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Abstract

This paper examines empirically how the productivity of Chinese firms affects their choice of export and FDI, and the choice of FDI destinations between low-income and high-income countries. The results of our statistical tests, using the original micro-data of Chinese firms, demonstrate new findings that in China, (i) the productivity of FDI firms is higher than that of non-FDI firms; (ii) firms tend to move from export to FDI according to a rise of their productivity; (iii) the productivity of FDI firms in low-income countries is not higher than the productivity of exporters, while the productivity of FDI firms in high-income countries is higher than the productivity of exporters since the productivity cutoff for internationalization varies according to the difference in market attributes, and (iv) a pecking order of FDI destinations is clearly observed wherein the higher the productivity of the firms, the larger the number of their FDI destinations.

Key words: productivity; export; FDI; non-parametric approach; pecking order.

JEL Classification: F1, F23, L6

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1. Introduction

The export and foreign direct investment (FDI) of Chinese firms have been increasing rapidly since 2001, the year of China's accession to the WTO.[1] The internationalization of Chinese firms has attracted a great deal of interest in the research issue on firm heterogeneity and internationalization. Melitz (2003) and Helpman, Melitz, and Yeaple (2004, HMY hereafter) have provided the framework for theoretical and empirical examinations on how firms' productivity affect their choices of internationalization regarding export and FDI. Bernard and Jensen (1999) and Bernard et al. (2007) have presented empirical evidence from US firms that exporting firms have productivity premium that compares with firms that supply only domestic markets. Bernard and Jensen (2007) confirmed that the US firms with the lowest productivity supply only the domestic market; firms with the next highest productivity export, and firms with the highest productivity branch out into FDI. As for European firms, Mayer and Ottaviano (2007) have provided evidence to support the HMY model, while Wakasugi et al. (2008) have obtained similar results from Japanese firms. The empirical results from Taiwan firms provided by Aw et al. (2000) and the results from firms in Columbia, Mexico, and Morocco provided by Clerides et al. (1998) are the same as those for US firms, and are consistent with the theoretical prediction by HMY.

Further studies examine the effects of different market conditions on firms' choices of internationalization in multiple countries and regions. By analyzing the data of electronics firms in Taiwan with a Multinomial Logit Model, Aw and Lee (2008) demonstrated that productivity differs significantly between firms with FDI in China and the United States, and the firms with FDI in the United States are more productive than those having FDI in China; further, firms with FDI in both countries are the most

[1] During the past ten years, Chinese exports have increased at a growth rate of about 60 percent annually, outstripping the United States in 2007 and Germany in 2009. It has become the largest exporting country in the world. According to the data from UNCTAD, the FDI of Chinese firms in terms of stock increased by 25 percent annually during the ten years from 2000 to 2010, which far exceeded the 11.4 percent of the average annual growth rate. Refer UNCTAD, FDI/TNC database.

productive[2]. Bade on a three-country model, Grossman et al. (2006) showed that the higher the productivity of a firm, the greater the number of FDI destinations. Yeaple (2009), using data from US multinational firms, provided empirical evidence showing that the most productive firms have FDI in the largest number of countries and establish the largest number of foreign subsidiaries.

These studies have provided proper bases for examining what factors affect the choices of Chinese firm's export. There are some studies of Chinese firms, including Yang and Mallick (2010) and Ma et al. (2011) which report that Chinese firms with high productivity begin to export, after which their productivity rises because of what they learn from exporting. They provide evidence to support the HMY model, which shows that the productivity of exporting firms is higher than non-exporters. In comparison with studies of firms in OECD countries, however, the relation between Chinese firms' choice of FDI and their productivity has not been studied sufficiently. It has not been examined what effect the productivity of Chinese firms and market attributes have on their choice of export or FDI, nor what effects their productivity has on the number of FDI destinations. This is partly due to the insufficient availability of Chinese firm-level data.

The purpose of this paper is, by constructing our own dataset of Chinese firms, to conduct empirical examinations on what factors affect the choices of FDI by Chinese firms. We constructed a data base by matching two firm-level datasets: *the Chinese Annual Survey of Industrial Firms* by the National Bureau of Statistics and *the List of FDI Firms and Organizations* assembled by the Ministry of Commerce[3].

The empirical results of our examination demonstrate new findings on Chinese firms as follows: (1) the productivity of internationalized firms is higher than the productivity of non-internationalized firms; (2) in comparison with non-internationalized firms, FDI firms have the highest productivity premium, followed by exporting firms; (3)

[2] Wakasugi et al. (2008) and Wakasugi and Tanaka (2012) showed, in their empirical studies of Japanese firms, that the relation between productivity and the choice of internationalization is influenced by firm's productivity and market conditions. They assert that the productivity of firms internationalizing in two regions (North America and Europe) is higher than that of firms internationalizing in only one region, North America or Europe, even though both regions are similar in income level.

[3] The survey includes all industrial firms whose sales are above 5 million RMB regardless state-owned or private. It consists of statistics based on FDI applications.

the firms with FDI in countries with a higher per capita GDP than China are more productive than firms with FDI in countries with a lower per capita GDP than China; and (4) firms with FDI in a larger number of countries tend to be more productive than firms with FDI in a small number of countries. The firms having FDI in more than three countries, in particular, are more productive than other firms. We confirmed that even the internationalization of Chinese firms is clearly sorted and the number of their FDI destinations is ordered by the productivity. These results, although consistent with the theoretical and empirical findings in the previous studies on OECD countries, provide the first report on Chinese firm's FDI.

The structure of this paper is as follows: the next section presents the analytical framework for the empirical studies and the hypotheses for testing the relation between firm's productivity and its internationalization. Section 3 describes the data used for our empirical studies. In Section 4, we measure the total factor productivity (TFP) of Chinese firms. Based on the TFP, we provide evidences that the internationalization modes sorted by the productivity vary according to the difference in market attributes. In Section 5, based on non-parametric approach, we confirm the existence of the pecking order of firms' FDI destinations according to the productivity. First, we present the probability distribution of FDI firms. Next, we conduct a statistical test for the relationship between the productivity of FDI firms and the number of their FDI destinations. In section 6, based on the Ordered Logit Model, we alternatively check the effects of firm's productivity on the number of FDI destinations after controlling for firm-specific and market-specific factors. The final section describes the conclusions and remaining research subject.

2. Analytical framework

2.1 Basic model

The analytical framework for our empirical study follows the HMY model. We assume the CES type utility function in presenting a typical consumer's preference as follows:

(1) $$u = \left[\int_{\omega\in\Omega} x(\omega)^{\alpha}\, d\omega\right]^{1/\alpha}, \quad 0 < \alpha < 1,$$

where $x(\omega)$ X is the demand for the differentiated goods, Ω is the set of differentiated goods available for the consumers in the country, and α is the parameter that determines the elasticity of substitution between the differentiated goods, $\varepsilon = 1/(1-\alpha) > 1$.

To maximize the consumer's utility, the demand for goods is determined as follows:

(2) $$x(\omega) = p(\omega)^{-\varepsilon} Y / P^{1-\varepsilon},$$

where $p(\omega)$ is the price of the goods ω. The consumer's total expenditure (Y) and the price index (P) are expressed as follows:

(3) $$Y = \int_{\omega \in \Omega} p(\omega) x(\omega) d\omega$$

(4) $$P = \left[\int_{\omega \in \Omega} p(\omega)^{1-\varepsilon} d\omega \right]^{1/(1-\varepsilon)}$$

Next, we describe the production function. We assume the labor as only one factor for production. Suppose a is the labor input required for producing one unit of goods. Then the reciprocal of the labor input coefficient $1/a$, represents the productivity. The firm is stochastically given a production technology with a certain level of productivity when it pays the cost f_e, for entering the market.

Assuming the wage rate in country i is expressed as w_i, we express the marginal cost for production as $C_i = w_i a$. The price for satisfying the firm's profit maximization is expressed as follows:

(5) $$p_i(a) = \frac{C_i}{\alpha}$$

Following the HMY model, we suppose three production modes of firms to obtain the profit:

(i) producing the goods in the domestic market and supplying them only for the domestic market,

(ii) producing the goods in the domestic market and exporting them to a foreign market, and

(iii) producing the goods overseas and supplying them in the overseas market through FDI.

Moreover, this model assumes that a firm's production technology is common in all cases of domestic supply, export, and overseas production and that firms are required additionally to pay the variable and fixed cost for export, and to pay the fixed costs for FDI. Here, we denote f_j^X as the fixed cost for export to country j, and f_j^I as the fixed cost for FDI in country j.

Exporters are required to pay the transport cost τ_j ($\tau_j > 1$) when they produce goods at the country i for exporting to the country j. The transport cost is expressed as an iceberg type. We express the marginal cost for exporting as follows:

$$C_i = \tau_j w_i a$$

Here, we suppose the fixed cost for domestic production to be zero. The profit of firms is expressed according to the types of supply as follows:

(6) $$\pi_i^D(a) = (1-\alpha)\left(\frac{w_i a}{\alpha P_i}\right)^{1-\varepsilon} Y_i$$, for the case of supply in the home market;

(7) $$\pi_j^X(a) = (1-\alpha)\left(\frac{\tau_j w_i a}{\alpha P_j}\right)^{1-\varepsilon} Y_j - f_j^X$$, for the case of export;

(8) $$\pi_j^I(a) = (1-\alpha)\left(\frac{w_j a}{\alpha P_j}\right)^{1-\varepsilon} Y_j - f_j^I$$, for the case of FDI.

By denoting that $\theta = a^{1-\varepsilon}$ and $B_k = (1-\alpha)(\alpha P_k)^{\varepsilon-1} Y_k$, $k = i, j$, the firm's profit is rewritten as a linear function of productivity θ as follows:

(9) $$\pi_i^D(a) = \left(\frac{1}{w_i}\right)^{\varepsilon-1} B_i \theta$$

(10) $$\pi_j^X(\theta) = \left(\frac{1}{w_i \tau_j}\right)^{\varepsilon-1} B_j \theta - f_j^X$$

(11) $$\pi_j^I(\theta) = \left(\frac{1}{w_j}\right)^{\varepsilon-1} B_j \theta - f_j^I$$

We define the productivity cutoff of firms as the threshold of their productivity to satisfy the non-zero profit condition of equations (10) and (11). The productivity cutoffs for export (θ^X) and FDI (θ^I) are expressed, respectively, as follows:

(12) $$\theta^X = \frac{f_j^X}{B_j}(w_i \tau_j)^{\varepsilon-1}$$

(13) $$\theta^I = \frac{f_j^I}{B_j}(w_j)^{\varepsilon-1}$$

Further, the productivity cutoff, $\tilde{\theta}$, to equalize the profit of export to that of FDI, $\pi_j^X = \pi_j^I$, is expressed as follows:

(14) $$\tilde{\theta} = (f_j^I - f_j^X)/B_j\left((\frac{1}{w_j})^{\varepsilon-1} - (\frac{1}{w_i\tau_j})^{\varepsilon-1}\right)$$

where $w_j \leq w_i\tau_j$ since we can assume that the wage in FDI destination j at most is equal to the wage and transport cost that is the marginal cost for exporting from country i.
For the simplification, previous studies, - assuming that the wage rates in domestic and foreign markets, the size of the markets, and other market attributes are identical ($w_i = w_j$ and $B_j = B_i$), demonstrate that firms choose domestic supply, export, and FDI in order to maximize their profits according to their given productivity level.[4] Consequently, they confirmed that firms will choose to export if their productivity is higher than the productivity cutoff for export and lower than that for FDI, and they will engage in FDI instead of export if their productivity is higher than the productivity cutoff for FDI. However, if we relax the condition that the wage rates in domestic and foreign markets, the size of the markets, and other market attributes are identical, we will predict that firms make different choices of export and FDI from those presented in the HMY model. Even firms having low productivity may engage in FDI instead of export if the wage rate on the overseas market is far lower than in the home market. Hence, a firm's choice of internationalization depends on the market conditions.

Furthermore, it is rare for firms to internationalize only in a single region; rather, they simultaneously internationalize in two or more countries and areas.[5] In the case of

[4] Refer Helpman, Melitz, and Yeaple (2004)
[5] See major FDI destinations in Appendix 2.

internationalization in multiple countries, we cannot clearly order the firms' choices of internationalization by their productivity since each destination has a different productivity cutoff. Further research is required for the case of internationalization in multiple countries.

2.2 Choice between export and FDI

In comparing between the productivity cutoffs for export and FDI, θ^X , θ^I and $\tilde{\theta}$ in equations (12), (13) and (14), we expect two cases of the order of productivity cutoff for export and FDI as follows:

(15) $$\theta^X < \theta^I < \bar{\theta} = \tilde{\theta} \quad \text{if} \quad f_j^X / f_j^I < \left(w_j / w_i \tau_j\right)^{\varepsilon-1}$$

(16) $$\tilde{\theta} = \underline{\theta} < \theta^I < \theta^X \quad \text{if} \quad \left(w_j / w_i \tau_j\right)^{\varepsilon-1} < f^X / f^I$$

We depict two cases of FDI in Figure 1. The case 1 of inequality ((15); $\theta_1^X < \theta_1^I < \tilde{\theta} = \bar{\theta}$) shows the standard case as presented by Helpman, Melitz, and Yeaple (2004), in which the wage rate in the FDI host country is same as that in the home country. As the solid line in Figure 1 shows, the choice of export or FDI is uniquely sorted out according to productivity rank. The firm whose productivity is between θ_1^X and $\bar{\theta}$ will export, and the firm whose productivity is higher than $\bar{\theta}$ will engage in FDI. This case is likely if the wage rate in FDI destination is similar to the wage and transport cost for export to country *i* and also if the relative fixed cost for FDI to export is high. This condition leads to the case that the productivity cutoff for FDI is higher than that for export. We can classify this case of FDI as a horizontal type of FDI in developed countries[6].

Figure 1

[6] See Markusen (1984).

On the other hand, the order of productivity cutoffs for export and FDI may be reversed. The inequality (16) ($\tilde{\theta} = \underline{\theta} < \theta_2^I < \theta_2^X$) is the case in which FDI firm's profit is depicted as the dotted line in Figure 1. The firms whose productivity exceeds θ_2^I will engage in FDI, instead of exporting. This scenario shows only when firms engage in FDI without exporting. This case is likely if the wage rate in FDI destination is lower than the wage in exporting country and also if the relative fixed cost for FDI to export is low. In this case, the productivity cutoff for FDI becomes lower than the productivity cutoff for export. Then firms even with low productivity will produce the goods in the overseas market instead of exporting. This type of FDI is included in a vertical type of FDI [7].

When firms internationalize in multiple countries having different, wage rates, transport costs, and fixed costs, a single pattern of internationalization to which the productivity will correspond is not applicable. A firm engaging in FDI in one country may turn to export to another country. Firm's choice of export or FDI depends on the productivity cutoff which is determined by the market attributes. Focusing on the wage rates, the productivity cutoff for firm's internationalization is expected to vary between high-wage and low-wage countries. To what degree the productivity affects the modes of firms' internationalization cannot be discussed in a "one-size-fits-all" approach across all countries; rather, it should be examined by taking into account the differences in wages, country by country. In such high-wage countries as OECD countries, the standard case (case 1) tends to be the norm: firms with the highest productivity engage in FDI, and firms with next high productivity export. In low wage countries, however, even firms with low productivity may engage in FDI only, instead of export. This leads to the hypothesis to be tested by empirical examination as follows:

Hypothesis 1

The productivity distribution of firms engaging in FDI in high income countries lies at higher productivity zone than the productivity distribution of exporting firms, and the

[7] See Helpman (1984)

productivity distribution of firms engaging in FDI in low income countries lies at the productivity zone similar to or lower than that of exporters.

2.3 Pecking order of FDI destinations

Firms may internationalize in multiple countries through mixing the modes of export and FDI since the productivity cutoffs for export and FDI vary according to different country-specific attributes. A firm given a certain level of productivity which exports to one country may engage in FDI in another country if it exceeds the level of the productivity cutoff required for FDI in the country. Therefore, a firm with more export destinations is not necessarily more productive than a firm with fewer export destinations since a firm with higher productivity is likely to switch its internationalization mode from export to FDI.

Suppose that the productivity cutoff for FDI, determined by the wage, transport cost and fixed costs, is common to all FDI candidates from a country. Firm is likely to engage in FDI in the easiest destination, and will move to expand the next FDI destination with obtaining FDI in the easiest destination if the firm's productivity is higher than the productivity cutoff for FDI in the next destination. If we order the FDI destinations along with the productivity cutoff, we can predict that the order of firm's productivity coincides with the order of the number of FDI destinations. This is expressed as follows:

$$\theta^i{}_1 < \theta^i{}_2 < \ldots < \theta^i{}_k < \cdots < \theta^i{}_m \Leftrightarrow N^i{}_1(\theta^i_1) < N^i{}_2(\theta^i_2) < \cdots < N^i{}_k(\theta^i_k) < \cdots < N^i{}_m(\theta^i_m) \ ,$$
$$k = 1, 2, \cdots, m$$

where $\theta^i{}_k$ is the productivity cutoff for FDI in destination *k* from country *i*, and $N^i{}_k$ is the aggregated number of FDI destinations of the firm with productivity $\theta^i{}_k$

Figure 2 depicts the relation between the firm's productivity and the accumulated number of FDI destinations of the firm. The horizontal axis presents firm's productivity and productivity cutoff, the vertical axis presents the accumulated number of FDI destinations, respectively.

Figure 2

As the figure depicts, the number of FDI destinations of the firm increases along with a rise of the firm's productivity. This leads to the hypothesis to be empirically tested as follows:

Hypothesis 2

The productivity distribution of firms engaging in FDI in larger number of destinations lies at higher productivity zone than the productivity distribution of firms engaging in FDI in smaller number of destinations.

3. Data of Chinese firms

In this paper, we construct an original dataset from the statistics of Chinese firms. The data for the Chinese firms used in this paper are based on *the Chinese Annual Survey of Industrial Firms* (hereafter, the Survey) conducted annually by the National Bureau of Statistics (NBS)[8]. The survey covers all industrial firms that are both state-owned and non-state firms with sales above 5 million RMB (hereafter referred to as the "above-scale" firms)[9]. In this paper, we use the firm-level data of the Survey for 2007 which includes 305,067 firms which cover more than 90 percent of the total industrial production and export of China.[10]

As for firm-level data for Chinese FDI, we used the *"List of FDI Firms and Organizations"* issued by the Chinese Ministry of Commerce, which includes 13,000 firms

[8] Based on this firm-level data, NBS annually releases industry-level aggregated data in the *China Statistical Yearbook*.

[9] The industries in the Survey are manufacturing, mining, and public utility industries (gas, water service, and electric power supply). The Survey contains more than one hundred variables, including such fundamental firm data as ownership, location, and telephone number; firm activities such as production, sales, the number of employees, value of intermediate inputs, and export value; and financial data, such as tangible fixed assets, debt, gross profit, tax payment, and wages.

[10] As for the issues for constructing data set, refer to Brandt et al (2011). Although we concentrate our analysis on manufacturing firms, we exclude the cigarette industry, which is a regulatory industry, and the recycling industry, which has no connection to previous industrial classification. Then, we cleaned the data in order to omit blank items and abnormal values from the samples, according to the precedent set by Brandt et al. (2011), as follows: we excluded firms having fewer than eight employees, tangible fixed assets, value-added, and sales that do not show positive values from the sample.

in the non-financial firms and 4550 manufacturing firms engaging in FDI at the end of 2010[11].

Finally, we construct the original firm-level panel data for empirical examination by matching the data of Survey with "List of FDI Firms and Organizations."[12] In matching 13,000 firms, we exclude the following firms: (i) those holding only overseas office with no actual business operation in the host countries, (ii) firms located in "tax haven" countries,[13] and (iii) firms in Hong Kong and Macao. The tax haven countries, Hong Kong, and Macao are not necessarily thought of as final destinations for FDI. Much of the FDI in those regions and countries is designated for reinvestment in other countries. In the case of Chinese firms' FDI, in particular, it is noted that Chinese firms engaging even in round-trip FDI via their subsidiaries established in tax haven countries, Hong Kong, and Macao, may receive preferential treatment.[14] These cases are regarded as disguised FDI. Of course, the benefit of round-trip FDI in China is disappearing because of the amendment to the tax law concerning preferential tax policy to foreign firms[15]. Hong Kong is a special destination for Chinese firms. Many Chinese firms regard Hong Kong as the bridgehead of their overseas expansion for collecting information in the foreign markets, as a base for overseas-oriented selling, and as a base for financing through listings on the Hong Kong Stock Exchange market. Taking into account that FDI firms in tax haven countries, Hong Kong, and Macao essentially differ from FDI firms in other countries, we exclude Chinese firms investing in tax haven countries, Hong Kong, and Macao.

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[11] The information on the list includes the names of the firms, the FDI destination, the names of affiliated firms, and the inaugural years of FDI, but unfortunately does not cover much information pertaining to firms' business activities, such as the capital stock of FDI, the sales of foreign affiliates, and the number of employees of foreign affiliates.

[12] Through matching each firm's name from the Survey with its name from the "List of FDI Firms and Organizations," we used not only the firms' names and identification numbers of Chinese firms in the Survey but also the addresses of the firms, the names of the representatives, the industry classifications, and other information from the firms' websites, for more accurate matching.

[13] In this paper we regard Andorra, Aruba, Bahamas, Bahrain, Belize, Bermuda, British Virgin Islands, Cayman Islands, Cook Islands, Dominica, Gibraltar, Grenada, Liechtenstein, Marshall Islands, Monaco, Netherlands' Antilles, Panama, Samoa, San Marino, Vanuatu as tax heaven countries and regions

[14] Refer to Huang (2003).

[15] After the implementation of the New China Corporate Law, enforced on January 1, 2008, the corporate income tax (25 percent) is, in principle, equivalently applied to both domestic and foreign firms.

As of 2007, 790 manufacturing firms are matched. From 2008 to 2010, 1433 firms began FDI. Although the number of Chinese FDI firms has increased so rapidly, it is still not so large in comparison with the number of exporters. Table 1 displays the number of manufacturing firms by mode of internationalization in 2007: a large number of exporters and a small number of FDI firms.[16] It also displays two cases: one is for the internationalization of all Chinese firms, and another is for the internationalization of firms excluding foreign-owned firms in China. There are reasons to exclude foreign-owned firms. One is that the corporate strategy of foreign-owned firms may be controlled by their parent firms outside China, and they may not operate for their own profit maximization. Another is that there may exist a wide difference in the fixed costs for FDI between domestic firms and foreign owned firms. We construct two types of samples for empirical examination: with and without foreign-owned firms.

Table 1

4. Premium of internationalization

4.1 Measurement of TFP

For calculating the productivity premium of internationalization, we measure two productivity indexes: labor productivity defined as the ratio of value added to the number of employees and total factor productivity (TFP) by using the method of Caves et al. (1982) as follows:

$$\ln TFP_i = (\ln VA_i - \overline{\ln VA_i}) - \tilde{S}_i(\ln L_i - \overline{\ln L_i}) - (1-\tilde{S}_i)(\ln K_i - \overline{\ln K_i}), \tag{17}$$

where $\ln VA_i$, $\ln L_i$, and $\ln K_i$ are the value-added, the number of employees, and capital stock of firm i, respectively. $\overline{\ln VA}$, $\overline{\ln L}$, and $\overline{\ln K}$ are the average value-added, the average

[16] The figure in Appendix 1 presents the number of firms according to internationalization mode when including the FDI firms in Hong Kong and Macao. The main FDI destinations, including Hong Kong and Macao, are expressed with Appendix 2.

number of employees, and the average tangible capital asset of firms belonging to 2-digits industry classification. All are expressed in terms of logarithms. The share of labor, $\tilde{S}_i$, is defined by $\tilde{S}_i = (s_i + \bar{s}_i)/2$, where s_i is given by the ratio of total payroll (the summation of salary and bonus) to the summation of the total payroll and the return to capital stock. $\bar{s}_i$ is given by the average labor share for the industry of firm i. The return to capital stock is calculated by multiplying the interest rate and the capital stock. Then $(1-\tilde{S}_i)$ expresses the share of capital[17].

In calculating TFP, all nominal values of value added value and payroll are changed to real value by denominating according to the product deflators at the 2-digit industry level. Capital stock is changed to the real term by the deflator of equipment investment. All deflators are from the *China Statistical Yearbook, 2008*.

4.2 Premium of internationalized firms

This section examines what premium Chinese internationalizing firms hold in comparison with domestic firms, following Bernard and Jensen (1999, 2007). We estimate the productivity premium of internationalized firms as dependent variables on the explanatory variables of three modes of internationalization with controlling for firm-specific, industry-specific, and location-specific factors, in two cases: labor productivity and TFP. The premium is estimated by the following equation:

$$\ln Y_i = \alpha + \beta_1 DExport_i + \beta_2 DFDI_i + \beta_3 DExport\&\cdot FDI_i + \gamma Z_i + \mu_i \ , \tag{18}$$

[17] According to the industrial statistics, industry's average share of labor reached only about 34% in 2007. On the other hand, National Income Accounts in China reports that the average share of the work force in all industries is about 55%.[17] This discrepancy implies the possibility that the value added to include excessive value. By multiplying a certain number on the payroll in each firm, Brandt et al. (2011) attempted to inflate the total payroll so as to equalize the adjusted share to National Income Accounts in China. In this paper, we used the ratio of total payroll (the summation of salary and bonus) to the summation of the total payroll and the return to capital, for the share of labor.

where Y_i is labor productivity or TFP of firm i. $DExport_i$ is the dummy variable for exporting (non-FDI) firm i, $DFDI_i$ for FDI (non-exporting) firm i, and $DExport\&\cdot FDI_i$ for exporting-FDI firm i, respectively. Z_i is the variables to control for the number of employees, the ownership (Hong Kong-Macao-Taiwan firms, other foreign firms, and state-owned firms), the industry-specific factors and firm's location in provinces and special cities. We estimate two cases: for all firms and for firms excluding foreign-owned firms.

Table 2 displays the estimated coefficients of exporters (non FDI), FDI firm (non-export), and export-FDI firms. They express to what degree the productivity of internationalized firms is higher than that of non-internationalized firms after controlling for firm, industry, and location specific factors.

Table 2

The estimated results for the productivity premium are summarized as follows:

(i) In the case of all firms expressed in the upper portion of the table, the premium of FDI firms in both labor productivity and TFP is observed regardless export, although the non-FDI exporters' premium is not observed.

(ii) For the case in which foreign-owned firms are excluded, as expressed in the lower portion of the table, all internationalized firms demonstrate the higher productivity than non-internationalized firms. The exporters have higher productivity premium in comparison with the non-exporters, regardless with and without FDI[18].

(iii)Comparing between FDI firms and non-internationalized firms, in all cases FDI firms both with and without export hold higher productivity premium than non-internationalized firms by 0.4 to 0.7 points.

(iv)The productivity premium of the foreign owned firms is different from Chinese firms. In all cases the highest is FDI firms with export. It is followed by FDI firms without export

[18] This result is consistent with the previous studies by Ma et al. (2011).

in case of firms including foreign firms, but by exporters without FDI in case of excluding foreign firms.

4.3 FDI Firms in multiple countries: Non-parametric approach

This section tests Hypothesis 1 discussed in section 2.2. The productivity cutoff that sorts the modes of firms' internationalization varies according to the differences in market attributes. Firms actually internationalize in multiple markets that have differing market attributes, such as size, transport costs, wage gaps, fixed costs, and so on. The different market attributes cause different productivity cutoffs for internationalization. prevents an accurate depiction of firms' productivity distribution. In order to avoid the contamination due to varying market attributes, we need to examine the mode of firms' internationalization, corresponding to each country, one by one—i.e. Chinese firms' internationalization in the United States, in Vietnam, and so on. But, for the limited availability of data, we divide the sample of firms into only two groups: the group of firms internationalizing in high-income countries (H-countries) and that of firms in low-income countries (L-countries)[19].

Here, we define H-countries by the countries with higher per capita GDP (GDPPC) than the Chinese GDPPC, and L-countries by the countries with lower GDPPC than the Chinese GDPPC, based on the statistical data from *"World Development Indicators"* by the World Bank. Furthermore, we omit the firms with FDI in both H-countries and L-countries from the sample to avoid the mixture of two types of FDI firms[20].

Table 3 displays the average productivity of three groups of firms: non-FDI firms, FDI firms in L-countries, and FDI firms H-countries, in terms of two productivities—labor productivity and TFP. The upper part of the table shows the case for all firms, the lower showing the case for firms excluding foreign-owned firms. The numbers of firms are counted, corresponding to the classification regardless the number of countries.

[19] As the Chinese government does not disclose the firm-level data for a firm's export destinations, we concentrate the firm's internationalization only on FDI, hereafter.
[20] See Appendix 3 for the classification of countries.

Table 3

The results in Table 3 are summarized as follows:

(i)Non-FDI firms, FDI firms in L-countries, and FDI firms in H-countries are ranked by the order of their productivity level: non-FDI firms are the lowest, FDI firms in L-countries is higher than non-FDI firms, FDI firms in H-countries are the highest. These results are perfectly consistent with our theoretical prediction in section 2.

(ii) The case for firms excluding foreign owned firms is almost same as the case for all firms.

Here, we attempt to test the difference of the average productivity. The results of the t-test in Table 3 show that the average productivity is significantly different between non-FDI, FDI in L-countries, and FDI in H-countries, except the case of firms excluding foreign owned firms. The insignificant difference in the average productivity between non-FDI firms and FDI firms in L-countries suggests that even low-productivity firms are able to conduct FDI in L-countries in which the productivity cutoff for FDI is no different from the productivity cutoff for entering the Chinese market.

We depict the probability density functions of productivity for non-FDI firms, FDI firms in L-countries, and FDI firms in H-countries by the Kernel function. Figures 3 and 4 depict the probability density functions of labor productivity for all firms and firms excluding foreign-owned firms. Figures 5 and 6 depict the probability density functions of TFP for all firms and firms excluding foreign-owned firms. The horizontal axis expresses the level of productivity, and the vertical axis presents the probability density of firms. In these figures we observe the shift of the probability density from left to right according to the order of non-FDI firms, FDI firms in L-countries, and FDI firms in H-countries. In the case of firms excluding foreign-owned firms, the order is observed more clearly than in the case for all firms.

Figures 3- 5

Next, we attempt to test whether the productivity distributions differ significantly between non-FDI firms, FDI firms in L-countries, and FDI firms in H-countries by using the Kolmogorov-Smirnov test (K-S test) in terms of labor productivity and the TFP, respectively. We assume that $G_1(\theta)$ and $G_2(\theta)$ denote the cumulative distribution functions (CDFs) of productivity θ for two comparison groups and that the stochastic dominance of $G_1(\theta)$ relative to $G_2(\theta)$ is defined by $G_1(\theta) - G_2(\theta) < 0$ for all values of productivity θ, following Delgado et al (2002).

First, we test the hypothesis that the cumulative distribution functions for two comparison groups $G_1(\theta)$ and $G_2(\theta)$ are different. The null and alternative hypotheses are expressed as follows:

(19)
$$\begin{aligned} &\mathrm{H}_0 : G_1(\theta) - G_2(\theta) = 0 \quad \text{for all } \theta \\ &\mathrm{H}_1 : G_1(\theta) - G_2(\theta) \neq 0 \quad \text{for some } \theta \end{aligned}$$

The K-S test statistics for the two-sided test is given by the following:

(20)
$$KS_2 = \sqrt{\frac{mn}{N}} \max_{1 \le \mathrm{i} < \mathrm{N}} \left| G_{1,m}(\theta_i) - G_{2,n}(\theta_i) \right|$$

where m and n are the sample sizes of the distributions $G_1(\theta)$ and $G_2(\theta)$, respectively, and $N = m + n$

Next, we test whether one group is stochastically dominant on the other. The null and alternative hypotheses are expressed as follows:

(21)
$$\begin{aligned} &\mathrm{H}_0 : G_1(\theta) - G_2(\theta) \le 0 \quad \text{for all } \theta \\ &\mathrm{H}_1 : G_1(\theta) - G_2(\theta) > 0 \quad \text{for some } \theta \end{aligned}$$

The K-S test statistics for the one-sided test is given by the following:

(22) $$KS_1 = \sqrt{\frac{mn}{N}} \max_{1 \le \mathrm{i} < \mathrm{N}} \{G_{1,m}(\theta_i) - G_{2,n}(\theta_i)\}$$

If the null hypothesis for the two-sided test is rejected and the null hypothesis for the one-sided test is not rejected, we judge that $G_1(\theta)$ is stochastically dominant on $G_2(\theta)$. Graphically, this means that $G_1(\theta)$ lies entirely at the right position to $G_2(\theta)$. We test two hypotheses on the 2007 year data.

Table 4 shows the notable results of K-S test. The low P-value expresses the rejection of the null hypothesis for two sided test that the two distributions do not differ, and the high P-value expresses the null hypothesis for one-sided test is not rejected in two cases of Non FDI vs. FDI in H-countries and FDI in L-countries vs. FDI in H-countries for firms excluding foreign owned firms, and the case of Non-FDI vs. FDI in H-countries for all firms. These results are consistent with the theoretical prediction that a high productivity is required for FDI in high-wage countries, although it is not necessarily required for FDI in low-wage countries. We do not observe a significant difference in distribution between non-FDI firms and FDI firms in L-countries. These are similar to the results of the t-test for the average productivity.

Table 4

5. Number of FDI destinations and productivity

Our theoretical discussion in section 2 also predicts that the rank of FDI firms by productivity coincides with the order of firms' number of FDI destinations. We here attempt an empirical test of Hypothesis 2, i.e. a pecking order in FDI destinations of Chinese firms. First, we divide Chinese firms into four groups: non-FDI firms, firms with FDI in one country, with FDI in two countries, and with FDI in more than three countries. Then we compare the average productivities among the groups. Table 5 shows the results in terms of labor productivity and TFP.

Table 5

The results in Table 5 find clear evidences that in terms of both labor productivity and TFP, (i) the average productivity of FDI firms is higher than that of non-FDI firms, and (ii) the larger the number of FDI destinations, the higher the average productivity of the groups, corresponding to the number of FDI destinations. This means that a pecking order of FDI destinations exists according to the productivity. and it also appears for the case of excluding foreign-owned firms more clearly than for the case of all.

Next, we attempt to examine statistically whether a pecking order of FDI destinations exists among the groups of FDI firms. In order to observe the pattern of the productivity order of FDI firms, we depict the cumulative distribution functions of the four groups of firms—non-FDI firms, firms with FDI in one country, in two countries, and in more than three countries—by the Kernel function.

Figures 7 and 8 depict the cumulative distributions functions of labor productivity for all firms and for firms excluding foreign-owned firms. Figures 8 and 9 depict those for the TFP for all firms and for firms excluding foreign-owned firms. The horizontal axis expresses the level of productivity, and the vertical axis presents the cumulative probability. These figures all clearly depict the shift of the cumulative distribution of productivity from left to right according to the order of non-FDI firms, firms with FDI in one country, in two countries, and in more than three countries.

Figures 7 - 10

We further attempt to test whether the cumulative distributions differ significantly among four groups of firms by applying the same statistical test method as section 4.4.We examine which group is statistically dominant on the others by using the K-S test in terms of both labor productivity and TFP.

Table 6 presents the results of the K-S test. The low P-value expresses the rejection of the null hypothesis for the two-sided test that no difference exists in distribution between the four groups. In particular, the P-value for the K-S tests is low at a 5 percent significance level for firms excluding foreign-owned firms. The high P-value expresses that the null hypothesis for one-sided test is not rejected in all cases, although we note a weak difference in distribution for some firms in the case of labor productivity.

Table 6

6. Alternative check

The number of FDI destinations is determined not only by productivity, but also affected by firm-specific attributes, including the capital intensity, the R&D intensity, and so on. This section statistically tests whether the productivity determines the order of the number of FDI destinations even after controlling for firm-specific and market-specific attributes.

For the first step, we test by the Ordinary Least Square method whether the choice of FDI destinations among one, two, or more than three countries is ordered by the productivity level. As the dependent variable is not the cardinal but the ordinal number, we further test by using the Ordered Logit Model as an alternative method. We construct the groups of FDI firms by excluding non-FDI firms from the sample and classifying FDI firms into three groups: firms with FDI in one country, firms with FDI in two countries, and firms with FDI in more than three countries. For classifying the groups of Chinese FDI firms, we use Chinese firm-level data for 2007 and 2010. The number of all firms and firms excluding foreign-owned firms for each group is tabulated in Table 7.

Table 7

Here, for the explanatory variables, we also use two types of productivity index: labor productivity and TFP. For other explanatory and control variables, we include firm-specific factors, such as capital intensity; the intensity of R&D expenditure defined by the ratio of

R&D to sales; the duration of operation; and the dummy variables for export, industry, and location in the regression equation. In order to avoid the sample selection bias, we include the dummy variable for foreign-owned firms in the estimation. We conduct two types of estimation for FDI firms: all firms and firms excluding foreign-owned firms. Tables 8 and 9 present the estimated results by OLS and Ordered Logit Model for all firms and firms excluding foreign-owned firms, respectively.

Tables 8 and 9

The results are summarized as follows:

(i) In the estimation under OLS, both labor productivity and TFP record a significant effect on the number of FDI destinations, after controlling for firm-specific attributes, and industry and location factors. The result demonstrates that the higher the productivity, the larger the number of FDI destinations.

(ii) Looking at the coefficients of the control variables for firm-specific factors, we find that an increase in R&D intensity and exportability raises the number of FDI destinations. The capital intensity and the operation period do not affect the choice of FDI. Firms will conduct FDI regardless of their operation experience if their productivities are high.

(iii) The coefficient of the dummy variable for foreign-owned firms is significantly positive in Ordered Logit estimation. This suggests that foreign-owned firms tend to increase the number of FDI destinations, *ceteris paribus*.

(iv) The estimated results for productivity and other control variables by the Ordered Logit Model almost coincide with those of OLS, even have a higher statistical significance. The estimated coefficients of the productivity, the R&D intensity, and the export dummy show the positive effect on the number of FDI destinations at a statistical significance of one to five percent.

We must note the simultaneous bias in the estimation of the productivity and the order of FDI destinations because both the explanatory variables (firm productivity) and the dependent variables (the cardinal number and the ordinal number of FDI destinations) are

determined simultaneously. In order to avoid simultaneous bias, we use the data of Chinese firms in 2010 for the number of FDI destinations and the groups of FDI firms, instead of the data in 2007. Three years' lagged data for the explanatory variables mitigate the statistical problem caused by the simultaneity. Furthermore, we test whether the firms engaging in FDI in 2007 tended to raise the number of their FDI destinations and the rank of the groups. In order to test the hypothesis, we add the dummy variable for the FDI firms in 2007. If the coefficient of the dummy variable for FDI firms in 2007 is positive, the firms already engaged in FDI tend to have more FDI destinations than the firms newly engaging in FDI after 2007. In order to check the sample selection bias, we include the dummy variable for foreign-owned firms in the estimation.

Tables 10 and 11 present the estimated results by OLS and Ordered Logit Model for all firms and firms excluding foreign-owned firms, respectively.

Tables 10 and 11

The results estimated by both the OLS and Ordered Logit Model demonstrate that the productivity affects positively the number of FDI destinations after controlling for firm-specific factors with high statistical significance. They are consistent with the results in Tables 8 and 9.

7. Concluding remarks

Chinese firms have been internationalizing rapidly in recent years, with both export and FDI rising since 2001, the year of China's accession to the WTO. During the past ten years, Chinese exports have increased at an average growth rate of about 60% annually, exceeding that of the United States in 2007 and of Germany in 2009; in sum, China has become the largest exporting country in the world. This internationalization of Chinese firms and the factors causing it have greatly attracted researchers.

This paper, following the HMY model, has empirically examined whether Chinese firms' productivity influence their choice in modes of internationalization, whether market

attributes influence their choice in modes of internationalization, and whether the productivity orders the number of FDI destinations. While these have been tested by a number of studies on firms in OECD countries, they have not been sufficiently examined for Chinese firms. Firm-level data are essential for the examination of these issues. By constructing the original dataset from firm-level data in China, we conducted empirical examinations.

The estimated results demonstrate empirical evidences that in China, (i) the productivity of internationalized firms is higher than that of non-internationalized firms; (ii) firms tend to move from export to FDI, according to their rise in productivity; (iii) internationalized firms may be clearly sorted by their choice of export or FDI in high-income countries, but not so clearly sorted in low-income countries since the productivity cutoff for internationalized firms in low-income countries is low; and (iv) a pecking order exists so that the higher the productivity of the firms, the larger the number of FDI destinations. These results show that market specific attributes as well as the productivity significantly affect the choice of internationalization among Chinese firms. The findings supplement recent studies of Chinese exporters by Yang and Mallick (2010) and Ma et al. (2011).

Although our studies constitute a step toward new findings, some issues still remain to be examined. Some FDIs of Chinese firms tend to take the form of export platform. Our investigation does not explicitly take into account the export platform type of FDI, although we decompose FDI into two regions: FDI in L-countries and H-countries and note the difference between two FDIs. The further research of firm's FDI for exporting to the third country remains.

Our results depended on the theoretical assumption that Chinese firms are stochastically given a certain level of technology at the initial stage of entering the market. This is the self-selection hypothesis. Chinese firms, however, are recording a high growth rate through absorbing foreign technology, and FDI is a typical channel for importing advanced technology. We should also question whether the rise in Chinese firms' productivity is accelerated via learning by exporting or by FDI. Ma et al. (2011) have

reported that Chinese firms have realized an improvement in productivity via export, but the learning effect of FDI has not yet been examined, so far as we know. Although this paper partly investigates it by using the three years' lagged data, the issue remains to be examined further.

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Table 1. Number of Firms by Mode of Internationalization (2007)

		Domestic firm	Exporter (Non-FDI)	FDI firm (Non-exporter)	Exporter*FDI firm	Total
All firms	Number of firms	227,230	77,047	242	548	305,067
	Share	74.5	25.3	0.1	0.2	100
Firms exluding foreign owned firms	Number of firms	202,066	37,736	193	366	240,361
	Share	84.1	15.7	0.1	0.2	100

Note: Above scale firms in the manufacturing sector. FDI firms exclude firms that invest in Hong Kong, Macao, and tax heavens only.

Table 2. Productivity Premium and Internationalization (2007)

All firms	(1) ln Labor productivity	(2) lnTFP
Exporter (Non-FDI)	-0.015	-0.006
	[0.013]	[0.012]
FDI firm (Non-exporter)	0.516***	0.446***
	[0.065]	[0.062]
Exporter*FDI firm	0.547***	0.489***
	[0.049]	[0.045]
Firm size	Yes	Yes
HMT/NHMT/SOE dummy	Yes	Yes
Industry*region dummy	Yes	Yes
N	305,067	305,067
Adj. R-squared	0.171	0.103
Firms exluding foreign owned firms		
Exporter (Non-FDI)	0.0558***	0.0581***
	[0.012]	[0.011]
FDI firm (Non-exporter)	0.513***	0.429***
	[0.070]	[0.067]
Exporter*FDI firm	0.743***	0.648***
	[0.057]	[0.053]
Firm size	Yes	Yes
SOE dummy	Yes	Yes
Industry*region dummy	Yes	Yes
N	240,361	240,361
Adj. R-squared	0.168	0.116

Note: Standard errors clustered at the industry-region level are shown in brackets. Constants, firm size, ownership dummies, industry*region dummies are suppressed. ***, **, * indicate significance at the 1%, 5%, and 10% levels,

Table 3. Average Productivity of non-FDI and FDI firms by Destination (2007)

Average productivity	Number of firms	(1) ln Labor productivity	(2) lnTFP
All firms			
Non-FDI	304,278	11.224	-0.061
FDI in L-countries	193	11.351	0.033
FDI in H-countries	560	11.532	0.229
Firms exluding foreign owned firms			
Non-FDI	239,803	11.246	-0.055
FDI in L-countries	159	11.309	-0.035
FDI in H-countries	377	11.628	0.278
t-test (*p* -value)			
All firms			
Non-FDI vs. FDI in L-countries		0.050	0.095
Non-FDI vs. FDI in H-countries		0.000	0.000
FDI in L-countries vs. FDI in H-countries		0.014	0.005
Firms exluding foreign owned firms			
Non-FDI vs. FDI in L-countries		0.218	0.397
Non-FDI vs. FDI in H-countries		0.000	0.000
FDI in L-countries vs. FDI in H-countries		0.000	0.000

Note: t-test is used to test the hypotheses about the equality of means for group 1 vs group 2
p -values are reported.

Table 4. Kolmogorov-Smirnov Test of Probability Density between FDI Firms

FDI destination		(1) ln Labor productivity		(2) lnTFP	
	KS test	D	*p* -value	D	*p* -value
All firms					
Non-FDI vs. FDI in L-countries	Two-sided	0.095	0.052	0.083	0.118
	One-sided	-0.014	0.923	-0.021	0.848
Non-FDI vs. FDI in H-countries	Two-sided	0.139	0.000	0.176	0.000
	One-sided	-0.001	0.998	-0.002	0.997
FDI in L-countries vs. FDI in H-countries	Two-sided	0.090	0.168	0.112	0.046
	One-sided	-0.004	0.996	-0.007	0.985
Firms exluding foreign owned firms					
Non-FDI vs. FDI in L-countries	Two-sided	0.078	0.272	0.050	0.800
	One-sided	-0.027	0.792	-0.036	0.665
Non-FDI vs. FDI in H-countries	Two-sided	0.182	0.000	0.206	0.000
	One-sided	-0.001	0.999	-0.002	0.997
FDI in L-countries vs. FDI in H-countries	Two-sided	0.150	0.010	0.179	0.001
	One-sided	-0.003	0.998	-0.008	0.986

Note: Two-sided KS test statistic (H_0): equality of distributions, one-sided KS test statistic (H_0): group 1 < group 2. Asymptotic *p* -values are reported. The number of firms are the same as Table 3.

Table 5. Number of FDI Destinations and Average Productivity (2007)

Number of FDI destinations	Number of firms	(1) ln Labor productivity	(2) lnTFP
All firms			
0	304,277	11.224	-0.061
1	692	11.468	0.159
2	58	11.688	0.417
More than 3	40	11.923	0.639
Firms exluding foreign owned firms			
0	239,802	11.246	-0.055
1	495	11.496	0.152
2	43	11.993	0.616
More than 3	21	12.292	0.842

Table 6. K-S Test on Cumulative Distribution of FDI Firms

Number of FDI destinations		(1) ln Labor productivity		(2) lnTFP	
	KS test	D	*p*-value	D	*p*-value
All firms					
0 vs. 1	Two-sided	0.124	0.000	0.139	0.000
	One-sided	-0.001	0.997	-0.005	0.973
1 vs. 2	Two-sided	0.168	0.085	0.178	0.059
	One-sided	-0.044	0.822	-0.043	0.828
2 vs. More than 3	Two-sided	0.238	0.080	0.252	0.055
	One-sided	0.000	1.000	0.000	1.000
Firms exluding foreign owned firms					
0 vs. 1	Two-sided	0.130	0.000	0.139	0.000
	One-sided	-0.001	0.999	-0.009	0.921
1 vs. 2	Two-sided	0.251	0.015	0.269	0.007
	One-sided	-0.045	0.869	-0.043	0.880
2 vs. More than 3	Two-sided	0.435	0.002	0.372	0.014
	One-sided	0.000	1.000	0.000	1.000

Note: Two-sided KS test statistic (H_0): equality of distributions, one-sided KS test statistic (H_0): group 1 < group 2. Asymptotic *p*-values are reported. The number of firms are the same as Table 5.

Table 7. Number of FDI Destinations of Chinese Firms (2007 and 2010)

Number of FDI destinations	2007		2010	
	All firms	Firms exluding foreign owned firms	All firms	Firms exluding foreign owned firms
1	692	495	1,779	1,233
2	58	43	280	203
More than 3	40	21	164	105
Total	790	559	2,223	1,541

Table 8 Estimated Results of Productivity and the Order of FDI Destinations (All Firms, 2007)

Number of FDI destinations	(1)	(2)	(3)	(4)
	OLS		Ordered Logit Model	
ln Labor productivity	0.0659*		0.398***	
	[0.036]		[0.121]	
lnTFP		0.0632*		0.502***
		[0.035]		[0.124]
Capital intensity	0.026	0.035	0.082	0.155
	[0.025]	[0.024]	[0.109]	[0.105]
R&D intensity	0.021	0.021	0.100***	0.0929**
	[0.014]	[0.014]	[0.037]	[0.038]
Firm age	0.046	0.046	0.169	0.198
	[0.040]	[0.040]	[0.169]	[0.172]
Exporter dummy	0.161***	0.160***	0.895***	0.890***
	[0.046]	[0.046]	[0.290]	[0.290]
Foreign firm dummy	0.095	0.094	0.506**	0.487**
	[0.077]	[0.077]	[0.239]	[0.240]
Industry*region dummy	Yes	Yes		
N	790	790	790	790
Adj. R-squared	0.091	0.090		
Pseudo R-squared			0.055	0.064
Log-likelihood			-351.1	-348
Chi-squared			41.06	47.24

Note: Standard errors are shown in brackets. In (1)-(2), standard errors clustered at the industry-region level. Constants, industry*region dummies are suppressed. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 9 Estimated Results of Productivity and the Order of FDI Destinations

(Firms excluding Foreign Owned Firms, 2007)

Number of FDI destinations	(1)	(2)	(3)	(4)
	OLS		Ordered Logit Model	
ln Labor productivity	0.0778*		0.593***	
	[0.043]		[0.155]	
lnTFP		0.0730*		0.658***
		[0.041]		[0.156]
Capital intensity	0.0498	0.0620*	0.261*	0.392***
	[0.037]	[0.036]	[0.150]	[0.145]
R&D intensity	0.0148	0.0144	0.0940**	0.0855*
	[0.017]	[0.017]	[0.043]	[0.044]
Firm age	0.0388	0.0376	0.165	0.193
	[0.049]	[0.049]	[0.195]	[0.199]
Exporter dummy	0.147**	0.145**	0.932***	0.895**
	[0.059]	[0.058]	[0.350]	[0.350]
Industry*region dummy	Yes	Yes		
N	559	559	559	559
Adj. R-squared	0.081	0.079		
Pseudo R-squared			0.095	0.103
Log-likelihood			-221.7	-219.8
Chi-squared			46.77	50.43

Note: Standard errors are shown in brackets. In (1)-(2), standard errors clustered at the industry-region level. Constants, industry*region dummies are suppressed. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 10. Estimated Results of Productivity and the Order of FDI Destinations (All Firms, 2010)

Number of FDI destinations	(1)	(2)	(3)	(4)
	OLS		Ordered Logit Model	
ln Labor productivity	0.0437**		0.229***	
	[0.017]		[0.058]	
lnTFP		0.0434**		0.262***
		[0.017]		[0.058]
Capital intensity	0.0289**	0.0356***	0.0639	0.109**
	[0.013]	[0.012]	[0.051]	[0.048]
R&D intensity	0.0152*	0.0151*	0.0524**	0.0511**
	[0.008]	[0.008]	[0.021]	[0.021]
Firm age	0.019	0.0184	0.0696	0.0708
	[0.020]	[0.020]	[0.077]	[0.077]
Exporter dummy	0.132***	0.131***	0.640***	0.624***
	[0.032]	[0.032]	[0.129]	[0.129]
Foreign firm dummy	0.0188	0.0185	0.0137	-0.00684
	[0.041]	[0.041]	[0.119]	[0.120]
FDI (in 2007) firm dummy	0.118***	0.118***	0.409***	0.405***
	[0.035]	[0.035]	[0.110]	[0.110]
Industry*region dummy	Yes	Yes		
N	2,223	2,223	2,223	2,223
Adj. R-squared	0.022	0.022		
Pseudo R-squared			0.029	0.031
Log-likelihood			-1363	-1360.7
Chi-squared			82.04	86.52

Note: Standard errors are shown in brackets. In (1)-(2), standard errors clustered at the industry-region level. Constants, industry*region dummies are suppressed. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 11. Estimated Results of Productivity and the Order of FDI Destinations (Firms excluding Foreign Owned Firms, 2010)

Number of FDI destinations	(1)	(2)	(3)	(4)
	OLS		Ordered Logit Model	
ln Labor productivity	0.0483**		0.358***	
	[0.023]		[0.070]	
lnTFP		0.0473**		0.375***
		[0.023]		[0.072]
Capital intensity	0.025	0.0325*	0.076	0.153***
	[0.018]	[0.017]	[0.061]	[0.058]
R&D intensity	0.009	0.009	0.0428*	0.041
	[0.011]	[0.011]	[0.025]	[0.025]
Firm age	0.018	0.017	0.094	0.095
	[0.024]	[0.025]	[0.088]	[0.088]
Exporter dummy	0.134***	0.133***	0.694***	0.670***
	[0.038]	[0.038]	[0.148]	[0.147]
FDI (in 2007) firm dummy	0.104**	0.103**	0.325**	0.313**
	[0.045]	[0.045]	[0.133]	[0.133]
Industry*region dummy	Yes	Yes		
N	1541	1541	1541	1541
Adj. R-squared	0.024	0.023		
Pseudo R-squared			0.041	0.042
Log-likelihood			-928.8	-928.2
Chi-squared			79.4	80.51

Note: Standard errors are shown in brackets. In (1)-(2), standard errors clustered at the industry-region level. Constants, industry*region dummies are suppressed. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Figure 1. Productivity Cutoff and Internationalization

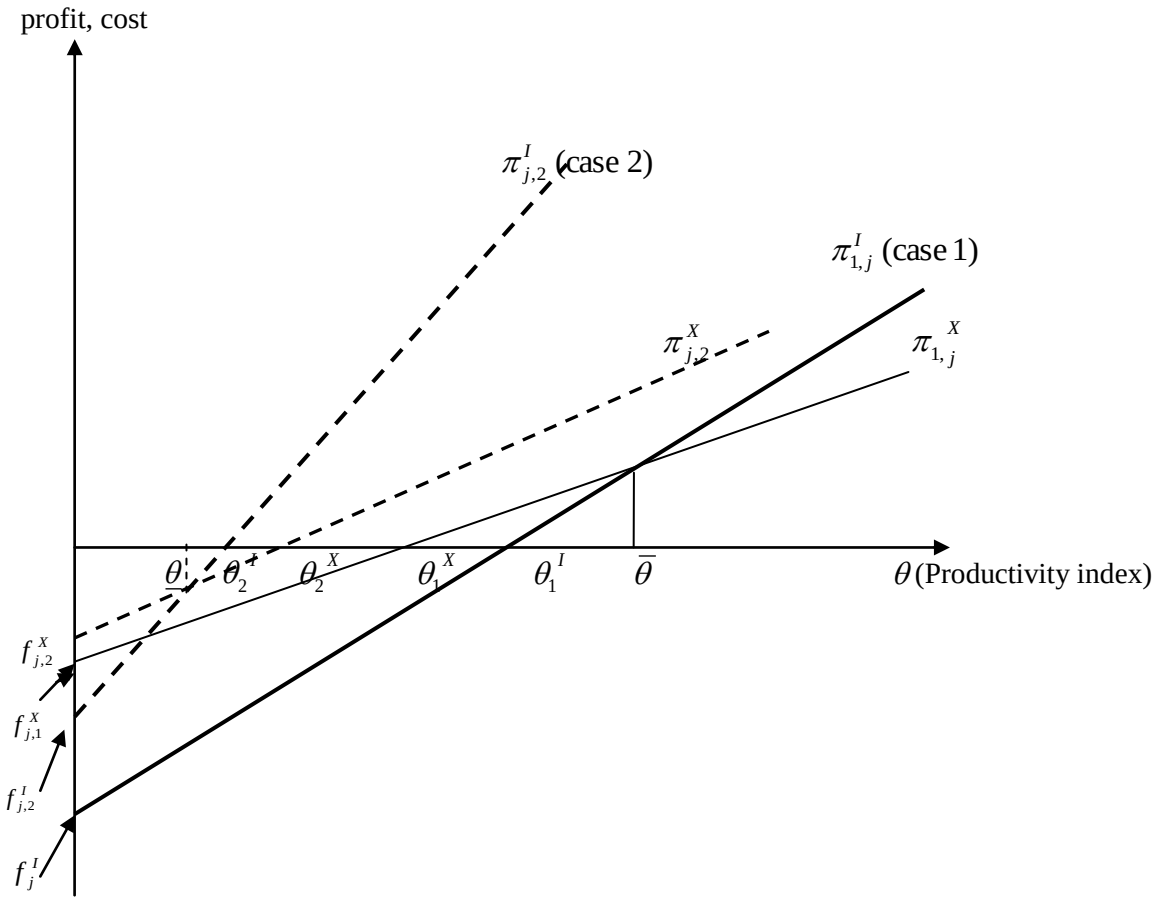


Figure 2. Firm's Productivity and Accumulated Number of FDI Destinations

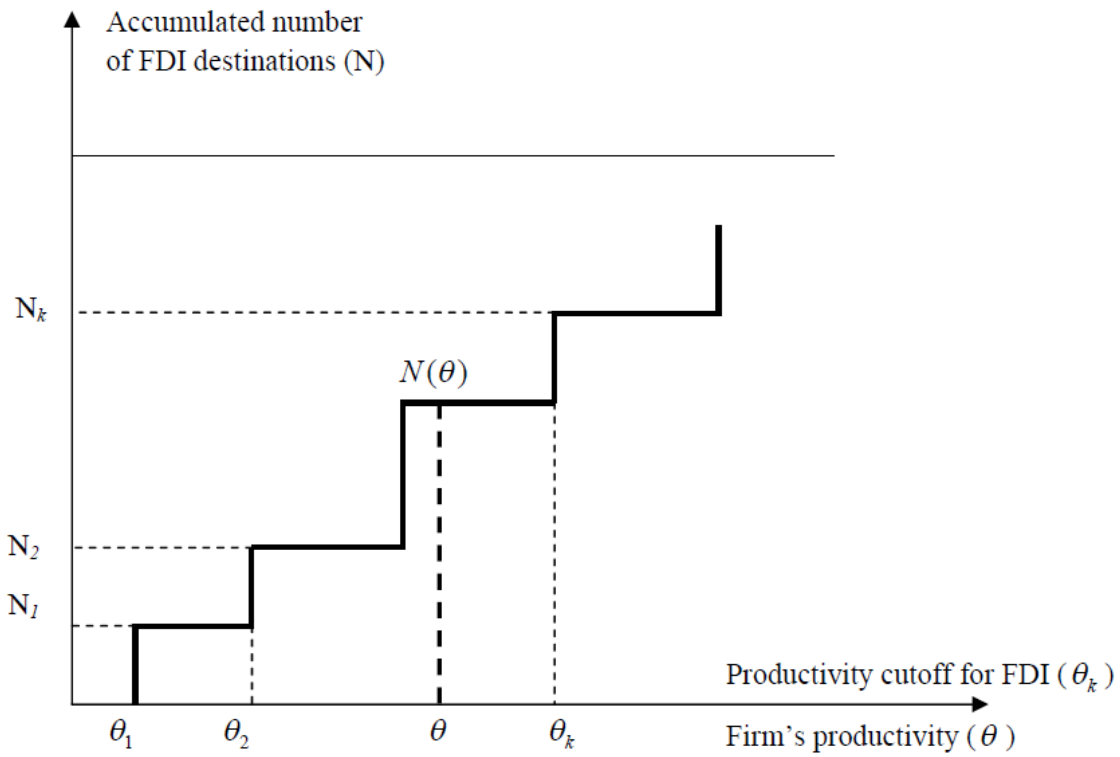


Figure 3. Probability Density of Firms

(All Firms' Labor Productivity, 2007)

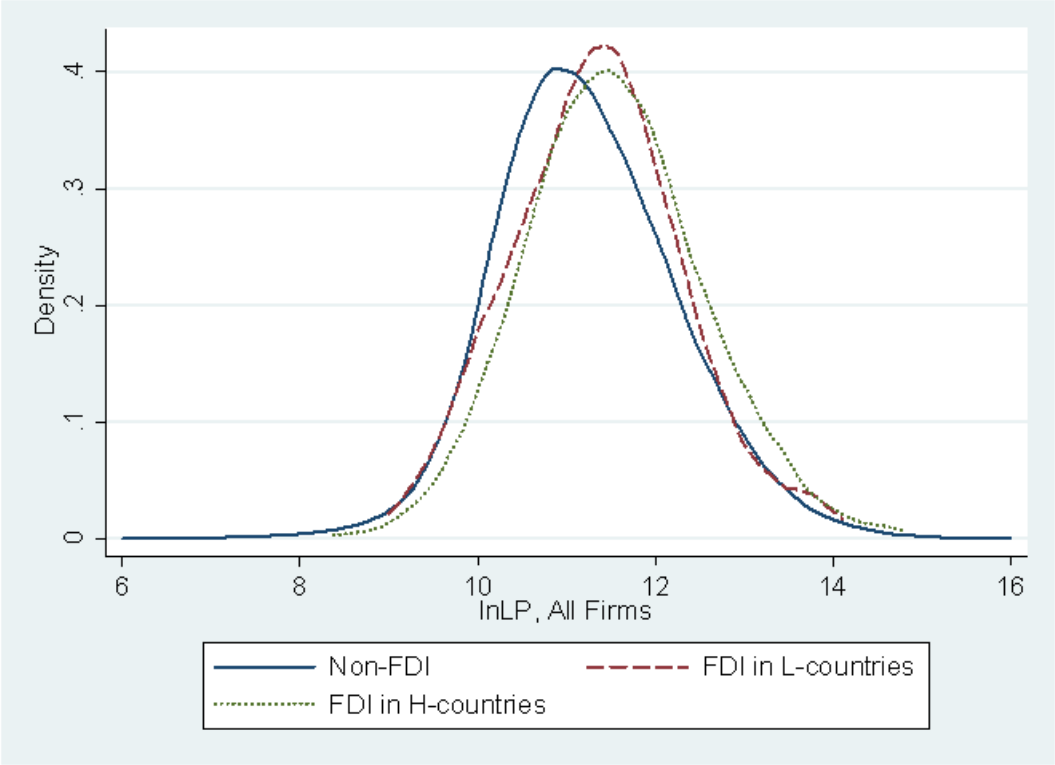


Figure 4. Probability Density of Firms

(Labor Productivity of Firms excluding Foreign Owned Firms, 2007)

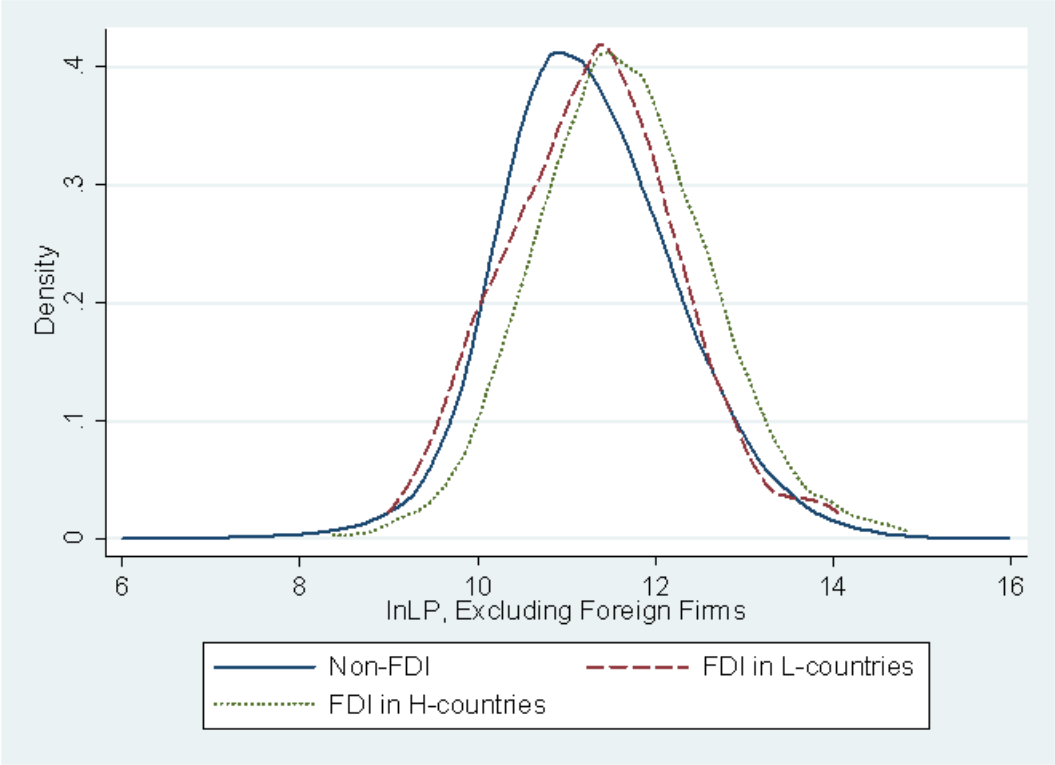


Figure 5. Probability Density of Firms

(All Firms' TFP, 2007)

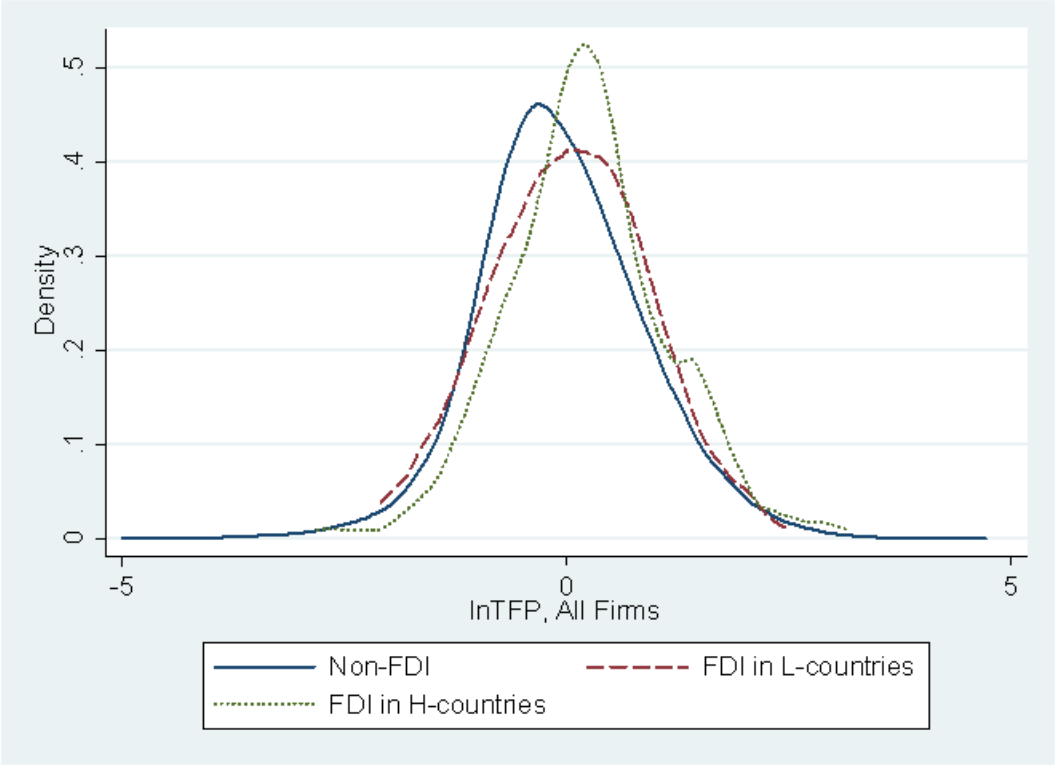


Figure 6. Probability Density of Firms

(TFP of Firms excluding Foreign Owned Firms, 2007)

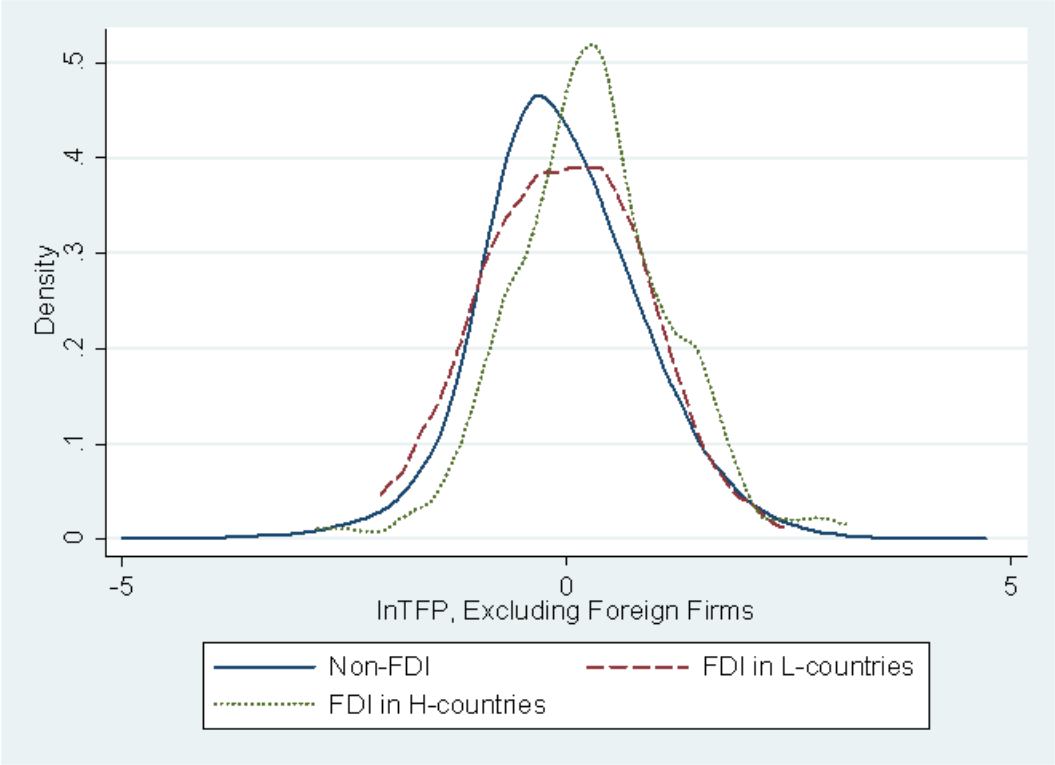


Figure 7. Cumulative Distribution of FDI Firms and Productivity

(Labor Productivity of All Firms, 2007)

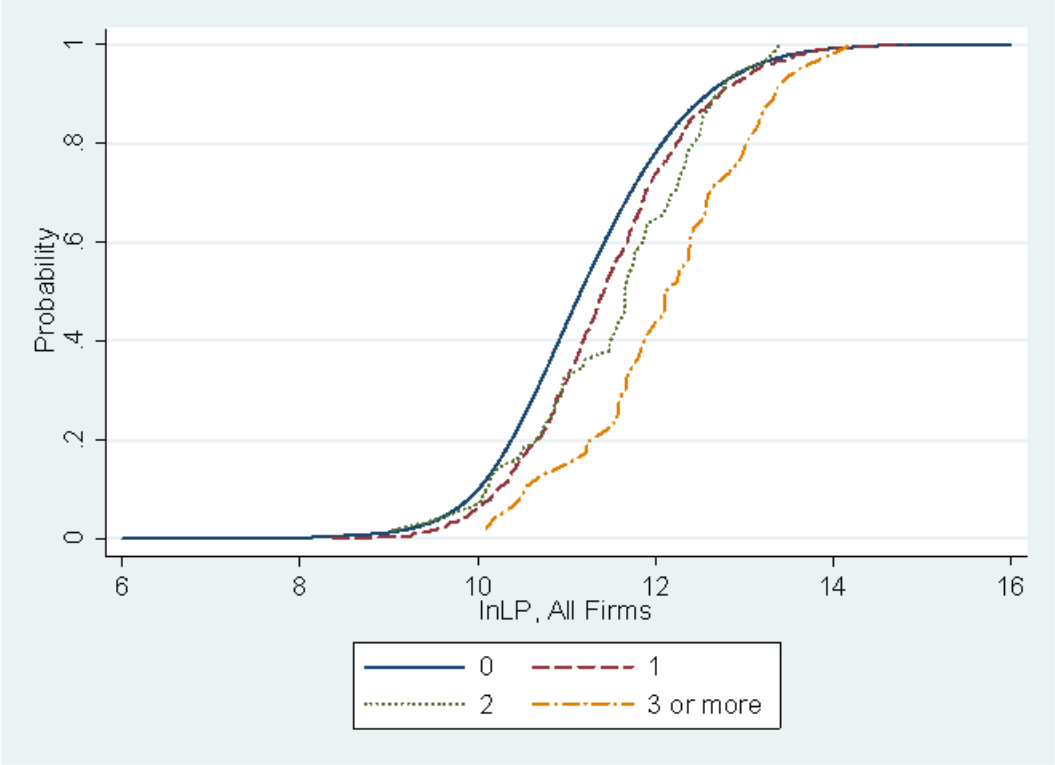


Figure 8. Cumulative Distribution of FDI Firms and Productivity

(Labor Productivity of Firms excluding Foreign Owned Firms, 2007)

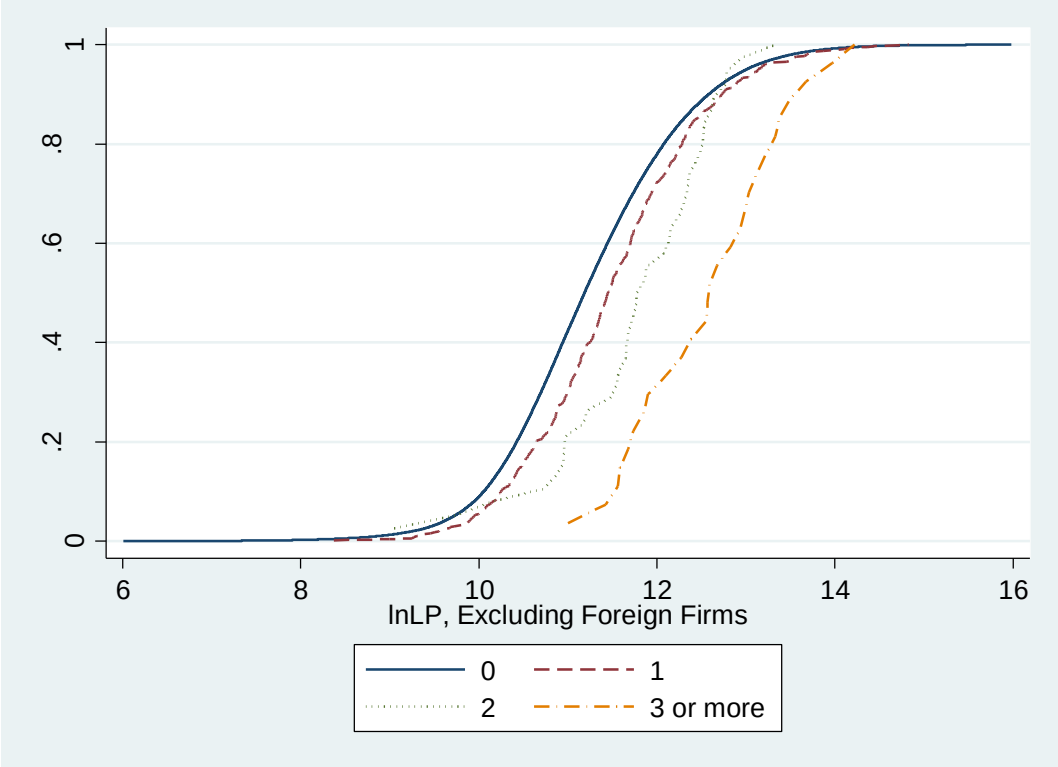


Figure 9. Cumulative Distribution of FDI Firms and Productivity

(The TFP of All Firms, 2007)

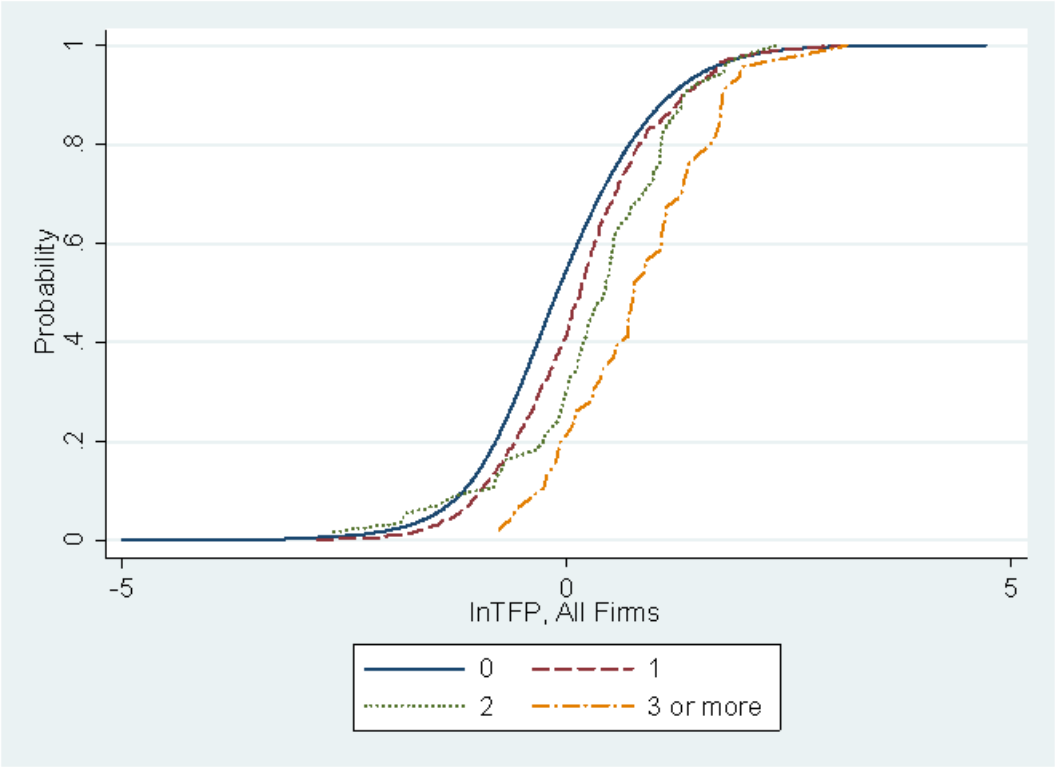
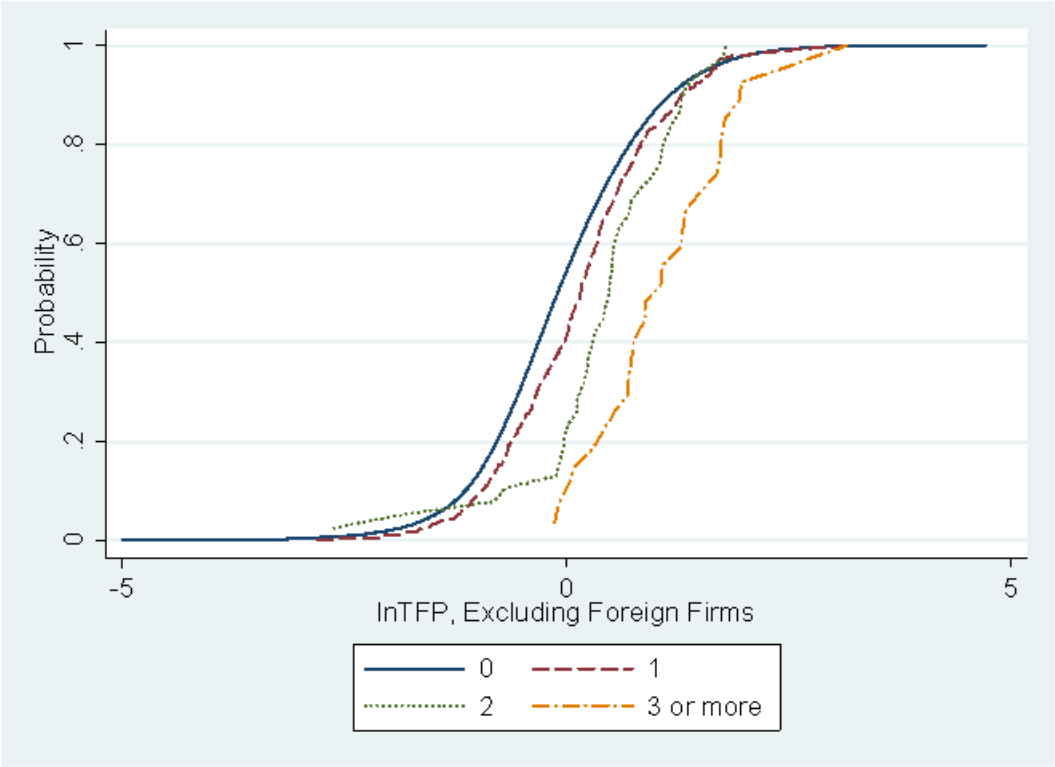


Figure 10. Cumulative Distribution of FDI Firms and Productivity

(TFP of Firms excluding Foreign Owned Firms, 2007)

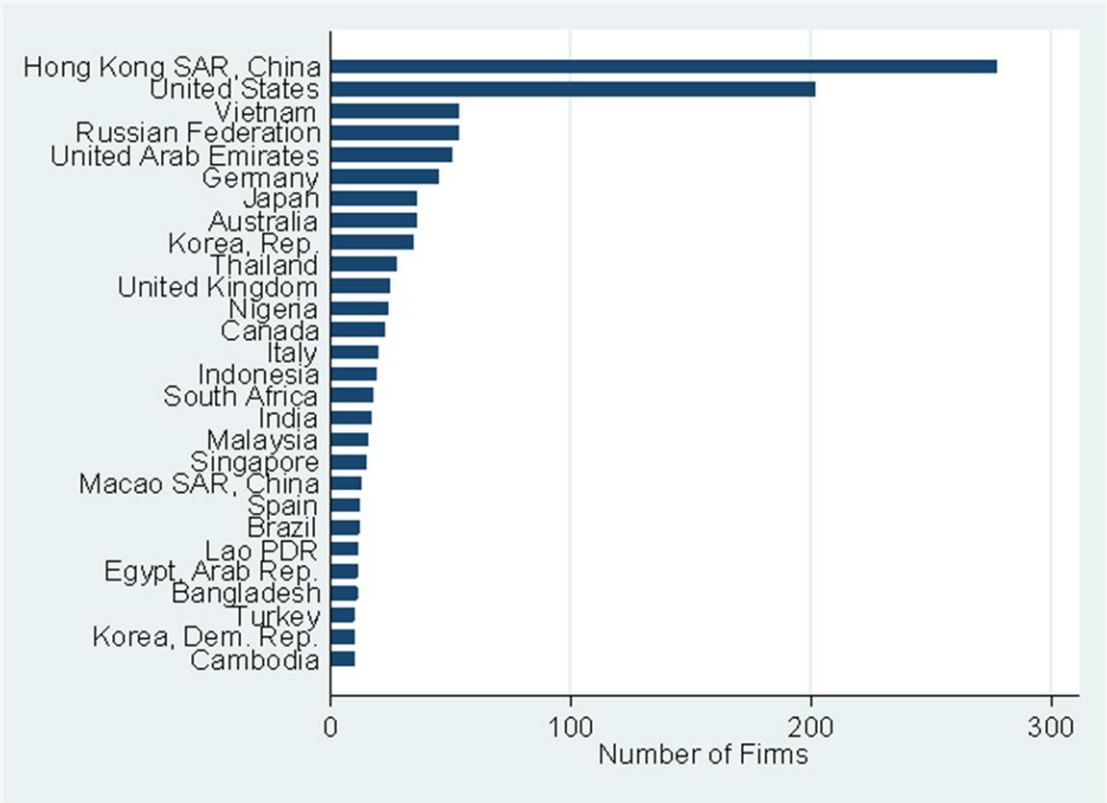


Appendix 1. Number of Firms by Internationalization Modes

		Domestic firm	Exporter (Non-FDI)	FDI firm (Non-exporter)	Exporter*FDI firm	Total
All firms	Number of firms	227,168	76,869	304	726	305,067
	Share	74.5	25.2	0.1	0.2	100
Firms exluding foreign owned firms	Number of firms	202,012	37,634	247	468	240,361
	Share	84.0	15.7	0.1	0.2	100

Note: Above scale firms in the manufacturing sector.

Appendix 2. Major FDI Destinations of Chinese Firms (Number of Firms, 2007)



(Note) Authors' calculation from "Chinese Annual Survey of Industrial Firms" NBS, China and "List of FDI Firms and Organizations" Department of Commerce, Chinese Government.

Appendix 3. List of H-countries and L-countries

H-countries:

Algeria, Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, Colombia, Croatia, Cyprus, Czech Republic, Denmark, Egypt Arab Rep. , Equatorial Guinea, France, Germany, Guatemala, Hungary, Iran, Islamic Rep. , Ireland, Italy, Japan, Jordan, Korea, Rep., Libya, Malaysia, Mexico, Namibia, Netherlands, New Zealand, Oman, Poland, Portugal, Qatar, Romania, Russian Federation, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, United Arab Emirates, United Kingdom, United States, Venezuela RB.

L-countries:

Azerbaijan, Bangladesh, Benin, Cambodia, Cameroon, Congo Dem. Rep., Cote d'Ivoire, Ethiopia, Ghana, Guinea, India, Indonesia, Kazakhstan, Kenya, Korea Dem. Rep., Kyrgyz Republic, Lao PDR, Lesotho, Madagascar, Mali, Mongolia, Morocco, Mozambique, Myanmar, Nigeria, Pakistan, Philippines, Senegal, Sri Lanka, Sudan, Tajikistan, Tanzania, Togo, Turkmenistan, Uganda, Ukraine, Uzbekistan, Vietnam, Zambia, Zimbabwe.

Appendix 4. Summary Statistics for Table 2

Variable	Mean	Std. Dev.	Min	Max
Labor productivity (ln VA/L)	11.227	1.048	6.008	15.997
lnTFP	1.278	1.159	-4.677	8.177
Adjusted lnTFP	0.002	0.915	-5.000	5.041
Exporter (Non-FDI) dummy	0.253	0.435	0	1
FDI firm (Non-exporter) dummy	0.001	0.028	0	1
Exporter*FDI firm dummy	0.002	0.042	0	1
Labor (lnL)	4.628	1.074	2.079	12.145
Net fixed assets (lnK)	15.190	1.652	6.822	24.845
NHMT firm dummy	0.100	0.300	0	1
HMT firm dummy	0.093	0.291	0	1
SOE dummy	0.016	0.126	0	1

Summary Statistics for Tables 8-12

Variable	Mean	Std. Dev.	Min	Max
Mutinationals in 2007				
Labor productivity (ln VA/L)	11.507	0.995	8.370	14.819
lnTFP	1.218	1.013	-2.060	5.541
Adjusted lnTFP	0.414	0.859	-2.524	3.749
Capital intensity (lnK/L)	11.036	1.170	7.040	13.923
R&D intensity (lnR&D/Sales)	0.323	0.610	0	3.137
Firm age (lnAge)	2.298	0.691	0	4.078
Foreign firm dummy	0.254	0.436	0	1
Exporter dummy	0.694	0.461	0	1
Multinationals in 2010				
Labor productivity (ln VA/L)	11.513	1.036	6.497	14.993
lnTFP	1.249	1.073	-3.375	6.734
Adjusted lnTFP	0.403	0.899	-4.267	3.749
Capital intensity (lnK/L)	10.993	1.199	1.796	15.442
R&D intensity (lnR&D/Sales)	0.307	0.592	0	3.708
Firm age (lnAge)	2.147	0.756	0	4.078
Foreign firm dummy	0.278	0.448	0	1
Exporter dummy	0.667	0.471	0	1
FDI (in 2007) firm dummy	0.356	0.479	0	1