Outward FDI and Domestic Input Distortions: Evidence from Chinese Firms[*]

Cheng Chen[†]   Wei Tian[‡]   Miaojie Yu[§]

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Abstract. This paper examines how domestic distortions affect firms' investment strategies abroad. The study first documents puzzling empirical findings concerning Chinese multinational corporations, which include that private multinational corporations are *less* productive than state-owned multinational corporations. A theoretical model is built to rationalize these findings and yields additional empirically consistent predictions. The key insight is that discrimination against private firms domestically incentivizes these firms to produce abroad, which results in less tough selection into foreign direct investment for them. A calibration exercise shows the quantitative impacts of domestic distortions on gains in aggregate productivity after investment liberalization.

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[†]School of Economics and Finance, University of Hong Kong. Email: ccfour@hku.hk.

[‡]School of International Trade and Economics, University of International Business and Economics, Beijing, China. Email: wei.tian08@gmail.com.

[§]China Center for Economic Research (CCER), National School of Development, Peking University, Beijing 100871, China. Email: mjyu@nsd.pku.edu.cn.

1   Introduction

Foreign direct investment (FDI) and the emergence of multinational corporations (MNCs) are dominant features of the world economy nowadays.[1] In 2013, world FDI inflows reached the level of US$1.47 trillion, and global FDI stock was roughly US$26 trillion, surpassing the gross domestic product of any country in the world (UNCTAD 2015). Moreover, almost all firms listed in Fortune 500 are MNCs, and MNCs are by far the largest firms in the global economy. Therefore, understanding the behavior of MNCs and patterns of FDI is important for analysis of the aggregate productivity and resource allocation of a modern economy.

The sharp increase in outward FDI from developing countries in the past decade is phenomenal, and this is especially true for China. The UNCTAD World Investment Report (UNCTAD 2015) shows that outward FDI flows from developing economies have already accounted for more than 33 percent of overall FDI flows, up from 13 percent in 2007. Furthermore, despite the fact that global FDI flows plummeted by 16 percent in 2014, MNCs from developing economies invested almost US$468 billion abroad in 2014, an increase of 23 percent over the previous year.[2] As the largest developing country in the world, China has seen an astonishing increase in its outward FDI flows in the past decade. In 2012, China's outward FDI reached the level of 6.5 percent of the world's total FDI flows, which made China the third largest home country of FDI outflows globally. In addition, there are more than 15,000 Chinese MNCs (parent firms), which is comparable to the number of MNCs of any developed economy in the world. Finally, outward FDI flows from China were US$140 billion in 2014, surpassing inward FDI flows to China, which were US$119 billion in the same year. In total, the behavior of Chinese MNCs and patterns of China's outward FDI flows need to be explored, given their importance for the world economy.

This study investigates the production and investment strategies of Chinese manufacturing MNCs and patterns of China's outward FDI of manufacturing firms, through the lens of domestic input market distortions. It has been documented that discrimination against private firms is a fundamental issue for the Chinese economy. For instance, state-owned enterprises (SOEs) enjoy preferential access to financing from state-owned banks, although SOEs are less efficient than private firms (Dollar and Wei 2007; Song, Storesletten, and Zilibotti 2011; Khandelwal, Schott, and Wei 2013; Manova et al. 2015). Moreover, Bai, Krishna, and Ma (2013); Bai, Hsieh, and Song (2015); and Khandelwal, Schott, and Wei (2013) document that private firms have been treated unequally by the Chinese government in the export-

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[1]MNCs refer to firms that own or control production of goods or services in countries other than their home country. FDI includes mergers and acquisitions, building new facilities, reinvesting profits earned from overseas operations and intra-company loans.

[2]The UNCTAD World Investment Report also demonstrates that FDI stock from developing economies to other developing economies grew by two-thirds, from US$1.7 trillion in 2009 to US$2.9 trillion in 2013. It also reports that transition economies now represent 9 of the 20 largest investor economies globally (UNCTAD 2015).

ing market, at least before 2001 when China joined the World Trade Organization. Unequal treatment comes from excessive (exporting) quotas granted to SOEs and the tougher requirements for exporting that private firms face. In short, it is natural to link the behavior of Chinese MNCs to domestic distortions in China.

To the best of our knowledge, there is no existing work studying how institutional distortions at home affect firms' investment patterns abroad. The reason is that developed economies have been home countries of outward FDI for many decades, and their economies are much less likely to be subject to distortions compared with developing economies. By contrast, various distortions are fundamental features of developing countries. For instance, size-dependent policies and red tape have been shown to generate substantial impacts on firm growth and resource allocation in India (Hsieh and Klenow 2009, 2012). The government discriminates against private firms in China (Huang 2003, 2008; Brandt, Tombe, and Zhu 2013). Brazil's economy is plagued with problems of difficult business registration, inefficient judicial systems, and rigid labor markets. Moreover, there is already anecdotal evidence documenting how firms circumvent these distortions by doing business abroad. For instance, the key to the success of Hainan Airlines (the fourth largest airline in China and a private firm) was to expand internationally and acquire foreign assets even at the early stage of its development.[3] In total, distortions in the domestic market do seem to impact firms' decisions concerning going abroad.

We first document three sets of stylized facts (on China's MNCs in manufacturing sectors) to motivate our theory. First, although private non-MNCs (and non-exporting firms) are more productive than state-owned non-MNCs (and non-exporting firms) on average, private MNCs are actually *less productive* than state-owned MNCs on average. Second, compared with private firms, the fraction of firms that undertake outward FDI is smaller among SOEs. Finally, the relative size of MNCs (i.e., average size of MNCs divided by average size of non-exporting firms) is *smaller* among private firms than among SOEs.

These findings seem to be counterintuitive. First, SOEs are much larger than private firms in China, and larger firms are more likely to become MNCs. Furthermore, it has been documented that SOEs receive substantial support from the Chinese government for investing abroad. Thus, why are there so few SOEs actually investing abroad in the data? Second, it has been documented that SOEs are less productive than private firms in China (e.g., Brandt, Van Biesebroeck, and Zhang 2012; Khandelwal, Schott, and Wei 2013). Our data also show this pattern when we look at non-exporting and exporting (but non-multinational) firms. Why is this pattern reversed when we focus on MNCs? Third, if SOEs were more likely to invest abroad, the relative size of state-owned MNCs should be smaller than that of

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[3]In China, the commercial aviation industry had been heavily regulated for many years. As a result, private firms could not enter this market, although SOEs could. To circumvent this distortion, Hainan Airlines undertook FDI and served the international market first. Interestingly, after the airline grew big enough and had the strength to compete against state-owned airlines (e.g., Air China), it went back to expand in the domestic market substantially. For more details, see http://www.washingtonpost.com/business/for-hainan-airlines-chen-feng-rise-of-resort-in-china-provides-lift-for-a-new-sky-empire/2014/05/22/d4bb7508-d9fb-11e3-b745-87d39690c5c0_story.html.

private MNCs, since the selection into FDI is less stringent for them. However, why do the data present the opposite pattern?

To rationalize these puzzling findings, we build a model based on the model in Helpman, Melitz, and Yeaple (2004) (henceforth, HMY) and highlight two economic forces: institutional arbitrage and selection reversal. The key assumption (and departure from HMY) we make is that there is *asymmetry* in the existence of distortions across borders. Specifically, we assume that private firms pay a higher input price when *producing* domestically (compared with SOEs), while all firms pay the same input price when they produce abroad. The existence of the input price wedge comes from the capital market and the land market, since the banking sector is dominated by state-owned banks and land is largely owned by the government (and the country) in China. In reality, the government charges higher interest rates and unit land prices when private firms buy these resources, which is equivalent to an implicit tax levied on inputs. When firms produce abroad, this input price wedge (at least a part of it) ceases to exist, since the capital market and the land market are not controlled by the Chinese government, which is the ultimate owner of Chinese SOEs. In other words, the relative domestic input price (compared with that in the foreign country) private firms (or SOEs) face is higher (or lower).

As a result of this asymmetry, there is an extra incentive for private firms to produce abroad, since they can circumvent the input market distortion that exists *only* domestically by becoming MNCs (i.e., institutional arbitrage). Therefore, compared with SOEs, private firms are more likely to undertake FDI, and they have disproportionately more MNCs. In addition, absent the domestic distortion, there should be no difference in the selection into the (domestic and) FDI market, since SOEs and private firms face the same domestic (and foreign) market environment. When there is a domestic distortion, selection into the domestic market is tougher for private firms. However, since they receive an extra benefit from producing abroad (i.e., not just saving on the variable trade cost), the incentive of becoming an MNC is higher for them. This leads to easier selection into the FDI market for private firms. We call this selection reversal. This reversal rationalizes why private MNCs are less productive than state-owned MNCs and why the relative size of private MNCs is smaller than that of state-owned MNCs. In summary, a model with distortion in the domestic input market rationalizes all three stylized facts.

In addition to explaining the three stylized facts, our model yields two empirical predictions. First, conditional on other firm-level characteristics, a private firm sells *disproportionately more* in the foreign market (compared with an SOE) because of the nonexistence of distortion abroad. Second, conditional on other firm-level characteristics, the (overall) size of a private firm increases more than that of an SOE when both of them undertake FDI. This is again because of the nonexistence of distortion abroad. We present supporting evidence for these two predictions as well.

It is plausible that the distortion in the input market shows up as a subsidy to SOEs. Specifically, SOEs receive a subsidy for their inputs *only* when they produce in China, while there is no such subsidy

for private firms wherever they produce. In this scenario, SOEs have *less* of an incentive to undertake FDI, since the relative domestic input price (compared with that in the foreign country) they face is lower, which is the same as in the case of an implicit tax. This results in *tougher* selection into the FDI market for SOEs, which leads to the same empirical predictions.[4] In short, the two types of distortions share the same key feature (i.e., a higher relative domestic input price faced by private firms) and generate the same empirical predictions.

Finally, we quantity how the domestic distortion affects the share of MNCs and aggregate gain in productivity after bilateral investment liberalization. We consider a model with two symmetric countries and calibrate the model to match several aggregate moments obtained from the firm-level data. We then implement counterfactual analysis by reducing the fixed FDI cost by 50 percent for both countries and keeping all other parameters of the model unchanged. The counterfactual analysis shows that the share of MNCs and aggregate productivity increase more after the liberalization of investment, when the distortion is more severe in both countries. Furthermore, the quantitative magnitude is sizeable. For instance, the increase in the share of MNCs (and un-weighted average of firm productivity) in our calibrated model with the distortion is about 2.2 times (and 1.8 times) as large as the increase in a model without distortions. There are presumably other distortions that exist only domestically and vary *continuously and positively* with firm size. Investigation of how these *asymmetric* distortions affect aggregate economic outcomes is probably quantitatively important, and we leave these interesting topics for future research.

Although we focus on how a particular type of asymmetric institutional treatment affects economic outcomes, the insights of this study apply to other circumstances as well. For instance, it was reported that a rising number of talented and wealthy French people moved abroad because of the increasing tax rates in France.[5] This serves as a perfect example of institutional arbitrage, which is the key idea of the current study. Furthermore, tax evasion motives for the location choice of MNCs is another example of institutional arbitrage for which there are many real-world examples. Finally, in India, red tape has forced many talented entrepreneurs to leave the country and start their businesses abroad.[6] In total, agents, firms, and entrepreneurs can move across countries and regions to circumvent distortions they face domestically.

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[4]We prove these results in Appendix C.

[5]See http://www.france24.com/en/20150808-france-wealthy-flee-high-taxes-les-echos-figures.

[6]Readers interested in studying anecdotal evidence of this can find it at http://www.thehindu.com/news/national/red-tape-forces-top-indian-entrepreneurs-to-shift-overseas/article7367731.ece.

2 Literature Review

This study aims to speak to the literature on FDI and MNCs. In research on vertical FDI, Helpman (1984) insightfully points out how the difference in factor prices across countries affects patterns of vertical FDI. Antràs (2003, 2005) and Antràs and Helpman (2004) emphasize the importance of contractual frictions for shaping the pattern of FDI and outsourcing in various industries (e.g., capital intensive versus labor intensive). In research on horizontal FDI, Markusen (1984) postulates the concentration-proximity trade-off, which receives empirical support from Brainard (1997). More recently, HMY (2004) develop a model of trade and FDI with heterogeneous firms. They show that the least productive firms sell in the domestic market only; firms with medium levels of productivity serve the domestic market and export; and the most productive firms sell domestically and undertake FDI. Our study contributes to this literature by pointing out another motive for firms to engage in FDI and showing its impact on patterns of FDI.

This study is also related to the literature that substantiates the existence of resource misallocation in developing economies. Hsieh and Klenow's (2009) pioneering work documents that compared with the United States, there is substantial resource misallocation across firms in China and India. Restuccia and Rogerson (2008) show how size-dependent taxes can generate a quantitatively important impact on aggregate productivity. Following their work, scholars have started to uncover how various types of distortions affect aggregate productivity. Midrigan and Xu (2014) and Moll (2014) study the aggregate impact of financial frictions on the economy. Guner, Ventura, and Xu (2008) and Garicano, Lelarge, and Van Reenen (2013) explore the impact of size-dependent policies on aggregate productivity and firm size distribution.[7] Our work contributes to this research area by showing a link between domestic distortions and firms' behavior in the global market.

The third related strand of the literature is the research on distortions in China and the FDI decisions of Chinese firms. Bai, Hsieh, and Song (2015) find that a key feature of the Chinese economy is crony capitalism, meaning that each local government supports businesses related to itself. Brandt, Tombe, and Zhu (2013) substantiate the existence of distortions between private firms and SOEs in China. Furthermore, they document that the distortions changed between the 1980s and the 2000s. Distortions related to foreign transactions exist in the Chinese economy as well. For instance, Khandelwal, Schott, and Wei (2013) document that private firms in the textile industry had to obtain licenses to export, while SOEs did not. More recently, using the same data set, Tian and Yu (2015) document the sorting pattern of Chinese MNCs among production FDI and non-production FDI, but abstract away from the key difference between state-owned MNCs and private MNCs. Compared with the existing work, the key innovation of our work is to link firms' decisions on outward FDI to domestic distortions, and this link deserves more attention in future research.

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[7]For a synthesis of work on misallocation and distortion, see Restuccia and Rogerson (2013).

3 Data and Stylized Facts

3.1 Data

Our first data set is a production data set of Chinese manufacturing firms from 2000 to 2008, which comes from the Annual Survey of Industrial Firms (ASIF) complied by the National Bureau of Statistics of China. All SOEs and non-SOEs (i.e., private firms) with annual sales of five million RMB (or equivalently, about $830,000) or more are included in the data set. This data set contains more than 100 variables, such as the number of employees, value of capital stock, total sales, and export value. Firms included in this data set contribute to 95 percent of China's total sales in all manufacturing sectors. This data set is particularly useful for identifying the ownership type of the firm (i.e., SOE or not) and other key firm-level characteristics, such as firm size and total factor productivity (TFP).

We are primarily interested in exploring how distortion in the input market (between SOEs and non-SOEs) affects Chinese firms' outward FDI decisions. We pay particular attention to identifying which firms are SOEs. As discussed in Yu (2015), the official definition of an SOE, as reported in the *China City Statistical Yearbook* (2006) includes domestic SOEs (code in the firm data set: 110), state-owned joint venture enterprises (141), and state-owned and collective joint venture enterprises (143), but excludes state-owned limited corporations (151). Table E.1 in Appendix E provides summary statistics for the SOE dummy used in this study.

We use two data sets that report information on Chinese firms' outward FDI decisions.[8] The first is a nationwide data set of firm-level outward FDI from 1980 to 2012, and the second is an outward FDI data set of firms from Zhejiang province during 2006–08.[9] In terms of the time span and regional coverage, the former data set has the advantage. However, the nationwide data set does not contain information on the amount of firms' investment in foreign countries. This information is available in the data set for Zhejiang province (the second data set). Nevertheless, both data sets provide information on the initial year when the firm engages in outward FDI in a foreign country, the type of the investment (wholesale or production FDI), and destination countries for the investment.

Following Tian and Yu (2015), we merge the two FDI data sets with the firm-level production data set by using the Chinese name of the firm. If a firm has the same Chinese firm in different data sets in a particular year,[10] it is considered as an identical firm.

In addition, we use the ORBIS data from Bureau Van Dijk, since it contains detailed financial information on foreign affiliates of Chinese MNCs. We merge our ASIF data with the ORBIS data by matching the names in Chinese. The merged data set is used to study how Chinese MNCs allocate their

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[8]See Tian and Yu (2015) for more details.

[9]Roughly 10 percent of Chinese MNCs are from Zhejiang province.

[10]For firms from Zhejiang Province, we use all the three date sets. The data set of FDI from Zhejiang province is excluded from using, when firms are from provinces other than Zhejiang.

sales across borders and how their global size responds to investment liberalization.

Table 1 provides information on FDI in our matched data sets. Rows (1) and (2) report the numbers of starting and continuing MNCs (including services firms) across years. Each observation accounts for one firm-country-affiliate pair. That is, if firm F invests in countries A and B in a given year, there will be two MNCs recorded by the Ministry of Commerce: firm F-A and firm F-B. The trend is that the number of FDI transactions has surged since 2005. Rows (3) and (4) report the number of manufacturing firms and the number of (matched) manufacturing MNCs (i.e., firm-country-affiliate pairs) in our sample. Row (5) presents the number of (matched) state-owned manufacturing MNCs (i.e., firm-country-affiliate pairs) year by year. One finding is that becoming an MNC is indeed a rare event, and this is especially true for SOEs. FDI share in row (6) is obtained by dividing the number of FDI manufacturing firms by the number of manufacturing firms (i.e., (6) = (4)/(3)). SOE FDI share in row (7) is obtained by dividing the number of SOE FDI manufacturing firms by the number of FDI manufacturing firms (i.e., (7) = (5)/(4)). Rows (8) and (9) instead only allow one firm–one record each year, even if a firm invests in multiple destination countries in a given year. For instance, we only record firm F once, as in the previous example. As a result, (10) = (8)/(3) and (11) = (9)/(8). The overall pattern is that the share of state-owned multinational firms becomes smaller over the years.

[Insert Table 1 Here]

We estimate firm TFP using the augmented Olley-Pakes (1996) approach as in Yu (2015). First, we estimate the production function for exporting firms and non-exporting firms in each industry separately.[11] Second, we include dummy variables for SOEs and number of years after China entered the World Trade Organization, in the inversion step of our productivity estimation.

3.2 Stylized Facts

The main purpose of this subsection is to document three stylized facts using the merged data sets. As our interest is to explore how resource misallocation (across firm type) at home affects Chinese firms' outward FDI behavior, we compare state-owned MNCs with private MNCs when stating these stylized patterns.

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[11] We chose to do this, since firms doing processing trade may use different technologies compared with other firms (Feenstra and Hanson 2005), and processing trade accounted for around half of China's foreign trade before 2008. As a robustness check, we also pool exporters and non-exporters together and re-estimate the production function by including a dummy variable for the exporting status in the inversion step of the productivity estimation. The results generated by this alternative method do not change our subsequent empirical findings.

3.2.1 Stylized Fact One: Productivity Premium for State-Owned MNCs

Table 2 reports the difference in TFP between SOEs and private firms. Simple *t*-tests in columns (1) and (3) show that, among non-MNCs and non-exporting firms, private firms are more productive than SOEs. To confirm this finding, we perform nearest-neighbor matching, which is a type of propensity score matching, by choosing firm sales and the number of employees as covariates.[12] Columns (2) and (4) present the estimates for average treatment for the treated for private firms. Again, the coefficients of the productivity difference between SOEs and private firms are highly significant, suggesting that non-multinational (and non-exporting) SOEs are less productive than non-multinational (and non-exporting) private firms. In total, the above findings for non-MNCs are consistent with other studies, such as Hsieh and Klenow (2009).

[Insert Table 2 Here]

On the contrary, when focusing on MNCs, we find a *selection reversal*. That is, private MNCs (i.e., *private* parent firms) are on average *less productive* than state-owned MNCs (i.e., state-owned parent firms), which is shown in column (5) in Table 2. To confirm this finding, we focus on the productivity difference between private and state-owned MNCs that are engaged in FDI and exporting as well.[13]Column (6) reveals the same pattern. Namely, private MNCs are less productive than state-owned MNCs on average.

Our first stylized fact is robust to the way we measure TFP and holds in the distributional sense. In Table E.2 in Appendix E, we scale down the TFP of firms in each industry by normalizing the TFP of the most productive firm in that industry to one (see Arkolakis 2010; Groizard et al. 2015). After normalization, we calculate the relative TFP of firms in each industry. The table shows that at each percentile, state-owned MNCs have higher TFP compared with private MNCs, which substantiates the existence of a productivity premium for state-owned MNCs in terms of the distribution of productivity. Second, we look at the productivity difference between state-owned and private MNCs industry by industry. Table E.3 in Appendix E shows that a productivity premium for state-owned MNCs exists only in capital intensive industries. This finding is consistent with our key finding in Section 5 that the input price wedge only exists in the credit (i.e., capital) market. Finally, Table E.4 in Appendix E shows that the productivity premium for state-owned MNCs holds year by year as well. This is true for incumbent MNCs (i.e., firm-destination country pairs) and entering MNCs (i.e., firm-destination country pairs). In short, our first empirical finding is robust.

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[12]To avoid the case in which multiple observations have the same propensity score, we perform a random sorting before matching.

[13]If foreign countries impose high tariffs on Chinese products, some FDI parent firms may set up foreign affiliates as a substitute for exporting. In reality, some Chinese MNCs engage in outward FDI and exporting. This is especially true for firms that undertake distribution FDI (Tian and Yu 2015).

3.2.2 Stylized Fact Two: Smaller Fraction of State-Owned MNCs

Our second stylized fact is presented in column (9) in Table 2, which shows that the fraction of MNCs is larger among private firms than among SOEs. On the one hand, this finding is puzzling, since SOEs are larger firms that should be more likely to invest abroad. Furthermore, the Chinese government supports its SOEs investing abroad for many years, known as the Going Out strategy. On the other hand, such an observation echoes with our first finding. Namely, as state-owned MNCs are more productive than private MNCs, the fraction of SOEs engaged in FDI should be smaller (i.e., tougher selection).

3.2.3 Stylized Fact Three: Bigger Size Premium for State-Owned MNCs

Our last stylized fact is related to the size premium of state-owned MNCs. First, we observe that firm size (i.e., log employment and sales) of state-owned exporting (but non-multinational) firms is larger than that of private exporting (but non-multinational) firms, as shown in columns (1) and (2) in Table 3. Next, this property also holds for state-owned MNCs and private MNCs, as shown in columns (3) to (6) in Table 3. In short, SOEs are larger than private firms irrespective of their FDI or exporting status.

[Insert Table 3 Here]

Importantly, the size premium for state-owned MNCs holds in the relative sense as well. Specifically, Table 4 shows that the ratio of average log employment of multinational parent firms to that of non-exporting firms is larger among SOEs than among private firms.[14] To sum up, our third stylized fact states that the absolute and relative sizes (compared with non-exporting firms) of private MNCs are smaller than those of state-owned MNCs.

[Insert Table 4 Here]

Thus far, we have established three interesting empirical findings. In what follows, we will present a theoretical model to rationalize these findings. Furthermore, the model yields several additional empirical predictions, which will be shown to be consistent with the data.

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[14]The first module in Table 4 reports the result from the comparison between the relative size of state-owned MNCs (compared with non-exporting firms) and that of private MNCs. The relative size is measured by l_o^j/l_d^j where l_o^j and l_d^j are log employment of MNCs and that of non-exporting firms for firm type j (i.e., private or state-owned). The year-average ratio in the first column shows that the relative size of private MNCs is significantly smaller than that of SOEs. As few SOEs were engaged in outward FDI before 2004 (see Table 1), we report the year-average ratio up to a particular year in the rest of Table 4. All columns suggest larger relative size for state-owned MNCs.

4 Model

We modify the standard FDI model proposed by HMY (2004) to rationalize the empirical findings documented so far. We study how discrimination against private firms in the input market affects the sorting pattern of MNCs and their size premium. At the same time, we investigate how the difference in foreign investment costs impacts the investment behavior of private MNCs and state-owned MNCs differently.

4.1 Setup

There is one industry populated by firms that produce differentiated products under conditions of monopolistic competition à la Dixit and Stiglitz (1977). Each variety is indexed by ω, and Ω is the set of all varieties. Consumers derive utility from consuming these differentiated goods according to

$$U = \Big[\int_{\omega \in \Omega} q(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \Big]^{\frac{\sigma}{\sigma-1}}, \tag{1}$$

where $q(\omega)$ is the consumption of variety ω, and σ is the constant elasticity of substitution between differentiated goods.

Entrepreneurs can enter the industry by paying a fixed cost, f_e (in terms of labor). After paying the entry cost, the entrepreneur receives a random draw of (labor) productivity, φ, for her firm. The cumulative density function of this draw is assumed to be $F(\varphi)$. Once the entrepreneur observes the productivity draw, she decides whether or not to stay in the market as there is a fixed cost to produce, f_D (in terms of labor). In equilibrium, entrepreneurs in the monopolistically competitive sector earn an expected payoff that is equal to zero due to free entry.

Labor is the only factor that is used in production. A productivity draw of φ means that the firm has to use q/φ units of labor to produce q unit of output. Since there are two (potentially asymmetric) countries in the model, we use w to denote the equilibrium wage and subscripts H and F to denote home and foreign respectively.

After entering and choosing to stay in the domestic market, each entrepreneur also chooses whether to serve the foreign market. There are two ways to serve the foreign market, the first of which is through exporting. Exporting entails a variable trade cost, $\tau(\geq 1)$, and a fixed exporting cost, f_X (in terms of labor). The second way is to set up a plant in the foreign country and produce there directly. The cost of doing this is fixed and denoted by f_I (in terms of labor). In short, we consider horizontal FDI here as in HMY (2004).

We assume that there are two types of firms in the economy: private firms and SOEs. We do not take a stance on why some firms become SOEs (and private enterprises), since the predictions of the model do

not depend on this.[15] The key innovation of the model is to introduce a wedge between the input prices paid by SOEs and by private enterprises when they produce *domestically.* Furthermore, it is assumed that private firms pay *unit variable cost c*(> 1) times as high as what the SOEs pay when they produce domestically. However, the firms pay the same unit input price when producing abroad. In short, the only departure we make from HMY (2004) is the addition of the price wedge, c, in the domestic input market.

4.2 Domestic Production, Exporting, and FDI

Following HMY (2004), we assume the cost function features constant returns to scale and is country-specific (i.e., no cost linkage across borders). Specifically, the total variable cost of a firm (at home) is assumed to be

$$\frac{(q_H + I_{\{q_E>0\}}\tau q_E)[I_{\{private\}}(c-1)+1]w_H}{\varphi} + I_{\{q_F>0\}}\frac{q_F w_F}{\varphi}, \tag{2}$$

where q_H and q_E are output produced for domestic sales and exporting, and q_F is the output produced and sold by the MNC's subsidiary abroad. In addition, $I_{\{q_E>0\}}$ and $I_{\{q_F>0\}}$ are indicator functions for exporting and FDI. Finally, the higher input price faced by private firms at home is reflected by the indicator function $I_{\{private\}}$, which equals one when the firm is a private enterprise.

We derive firm profit and sales as follows. First, based on equation (1), the demand function for variety ω can be derived as

$$q(\omega) = \frac{p(\omega)^{-\sigma}}{P^{1-\sigma}}E, \tag{3}$$

where E is the total income of the economy and P is the ideal price index and defined as

$$P \equiv \left[\int_{\Omega(\omega)\in\Omega} p^{1-\sigma}(\omega)MdF(\omega)\right]^{\frac{1}{1-\sigma}},$$

where M is the total mass of varieties in equilibrium. The resulting revenue function is

$$R(q) = q^{\frac{\sigma-1}{\sigma}}E^{\frac{1}{\sigma}}P^{\beta}, \tag{4}$$

where $\beta \equiv \frac{\sigma-1}{\sigma}$. Second, operating profit and final profit of a non-exporting private firm are derived as

$$\pi_{PD}(\varphi) = \frac{1}{\sigma}\left(\frac{\beta\varphi}{cw_H}\right)^{\sigma-1}D_H; \quad \Pi_{PD}(\varphi) = \frac{1}{\sigma}\left(\frac{\beta\varphi}{cw_H}\right)^{\sigma-1}D_H - w_H f_D,$$

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[15]Random selection into SOEs (and private firms) after entry is the assumption we adopt in the calibration exercise.

where $D_H \equiv P_H^{\sigma-1} E_H$. For a non-exporting SOE, operating profit and final profit are

$$\pi_{SD}(\varphi) = \frac{1}{\sigma}\left(\frac{\beta\varphi}{w_H}\right)^{\sigma-1} D_H; \quad \Pi_{SD}(\varphi) = \frac{1}{\sigma}\left(\frac{\beta\varphi}{w_H}\right)^{\sigma-1} D_H - w_H f_D. \tag{5}$$

If the firm is productive enough, serving the foreign market is optimal. If a private firm exports, the profit earned from exporting is

$$\frac{1}{\sigma}\left(\frac{\beta\varphi}{\tau c w_H}\right)^{\sigma-1} D_F - w_H f_X,$$

where $D_F \equiv P_F^{\sigma-1} E_F$, and the profit from engaging in FDI (for a private firm) is

$$\frac{1}{\sigma}\left(\frac{\beta\varphi}{w_F}\right)^{\sigma-1} D_F - w_H f_I.$$

Therefore, the cutoff for becoming an MNC is

$$\bar{\varphi}_{PO} = \left[\frac{\sigma(w_H f_I - w_H f_X)/D_F}{\frac{\beta^{\sigma-1}}{w_F^{\sigma-1}} - \frac{\beta^{\sigma-1}}{(\tau c w_H)^{\sigma-1}}}\right]^{\frac{1}{\sigma-1}}, \tag{6}$$

while the exporting cutoff and the survival cutoff are

$$\bar{\varphi}_{PX} = \frac{\tau c w_H (\sigma w_H f_X/D_F)^{\frac{1}{\sigma-1}}}{\beta}; \tag{7}$$

and

$$\bar{\varphi}_{PD} = \frac{c w_H (\sigma w_H f_D/D_H)^{\frac{1}{\sigma-1}}}{\beta} \tag{8}$$

respectively. For SOEs, the three cutoffs are

$$\bar{\varphi}_{SO} = \left[\frac{\sigma(w_H f_I - w_H f_X)/D_F}{\frac{\beta^{\sigma-1}}{w_F^{\sigma-1}} - \frac{\beta^{\sigma-1}}{(\tau w_H)^{\sigma-1}}}\right]^{\frac{1}{\sigma-1}}, \tag{9}$$

$$\bar{\varphi}_{SX} = \frac{\tau w_H (\sigma w_H f_X/D_F)^{\frac{1}{\sigma-1}}}{\beta}, \tag{10}$$

and

$$\bar{\varphi}_{SD} = \frac{w_H (\sigma w_H f_D/D_H)^{\frac{1}{\sigma-1}}}{\beta} \tag{11}$$

respectively. We need a high enough fixed cost of exporting and a high enough cost of FDI (i.e., $f_I \gg f_X \gg f_D$ and $\tau c w_H > w_F$) to ensure the sorting pattern of domestic, exporting, and multinational firms

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(i.e., $\bar{\varphi}_{iO} > \bar{\varphi}_{iX} > \bar{\varphi}_{iD}$) where $i \in \{P, S\}$. It is straightforward to show that

$$\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}} = \frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}}, \tag{12}$$

$$\bar{\varphi}_{PD} = c\bar{\varphi}_{SD} > \bar{\varphi}_{SD}, \tag{13}$$

and

$$\bar{\varphi}_{PO} < \bar{\varphi}_{SO}. \tag{14}$$

4.3 Sorting Pattern and Size-Premium of MNCs

In this subsection, we focus on how the domestic distortion affects the sorting pattern of MNCs and their size premium. We summarize our results on the sorting pattern using the following proposition.

Proposition 1 *Sorting Pattern among Private Firms and SOEs:*

1. *The exit cutoff and exporting cutoff are higher for private firms than for SOEs. However, the cutoff for becoming an MNC is lower for private firms than for SOEs (i.e., selection reversal).*

2. *Assume that the initial productivity draw follows a Pareto distribution with the same shape parameter, k, for private firms and SOEs. Then, the fraction of MNCs is larger among private firms than among SOEs. The average productivity of non-exporting (and all) private firms is greater than that of non-exporting (and all) SOEs. However, the average productivity of private MNCs is less than that of state-owned MNCs (i.e., productivity premium for state-owned MNCs).*

3. *Conditional on the initial productivity draw, private firms are more likely to become MNCs.*

Proof. See Appendix B. ∎

The intuition for this result is as follows. First, since there is discrimination against private firms at home, it is more difficult for private firms to survive and export. As a result, the exit cutoff and the exporting cutoff are higher for these firms. Absent the choice of exporting (i.e., firms only choose between engaging in FDI or not), the FDI cutoff would be the same for SOEs and private firms, as they face the same FDI cost and the same market environment in the foreign country. However, since the firm at the FDI cutoff compares profit earned from exporting with that earned from engaging in FDI, the (opportunity) cost of engaging in FDI (i.e., exporting profit) is smaller for private firms than for SOEs.[16] As a result, the FDI cutoff is smaller for private firms than for SOEs. This selection reversal, which is graphed in Figure 1, leads to a productivity premium for state-owned MNCs directly, and the above

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[16]Exporting does not eliminate the distortion private firms face in the domestic market.

theoretical results rationalize the first two stylized facts. The lower probability of becoming an MNC for the SOE is shown in Table 5 in the next section.[17]

[Insert Figure 1 Here]

The next proposition discusses how the absolute size premium varies with the enterprise type.

Proposition 2 *Absolute Size Premium for State-Owned MNCs: Suppose the initial productivity draw follows a Pareto distribution with the same shape parameter for private firms and SOEs.*

1. *Average domestic size (i.e., sales and employment) of private MNCs is smaller than that of state-owned MNCs.*

2. *Average overall firm size (i.e., sales and employment) of private exporting (and multinational) firms is smaller than that of exporting (and multinational) SOEs.*

   Proof. See Appendix B. ∎

These results receive strong empirical support from Table 3, since the average firm size (i.e., log sales and log employment) of private exporting firms and MNCs is much smaller than that of state-owned exporting firms and MNCs.[18] This size difference is especially true when we focus on the domestic sales of MNCs. Furthermore, the size premium for state-owned MNCs holds in the relative sense as well, which is summarized by the following proposition.

Proposition 3 *Relative Size Premium for State-Owned MNCs: Suppose the initial productivity draw follows a Pareto distribution with the same shape parameter for private firms and SOEs.*

1. *The relative size (i.e., employment) of private exporting firms (i.e., compared with private non-exporting firms) is smaller than that of state-owned exporting firms..*

2. *The relative domestic and overall size (i.e., employment) of private multinational firms (i.e., compared with private non-exporting firms) is smaller than that of state-owned multinational firms.*

   Proof. See Appendix B. ∎

These results receive strong statistical support from Table 4. As the table shows, the relative size of private MNCs is smaller than that of state-owned multinational firms. In addition, the relative size of private exporting firms is smaller than that of state-owned exporting firms.

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[17]The selection reversal holds irrespective of the distribution of the initial productivity draw. In addition, the productivity premium for state-owned MNCs exists, even if the Pareto distribution has different values for the minimum productivity draw across the two types of firms.

[18]Following the convention, we use the amount of factors employed in the production process to measure firm size. That is, the employment of a firm only includes the number of workers used for the variable cost.

4.4 Investment Costs, Distortion, and Allocation of Sales across Borders

The following proposition discusses how MNCs allocate their products across borders and how this differs across state-owned MNCs and private MNCs. Furthermore, it shows how overall firm size changes when the firm starts to undertake FDI and how it differs across SOEs and private firms.

Proposition 4 *Global Allocation of Sales:*

1. *Conditional on the productivity draw of φ and other firm-level characteristics, the ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs.*

2. *Suppose there is a reduction in the fixed cost of FDI. Conditional on the initial productivity draw and other firm-level characteristics, the increase in overall firm size is larger for a new multinational private firm than for a new multinational SOE.*

3. *3.   Suppose the initial productivity draw follows a Pareto distribution with the same shape parameter k for private firms and SOEs. Furthermore, assume that there are multiple sectors, each of which is small relative to the whole economy. When the distortion deteriorates in one sector (i.e., c increases), the ratio of the relative (domestic) size of state-owned MNCs (compared with non-exporting SOEs) to that of private MNCs increases in that sector. In addition, the log difference between these two relative sizes increases in that sector.*

    Proof. See Appendix B. ∎

    The intuition for Proposition 4 is straightforward. Since there is an extra benefit for private firms to produce abroad, they produce and sell more in the foreign market. Similarly, when private firms *become* MNCs, they produce and sell disproportionately more in the foreign market, because of the non-existence of discrimination in that market. This effect is another key result of our model, for which we provide empirical support in the next section.

    Proposition 4 receives empirical support from Tables 7 to 9, which are discussed in detail in the next section. In summary, for the decision on FDI, distortions in factor markets generate two economic forces that have not been explored in the literature. First, institutional arbitrage generates an additional incentive for firms that are not favored in the domestic market to invest abroad. As a result, there is less tough selection into the FDI market for this type of firm. In our story, these non-favored firms are private firms in China. Second, when these firms undertake FDI, they produce and sell products disproportionately more in the foreign market because of the non-existence of institutional distortion.

5 Evidence

Our theoretical model states four propositions. Some of them have already been shown to be consistent with the stylized facts presented in Section 3, while others are still waiting for further empirical examination. That is the purpose of this section.

5.1 FDI Decision and Firm Ownership

Most predictions of Propositions 1-3 have been shown to be consistent with the empirical results in Tables 2 to 4. Only the last prediction of Propositions 1 needs further empirical examination.

Table 5 reports estimation results starting from a linear probability model (LPM) in which the regressand is an indicator of outward FDI, which equals one if a firm engages in FDI and zero otherwise. To explore whether SOEs are less likely to engage in FDI, we include an SOE indicator in the estimation. Furthermore, we control for several key firm characteristics, such firm size (i.e., log employment), firm-level TFP, and exporting status. In addition, we control for year-specific and industry-specific fixed effects for all regressions other than the one reported in column (1).

As discussed in Tian and Yu (2015), our nationwide FDI data are pooled, cross-sectional data, as we only know the first year when firms begin to undertake FDI in a given country (i.e., no information on whether firms continue to engage in FDI in a given country or whether they exit from FDI after entry). Therefore, the estimations in Table 5 and the other tables only include non-MNCs and FDI starters. The SOE indicator is shown to be negative and statistically significant in column (2), suggesting that SOEs are indeed less likely to engage in outward FDI. The magnitude of the SOE indicator is too small, which we suspect is because of a well-known pitfall of LPM, which is that the predicted probability of the LPM model could be greater than one or less than zero. To overcome this drawback, we report the results from Probit estimation in column (3) and Logit estimation in column (4), which yield the same qualitative findings as for the LPM model. That is, compared with private firms, SOEs are less likely to engage in outward FDI.

However, there are two important caveats with the Probit (and Logit) estimates. First, as shown in Table 1, less than 1 percent of manufacturing firms undertook FDI each year until 2008. Within FDI firms, a small fraction are SOEs. Thus, becoming a state-owned MNC is a rare event whose distribution exhibits faster convergence toward the probability that SOEs engage in foreign investment. However, standard Logit or Probit estimates are assumed to be symmetric to the original point. We thus run the complementary log-log regression in column (5) in Table 5, which allows faster convergence toward rare events. Second, as highlighted by King and Zeng (2001, 2002), standard binary nonlinear models, such as Logit and Probit models, underestimate the probability of rare events. To address this concern, King and Zeng recommend using the rare-event Logit approach, which corrects for possible downward

bias.[19] The last column in Table 5 reports the Logit estimates with rare-event corrections. The key coefficient of the SOE indicator is much larger than its counterparts in columns (4) and (5) in absolute value. Equally important, the coefficient is still negative and statistically significant, confirming that SOEs are less likely to engage in outward FDI. In total, the estimation results in Table 5 are consistent with part three of Proposition 1.

[Insert Table 5 Here]

5.2 Input Market Distortions

Our theoretical model is built on the assumption that private firms face discrimination in input factor markets. Compared with SOEs, private firms have to bear higher input costs in the domestic market. Although this assumption seems to be widely accepted, we provide direct evidence for it in this subsection.

Previous work suggests that Chinese SOEs access working capital by paying a lower interest rate than what private firms pay (Feenstra et al. 2014). Similarly, SOEs acquire land at a lower market price than the price for private firms, which is especially true in the manufacturing sector (Tian et al. 2015). To see whether these conjectures are supported by the data, we first construct a measure for the firm-level interest rate by dividing firms' interest expenses by firms' current liability (in each year), both of which are obtained from the ASIF data set. We then regress this measure on the SOE indicator in columns (1) to (3) in Table 6. Our underlying assumption is that SOEs can access external working capital at a lower cost than private firms. If so, it should be observed that the SOE indicator has a negatively significant coefficient.

This outcome is exactly what we observe in Table 6. The estimates in column (1) abstract away other control variables, whereas those in column (2) include year-specific and industry-specific fixed effects. In addition to various fixed effects, column (3) controls for other key firm characteristics, such as firm TFP and log employment of the firm. It turns out that the key coefficient, the SOE indicator, is always negative and statistically significant, suggesting that SOEs pay lower interest rates and hence bear lower capital costs than private firms.

Columns (4) to (7) check whether SOEs acquire land at lower cost. An empirical challenge is that data on each firm's cost of acquiring land is unavailable. Instead, we are able to access prices of land sales (conversion) at the prefectural city level by year.[20] We thus construct a variable of SOE intensity, which

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[19]Rare-events estimation bias can be corrected as follows. We first estimate the finite sample bias of the coefficients, $bias(\hat{\beta})$, to obtain the bias-corrected estimates $\hat{\beta} - bias(\hat{\beta})$, where $\hat{\beta}$ denotes the coefficients obtained from the conventional logistic estimates.

[20]Data are from *China's Land and Resources Statistical Yearbook* (various years). As in Tian et al. (2015), we only use data on land sales that are sold or granted by market channels, including agreement, auction, bidding, and listing. We exclude land transfers to SOEs through direct government leasing and allocation. Thus, the coefficients in the estimates in Table 6 shall be understood as the lower bound of the measured distortion.

is defined as the number of SOEs divided by the number of total manufacturing firms in each prefectural city. If our hypothesis is supported by the data, a city with a higher SOE intensity is expected to have a lower average price of land. The estimations reported in columns (4) to (7) regresses prefectural-city average land price on SOE intensity and find support for the hypothesis.[21] Specifically, the coefficient of SOE intensity is negatively significant. Column (4) only controls for year-specific fixed effects, whereas column (5) controls for year-specific and industry-specific fixed effects. In addition, it is possible that aggregate demand for land acquisition in each city affects the price of land in the city; column (6) thus controls for cities' total sales as well as city-specific, year-specific, and industry-specific fixed effects. Finally, one may worry that the land market discrimination could reversely induce firm churning (from private firms to SOEs). This is very unlikely to happen in our story, as very few private firms switched to SOEs during the period of time we focus on. Still, for the sake of completeness, column (7) regresses city land price on the one-year lag of SOE intensity to mitigate any possible simultaneous bias. In all cases, the coefficient of SOE intensity is negative and statistically significant, suggesting that SOEs pay lower land prices on average and hence bear lower land costs than private firms.

[Insert Table 6 Here]

5.3 Firm Size and Investment Liberalization

We now provide empirical support for Proposition 4. The first prediction of Proposition 4 states that the ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs. As data on sales of foreign affiliates are unavailable in the Chinese firm-level ASIF data set, we merge the ASIF data set with the ORBIS data set, which contains information on sales of foreign affiliates of Chinese MNCs.[22] Column (1) in Table 7 regresses the ratio of the foreign affiliate's sales to its parent firm's sales on the SOE indicator. It shows that the SOE indicator has a negative and statistically significant coefficient, which is consistent with our prediction. The estimates in columns (2) and (3) take a step further to control for various fixed effects, and find similar results. As a robustness check, column (4) includes the log of license costs, which is a proxy for fixed investment cost.[23] In any case, the SOE indicator is negatively significant, which reconfirms the finding in column (1).

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[21]Cities with zero SOEs or all SOEs are dropped from the sample.

[22]The ORBIS data set is a product of Bureau Van Dijk and contains financial information on 180 million private firms worldwide. We merge the ORBIS data set with the ASIF data set using firms' names in Chinese characters. As the ORBIS data set reports affiliates' names in English, we first translate all these names into Chinese, and then carefully check the translated names one by one, using Internet resources. As a result, around 15 percent of Chinese parent firms have their foreign affiliates show up in the ORBIS data set. The ORBIS data set covers the period 2005–08, which is also the period when Chinese firms began to invest abroad intensively.

[23]License costs measure the average cost of obtaining a business license in an economy and is reported by the *Doing Business* project (2009), which is compiled by the World Bank.

[Insert Table 7 Here]

Furthermore, the second prediction of Proposition 4 implies that, in response to investment liberalization (i.e., a reduction in the fixed cost of FDI) in FDI destination countries, the increase in overall firm size is larger for new private MNCs than for new state-owned MNCs. We implement empirical analysis to show support for this prediction. First, firm sales is used to measure firm size, as usual. We first construct a variable for total sales of MNCs by summing the parent firm's sales and the affiliate's sales using the ASIF-ORBIS matched data set. Second, we use log license costs to measure the fixed investment cost in the destination country.

To conduct the empirical analysis, we include in the regression an interaction term between the log of license costs and the SOE indicator. If the theoretical predictions gain support from the data, the coefficient of the log of license costs should be negatively significant. The fixed-effects estimates in column (1) confirm this theoretical prediction, even after controlling for a full set of industry-year interaction dummies. Moreover, if our theoretical predictions are supported by the data, the coefficient of the interaction term between the log of license cost and the SOE indicator is anticipated to be positively significant.[24] The fixed-effects estimates in column (2), again, confirm the theoretical predictions.

As a robustness check, we use the sum of the parent firm's fixed capital stock and the value of its FDI as an alternative measure of overall firm size. As the nationwide FDI data set does not report the amount of FDI for each MNC, the sample in Table 8 only covers MNCs from Zhejiang province. As there may be a concern that the SOE indicator is too crude to measure the firm's share of state capital, we instead use state-capital intensity to measure the firm's ownership.[25] As there may be a concern that the SOE indicator is too crude to measure the firm's share of state capital, we instead use state-capital intensity to measure the firm's ownership.[26] The estimates in column (3) show that higher FDI fixed costs lead to smaller firm size. Finally, as our model implicitly assumes a substitution between exporting and FDI, we drop distribution FDI (i.e., keeping production FDI only) and rerun the regression (Tian and Yu 2015). The estimation results are reported in column (4) and support our theoretical predictions.

[Insert Table 8 Here]

5.4 Size Premium of SOEs

Proposition 3 predicts that the relative size of state-owned MNCs is larger than that of private MNCs. Furthermore, the third prediction of Proposition 4 states that the difference in the relative size (between

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[24]These results indicate that a decline in fixed investment costs at the destination country leads to larger firm size, and this effect is more pronounced for private MNCs than for state-owned MNCs.

[25]We recover information on firms' capital stock following the approach introduced by Brandt et al. (2012).

[26]State-capital intensity is defined by the ratio of the firm's state capital divided by its total capital (including capital from state, collective, private, and foreign sources).

state-owned MNCs and private MNCs) increases when distortions deteriorate at the sector level. In what follows, we provide evidence for this. We start with the following empirical specification:

$$(l^o_{jt}/l^d_{jt}) = \alpha_0 + \alpha_1 SOEInt_{jt} + \alpha_2 r_{jt} + \eta_t + \lambda_j + \varepsilon_{jt} \tag{15}$$

where l^o_{jt} and l^d_{jt} represent average log employment of MNCs and that of non-exporting firms in industry j, respectively. As a result, the regressand in (15) measures the relative size of MNCs at the industry level. $SOEInt_{jt}$ denotes SOE intensity in industry j at year t (as defined before). r_{jt} is the average interest rate paid by firms in industry j at year t (as defined before). Finally, the error term is decomposed into three components: (1) year-specific fixed effects η_t, which are used to control for industry-invariant factors such as the exchange rate of the Chinese RMB; (2) industry-specific fixed effects which are used to control for time-invariant factors (that affect firms' incentives to invest abroad), such as the comparative advantage; and (3) an idiosyncratic term, ε_{it}, with a normal distribution which is used to control for other unspecified factors. If Proposition 3 is supported by the data, we should observe a positive coefficient of $SOEInt_{jt}$. Namely, the higher is the industrial SOE intensity, the larger is the relative FDI size premium. The fixed-effects estimates in column (1) in Table 9 clearly suggest that industries with higher SOE intensities have a larger FDI size premium.

Similarly, if firms in an industry pay lower prices for acquiring capital (i.e., a lower average interest rate), they should have greater profits, which would in turn affect the FDI size premium at the industry level. Column (2) regresses the relative size of MNCs on the industrial interest rate and finds that a lower industrial interest rate is associated with a larger relative size of MNCs at the industry level. Column (3) includes the industrial interest rate and the SOE intensity as the regressors and finds similar results.

One of the key ideas of this study is that distortions in input factor markets lead to the relative size premium for state-owned MNCs. Thus, it is important and interesting to explore how the difference in interest rates paid by SOEs and private firms (measuring the level of the distortion), $r^{SOE}_{jt} - r^{PRIVATE}_{jt}$, respectively, affects the difference in the relative size of MNCs (i.e., $(l^o/l^d)^{SOE}_{jt} - (l^o/l^d)^{PRIVATE}_{jt}$). Part 3 of Proposition 4 suggests that the difference in the relative size of MNCs between SOEs and private firms increases, when the distortion (i.e., c) deteriorates. If this theoretical prediction is supported by the data, a smaller (and positive) difference in the interest rates (i.e., $r^{PRIVATE}_{jt} - r^{SOE}_{jt}$) should lead to a smaller difference in the relative size of MNCs (between SOEs and private firms). We thus run the following regression in columns (4) to (8) in Table 9:

$$(l^o/l^d)^{SOE}_{jt} - (l^o/l^d)^{PRIVATE}_{jt} = \gamma_0 + \gamma_1(r^{SOE}_{jt} - r^{PRIVATE}_{jt}) + \epsilon_{jt}. \tag{16}$$

The industries used for the estimation in columns (4) and (5) are defined at the 2-digit China Industrial Classification (CIC) level. We provide robustness checks in column (6) by defining industries at the

4-digit CIC level. Not every 4-digit CIC industry has both types of MNCs (i.e., state-owned and private), and 2-digit CIC industries are more likely to have both types of MNCs. As a result, the number of (non-missing) dependent variables does not increase that much when we move from 2-digit CIC industries to 4-digit CIC industries. The estimates in column (5) also control for industrial relative TFP.[27] The coefficient of $\hat{\gamma}_1$ is negatively significant in the estimates in columns (4) to (6), suggesting that the difference in the relative interest rates (between the low rates paid by SOEs and the high rates paid by private firms) is *negatively* associated with the difference in the relative size between state-owned MNCs and private MNCs. These findings are consistent with our theoretical predictions.

To be more precise and exactly matching our theoretical framework, column (7) regresses the ratio of FDI relative size $((l^o/l^d)_{jt}^{SOE}/(l^o/l^d)_{jt}^{PRIVATE})$ on the ratio of industrial interest rates $(r_{jt}^{SOE}/r_{jt}^{PRIVATE})$. The corresponding coefficient of the ratio of industrial interest rates is still negative, although insignificant, in column (7) with 2-digit CIC industrial fixed effects. However, this key coefficient becomes negative and significant once we control for both year-specific and 4-digit CIC industry-specific fixed effects in the last column of Table 9.

We now turn to discuss the economic magnitude of one key coefficient: . The average of the interest rate differential across industries is around 21 percent. The average measured interest rate for SOE firms is 3 percent, whereas that for private firms is 24 percent in our sample. One reason that private firms bear such high capital costs is because of the inclusion of borrowing from informal financial institutions (e.g., credit cooperatives, rotating savings, credit associations, etc.) in which the *de facto* interest rate is much higher than the *de jure* interest rate listed by the commercial banks in China.[28] The difference in the relative size between state-owned MNCs and private MNCs is 0.09.[29] Thus, as shown in column (6) in Table 9, the contribution of the interest rate differential to the difference in the relative size is 10.5 percent, which is obtained from (-0.044)×(-0.21)/0.09. Therefore, if there were no domestic distortions in the capital market, the difference in the relative size between state-owned MNCs and private MNCs would fall by around 10 percent. The caveat here is that the overall contribution of domestic distortions to the difference in the relative size should be substantially larger than the value obtained from such a crude accounting, as we do not take distortions in land acquisition and other input factors into account in our simple calculation.

[Insert Table 9 Here]

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[27]Arkolakis (2010) argues that firm productivity cannot be compared across industries directly. Therefore, we scale the estimated TFP into the range from zero to one by each 2-digit CIC industry, and normalize the highest estimated TFP of firms in each industry to one, to obtain firm-level relative TFP in each industry. Then, we calculate the average relative TFP at the industry level and use it as the industrial relative TFP.

[28]Interest rates are measured by the firm's interest expenses divided by its current liabilities, which include money borrowed from formal and informal financial institutions.

[29]The average difference in the relative size across industries (used in Table 9) differs from the values reported in Table 4, since Table 4 reports the average difference in relative size across *firms*.

5.5 Discussion of Modeling Choices

Before presenting our quantitative work, we discuss several modeling choices for our model, based on the empirical patterns we have documented so far. First, it is plausible that the distortion that we discussed shows up as a subsidy to SOEs. Specifically, SOEs receive a subsidy for their input use *only* when they produce in China, while there is no such subsidy for private firms wherever they produce. In this scenario, it is the SOEs that have *less* of an incentive to undertake FDI, since the relative domestic input prices they face are lower compared with private firms, which is the same as in the case of an implicit tax. This results in *tougher* selection into the FDI market for SOEs, which leads to the same empirical predictions. We prove these results in Appendix C.

Second, we discuss the role played by fixed costs in our model. It is possible that various fixed costs (i.e., f_D, f_X, f_I) differ across firm type (i.e., state-owned or private). Some of the predictions of our model would be the same if we instead assumed that private firms (compared with SOEs) pay a higher fixed production cost and a higher fixed exporting cost, but a higher fixed FDI cost that is *not* too high. A higher fixed production cost and a higher exporting cost lead to tougher selection into the domestic market and into the exporting market for private firms. This is the same as the effect generated by the input price wedge in our model. Furthermore, since the fixed FDI cost is not too much higher for private firms,[30] these firms have a greater incentive to set up plants abroad and produce there. This situation leads to less tough selection into the FDI market for private firms. In total, Proposition 1 holds. However, since the difference in the fixed costs only matters for the extensive margin, the other predictions of our model do not hold under this alternative setup. In particular, it is no longer true that private MNCs allocate more output to the foreign market. It is also not true that conditional on the productivity draw, a new private MNC increases its firm size more than a new state-owned MNC. In other words, Proposition 4 does not hold. In short, these two setups are not equivalent. To the extent that all of the predictions of our model receive empirical support, we assume that there is an input price wedge.

Third, it might be true that there is a price wedge in the domestic product market as well. A difference in revenue tax is an example. However, we cannot generate the result of selection reversal with the existence of the output price wedge only. Under this alternative setup, selection into the domestic market is still tougher for private firms. However, there is no difference in terms of selection into the FDI market. This is because the cost (the increase in the fixed cost: $f_I - f_X$) and benefit (the change in the variable cost) of switching from an exporter to an MNC are the same for private and state-owned firms, conditioning on the productivity draw of φ. Therefore, we chose to introduce a wedge in the input price to set up our model.

Finally, we assume labor is the only factor used in production, although the evidence presented in Section 5.2 shows that the input price wedge mainly exists in the capital (or credit) market. We do

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[30]The exact condition is $f_I - f_X$ is smaller for private firms.

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not assume capital is the factor of production, since a model with capital usually entails dynamics and adjustment costs, which are beyond the scope of the current study. We alleviate this concern by presenting evidence using firm sales and capital stock (instead of employment) in some of our regressions and tables. Furthermore, if we introduced capital and labor into the Melitz (2003) model, in the Cobb-Douglas fashion (i.e., Bernard, Redding, and Schott 2007), and assumed private firms pay a higher domestic rental price of capital, the predictions of our model (on employment) would hold under this alternative setup, as the two factors are complements. In short, we chose labor to be the only factor of the economy for simplicity.

6 Quantification

In this section, we quantify the impact of the distortion in the domestic input market on patterns of outward FDI and aggregate productivity. To do this, we consider our model with two symmetric countries and calibrate the model to match several moments obtained from our firm-level data. In total, we need to back out the values of eight parameters (i.e., f_D, f_X, f_I, f_e, τ, c, k, σ) and normalize the wage rate in both countries to one.

We proceed with our calibration exercise in the following several steps; details of the calibration can be found in Appendix D. First, following the literature, we set σ to 4 (Bernard et al. 2003) and normalize the fixed cost of entry, f_e, to one.[31] Second, Table 2 shows that among non-exporting firms, the average productivity of private firms is roughly 20 percent higher than that of SOEs. (3.63/2.99 or 3.54/2.99). Since the average productivity premium for private non-exporting firms is $c(>1)$ under the Pareto assumption,[32] the value of c can be directly backed out as 1.2. Third, we use the coefficient obtained from the log rank-log size regression to back out the Pareto shape parameter, k. Since $\sigma = 4$ and the regression coefficient obtained from the regression is -1.091, we back out the value of k as $3.273 = (4 - 1) * 1.091$. Fourth, the share of exporting firms (16.11 percent) and the share of MNCs (0.325 percent) are used to back out the value of the fixed exporting cost and the value of fixed FDI cost: f_X and f_I, respectively. Fifth, average (domestic) firm size is used to back out the fixed production cost, f_D. Sixth, since the export intensity of exporting firms equals $\frac{1}{1+\tau^{\sigma-1}}$ and takes the value is 26.28 percent in our data, the implied variable trade cost, τ, is 1.41.[33] Finally, we assume that after entering the market

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[31]The value of f_e does not matter for our calibration and counterfactual analysis.

[32]We could separately identify c, since the minimum productivity draws (for private and state-owned firms) do not affect the ratio of average productivity of *active* private firms to that of *active* SOEs.

[33]The raw statistic shows that the export intensity of exporting firms is 0.63, which implies a variable trade cost less than one. It has been documented that about a half of exporting firms in China engage in processing trade (see Yu 2015), and they have extremely high export intensities. The productivities of such firms are even lower than those of non-exporters. These firms do not fit into the world of Melitz (2003). Therefore, we do not include exporters whose export intensities are greater than 0.7, when the share of exporting firms and the export intensity are calculated.

and receiving a productivity draw (i.e., φ), every firm randomly becomes either an SOE or a private firm. In other words, we have one free entry condition for all firms. We use this condition to pin down the mass of firms in equilibrium. Values for the moments obtained from the data and generated by the model are reported in Table 10.

We search the parameter space for the parameter values that match these moments. The objective function is a weighted sum of the square norms of the individual deviations (in percent) between the data and the model. We put extra weight on the moment of the share of MNCs,[34] since the key feature of our study is related to MNCs. Values of the calibrated parameters are reported in Table 11.

Two things are worth mentioning here. First, the calibrated model matches the targeted moments well. In particular, the implied share of MNCs from the calibrated model is 0.33 percent, which is close to the moment in the data (i.e., 0.325 percent). Second, the calibrated fixed cost of FDI is extremely high, because only 0.325 percent of the firms are MNCs in the data.

6.1 Counterfactual Analysis

After backing out values for all 10 parameters, we implement counterfactual analysis by reducing f_I by 50 percent for both countries and keeping all other parameters unchanged. The goal is to investigate how the level of distortion affects the share of MNCs and aggregate productivity. We consider a range of c from 1 to 1.2. When $c = 1$, there are no distortions in both countries.

Since $k < \sigma$, the weighted average of firm productivity (using employment as the weight) is undefined. Therefore, we use the un-weighted average of productivity of firms *producing* in a given country as our measure of the aggregate productivity of the economy.

Figure 2 (the upper half) shows that the share of MNCs is larger when two economies have more severe distortions. The lower part of Figure 2 shows that the increase in the share of MNCs is larger (after the 50 percent drop in fixed FDI cost) when the distortions are more severe. The two findings come from the observation that a larger fraction of private firms switches from exporting to engaging in FDI after f_I goes down, when distortions are more severe. Moreover, the quantitative magnitude is sizeable as well. After the fixed FDI cost goes down by half, the increase in the share of MNCs in the case with distortions (i.e., c = 1.2) is about 0.38 percent, while it is about 0.17 percent in the case without distortions (i.e., c = 1). The existence of the distortion *amplifies* the increase in the share of MNCs by 0.21 percentage points or 123 percent.[35]

[Insert Figure 2 Here]

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[34]The weight for this moment is 10 times as large as for all other moments.

[35]This value is obtained from $(0.38\% - 0.17\%)/0.17\% = 123\%$.

Figure 3 shows how the gain in aggregate productivity is affected by the level of distortions. As Figure 3 indicates, the increase in aggregate productivity is larger when distortions are more severe. This is because there is a larger increase in the share of MNCs (entering the foreign country) after the bilateral investment liberalization, when c (at home) is larger. Since these firms are the most productive ones, the increase in aggregate productivity in foreign (and at home) is amplified, when distortions are more severe at home (and in foreign). Finally, the quantitative magnitude is high as well. After the fixed FDI cost goes down by half, the increase in aggregate productivity in the case with distortions (i.e., $c = 1.2$) is about 1.7 percent, while it is about 1.04 percent in the case without distortions (i.e., $c = 1$). The existence of the distortion *amplifies* the increase in the un-weighted average of firm productivity by 0.66 percentage points or by roughly 63.5 percent.[36]

[Insert Figure 3 Here]

7 Concluding Remarks

In this study, we utilize data on Chinese MNCs to study how distortions (i.e., discrimination against private firms) in the domestic market affect firms' FDI decisions. We first document three puzzling stylized facts. First, private MNCs are *less* productive than state-owned MNCs, although private non-MNCs are more productive than state-owned non-MNCs. Second, SOEs are *less* likely to undertake FDI, although they are *larger* and receive various supports from the government for investing abroad. Third, the relative size of state-owned MNCs (compared with non-exporting firms) is larger than that of private MNCs.

We then build up a model to rationalize these findings and highlight a key channel through which distortions affect firms' FDI decisions. Distortions in the domestic market incentivize private firms to invest and produce abroad, which results in less tough selection into the FDI market for them. In addition, compared with state-owned MNCs, private MNCs allocate output disproportionately more in the foreign market, and their size increases disproportionately when they become MNCs. All the empirical predictions of the model receive support from the data.

We believe that this study is the start of our research on how outward FDI and MNCs from developing economies behave differently compared with those from developed economies. At the micro level, how these differences impact firm productivity and firm-level research and development is worth exploring in the near future. At the macro level, how these differences affect misallocation, aggregate TFP, and welfare is also worth investigating. At the same time, more and more data on developing economy MNCs are becoming available. This study reveals an important aspect of these firms' investment behavior.

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[36]This value is obtained from $(1.7\% - 1.04\%)/1.04\% = 63.5\%$.

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Table 1: FDI Share in Chinese Manufacturing Firms (2000-08)

Firm type	2000	2001	2002	2003	2004	2005	2006	2007	2008
(1) FDI starting firm-country-affiliates	22	20	69	81	241	1,067	1,212	1,532	1,715
(2) FDI accumulating firm-country-affiliates	155	175	244	325	566	1,633	2,845	4,377	6,092
(3) Mfg. firms	83,579	100,068	110,498	129,448	199,873	198,260	224,807	257,140	191,018
(4) FDI mfg. firm-country-affiliates	14	17	20	30	103	431	761	1,168	1,183
(5) SOE FDI mfg. firm-country-affiliates	3	3	3	4	4	18	22	29	18
(6) FDI share (%)	0.017	0.017	0.018	0.023	0.052	0.22	0.34	0.45	0.62
(7) SOE FDI share (%)	21.4	17.6	15.0	13.3	3.8	4.17	2.89	2.48	1.52
(8) FDI mfg. firms	5	6	9	20	56	276	524	836	761
(9) SOE FDI mfg. firms	1	2	2	2	3	12	19	23	17
(10) FDI share ($\%_{00}$)	0.59	0.60	0.82	1.55	2.80	13.9	23.3	32.5	39.8
(11) SOE FDI share (%)	20.0	33.3	22.2	10.0	5.35	4.34	3.62	2.75	2.23

Note: Data on FDI starting firms were obtained from the Ministry of Commerce of China and authors' calculations. FDI share in row (6) is obtained by dividing the number of FDI manufacturing firms (with many country-regions) by the number of manufacturing firms (i.e., (6) = (4)/(3)). SOE FDI share in row (7) is obtained by dividing the number of SOE FDI manufacturing firm-country-affiliates by the number of FDI manufacturing firm-country-affiliates (i.e., (7) = (5)/(4)). That is, if firm F invests in countries A and B, there will be two MNCs recorded by the Ministry of Commerce: firm F-A and firm F-B. Rows (8) and (9) instead only allow one-firm-one-record each year even if a firm invests in multiple countries in a given year. For example, we only record Firm F once as in the previous example. As a result, (10) = (8)/(3) and (11) = (9)/(8).

Table 2: Selection Reversal: State-Owned MNCs Are More Productive than Private MNCs

Category	Non-MNCs				MNCs		# of	# of	Fraction of
	domestic only		domestic+export		all firms	with exports	MNCs	All firms	MNCs
PSM Matching	unmatched	matched	unmatched	matched	unmatched	unmatched			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(i) Private firms	3.63	3.54	3.62	3.58	4.28	4.28	3,623	1,100,212	0.33%
(ii) SOE	2.99	2.99	3.05	3.05	4.48	4.76	104	40,612	0.25%
Difference=(i)-(ii)	0.63***	0.55***	0.57***	0.53***	-0.20*	-0.48***			
	(93.60)	(41.34)	(95.76)	(46.73)	(-1.67)	(-3.30)			

Note: Columns (1) and (2) show that private firms have higher TFP than SOEs among non-MNCs with only domestic sales. Columns (3) and (4) show that private firms have higher TFP than SOEs for non-FDI firms with domestic sales and exports. Columns (5) and (6) show that, on average, private MNCs are less productive than state-owned MNCs. This is consistent with part 1 of Proposition 1. Column (9) reports the fraction of MNCs that is obtained by dividing column (8) by column (7). Clearly, the share of MNCs is smaller among SOEs than among private firms, which is consistent with part 2 of Proposition 1. Firm size (i.e., log employment) and sales are used as covariates to obtain the propensity score. The numbers in parentheses are t-values. *** (**, *) denotes the significance at 1 percent (5 percent, 10 percent).

Table 3: Absolute Size Premium for SOEs

Category	Non-FDI exporting firms		FDI non-exporting firms		MNCs		Domestic sales of MNCs
Variable	Lnl	Sales	Lnl	Sales	Lnl	Sales	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(i) Private firms	5.19	60,703	4.73	181,713	5.77	3,110,883	1,874,675
(ii) SOE	6.88	130,238	6.55	549,485	8.29	11,130,681	10,347,231
Difference=(i)-(ii)	-1.69***	-69,535***	-1.82***	-367,772**	-2.52***	-8,019,798***	-8,472,556***
	(-140.8)	(-26.71)	(-7.85)	(-2.26)	(-14.14)	(-5.49)	(-8.48)
			Regressions				
SOE Indicator	1.566***	1.491***	1.795***	1.701***	2.400***	2.841***	3.727***
	(79.35)	(70.83)	(4.78)	(4.07)	(7.68)	(8.14)	(6.84)
Firm TFP	0.068***	0.550***	0.180***	0.683***	0.345***	0.807***	0.938***
	(21.56)	(163.30)	(4.41)	(15.03)	(7.61)	(15.95)	(11.51)
Year-specific Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	323,397	323,397	1,375	1,375	2,352	2,352	2,058
R-squared	0.07	0.21	0.15	0.33	0.16	0.31	0.21

Note: Columns (1) to (6) of the upper module show that private firms have lower sales and employment than SOEs for non-FDI exporting firms, FDI non-exporting firms, and MNCs, respectively. Column (7) in the upper module shows that domestic sales of private MNCs are smaller than those of state-owned MNCs. The lower module regresses firm size (in log employment) and firm sales on the SOE indicator while controlling for firm TFP, year-specific fixed effects, and firm-specific fixed effects. All the regressions show that SOEs are larger than private firms among non-FDI exporting firms, non-exporting MNCs, and MNCs. The results are consistent with the predictions of Proposition 2. The numbers in parentheses are *t*-values. *** (**, *) denotes significance at the 1 percent (5 percent, 10 percent) level.

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Table 4: Relative Size Premium for SOEs

Year coverage	Avg.	≤ 2001	≤ 2002	≤ 2003	≤ 2004	≤ 2005	≤ 2006	≤ 2007	≤ 2008
		relative size of MNCs to non-exporting firms (l_o/l_d)							
(1) Private Firms	4.50	4.59	4.59	4.56	4.54	4.53	4.52	4.51	4.50
(2) SOE	5.48	5.65	5.64	5.58	5.55	5.53	5.51	5.49	5.48
Size Difference=(1)-(2)	-0.97***	-1.06***	-1.05***	-1.02***	-1.01***	-1.00***	-0.99***	-0.98***	-0.98***
	(-488.1)	(-234.0)	(-283.5)	(-329.0)	(-374.1)	(-400.1)	(-430.4)	(-445.5)	(-466.6)
		relative size of exporting firms to non-exporting firms (l_e/l_d)							
(3) Private Firms	4.70	4.83	4.83	4.79	4.76	4.74	4.73	4.71	4.71
(4) SOE	5.79	5.98	5.96	5.90	5.86	5.85	5.82	5.80	5.79
Size Difference=(3)-(4)	-1.08***	-1.15***	-1.13***	-1.11***	-1.10***	-1.09***	-1.09***	-1.09***	-1.08***
	(-432.0)	(-200.2)	(-239.4)	(-289.4)	(-300.9)	(-365.1)	(-395.9)	(-425.8)	(-441.7)

Note:This table reports the difference in relative firm size between private MNCs and state-owned MNCs. Firm size is measured by log employment. The top module shows that the relative size of FDI firms to non-exporting firms is smaller for private firms than that for SOEs. The bottom module shows that the relative size of exporting firms to non-exporting firms is smaller for private firms than for SOEs as well. These findings are consistent with the predictions of Proposition 3 that relative size of MNCs and exporting firms is smaller for private firms than for SOEs. The numbers in parentheses are t-values. ***(**, *) denotes significance at the 1 percent (5 percent, 10 percent) level.

Table 5: Private Firms Are More Likely to Undertake FDI (2000-08)

Regressand: FDI Indicator	LPM	LPM	Probit	Logit	Complementary Log-Log	Rare Event Logit
Variable:	(1)	(2)	(3)	(4)	(5)	(6)
SOE Indicator	-0.002**	-0.003**	-0.268***	-0.703***	-0.628**	-0.975***
	(-2.09)	(-2.56)	(-2.66)	(-2.71)	(-2.56)	(-9.50)
Firm TFP	0.001***	0.001***	0.043**	0.140**	0.146**	0.493***
	(3.96)	(3.31)	(2.25)	(2.16)	(2.15)	(28.22)
Log Firm Labor	0.003***	0.003***	0.232***	0.606***	0.566***	0.535***
	(6.52)	(5.34)	(12.11)	(10.69)	(8.90)	(36.78)
Export Indicator	0.004***	0.006***	0.426***	1.150***	1.156***	1.154***
	(7.45)	(12.60)	(8.49)	(6.07)	(6.13)	(27.01)
Foreign Firms Dropped	No	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Number of Observations	1,140,824	899,910	898,800	898,800	898,800	899,910

Note: The regressand is the FDI indicator. All columns except column (1) include industry dummies at the 2-digit level and year dummies. Column (1) includes foreign-invested firms, whereas all other columns drop those firms. The numbers in parentheses are t-values clustered at the firm level. All the results are consistent with part 3 of Proposition 1: SOEs are less likely to be engaged in outward FDI than private firms. *** (**) denotes significance at the 1 percent (5 percent) level.

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Table 6: Distortions in Input Factors Markets

Regressand	Measured Firm Interest Rates			City Land Price			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SOE Indicator	-0.124***	-0.134*	-0.212*				
	(-2.58)	(-1.90)	(-1.75)				
SOE Intensity				-125.5***	-105.9**	-137.8**	-164.0***
				(-2.76)	(-2.08)	(-2.09)	(-3.27)
One Lag of SOE Intensity							
Other Firm Factors Controls	No	No	No	No	No	Yes	Yes
Year-specific Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Industry-specific Fixed Effects	No	Yes	Yes	No	Yes	Yes	Yes
City-specific Fixed Effects	No	No	No	No	No	Yes	Yes
Number of Obs.	1,119,454	1,119,454	1,119,446	547	547	547	507
R-squared	0.01	0.01	0.01	0.08	0.15	0.11	0.14

Note: The regressand in columns (1) to (3) is the firm-level interest rate calculated as the ratio of firm interest expenses to current liabilities. Column (1) is the simple OLS estimate, whereas column (2) controls for year-specific and industry-specific fixed effects. Column (3) adds other firm-characteristic controls such as firm TFP, log firm labor, foreign indicator, and export dummy as well as industry- and year-specific fixed effects. The SOE indicator is shown to be negative and statistically significant. The regressand in columns (4) to (6) is the city-level average price of land purchased by firms from the government. This is defined as the ratio of government's total land revenue to its land area in each prefectural city. The SOE intensity is defined as the number of SOEs divided by the number of total manufacturing firms within each prefectural city. Cities in which SOE intensity equals zero or one are dropped from the estimation. Column (4) controls for year-specific fixed effects only, while column (5) controls for year-specific and industry-specific fixed effects. Column (6) controls for cities' total land sales as well as city-specific, year-specific, and industry-specific fixed effects. The numbers in parentheses are *t*-values. *** (**, *) denotes significance at the 1 percent (5 percent, 10 percent) level.

Table 7: Ratio of Foreign Sales to Domestic Sales by MNCs

Regressand: Ratio of foreign sales to domestic sales	(1)	(2)	(3)	(4)
SOE Indicator	-46.03***	-46.54*	-55.27*	-54.33*
	(-2.82)	(-1.84)	(-1.84)	(-1.74)
Log Licence Cost				-0.48***
				(-2.38)
Year-specific Fixed Effects	No	Yes	Yes	Yes
Industry-specific Fixed Effects	No	No	Yes	Yes
Observations	246	246	246	229
R-squared	0.01	0.01	0.01	0.01

Note: The regressand in all columns is the ratio of Chinese foreign affiliates' sales to Chinese parent firm's sales. Data on foreign affiliates' sales are obtained from the ORBIS data set. As the amount of sales in the ORBIS data set is in US dollars, we convert it to Chinese RMB using the average exchange rate ($1 = RMB 8.05) during 2005–08. Log of license cost is used to proxy firm fixed investment cost in destination countries. The findings are consistent with part 1 of Proposition 4: the ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs. The numbers in parentheses are t-values clustered at firm level. *** (*) denotes significance at the 1 percent (10 percent) level.

Table 8: Change in Firm Size in Response to Investment Liberalization

| Regressand: | FDI firms total sales | | FDI firm's total capital | |
| Type of FDI: | (using ORBIS data) | | FDI firms | Production FDI |
	(1)	(2)	(3)	(4)
Log License Costs	-0.004*	-0.005**	-0.002*	-0.002***
	(-1.79)	(-2.11)	(-1.86)	(-3.17)
Log License Costs× SOE Indicator		0.014*		
		(1.79)		
Log License Costs			0.100*	0.098*
× State-capital Intensity			(1.64)	(1.65)
Year-specific Fixed Effects	Yes	Yes	Yes	Yes
Industry-specific Fixed Effects	Yes	Yes	Yes	Yes
Year × Industry Fixed Effects	Yes	Yes	No	No
Observations	229	229	180	32
R-squared	0.45	0.50	0.04	0.05

Note: The regressand in columns (1) and (2) is the sum of Chinese parent firm's sales and its foreign affiliate's sales. Data on foreign affiliate's sales are obtained from the ORBIS data set. As the amount of FDI volume is in US dollars, we convert it to Chinese RMB using the average exchange rate ($1 = RMB 8.05) during 2005–08. The estimates in columns (1) and (2) include a full set of industry (2-digit level)-year interacted dummies. The regressand in columns (3) and (4) is FDI firm's total capital stock which is the sum of firm's foreign direct investment and its Chinese parent firm's fixed capital stock. FDI firms from Zhejiang province during 2006–08 are used as observations. License costs in destination countries are used to proxy firm's fixed costs of doing FDI in destination countries. The data were obtained from the Doing Business Project (2008). State-capital intensity is defined by the ratio of firm's state capital divided by its total capital (including capital from state, collective, private, and foreign sources). The empirical findings from this table are consistent with part 2 of Proposition 4: firm size increases more for private firms than for SOEs after the fixed FDI cost drops in the destination country. The numbers in parentheses are t-values and clustered at the firm level. *** (**, *) denotes significance at the 1 percent (5 percent, 10 percent) level.

Table 9: Difference in FDI Size Premium

Regressand	FDI relative size $(l_o/l_d)_{jt}$			Difference in FDI relative size $(l_o/l_d)^{SOE}_{jt} - (l_o/l_d)^{PRI}_{jt}$			Ratio in FDI relative size $(l_o/l_d)^{SOE}_{jt}/(l_o/l_d)^{PRI}_{jt}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Industrial Interest Rates (r_{jt})	–	-8.417**	-8.143*	–	–	–	–	–
		(-2.31)	(-1.74)					
Difference in Ind. Interest Rates ($r^{SOE}_{jt} - r^{PRIVATE}_{jt}$)	–	–	–	-0.029**	-0.025*	-0.044*	–	–
				(-2.17)	(-1.81)	(-1.70)		
Ratio in Ind. Interest Rates ($r^{SOE}_{jt}/r^{PRIVATE}_{jt}$)	–	–	–	–	–	–	-0.001	-0.034*
							(-1.23)	(-1.77)
Industrial SOE Intensity	1.354***	–	1.373**	–	–	–	–	–
	(2.63)		(2.06)					
Industrial Relative TFP			-0.166		0.085*	-0.467	-0.577***	-0.065
			(-0.76)		(1.86)	(-1.12)	(-3.37)	(-0.15)
Year-specific Fixed Effects	Yes	Yes	Yes	No	No	No	No	Yes
2-digit Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	–	Yes	–
4-digit Industry Fixed Effects	No	No	No	No	No	Yes	No	Yes
Number of Obs.	160	160	160	147	147	205	147	205
R-squared	0.65	0.66	0.69	0.97	0.97	0.87	0.91	0.88

Notes: Columns (1) to (3) regress CIC 2-digit level industrial FDI relative size $(l_o/l_d)_{jt}$ on industrial interest rate (defined as the ratio of industry-average interest expenses to its current liability) and industrial SOE intensity (defined as the number of SOEs divided by the number of total manufacturing firms within each industry). Columns (4) to (6) regress the difference in relative size of FDI firms at the industry level $(l_o/l_d)^{SOE}_{jt} - (l_o/l_d)^{PRI}_{jt}$ on the difference in industrial interest rates $(r^{SOE}_{jt} - r^{PRIVATE}_{jt})$. Columns (7) and (8) regress the ratio of relative size of FDI firms at the industry level $(l_o/l_d)^{SOE}_{jt}/(l_o/l_d)^{PRI}_{jt}$ on the ratio of industrial interest rates $(r^{SOE}_{jt}/r^{PRIVATE}_{jt})$. Columns (3) and (5)-(8) control average TFP at the industry level. Industries in columns (1) to (5), and (7) are defined at the CIC 2-digit level, while those in columns (7) and (8) are defined at CIC 4-digit level. Columns (1) to (3) show that the FDI size premium becomes larger (at the industry level), when input costs such as the interest rate fall at the industry level, or the share of SOEs increases. Columns (4) to (8) show that the difference in or the ratio of the relative FDI size premium (between SOEs and private firms) decreases, when the (negative) gap in interest rates (paid by SOEs and private firms) shrinks or the ratio of interest rates (less than one) increases. This is consistent with part 3 of Proposition 4. The numbers in parentheses are t-values. ***(**, *) denotes significance at the 1 percent (5 percent, 10 percent) level.

Table 10: *Moments from the Data and the Model*

	Data	Model
Pareto shape parameter	-1.091	-1.091
Ratio of average productivity	1.2	1.2
Share of exporters	16.11%	16.11%
Export intensity of exporting firms	26.28%	26.29%
Average employment	265	265.00
Share of MNCs	0.325%	0.33%

Table 11: *Parameter Values*

	Value	Sources
σ	4	Bernard et al. (2003)
f_e	1	normalization
$\varphi_{min,SOE}$	1	normalization
$\varphi_{min,private}$	1	normalization
k	3.273	Calculated
c	1.2	Calculated
τ	1.41	Calculated
f_X	8.975	Calibrated
f_D	4.809	Calibrated
f_I	1215.26	Calibrated

Figure 1: Selection Reversal

SOEs: $\overline{\phi}_{SD}$ $\overline{\phi}_{SX}$ $\overline{\phi}_{SO}$ ϕ

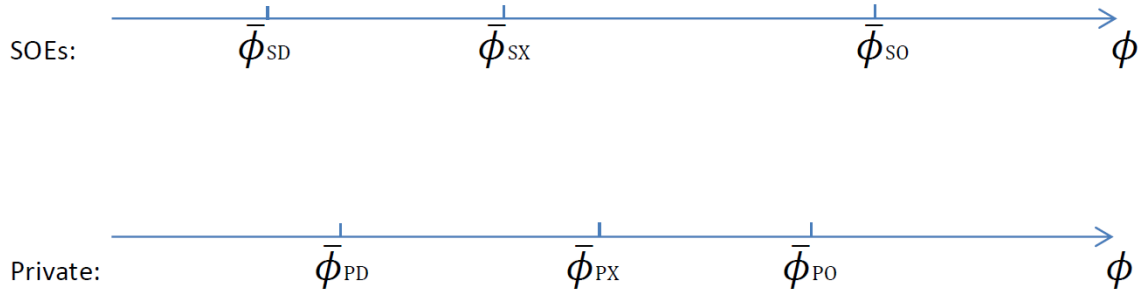Private: $\overline{\phi}_{PD}$ $\overline{\phi}_{PX}$ $\overline{\phi}_{PO}$ ϕ

Figure 2: Distortions and the Share of MNCs
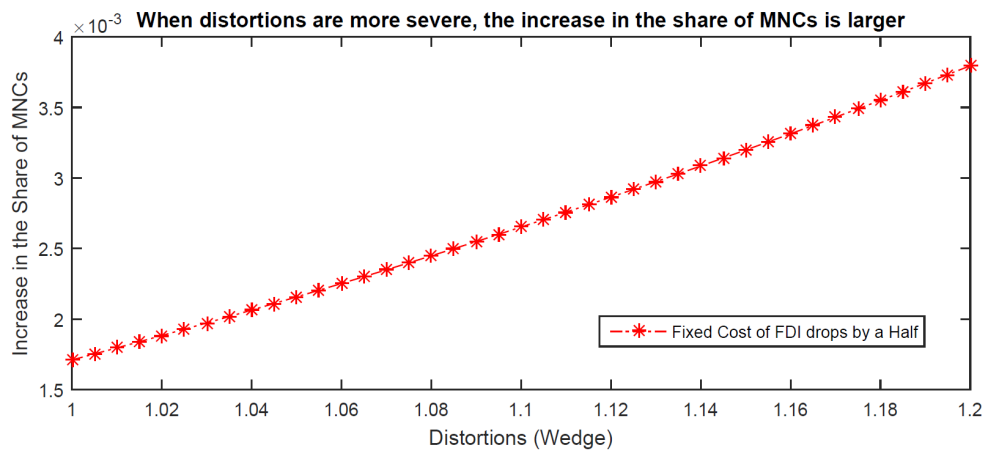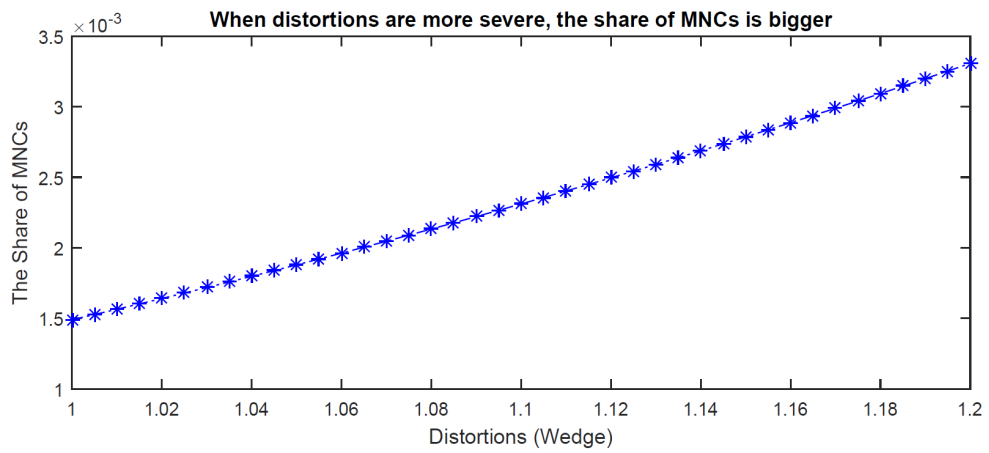
Figure 3: Distortions and Gains in Aggregate Productivity

When distortions are more severe, increase in aggregate productivity is bigger
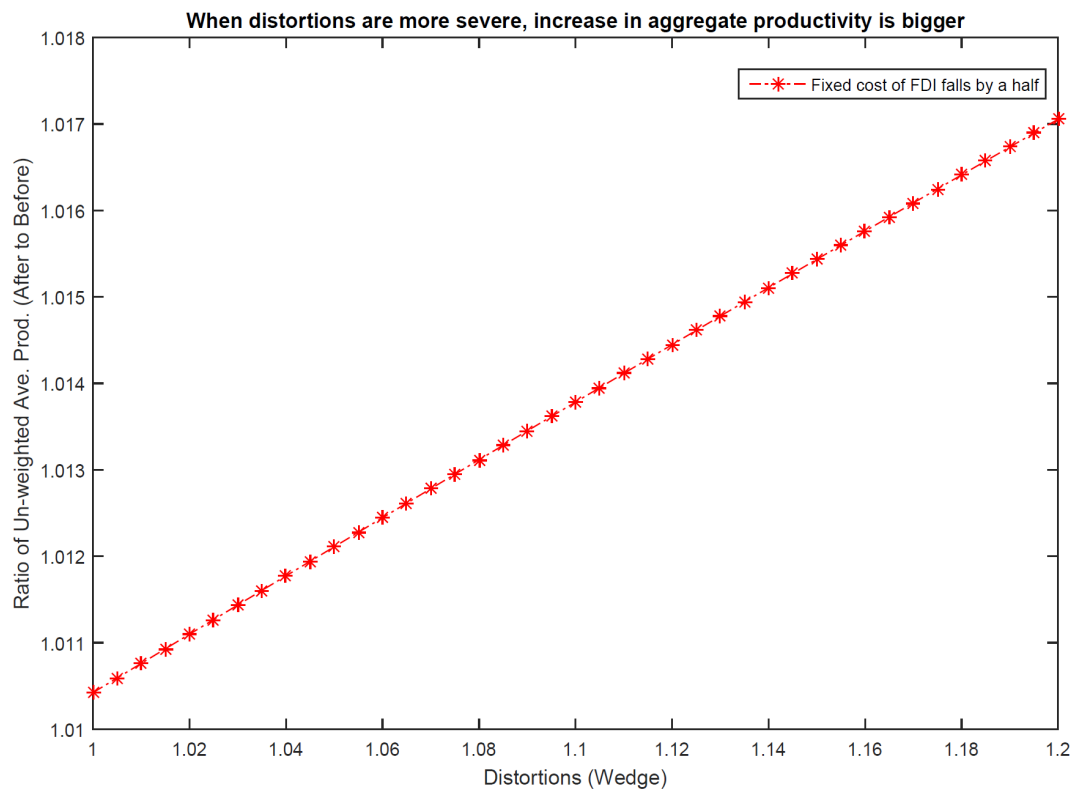
8 Appendix: Not For Publication

8.1 Appendix A: Data Description

This appendix draws heavily on Tian and Yu (2015).

FDI Decision Data. The nationwide data set of Chinese firms' FDI decisions was obtained from the Ministry of Commerce of China (MOC). MOC requires every Chinese MNC to report its detailed investment activity since 1980. To invest abroad, every Chinese firm is required by the government to apply to the MOC and its former counterpart, the Ministry of Foreign Trade and Economic Cooperation of China, for approval and registration. MOC requires such firms to provide the following information: the firm's name, the names of the firm's foreign subsidiaries, the type of ownership (i.e., state-owned enterprise (SOE) or private firm), the investment mode (e.g., trading-oriented affiliates, mining-oriented affiliates), and the amount of foreign investment (in U.S. dollars). Once a firm's application is approved by MOC, MOC will release the information mentioned, as well as other information, such as the date of approval and the date of registration abroad, to the public. All such information is available except the amount of the firm's investment, which is considered to be confidential information.

Since 1980, MOC has released information on new MNCs every year. Thus, the nationwide FDI decision data report FDI starters by year. The database even reports specific modes of investment: trading office, wholesale center, production affiliate, foreign resource utilization, processing trade, consulting service, real estate, research and development center, and other unspecified types. Here trading offices and wholesale centers are classified as distribution FDI, whereas the rest are referred to as non-distribution FDI. However, since this data set does not report firms' FDI flows, researchers are not able to explore the intensive margin of firm FDI with this data set.

FDI Flow Data. To explore the intensive margin, we use another data set, which is compiled by the Department of Commerce of Zhejiang province. The most novel aspect of this data set is that it includes data on firms' FDI flows (in current U.S. dollars). The data set covers all firms with headquarters located (and registered) in Zhejiang and is a short, unbalanced panel from 2006 to 2008. In addition to the variables covered in the nationwide FDI data set, the Zhejiang data set provides each firm's name, city where it has its headquarters, type of ownership, industry classification, investment destination countries, and stock share from its Chinese parent company.

Although this data set seems ideal for examining the role of the intensive margin of firm FDI, the disadvantage is also obvious: the data set is for only one province in China.[37] Regrettably, as is the case for many other researchers, we cannot access similar databases from other provinces. Still, as discussed in Appendix C, we believe that Zhejiang's firm-level FDI flow data are a good proxy for understanding the universal Chinese firm's FDI flows. In particular, the FDI flows from Zhejiang province are outstanding in the whole of China; the distribution of both types of ownership and that of Zhejiang's MNCs' destinations and industrial distributions are similar to those for the whole of China.

Firm-Level Production Data. Our last database is the firm-level production data compiled by China's National Bureau of Statistics in an annual survey of manufacturing enterprises. The data set covers around 162,885 firms in 2000 and 410,000 firms in 2008 and, on average, accounts for 95 percent of China's total annual output in all manufacturing sectors. The data set includes two types of manufacturing firms: universal SOEs and non-SOEs whose annual sales are more than RMB 5 million (or equivalently $830,000 under the current exchange rate). The data set is particularly useful for calculating measured total factor productivity (TFP), since the data set provides more than 100 firm-level variables listed in the main accounting statements, such as sales, capital, labor, and intermediate inputs.

As highlighted by Feenstra et al. (2014) and Yu (2015), some samples in this firm-level production data set are noisy and somewhat misleading, largely because of mis-reporting by some firms. To guarantee that our estimation sample is reliable and accurate, we screen the sample and omit outliers by adopting the following criteria. First, we eliminate a firm if its number of employees is less than eight workers, since otherwise such an entity would be identified as self-employed. Second, a firm is included only if its key financial variables (e.g., gross value of industrial output, sales, total assets, and net value of fixed assets) are present. Third, we include firms based on the requirements of the Generally Accepted Accounting Principles.[38]

Data Merge. We then merge the two firm-level FDI data sets (i.e., nationwide FDI decision data and Zhejiang's FDI flow data) with the manufacturing production database. Although the two data sets share a common variable—the firm's identification number—their coding systems are completely different. Hence, we use alternative methods to merge the three data sets. The matching procedure involves three steps. First, we match the three data sets (i.e., firm production data, nationwide FDI decision data, and Zhejiang FDI flow data) by using each firm's Chinese name and year. If a firm has an exact Chinese name in a particular year in all three data sets, it is considered an identical firm. Still, this method could miss some firms since the Chinese name for an identical company may not have the exact Chinese characters in the two data sets, although they share some common strings.[39] Our second step is to decompose a firm name into several strings referring to its location, industry,

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[37]To our knowledge, almost all previous work was not able to access nationwide universal outward FDI flow data. An outstanding exception is Wang et al. (2012), who use nationwide firm-level outward FDI data to investigate the driving force of the outward FDI of Chinese firms. However, the study uses data only from 2006 to 2007; hence, it cannot explore the possible effects of the financial crisis in 2008.

[38]In particular, an observation is included in the sample only if the following observations hold: (1) total assets are greater than liquid assets; (2) total assets are greater than the total fixed assets and the net value of fixed assets; (3) the established time is valid (i.e., the opening month should be between January and December); and (4) the firm's sales must be greater than the required threshold of RMB 5 million.

[39]For example, "Ningbo Hangyuan communication equipment trading company" shown in the FDI data set and "(Zhejiang) Ningbo Hangyuan communication equipment trading company" shown in the National Bureau of Statistics of China production

business type, and specific name. If a company has all identical strings, such a firm in the three data sets is classified as an identical firm.[40] Finally, to avoid possible mistakes, all approximate string-matching procedures are done manually.

8.2 Appendix B: Proofs

For future use, we derive operating profit for exporting SOEs and multinational SOEs as:

$$\pi_{SX}(\varphi) = \frac{1}{\sigma}\Big(\frac{\beta\varphi}{w_H}\Big)^{\sigma-1}D_H + \frac{1}{\sigma}\Big(\frac{\beta\varphi}{\tau w_H}\Big)^{\sigma-1}D_F \tag{17}$$

and

$$\pi_{SO}(\varphi) = \frac{1}{\sigma}\Big(\frac{\beta\varphi}{w_H}\Big)^{\sigma-1}D_H + \frac{1}{\sigma}\Big(\frac{\beta\varphi}{w_F}\Big)^{\sigma-1}D_F. \tag{18}$$

For private firms, they are

$$\pi_{PX}(\varphi) = \frac{1}{\sigma}\Big(\frac{\beta\varphi}{cw_H}\Big)^{\sigma-1}D_H + \frac{1}{\sigma}\Big(\frac{\beta\varphi}{\tau cw_H}\Big)^{\sigma-1}D_F \tag{19}$$

and

$$\pi_{PO}(\varphi) = \frac{1}{\sigma}\Big(\frac{\beta\varphi}{cw_H}\Big)^{\sigma-1}D_H + \frac{1}{\sigma}\Big(\frac{\beta\varphi}{w_F}\Big)^{\sigma-1}D_F \tag{20}$$

respectively.

8.2.1 Proof for Proposition 1

Proof: Part one comes from the discussion in the main text.
For part two, under the Pareto assumption, the fraction of MNCs among SOEs is

$$\Big(\frac{\bar{\varphi}_{SD}}{\bar{\varphi}_{SO}}\Big)^k,$$

while it is

$$\Big(\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{PO}}\Big)^k$$

for private firms. The share of MNCs is higher among private firms than among SOEs, since

$$\bar{\varphi}_{SD} < \bar{\varphi}_{PD}$$

and

$$\bar{\varphi}_{SO} > \bar{\varphi}_{PO}.$$

In addition, under the Pareto assumption, the (simple) average productivity of firms with productivity draws above φ_0 only depends on φ_0 and increases in it. Therefore, average productivity of private MNCs

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data set are the same company but do not have exactly the same Chinese characters.

[40]In the example, the location fragment is "Ningbo," the industry is "communication equipment," the business type is "trading company," and the specific name is "Hangyuan."

is less than that of state-owned MNCs, and the average productivity of active private firms is greater than that of active state-owned firms. Furthermore, since

$$\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}} = \frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}}$$

and

$$\bar{\varphi}_{PD} > \bar{\varphi}_{SD},$$

the average productivity of private non-exporting firms is greater than that of non-exporting SOEs. This completes the proof for part two.

Part three is true, since $\bar{\varphi}_{SO} > \bar{\varphi}_{PO}$.

8.2.2 Proof for Proposition 2

Proof: First, since φ follows the Pareto distribution with the same parameter, we only need to compare firm size of the marginal SOE (i.e., at the FDI cutoff) with the marginal private firm. For the marginal SOE that has the draw of $\bar{\varphi}_{SO}$ and the marginal private firm that has the draw of $\bar{\varphi}_{PO}$, domestic sales are

$$S(\bar{\varphi}_{SO})_{dom} = \sigma w_H f_D \left(\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}}\right)^{\sigma-1}$$

and

$$S(\bar{\varphi}_{PO})_{dom} = \sigma w_H f_D \left(\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PD}}\right)^{\sigma-1},$$

since

$$S(\bar{\varphi}_{PD})_{dom} = S(\bar{\varphi}_{SD})_{dom} = \sigma w_H f_D.$$

As

$$\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PD}} < \frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}},$$

we must have

$$S(\bar{\varphi}_{SO})_{dom} > S(\bar{\varphi}_{PO})_{dom}.$$

Therefore, average domestic sales of private MNCs are less than those of state-owned MNCs.

Second, for all firms, β is the fraction of revenue that is paid to inputs used in the variable cost, and the input price private firms pay domestically is higher than what SOEs pay. Therefore, average employment or capital stock (depending on which input the firm uses) of private MNCs is also smaller than that of state-owned MNCs. Moreover, the difference in average employment between private MNCs and state-owned MNCs is bigger than that in average sales, since private firms pay a greater input price.

Third, since private firms and SOEs face the same market condition and pay the same input price when producing abroad, and $\bar{\varphi}_{SO} > \bar{\varphi}_{PO}$, we must have

$$S(\bar{\varphi}_{SO})_{for} > S(\bar{\varphi}_{PO})_{for},$$

where $S(.)_{for}$ refers to foreign sales. Since φ follows a Pareto distribution with the same shape parameter (for private firms and SOEs), average foreign sales and employment of private MNCs are smaller than the average foreign sales and employment of state-owned MNCs. As total sales (or employment) equals the sum of domestic sales (or employment) and foreign sales (or employment), the average overall firm size of private MNCs are less than those of state-owned MNCs.

Finally, since $\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}} = \frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}}$ and $S(\bar{\varphi}_{SD}) = S(\bar{\varphi}_{PD})$, the marginal exporting SOE and the marginal private exporting firm have the same domestic sales. Moreover, the total sales of a private firm with the productivity draw of $\bar{\varphi}_{PX}$ are

$$S(\bar{\varphi}_{PD})_{dom}\left(\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}}\right)^{\sigma-1}\left(1 + \frac{D_F}{\tau^{\sigma-1}D_H}\right),$$

while total sales are

$$S(\bar{\varphi}_{SD})_{dom}\left(\frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}}\right)^{\sigma-1}\left(1 + \frac{D_F}{\tau^{\sigma-1}D_H}\right)$$

for an SOE with the productivity draw of $\bar{\varphi}_{SX}$. Therefore, they also have the same overall sales. Moreover, since $\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PX}} < \frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SX}}$ and the productivity draw follows a Pareto distribution with the same shape parameter, average sales of private exporting firms is smaller than that of exporting SOEs. Since private non-MNCs pay a higher input price, average employment of private exporting firms is smaller than that of exporting SOEs as well.

8.2.3 Proof for Proposition 3

Proof: The key observation is that average sales of non-exporting SOEs equal those of private non-exporting firms. To see this, first note that the marginal SOE and the marginal private firm have the same sales:

$$S(\bar{\varphi}_{SD})_{dom} = S(\bar{\varphi}_{PD})_{dom} = \sigma w_H f_D.$$

Furthermore, since the draw of φ follows the Pareto distribution and

$$\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}} = \frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}},$$

the average sales of non-exporting SOEs equals the average sales of private non-exporting firms. As the average sales of exporting SOEs are greater, the ratio of average sales of exporters to those of non-exporters is greater for SOEs. Furthermore, among private firms or SOEs, exporting and non-exporting firms pay the same factor price and have the same share of revenue (i.e., β) that is paid to the inputs. Therefore, the ratio of the average employment of exporters to that of non-exporters is also greater for SOEs than for private firms.

Next, we discuss how the relative size of MNCs varies across the type of ownership. First, as shown by Proposition 2, average domestic sales of private MNCs are less than those of state-owned FDI firms. Therefore, the ratio of average sales of MNCs' domestic subsidiaries to that of non-exporting firms is also greater for SOEs than for private firms. Second, domestic subsidiaries of private MNCs face the same factor price as private non-exporting firms. Thus, the ratio of average domestic employment between the two types of firms is the same as the ratio of average domestic sales (between the two types of firms). Similarly, domestic subsidiaries of state-owned MNCs face the same factor price as non-exporting SOEs. Thus, the ratio of average domestic employment (between the two types of firms) is the same as the ratio of average domestic sales (between the two types of firms). Therefore, the ratio of average domestic employment of MNCs to that of non-exporting firms is higher for SOEs than for private firms.

Finally, Proposition 2 also shows that average foreign employment of multinational private firms is less than that of multinational SOEs. Therefore, the ratio of average foreign employment of MNCs to that of non-exporting firms is smaller for private firms. In total, we have the result that relative global employment of private MNCs is less than that of state-owned multinational firms.

8.2.4 Proof for Proposition 4

Proof: Comparing equation (18) with equation (20) and noticing that overall sales are proportional to operating profit, we know that the ratio of foreign sales to domestic sales is higher for private MNCs (than for state-owned MNCs) conditioning on φ. This proves the first part of this proposition.

For the second part of the proposition, there are three cases to consider. The first case is the case in which both firms are non-exporters before the reduction in $w_H f_I$. Equations (5), (18) and (20) together imply that

$$\frac{\pi_{PO}(\varphi)}{\pi_{PD}(\varphi)} > \frac{\pi_{SO}(\varphi)}{\pi_{SD}(\varphi)},$$

which is what we need to prove (remember overall sales are proportional to the operating profit). The next case is the case in which both firms are exporters before the reduction of $w_H f_I$. In this case, equations (17) to (20) also imply that

$$\frac{\pi_{PO}(\varphi)}{\pi_{PX}(\varphi)} > \frac{\pi_{SO}(\varphi)}{\pi_{SX}(\varphi)}.$$

Therefore, after the two firms undertake FDI, the increase in overall firm size is greater for the new private MNC than for the new state-owned FDI firm.

The final case to consider is the case in which the SOE is an exporter and the private firm is a non-exporter before the reduction of the fixed FDI cost. In this case, we have

$$\frac{\pi_{PO}(\varphi)}{\pi_{PD}(\varphi)} > \frac{\pi_{PO}(\varphi)}{\pi_{PX}(\varphi)} > \frac{\pi_{SO}(\varphi)}{\pi_{SX}(\varphi)},$$

since $\pi_{PX}(\varphi) > \pi_{PD}(\varphi)$. Therefore, after the two firms undertake FDI, the increase in overall firm size is bigger for the new private MNC (than for the new state-owned MNC), conditioning on φ. In total, the second part of this proposition is true for all possible cases.

We discuss the third part of this proposition now. First since each sector is small relative to the economy, any change in c in each sector level does not affect equilibrium wages (i.e., w_H and w_F). Next, the relative size of private MNCs (relative to private non-exporting firms) is

$$\frac{Ave(empl)_{PO,dom}}{Ave(empl)_{PD,dom}} = \frac{Ave(Sales)_{PO,dom}}{Ave(Sales)_{PD,dom}} = \left(\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PD}}\right)^{\sigma-1} \frac{1}{1 - \left(\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{PX}}\right)^{k-(\sigma-1)}},$$

where *dom* refers to domestic employment or sales. Similarly, the relative size of state-owned MNCs (relative to state-owned non-exporting firms) is

$$\frac{Ave(empl)_{SO,dom}}{Ave(empl)_{SD,dom}} = \frac{Ave(Sales)_{SO,dom}}{Ave(Sales)_{SD,dom}} = \left(\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}}\right)^{\sigma-1} \frac{1}{1 - \left(\frac{\bar{\varphi}_{SD}}{\bar{\varphi}_{SX}}\right)^{k-(\sigma-1)}}.$$

Note that

$$\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}} = \frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}}.$$

Therefore, the ratio of the relative (domestic) size of state-owned MNCs to that of private MNCs can be

expressed as

$$\frac{Ave(empl)_{SO,dom}/Ave(empl)_{SD,dom}}{Ave(empl)_{PO,dom}/Ave(empl)_{PD,dom}} = \frac{\left(\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}}\right)^{\sigma-1}}{\left(\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PD}}\right)^{\sigma-1}} = \frac{(\tau w_H c)^{\sigma-1} - w_f^{\sigma-1}}{(\tau w_H)^{\sigma-1} - w_f^{\sigma-1}},$$

which increases in c, conditioning on w_H and w_F.

Finally, we know the ratio of the two relative size increases after c increases. This directly leads to the result that

$$\ln\left[\frac{Ave(empl)_{SO,dom}}{Ave(empl)_{SD,dom}}\right] - \ln\left[\frac{Ave(empl)_{PO,dom}}{Ave(empl)_{PD,dom}}\right] = \ln\left[\frac{Ave(empl)_{SO,dom}/Ave(empl)_{SD,dom}}{Ave(empl)_{PO,dom}/Ave(empl)_{PD,dom}}\right]$$

increases in c, since $\frac{Ave(empl)_{SO,dom}/Ave(empl)_{SD,dom}}{Ave(empl)_{PO,dom}/Ave(empl)_{PD,dom}}$ is greater than zero and increases with c.

8.3 Appendix C: A World with the Subsidy

In this appendix, we consider a world in which SOEs receive a subsidy when they use inputs to produce at home, while there is no such subsidy when they produce abroad and when private firms produce domestically. Specifically, we assume that the government subsidizes a fraction, $1 - b$, of the unit input price to SOEs when they produce at home. The fraction of the subsidy, $1 - b$, is assumed to be between zero and one. As a result, the total variable cost becomes:

$$\frac{(q_H + I_{\{q_E>0\}}\tau q_E)[1 - I_{\{SOE\}}(1 - b)]w_H}{\varphi} + I_{\{q_F>0\}}\frac{q_F w_F}{\varphi}, \tag{21}$$

where $I_{\{SOE\}}$ is an indicator function for SOEs. For SOEs, the operating profit functions are

$$\pi_{SD}(\varphi) = \frac{1}{\sigma}\left(\frac{\beta\varphi}{bw_H}\right)^{\sigma-1}D_H, \tag{22}$$

$$\pi_{SX}(\varphi) = \frac{1}{\sigma}\left(\frac{\beta\varphi}{bw_H}\right)^{\sigma-1}D_H + \frac{1}{\sigma}\left(\frac{\beta\varphi}{\tau bw_H}\right)^{\sigma-1}D_F \tag{23}$$

and

$$\pi_{SO}(\varphi) = \frac{1}{\sigma}\left(\frac{\beta\varphi}{bw_H}\right)^{\sigma-1}D_H + \frac{1}{\sigma}\left(\frac{\beta\varphi}{w_F}\right)^{\sigma-1}D_F. \tag{24}$$

For private firms, they are

$$\pi_{PD}(\varphi) = \frac{1}{\sigma}\left(\frac{\beta\varphi}{w_H}\right)^{\sigma-1}D_H, \tag{25}$$

$$\pi_{PX}(\varphi) = \frac{1}{\sigma}\left(\frac{\beta\varphi}{w_H}\right)^{\sigma-1}D_H + \frac{1}{\sigma}\left(\frac{\beta\varphi}{\tau w_H}\right)^{\sigma-1}D_F \tag{26}$$

and

$$\pi_{PO}(\varphi) = \frac{1}{\sigma}\left(\frac{\beta\varphi}{w_H}\right)^{\sigma-1}D_H + \frac{1}{\sigma}\left(\frac{\beta\varphi}{w_F}\right)^{\sigma-1}D_F. \tag{27}$$

Based on equations (22) to (27), we can derive the six cutoffs as

$$\bar{\varphi}_{PD} = \frac{w_H(\sigma w_H f_D/D_H)^{\frac{1}{\sigma-1}}}{\beta}, \tag{28}$$

$$\bar{\varphi}_{PX} = \frac{\tau w_H(\sigma w_H f_X/D_F)^{\frac{1}{\sigma-1}}}{\beta}, \tag{29}$$

$$\bar{\varphi}_{PO} = \left[\frac{\sigma(w_H f_I - w_H f_X)/D_F}{\frac{\beta^{\sigma-1}}{w_F^{\sigma-1}} - \frac{\beta^{\sigma-1}}{(\tau w_H)^{\sigma-1}}}\right]^{\frac{1}{\sigma-1}}, \tag{30}$$

$$\bar{\varphi}_{SD} = \frac{b w_H(\sigma w_H f_D/D_H)^{\frac{1}{\sigma-1}}}{\beta}, \tag{31}$$

$$\bar{\varphi}_{SX} = \frac{b \tau w_H(\sigma w_H f_X/D_F)^{\frac{1}{\sigma-1}}}{\beta} \tag{32}$$

and

$$\bar{\varphi}_{SO} = \left[\frac{\sigma(w_H f_I - w_H f_X)/D_F}{\frac{\beta^{\sigma-1}}{w_F^{\sigma-1}} - \frac{\beta^{\sigma-1}}{(\tau b w_H)^{\sigma-1}}}\right]^{\frac{1}{\sigma-1}}. \tag{33}$$

respectively. Note that we need a high enough fixed exporting cost and a high enough FDI cost (i.e., $f_I \gg f_X \gg f_D$ and $\tau b w_H > w_F$) to ensure the sorting patterns of domestic, exporting and multinational firms (i.e., $\bar{\varphi}_{iO} > \bar{\varphi}_{iX} > \bar{\varphi}_{iD}$) where $i \in \{P, S\}$. It is straightforward to show that

$$\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}} = \frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}},$$

$$\bar{\varphi}_{SD} = b\bar{\varphi}_{PD} < \bar{\varphi}_{PD},$$

and

$$\bar{\varphi}_{PO} < \bar{\varphi}_{SO}.$$

Now we show that all four propositions we have established still hold in a world with subsidy. These four propositions are proved exactly the same as in Appendix B, and we only emphasize several key steps for the proofs to save space. First, Proposition 1 is true, since equations (12) to (14) still hold. That is, we still have the result of selection reversal, and SOEs are less likely to become MNCs. Second, Proposition 2's results on firm sales are still true, since the following equalities and inequalities still hold:

$$S(\bar{\varphi}_{SO})_{dom} > S(\bar{\varphi}_{PO})_{dom},$$

$$S(\bar{\varphi}_{SO})_{for} > S(\bar{\varphi}_{PO})_{for},$$

$$S(\bar{\varphi}_{SD}) = S(\bar{\varphi}_{PD}),$$

$$S(\bar{\varphi}_{SX}) = S(\bar{\varphi}_{PX})$$

and

$$\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PX}} < \frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SX}}.$$

That is, exporting SOEs (and state-owned MNCs) have greater sales than private exporting firms (and private MNCs) on average. In addition, since SOEs pay a lower input price when they produce domestically, Proposition 2's results on firm employment are also true under the current setup. That is, exporting SOEs (and state-owned MNCs) employ more workers than private exporting firms (and private MNCs) on average. Third, Proposition 3's results on relative sales of exporting (and multinational) firms are still true, since the average sales of non-exporting SOEs and the average sales of private non-exporting firms are still the same. That is, (compared with non-exporting firms) exporting SOEs (and state-owned MNCs) have relatively greater sales than private exporting firms (and private MNCs) on average. In addition, for each type of firms (i.e., private or state-owned), since exporting and non-exporting firms pay the same factor price, the ratio of the average employment of exporters to that of non-exporters is also higher for SOEs than for private firms. Furthermore, for each type of firms, domestic subsidiaries of MNCs face the same factor price as non-exporting firms. Therefore, the ratio of average domestic employment of MNCs to that of non-exporting firms is higher for SOEs than for private firms.

   Finally, we discuss Proposition 4. Comparing equation 24 with equation 27 and noticing that overall sales are proportional to operating profit, we know that the ratio of foreign sales to domestic sales is higher for private MNCs (than for state-owned MNCs), conditioning on φ. This proves the first part of this proposition. Second, conditional on φ, the firm size of a new private MNC increases more than that of a new state-owned MNC, as the following inequalities are still true:

$$\frac{\pi_{PO}(\varphi)}{\pi_{PD}(\varphi)} > \frac{\pi_{SO}(\varphi)}{\pi_{SD}(\varphi)},$$

$$\frac{\pi_{PO}(\varphi)}{\pi_{PX}(\varphi)} > \frac{\pi_{SO}(\varphi)}{\pi_{SX}(\varphi)}.$$

and

$$\frac{\pi_{PO}(\varphi)}{\pi_{PD}(\varphi)} > \frac{\pi_{PO}(\varphi)}{\pi_{PX}(\varphi)} > \frac{\pi_{SO}(\varphi)}{\pi_{SX}(\varphi)}.$$

This completes the proof for part two. For the final part of Proposition 4, we still have

$$\frac{Ave(empl)_{PO,dom}}{Ave(empl)_{PD,dom}} = \frac{Ave(Sales)_{PO,dom}}{Ave(Sales)_{PD,dom}} = \left(\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PD}}\right)^{\sigma-1} \frac{1}{1 - \left(\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{PX}}\right)^{k-(\sigma-1)}}$$

and

$$\frac{Ave(empl)_{SO,dom}}{Ave(empl)_{SD,dom}} = \frac{Ave(Sales)_{SO,dom}}{Ave(Sales)_{SD,dom}} = \left(\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}}\right)^{\sigma-1} \frac{1}{1 - \left(\frac{\bar{\varphi}_{SD}}{\bar{\varphi}_{SX}}\right)^{k-(\sigma-1)}}.$$

The only difference is that

$$\frac{Ave(empl)_{SO,dom}/Ave(empl)_{SD,dom}}{Ave(empl)_{PO,dom}/Ave(empl)_{PD,dom}} = \frac{\left(\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}}\right)^{\sigma-1}}{\left(\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PD}}\right)^{\sigma-1}} = \frac{(\tau w_H)^{\sigma-1} - w_f^{\sigma-1}}{(\tau w_H b)^{\sigma-1} - w_f^{\sigma-1}},$$

which decreases in b. Since the input price wedge is negatively related to b, the ratio of the relative (domestic) size of state-owned MNCs to that of private MNCs increases when the distortion deteriorates in that sector. In addition, the log difference between the two relative sizes also increases with the distortion in that sector.

In total, we have established the equivalence between the case of a subsidy and the case of an implicit tax.

8.4 Appendix D: Calibration Details

In this appendix, we elaborate on the steps for calibration which are omitted in the main text of the paper.

- First, we do the log-rank log-size regression to obtain the value for k. Specifically, we regress $\ln(Prob.(\ln(emp) \geq x))$ on $\ln(emp) = x$ using simple OLS. The slope obtained from the OLS regression is $k/(\sigma - 1)$.
  For any level of ln employment, x, the implied productivity draw (for the domestic firm) is

$$x = (\sigma - 1)[\ln(\beta) + \ln(\varphi(x)) - \ln(w_H)] + \ln\left(\frac{D_H \beta}{w_H I_c}\right),$$

  where $I_c = c$ for private firms and $I_c = 1$ for SOEs. This can be simplified to

$$x = (\sigma - 1)\ln(\varphi(x)) + A(D_H, w_H, \beta) - \ln(I_c), \tag{34}$$

  where $A(D_H, w_H, \beta)$ captures the economic environment at home. Variable $\ln(Prob.(\ln(emp) \geq x))$ equals

$$k[\ln(\bar{\varphi}_{iD}) - \ln(\varphi(x))], \tag{35}$$

  where $i \in \{S, P\}$. Combining equation (2) with equation (1), we end up with

$$\ln(Prob.(\ln(emp) \geq x)) = \frac{-k}{\sigma - 1}(\ln(emp) = x) + B(D_H, w_H, \beta, \bar{\varphi}_{iD}, I_c),$$

  where $B(D_H, w_H, \beta, \bar{\varphi}_{iD}, I_c)$ is country- and firm-type (i.e., SOE or not) specific. In the open economy with two symmetric countries, the slope is the same for exporting firms. The difference is that ln employment of any exporting firm has an extra term ($\ln(1 + \frac{1}{\tau^{\sigma-1}})$) compared with domestic firms. For MNCs, the slope is also the same. The coefficient obtained from our data is -1.091. Therefore, $k = 3 * 1.091 = 3.273$. This number is close to the one obtained from the U.S. data for 2002 (i.e., -1.095 used in Caliendo and Rossi-Hansberg (2012)).[41]

- Second, from Table 2, we know that the share of MNCs is 0.325 percent ($=3727/114824$) and the share of SOEs is 3.56 percent$=(40612/1140834)$. In the model, the share of MNCs is

$$\left(\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}}\right)^{-k} * 0.0356 + \left(\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PD}}\right)^{-k} * 0.9644,$$

---

[41]The tail distribution of Chinese manufacturing firms (i.e., small firms) features the log-normal distribution, which is true for other countries as well. Therefore, we focus on top 75 precent firms (in terms of employment) to implement the log rank log size distribution.

where the first and the second terms are the share MNCs among SOEs and private firms respectively. We know that

$$\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}} = \left(\frac{f_I - f_X}{f_D}\right)^{\frac{1}{\sigma-1}} \frac{\tau}{(\tau^{\sigma-1} - 1)^{\frac{1}{\sigma-1}}}$$

and

$$\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PD}} = \left(\frac{f_I - f_X}{f_D}\right)^{\frac{1}{\sigma-1}} \frac{\tau}{((\tau c)^{\sigma-1} - 1)^{\frac{1}{\sigma-1}}}.$$

Therefore, given τ, f_X and f_D, we can back out f_I.

- Third, from Table 10, we know that the share of exporters is 16.11% in China. In the model, this ratio equals:

$$\left[\left(\frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}}\right)^{-k} - \left(\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}}\right)^{-k}\right] * 0.0356 + \left[\left(\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}}\right)^{-k} - \left(\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}}\right)^{-k}\right] * 0.9644,$$

where

$$\frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}} = \frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}} = \tau \left(\frac{f_X}{f_D}\right)^{\frac{1}{\sigma-1}}.$$

Therefore, given τ, f_I and f_D, we can back out f_X.

- Fourth, the average (domestic) firm size (i.e., employment) of SOEs equals

$$Ave_S \equiv \frac{f_D k(\sigma - 1)}{k - (\sigma - 1)}\left[1 + \left(\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}}\right)^{-k+(\sigma-1)}\right] + \frac{f_D k(\sigma - 1)}{[k - (\sigma - 1)]\tau^{\sigma-1}}\left[\left(\frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}}\right)^{-k+(\sigma-1)} - \left(\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{SD}}\right)^{-k+(\sigma-1)}\right].$$

And the average (domestic) firm size (i.e., employment) of private firms equals

$$Ave_P \equiv \frac{f_D k(\sigma - 1)}{c[k - (\sigma - 1)]}\left[1 + c\left(\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PD}}\right)^{-k+(\sigma-1)}\right] + \frac{f_D k(\sigma - 1)}{c[k - (\sigma - 1)]\tau^{\sigma-1}}\left[\left(\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}}\right)^{-k+(\sigma-1)} - \left(\frac{\bar{\varphi}_{PO}}{\bar{\varphi}_{PD}}\right)^{-k+(\sigma-1)}\right].$$

Therefore, average firm size of all firms is

$$Ave_S * 0.0356 + Ave_P * 0.9644.$$

Average employment in our data is roughly 265. Given τ, f_I and f_X, we can back out f_D.

Next, we solve the model by calculating the values of other exogenous parameters. First, expected (ex post) profit (for private firms and SOEs) is

$$Profit_p \equiv \left(\frac{\varphi_{min,P}}{\bar{\varphi}_{PD}}\right)^k\left[\frac{f_D(\sigma - 1)}{k - (\sigma - 1)} + \frac{f_X(\sigma - 1)}{k - (\sigma - 1)}\left(\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{PX}}\right)^k\left[1 - \left(\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PO}}\right)^k\right]\right]$$
$$+ \left(\frac{\varphi_{min,P}}{\bar{\varphi}_{PD}}\right)^k\left[\left(\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{PO}}\right)^{k-(\sigma-1)}\frac{f_D k c^{\sigma-1}}{k - (\sigma - 1)} - f_I\left(\frac{\bar{\varphi}_{PD}}{bar\varphi_{PO}}\right)^k\right]$$

and

$$Profit_s \equiv \left(\frac{\varphi_{min,S}}{\bar{\varphi}_{SD}}\right)^k \left[\frac{f_D(\sigma - 1)}{k - (\sigma - 1)} + \frac{f_X(\sigma - 1)}{k - (\sigma - 1)}\left(\frac{\bar{\varphi}_{SD}}{\bar{\varphi}_{SX}}\right)^k \left[1 - \left(\frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SO}}\right)^k\right]\right]$$
$$+ \left(\frac{\varphi_{min,S}}{\bar{\varphi}_{SD}}\right)^k \left[\left(\frac{\bar{\varphi}_{SD}}{\bar{\varphi}_{SO}}\right)^{k-(\sigma-1)} \frac{f_D k}{k - (\sigma - 1)} - f_I \left(\frac{\bar{\varphi}_{SD}}{\bar{\varphi}_{SO}}\right)^k\right],$$

where $\varphi_{min,S}$ and $\varphi_{min,P}$ are the minimum draws for SOEs and private firms, respectively. Since we assume that firms randomly become SOEs and private firms after entry, the free entry condition becomes

$$f_e = Pr(s)Profit_s + Pr(p)Profit_p,$$

where $Pr(s)$ ($Pr(p)$) is the (exogenous) probability of becoming an SOE (a private firm). The free entry condition is used to pin down the mass of firms in equilibrium.

8.5 Appendix E: Supplementary Tables

Table E.1: Summary Statistics of Key Variables (2000-08)

Variable	Mean	Std. dev.	Min	Max
Firm TFP (Olley-Pakes)	3.61	1.18	0.61	6.57
Firm FDI indicator	0.003	0.066	0	1
Firm export indicator	0.29	0.451	0	1
SOE indicator	0.04	0.219	0	1
Foreign indicator	0.20	0.402	0	1
Firm log labor	4.78	1.115	1.61	13.25

Table E.2: *Distribution of Relative TFP (2001-2008)*

Percentiles	State-owned MNCs	Private MNCs
	(1)	(2)
10%	0.368	0.347
25%	0.497	0.475
50%	0.648	0.608
75%	0.842	0.752

Notes: Productivity of the most productive firms in each industry is normalized to one.

Table E.3: *Relative TFP and Capital Intensity (2001-2008)*

Chinese Industry	Private MNCs		State-owned MNCs		Difference=(2)-(4)	
(2-digit level)	Obs.	Mean	Obs.	Mean	Mean	*t*-value
	(1)	(2)	(3)	(4)	(5)	(6)
Labor Intensive	1,193	0.588	25	0.537	0.051	(1.14)
Capital Intensive	2,430	0.629	79	0.686	-0.056***	(-2.48)

Note: This table reports size difference between private MNCs and state-owned MNCs. Firm size is measured by log number of employees in the top module and by firm TFP (Olley-Pakes) in the bottom module. The top module shows that the average firm size of private MNCs is smaller than that of state-owned MNCs by year, especially for years after 2004. This pattern exists for years after 2006 when measured by firm productivity. This is probably because there were few state-owned MNCs before 2005, as shown in Table 1. The numbers in parentheses are *t*-values. *** (**, *) denotes significance at the 1 percent (5 percent, 10 percent) level.

Table E.4: Size Difference by Year

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Log Number of Employees (incumbent firms)								
(1) Non-MNCs	5.173	5.096	5.057	4.947	4.685	4.746	4.685	4.634	4.556
(2) All MNCs	8.146	8.075	7.874	7.901	5.949	5.957	5.975	5.908	5.502
(3) SOE MNCs	8.645	8.629	8.593	9.048	8.756	8.049	8.824	8.820	6.602
(4) Private MNCs	8.010	7.957	7.748	7.724	5.836	5.866	5.890	5.833	5.485
Size Difference=(3)-(4)	0.635	0.672	0.845	1.324	2.919***	2.183***	2.934***	2.986***	1.117***
	(0.71)	(0.64)	(0.79)	(1.16)	(2.79)	(5.62)	(2.25)	(10.01)	(2.32)
	Firm TFP (incumbent firms)								
(5) Non-MNCs	3.109	3.002	3.218	3.283	3.065	3.421	3.540	3.659	4.966
(6) All MNCs	4.396	4.190	4.376	5.309	4.163	3.855	3.738	3.877	5.194
(7) SOE MNCs	3.713	3.451	3.973	4.638	5.208	4.154	4.217	4.570	5.222
(8) Private MNCs	4.582	4.348	4.447	5.413	4.120	3.842	3.724	3.859	5.193
Size Difference=(7)-(8)	-0.869	-0.897*	-0.473	-0.774	1.087	0.312	0.492**	0.710***	0.029
	(-1.49)	(-1.66)	(-0.73)	(-1.20)	(1.63)	(1.16)	(2.12)	(3.41)	(0.13)
	Firm TFP (starting Firms)								
(9) SOE MNCs	2.78	–	–	5.85	3.61	3.82	3.77	4.29	5.96
(10) Private MNCs	3.44	2.83	4.29	4.48	3.31	3.51	3.71	3.77	5.20

Notes: This table reports size difference between private MNCs and state-owned MNCs. Firm size is measured by log number of employees in the top module and by firm TFP (Olley-Pakes) in the bottom module. The top module shows that average firm size of private MNCs is smaller than that of state-owned MNCs by year, especially for years after 2004. Such a pattern exists for years after 2006 when measured by firm productivity. This is probably due to the fact that there were few state-owned MNCs before 2005, as shown by Table 1. Numbers in parentheses are *t*-values. ***(**, *) denotes significance at the 1% (5%, 10%) level.