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

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Abstract. We examine how domestic distortions affect firms' production strategies abroad by documenting two puzzling findings using Chinese firm-level data. First, private multinational corporations (MNCs) are *less* productive than state-owned MNCs, and they are more productive than state-owned enterprises overall (i.e., *selection reversal*). Second, there are disproportionately fewer state-owned MNCs than private MNCs. We build a model to rationalize these findings by showing that discrimination against private firms domestically incentives them to produce abroad. The model shows that selection reversal is more pronounced in industries with more severe discrimination against private firms which receives empirical support.

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Keywords: Outward FDI, Multinational Corporations, Institutional Distortion.

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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 the 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 has been 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 2015, China's outward FDI reached the level of 9.9 percent of the world's total FDI flows, which made China the second largest home country of FDI outflows globally. In addition, outward FDI flows from China were US $145 billion in 2015, surpassing inward FDI flows to China, which were US $135 billion in the same year. Finally, manufacturing outward FDI from China is important and becoming more important in China' total outward FDI flows. For instance, manufacturing outward FDI from China reached the level of US $31 billion in 2016. Moreover, its share in China's total outward FDI has increased from 9.9% in 2012 (and 13.7% in 2015) to 18.3% in 2016. Top destination economies of Chinese manufacturing FDI are the U.S. and European countries.[3] In sum, the behavior of Chinese MNCs and patterns of China's manufacturing 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

[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 nine of the 20 largest investor economies globally (UNCTAD 2015).

[3] See Statistical Bulletin of China's Outward Foreign Direct Investment (2015 and 2016).

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, Wei, and Zhang, 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 exporting market, at least before 2001 when China joined the World Trade Organization (WTO). Unequal treatment comes from the 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 little existing work studying how institutional distortions at home affect firms' investment patterns abroad. The reason is that developed economies have been the 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, 2014). The government discriminates against private firms in China (Huang 2003, 2008; Brandt, Tombe, and Zhu 2013). And the Brazilian 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 Geely automobile company (a large private car maker in China) was to expand internationally and acquire foreign assets even at early stages of its development (e.g., the purchase of Volvo in 2010). Thus, distortions in the domestic market do seem to affect firms' decisions concerning going abroad.

We 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 that actually invested 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 private MNCs, since the selection into FDI is less stringent for them. However, why do the data suggest the opposite pattern?

To rationalize these puzzling findings, we build a model based on Helpman, Melitz, and Yeaple (2004) (henceforth, HMY) and highlight two economic forces: institutional arbitrage and selection reversal. Two key departures we make from HMY are the addition of capital (or land) use in the production process and asymmetric distortions across border. Specifically, we assume that private firms pay a higher capital rental price (and land price) when *producing* domestically (compared with SOEs), while all firms pay the same input prices 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 in China. In reality and also revealed from our data, the government charges higher interest rates and unit land price when private firms purchase these resources, which is equivalent to an implicit tax levied on inputs. When firms produce abroad, this input price wedge (at least 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 a foreign country) private firms face is higher than that of SOEs.[4]

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). 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 the saving on the variable trade cost), the incentive of becoming a MNC is higher for them. This leads to less tough selection into the FDI market for private firms, which is termed as selection reversal in this paper. This reversal rationalizes why there are disproportionately fewer MNCs among SOEs than among private firms and why private MNCs are less productive than state-owned MNCs. In addition, the relative size of private MNCs is smaller than that of state-owned MNCs, as selection into the FDI market is tougher for SOEs than for private firms. In summary, a model with distortion in the domestic capital and land markets rationalizes all three stylized facts.

In addition to explaining the three stylized facts, our model yields several additional empirical pre-

[4]It is plausible that the distortion in the input market shows up as a subsidy to SOEs. Specifically, SOEs receive subsidy for their inputs only when they produce in China, while there is no such a 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 they face is lower, which is the same as in our main model. This situation results in tougher selection into the FDI market for SOEs as well, which leads to the same empirical predictions. In short, the two types of distortions share the same key feature and generate the same empirical predictions.

dictions. 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, as the distortion exists in the capital market (rather than in the labor market), the selection reversal for state-owned MNCs is more pronounced in capital intensive industries and in industries in which the (industry-level) interest rate differential between private firms and SOEs is larger. Moreover, as the land market also features discrimination against private firms (i.e., private firms pay higher unit land price than SOEs), the selection reversal pattern is also more pronounced in industries in which the (industry-level) difference in the unit land price paid by private firms and by SOEs is larger. We present supporting evidence for these additional predictions of the model and for the existence of discrimination against private firms in the credit and land markets.

It might be true that Chinese firms can (and sometime want to) borrow money from domestic banks to finance a part of their outward FDI projects. Therefore, the discrimination against private firms in the credit market might still exist even when private firms invest abroad. However, even if this is true for a fraction of firms in our study, the discrimination against private firms in the land market is limited to the domestic market as firms can not move land abroad to do investment. Moreover, we find evidence that the selection reversal is also more pronounced in industries in which the difference in the unit land price paid by private firms and by SOEs is larger. Therefore, the asymmetric distortion in input markets across border does seem to play a role in affecting Chinese firms' investment and production strategies abroad.

The data set of outward FDI used in this paper is a representative sample of China's outward FDI projects, as the ministry of commerce of China requires all outward FDI deals whose investment amounts are higher than USD 10 million to be reported to and registered at the ministry. In particular, outward FDI deals conducted by giant SOEs are also covered by our outward FDI data set.[5] As outward FDI deals whose investment amounts are below a certain threshold are only required to be registered at the provincial government level, our data set loses small outward FDI projects which are most likely to be conducted by private firms.[6] Naturally, the exclusion of small private outward FDI deals (i.e., the selection issue) would prevent us from finding the selection reversal pattern. Given that we do find the selection reversal pattern using the ministry of commerce data, this pattern should be more pronounced if we used a universal data set that include small outward FDI deals.

Although some manufacturing firms that appear in the outward FDI data set are not matched with observations in the Annual Survey of Industrial Firms, we make sure that the matched sample is representative of state-owned MNCs and private MNCs. In particular, we show that the rate of successful

[5] In our data set, we do find multiple entries of ministerial-level SOEs such as CNPC (China national petroleum corporation), CPCC (China petroleum chemical corporation) and CNOOC (China national offshore oil corp). Therefore, mega outward FDI deals by SOEs are indeed covered by our data set.

[6] Shen (2013) and Chen, Dollar, and Tang (2016) draw the same conclusion that outward FDI projects conducted by private firms are substantially underreported in the data set provided by the ministry of commerce.

matching has improved over the years (especially after 2010). In addition, our matched sample displays a declining share of SOEs in Chinese MNCs over the years, which is consistent with the finding from Statistical Bulletin of China's Outward Foreign Direct Investment.[7] Moreover, when we compare the productivity difference between state-owned MNCs and private MNCs, we also look at the productivity distribution of these the types of firms.[8] Analysis shows that at each percentile, state-owned MNCs have higher (normalized) TFP compared to private MNCs, which is hard to be rationalized without using the argument of selection reversal.

It is important to stress that Chinese firms have different motivations to undertake outward FDI. Most manufacturing firms seek international markets, while firms in the mining industries seek natural resources and firms in the construction sectors invest in foreign infrastructure. In this paper, we focus on manufacturing FDI and exclude outward FDI projects in the construction and mining sectors for three reasons. First and foremost, manufacturing firms' investment behavior is more related to firm performance and profit-driven.[9] By contrast, the investment behavior of firms in the mining and construction industries is more or less of politics in the case of China's outward FDI. Second, the canonical model of FDI (i.e., HMY) and asymmetric distortions across border which are assumed in this paper fit well into the case of manufacturing MNCs from China. In particular, the share of manufacturing FDI in total outward FDI is much larger for China's investment into developed economies than its investment into developing (or resource-abundant) economies.[10] Since developed economies probably have fewer distortions and do not discriminate against Chinese private firms, our story fits better into manufacturing MNCs than non-manufacturing MNCs. Finally, China's manufacturing outward FDI plays an important role now (18.3% of China's total outward FDI in 2016), and only production data on manufacturing firms are available for us.

To sharpen our findings, we also use several sub-samples of our data sets to exclude alternative hypotheses for the selection reversal as many as possible. First, we find that the selection reversal does not hold, when we compare private exporting firms to state-owned exporting firms. Particularly, private exporting firms are still more productive than state-owned exporting firms. Given that exporting does not allow private firms to escape from domestic input distortions, this finding is consistent with our model's prediction and excludes an alternative hypothesis which is the discrimination in the output market.[11] Second, we find that the selection reversal pattern still exists, even after we exclude merger and acqui-

[7] This is the data set that covers all China's outward FDI deals above USD 10 million.

[8] See Table 4.

[9] Shen (2013) and Chen, Dollar, and Tang (2016) find empirical support for this argument.

[10] According to Statistical Bulletin of China's Outward Foreign Direct Investment (2015), the share of manufacturing FDI in total outward FDI is 26.3% for China's investment into the U.S. and 19.7% for China's investment into EU. Note that the average share of manufacturing FDI in total outward FDI is 13.7% across all countries.

[11] See Table 2A for details.

sition (M&A)-type FDI projects from our regressions[12]. As the motive of acquiring better technology and good brand names is probably more pronounced for M&A-type FDI (rather than for greenfield-type FDI), we believe that this type of motive cannot be used to explain our empirical findings.

Third, as we only observe the pattern of selection reversal in capital-intensive industries and in industries with more severe discriminations against private firms (in terms of the interest rate and unit land price), we believe that discriminations against private firms in the land and credit markets are responsible for our empirical findings. Last but not least, we also differentiate MNEs that undertake outward FDI projects in one foreign country from those that invest in multiple foreign countries in some of our regressions, as state-owned MNCs might differ from private MNCs in the number of countries they invest.[13] In addition, we exclude multiple outward FDI projects made by the same Chinese manufacturing company in some of our regressions as well.[14] Regressions using all these sub-samples consistently show that the selection reversal exists even within these sub-samples. In total, robustness checks using different sub-samples confirm the explanation we propose to explain the selection reversal.

Finally, 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.[15] This serves as a perfect example of institutional arbitrage, which is the key idea of the current study. In India, red tape has forced many talented entrepreneurs to leave the country and start their businesses abroad. [16] Agents, firms, and entrepreneurs can move across countries and regions to circumvent the distortions they face domestically. Cross-border activities that seek for institutional arbitrage are waiting for further economic analysis.

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

[12] See column 10 of Tables 6 and Appendix Table 5 for details.

[13] In Appendix Table 6, we include destination country fixed effects into our regressions to take care of this issue.

[14] In this case, the dummy variable of doing FDI equals one, if the firm conducts FDI for the first time (and zero otherwise). For details, see Appendix Table 5.

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

[16] 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`.

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), Moll (2014), and Gopinath et al. (2015) study the aggregate impact of financial frictions on firm productivity and investment. Guner, Ventura, and Xu (2008) and Garicano, Lelarge, and Van Reenen (2016) explore the impact of size-dependent policies on aggregate productivity and firm size distribution. [17] 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 had 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. Using a similar data set to ours, Shen (2013) and Chen, Dollar, and Tang (2016) study the motives and consequences of China's outward FDI into Africa. They document similar empirical findings to ours, such as the dominance of private Chinese MNCs in African countries' manufacturing industries and the importance of horizontal FDI in China's outward FDI into Africa. 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.

Finally, there is a body of research in the international business literature which looks at how institutional distortions affect firms' investment strategies abroad.[18] These papers focus on institutional distortions either at home or in destination countries. Our approach differs from their approaches, as

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

[18] See Morck and Yeung (1991), Cuervo-Cazurra (2007) and Buckley et al. (2008).

we emphasize how *asymmetric* institutional distortions (cross borders) affect firms' investment strategies aboard.

3 Data and Stylized Facts

3.1 Data

There are four main data sets used in the present paper, in which we introduce as follows.

Annual Survey of Industrial Firms Data. Our first data set is a production data set of Chinese manufacturing firms from 2000 to 2013, which comes from the Annual Survey of Industrial Firms (ASIF) complied by the National Bureau of Statistics of China. All SOEs and "above-scale" non-SOEs (i.e., private firms) are included in the data set.[19] 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).

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, if it is above USD 10 million. To invest abroad, every Chinese firm is required by the government to apply to the MOC for approval, or for registration if no approval needed.[20] 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 or private firm), the investment mode (e.g., trading-oriented affiliates, mining-oriented affiliates), and the amount of foreign investment (in U.S. dollars). In addition, the nationwide FDI decision data report FDI starters by year. All such information is available and released to the public except the amount of the firm's investment, which is considered to be confidential information.

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 (or equivalently, vertical FDI), whereas the rest are referred to as non-distribution (or horizontal) FDI. [21]

[19]The "above-scale" firms are defined as firms with annual sales of RMB 5 million (or equivalently, about US$830,000) or more before 2010 and with RMB 10 million afterward.

[20]Note that the SOEs directly controlled by central government are also required to report their FDI deals. This is why our data samples include such firms like CNPC(China national petroleum corporation), CPCC(China petroleum chemical corporation), and China resource corporation.

[21]According to Chen and Tang (2014), the horizontal FDI is the most important FDI mode in China, which further justifies

Firm Land Price Data. To explicitly show the price discrimination against private firms in input factor markets, we use a comprehensive and novel firm-level data set of land price which is collected from the official website of China's land transaction monitoring system operated and maintained by the Ministry of Land and Resources. This monitoring system contains detailed information of land transactions, including land area, deal price, assigner and assignee.[22] According to Chen et al.(2017), there are 61,805 firms that had acquired 214,388 cases of land with an average price of 252.5 RMB per square meters during 2000-13. A firm could makes several deals in a given year but no deals in some other years. Only 3,686 firms acquired 16,469 cases of land before 2009 whereas 58,119 firms acquired 198,085 cases of land after the global financial crisis. These land deals also cover 349 prefectures of 31 provinces in China.

Orbis Data. Finally, we use the Orbis data from Bureau Van Dijk from 2005 to 2014, since they contain detailed financial information on foreign affiliates of Chinese MNCs. For the data before 2011, we merge our ASIF data with the Orbis data by matching the names in Chinese. For the data after 2011, we merge our ASIF data with the Orbis data using (Chinese) parent firms' trade registration number which is contained in both data sets after 2011. We use the merged data set to study how Chinese MNCs allocate their sales across border.

Data Merge. We then merge the firm-level FDI and price price data sets with the manufacturing production database. Although the three 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, FDI data, and land 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.[23] Our second step is to decompose a firm name into several strings referring to its location, industry, 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.[24] Finally, to avoid possible mistakes, all approximate string-matching procedures are double-checked manually.

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the use of HMY model in the current paper.

[22]Data can be accessed from http://www.landchina.com/. According to the administrative order, all the local branches should make sure this system was "fully operated" before June 2004 (Notification on Establishing the Land Market Dynamic Monitoring System, http://www.mlr.gov.cn/zwgk/flfg/tdglflfg/200406/t20040625_584195.htm, Jan 2nd, 2004).

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

[24]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."

[Insert Table 1 Here]

In terms of the merge quality, our matched data cover the majority of manufacturing FDI projects which had been invested between 2008 and 2013. In the upper module of Table 1, we report the number of FDI manufacturing parent firms reported in the Statistical Bulletin of China's Outward Foreign Direct Investment and reported in our matched sample year by year.[25] As row (3) of Table 1 shows, we are able to match 22% − 42% of current manufacturing multinational firms reported in the statistical bulletin to our ASIF data before 2010. Importantly, the matching quality has improved substantially after 2010. For instance, 82% of current manufacturing multinational firms (reported in the statistical bulletin) are successfully matched to our ASIF data in 2012. Regarding the number of state-owned MNCs, our matched sample also exhibits a similar trend as in the bulletin: The proportion of state-owned MNCs is decreasing over year.[26]

Although our firm-level data set covers 2000-13, we use data for 2000-08 to conduct our main empirical analysis, because the data after 2008 lack information on (parent) firm's value-added and use of materials, which is essential for us to estimate firm productivity–a key variable in our empirical analysis. We instead use data after 2008 for further discussions. As highlighted by Feenstra, Li and Yu (2014), 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 criteria a là Feenstra, Li and Yu (2014). [27]

The lower module of Table 1 reports the number of FDI firms in our matched data sets for 2006-2013 (in even years). Row (6) reports the number of manufacturing firms (i.e., Chinese parent firms). The trend is that the number of manufacturing FDI transactions has surged after 2010. Different from row (1) in which the number of continuing multinational firms is reported by year, row (7) reports the number of new manufacturing multinational firms. Note that the sum of the number of continuing manufacturing multinational firms and the number of new manufacturing multinational firms is the number of current manufacturing multinational firms (i.e., (1) = (7)+(8)). FDI share in row (9) is obtained by dividing the number of current FDI manufacturing firms (with many country-regions) by the number of manufacturing firms (i.e., (9) = (1)/(6)). Similarly, SOE manufacturing FDI share in row (4) is obtained by dividing

[25]The bulletin does not report the number of manufacturing FDI projects before 2006. For comparisons, we start to report the matching quality after 2006, as shown in Table 1.

[26]Ideally, we should compare the percentage of state-owned manufacturing MNCs in our matched sample to that reported in the bulletin. However, the bulletin does *not* report such detailed information but only reports state-owned MNCs share.

[27]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. 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.

the number of current FDI manufacturing SOEs by the number of current FDI manufacturing firms (i.e., (4) = (10)/(1)).

Two observations in Table 1 merit special attention. First, as shown in row (9) of Table 1, FDI share is tiny. In 2012, only 1.94% of manufacturing firms were engaged in outward FDI, indicating that FDI is a rare event indeed though its share (out of manufacturing firms) is increasing. Second, by way of comparisons, the share of state-owned MNCs (out of all MNCs) is declining over the years, from 3% in 2006 to around 1.8% in 2012.

3.2 Measures

The SOE indicator and measured firm productivity are the two key variables used in the paper. This subsection describes how we construct these two measures.

3.2.1 SOE Measures

We define SOEs using two methods. The first is to adopt the official definition of SOEs, as reported in the *China City Statistical Yearbook* (2006), by using information on firm's legal registration. A firm is classified as an SOE if its legal registration identification number belongs to the following categories: state-owned sole enterprises (code in the firm data set: 110), state-owned joint venture enterprises (141), and state-owned and collective joint venture enterprises (143). State-owned limited corporations (151) are excluded from SOEs by this measure. As this is the conventional measure widely used in the literature, we thus adopt such a measure as the default measure to conduct our empirical analysis. Appendix Table 1 provides summary statistics for the SOE dummy used in this study.

Recently, Hsieh and Song (2015) introduce a broader definition of SOEs. They observe that some foreign firms and public listed companies have a controlling stake held by a state-controlled holding company. Thus, they suggest defining a firm as an SOE when its state-owned equity share is greater than or equal to 50 percent. Along this line, we introduce an alternative way to define SOEs. As a result, a firm is defined as a SOE if either (1) it is classified as a SOE using the conventional measure; or (2) its state-owned equity share is greater than or equal to 50 percent. We use such a broadly defined SOE dummy in our robustness checks.

3.2.2 TFP Measures

First and foremost, we estimate firm TFP using the augmented Olley-Pakes (1996) approach as adopted in Yu (2015). Compared with the standard Olley-Pakes (1996) approach, our approach has five new elements. First, we estimate the production function for MNCs and non-MNCs in each industry, separately,

since these two types of firms may adopt different technology.[28] Second, we use detailed industry-level input and output prices to deflate firm's input use and revenue in our productivity estimation. As the revenue-based TFP may pick up differences in price-cost markup and prices across firms (De Loecker and Warzynski, 2012), an ideal method is to use firm-specific price deflators to construct quantity-based TFP. However, such data are not available in China. To mitigate this problem, we follow Brandt, Van Biesebroeck, and Zhang (2012) to use four-digit Chinese Industrial Classification (CIC)-level input and output prices to deflate firm's input use and revenue. Once industry-level price deflators are well defined and the price-cost markup is positively associated with true efficiency, revenue-based TFP can capture the true efficiency of the firm reasonably well (Bernard et al., 2003).

Third, we take the effect of China's accession to the WTO (on firm performance) into account, as Chinese firms may export more or do more outward FDI due to the expansion of foreign markets after 2001. We thus include a WTO dummy in the inversion step of our productivity estimation. Fourth and similarly, we also include a processing export dummy in the inversion step as processing exporters and non-processing firms may use different technology (Feenstra and Hanson, 2005). Last and most importantly, we also add a SOE indicator and an export indicator to the control function in the first-step Olley-Pakes estimates. In particular, we include the SOE indicator (and the export indicator) and its interaction terms with log-capital and log-investment to approximate the fourth-order polynomials in the inversion step of the TFP estimates.

As stressed in Arkolakis (2010), firm TFP cannot be directly comparable across industries. We thus calculate the relative TFP ($RTFP$) by normalizing our augmented Olley-Pakes TFP in each industry.

Although we control for the SOE indicator in the productivity estimation described above, it might still be unclear whether the TFP difference between SOE and private firms is caused by input factor distortions (or any other factors). If input factor distortions play an essential role in determining firms' input use, it should be observed that SOEs are more capital intensive even within each narrowly defined industry (after controlling for firm size and other year-variant factors), as SOEs can access working capital at lower cost. Inspired by this intuition and Gandhi, Navarro, and Rivers (2016)[29], we first regress the capital-labor ratio of the firm on its size (proxied by firm sales), industry fixed effects (at the finest four-digit CIC level), and year fixed effects, to obtain firm-level clustered residuals. We then interact these residuals with log-capital and log-investment as additional variables in the fourth-order polynomials used in the inversion step of the TFP estimates. We thus re-estimate our augmented relative TFP, taking into consideration the input distortions ($RTFP^{Distort}$). Finally, we also consider another specification ($RTFP_{SOE}^{Distort}$) by including the firm-level clustered residuals and the SOE indicator (with

[28] As a robustness check, we also pool MNCs and non-MNCs together and, in the inversion step of the productivity estimation, re-estimate the production function by including a dummy variable for exporting status. The results generated by this alternative method do not change our subsequent empirical findings.

[29] They develop a new nonparametric estimator of TFP by examining the firm's first-order condition.

interactions with log-capital and log investment) in the inversion step of the TFP estimates for robustness checks.

3.3 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.

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

Table 2A reports the difference in our augmented Olley-Pakes TFP estimates 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 propensity score matching, by choosing firm sales and the number of employees as covariates. To avoid the case in which multiple observations have the same propensity score, we perform a random sorting before matching. 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. The findings for non-MNCs are consistent with other studies, such as Hsieh and Song (2015).

By contrast, a *selection reversal* is found when we focus on MNCs only. 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 2A. 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.[30] Column (6) reveals the same pattern. Namely, private MNCs are less productive than state-owned MNCs on average.

The lower module of Table 2A presents evidence of the selection reversal using a broadly defined SOE indicator à la Hsieh and Song (2015). Compared with the numbers of MNCs and SOEs shown in the upper module, there are more SOEs engaged in outward FDI and more firms classified as SOEs when we use the broadly defined SOE dummy.

[Insert Table 2A Here]

[30] In reality, some Chinese MNCs engage in outward FDI and exporting. This is especially true for firms that undertake distribution FDI by setting up trade office abroad to promote exports. See Tian and Yu (2015) for detailed discussions.

Table 2B reports number of MNCs by types of ownership and the consequent fraction of MNCs during the sample year. There are 566 broad-defined state-owned MNCs in our sample, which double its counterpart when SOEs are measured in a conventional way. Still, the evidence shows that private MNCs are less productive than state-owned MNCs, although private non-MNCs are more productive than state-owned MNCs.

[Insert Table 2B Here]

Our first stylized fact is robust to different TFP measures as shown in Table 3. Columns (1), (4) and (7) report relative TFP for all firms, non-MNCs, and MNCs, respectively. Firm's relative TFP is obtained by scaling down firm TFP in each industry after normalizing the TFP of the most productive firm in that industry to one (see Arkolakis 2010; Groizard, Ranjan, and Rodriguez-Lopez. 2015). After normalization, we calculate the relative TFP of firms in each industry. The TFP measure used in columns (2), (5) and (8), $RTFP^{distort}$, takes firm's input factor distortions into account when we estimate firm's relative TFP. The alternative firm TFP measure, $RTFP^{distort}_{soe}$, reported in columns (3), (6) and (9), puts the SOE dummy, distortion residuals and their interaction terms with other firm-level key variables into TFP estimations, as discussed above. Again, our findings are robust to the different TFP measures. Our data clearly exhibit selection reversal in the sense that private MNCs are less productive than state-owned MNCs.

Equally interestingly, we then look at the productivity difference between state-owned and private MNCs industry by industry. To do so, we separate all industries into two categories: capital-intensive and labor-intensive industries, according to the official definition adopted by the National Statistical Bureau of China.[31] The lower module of Table 3 shows that a productivity premium for state-owned MNCs exists in capital-intensive industries. This finding is important, as it shows that selection reversal exists in industries with more severe distortions in the input market.[32]

[Insert Table 3 Here]

In order to validate our finding further, we run simple OLS regressions. Specifically, we first regress the estimated TFP on the SOE Indicator, the interaction between SOE indicator and MNC indicator, the firm fixed effects and some other important firm-level characteristics such as log employment, export indicator, foreign-invested indicators. Columns (1), (3), (5) and (7) of Appendix Table 2 show that the selection reversal exists as the own coefficient of the SOE indicator and its interaction term with MNC indicator are negatively (and positively) significant, respectively. Although we have controlled

[31] In particular, among the 28 CIC two-digit industries, the following industries are classified as labor-intensive sectors: processing of foods (code: 13), manufacture of foods (14), beverages (15), textiles (17), apparel (18), leather (19), and timber (20).

[32] Section 5 shows that the input price wedge mainly exists in the credit (i.e., capital) market.

for (parent) firm-specific fixed effects (and hence industry-specific fixed effects), it is possible that a manufacturing producer in China can invest in different types of services abroad to facilitate exporters, without any actual manufacturing production. Such export-promoting facilitation effects may also differ in destination countries. We thus also control for *affiliate*'s industry fixed effects and the destination fixed effects of FDI in the regressions. The even columns of Appendix Table 2 show that the inclusion of these factors do not affect our finding both qualitatively and quantitatively.

To verify that input distortion plays an essential role in interpreting the productivity premium of state-own MNCs (compared to private MNCs), we need to make sure that both SOEs and private firms have similar productivity dispersions (also implied by our model in the next section). Admittedly, the productivity distribution of SOEs might have a different level of dispersion compared to that of private firms, and the productivity distribution may change during the era of SOE reforms (see, e.g., Lardy, 2004; Hsieh and Song, 2015). However, we will show that the productivity distribution of state-own MNCs first-order stochastically dominates that of private MNCs (i.e., state-owned MNCs are more productive than private MNCs at each percentile of the distribution).

Table 4 takes a step further to check whether the selection reversal holds in the distributional sense for the default TFP measures we use (i.e., $RTFP_{soe}^{distort}$). The table shows that at each percentile, state-owned MNCs have higher relative TFP compared with private MNCs (i.e., first order stochastic dominance), which substantiates the existence of a productivity premium for state-owned MNCs in terms of the distribution of productivity. In particular, we find that the estimated productivity at 1% (and 5%) percentile is higher for state-owned MNCs than for private MNCs, which suggests that the entry cutoff (on productivity) is higher for SOEs than for private firms among MNCs. Moreover, the first order stochastic dominance finding is more pronounced for MNCs operating in capital-intensive sectors. The empirical findings on productivity distribution confirm our previous findings on the average productivity difference between state-owned MNCc and private MNCs. Furthermore, all the above findings call for a model which can generate tougher selection into the FDI market for SOEs.

[Insert Table 4 Here]

Finally, as all of the TFP estimates are essentially based on the Olley-Pakes approach, which uses investment as a proxy for TFP, there may be a concern that the missing value of investment can cause some estimation bias. However, this is not a problem in our estimations as discussed in Yu (2015). In particular, we have already dropped those bizarre observations in our sample following the General Accepted Accounting Principle (GAAP) criteria. Still, for the sake of completeness, we report simple labor productivity (defined as value-added per employee) and Levinsohn-Petrin (2003) TFP in Appendix Table 3. Once again, we see that state-owned non-MNCs are less productive than private non-MNCs. But the opposite is true for MNCs: State-owned MNCs are more productive than private MNCs. In short,

our first empirical finding is robust.

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

Columns (3) and (6) of Table 2B present our second stylized fact. That is, the fraction of MNCs is larger among private firms than among SOEs. Again, this finding is robust to the different definitions we use to construct the SOE indicator and the different time periods of we focus on. When using a broadly defined SOE indicator, we find that more firms are classified as SOEs whereas the number of state-owned MNCs does not change much for the sample of 2000-08. For the period of 2000-2013, the share of MNCs increases both among SOEs and among private firms compared to the period of 2000-08. In all four cases (two time periods and two definitions of SOEs), there are always disproportionately more MNCs among private firms than among SOEs. On one hand, this finding is puzzling, since SOEs are larger firms that should be more likely to invest abroad. Furthermore, the Chinese government has supported its SOEs investing abroad for many years, known as the Going-Out strategy. On the other hand, such an observation is consistent 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).

3.3.3 Stylized Fact Three: Larger Relative Size Premium for State-Owned MNCs

Our last stylized fact is related to the relative size premium of state-owned MNCs. The conventional view is that SOEs are larger in size, which is usually measured by log employment or log sales. Our data also exhibit such features. As shown in Appendix Table 4, SOEs are larger than private firms irrespective of their FDI or exporting status.[33]

More importantly, the size premium for state-owned MNCs holds in the relative sense as well. Table 5 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. The first module in Table 5 reports the result obtained 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 the average 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 2005, we report the year-average ratio up to a particular year in Table 5 as well. All columns suggest larger relative size for state-owned MNCs. 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.

[33]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 Appendix Table 4. Next, this property also holds for state-owned MNCs and private MNCs, as shown in columns (3) to (6) in Appendix Table 4.

[Insert Table 5 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.

4 Model

We modify the standard horizontal 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 intensive margin. At the same time, we investigate how the difference in foreign investment costs impacts the investment behavior of private MNCs and state-owned MNCs at the extensive margin.[34]

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 the unit of goods produced by the firm.[35] After paying the entry cost, the entrepreneur receives a random draw of 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 the units of the goods produced by the firm). In equilibrium, entrepreneurs in the monopolistically competitive sector earn an expected payoff that is equal to zero due to free entry.

[34] Major predictions of the canonical horizontal FDI model a la HMY (2004) are consistent with our empirical findings documented in Table 2A. For instance, average productivity of MNCs is higher than that of non-multinational firms (see columns (3) and (5) of the table). Moreover, after the propensity score matching, we find that average productivity of non-multinational firms (domestic firms plus exporting but non-multinational firms) is higher than that of domestic firms (see columns (2) and (4) of the table).

[35] We follow Bernard, Redding, and Schott (2007) to choose this specification in order to make various fixed costs have the same capital (or land) intensity as the variable cost.

After entering and choosing to stay in the domestic market, each entrepreneur also chooses whether to serve the foreign market. There are two options for doing this, the first of which is exporting. Exporting entails a variable trade cost, $\tau(\geq 1)$, and a fixed exporting cost, f_X. 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. Both fixed costs of serving the foreign market are in terms of the units of the goods produced by the firm. In short, we consider horizontal FDI here as in HMY (2004).

Similar to Bernard, Redding, and Schott (2007), there are two factors of production, capital (or land) and labor, and the production function takes the following constant-elasticity-of-substitution form:

$$q(k,l) = \varphi\Big(k^{\frac{\mu-1}{\mu}} + l^{\frac{\mu-1}{\mu}}\Big)^{\frac{\mu}{\mu-1}}, \tag{2}$$

where k and l are capital (or land) and labor inputs respectively, and φ is the productivity draw the firm receives. Parameter $\mu(\geq 1)$ is the elasticity of substitution between capital and labor.

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 (or private enterprises), since the predictions of the model do not depend on this. The key innovation of the model is to introduce a wedge between the input price paid by SOEs and that paid by private enterprises when they produce *domestically*. Specifically, it is assumed that private firms pay a capital rental price (or the unit land price) $c(> 1)$ times as high as what SOEs pay when they *produce* domestically. However, (state-owned and private) firms pay the same wage and capital rental price (or the unit land price) when producing abroad.[36] In short, the two departures we make from HMY (2004) are the addition of capital in production and the existence of a wedge in capital rental price.

Based on equation (2), we derive total variable cost as

$$TVC(q,\varphi) = \frac{qr}{\varphi(1+\omega^{\mu-1})^{\frac{1}{\mu-1}}}, \tag{3}$$

where r and w are the capital rental price (or the unit land price) and the wage rate, and $\omega = \frac{r}{w}$ is relative price of capital (or land). Since the fixed costs have the same capital (or land) intensity as the variable cost and the efficiency of covering the fixed costs is normalized to one for all firms, their value is given by

$$FC(r,w) = \frac{f_i r}{(1+\omega^{\mu-1})^{\frac{1}{\mu-1}}}, \tag{4}$$

[36] We will show that there is evidence for the existence of an input price wedge in the credit land markets, but not in the labor market. Since buying capital usually requires a substantial amount of borrowing, we assume that private firms pay a higher capital rental price than SOEs.

where $i \in \{e, D, X, I\}$. Capital (or land) intensity in equilibrium is given by

$$\frac{l(w,r)w}{k(w,r)r} = \omega^{\mu-1}.$$

As long as $\mu > 1$, a higher relative price of capital leads to lower capital (or land) intensity. This property is utilized in our productivity estimation discussed above.

4.2 Domestic Production, Exporting, and FDI

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

$$q(\omega) = \frac{p(\omega)^{-\sigma}}{P^{1-\sigma}}E, \tag{5}$$

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

$$R(q) = q^{\frac{\sigma-1}{\sigma}}E^{\frac{1}{\sigma}}P^{\beta}, \tag{6}$$

where $\beta \equiv \frac{\sigma-1}{\sigma}$.

We derive SOE's operating profit earned from domestic production and exporting first. Since both types of production use domestic factors only, their operating profits are given by

$$\pi_{SD}(\varphi) = \frac{D_H}{\sigma}\Big(\frac{\beta\varphi}{r_H}\Big)^{\sigma-1}(1+\omega_H^{\mu-1})^{\frac{\sigma-1}{\mu-1}} \tag{7}$$

and

$$\pi_{SX}(\varphi) = \pi_{SD}(\varphi) + \frac{D_F}{\sigma}\Big(\frac{\beta\varphi}{\tau r_H}\Big)^{\sigma-1}(1+\omega_H^{\mu-1})^{\frac{\sigma-1}{\mu-1}}, \tag{8}$$

where $D_i \equiv P_i^{\sigma-1}E_i$ and $i \in \{H, F\}$. Subscripts S, D, X, H and F refer to SOE, domestic production, exporting, home country and foreign country respectively. For private firms, the operating profits are

$$\pi_{PD}(\varphi) = \frac{D_H}{\sigma}\Big(\frac{\beta\varphi}{cr_H}\Big)^{\sigma-1}(1+(c\omega_H)^{\mu-1})^{\frac{\sigma-1}{\mu-1}} \tag{9}$$

and

$$\pi_{PX}(\varphi) = \pi_{PD}(\varphi) + \frac{D_F}{\sigma}\Big(\frac{\beta\varphi}{\tau cr_H}\Big)^{\sigma-1}(1+(c\omega_H)^{\mu-1})^{\frac{\sigma-1}{\mu-1}}. \tag{10}$$

Private firms face a higher capital rental price when producing domestically. Since revenue is σ times as high as the operating profit, it can be derived as

$$R_{ij}(\varphi) = \sigma\pi_{ij}(\varphi)$$

where $i \in \{S, P\}$ and $j \in \{D, X\}$.

We can derive the exit cutoff and the exporting cutoff for SOEs and private firms respectively:

$$\bar{\varphi}_{SD} = \frac{r_H(\sigma r_H f_D/D_H)^{\frac{1}{\sigma-1}}}{\beta\Big(1+\omega_H^{\mu-1}\Big)^{\frac{\sigma}{(\sigma-1)\mu-1)}}}; \quad \bar{\varphi}_{SX} = \tau\frac{r_H(\sigma r_H f_X/D_F)^{\frac{1}{\sigma-1}}}{\beta\Big(1+\omega_H^{\mu-1}\Big)^{\frac{\sigma}{(\sigma-1)\mu-1)}}};$$

$$\bar{\varphi}_{PD} = \frac{cr_H(\sigma c r_H f_D/D_H)^{\frac{1}{\sigma-1}}}{\beta\Big(1+(c\omega_H)^{\mu-1}\Big)^{\frac{\sigma}{(\sigma-1)\mu-1)}}}; \quad \bar{\varphi}_{PX} = \tau\frac{cr_H(\sigma c r_H f_X/D_F)^{\frac{1}{\sigma-1}}}{\beta\Big(1+(c\omega_H)^{\mu-1}\Big)^{\frac{\sigma}{(\sigma-1)\mu-1)}}}.$$

Note that $\bar{\varphi}_{PD} > \bar{\varphi}_{SD}$ and $\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}} = \frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}}$.

Here we discuss the case of FDI. Following HMY, we assume that the firm uses foreign factors to produce after setting up a plant in the foreign country.[37] In addition, foreign factors are used to pay for the fixed FDI cost. It is worth stressing that our theoretical predictions will hold well independent of this assumption. In Appendix C, we allow for FDI fixed cost to be paid using domestic factors, and private firms do not face discrimination when they pay the FDI fixed cost using domestic factors. In both cases, our theoretical results are still preserved. Based on the above assumptions, the operating profit of firms that engage in outward FDI can be derived as follows:

$$\pi_{SO}(\varphi) = \pi_{SD}(\varphi) + \frac{D_F}{\sigma}\Big(\frac{\beta\varphi}{r_F}\Big)^{\sigma-1}(1+\omega_F^{\mu-1})^{\frac{\sigma-1}{\mu-1}}; \tag{11}$$

$$\pi_{PO}(\varphi) = \pi_{PD}(\varphi) + \frac{D_F}{\sigma}\Big(\frac{\beta\varphi}{r_F}\Big)^{\sigma-1}(1+\omega_F^{\mu-1})^{\frac{\sigma-1}{\mu-1}}. \tag{12}$$

When both SOEs and private firms produce abroad, they face the same factor prices. The FDI cutoffs are pinned down by the following indifference conditions (between exporting and engaging in FDI):

$$\frac{f_I r_F}{(1+\omega_F^{\mu-1})^{\frac{1}{\mu-1}}} - \frac{f_X r_H}{(1+\omega_H^{\mu-1})^{\frac{1}{\mu-1}}} = \frac{D_F}{\sigma}\Big(\beta\bar{\varphi}_{SO}\Big)^{\sigma-1}\left[\frac{(1+\omega_F^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{r_F^{\sigma-1}} - \frac{(1+\omega_H^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{(\tau r_H)^{\sigma-1}}\right] \tag{13}$$

[37] In our Zhejiang data set, we checked whether firms increased their foreign investment after the initial investment and ended up with few cases. The finding is evidence that at least a substantial fraction of factors used in foreign production (including capital and land) is sourced from the foreign country.

and

$$\frac{f_I r_F}{(1+\omega_F^{\mu-1})^{\frac{1}{\mu-1}}} - \frac{f_X c r_H}{(1+(c\omega_H)^{\mu-1})^{\frac{1}{\mu-1}}} = \frac{D_F}{\sigma}\left(\beta\bar{\varphi}_{PO}\right)^{\sigma-1}\left[\frac{(1+\omega_F^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{r_F^{\sigma-1}} - \frac{(1+(c\omega_H)^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{(c\tau r_H)^{\sigma-1}}\right]. \tag{14}$$

It is evident that selection into FDI is tougher for *SOEs* than for private firms (i.e., $\bar{\varphi}_{SO} > \bar{\varphi}_{PO}$), as the opportunity cost of engaging in FDI is smaller for private firms than for SOEs. Specifically, private firms have lower opportunity cost of engaging in FDI (compared with exporting), as both the variable cost of exporting and the fixed cost of exporting are higher for them.

4.3 Domestic Distortion and Patterns of Outward FDI

In this subsection, we discuss how the existence of domestic distortions in the capital and land markets affects the patterns of outward FDI at the extensive and intensive margins.

Proposition 1 ***Sorting Patterns of Private Firms and SOEs (Extensive Margin)****:*

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. *Conditional on the initial productivity draw (and other firm-level characteristics), private firms are more likely to become MNCs.*

3. *Assume that the truncated distribution of the productivity draw for private firms (weakly) first order stochastically dominates (FOSD) that of SOEs, or the two conditional probability density functions (PDFs) satisfy the (weak) monotone likelihood ratio property (MLRP) with:*

$$\frac{\partial}{\partial\varphi}\left(\frac{f_P(\varphi|\varphi\geq\varphi_0)}{f_S(\varphi|\varphi\geq\varphi_0)}\right)\geq 0 \qquad \forall\varphi\geq\varphi_0,$$

   where $f_P(\varphi|\varphi\geq\varphi_0)$ and $f_S(\varphi|\varphi\geq\varphi_0)$ are the truncated probability density functions of the productivity draw for private firms and SOEs respectively. Then, the fraction of MNCs is larger among private firms than among SOEs. Furthermore, simple average productivity of private firms is greater than that of SOEs overall.

4. *Assume that both types of firms draw productivities from the same distribution (which trivially satisfies weak FOSD property). Then the (simple) average productivity of private MNCs is smaller than that of state-owned MNCs (i.e., productivity premium for state-owned MNCs).*

Proof. See Appendix B. ■

The intuition for the above proposition 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 for private firms, as they face the same FDI costs and the same market environment in the foreign country. However, since the firm at the FDI cutoff compares exporting with FDI, the (opportunity) cost of engaging in FDI is smaller for private firms than for SOEs.[38] As a result, the FDI cutoff is lower for private firms than for SOEs. Table 4 shows that the selection reversal (for entering the FDI market) holds (in terms of the entry cutoff), as the estimated productivity at 1% (and 5%) percentile is higher for state-owned MNCs than for private MNCs. If we make assumptions on the distribution of the productivity draws (as stated in parts 3 and 4 of the above proposition), the selection reversal, which is graphed in Figure 1, leads to a average productivity premium for state-owned MNCs, and the above theoretical results rationalize the first two stylized facts.[39] Finally, Table 6 and Appendix Table 5 in the next section show the lower probability of becoming an MNC for SOEs.

We next discuss how a variation in the level of domestic distortion affects the sorting pattern of private MNCs and state-owned MNCs differently using the following proposition.

Proposition 2 ***Cross-Industry Variations****:*

1. *In industries with more severe distortion (i.e., $c \uparrow$), the productivity premium of state-owned MNCs is larger. Moreover, SOEs are less likely to produce abroad in industries with more severe distortion than SOEs in industries with less severe distortion.*

2. *Assume that the production function is Cobb-Douglas with capital and labor. Then, the productivity premium of state-owned MNCs is more pronounced in capital intensive industries. Furthermore, SOEs are less likely to engage in FDI (compared with private firms) in capital intensive industries.*

Proof. See Appendix B. ■

The intuition for the above proposition is straightforward. Since the asymmetric distortion disincentives SOEs to produce abroad, the selection into the FDI market becomes more stringent for SOEs (than for private firms) in industries with more severe discrimination against private firms. Furthermore, as the

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

[39] The selection reversal holds irrespective of the distribution of the initial productivity draw. The average productivity premium for state-owned MNCs exists, if SOEs and private firms draw productivity from the same distribution. However, the assumption of the same productivity distribution is not required. What we need is that a lower cutoff on the productivity draw implies a smaller average productivity (i.e., a relationship between the marginal productivity and the inframarginal productivity). This is why we need MLRP for part 3 of the above proposition.

distortion exists in the capital market, we expect a more stringent selection into the FDI market for SOEs (than for private firms) in capital intensive industries. We will provide empirical evidence for these two predictions in what follows.

Finally, we discuss how domestic distortion affects the sorting patterns of MNCs at the intensive margin.

Proposition 3 ***Sorting Pattern of Private Firms and SOEs (Intensive Margin)****:*

1. *Suppose the initial productivity draw follows a Pareto distribution with the same shape parameter for private firms and SOEs. Then, the relative size of private MNCs in the domestic market (i.e., compared with private non-exporting firms) is smaller than that of state-owned MNCs (i.e., compared with non-exporting SOEs).*

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

Proof. See Appendix B. ■

The intuition for Proposition 3 is straightforward. Since there is an extra benefit for private firms to produce abroad, they produce and sell more in the foreign market. This effect is another key result of our model, for which we provide empirical support in the next section. The first part of Proposition 3 receives strong statistical support from Table 5. As the table shows, the relative size of private MNCs is smaller than that of state-owned multinational firms. We will provide evidence for the second part of the above proposition in what follows.

5 Evidence

Our theoretical model yields three empirical propositions. Some of the predictions of the propositions have already been shown to be consistent with the stylized facts presented in Section 3, others are still waiting for empirical examination, which is the purpose of this section.

5.1 FDI Decision and Firm Ownership

Most of the predictions of Proposition 1 have been shown to be consistent with the empirical results in Tables 2-5. Only part 2 of Proposition 1 needs further empirical examination. The nationwide FDI data only cover the information that the first year when firms began to undertake FDI in a given country (i.e., no information on whether firms continued to engage in FDI in a *given* country or whether they exited from FDI in a particular country after entry). Therefore, the estimations in Table 6 and the other tables include non-MNCs and current MNCs every year.

Table 6 reports the estimation results starting from a linear probability model (LPM) in which the regressand is an indicator of outward FDI. As the outward FDI data set only reports the first year when a firm engages in outward FDI in a given country, we assume that a firm will continue to engage in outward FDI afterward.[40] That is, the FDI indicator equals one once a firm engages in FDI and zero otherwise. To explore whether SOEs are less likely to engage in FDI, we include a SOE indicator in the regression, as well as several key firm characteristics, such as firm size (i.e., log employment), firm-level TFP, and exporting status. Equally importantly, we include (3-digit) industry-specific fixed effects and year-specific fixed effects to control for unobservable time-invariant and industry-invariant factors.[41] The SOE indicator is shown to be negative and statistically significant in column (1), suggesting that SOEs are indeed less likely to engage in outward FDI. The magnitude of the SOE indicator is too small, which is probably due to a well-known pitfall of LPM: The predicted probability could be greater than one or less than zero.

To overcome this drawback, we report the logit estimates in column (2) by controlling for a rich set of fixed effects with interactions of (2-digit level) industry and year dummies, which yield qualitatively the same results as for the LPM model. Particularly, compared with private firms, SOEs are less likely to engage in outward FDI. For such a nonlinear probability model, firm-specific fixed effects cannot be included in the regression. Instead, we control for year-specific and industry-specific fixed effects in all the rest of the regressions.

Our estimates include foreign-invested enterprises (FIEs), which are firms that receive direct investment from foreign entities. However, if a FIE has a dominant share of foreign stakes, it is directly controlled by its foreign headquarters. Our model does not consider such firms, as FIE headquarters are not located in the home country. Thus, we drop FIEs from the sample in all regressions, and columns (3) to (10) in Table 6 report the results. After dropping the FIE sample, the logit estimates in column (3) still show that SOEs are less likely to engage in outward FDI, conditioning on other firm-level characteristics.

There are two important caveats here. First, as shown in row (9) of Table 1, less than 1 percent of manufacturing firms undertook FDI in most of the sample years. Within MNCs, a small fraction of them are SOEs. As highlighted by King and Zeng (2001), standard binary nonlinear models, such as logit or 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.[42]

[40] It is important to note that our findings remain unchanged even without imposing such an assumption and with only FDI starters examined. This can be seen from Appendix Table 5.

[41] In principle we can control for firm-specific fixed effects. However, since there are less than two ODI deals per Chinese MNC over 2000-13, there are not enough degrees of freedom to identify the coefficient on the SOE indicator with firm-specific fixed effects. We thus add disaggregated 3-digit industry-specific fixed effects in the LPM estimates.

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

Column (4) in Table 6 reports the logit estimates with rare-event corrections. The key coefficient of the SOE indicator is much larger than its counterparts in columns (2) and (3) in absolute value. Equally importantly, the coefficient is still negative and statistically significant, ascertaining that SOEs are less likely to engage in outward FDI.

The rare-event feature of our FDI data also generates another problem, that the probability distribution of state-owned MNCs engaging in FDI exhibits faster convergence toward the true probability that SOEs engage in foreign investment. Standard logit or probit estimates cannot deal with this problem. We thus run complementary log-log regressions in the rest of Table 6, which allows for faster convergence toward rare events. Column (5) in Table 6 reports the complementary log-log regression by dropping foreign firms. Column (6) adopts the broadly defined SOE indicator in the regression. Clearly, our key results are robust regardless of different SOE definitions.

There may be a worry that some Chinese firms may invest in tax haven destinations, such as Hong Kong and the Cayman Islands, due to the motive of tax evasion. Consequently, our model and its underlying story cannot be applied to those firms. Column (7) in Table 6 thus drops observations of outward FDI in tax haven destinations.[43] Similarly, it is also possible that some Chinese firms may establish trading offices in their exporting destinations to promote market-specific exports (Tian and Yu 2015). Such distribution-oriented (or, vertical) outward FDI is *not* the focus of our model, and our theory does not apply to this type of FDI. Column (8) thus drops the sample of distribution-oriented FDI.

Next, as shown in row (1) of Module A in Table 1, China's outward FDI increases rapidly after 2004, when the government adopted policies to encourage firms to go abroad. It is also true that a large wave of privatization of SOEs took place after 1998 (Hsieh and Song, 2015). We thus drop SOE switching firms from the sample and focus on observations from 2004 to 2008 in columns (9) and (10) in Table 6. The coefficient of the SOE indicator in column (9) is larger than its counterpart in column (8), suggesting that private firms were more likely to go abroad after 2004. Still, there may be a worry that our story fits better into the case of greenfield FDI rather than M&A-type FDI, as the latter usually targets at better technology or seeks famous brand names of the targeted firms. We thus drop the M&A–type FDI in column (10) and the estimation still yields the same results: SOEs are less likely to engage in outward FDI.[44]

[Insert Table 6 Here]

Finally, we provide two additional robustness checks. First, we rerun all the regressions in Appendix Table 5 by setting the FDI indicator to one only in the first year when the Chinese manufacturing firm

[43]The tax haven regions include the Bahamas, Bermuda, the Cayman Islands, Hong Kong, Luxembourg, Macao, Monaco, Panama, the Virgin Islands, and Switzerland.

[44]To identify M&A–type FDI, we manually merge the outward FDI data set with the M&A–type FDI data compiled by Thomson Reuters, by using the identical names of Chinese parent firms.

became an MNC (i.e., the indicator for starting FDI). The results reported in Appendix Table 5 show that our findings in Table 6 are not driven by subsequent entries into the outward FDI market. Second, the inclusion of *destination*-specific fixed effects and *affiliates*' industry-specific fixed effects does not change our qualitative findings in Table 6 either, though the value of the estimated coefficients changes somewhat. The results are reported in Appendix Table 6. In total, our finding of a lower probability of SOEs' doing outward FDI is robust to different estimation methods, various specifications, and different time spans.

5.2 Input Market Distortions

Our theoretical model is built on the premise that, 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, Li, and Yu 2014). Similarly, SOEs acquire land at a lower market price than private firms do, which is especially true in the manufacturing sector (Tian, Sheng, and Zhang 2015). To see whether these conjectures are supported by the data, we first construct a measure of the firm-level interest rate by dividing the firm's interest expenses by its current liability (in each year), both of which are available from the ASIF data set over the period of 2000-08 but not after 2008. We then regress this measure on the narrowly defined SOE indicator in columns (1) and (2) in Table 7. If our underlying assumption that SOEs access external working capital at a lower cost than private firms do is supported by the data,[45] we should observe that the SOE indicator has a negatively significant coefficient.

This outcome is exactly what we observe in Table 7. Both estimates in columns (1) and (2) include year-specific and industry-specific fixed effects. In addition, column (2) controls for prefectural city fixed effects and other key firm characteristics, such as firm TFP, log employment of the firm, foreign indicator, and export indicator.[46] It turns out that the key coefficient, the SOE indicator, is always negative and statistically significant. Its magnitudes in absolute value vary in the range of 0.13 to 0.15, suggesting that private firms pay annual interest rates 13 to 15 percent higher than SOEs, and hence bear higher capital costs than SOEs.[47]

Still, one may have a concern that private firms could use domestic credits to finance costs associated with FDI projects. If so, they would still face discrimination even when investing abroad. Admittedly,

[45] We find similar results when SOEs are measured in a broad way à la Hsieh and Song (2015).

[46] There is a substantial decrease in the number of observations in column (2), as many observations do not report their prefectural city location.

[47] The relative interest rate differential between SOEs and private firms is plausible if the firms' informal finance is taken into account. Private firms usually have to finance their working capital from unofficial and gray financial markets due to severe credit constraints (see Lardy 2014).

we cannot rule out this possibility without further information on firm's credit allocation. However, a better investigation is to check whether private firms acquire land at a higher unit cost than SOEs. If so, whether the land market distortion plays a role when private firms engage in outward FDI.

Thus, columns (3)-(7) in Table 7 go further to check whether SOEs acquire land at lower costs. By controlling for 2-digit industry and year fixed-effects, respectively, we first regress firm-level unit land price on the SOE indicator over the period of 2000-13. Columns (4) and (5) add other firm-level controls such as firm TFP, log employment, the foreign indicator, and the export indicator. Since there may be a concern that land market discrimination could reversely induce firm churning (from private firms to SOEs or vice versa), column (5) regresses the unit land price on the one-year lag of SOE indicator to avoid possible simultaneous bias. The regression results in Table 7 show that the coefficient of SOE indicator is always negatively significant. Thus, private firms do seem to pay higher unit land price than SOEs.

Compared with the interest rate estimates in columns (1) and (2), the numbers of observations drop dramatically in columns (3)-(5) due to the usual imperfect matching between the production data set and the land price data set. To overcome such data matching challenge, we use the prefectural-level land data set for robustness checks.[48] We first construct a variable of SOE intensity, which is defined as the number of SOEs divided by the number of total manufacturing firms in the city. Our theory predicts that a city with a higher SOE intensity is expected to have a lower average price of land, conditioning on other prefecture-level characteristics. Estimations whose results are reported in columns (6) and (7) regress average land price at the prefectural city level on SOE intensity. Particularly, columns (6) and (7) control for both year-specific and city-specific fixed-effects, respectively. Still, it is possible that aggregate demand for land in each city affects the price of land in the city. columns (6) and (7) thus control for cities' total land sales. In all cases, the coefficient of SOE intensity is negative and statistically significant, suggesting that SOEs pay lower unit land price on average and hence bear lower land costs than private firms.

[Insert Table 7 Here]

5.3 Channels and Sectoral Heterogeneity

Part 1 of Proposition 2 hints that the selection reversal is heterogeneous across sectors. Specifically, the productivity premium of state-owned MNCs will be more pronounced in industries with severe distortions. Similarly, we should observe that SOEs are less likely to produce abroad in these sectors compared

[48]Data are from China's *Land and Resources Statistical Yearbook* (various years). As in Tian, Sheng, and Zhang (2015), we only use data on land sales for land that is 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 last two estimates in Table 7 shall be understood as the lower bound of the measured distortion.

to SOEs in sectors with less severe distortions. To verify these predictions, we regress the firm outward FDI indicator on the SOE indicator and its interaction with the industry-level input price differential which is first measured by the interest rate differential, followed by the difference in the unit land price. For this difference-in-differences regression, our model predicts a negatively significant coefficient of the SOE dummy and of its interaction with the (positive) industry-level input price differential. The economic rationale is evident: Compared to SOEs in other industries, SOEs in industries with more severe credit and/or land market distortions against private firms are less likely to undertake outward FDI projects, as they receive even better treatments in the domestic input markets than their counterparts in other sectors. Indeed, the interaction between SOE and industrial input price differential is crucial to testing our hypothesis, as it shows the effect of input price distortions on the likelihood of SOEs' investing abroad directly.

To check whether the credit market plays an important role in shaping the pattern of firms's selection reversal, columns (1)-(5) of Table 8 report the estimation results using the interest rate to measure the input price. The industrial input price differential here is calculated as the difference between the (high-level) average interest rate paid by private firms and the (low-level) average interest rate paid by SOEs in the same 3-digit industry level.[49] After controlling for industry and year fixed effects and other key firm-level variables, the SOE indicator and its interaction term with the industry-level interest rate differential are both negative and statistically significant. These results suggest that the credit market distortion is an important reason why SOEs are less likely to go abroad. Such a key finding is robust to different specifications. Particularly, we drop the sample of FIEs in column (2) and the sample of outward FDI to tax haven destinations in column (3). We also drop the sample of distribution-oriented FDI in column (4) and narrow the time window to 2004-08 in column (5). All the reestimation results suggest that the credit market distortion is an important factor for us to interpret the pattern of Chinese firms' selection reversal.

As mentioned above, one may worry that private firms still suffer from domestic credit market distortions if they use domestic credits to finance FDI fixed cost and/or variable cost. To mitigate such a concern, we go further to examine the channel of land market distortions, which would be a cleaner experiment as firms cannot move their domestic land input abroad.

To do so, we first obtain firm's total cost of acquiring land during the sample period of 2000-13 which is time-*invariant*, as firms could acquire land unevenly and infrequently across years. We then calculate the 3-digit CIC industry-level difference in the unit land price paid by private firms and by SOEs. Both its own term (of the industrial land price differential) and its interacted term with the SOE indicator are included in columns (6)-(10) of Table 8.

[49]The industrial interest rate differential is measured at the 3-digit CIC level. Thus, the coefficient of the industrial interest rate differential is still identifiable even after we control for 2-digit CIC industry fixed effects.

Similar to columns (1)-(5), columns (6)-(10) include important firm-level control variables such as firm's log employment and the export dummy. Columns (6)-(8) cover the entire sample period of 2000-13. Columns (7)-(10) drop observations with tax-haven FDI destination countries, and columns (8)-(10) drop foreign firms from the regressions. Column (9) includes the sample of 2000-08 so that it can be directly compared to column (3) with the measure of interest rates.[50] We also control for 2-digit industry and year fixed-effects respectively in all regressions. In particular, we include the interacted industry-year fixed-effects in the last column of Table 8. All the specifications in columns (6)-(10) of Table 8 yield the same findings: SOEs are less likely to engage in outward FDI. More importantly, SOEs in industries with more severe land market distortions are less likely to undertake outward FDI than SOEs in industries with less severe land market distortions (i.e., the negative interaction term). This is the key evidence we provide for our explanation for the selection reversal pattern.

[Insert Table 8 Here]

5.4 Capital Intensity and Pattern of Outward FDI

Part 2 of Proposition 2 implies that, compared with private firms, SOEs are less likely to engage in outward FDI in capital-intensive industries. This subsection provides evidence for this prediction. By definition, firms in capital-intensive industries have higher demand for working capital. Accordingly, domestic input distortions against private firms favor SOEs more in such industries. If domestic input distortions are the fundamental driving force for explaining the behavior of Chinese firms' outward FDI, SOEs in capital-intensive industries should be unlikely to undertake outward FDI. By contrast, such a phenomenon may not exist in labor-intensive industries.

To check this out, we run the following difference-in-differences regression and focus on the difference between capital-intensive sectors and labor-intensive sectors. Specifically, we interact the dummy variable for the firm's being in the capital-intensive sector and the dummy variable for firm's being in the labor-intensive sector (i.e., one minus the dummy variable for the firm's being in the capital-intensive sector) with the SOE dummy in our Logit regressions.[51] The interacted coefficient between SOE indicator and labor-intensive indicator shows how the state ownership affects the likelihood of investing abroad for the parent firms from labor intensive industries. Similarly, the interacted coefficient between SOE indicator and labor-intensive shows how the state ownership affects the likelihood of investing abroad for

[50]The number of observations in column (9) is substantially higher than that in column (3), as the land price differential used in column (9) is time-invariant and hence prevalent in all 3-digit CIC industries whereas the interest rate used in column (3) is time-variant and some industry-year pairs have missing observations.

[51]Note that our specification is the same as the specification of $OFDI_{it} = \beta_1 SOE_{it} + \beta_2 SOE_{it} \times Kdummy + ...$, since it is equal to $OFDI_{it} = (\beta_1 + \beta_2) SOE_{it} \times Kdummy + \beta_1 SOE_{it} \times (1 - Kdummy)$ where $Kdummy$ denotes capital-intensive indicator, which equals one minus labor-intensive indicator. As we don't include parent-firm fixed effects in the regression, the perfect collinearity problem does not arise here.

the parent firms from capital intensive industries. Column (1) in Table 9 shows that SOEs are less likely to engage in outward FDI in capital-intensive industries. By contrast, the SOE indicator is insignificant for parent firms from labor-intensive sectors. This finding is robust to different specifications, such as dropping foreign firms, dropping SOE switching firms, dropping FDI to tax haven destinations, or using a shorter time period (2004-08).

It is worth discussing why the key coefficient of the SOE indicator is insignificant in labor-intensive sectors. In China, the cost of labor has increased dramatically after 2004. Accordingly, some firms in labor-intensive sectors established foreign affiliates in other least-cost, labor-abundant countries, such as Bangladesh, Ethiopia, and Vietnam (Shen 2013). Such firms sought global sourcing instead of global markets (Antràs 2016), which is out of the scope of the current paper.

[Insert Table 9 Here]

5.5 Estimates at the Intensive Margin

We now provide evidence for Proposition 3. Table 5 provides evidence for part 1 of the proposition. Part 2 of Proposition 3 states that the ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs. Data on sales of foreign affiliates are unavailable in the Chinese firm-level ASIF data set. Therefore, we merged the ASIF data set with the Orbis data set, which contains information on sales and revenue of (domestic and foreign) affiliates of Chinese MNCs. For the data between 2005 and 2008, we merge our ASIF data with the Orbis data by matching firms' names in Chinese. For the data between 2011 and 2013, we merge our ASIF data with the Orbis data using the trade registration number of the (Chinese) parent firms, as this information is contained in both data sets after 2011. Unfortunately, the Orbis data do not have good coverage on (domestic and foreign) affiliates of Chinese MNCs. As a result, the foreign affiliates of around 15 percent of Chinese parent firms reported in ASIF data show up in the Orbis data set between 2005 and 2008.[52] For 2011-13, 11,000 observations (i.e., affiliate-year pairs) have non-missing values for sales, revenue, and employment in the Orbis data. Among these affiliates, roughly 70% of them are in non-manufacturing sectors. Furthermore, since we can only identify FDI starters (between 2011 and 2013) in our matching, we managed to match roughly 750 affiliate-year observations for the two data sets between 2011 and 2013.

Table 10 regresses log sales (or log revenue) of each domestic or foreign affiliate of Chinese MNCs in a given year on a dummy variable for being a private (parent) firm, a dummy variable for being a foreign

[52]The main reason responsible for the low matching rate is that firms' names are in Chinese in our ASIF data, while they are in English in Orbis data. As English translations of a firm's Chinese name can be multiple, it is extremely challenging to match observations from the two independent data sets (e.g., the company whose English name is Lenovo currently should be translated into "Legend" based on its Chinese name). We identify a matched observation, when the English translation of the firm's name exactly matches the characters of its Chinese name, the non-matched firms are probably random and should not affect our empirical results.

affiliate, and characteristics of the parent firm.[53] Importantly, we add an interaction term between the two dummy variables: $Private_{i,t} \times Foreign_{j,t}$ where i, j and t refer to parent firm (private or state-owned), affiliate and year respectively. As expected, the regression results show that private parent firms have smaller affiliates on average, and foreign affiliates are smaller than domestic affiliates on average. What is interesting is that the size difference between the domestic affiliate and the foreign affiliate (of the same parent firm) is smaller among private MNCs than among state-owned MNCs, as the coefficient of $Private_{i,t} \times Foreign_{j,t}$ is positively significant. This is exactly what part 2 of Proposition 3 predicts: The ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs.

[Insert Table 10 Here]

5.6 Outward FDI Data between 2000 and 2013

In this subsection, we expand the time horizon of our sample to 2000-13. The major reason is the number of state owned MNCs is small before 2008, as the total number of manufacturing outward FDI projects is not too big before 2008. As there are much more manufacturing outward FDI projects after 2008, the inclusion of outward FDI data until 2013 can alleviate the concern that the small number of state owned MNCs might affect our estimation results.[54] Moreover, the quality of our data matching becomes better after 2010, and the importance of China's manufacturing outward FDI (in China's total outward FDI) is increasing with time. Therefore, using outward FDI data after 2009 is a crucial robustness checks for our previous empirical findings. However, the drawback of using the longer time-series data set is that we cannot estimate firm productivity accurately. The reason is that China's firm-level production data report neither value added nor purchase of intermediate inputs after 2008. Without knowing these key variables, we cannot precisely estimate TFP or calculate labor productivity (i.e., value added per worker). Because of these substantial restrictions on the data, we do not use the data for 2000-13 as our main data set. Instead, we use the longer time-series data for robustness checks only and relegate detailed discussions into Appendix 6.3.

The empirical findings based on the sample from 2000 to 2013 are qualitatively the same as our previous findings. In particular, We still find that SOEs are less likely to invest abroad after we control for important firm-level characteristics and a variety of fixed effects. In addition, this pattern is more pronounced in sectors that have larger interest rate differentials (between SOEs and private firms) and in sectors that are more capital-intensive. In total, both the short sample and the long sample of our outward FDI data lead to the same empirical findings emphasized in this paper.

[53] Note that the revenue of a firm includes other income from investments or licenses (or interest on debts), in addition to sales income. Therefore, firm sales are a part of firm revenue.

[54] We have taken into account this issue in Table 6 and Appendix Table 5 by using the rare event Logit regression.

5.7 Discussions on Modeling Choices

Here we discuss several modeling choices of our model, based on the empirical patterns we have documented so far. First, it is plausible that the distortion discussed above 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 incentive to undertake FDI, since the relative domestic input price (compared with the foreign input price) they face is 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.

Second, it might be true that there is a price wedge in the domestic product market as well. The 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 assumption, selection into the domestic market is still tougher for private firms. However, there is no difference in 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 becoming an MNC are the same for private and state-owned firms, conditioning on the productivity draw of φ. Moreover, there is no evidence we can find to support the existence of a domestic output price wedge (between SOEs and private firms) in most manufacturing industries in China after 2000. Therefore, we choose to introduce a wedge in the input price to set up our model.[55]

Finally, we discuss the role played by the fixed FDI cost in our model and relegate the proof of the result to Appendix C. It might be the case that MNCs use domestic factors to pay for the fixed FDI cost. Examples include bringing machinery and equipment purchased domestically to the foreign affiliates. In this case, the fixed cost of engaging in FDI is smaller for SOEs than for private firms, as SOEs pay lower input prices than private firms do. Even in this case, if the marginal cost of production is reasonably lower in China (compared with FDI destination countries on average), we still obtain the result of selection reversal. Economically, the relatively low marginal cost of production in China implies that relative saving on the variable trade cost (coming from producing abroad) is larger for private firms.[56] As a result, the relative incentive to produce abroad is higher for private firms, which again validates our previous theoretical prediction. This condition is likely to hold in the case of China (especially before

[55]Note that a higher FDI fixed cost for SOEs, combined with a domestic output price wedge, can generate the selection reversal pattern between SOEs and private firms. However, we can not find evidence that supports this output price wedge in most manufacturing industries in China after 2000.

[56]We can imagine an extreme case in which the marginal cost of production (in China) adjusted by the variable trade cost is too high for private firms. As a result, there is no difference between the marginal cost of production (in the foreign country) and the marginal cost of production (in China) adjusted by the variable trade cost for private firms. Therefore, private firms have no incentive to produce abroad. However, since SOEs face lower input prices when producing in China, the incentive of producing abroad is still positive for SOEs. This extreme case shows that an extremely higher marginal cost of production in China leads to a lower relative incentive to produce abroad for private firms than for SOEs.

2008), as China had enjoyed relatively low production costs compared with most rich countries.

In the working paper version of this manuscript (Chen, Tian, and Yu 2016), we show that input market distortions in China matter for aggregate productivity in the global economy. We quantity how the domestic distortion affects aggregate gain in productivity after bilateral investment liberalization in a world with two symmetric countries. After calibrating the model to match several key moments obtained from the firm-level data, we implement counterfactual analysis by reducing the fixed FDI cost for both countries and keeping all other parameters of the model unchanged. Counterfactual analysis shows that aggregate productivity increases more after the investment liberalization, when the distortion is more severe in both countries, and the quantitative magnitude is sizeable. We believe that quantifying how asymmetric distortions across border affect aggregate productivity is a promising area for future research.

6 Concluding Remarks

In this study, we utilize data on Chinese MNCs to investigate how distortions (i.e., discrimination against private firms) in the domestic market affect firms' FDI decisions. We 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 a model to rationalize these findings and highlight a key channel through which distortions affect firms' FDI decisions. Distortions in the domestic market incentives 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. Finally, the selection reversal and productivity premium for state-owned MNCs are more pronounced in capital-intensive industries and in industries with more severe discrimination against private firms. All the empirical predictions of the model receive support from the data.

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7 Appendix

7.1 Appendix A: Tables and Figures

Table 1: FDI Share in Chinese Manufacturing Firms (2000-13)

Firm type	2006	2008	2010	2012
Module A: Quality of Matching				
(1) FDI mfg. parent firms (in our sample)	562	867	1945	5501
(2) FDI mfg. parent firms (in the bulletin)	2670	3650	4654	6744
(3) Matching Percentage (%)	21.1	23.8	41.8	81.6
(4) FDI mfg. SOEs share (%, in our sample)	3.02	1.49	1.23	1.81
(5) FDI SOEs share (%, in the bulletin)	26.0	16.1	10.2	9.1
Module B: Number of Firms				
(6) Manufacturing firms	194,201	158,220	306,366	283,018
(7) Continuing FDI Mfg. firms	286	706	1015	3273
(8) New FDI Mfg. firms	276	161	930	2228
(9) FDI share (%)	0.29	0.55	0.64	1.94
(10) Current FDI SOEs	17	13	24	100

Note: Data on FDI starting firms were obtained from the Ministry of Commerce of China and authors' calculations. FDI share in row (9) is obtained by dividing the number of FDI manufacturing firms by the number of manufacturing firms (i.e., (9) = (1)/(6)). SOE FDI share in row (4) is obtained by dividing the number of FDI manufacturing SOE by the number of FDI manufacturing firms (i.e., (4) = (10)/(1)). Matching percentage in row (3) equals FDI mfg. parent firms in our sample divided by FDI mfg. parent firms in the bulletin (i.e., (3) = (1) / (2)).

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

Category	Non-MNCs				MNCs	
	domestic only		domestic+export		all firms	with exports
PSM Matching	unmatched	matched	unmatched	matched	unmatched	unmatched
	(1)	(2)	(3)	(4)	(5)	(6)
(i) Private firms	3.63	3.54	3.62	3.58	4.28	4.28
(ii) SOE	2.99	2.99	3.05	3.05	4.48	4.76
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)
	Ownership defined by state share					
(iii) Private firms	3.63	3.55	3.62	3.58	4.28	4.28
(iv) SOE	3.00	3.00	3.06	3.06	4.49	4.78
Difference=(iii)-(iv)	0.63***	0.55***	0.56***	0.53***	-0.21*	-0.50***
	(95.52)	(42.81)	(97.92)	(48.72)	(-1.72)	(-3.53)

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. These findings are consistent with parts 3 and 4 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). In Rows (iii) and (iv) private firms and SOEs are defined by using the state share in firm's ownership a là Hsieh and Song (2015). Note that we lose some observations when defining SOEs using the state share in firm's ownership, as some firms did not report their state shares in our data. Refer to the texts for details.

Table 2B: Selection Reversal: There Are Disproportionately More Private MNCs

Category	2000-08			2000-13		
MNCs	# of MNCs (1)	# of All firms (2)	Fraction of MNCs (3)	# of MNCs (4)	# of All firms (5)	Fraction of MNCs (6)
(i) Private firms	3,623	1,335,514	0.27%	21,426	2,287,915	0.94%
(ii) SOE	104	40,612	0.25%	270	66,192	0.41%
Ownership defined by state share						
(iii) Private firms	3,622	1,097,322	0.33%	21,130	2,273,486	0.93%
(iv) SOE	105	43,512	0.24%	566	80,621	0.70%

Note: Column (3) reports the fraction of MNCs that is obtained by dividing column (1) by column (2) for year 2000-08. Similarly, column (6) reports the fraction of MNCs that is obtained by dividing column (4) by column (5) for year 2000-13. Clearly, the share of MNCs is smaller among SOEs than among private firms, which is consistent with part 3 of Proposition 1. In Rows (iii) and (iv) private firms and SOEs are defined by using the state share in firm's ownership a là Hsieh and Song (2015). Note that we lose some observations when defining SOEs using the state share in firm's ownership, as some firms did not report their state shares in our data. Refer to the texts for details.

Table 3: Productivity Premium of State-owned MNC by Different Types of Relative TFP (2000-08)

Category	All Firms			Non-MNC Firms			MNC Firms		
Measures of RTFP	$RTFP^{OP}$	$RTFP^{Distort}$	$RTFP^{Distort}_{soe}$	$RTFP^{OP}$	$RTFP^{Distort}$	$RTFP^{Distort}_{soe}$	$RTFP^{OP}$	$RTFP^{Distort}$	$RTFP^{Distort}_{soe}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(i) Private firms	0.506	0.494	0.497	0.505	0.494	0.497	0.616	0.500	0.503
(ii) SOE	0.412	0.478	0.481	0.411	0.479	0.481	0.650	0.528	0.532
Difference=(i)-(ii)	0.094***	0.016***	0.016***	0.094***	0.015***	0.016***	-0.034*	-0.028***	-0.029***
	(93.95)	(46.42)	(46.29)	(97.07)	(46.53)	(46.40)	(-1.69)	(2.69)	(2.73)
	Capital-Intensive Industries Only								
(iii) Private firms	0.509	0.500	0.503	0.509	0.500	0.503	0.624	0.505	0.509
(iv) SOE	0.422	0.477	0.480	0.422	0.477	0.480	0.676	0.525	0.529
Difference=(iii)-(v)	0.087***	0.023***	0.023***	0.087***	0.023***	0.023***	–0.052***	-0.020*	-0.020***
	(78.03)	(59.05)	(59.54)	(78.28)	(59.14)	(59.62)	(-2.39)	(-1.65)	(-1.64)

Notes: Number in parenthesis are t-value. ***(**,*) denotes the significance at 1(5, 10)%, respectively. Columns (1)-(3) show that private firms have higher relative TFP than SOEs for all firms. Similarly, columns (4)-(6) show that private non-MNC firms have higher relative TFP than SOE non-MNC firms. Columns (7)-(9) show that private MNC firms are *less* productive than state-owned MNCs. Columns (1), (4) and (7) are relative Olley-Pakes TFP . Columns (2), (5) and (8) are relative TFP featured with input factor distortions. Columns (3), (6) and (9) are relative TFP featured with input factor distortions and interacted SOE dummy with other polynomials. The upper module includes all sample whereas the bottom one includes capital-intensive industries only, which account for around three quarters of the entire sample.

Table 4: Distribution of MNCs' Relative TFP (2000-08)

Measures of RTFP: $RTFP_{soe}^{Distort}$	All Industries		Capital-intensive Industries	
Category of MNCs:	SOEs	Private firms	SOEs	Private firms
Percentile	(1)	(2)	(3)	(4)
1%	0.322	0.269	0.323	0.250
5%	0.373	0.337	0.374	0.332
25%	0.435	0.439	0.435	0.428
50%	0.515	0.489	0.553	0.486
75%	0.585	0.558	0.598	0.583
95%	0.785	0.681	0.829	0.698
99%	0.917	0.768	0.922	0.820

Notes: Productivity of the most productive firms in each industry is normalized to one. Capital-intensive industries are defined as indsutries with CIC code higher than 20.

Table 5: 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 part 1 of Proposition 3 that relative size of MNCs 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 6: Private Firms Are More Likely to Undertake FDI

Regressand: FDI Indicator	LPM	Logit	Logit	Rare Event Logit	Complementary Log-Log					
Year coverage:	2000-2008								2004-2008	
SOE defined:	narrow	narrow	narrow	narrow	narrow	broad	narrow	narrow	narrow	narrow
Variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SOE Indicator	-0.002**	-0.454*	-0.757***	-1.306***	-0.693***	-0.682***	-1.179***	-0.532*	-0.703***	-0.662**
	(-2.41)	(-1.85)	(-2.88)	(-12.63)	(-2.81)	(-2.88)	(-3.26)	(-1.73)	(-2.68)	(-2.56)
Firm TFP	0.009***	1.333*	1.716**	4.237***	1.838**	1.843**	1.552*	1.603	2.360***	2.500***
	(4.14)	(1.80)	(2.00)	(18.50)	(2.25)	(2.26)	(1.66)	(1.28)	(4.25)	(4.96)
Log Firm Labor	0.003***	0.589***	0.623***	0.588***	0.587***	0.587***	0.565***	0.734***	0.574***	0.567***
	(6.55)	(10.85)	(9.78)	(38.49)	(8.86)	(8.86)	(7.86)	(8.21)	(9.37)	(11.03)
Export Indicator	0.004***	0.900***	1.142***	1.102***	1.145***	1.145***	1.167***	0.736***	1.145***	1.174***
	(7.42)	(4.45)	(6.03)	(26.01)	(6.03)	(6.03)	(5.43)	(3.81)	(5.82)	(6.49)
Foreign Firms Dropped	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tax Haven Dropped	No	No	No	No	No	No	Yes	No	No	No
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distr. FDI Dropped	No	No	No	No	No	No	No	Yes	No	No
Industry Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Switching SOE Dropped	No	No	No	No	No	No	No	No	Yes	Yes
M&A Deals Dropped	No	No	No	No	No	No	No	No	No	Yes
Observations	1,136,603	1,135,467	895,209	896,314	895,209	895,210	894,815	893,754	701,277	701,204

Note: The regressand is the FDI indicator. All columns except column (1) include industry dummies at the 2-digit level and year dummies. The numbers in parentheses are *t*-values clustered at the firm level. *** (**) denotes significance at the 1 percent (5 percent) level. Columns (1)-(2) include foreign-invested firms whereas all other columns drop those firms. Columns (1)-(8) cover data over the period of 2000-2008 whereas Columns (9)-(10) cover data over the period of 2004-2008. Column (6) uses broadly defined SOE. Column (7) drops outward FDI to tax haven destinations. Column (8) drops distribution-oriented FDI (i.e., Distr. FDI). Column (9) drops the switching SOEs (i.e., switching from SOEs to private firms). Column (10) drops both switching SOEs and merge & acquisition deals. In all columns, TFP is measured by augmented Olley-Pakes controlling for input price distortions.

Table 7: Distortions in Input Factors Markets

Regressand	Measured Firm Interest Rates		Firm-Level Unit Land Price			City-Level Unit Land Price	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SOE Indicator	-0.134*	-0.156***	-9.39***	-6.78***			
	(-1.90)	(-2.11)	(-4.43)	(-3.02)			
SOE Intensity						-54.53*	
						(-1.84)	
One-year Lag of SOE Indicator					-11.43***		
					(-4.47)		
One-year Lag of SOE Intensity							-48.97*
							(-1.67)
Other Firm Factors Controls	No	Yes	No	Yes	Yes	No	No
Year-specific Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-specific Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City-specific Fixed Effects	No	Yes	No	No	No	Yes	Yes
Year coverage	2000-08			2000-13		2000-08	
Number of Obs.	1,119,454	106,828	208,320	157,810	103,826	1,489	1,306
R-squared	0.01	0.01	0.07	0.07	0.08	0.13	0.15

Note: Columns (1)-(2) and (6)-(7) cover the period of 2000-08 whereas columns (3)-(5) cover the period of 2000-13. The regressand in columns (1)-(2) is the firm-level interest rate calculated as the ratio of firm interest expenses to current liabilities. The regressand in columns (3)-(5) is the firm-level price of land purchased from the government. This is defined as the ratio of the firm's total spending on land acquisition to the area of land it purchases. The regressand in columns (6)-(7) is the prefectural city-level 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 in columns (6)-(7) is defined as the number of SOEs divided by the total number of manufacturing firms within each prefectural city. All columns control for year-specific and industry-specific fixed effects, respectively. Column (2) adds other controls of firm-level characteristics such as firm TFP, log firm labor, foreign indicator, and export dummy. Columns (4)-(5) add other controls of firm-level characteristics such as firm's capital-labor ratio, foreign indicator, and export dummy. Columns (5) uses the lag of SOE indicator whereas column (7) uses the lag of SOE intensity in the regressions. The numbers in parentheses are *t*-values. *** (**, *) denotes significance at the 1 percent (5 percent, 10 percent) level.

Table 8: Logit Estimates on Channels

Measure of Input Price	Measured Firm-Level Interest Rate					Firm-Level Land Price				
Regressand: FDI Indicator	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SOE Indicator	-0.264**	-0.488***	-0.994***	-0.290**	-0.254**	-0.638***	-1.069***	-1.343***	-1.850***	-1.855***
	(-2.33)	(-4.22)	(-6.36)	(-2.09)	(-2.11)	(-7.67)	(-8.42)	(-10.46)	(-6.61)	(-6.60)
SOE Indicator ×	-0.638*	-0.886**	-0.948*	-1.033**	-0.767*	-0.003**	-0.006***	-0.006***	-0.006***	-0.006***
Ind. Input Price Diff.	(-1.69)	(-2.41)	(-1.90)	(-2.19)	(-1.89)	(-2.10)	(-4.01)	(-4.35)	(-2.76)	(-2.36)
Ind. Input Price Diff.	0.019	0.057	0.079*	0.090	0.019	0.000	0.001***	0.001***	0.001**	0.001*
	(0.54)	(1.56)	(1.84)	(1.30)	(0.53)	(1.35)	(3.27)	(3.40)	(2.34)	(2.24)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Foreign Firms Included	Yes	No	No	No	Yes	Yes	Yes	No	No	No
Tax Haven Included	Yes	Yes	No	Yes	Yes	Yes	No	No	No	No
Distribution FDI Included	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Year Coverage		2000-08			2004-08		2000-13		2000-08	2004-08
Observations	1,121,845	879,003	873,150	829,655	883,712	2,278,062	2,200,723	1,750,939	1,005,294	739,082

Note: The regressand is the FDI indicator. The numbers in parentheses are *t*-values. *** (**) denotes significance at the 1 percent (5 percent) level. Input prices in columns (1)-(5) are measured by firm-level interest rate whereas those in columns (6)-(10) are firm-level unit land price. In particular, the industry interest rate (or unit land price) differential (i.e., Ind. Input Price Diff.) is measured by the average industry-level interest rate (unit land price) paid by private firms minus that paid by SOEs in each 3-digit CIC industries. Industry-level interest rate (or unit land price) is the aggregated average firm-level interest rate (or unit land price) at CIC 3-digit industry level. Columns (1)-(4), (9) cover data over 2000-08 whereas Columns (5) and (10) cover data over 2004-08. Columns (6)-(8) cover data over 2000-13. Columns (2)-(4) and (8)-(10) drop foreign firms. Columns (3), (7)-(10) drop FDI to tax haven destination countries. Column (4) drops distribution FDI. All columns include other firm-level controls such as firm TFP (in columns (1)-(5) only), log employment and export indicator. All regressions include 2-digit industry fixed-effects and year fixed-effects whereas column (10) even controls the industry-year specific fixed-effects.

Table 9: Logit Estimates by Sectors

Sectoral Category:	2000-08			2004-08	
Regressand: FDI Indicator	(1)	(2)	(3)	(4)	(5)
SOE Indicator ×	-0.276	-0.290	-0.690	-0.180	-0.170
Labor-intensive Indicator	(-0.68)	(-0.70)	(-1.36)	(-0.44)	(-0.35)
SOE Indicator ×	-0.475*	-0.754***	-1.257***	-0.834***	-0.646**
Capital-intensive Indicator	(-1.73)	(-2.70)	(-2.98)	(-3.09)	(-2.35)
Firm Relative TFP	1.305*	1.837**	1.551*	2.328***	2.069***
	(1.81)	(2.25)	(1.66)	(4.20)	(3.82)
Log Firm Labor	0.582***	0.587***	0.565***	0.570***	0.539***
	(11.18)	(8.84)	(7.85)	(9.61)	(19.46)
Export Indicator	0.896***	1.146***	1.167***	1.152***	1.297***
	(4.44)	(6.03)	(5.43)	(5.93)	(18.71)
Foreign Firms Dropped	No	Yes	Yes	Yes	Yes
Tax Haven Destinations Dropped	No	No	Yes	No	No
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
SOE switching firms dropped	No	No	No	No	Yes
Observations	1,135,468	895,210	894,816	707,154	554,768

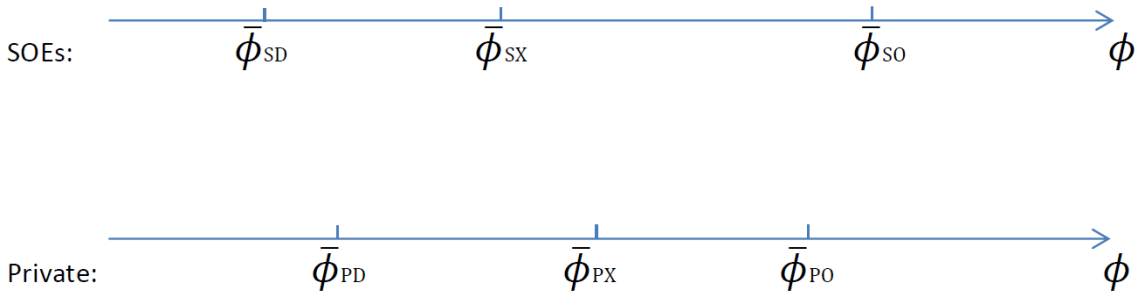
Note: The regressand is the FDI indicator. All columns include industry dummies at the 2-digit level and year dummies. The numbers in parentheses are *t*-values clustered at the firm level. *** (**) denotes significance at the 1 percent (5 percent) level. Columns (1)-(3) cover observations during years 2000-08 whereas columns (4)-(5) cover observations during years 2004-08. Columns (1) keeps foreign invested firms whereas the other columns drop foreign invested firms. Columns (3) drops outward FDI to tax-haven regions. Columns (5) drops SOE switching firms. The relative TFP in columns (1)-(5) are measured by augmented Olley-Pakes controlling for input price distortions. Labor intensive sectors indicator equals one if firm's Chinese industrial classification is higher than 20 and zero otherwise.

Table 10: Ratio of Foreign Sales to Domestic Sales is Higher for Private MNCs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regressand:	log(sales)	log(revenue)	log(sales)	log(revenue)	log(sales)	log(revenue)	log(sales)	log(revenue)
Private Indicator ×	1.223***	1.103***	1.338***	1.111***	1.213***	1.088***	1.326***	1.088***
Foreign Indicator	(9.92)	(7.91)	(7.51)	(5.78)	(9.72)	(7.57)	(7.65)	(5.58)
Private Indicator	-1.546***	-1.405***	-1.567***	-1.380***	-1.496***	-1.356***	-1.541***	-1.342***
	(-7.35)	(-5.48)	(-5.01)	(-3.38)	(-6.97)	(-5.03)	(-5.12)	(-3.30)
Foreign Indicator	-2.518***	-2.323***	-4.362***	-4.190***	-2.217***	-2.013***	-4.032***	-3.816***
	(-3.81)	(-2.94)	(-8.95)	(-6.82)	(-3.55)	(-2.64)	(-7.82)	(-5.66)
Log Total Assets$_{parent}$	0.855***	0.906***	0.802***	0.901***	0.688***	0.749***	0.670***	0.777***
	(11.39)	(10.05)	(7.48)	(6.25)	(7.76)	(4.82)	(5.84)	(4.34)
Log Exports$_{parent}$			0.181	0.0767			0.133	0.0283
			(1.04)	(0.44)			(0.79)	(0.16)
Log Current Liability$_{parent}$					0.168*	0.160	0.131	0.129
					(1.80)	(1.02)	(1.38)	(0.74)
Parent Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	713	733	586	604	678	698	559	577
R-squared	0.896	0.875	0.897	0.865	0.903	0.881	0.900	0.868

Note: Observation are affiliate-year pairs between 2012 and 2014, and log(*sales*) and log(*revenue*) are log sales and log revenue of each (domestic or foreign) affiliate of Chinese MNCs in a given year. Orbis data of affiliates between 2012-2014 are merged to ASIF data of parent firms between 2011-2013 (i.e., one year lag). Specifically, we merge our ASIF data with the ORBIS data using (Chinese) parent firms' trade registration number (in China) whose information is contained by both data sets after 2011. Both MNC starters and incumbents (after 2011) are included into the regression. Standard errors are clustered at the parent firm level. *** (**, *) denotes significance at the 1 percent (5 percent, 10 percent) level, and *t* statistics are reported in parentheses.

Figure 1: Selection Reversal



7.2 Appendix B: Proofs

7.2.1 Proof of Proposition 1

Proof: The first two parts have already been proved. Here we prove the last two parts. Because the monotone likelihood ratio property (MLRP) implies first-order stochastically dominance (FOSD), we only need to prove the part 3 under the assumption of FOSD.

First, the fraction of MNCs among each type of firm is

$$frac_{i,mnc} = \frac{1 - F_i(\bar{\varphi}_{iO})}{1 - F_i(\bar{\varphi}_{iD})},$$

where $i \in \{P, S\}$ and $F_i(\varphi)$ is the cumulative probability density function (CDF) of the productivity draw. Note that since $\bar{\varphi}_{PD} > \bar{\varphi}_{SD}$, a sufficient condition for $frac_{S,mnc} < frac_{P,mnc}$ to hold is

$$\frac{1 - F_S(\bar{\varphi}_{SO})}{1 - F_S(\bar{\varphi}_{PD})} < \frac{1 - F_P(\bar{\varphi}_{PO})}{1 - F_P(\bar{\varphi}_{PD})}.$$

Since the FOSD property holds for the truncated productivity distributions and $\bar{\varphi}_{SO} > \bar{\varphi}_{PO}$, it must be true that

$$\frac{1 - F_S(\bar{\varphi}_{SO})}{1 - F_S(\bar{\varphi}_{PD})} < \frac{1 - F_S(\bar{\varphi}_{PO})}{1 - F_S(\bar{\varphi}_{PD})} < \frac{1 - F_P(\bar{\varphi}_{PO})}{1 - F_P(\bar{\varphi}_{PD})},$$

which leads to the result that the fraction of MNCs is larger among private firms than among SOEs.

Second, average productivity of active private firms is

$$\begin{aligned}
\int_{\bar{\varphi}_{PD}}^{\infty} \frac{\varphi f_P(\varphi)}{1 - F_P(\bar{\varphi}_{PD})} d\varphi &= \bar{\varphi}_{PD} + \int_{\bar{\varphi}_{PD}}^{\infty} \frac{1 - F_P(\varphi)}{1 - F_P(\bar{\varphi}_{PD})} d\varphi \\
&> \bar{\varphi}_{SD} + \int_{\bar{\varphi}_{SD}}^{\infty} \frac{1 - F_P(\varphi)}{1 - F_P(\bar{\varphi}_{SD})} d\varphi \\
&> \bar{\varphi}_{SD} + \int_{\bar{\varphi}_{SD}}^{\infty} \frac{1 - F_S(\varphi)}{1 - F_S(\bar{\varphi}_{SD})} d\varphi,
\end{aligned}$$

where the first line comes from integration by parts, and the second line is true as $\bar{\varphi}_{SD} < \bar{\varphi}_{PD}$. The last

step is true because the truncated distribution of the productivity draw also satisfies the FOSD property. Furthermore, as

$$\int_{\bar{\varphi}_{SD}}^{\infty} \frac{\varphi f_S(\varphi)}{1-F_S(\bar{\varphi}_{SD})} d\varphi = \bar{\varphi}_{SD} + \int_{\bar{\varphi}_{SD}}^{\infty} \frac{1-F_S(\varphi)}{1-F_S(\bar{\varphi}_{SD})} d\varphi,$$

we have the result that average productivity of private firms is greater than that of SOEs overall.

For the proof of part 4, we have to impose a stronger assumption that both types of firms make productivity draws from the same distribution (i.e., $f(\varphi) = f_P(\varphi) = f_S(\varphi)$), although this is not a necessary condition for the result to hold. Under this assumption, we have

$$\begin{aligned}
\int_{\bar{\varphi}_{PO}}^{\infty} \frac{\varphi f(\varphi)}{1-F(\bar{\varphi}_{PO})} d\varphi &= \bar{\varphi}_{PO} + \int_{\bar{\varphi}_{PO}}^{\infty} \frac{1-F(\varphi)}{1-F(\bar{\varphi}_{PO})} d\varphi \\
&< \bar{\varphi}_{SO} + \int_{\bar{\varphi}_{SO}}^{\infty} \frac{1-F(\varphi)}{1-F(\bar{\varphi}_{SO})} d\varphi \\
&= \int_{\bar{\varphi}_{SO}}^{\infty} \frac{\varphi f(\varphi)}{1-F(\bar{\varphi}_{SO})} d\varphi,
\end{aligned}$$

which implies that (simple) average productivity of private MNCs is smaller than that of state-owned MNCs.

7.2.2 Proof of Proposition 2

Proof: Comparing equation (13) with equation (14), we know that the productivity premium of state-owned MNCs increases with the level of domestic distortion (i.e., selection into the FDI market becomes much less stringent for private firms compared with SOEs), or $\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{PO}}\Big(>1\Big)$ increases with c. Furthermore, selection into the domestic market becomes more stringent for private firms compared with SOEs when c increases, as $\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{SD}}\Big(>1\Big)$ increases with c. Therefore, the first part follows.

For the second part, since we have $\mu = 1$ now, the production function becomes

$$q(k,l) = \varphi\Big(\frac{k}{0.5}\Big)^{0.5}\Big(\frac{l}{0.5}\Big)^{0.5}, \tag{15}$$

and TVC and FC (for SOEs) become

$$TVC(q,\varphi) = \frac{qr}{\varphi\omega^{0.5}} \tag{16}$$

and

$$FC(q,\varphi) = \frac{f_i r}{\omega^{0.5}}, \tag{17}$$

where $i \in \{e, D, X, I\}$. Repeating the procedure as before, we obtain

$$\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}} = \frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}} > 1; \quad \bar{\varphi}_{SO} > \bar{\varphi}_{PO}; \quad \bar{\varphi}_{SD} < \bar{\varphi}_{PD}.$$

Furthermore, it is straightforward to establish that both $\frac{\bar{\varphi}_{SO}}{\bar{\varphi}_{PO}}\Big(>1\Big)$ and $\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{SD}}\Big(>1\Big)$ increase with c. There-

fore, the productivity premium of state-owned MNCs is more pronounced in capital intensive industries. And, SOEs are much less likely to engage in FDI (relative to private firms) in capital intensive industries.

7.2.3 Proof for Proposition 3

Proof: For the first part, the relative size of private MNCs (i.e., compared with private non-exporting firms) is

$$\frac{\pi_{PD}(\bar{\varphi}_{PO})\left[1-\left(\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{PX}}\right)^{k}\right]}{\pi_{PD}(\bar{\varphi}_{PD})\left[1-\left(\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{PX}}\right)^{k-(\sigma-1)}\right]}=\frac{\bar{\varphi}_{PO}^{\sigma-1}\left[1-\left(\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{PX}}\right)^{k}\right]}{\bar{\varphi}_{PD}^{\sigma-1}\left[1-\left(\frac{\bar{\varphi}_{PD}}{\bar{\varphi}_{PX}}\right)^{k-(\sigma-1)}\right]}$$

under the Pareto assumption. Similarly, for SOEs, the relative size is

$$\frac{\pi_{SD}(\bar{\varphi}_{SO})\left[1-\left(\frac{\bar{\varphi}_{SD}}{\bar{\varphi}_{SX}}\right)^{k}\right]}{\pi_{SD}(\bar{\varphi}_{SD})\left[1-\left(\frac{\bar{\varphi}_{SD}}{\bar{\varphi}_{SX}}\right)^{k-(\sigma-1)}\right]}=\frac{\bar{\varphi}_{SO}^{\sigma-1}\left[1-\left(\frac{\bar{\varphi}_{SD}}{\bar{\varphi}_{SX}}\right)^{k}\right]}{\bar{\varphi}_{SD}^{\sigma-1}\left[1-\left(\frac{\bar{\varphi}_{SD}}{\bar{\varphi}_{SX}}\right)^{k-(\sigma-1)}\right]}$$

Since

$$\frac{\bar{\varphi}_{PX}}{\bar{\varphi}_{PD}}=\frac{\bar{\varphi}_{SX}}{\bar{\varphi}_{SD}}>1,\quad \bar{\varphi}_{SO}>\bar{\varphi}_{PO},\quad \bar{\varphi}_{SD}<\bar{\varphi}_{PD},$$

the relative size of private MNCs (i.e., compared with private non-exporting firms) is smaller than that of state-owned MNCs.

We now prove the second part. Comparing equation (12) with equation (9) and noting that overall sales are proportional to the operating profit, we conclude that the ratio of foreign sales to domestic sales is higher for private MNCs (than for state-owned MNCs), conditioning on φ. This is because domestic sales are smaller for private firms than for SOEs, conditioning on the productivity draw, φ.

For the third part of the proposition, there are three cases to consider. The first case is that both types of firms are non-exporters before the reduction in f_I. Equations (7), (9) (11) and (12) 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 that overall sales are proportional to the operating profit). The second case is that both types of firms are exporters before the reduction in f_I. In this case, equations (8), (10) (11) and (12) together imply that

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

Therefore, after two firms with the same φ 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 is that 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 two firms with the same φ undertake FDI, the increase in overall firm size is larger for the new private MNC (than for the new state-owned MNC). In total, the third part of this proposition is true for all possible cases.

7.3 Appendix C: Variants of the Model

7.3.1 Fixed FDI Cost

In this subsection, we assume that the fixed FDI cost is paid using domestic factors. Under current specification, we derive FDI cutoffs as

$$\frac{(f_I - f_X)r_H}{(1+\omega_H^{\mu-1})^{\frac{1}{\mu-1}}} = \frac{D_F}{\sigma}\left(\beta\bar{\varphi}_{SO}\right)^{\sigma-1}\left[\frac{(1+\omega_F^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{r_F^{\sigma-1}} - \frac{(1+\omega_H^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{(\tau r_H)^{\sigma-1}}\right] \tag{18}$$

and

$$\frac{(f_I - f_X)cr_H}{(1+(c\omega_H)^{\mu-1})^{\frac{1}{\mu-1}}} = \frac{D_F}{\sigma}\left(\beta\bar{\varphi}_{PO}\right)^{\sigma-1}\left[\frac{(1+\omega_F^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{r_F^{\sigma-1}} - \frac{(1+(c\omega_H)^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{(c\tau r_H)^{\sigma-1}}\right]. \tag{19}$$

Denote the inverse of domestic marginal cost (after normalizing φ to one) as

$$x_H(r_H, w_H) = \frac{(1+\omega_H^{\mu-1})^{\frac{1}{\mu-1}}}{r_H} \tag{20}$$

and the inverse of foreign marginal cost as

$$x_F(r_F, w_F) = \frac{(1+\omega_F^{\mu-1})^{\frac{1}{\mu-1}}}{r_F}. \tag{21}$$

Note that the existence of the input price wedge increases the domestic marginal cost, or

$$x_H(r_H, w_H) > x_H(cr_H, w_H).$$

A sufficient and necessary condition for $\bar{\varphi}_{SO} > \bar{\varphi}_{PO}$ (for any $c > 1$) is that

$$\tau^{\sigma-1}x_F(r_F, w_F)^{\sigma-1}(x_H(r_H, w_H) - x_H(cr_H, w_H)) < x_H(r_H, w_H)^{\sigma} - x_H(cr_H, w_H)^{\sigma},$$

which puts an upper bound on the marginal production cost in China (i.e., "H").[57] The above condition is more likely to hold in the case of China (especially before 2008), as China enjoyed relatively low production costs compared with developed economies.

Another variant of the above model is that both types of firms use domestic resources to pay for the fixed FDI cost, and private firms do not face discrimination when they pay for this fixed cost. This assumption receives some empirical support, as the Chinese government is actively seeking to support the "Going-Out" strategy of Chinese firms which include private firms. For this variant of the model,

[57] Note that since $\sigma > 1$, $\frac{x_H(r_H,w_H)^{\sigma} - x_H(cr_H,w_H)^{\sigma}}{x_H(r_H,w_H) - x_H(cr_H,w_H)}$ increases with $x_H(r_H, w_H)$.

FDI cutoffs can be derived as

$$\frac{(f_I - f_X)r_H}{(1+\omega_H^{\mu-1})^{\frac{1}{\mu-1}}} = \frac{D_F}{\sigma}\left(\beta\bar{\varphi}_{SO}\right)^{\sigma-1}\left[\frac{(1+\omega_F^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{r_F^{\sigma-1}} - \frac{(1+\omega_H^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{(\tau r_H)^{\sigma-1}}\right] \tag{22}$$

and

$$\frac{f_I r_H}{(1+\omega_H^{\mu-1})^{\frac{1}{\mu-1}}} - \frac{f_X c r_H}{(1+(c\omega_H)^{\mu-1})^{\frac{1}{\mu-1}}} = \frac{D_F}{\sigma}\left(\beta\bar{\varphi}_{PO}\right)^{\sigma-1}\left[\frac{(1+\omega_F^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{r_F^{\sigma-1}} - \frac{(1+(c\omega_H)^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{(c\tau r_H)^{\sigma-1}}\right]. \tag{23}$$

Obviously, the selection reversal result holds irrespective of parameter values (i.e., $\bar{\varphi}_{SO} > \bar{\varphi}_{PO}$), since there is no difference in the fixed cost of engaging in FDI between SOEs and private firms.

7.3.2 Variable FDI Cost

In this subsection, we modify our basic model to allow SOEs to use domestic factors when producing abroad. SOEs would have incentive to do so, if

$$x_H(r_H, w_H) > x_F(r_F, w_F) > x_H(cr_H, w_H),$$

and firms are allowed to bring domestic factors to the foreign country to produce. Under this specification, FDI cutoffs can be derived as

$$\frac{f_I r_F}{(1+\omega_F^{\mu-1})^{\frac{1}{\mu-1}}} - \frac{f_X r_H}{(1+(\omega_H)^{\mu-1})^{\frac{1}{\mu-1}}} = \frac{D_F}{\sigma}\left(\beta\bar{\varphi}_{SO}\right)^{\sigma-1}\left[\frac{(1+\omega_H^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{r_H^{\sigma-1}} - \frac{(1+\omega_H^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{(\tau r_H)^{\sigma-1}}\right] \tag{24}$$

and

$$\frac{f_I r_F}{(1+\omega_F^{\mu-1})^{\frac{1}{\mu-1}}} - \frac{f_X c r_H}{(1+(c\omega_H)^{\mu-1})^{\frac{1}{\mu-1}}} = \frac{D_F}{\sigma}\left(\beta\bar{\varphi}_{PO}\right)^{\sigma-1}\left[\frac{(1+\omega_F^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{r_F^{\sigma-1}} - \frac{(1+(c\omega_H)^{\mu-1})^{\frac{\sigma-1}{\mu-1}}}{(c\tau r_H)^{\sigma-1}}\right]. \tag{25}$$

A sufficient condition for the selection reversal result to hold (i.e., $\bar{\varphi}_{SO} > \bar{\varphi}_{PO}$) is

$$\tau^{\sigma-1}[x_H(r_H, w_H)^{\sigma-1} - x_F(r_F, w_F)^{\sigma-1}] < x_H(r_H, w_H)^{\sigma-1} - x_H(cr_H, w_H)^{\sigma-1},$$

where $x_H(.,.)$ and $x_F(.,.)$ are defined in equations (20) and (21) respectively. Note that this condition is a sufficient but non-necessary condition for the selection reversal result to hold. Absent general equilibrium feedback, the above inequality holds if the distortion is more severe (i.e., $x_H(cr_H, w_H)$ is small enough) or the difference in the undistorted factor prices across countries is small (i.e., $x_H(r_H, w_H)$ is close enough to $x_F(r_F, w_F)$).

7.4 Appendix D: Outward FDI between 2000 and 2013

In this appendix, we use the new sample with the longer time span to check the extensive margin of outward FDI. For 2000-13, the MNC ratio for private firms is *0.93* percent, whereas that for broadly

defined SOEs is *0.70* percent. This finding suggests that the fraction of MNCs is larger among private firms than among SOEs, which is consistent with our theoretical prediction and our finding using data for 2000-08. Since firm productivity cannot be precisely estimated using the new data set, we do not check the productivity premium of state-owned MNCs. Instead, we focus on examining whether SOEs are still less likely to engage in outward FDI, even after we include data after 2008.

Appendix Table 7 picks up this task. Similar to the estimates in Table 5, the regressand is the firm's outward FDI indicator, whereas the SOE indicator is the key regressor. In all estimates, we control for the log of employment and log of firm size as well as the firm's export indicator. Column (1) is the simple linear probability model, and columns (2) and (3) are logit estimates. It turns out that, once again, the coefficient of the SOE indicator is negative and statistically significant, suggesting that SOEs are less likely to undertake outward FDI. Column (4) uses rare-event logit to correct for rare-event bias; the rest of the table uses complementary log-log regressions. In particular, column (6) uses a broadly defined SOE indicator, and column (7) drops observations with outward FDI to tax haven destinations. Column (8) drops observations before 2004, and columns (9) and (10) only include observations after the global financial crisis (2010-13). Finally, column (10) drops the switching SOEs (to private firms) from the sample. In all respects, our previous key finding that SOEs are less likely to engage in outward FDI is shown to be robust.

[Insert Appendix Table 7 Here]

As further robustness checks for our previous findings, we use observations until 2013 to run the difference-in-differences regressions with emphasis on the industry-level interest rate differential and the difference between capital-intensive industries and labor-intensive industries. The results are reported in Appendix Tables 8 and 9. Similar to our findings using the sample of 2000-2008, SOEs are still less likely to engage in outward FDI when industry-level interest rate differential (between SOEs and private firms) becomes larger. Furthermore, they are still less likely to engage in outward FDI when they come from capital intensive industries (compared to SOEs coming from labor intensive industries). In all respects, it is still true that SOEs are less likely to engage in outward FDI in sectors that experience more severe distortion distortion (in terms of the cost of borrowing). Furthermore, it is still true that SOEs are less likely to engage in outward FDI in sectors that have higher demand for working capital, since the magnitude of the interacted coefficient of the SOE indicator and capital-intensive indicator is larger than that of the SOE indicator and labor-intensive indicator.

[Insert Appendix Table 8 Here]
[Insert Appendix Table 9 Here]

8 Appendix Tables: Not for Publication

Appendix Table 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	0.191	0	1
SOE indicator (broader)	0.07	0.252	0	1
Foreign indicator	0.20	0.402	0	1
Firm log employment	4.78	1.115	1.61	13.25

Appendix Table 2: Estimations on Productivity Premium of State-owned MNC (2000-08)

Regressand:	TFP^{OP}				Relative TFP^{OP}			
Measures of SOE	narrow	narrow	broad	broad	narrow	narrow	broad	broad
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SOE Indicator	-0.320***	-0.332***	-0.282***	-0.284***	-0.053***	-0.055***	-0.047***	-0.048***
	(-26.97)	(-28.78)	(-26.06)	(-26.88)	(-26.84)	(-28.24)	(-25.94)	(-26.86)
SOE Indicator×MNC Indicator	0.547***	0.546***	0.562***	0.575***	0.092***	0.094***	0.094***	0.097***
	(3.91)	(4.01)	(4.24)	(4.45)	(3.91)	(4.10)	(4.23)	(4.45)
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
Affiliate Industry Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Destination Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Parent Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	1,140,824	1,140,824	1,140,824	1,140,824	1,140,824	1,140,824	1,140,824	1,140,824
R-squared	0.01	0.05	0.01	0.05	0.01	0.05	0.01	0.05

Notes: Number in parenthesis are t-value. ***(**,*) denotes the significance at 1(5, 10)%, respectively. The regressands in columns (1)-(4) are Olley-Pakes TFP whereas those in columns (5)-(8) are relative Olley-Pakes TFP. Columns (1), (2), (5) and (6) use the narrow-defined SOE indicator whereas those in columns (3), (4), (7) and (8) use the broad-defined SOE indicator. All columns are controlled with firm-specific fixed effects. In additions, columns (2), (4), (6), (8) include affiliate industry fixed effects, FDI destination country fixed effects and more firm-level controls such as log employment, foreign indicator, and export indicator.

Appendix Table 3: Robustness Checks for Productivity Premium of State-owned MNCs (2000-06)

Category	All Firms		Non-MNC Firms		MNC Firms	
Measures of RTFP	Labor Productivity	$RTFP^{LevPet}$	Labor Productivity	$RTFP^{LevPet}$	Labor Productivity	$RTFP^{LevPet}$
	(1)	(2)	(3)	(4)	(5)	(6)
(i) Private firms	10.69	0.525	10.69	0.525	11.14	0.596
(ii) SOE	10.30	0.518	10.29	0.519	11.72	0.684
Difference=(i)-(ii)	0.39***	0.007***	0.40***	0.006***	-0.588*	-0.088***
	(58.82)	(6.49)	(59.08)	(6.57)	(-4.46)	(-2.80)

Notes: Columns (1)-(2) show that private firms have higher log labor productivity and relative TFP (measured in Levinsohn-Petrin) than SOEs for all firms. Similarly, columns (3) and (4) show that private non-MNC firms have higher log labor productivity and relative TFP than SOE non-MNC firms. Columns (5) and (6) show that private MNC firms are *less* productive than SOE MNC firms. Number in parenthesis are t-value. ***(**,*) denotes the significance at 1(5, 10)%, respectively.

Appendix Table 4: Absolute Size Premium for SOEs

Category	Non-FDI exporting firms		FDI non-exporting firms		MNCs		Domestic sales
Variable	Lnl	Sales	Lnl	Sales	Lnl	Sales	of MNCs
	(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 numbers in parentheses are *t*-values. *** (**, *) denotes significance at the 1 percent (5 percent, 10 percent) level.

Appendix Table 5: Private Firms Are More Likely to Start FDI

Regressand: Starting FDI Indicator	LPM	Logit	Logit	Rare Event Logit	Complementary Log-Log					
Year coverage:	2000-2008								2004-2008	
SOE defined:	narrow	narrow	narrow	narrow	narrow	broad	narrow	narrow	narrow	narrow
Variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SOE Indicator	-0.001***	-0.878***	-1.079***	-1.579***	-1.071***	-0.981***	-1.402***	-0.818***	-1.114***	-1.212***
	(-5.46)	(-3.97)	(-4.79)	(-7.54)	(-4.79)	(-4.29)	(-5.06)	(-2.99)	(-4.68)	(-4.59)
Firm TFP	0.004***	2.641***	2.975***	3.820***	2.933***	2.934***	2.773***	3.629***	2.871***	2.691***
	(6.10)	(5.19)	(5.40)	(9.44)	(5.40)	(5.40)	(4.63)	(4.98)	(5.20)	(4.70)
Log Firm Labor	0.001***	0.583***	0.603***	0.557***	0.598***	0.596***	0.569***	0.720***	0.598***	0.587***
	(14.56)	(21.84)	(18.87)	(21.23)	(19.02)	(18.98)	(16.65)	(16.41)	(18.88)	(18.94)
Export Indicator	0.002***	1.347***	1.621***	1.624***	1.620***	1.620***	1.708***	1.159***	1.621***	1.520***
	(15.77)	(16.08)	(16.98)	(19.09)	(16.98)	(16.97)	(16.39)	(9.00)	(16.92)	(16.14)
Foreign Firms Dropped	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tax Haven Dropped	No	No	No	No	No	No	Yes	No	No	No
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distribution FDI Dropped	No	No	No	No	No	No	No	Yes	No	No
Industry Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Switching SOE Dropped	No	No	No	No	No	No	No	No	Yes	Yes
M&A Deals Dropped	No	No	No	No	No	No	No	No	No	Yes
Observations	1,136,604	1,135,468	859,096	896,315	859,096	859,096	858,705	857,641	707,154	554,760

Note: The regressand is the starting FDI indicator. All columns except column (1) include industry dummies at the 2-digit level and year dummies. The numbers in parentheses are *t*-values clustered at the firm level. *** (**) denotes significance at the 1 percent (5 percent) level. Columns (1)-(2) include foreign-invested firms whereas all other columns drop those firms. Columns (1)-(8) cover data over the period of 2000-2008 whereas Columns (9)-(10) cover data over the period of 2004-2008. Column (6) uses broadly defined SOE. Column (7) drops outward FDI to tax haven destinations. Column (8) drops distribution-oriented FDI. Column (9) drops the switching SOEs (i.e., switching from SOEs to private firms). Column (10) drops both switching SOEs and merge & acquisition deals. In all columns, TFP is measured by augmented Olley-Pakes controlling for input price distortions.

Appendix Table 6: Regressions with Destination-specific and Affiliates' Industry-specific Fixed Effects

Regressand:	FDI Indicator		Starting FDI Indicator	
	2000-2008			
SOE Indicator	-0.000***	-0.000***	-0.000	-0.000
	(-9.55)	(-3.96)	(-0.73)	(-1.54)
Parent Industry FEs	Yes	Yes	Yes	Yes
Affiliate Industry FEs	Yes	Yes	Yes	Yes
Destination FEs	No	Yes	No	Yes
Year FEs	Yes	Yes	Yes	Yes
Observations	1,136,604	1,136,604	1,136,604	1,136,604
R-squared	1.00	1.00	0.32	0.33

Note: The regressand in columns (1) to (2) is FDI Indicator as in Table 5, while the regressand in columns (3) to (4) is the indicator of starting FDI as in Table 6. All columns include firm-level controls such as firm's relative TFP, log employment and the exporting indicator. Parent industry-specific, year-specific and affiliate industry-specific fixed effects are included into all columns. The numbers in parentheses are robust *t*-values. *** (**, *) denotes significance at the 1 percent (5 percent, 10 percent) level.

Appendix Table 7: Private Firms Are More Likely to Undertake FDI (2000-2013)

Regressand: FDI Indicator	LPM	Logit	Logit	Rare Event Logit	Complementary Log-Log					
Year coverage:				2000-2013				2004-13	2010-2013	
SOE defined:	narrow	narrow	narrow	narrow	narrow	broad	narrow	narrow	narrow	narrow
Variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SOE Indicator	-0.002***	-0.541***	-0.699***	-1.413***	-0.695***	-0.756***	-0.951***	-0.692***	-0.399***	-0.425***
	(-6.35)	(-5.23)	(-6.64)	(-16.88)	(-6.63)	(-7.99)	(-6.50)	(-6.58)	(-3.78)	(-3.93)
Log Firm Sales	0.004***	0.431***	0.455***	0.548***	0.443***	0.444***	0.443***	0.442***	0.430***	0.430***
	(37.66)	(44.35)	(39.50)	(71.84)	(39.80)	(39.86)	(28.33)	(39.79)	(35.94)	(35.85)
Log Firm Labor	0.001***	0.216***	0.268***	0.142***	0.258***	0.262***	0.276***	0.258***	0.261***	0.263***
	(10.26)	(16.88)	(17.93)	(14.23)	(17.89)	(18.06)	(13.57)	(17.91)	(15.57)	(15.60)
Export Indicator	0.004***	0.671***	0.721***	1.109***	0.713***	0.712***	1.168***	0.712***	0.367***	0.366***
	(22.24)	(26.63)	(24.50)	(52.99)	(24.45)	(24.42)	(27.23)	(24.42)	(13.18)	(13.12)
Foreign Firms Dropped	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tax Haven Dropped	No	No	No	No	No	No	Yes	No	No	No
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	No	No	No	No	No	No	No	No	No
Industry Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
with Swtiching SOEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Observations	2,529,449	2,529,074	2,028,733	1,820,515	2,028,733	2,028,733	2,022,589	1,696,358	547,719	545,306

Note: The regressand is the FDI indicator. All columns except column (1) include industry dummies at the 2-digit level and year dummies. The numbers in parentheses are *t*-values clustered at the firm level. *** (**) denotes significance at the 1 percent (5 percent) level. Columns (1)-(2) include foreign-invested firms whereas all other columns drop those firms. Columns (1)-(7) cover data over the period of 2000-2013, whereas Column (8) cover data from 2004-2013. Columns (9)-(10) cover data over the period of 2010-2013. Column (6) uses broadly defined SOE. Column (7) drops outward FDI to tax haven destinations. Column (10) drops the switching SOEs (i.e., switchers from SOEs to private firms).

Appendix Table 8: Logit Estimates on Channels (2000-13)

SOE Defined	Narrow					Broad		
Regressand: FDI Indicator	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SOE Indicator	-0.599***	-0.728***	-0.591***	-1.004***	-1.002***	-0.254***	-0.449***	-0.262***
	(-8.59)	(-10.39)	(-8.44)	(-10.02)	(-9.96)	(-5.53)	(-9.20)	(-5.65)
Industry Rate Differential	-0.000**	-0.000**	-0.000*	0.000	0.000	-0.000**	-0.000**	-0.000**
	(-2.00)	(-2.43)	(-1.95)	(0.89)	(1.05)	(-2.15)	(-2.39)	(-2.09)
SOE Indicator ×	-0.000	-0.001*	-0.000	-0.001**	-0.001**	-0.000	-0.000	-0.000
Ind. Rate Differential	(-1.53)	(-1.79)	(-1.52)	(-2.38)	(-2.54)	(-1.03)	(-1.54)	(-1.05)
Log Firm Labor	0.609***	0.684***	0.608***	0.706***	0.701***	0.610***	0.690***	0.609***
	(89.18)	(87.33)	(88.81)	(70.15)	(69.73)	(87.93)	(86.04)	(87.62)
Export Indicator	0.752***	0.819***	0.751***	1.212***	1.217***	0.753***	0.819***	0.751***
	(41.55)	(39.90)	(41.43)	(42.18)	(42.37)	(41.56)	(39.85)	(41.43)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Foreign Firms Included	Yes	No	Yes	No	No	Yes	No	Yes
Tax Haven Included	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Year Coverage	2000-13		2004-13	2000-13	2004-13	2000-13		2004-13
Observations	2,586,369	2,066,377	2,178,413	2,056,130	1,735,448	2,586,369	2,066,377	2,178,413

Note: The regressand is the FDI indicator. The numbers in parentheses are *t*-values clustered at the firm level. *** (**) denotes significance at the 1 percent (5 percent) level. Columns (1)-(5) use conventional definition of the SOE indicator whereas the SOE indicator in column (6)-(8) is broadly defined as in Hsieh and Song (2015). Industry interest rate differential is measured by average industry-level interest rate paid by private firms minus that paid by SOEs in each 3-digit industry level. Columns (4) and (5) drop FDI to tax haven destinations. Columns (2), (4), (5) and (7) drop parent firms that are foreign firms. Columns (1), (2), (4), (6) and (7) cover data over 2000-13 whereas the rest of the table covers data over 2004-13. All regressions include 3-digit industry fixed-effects and year fixed-effects.

Appendix Table 9: Logit Estimates by Sectors (2000-13)

Sectoral Category:	2000-13			2004-13	
Regressand: FDI Indicator	(1)	(2)	(3)	(4)	(5)
SOE Indicator ×	-0.567***	-0.648***	-0.443	-0.638***	-0.598*
Labor-intensive Indicator	(-2.61)	(-2.97)	(-1.50)	(-2.93)	(-1.81)
SOE Indicator ×	-0.582***	-0.753***	-1.164***	-0.754***	-0.995***
Capital-intensive Indicator	(-4.73)	(-6.07)	(-6.79)	(-6.03)	(-5.57)
Log Firm Labor	0.607***	0.681***	0.696***	0.680***	0.738***
	(49.28)	(49.59)	(38.46)	(49.55)	(47.31)
Export Indicator	0.758***	0.836***	1.248***	0.835***	1.016***
	(28.10)	(26.40)	(27.57)	(26.37)	(26.47)
Foreign Firms Dropped	No	Yes	Yes	Yes	Yes
Tax Haven Destinations Dropped	No	No	Yes	No	No
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
SOE switching firms dropped	No	No	No	No	Yes
Observations	2,602,602	2,080,027	2,074,328	1,747,652	1,056,652

Note: The regressand is the FDI indicator. All columns include industry dummies at the 2-digit level and year dummies. The numbers in parentheses are *t*-values clustered at the firm level. *** (**) denotes significance at the 1 percent (5 percent) level. Columns (1)-(3) cover observations during years 2000-13 whereas columns (4)-(5) cover observations during years 2004-13. Columns (1) keeps foreign invested firms whereas the other columns drop foreign invested firms. Columns (3) drops outward FDI to tax-haven regions. Columns (5) drops SOE switching firms. Labor intensive sectors indicator equals one if firm's Chinese industrial classification is higher than 20 and zero otherwise.