with productivity $\Theta < \Theta^{ix}_i$, it cannot earn any profit from exporting. For a firm with productivity $\Theta^x_i > \Theta \geq \Theta^{ix}_i$, it earns profit from exporting through intermediaries, and this profit is higher than that from direct exporting. For a firm with productivity $\Theta \geq \Theta^x_i$, its profit from direct exporting is higher than that from exporting through intermediaries. Hence, we have the following lemma:

**Lemma 2** When Assumption (A2) holds, firms with productivity $\Theta \geq \Theta^x_i$ use direct exporting, firms with productivity $\Theta^x_i > \Theta \geq \Theta^{ix}_i$ use exporting through intermediaries, and firms with productivity $\Theta < \Theta^{ix}_i$ do not export.

When Assumption (A2) does not hold (i.e., the case of $\Theta^x_i \leq \Theta^{ix}_i$), the optimal choice regarding whether and how to export to foreign market $i$ is illustrated in Figure 1b. Note that in this case, we have $\Theta^{iz}_i > \Theta^{dx}_i > \Theta^x_i$ (see Figure 1b). For a firm with productivity $\Theta < \Theta^{dx}_i(< \Theta^{iz}_i)$, it cannot earn any profit from exporting. For a firm with productivity $\Theta \geq \Theta^{dx}_i(> \Theta^x_i)$, it earns profit from direct exporting, and this profit is higher than that from exporting through intermediaries. Hence, we have the following lemma:

**Lemma 3** When Assumption (A2) does not hold, firms with productivity $\Theta \geq \Theta^{dx}_i$ use direct exporting, and firms with productivity $\Theta < \Theta^{dx}_i$ do not export.
Assumption (A2) basically imposes an upper limit on the costs for using intermediaries to export. Intuitively, with exporting through intermediaries, firms need to give away $1 - \beta_i$ share of exporting revenue but saves $1 - \gamma_i$ fraction of the fixed cost. As long as the saving in the fixed cost outweighs the loss of exporting revenue (i.e., $1 - \gamma_i > 1 - \beta_i$ or $\beta_i > \gamma_i$), exporting through intermediaries becomes a viable choice. Otherwise, exporting through intermediaries is always dominated by direct exporting. Henceforth, we focus on the case of $\beta_i > \gamma_i$. Later in Section 4.4, we will show that our main results remain robust as long as Assumption (A2) holds for some of the foreign countries.

4.3 Equilibrium Choice

As shown in Lemma 2, for an individual foreign country $i$, firms with productivity $\Theta < \Theta_i^{ix}$ do not export at all; firms with productivity $\Theta_i^{ix} \leq \Theta < \Theta_i^x$ use intermediaries to export; and firms with productivity $\Theta \geq \Theta_i^x$ export directly by themselves. Now, we examine the exporting behavior of firms in the setting of one home country and $N$ foreign countries.

For simplicity of analysis, we assume that the ranking of $\Theta_i^{ix}$ across $N$ foreign countries is the same as that of $\Theta_i^x$, that is,

$$\Theta_1^{ix} \leq \Theta_2^{ix} \leq \ldots \leq \Theta_N^{ix} \leq \Theta_1^x \leq \Theta_2^x \leq \ldots \leq \Theta_N^x.$$  

(9)

All of our results, however, still hold when the ranking of $\Theta_i^{ix}$ across $N$ foreign countries differs from that of $\Theta_i^x$ (see Section 4.4 for details).

Note that there are only two exhaustive and mutually exclusive scenarios. One is $\Theta_1^x > \Theta_N^{ix}$, which takes place when the costs of direct exporting are relatively high, and henceforth is referred to as high-cost direct exporting. The other is $\Theta_1^x \leq \Theta_N^{ix}$, referred to as low-cost direct exporting.

For the scenario of high-cost direct exporting (i.e., $\Theta_1^x > \Theta_N^{ix}$), we have $\Theta_0 < \Theta_1^{ix} \leq \Theta_N^{ix} < \Theta_1^x \leq \Theta_N^x$, where the first inequality comes from Assumption (A1), and the remaining are from Condition (9). The optimal choice for firms regarding sales in the home and foreign countries is illustrated in Figure 2:

- **Case (i)**, productivity $\Theta \geq \Theta_N^x$: the firm has sales in the home country because its productivity is above the cutoff point for production in the home country (i.e., $\Theta \geq \Theta_N^x > \Theta_0$). Meanwhile, it exports directly to all foreign countries, because its productivity is above the cutoff point for which direct exporting is more profitable than exporting through

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intermediaries for each of these foreign countries (i.e., \( \Theta \geq \Theta_i^x \forall i \in \{1, \ldots, N\} \)).

- Case (ii), productivity \( \Theta_i^x \leq \Theta < \Theta_N^x \): without loss of generality, assume that \( \Theta_j^x \leq \Theta < \Theta_{j+1}^x \), where \( j \in \{1, \ldots, N-1\} \). The firm has sales in the home market because \( \Theta \geq \Theta_j^x > \Theta_0 \). It can export to all foreign countries through intermediaries because its productivity is above the cutoff point for exporting through intermediaries for each of the foreign countries (i.e., \( \Theta \geq \Theta_j^x > \Theta_N^x \geq \Theta_i^x \forall i \in \{1, \ldots, N\} \)). For some foreign countries (i.e., \( i \in \{1, \ldots, j\} \)), however, it is optimal for the firm to use direct exporting because its productivity is above the cutoff point at which the profit from direct exporting is higher than that from exporting through intermediaries (i.e., \( \Theta_i^x \leq \ldots \leq \Theta_j^x \leq \Theta < \Theta_{j+1}^x \)). As a result, in equilibrium, the firm has sales in the home market, exports through intermediaries to foreign countries \( \{j + 1, \ldots, N\} \), and exports directly to foreign countries \( \{1, \ldots, j\} \).

- Case (iii), productivity \( \Theta_N^x < \Theta \leq \Theta_i^x \): the firm has sales in the home country because \( \Theta \geq \Theta_N^x > \Theta_0 \). It can export to all foreign countries through intermediaries because \( \Theta \geq \Theta_N^x \geq \Theta_i^x \forall i \in \{1, \ldots, N\} \). Meanwhile, because its productivity is below the cutoff point at which the profit from direct exporting is higher than that from exporting through intermediaries for each of the foreign countries (i.e., \( \Theta_i^x \leq \ldots \leq \Theta_j^x \leq \Theta < \Theta_{j+1}^x \forall i \in \{1, \ldots, N\} \)), it is not optimal for the firm to export directly to any of these foreign countries. As a result, in equilibrium, the firm has sales in the home country and exports to all foreign countries through intermediaries.

- Case (iv), productivity \( \Theta_1^x < \Theta \leq \Theta_N^x \): without loss of generality, we assume that \( \Theta_j^x \leq \Theta < \Theta_{j+1}^x \), where \( j \in \{1, \ldots, N-1\} \). The firm has sales in the home country as \( \Theta \geq \Theta_1^x > \Theta_0 \). It can export to some foreign countries (i.e., \( i \in \{1, \ldots, j\} \)) through intermediaries as \( \Theta_i^x \leq \ldots \leq \Theta_j^x \leq \Theta < \Theta_{j+1}^x \). Meanwhile, it is not optimal for the firm to export directly to any of these foreign countries because its productivity is below the cutoff point for direct exporting to be more profitable than exporting through intermediaries for each of these foreign countries (i.e., \( \Theta < \Theta_{j+1}^x \leq \Theta_i^x < \Theta_1^x \leq \Theta_i^x \forall i \in \{1, \ldots, N\} \)). As a result, in equilibrium, the firm has sales in the home country, and exports through intermediaries to some foreign countries \( \{1, \ldots, j\} \).

- Case (v), productivity \( \Theta_0 \leq \Theta < \Theta_1^x \): the firm can only sell in the home country, because its productivity is above the cutoff point for
production in the home country (i.e., $\Theta \geq \Theta_0$), but below the cutoff point for either direct exporting or exporting through intermediaries to any foreign country (i.e., $\Theta < \Theta_i^{\text{ix}} \leq \Theta_i^{\text{ix}} < \Theta_i^x \forall i \in \{1, \ldots, N\}$).

- Case (vi), productivity $\Theta < \Theta_0$: the firm exits from the market because its productivity is even below the cutoff point for production in the home country (i.e., $\Theta < \Theta_0$).

For the scenario of low-cost direct exporting (i.e., $\Theta_1^{\text{ix}} \leq \Theta_N^{\text{ix}}$), we have $\Theta_0 < \Theta_1^{\text{ix}} < \Theta_1^{\text{ix}} < \Theta_N^{\text{ix}} < \Theta_N^{\text{ix}}$. The optimal choice for firms regarding sales in the home and foreign countries is illustrated in Figure 3:

- Case (i), productivity $\Theta \geq \Theta_N^{\text{ix}}$: the case is the same as case (i) under the scenario of high-cost direct exporting, in which the firm has sales in the home country and exports directly to all foreign countries.

- Case (ii), productivity $\Theta_N^{\text{ix}} < \Theta < \Theta_N^{\text{ix}}$: the analysis for this case is the same as that for case (ii) under the scenario of high-cost direct exporting. In equilibrium, the firm has sales in the home market, exports through intermediaries to foreign countries $\{j + 1, \ldots, N\}$, and exports directly to foreign countries $\{1, \ldots, j\}$.

- Case (iii), productivity $\Theta_1^{\text{ix}} \leq \Theta < \Theta_N^{\text{ix}}$: without loss of generality, we assume that $\Theta_1^{\text{ix}} \leq \Theta < \Theta_{j+1}^{\text{ix}}$, where $j \in \{1, \ldots, N - 1\}$ and $\Theta_1^{\text{ix}} \leq \Theta < \Theta_{k+1}^{\text{ix}}$, where $k \in \{1, \ldots, N - 1\}$. The firm has sales in the home country as $\Theta \geq \Theta_1^{\text{ix}} > \Theta_j^{\text{ix}} > \Theta_0$. It can export through intermediaries to some foreign countries (i.e., $\Theta_i^{\text{ix}} < \Theta_0$) as $\Theta_1^{\text{ix}} \leq \Theta < \Theta_{k+1}^{\text{ix}}$. Meanwhile, it is optimal for the firm to export directly to some foreign countries (i.e., $i \in \{1, \ldots, k\}$) because its productivity is above the cutoff point at which direct exporting is more profitable than exporting through intermediaries for these foreign countries (i.e., $\Theta_1^{\text{ix}} \leq \Theta < \Theta_{j+1}^{\text{ix}}$). And it can be shown that $k \geq j$; otherwise, we have $\Theta \geq \Theta_j^{\text{ix}} > \Theta_j^{\text{ix}} \geq \Theta_{k+1}^{\text{ix}}$, which contradicts the assumption $\Theta_1^{\text{ix}} < \Theta < \Theta_{k+1}^{\text{ix}}$.12 Thus, when $k = j$, the firm has sales in the home country and exports directly to foreign countries $\{1, \ldots, j\}$; when $k > j$, the firm has sales in the home country, exports through intermediaries to foreign countries $\{j + 1, \ldots, k\}$, and exports directly to foreign countries $\{1, \ldots, j\}$.

12As shown in Lemma 2, whenever a firm can export directly to a foreign country, it can also use intermediaries to export to that same country. Following this intuition, the number of countries to which a firm can export through intermediaries should be at least equal to the number of countries to which the firm can export directly.
Case (iv), productivity $\Theta_1^{ix} \leq \Theta < \Theta_1^e$: the analysis for this case is the same as that for case (iv) under the scenario of high-cost direct exporting. In equilibrium, the firm has sales in the home country and exports through intermediaries to some foreign countries $\{1, \ldots, j\}$.

Case (v), productivity $\Theta_0 \leq \Theta < \Theta_1^{ix}$: the case is the same as case (v) under the scenario of high-cost direct exporting, in which the firm has sales only in the home market.

Case (vi), productivity $\Theta < \Theta_0$: the case is the same as case (vi) under the scenario of high-cost direct exporting, in which the firm exits from the market.

For both scenarios, as a firm’s productivity increases, it clearly moves from having sales in the home country only to having both sales in the home country and exporting. Meanwhile, regarding the methods for exporting, as a firm’s productivity increases, it starts with exporting through intermediaries, then having both direct exporting and exporting through intermediaries, and finally direct exporting. Moreover, as a firm’s productivity increases, it starts with exporting to some foreign countries, and finally to all foreign countries. These theoretical results can explain all the empirical findings reported in Section 3. However, some of the theoretical predictions (i.e., regarding the relation between firm productivity and the number of export markets) could not be tested in this paper due to data limitation, and they will be the subject of future research when finer data is available.

To summarize, we have the following proposition.

**Proposition:** When Assumption (A2) and Condition (9) hold, the most productive firms have sales in the home country and also direct exporting to foreign countries, followed by those with sales in the home country and exporting directly and through intermediaries, then those with sales in the home country and exporting through intermediaries, and finally those with sales in the home country only.

Finally, we consider the entry decision by a representative firm. The free entry condition requires that the present value of expected profit should be equal to the fixed cost of entry ($f_e$), that is,

$$V \equiv \frac{E(\pi)}{\delta} = f_e,$$  \hspace{1cm} (10)
where

\[ E(\pi) = [1 - G(\Theta_0)] [\pi_H + \chi_{IX} \pi_{IX} + \chi_{DIX} \pi_{DIX} + \chi_{DX} \pi_{DX}] \]

and \( \pi_H \) is the average profit across firms from serving the home country; \( \pi_{IX} \) is the average profit from exporting through intermediaries; \( \pi_{DIX} \) is the average profit from exporting directly and through intermediaries; and \( \pi_{DX} \) is the average profit from exporting directly. \( \chi_{IX} \) is the probability of exporting through intermediaries conditional on successful entry; \( \chi_{DIX} \) is the probability of exporting directly and through intermediaries conditional on successful entry; and \( \chi_{DX} \) is the probability of exporting directly conditional on successful entry.

### 4.4 Extensions

**Relaxation of Condition (9).** Note that in the main analysis (Section 4.3), we assume that the ranking of \( \Theta_i^{ix} \) across \( N \) foreign countries is the same as that of \( \Theta_i^x \) (i.e., Condition (9)). Now, we relax this condition, and show that all of our results still hold.

Let the ranking of \( \Theta_i^{ix} \) and \( \Theta_i^x \) across \( N \) foreign countries be

\[
\begin{align*}
\Theta_i^{ix} &\leq \Theta_{i+1}^{ix} \leq \ldots \leq \Theta_{N}^{ix} \\
\Theta_1^x &\leq \Theta_2^x \leq \ldots \leq \Theta_N^x.
\end{align*}
\]

(9')

There are two exhaustive and mutually exclusive scenarios as in Section 4.3, high-cost direct exporting (i.e., \( \Theta_1^x > \Theta_N^x \)) and low-cost direct exporting (i.e., \( \Theta_1^x \leq \Theta_N^x \)). The analysis for the scenario of high-cost direct exporting is the same as that in Section 4.3, whereas the analysis for the scenario of low-cost direct exporting differs from that in Section 4.3 only for the case (iii).

Specifically, for the case (iii) of low-cost direct exporting (i.e., firms with productivity \( \Theta_i^x \leq \Theta < \Theta_N^x \)), without loss of generality, we assume that \( \Theta_j^x \leq \Theta < \Theta_{j+1}^x \), where \( j \in \{1, \ldots, N-1\} \) and \( \Theta_j^{ix} \leq \Theta < \Theta_{k'}^{ix} \), where \( k' \in \{1, \ldots, N-1\} \). The firm has sales in the home country as \( \Theta \geq \Theta_j^x > \Theta_0^x \). It can export through intermediaries to foreign countries \( \{1', \ldots, k'\} \) as \( \Theta_j^{ix} \leq \ldots \leq \Theta_{k'}^{ix} \leq \Theta < \Theta_{k'}^{ix} \). Meanwhile, it is optimal for the firm to export directly to foreign countries \( \{1, \ldots, j\} \) because its productivity is above the cutoff point at which direct exporting is more profitable than exporting through intermediaries for these foreign countries (i.e., \( \Theta_1^x \leq \ldots \leq \Theta_j^x \leq \Theta < \Theta_{j+1}^x \)). It can be shown that \( k' \geq j \); otherwise, we have \( \Theta \geq \Theta_j^x > \Theta_j^{ix} \geq \Theta_{k'}^{ix} \), which contradicts the assumption \( \Theta_j^{ix} \leq \Theta < \Theta_{k'}^{ix} \). Thus, when \( k' = j \), the firm has sales in the home country and exports directly.
to foreign countries \{1, \ldots, j\}; when \(k' > j\), the firm has sales in the home country, exports through intermediaries to foreign countries \{j + 1, \ldots, k'\}, and exports directly to foreign countries \{1, \ldots, j\}.

Hence, we have

**Corollary 1:** The Proposition is robust to the relaxation of Condition (9).

**Relaxation of Assumption (A2).** As shown by Lemma 3, if Assumption (A2) does not hold for foreign country \(i\), exporting through intermediaries is dominated by direct exporting, and firms either do not export or export directly to foreign country \(i\). As a result, if Assumption (A2) does not hold for any foreign country, we should not observe the use of exporting through intermediaries, which is not consistent with the empirical observation. In what follows, we focus on the case that Assumption (A2) holds for some but not all foreign countries.

Without loss of generality, we assume that Assumption (A2) holds for foreign countries \(i \in \{1, \ldots, j\}\) (referred to as Group A) but not for foreign countries \(i \in \{j + 1, \ldots, N\}\) (referred to as Group B).

For the foreign countries of Group A, let the ranking of \(\Theta_i^{ix}\) and \(\Theta_i^x\) across these foreign countries be

\[
\left\{ \begin{array}{c}
\Theta_i^{ix} \leq \Theta_{i+1}^{ix} \leq \ldots \leq \Theta_j^{ix} \\
\Theta_i^x \leq \Theta_{i+1}^x \leq \ldots \leq \Theta_j^x
\end{array} \right. \quad (9')
\]

The analysis regarding the exporting behavior of firms for this case is the same as that in Section 4.3. Specifically, firms with productivity \(\Theta \geq \Theta_i^x\) have direct exporting, those with productivity \(\Theta_i^x > \Theta \geq \Theta_i^{ix}\) have both direct exporting and exporting through intermediaries, those with productivity \(\Theta_i^x > \Theta \geq \Theta_i^{ix}\) have exporting through intermediaries, and those with productivity \(\Theta_i^{ix} > \Theta\) do not have any export.

For the foreign countries of Group B, the optimal choice regarding whether and how to export to foreign country \(i\) is summarized in Lemma 3. Let the ranking of \(\Theta_i^{dx}\) across these foreign countries be

\[
\Theta_{j+1}^{dx} \leq \Theta_{j+2}^{dx} \leq \ldots \leq \Theta_N^{dx}.
\]

Thus, firms with productivity \(\Theta \geq \Theta_{j+1}^{dx}\) have direct exporting, and those with productivity \(\Theta < \Theta_{j+1}^{dx}\) do not have any exporting.

Taken together, we have two exhaustive and mutually exclusive scenarios:

(i) \(\Theta_{j+1}^{dx} > \Theta_i^{ix}\) and (ii) \(\Theta_{j+1}^{dx} \leq \Theta_i^{ix}\). For the scenario of \(\Theta_{j+1}^{dx} > \Theta_i^{ix}\), the
optimal choice for firms regarding sales in the home and foreign countries is qualitatively the same as that in the Proposition. Specifically, firms with productivity $\Theta \geq \Theta^f_j$ have sales in the home country and direct exporting; those with productivity $\Theta^f_j > \Theta \geq \min\{\Theta^i_{j+1}, \Theta^f_i\}$ have sales in the home country and exporting both directly and through intermediaries; those with productivity $\min\{\Theta^i_{j+1}, \Theta^f_i\} > \Theta \geq \Theta^i_i$ have sales in the home country and exporting through intermediaries; those with productivity $\Theta^i_i > \Theta \geq \Theta_0$ have sales in the home country only; and those with productivity $\Theta_0 > \Theta$ exit from the market.

For the scenario of $\Theta^i_{j+1} \leq \Theta^i_i$, the optimal choice for firms regarding sales in the home and foreign countries is as follows. Firms with productivity $\Theta \geq \Theta^f_j$ have sales in the home country and direct exporting; those with productivity $\Theta^f_j > \Theta \geq \Theta^i_i$ have sales in the home country and exporting both directly and through intermediaries; those with productivity $\Theta^i_i > \Theta \geq \Theta^i_{j+1}$ have sales in the home country and direct exporting; those with productivity $\Theta^i_{j+1} > \Theta \geq \Theta_0$ have sales in the home country only; and those with productivity $\Theta_0 > \Theta$ exit from the market. Clearly, in this scenario, having sales in the home country and exporting only through intermediaries is not an equilibrium choice. In other words, we should not observe any firms having sales in the home country and exporting only through intermediaries, which is not consistent with the empirical observation.

Let

$$\Theta^i_{j+1} > \Theta^i_i$$  \hspace{1cm} (12)

**Corollary 2:** As long as Assumption (A2) holds for some foreign countries, the qualitative results in the Proposition hold under Condition (12).

Recall that $\Theta^i_i$ is the lowest cutoff point of productivity for exporting through intermediaries to be profitable among foreign countries of Group A, whereas $\Theta^i_{j+1}$ is the lowest cutoff point of productivity for direct exporting to be profitable among foreign countries of Group B. If Condition (12) does not hold, it implies that direct exporting to Group B countries is rather easy. Meanwhile, note that for foreign countries of Group B, Assumption (A2) does not hold, which implies that the costs of using intermediaries to export to these countries are relatively high. Combined, we have an apparent contradiction, that is, the costs of using intermediaries to export are high for those foreign countries where direct exporting is easy. Hence, we expect Condition (12) to hold for most cases.
Alternative Cost Structures of Using Intermediaries. In the analysis thus far, it is assumed that the cost structure of using intermediaries for exporting takes the form of a share of the exporting revenue ($\beta \in (0, 1)$) and a fixed fee (which can be written as a fraction of the fixed cost associated with the direct exporting, $\gamma \in (0, 1)$). Here we consider two alternative cost structures: (i) $\beta = 0$ and $\gamma < 0$; and (ii) $\beta > 1$ and $\gamma \in (0, 1)$.

The first case may arise when exporting firms are relatively more risk averse than intermediaries, and as a result intermediaries make fixed payments to those exporting firms in exchange for the entire exporting output. Under this cost structure, the profit from exporting to foreign country $i$ through intermediaries becomes:

$$\pi_i^{ix} = \beta_i \frac{(1 - \alpha)I_i}{T_i} \Theta - \gamma_i f_i = -\gamma_i f_i > 0. \quad (13)$$

This implies that firms always make profits from exporting through intermediaries. As a result, we should observe all firms to have both sales in the home country and exporting, which contradicts with the empirical observation that majority of firms only serve the home country and only a small portion of firms have both sales in the home country and export (Bernard, Jensen, Redding, and Schott, 2007; Mayer and Ottaviano, 2007). In other words, this type of cost structure of using intermediaries for exporting is not widely used in reality.

The second case may arise when intermediaries have expertise in selling the output of exporting firms in the foreign countries at higher prices than the firms would have got from direct exporting. Under this cost structure, it can be shown that the profit from exporting to foreign country $i$ through intermediaries is always higher than that from directly exporting, i.e.,

$$\pi_i^{ix} = \beta_i \frac{(1 - \alpha)I_i}{T_i} \Theta - \gamma_i f_i > \frac{(1 - \alpha)I_i}{T_i} \Theta - f_i = \pi_i^{dx} \quad (14)$$

as $\beta_i > 1$ and $\gamma_i < 1$. This implies that if any firm has any exporting, it should be done through intermediaries, which again contradicts with the empirical evidence reported in the literature (e.g., Ahn, Khandelwal, and Wei, 2010; Akerman, 2010). In other words, this type of cost structure is not widely used in reality, either.

5 Conclusion

There is an emerging literature investigating the roles of intermediaries in international trade (Feenstra and Hanson, 2004; Rauch and Watson, 2004;
Blum, Claro, and Horstmann, 2009; Felbermayr and Jung, 2009; Ahn, Khandelwal, and Wei, 2010; Akerman, 2010; Antras and Costinot, 2010; Bernard, Jensen, Redding, and Schott, 2010; McCann, 2010). The few available studies focus mainly on how intermediaries work and how they differ from direct exporters. However, what seems to be the most basic question, i.e., what types of firms export through intermediaries rather than directly by themselves, has yet to be addressed.

To the best of our knowledge, this paper is among the first few providing direct evidence on the relation between firm productivity and methods of exporting. By using a data of 12,679 firms in 29 developing economies during the period of 2002-2004, we find that the most productive firms have sales in the home country and also exporting directly to foreign countries, followed by those with sales in the home country and exporting directly and through intermediaries, then those with sales in the home country and exporting through intermediaries, and finally those with sales in the home country only.

To understand the trade-off in using these different methods of exporting, we then build a theoretical model upon the standard trade framework à la Melitz (2003) and Cheney (2009) by incorporating the role of intermediaries. Our theoretical analysis can explain our empirical findings as well as some of the empirical results reported in the literature. Moreover it also offers some new predictions for future studies when the finer data is available.
References


Figure 1a, Optimal Choice of Whether and How to Export to Foreign Country $i$ when $\Theta^x_i > \Theta^{ix}_i$
Figure 1b, Optimal Choice of Whether and How to Export to Foreign Country \( i \) when \( \Theta_i^x \leq \Theta_i^{ix} \)
Case (vi) | Case (v) | Case (iv) | Case (iii) | Case (ii) | Case (i)  
---|---|---|---|---|---  
E | H | H+IX(Some) | H+IX(All) | H+DIX(All) | H+DX(All)  
0 | \( \Theta_0 \) | \( \Theta_x^1 \) | \( \Theta_x^N \) | \( \Theta_x^1 \) | \( \Theta_x^N \) | \( \Theta \)  

Figure 2, Equilibrium Choice for the Scenario of High-cost Direct Exporting

where
- E: Exit
- H: Home country
- IX: Exporting through intermediaries
- DIX: Exporting both directly and through intermediaries
- DX: Exporting directly
- Some: Exporting to some foreign countries
- All: Exporting to all foreign countries
Figure 3, Equilibrium Choice for the Scenario of Low-cost Direct Exporting

where

E: Exit
H: Home country
IX: Exporting through intermediaries
DIX: Exporting both directly and through intermediaries
DX: Exporting directly
Some: Exporting to some foreign countries
All: Exporting to all foreign countries
### Table 1, Descriptive Statistics

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<th>Sales in the Home Country Only</th>
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Table 2, Main Results

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<tr>
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<td>Log Output per Worker</td>
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<td>TFP FE</td>
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<td>IX</td>
<td>0.215***</td>
<td>0.524***</td>
<td>0.277***</td>
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**Controls**
- Industry Dummy: Yes, Yes, Yes
- Country-year Dummy: Yes, Yes, Yes

Number of Observations
- 9,088
- 6,415
- 6,415

R-squared
- 0.8011
- 0.6248
- 0.5428

p-value for F-test
- 0.0000
- 0.0000
- 0.0000

Note: White-robust standard errors clustered at country-year level are reported in the bracket. *, **, *** represent statistical significance at the 10%, 5%, and 1%, respectively.
Table 3, Robustness Checks I, Exclusion of Outliers

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<tr>
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<th>2 TFP LP</th>
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<td>0.772***</td>
<td>0.948***</td>
<td>0.472***</td>
</tr>
<tr>
<td></td>
<td>[0.034]</td>
<td>[0.029]</td>
<td>[0.020]</td>
</tr>
</tbody>
</table>

**Controls**

| Industry Dummy   | Yes | Yes | Yes |
| Country-year Dummy | Yes | Yes | Yes |

| Number of Observations | 8940 | 6288 | 6286 |
| R-squared             | 0.7853 | 0.6526 | 0.6213 |
| p-value for F-test    | 0.0000 | 0.0000 | 0.0000 |

Note: White-robust standard errors clustered at country-year level are reported in the bracket. *, **, *** represent statistical significance at the 10%, 5%, and 1%, respectively.
Table 4, Robustness Checks II, Inclusion of Firm Size

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Log Output per Worker</td>
<td>TFP LP</td>
<td>TFP FE</td>
</tr>
<tr>
<td>IX</td>
<td>0.142*</td>
<td>0.176***</td>
<td>0.156**</td>
</tr>
<tr>
<td></td>
<td>[0.076]</td>
<td>[0.065]</td>
<td>[0.062]</td>
</tr>
<tr>
<td>DIX</td>
<td>0.523***</td>
<td>0.291***</td>
<td>0.220***</td>
</tr>
<tr>
<td></td>
<td>[0.088]</td>
<td>[0.070]</td>
<td>[0.065]</td>
</tr>
<tr>
<td>DX</td>
<td>0.631***</td>
<td>0.339***</td>
<td>0.256***</td>
</tr>
<tr>
<td></td>
<td>[0.040]</td>
<td>[0.033]</td>
<td>[0.031]</td>
</tr>
<tr>
<td>Log Employment</td>
<td>0.101***</td>
<td>0.482***</td>
<td>0.168***</td>
</tr>
<tr>
<td></td>
<td>[0.013]</td>
<td>[0.011]</td>
<td>[0.011]</td>
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</table>

**Controls**

- Industry Dummy: Yes
- Country-year Dummy: Yes

<table>
<thead>
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<th>6415</th>
<th>6415</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.8028</td>
<td>0.7269</td>
<td>0.5653</td>
</tr>
<tr>
<td>p-value for F-test</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Note: White-robust standard errors clustered at country-year level are reported in the bracket. *, **, *** represent statistical significance at the 10%, 5%, and 1%, respectively.
Table 5, Robustness Checks III, Sub-sample of Domestic Firms

<table>
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<tr>
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<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Log Output per Worker</td>
<td>TFP LP</td>
<td>TFP FE</td>
</tr>
<tr>
<td>IX</td>
<td>0.200**</td>
<td>0.512***</td>
<td>0.278***</td>
</tr>
<tr>
<td></td>
<td>[0.078]</td>
<td>[0.075]</td>
<td>[0.064]</td>
</tr>
<tr>
<td>DIX</td>
<td>0.585***</td>
<td>0.876***</td>
<td>0.422***</td>
</tr>
<tr>
<td></td>
<td>[0.091]</td>
<td>[0.081]</td>
<td>[0.072]</td>
</tr>
<tr>
<td>DX</td>
<td>0.672***</td>
<td>0.892***</td>
<td>0.436***</td>
</tr>
<tr>
<td></td>
<td>[0.038]</td>
<td>[0.036]</td>
<td>[0.030]</td>
</tr>
</tbody>
</table>

**Controls**

- Industry Dummy: Yes
- Country-year Dummy: Yes

<table>
<thead>
<tr>
<th>Number of Observations</th>
<th>8151</th>
<th>5683</th>
<th>5683</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.7965</td>
<td>0.6110</td>
<td>0.5220</td>
</tr>
<tr>
<td>p-value for F-test</td>
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</tbody>
</table>

Note: White-robust standard errors clustered at country-year level are reported in the bracket. *, **, *** represent statistical significance at the 10%, 5%, and 1%, respectively.
Appendix: Description of the Dataset

<table>
<thead>
<tr>
<th>Country</th>
<th>Survey Year</th>
<th>Number of Surveyed Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>2002</td>
<td>985</td>
</tr>
<tr>
<td>Benin</td>
<td>2004</td>
<td>190</td>
</tr>
<tr>
<td>Brazil</td>
<td>2003</td>
<td>1,636</td>
</tr>
<tr>
<td>Cambodia</td>
<td>2003</td>
<td>503</td>
</tr>
<tr>
<td>Ecuador</td>
<td>2003</td>
<td>445</td>
</tr>
<tr>
<td>El Salvador</td>
<td>2003</td>
<td>465</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>2002</td>
<td>422</td>
</tr>
<tr>
<td>Guatemala</td>
<td>2003</td>
<td>455</td>
</tr>
<tr>
<td>Honduras</td>
<td>2003</td>
<td>450</td>
</tr>
<tr>
<td>India</td>
<td>2002</td>
<td>1,711</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2003</td>
<td>711</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>2003</td>
<td>102</td>
</tr>
<tr>
<td>Lithuania</td>
<td>2004</td>
<td>239</td>
</tr>
<tr>
<td>Mali</td>
<td>2003</td>
<td>134</td>
</tr>
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<td>Moldova</td>
<td>2003</td>
<td>103</td>
</tr>
<tr>
<td>Montenegro</td>
<td>2003</td>
<td>100</td>
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<tr>
<td>Nicaragua</td>
<td>2003</td>
<td>452</td>
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<td>Oman</td>
<td>2003</td>
<td>330</td>
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<tr>
<td>Philippines</td>
<td>2003</td>
<td>666</td>
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<tr>
<td>Poland</td>
<td>2003</td>
<td>108</td>
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<tr>
<td>Senegal</td>
<td>2003</td>
<td>241</td>
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<tr>
<td>Serbia</td>
<td>2003</td>
<td>408</td>
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<td>South Africa</td>
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<td>--------------</td>
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<td>--------</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>2004</td>
<td>450</td>
</tr>
<tr>
<td>Syria</td>
<td>2003</td>
<td>552</td>
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<tr>
<td>Tajikistan</td>
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<td>Thailand</td>
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<td>Uzbekistan</td>
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<td>100</td>
</tr>
<tr>
<td>Zambia</td>
<td>2002</td>
<td>207</td>
</tr>
</tbody>
</table>