RIETI Discussion Paper Series 15-E-127

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RIETI Discussion Paper Series 15-E-127

November 2015

Effect of Foreign Affiliates on Exporting and Markups[*]

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Abstract

In this paper, we empirically investigate the effect of foreign affiliates on the relationship between exports and markups of Chinese firms. After recovering quantity-based firm markups by correcting for both output and input price biases, we find evidence that exporters charge higher markups than non-exporters, and this effect is substantially less pronounced for foreign affiliates. We further decompose markups into a price and cost effect and find that the cost effect accounts for the lower markups of foreign-owned exporters. Our results suggest that foreign-owned exporters have a price premium but higher marginal costs on average.

Keywords: Markups, Marginal cost, Exports, Foreign affiliates

JEL classification: D22, D24, F14

[*] This study was conducted as part of the research project "Global Markets and Japan's Industrial Growth" undertaken at Research Institute of Economy, Trade and Industry (RIETI). We thank Masahisa Fujita, Masayuki Morikawa, Heiwai Tang, Ryuhei Wakasugi, Zhihong Yu, Yifan Zhang, and the participants in conferences and workshops for their insightful comments and suggestions. All remaining errors are our own.

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1 Introduction

Promoting the exports of manufacturing firms to international markets is regarded as an effective development and industrialization policy among many developing countries (United Nation Trade and Investment Division, 2001; World Bank, 1987). It is believed that such an export-oriented policy helps the firms to acquire foreign markets, enhance firm productivity, and move up the technology ladder more rapidly. To a large extent, the export-oriented development policies were successful in Korea, Taiwan, China, and several other East Asian economies. China reformed its trade and foreign direct investment (FDI) regimes over the 1990s and entered the World Trade Organization (WTO) in 2001. As a result, the nominal value of exports and imports has risen by roughly ten times over 1992–2006 in both the ordinary and processing trade categories (Feenstra and Wei, 2010). By 2005, any firm that wished to trade with foreign partners was allowed to do so. Relying on the assumption that firms export if the expected profits are non-negative, more productive firms are more likely to export because higher productivity yields greater profits (e.g., Bernard and Jensen, 1995, 1999; Melitz, 2003). Using Chinese firm-level data, Du, Lu, Tao, and Yu (2012) and Ma, Tang, and Zhang (2014) show that on average, exporters are more productive ex ante than non-exporters are, that is, firms self-select to export. Recent studies also lent support to the positive impacts of exporting on firm productivity, that is, learning by exporting (e.g., Yang and Mallick, 2010, and Du, Lu, Tao, and Yu, 2012).[1]

However, it is widely documented that export-platform foreign direct investment (FDI) and intra-firm trade conducted by multinational corporations play an important role in China's exports.[2] A major share of exports, including high-value-added products, are made not by domestic firms (indigenous firms) but by foreign affiliates that often use China as an export platform (Manova and Zhang, 2008). Recent research has begun to examine the relative performance of domestic firms and foreign affiliates in Chinese exports. Blonigen and Ma (2010) find that for a typical product of six-digit Harmonized System (HS) code, the unit values of foreign exporters relative to those of domestic exporters are increasing over time for the period 1997–2005. They argue that there is no evidence of "catching up" by domestic firms.[3] Using comprehensive customs and production data, Ge, Lai, and Zhu

[1] While self-selection is widely accepted as a part of stylized fact, evidence of supporting learning by exporting is especially from transitional and developing countries. For learning by exporting, see Blalock and Gertler (2004) for the case of Indonesia, Van Biesebroeck (2005) for the case of sub-Saharan African countries, and De Loecker (2007) for the case of Slovenia.

[2] This is also true in the case of other low-cost countries such as Brazil, India, and Mexico.

[3] Related to this, Schott (2008) finds that over time, Chinese exports exhibit rising sophistication relative to other developing countries and that China exports more products similar to those by the OECD members rich in capital and skill endowments. However, in comparison with the OECD countries, Chinese export prices are on average 23%–60% in Chemical, Manufactured Materials and Machinery from 1980–2005.

(2015) show that foreign exporters enjoy a price premium over domestic exporters. The technology transfer within multinational firms improves the ability of foreign affiliates to produce high-quality goods. Upon exporting, it is natural to expect that firms would adjust costs, prices, and markups when faced with competition on international markets. This is crucial to domestic firms rather than to foreign affiliates that have advantages over domestic firms in terms of productivity, knowledge, and overseas network. However, the existing literature offers us little evidence for the relationship between a firm's exporting behavior and price-cost margins (i.e., markups) and how foreign ownership affects this relationship.

In this study, we extend the examination of firm heterogeneity between exporters and non-exporters as well as within exporters in three dimensions: (i) Do exporters have different markups in China? (ii) Whether the effect of export on markups is different between domestic firms and foreign affiliates? (iii) Since a markup can be decomposed into a price effect and a cost effect, which of these accounts for the markup difference across firms? Our extensions are meaningful, particularly for developing countries, because of the ongoing trade liberalization and rising popularity of offshoring and export-platform FDI conducted by multinationals in countries with low labor cost. Another important question—to understand a firm's adjustments of price and cost and its response to market toughness upon export entry—is whether exporters have higher markups beyond productivity and price premium. Moreover, the possible differences between the price-cost margins of domestic firms and foreign affiliates in the exporting market could have important policy implications to the governments of developing countries. Given that the export-oriented development policy aims to facilitate the exports and productivity growth of indigenous firms and the upgrading of the industrial structure in the long run, it is essential to investigate the mechanism underlying the differences between the price-cost margins of domestic exporters and foreign exporters.

We empirically investigate the relationship between markups, exporting behavior, and ownership for a rich panel of Chinese firms over the period 2000–2006. China is a particularly interesting and useful case in this regard, for the following reasons. First, while the Chinese manufacturing sector enjoyed a significant productivity growth and high turnovers in the late 1990s and 2000s, during which China's WTO accession occurred (Brandt, Van Biesebroeck, and Zhang, 2012), trade liberalization also reduces markup dispersion within a narrowly defined industry (Lu and Yu, forthcoming). Second, China's exports are characterized by a considerable presence of foreign firms, accounting for about 50% of its total exports during the 2000s.

We find that on average, exporters charge higher markups than non-exporters do, controlling for differences in total factor productivity (TFP). To measure firm-specific markup, we follow the methodology developed by De Loecker, Goldberg, Khandelwal, and Pavcnik (forthcoming). Specifically, we use newly compiled data to more accurately estimate quantity-based translog production function and calculate firm markups. Surprisingly, we find that foreign ownership has a negative effect on the relationship between exports and markups. However, by using information on the production quantity, we can decompose the markup difference into a cost effect and a price effect. Our findings suggest that although foreign exporters have a price premium, higher marginal costs lead to lower markups. To the best of our knowledge, this is the first study reporting these relationships in the literature.

The remainder of this paper is organized as follows. Section 2 offers a brief literature review on export prices, markups, and product quality. Section 3 describes the data and the estimation of firm markups. In Section 4, we report the empirical results of exports, markups, and foreign ownership. The paper concludes with Section 5.

2 Literature Review

Our paper is related to several recent theoretical models and empirical analyses regarding the relationship between firm-level export status and markups. Bernard, Eaton, Jensen, and Kortum (2003) introduce Bertrand competition into the Ricardian framework and predict that more efficient exporters tend to have a greater cost advantage over their competitors, as they charge higher markups on average because of their higher productivity. Melitz and Ottaviano (2008) develop a monopolistically competitive model of trade with heterogeneous firms and generate firm-specific markup that is a function of the difference between the firm's marginal cost and the cut-off marginal cost. In their model, the more productive firm charges a higher markup and enjoys higher profits. They also show that larger markets exhibit tougher competition, resulting in lower average markups and higher aggregate productivity. Meanwhile, a growing number of studies empirically analyze the relationship between firm-level export status and markups. De Loecker and Warzynski (2012) develop a novel method to estimate firm-level markups without specifying market structure and the manner in which firms compete in the product market. Using Slovenian manufacturing firm-level data, they find that exporters charge higher markups and that markups increase upon export entry.[4] Bellone, Musso, Nesta, and Warzynski (forthcoming) extend the Melitz and Ottaviano (2008) model, which features both quality and spatial differentiation across firms, and find evidence that markups are higher for exporters in France.

This study is also related to a growing literature emphasizing the differences in input

[4]Furthermore, using product-level quantity and price information of Indian firms, De Loecker, Goldberg, Khandelwal, and Pavcnik (forthcoming) identify markups for each firm-product-year observation and examine how Indian firms adjust prices and markups to trade liberalization.

quality and product quality across firms. Most of these studies use unit-value prices as proxy for quality, because intuitively, high-quality goods usually sell at high prices. Kugler and Verhoogen (2008) and Hallak and Sivadasan (2009) present the theoretical model and empirical evidence that because exporters in India, the U.S., Chile, and Colombia produce higher-quality goods with higher-quality inputs, conditional on firm size, they can charge higher prices and markups. Using detailed Chinese customs transaction-level data in 2005, Manova and Zhang (2012) report similar evidence: more successful exporters use higher-quality inputs to produce higher-quality goods, and therefore, charge higher export prices; further, exporters charge higher prices for richer and more distant markets.

This study contributes to the above literature in different ways. First, we examine the effect of foreign ownership on the relationship between markups and export status. Second, we use unique merged firm product-level data and investigate the markup difference across firms by decomposing markup into a price effect and a cost effect. We find that although foreign exporters have a price premium, they have higher marginal costs and lower markups.

3 Estimation Strategy

3.1 Specification

To study the effect of foreign affiliates on the relationship between firms exports and markups, we consider the following estimation specification:[5]

$$y_{ft} = \gamma Foreign_{ft} \cdot Export_{ft} + \mathbf{X}_{ft}\boldsymbol{\varpi} + \gamma_i + \gamma_r + \gamma_t + \epsilon_{fit}, \tag{1}$$

where y_{ft} is the logarithm of firm f's markups at year t.[6] $Foreign_{ft}$ is an indicator of foreign affiliate, which equals one if a firm's foreign capital share is greater than 25%, and zero otherwise. $Export_{ft}$ is the firm's export intensity, measured as the ratio of exports to total output.[7] $\mathbf{X}_{ft}$ is a vector of control variables including firm size, TFP, capital–labor ratio, and a state-owned enterprises (SOEs) dummy. D_i, D_r, and D_t represent a full set of industry, province, and year fixed effects, respectively.

[5] Our results (available upon request) are robust to propensity score matching with difference-in-differences (PSM-DD) estimators.

[6] We further decompose firm markup into price and marginal cost effects in Section 4.2. Thus, the dependent variable is replaced with log of firm output price or marginal cost.

[7] We use export share, instead of exporter dummy, to capture the differences in exporting patterns across firms. As reported in Lu (2010), Chinese exporters display a U-shaped distribution of export intensity and a large fraction of firms selling most of their output abroad. Lu (2010) argues that this pattern cannot be explained by foreign ownership only, although a large number of manufacturers are foreign affiliates that serve as an exporting platform for foreign markets.

3.2 Estimation of Quantity-Based Firm Markups

Framework.—To recover firm-level markups, we follow the approach in De Loecker, Goldberg, Khandelwal, and Pavcnik (forthcoming). Consider that a firm f at time t produces output using the following production technology:

$$Q_{ft} = Q_t(L_{ft}, K_{ft}, M_{ft}, \omega_{ft}), \tag{2}$$

where Q_{ft} is the firm's physical output and L_{ft}, K_{ft}, M_{ft} are the firm's physical inputs of labor, capital, and intermediate input, respectively. ω_{ft} denotes firm productivity. $Q_t(\cdot)$ is assumed to be continuous and twice differentiable with respect to all of its elements.

Consider a firm's cost minimization problem and the associated Lagrangian function for firm f at time t:

$$\begin{aligned} \mathcal{L}(L_{ft}, K_{ft}, M_{ft}, \lambda_{ft}) &= w_{ft}L_{ft} + r_{ft}K_{ft} + p^m_{ft}M_{ft} \\ &\quad +\lambda_{ft}(Q_{ft} - Q_t(L_{ft}, K_{ft}, M_{ft}, \omega_{ft})), \end{aligned} \tag{3}$$

where w_{ft}, r_{ft}, and p^m_{ft} denote the firm's wage rate, rental price of capital, and price of intermediate input, respectively. The estimation of markup hinges upon the factor that the firm can freely adjust. As China's capital and labor market are heavily regulated and resource misallocations are severe (e.g., Hsieh and Klenow, 2009), we follow Lu and Yu (forthcoming) and choose intermediate input as the optimal input free of any adjustment costs. Thus, the first-order condition for intermediate input is

$$\frac{\partial \mathcal{L}}{\partial M_{ft}} = p^m_{ft} - \lambda_{ft}\frac{\partial Q_{ft}}{\partial M_{ft}} = 0, \tag{4}$$

where $\lambda_{ft} = \frac{\partial \mathcal{L}_{ft}}{\partial M_{ft}}$ is the marginal cost of production at a given level of output.

Rearranging equation (4) and multiplying both sides by $\frac{M_{ft}}{Q_{ft}}$, we obtain

$$\frac{\partial Q_{ft}}{\partial M_{ft}}\frac{M_{ft}}{Q_{ft}} = \frac{1}{\lambda_{ft}}\frac{p^m_{ft}M_{ft}}{Q_{ft}}. \tag{5}$$

The firm markup is defined as the ratio of price over marginal cost, that is, $\mu_{ft} \equiv \frac{P_{ft}}{\lambda_{ft}}$. Using equation (5), we express firm-level markup as

$$\mu_{ft} = \alpha^m_{ft}\frac{p^m_{ft}M_{ft}}{P_{ft}Q_{ft}} = \alpha^m_{ft}(\theta^m_{ft})^{-1}, \tag{6}$$

where α_{ft}^m is the output elasticity of intermediate input and θ_{ft}^m is the share of expenditure on intermediate input. The share of expenditure on intermediate input is measured from the firm-level data. To compute firm-level markup, we need estimate the production function to obtain output elasticity of intermediate input.

Estimating quantity-based production function.[8]—Consider the following production function for estimation:

$$q_{ft} = f_t(x_{ft}; \boldsymbol{\beta}) + \omega_{ft} + \varepsilon_{ft}, \tag{7}$$

where q_{ft} is the log physical output; x_{ft} is the vector of the log physical inputs of labor (l_{ft}), capital (k_{ft}), and intermediate input (m_{ft}); ω_{ft} is the firm's productivity; and ε_{ft} is an i.i.d error term capturing measurement error and/or unanticipated shocks to production.

To obtain unbiased production function estimates, we require physical data on both firm output and inputs. For the physical output, we use information on quantities of single-product firms that are available in Chinese product-level data. Meanwhile, we use employment to measure physical input of labor. For physical inputs of capital and intermediate input, we use input expenditures, deflated by industry-specific price indices. The use of deflated input expenditures other than physical inputs in the production function estimation may suffer from an input price bias.

To correct for input price bias, we estimate the following production function:

$$q_{ft} = f_t(\tilde{x}_{ft}; \boldsymbol{\beta}) + A(\mathbf{w}_{ft}, \tilde{x}_{ft}; \boldsymbol{\beta}) + \omega_{ft} + \varepsilon_{ft}. \tag{8}$$

Here, $\tilde{x}_{ft}$ is a vector of inputs including (log) labor ($\tilde{l}_{ft}$); (log) deflated input expenditures on capital ($\tilde{k}_{ft}$) and intermediate input ($\tilde{m}_{ft}$). $\mathbf{w}_{ft}$ is firm-specific input prices. Following De Loecker, Goldberg, Khandelwal, and Pavcnik (forthcoming), we assume that input price ($\mathbf{w}_{ft}$) is a function of output price (p_{ft}), market share (ms_{ft}), industry dummies (D_i), regional dummies (D_r), and the firm's export status (EXP_{ft}):

$$w_{ft} = w_t(p_{ft}, ms_{ft}, D_i, D_r, EXP_{ft}).$$

In addition, we denote $A(w_{ft}, \tilde{x}_{ft}; \boldsymbol{\beta})$ as an input price control function, from which we have the following expression:[9]

$$A(w_{ft}, \tilde{x}_{ft}; \boldsymbol{\beta}) = A((p_{ft}, ms_{ft}, D_i, D_r, EXP_{ft}) \times \tilde{x}_{ft}^c; \boldsymbol{\delta}), \tag{9}$$

[8]The quantity-based production function estimation is based on the work by Lu, Wu, and Zhu (2015), who discuss the data and estimation issues in production function estimation by using Chinese firm-level data and compare the production function estimators by using various specifications.

[9]We refer to De Loecker, Goldberg, Khandelwal, and Pavcnik (forthcoming) for a detailed discussion on the micro-foundation of controlling for input price bias $A(w_{ft}, \tilde{x}_{ft}; \boldsymbol{\beta})$ in the production function estimation.

where $\tilde{x}^c_{ft} = \{1, \tilde{x}_{ft}\}$, and $\boldsymbol{\delta}$ is an additional parameter vector to be estimated alongside the production function estimation.

By substituting the control for input price bias from equation (9) into equation (8), we obtain

$$q_{ft} = f_t(\tilde{x}_{ft}; \boldsymbol{\beta}) + A((p_{ft}, ms_{ft}, D_i, D_r, EXP_{ft}) \times \tilde{x}^c_{ft}; \boldsymbol{\delta}) + \omega_{ft} + \varepsilon_{ft}. \tag{10}$$

To obtain consistent production function estimates, we need to control for unobserved productivity shocks potentially leading to simultaneity and selection biases. We address this issue by using a control function based on a static input demand function to proxy for the unobserved productivity.

Following the control function approach initiated by Olley and Pakes (1996) and extended by Levinsohn and Petrin (2003), and De Loecker, Goldberg, Khandelwal, and Pavcnik (forthcoming), we proxy for the unobserved productivity by using the materials demand function:

$$m_{ft} = m_t(\tilde{k}_{ft}, \omega_{ft}, p_{ft}, ms_{ft}, D_i, D_r, EXP_{ft}, \tau^{output}_{it}, \tau^{input}_{it}), \tag{11}$$

where τ^{output}_{it} and τ^{input}_{it} are output and input tariffs of industry i that may potentially affect a firm's optimal choice. Inverting equation (11) yields the control function for productivity:

$$\omega_{ft} = h_t(\tilde{k}_{ft}, p_{ft}, ms_{ft}, D_i, D_r, EXP_{ft}, \tau^{output}_{it}, \tau^{input}_{it}).$$

In the first stage, we separate productivity from unanticipated shocks and/or measurement error by estimating the following:

$$q_{ft} = \phi_t\left(\tilde{l}_{ft}, \tilde{k}_{ft}, \tilde{m}_{ft}, p_{ft}, ms_{ft}, D_i, D_r, EXP_{ft}, \tau^{output}_{it}, \tau^{input}_{it}\right) + \varepsilon_{ft}, \tag{12}$$

which yields an estimate of predicted output ($\hat{\phi}_{ft}$).[10]

We use equations (10) and (12) from the first-stage estimation to express productivity:

$$\omega_{ft}(\boldsymbol{\beta}, \boldsymbol{\delta}) = \hat{\phi}_{ft} - f_t(\tilde{x}_{ft}; \boldsymbol{\beta}) - A((p_{ft}, ms_{ft}, EXP_{ft}) \times \tilde{x}^c_{ft}; \boldsymbol{\delta}). \tag{13}$$

To estimate production function coefficients, we follow Ackerberg, Caves, and Frazer (2015) and form moments based on innovation in the productivity shock ξ_{ft} in the law of motion for productivity:

$$\omega_{ft} = g\left(\omega_{ft-1}, EXP_{ft-1}, \tau^{output}_{it-1}, \tau^{input}_{it-1}, SP_{ft}\right) + \xi_{ft}.$$

[10] $\phi_t(\cdot)$ is approximated by a flexible third-order polynomial, with exceptions for D_i and D_r.

The use of single-product firms in the estimation may cause a selection bias due to a firm's nonrandom choice of adding a product and becoming a multi-product firm. To correct for the selection bias, we include the probability that a firm remains a single-product for the next period in the law of motion for productivity.[11] Specifically, we define an indicator function χ_t as equal to 1 if the firm remains single-product (SP_{ft}) and zero otherwise, then the selection rule:

$$SP_{ft} \equiv \Pr(\chi_t) = \Phi_{t-1}\left(\tilde{x}_{ft-1}, i_{ft-1}, p_{ft}, ms_{ft}, D_i, D_r, EXP_{ft}, \tau_{it}^{output}, \tau_{it}^{input}\right),$$

where i_{ft-1} is firm investment. Using equation (13) and by nonparametrical regression of $\omega_{ft}(\boldsymbol{\beta}, \boldsymbol{\delta})$ on $g\left(\omega_{ft-1}, EXP_{ft-1}, \tau_{it-1}^{output}, \tau_{it-1}^{input}, SP_{ft}\right)$, we obtain the innovation:

$$\xi_{ft}(\boldsymbol{\beta}, \boldsymbol{\delta}) = \omega_{ft}(\boldsymbol{\beta}, \boldsymbol{\delta}) - E\left(\omega_{ft}(\boldsymbol{\beta}, \boldsymbol{\delta}) | \omega_{ft-1}(\boldsymbol{\beta}, \boldsymbol{\delta}), EXP_{ft-1}, \tau_{it-1}^{output}, \tau_{it-1}^{input}, SP_{ft}\right).$$

The moment conditions used to estimate production function coefficients are

$$E\left(\xi_{ft}(\boldsymbol{\beta}, \boldsymbol{\delta}_{ft}) \mathbf{Y}_{ft}\right) = 0,$$

where $\mathbf{Y}_{ft}$ contains lagged labor and intermediate input, current capital, and their higher order and interactions, and lagged output prices, lagged market shares, lagged export status, and their interaction terms with inputs.[12]

Given the translog production function, the output elasticity of intermediate input is measured as $\widehat{\alpha}_{ft}^m = \widehat{\beta}_m + 2\widehat{\beta}_{mm}\tilde{m}_{ft} + \widehat{\beta}_{lm}\tilde{l}_{ft} + \widehat{\beta}_{km}\tilde{k}_{ft} + \widehat{\beta}_{lkm}\tilde{l}_{ft}\tilde{k}_{ft}$.

3.3 Data

Firm-level data.—The main firm-level data for this study comes from the *Annual Survey of Industrial Firms* (ASIF) conducted by the National Bureau of Statistics (NBS) of China for the period of 2000–2006. These annual surveys covered all state-owned firms and the non-state owned firms with annual sales above 5 million RMB in industrial sectors. This dataset contains detailed information on the firms' productions and performances, including intermediate inputs, outputs, capital, number of employees, and export status, which are essential to this study. We exclude firms that have missing, zero, or negative values for our main variables because their log values cannot be defined for markup estimation. We deflate

[11] We refer to De Loecker, Goldberg, Khandelwal, and Pavcnik (forthcoming) for a detailed discussion on this sample selection bias.

[12] Following the literature, we treat labor and materials as flexible inputs and their lagged values are used to construct moments. As capital is considered as a dynamic input that faces adjustment costs, its current value is used to form moments.

intermediate inputs and outputs by industry-specific input/output deflators provided by Brandt, Van Biesebroeck, and Zhang (2012). The cleaned data set provides an unbalanced panel of firms that increases in coverage from 130,000 firms in 2000 to over 250,000 in 2006. These firms are distributed among 29 two-digit manufacturing industries. The percentage of China's total exports contributed by the firms in our dataset is around 70% during the sample period, indicating that our dataset is highly comprehensive.

The ASIF data provides information on whether sample firms are registered as foreign-invested enterprises. According to the *Criteria for Classifications of the Registration of Enterprise Ownership Types* issued by the NBS, only enterprises where foreign capital accounts for no less than 25% of total registered capital are eligible for being registered as foreign-invested enterprises.

Firm product-level data.—Our estimation and decomposition of firm markups require the observation of firm-level output in physical terms. As this information is not available in the ASIF data, we use product-level data from the NBS for the period 2000–2006. The product-level data reports output quantity of over 500 products produced by the manufacturing firms. These products include shirts, glasses, cameras, computers, etc. As the product-level data and the ASIF data share the same identification number, we can easily match these two data. Furthermore, using this combined firm product-level dataset, we can calculate the unit value (measured as the ratio of output to quantity) for each single-product firm, and then, marginal cost after the estimation of firm markups. We cannot measure the unit value for multiple-product firms for two reasons: first, different units are used across products; second, we cannot observe the output share of each product because firms only report the total output in the firm-level data.

Descriptive statistics.—Table 1 reports the number of exporters and non-exporters for both domestic firms and foreign affiliates for each of the sample years. The full sample shows that from 2000–2006, a growing and large number of firms started to supply to foreign markets. However, export participation ratios are rather stable over the sample period. The share of exporters is around 17–20% within domestic firms, while exporters account for 61–68% within the group of foreign affiliates. These shares remain quite stable in the single-product firms sub-sample, which implies that our sub-sample is sufficiently representative of the full sample.

[Insert Table 1 here]

Table 2 reports the descriptive statistics of markup estimates and other main variables used in this study. Mean of markups is 0.17 in log and about 1.18 in real number. The figures are consistent with the results of De Loecker and Warzynski (2012), specifically, around 1.10–

1.28 by specifications. We also report an alternative markup (markup data) measured by the raw data, that is, total sales divided by total costs. It is obvious that our estimation of firm markups is very close to markups obtained from raw data. The respective means of markups are almost the same and the standard deviations are very slightly different. For our sub-sample, that is, single-product firms, price is defined as output divided by quantity. Log marginal cost simply equals to log price minus log markup. Regarding other variables, such as export status, foreign affiliate dummy, TFP, firm size, and SOEs dummy, summary statistics are quite similar between the full sample and the single-product firms sample. In summary, the descriptive statistics show that the estimation of markups is accurate and robust and our sub-sample is representative of the full sample.

[Insert Table 2 here]

4 Empirical Findings

In this section, we report our main results that (i) on average, exporters have higher markups and (ii) foreign ownership has a negative effect on the relationship between exports and markups. We control for productivity and other firm-specific characteristics (firm size and capital–labor ratio). In order to investigate the underlying mechanism of the negative effect of foreign ownership, we use the sub-sample to decompose the markup into a cost effect and a price effect. We present evidence that while foreign exporters have a price premium, they simultaneously have a much higher marginal cost.

4.1 Estimation Results

Main results.—Table 3 reports our main results. We begin with regressions on export share, including foreign affiliate dummy, and end with full specification with the interaction term between them. In columns (1) and (2), the coefficient of export share is positive and significant at 1% level, implying that on average, upon controlling for differences in productivity, an exporter has higher markups than non-exporters. The result is consistent with De Loecker and Warzynski (2012). To examine the effect of foreign ownership on the relationship between firm exports and markups, we include an interaction term between export share and foreign affiliate dummy. As shown in column (3), the coefficient of the interaction term is negative and statistically significant, suggesting that foreign ownership has a negative effect on the relationship between exporting and markups. The results indicate that the more the foreign affiliates export, the lower their markups are.

[Insert Table 3 here]

Robustness checks.—We provide robustness checks by using raw markup data measured directly from the ASIF data. As shown in column (4), our estimates are robust in terms of both statistical significance and magnitude.

Economic magnitude.—To calculate the magnitude of the impact, we rely on the estimate in column (3) of Table 3. We find that if the export share increases by 10%, the average log of markup of foreign affiliates would drop by 0.1% more than that of domestic firms. From 2000–2006, the difference between the average export shares of foreign affiliates and domestic firms increases from 0.2943 to 0.329, suggesting that based on our estimates, the difference between the log values of markup of the two types of firms would drop by 0.0347 percentage point. Meanwhile, the difference between the average log markups of foreign affiliates and domestic firms in 2000 is -0.0121, and the corresponding number in 2006 is 0.0195. Hence, if the export share difference between foreign affiliates and domestic firms is maintained as that in 2000, the log markup gap would increase by 1.8 percentage points.

4.2 Decomposition of Firm Markups

To disentangle the lower markups of foreign exporters, we utilize the sub-sample (the matched firm product-level data) to distinguish the markup difference into a cost effect and a price effect. Our goal is to examine which effect accounts for the lower markups of foreign exporters. We use the specification in equation (1), interchanging the dependent variable with the log of firm markups, output price, or marginal cost.

The estimation results are shown in columns (1)–(3) of Table 4. Comparing to domestic firms, the effect of exporting on markups is smaller for foreign affiliates. In terms of output prices and marginal cost, we find that while the exporting effects are much larger for foreign firms, the effect of exporting on marginal cost dominates. In China, a large number of foreign exporters engage in processing trade, and they intensively use labor and imported intermediate inputs for re-export. As a result, their marginal costs increase with their exports volumes.[13]

[Insert Table 4 here]

Our findings are reasonable and supported by two recent studies. First, Lu, Lu, and Tao (2010) find that among foreign affiliates in China, exporters are less productive than

[13] Different from Ge, Lai, and Zhu (2015) that study the price premium of foreign exporters, we investigate the output price premium of foreign affiliates. Ge, Lai, and Zhu (2015) show that foreign exporters charge about 28% higher prices than domestic exporters do, and the multinational price premium is not a result of transfer pricing.

non-exporters. It is suggested that foreign affilates may generate lower markups. Second, Greenaway, Guariglia, and Yu (2014) show that there is an inverse U-shaped relationship between foreign ownership and productivity, that is, productivity initially increases with foreign ownership but starts declining once foreign ownership reaches beyond 64%. This suggests that foreign exporters could have lower productivity because the export participation ratio always increases with foreign capital share.

5 Conclusion

This paper investigates the effect of foreign ownership on the relationship between exports and firm markups in China. Our study provides evidence that exporters charge, on average, higher markups even after controlling for productivity differences. However, foreign ownership has a negative effect on the relationship between export status and markups. Importantly, on the other hand, foreign exporters have higher prices and even higher marginal costs. Since the marginal cost effect dominates the price effect, our results suggest that the marginal cost effect accounts for lower markups of foreign exporters. Our findings also provide an alternative answer to the question on why foreign exporters in China have a price premium over domestic exporters.

Our results have important implications to the export promotion policies of China and other developing countries. While foreign affiliates account for a half of China's exports and charge higher prices, many domestic firms are still at the end of the global value chain and export at lower prices. As documented in this study, compared to domestic exporters, foreign exporters have higher prices and marginal costs but lower markups. Therefore, a multinational price premium does not mean the Chinese economy as a whole is a net exporter of technology-intensive goods. Our results imply that industrial policies promoting the export-platform FDI are not likely to enhance the firms' real capacity to produce quality products and charge higher markups simultaneously.

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Table 1: Number of Exporters and Non-exporters

Year	Domestic firms			Foreign affiliates		
	# exporters	# non-exporters	% exporters	# exporters	# non-exporters	% exporters
Full sample						
2000	17,638	81,852	17.7	9,889	15,841	61.6
2001	18,910	86,526	17.9	10,845	17,786	62.1
2002	21,243	89,964	19.1	11,586	19,030	62.2
2003	23,737	99,357	19.3	13,007	22,198	63.1
2004	34,798	143,698	19.5	16,507	35,761	68.4
2005	35,673	137,217	20.6	18,642	32,357	63.4
2006	37,328	159,028	19.0	20,678	34,485	62.5
Single-product firms sample						
2000	5,511	25,902	17.5	4,704	2,492	65.4
2001	5,589	24,727	18.4	4,696	2,416	66.0
2002	6,650	27,470	19.5	5,160	2,590	66.6
2003	7,070	28,390	19.9	5,617	2,731	67.3
2004	5,395	18,951	22.2	4,186	1,849	69.4
2005	7,801	26,395	22.8	4,539	2,691	62.8
2006	8,015	30,422	20.9	5,207	2,974	63.6

Table 2: Descriptive Statistics

	Full sample			Single-product firms sample		
Variables	Mean	S.D.	# Obs.	Mean	S.D.	# Obs.
(log) Markup	0.17	0.24	1,265,581	0.17	0.21	280,140
(log) Markup data	0.17	0.14	1,265,176	0.16	0.14	274,854
(log) Price	–	–	–	2.62	2.88	280,140
(log) Marginal cost	–	–	–	2.46	2.89	280,140
Export share (%)	0.18	0.35	1,265,581	0.16	0.34	280,140
Foreign affiliate dummy	0.22	0.41	1,265,581	0.19	0.39	280,140
(log) TFP	−0.23	1.60	1,265,581	−0.56	1.46	280,140
(log) Output	9.93	1.33	1,265,581	10.10	1.36	280,140
(log) Capital-labor ratio	3.50	1.30	1,265,581	3.58	1.24	280,140
SOE dummy	0.08	0.28	1,265,581	0.11	0.31	280,140

Note: The table reports mean, standard deviation, and number of observations of firm level markup, price, marginal cost, export share, foreign affiliate dummy, TFP, output, capital-labor ratio, and SOE dummy.

Table 3: Export, Markup and Foreign Ownership

Dependent variable:	(log) Markup	(log) Markup	(log) Markup	(log) Markup data
	(1)	(2)	(3)	(4)
Export share × Foreign affiliate			−0.010***	−0.018***
			(0.002)	(0.001)
Export share	0.003***	0.002**	0.007***	−0.014***
	(0.001)	(0.001)	(0.001)	(0.001)
Foreign affiliate		0.000	0.003***	0.029***
		(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes
Observations	1,265,581	1,265,581	1,265,581	1,265,176

Note: Industry, province, and year dummies are included in all specifications. Standard errors are clustered at the firm level in parentheses. Other controls include firm size, TFP, capital-labor ratio, and SOE dummy. ***, ** and * denote significance at the 1, 5 and 10% level respectively.

Table 4: Markup, Price and Marginal Cost

Dependent variable:	(log) Markup	(log) Price	(log) Marginal Cost
	(1)	(2)	(3)
Export share × Foreign affiliate	−0.009**	0.143**	0.151**
	(0.003)	(0.057)	(0.058)
Export share	0.015***	−0.203***	−0.218***
	(0.002)	(0.037)	(0.037)
Foreign affiliate	0.009***	−0.081**	−0.090**
	(0.002)	(0.032)	(0.032)
Controls	Yes	Yes	Yes
Observations	280,140	280,140	280,140

Note: Industry, province, and year dummies are included in all specifications. Standard errors are clustered at the firm level in parentheses. Other controls include firm size, TFP, capital-labor ratio, and SOE dummy. ***, ** and * denote significance at the 1, 5 and 10% level respectively.