Outward FDI and Domestic Input Distortion: Evidence from Chinese Firms

Cheng Chen, Wei Tian and Miaojie Yu

SEF of HKU; SITE of UIBE; CCER and NSD of PKU
Outward foreign direct investment (outward FDI) from developing countries is increasing at a high speed (UNCTAD World Investment Report (2015)):

- In 2014, MNCs from developing economies invested almost 468 billion USD abroad, a 23 per cent increase from the previous year.
Motivation: Outward FDI from Developing Countries

- Outward foreign direct investment (outward FDI) from developing countries is increasing at a high speed (UNCTAD World Investment Report (2015)):
  - In 2014, MNCs from developing economies invested almost 468 billion USD abroad, a 23 per cent increase from the previous year.
  - Developing and transition economies represent 9 of the 20 largest investor economies globally.
  - Developing economies now account for more than one third of global FDI outflows, up from 13 per cent in 2007.
Chinese Firms’ Going Globe

- China has seen an astonishing increase in its outward FDI flows in the past decade.
  - China’s outward FDI flows: 6.5% of the world’s FDI flows in 2012.
  - China’s outward FDI flows have increased by 37.8 times in the past ten years, while GDP and trade volume of FDI have only increased by less than fourfold.
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  - China’s outward FDI flows have increased by 37.8 times in the past ten years, while GDP and trade volume of FDI have only increased by less than fourfold.
- China’s outward FDI flows (140 billion USD) surpassed its inward FDI flows (119 billion USD) in 2014.
Distortion and Misallocation in China

- We investigate investment and production strategies of Chinese MNCs and patterns of China’s outward FDI through the lens of domestic distortions.
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- Discriminations against private firms are a fundamental issue for Chinese economy.
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Introduction

Stylized Facts

1. Although non-FDI private firms are more productive than non-FDI SOEs on average, private FDI firms are less productive than state-owned FDI firms on average (productivity premium for state-owned MNCs).
   - Puzzling, since it is well known that SOE are less productive than private firms in China.
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2. Compared with private firms, SOEs are less likely to undertake outward FDI, and the fraction of outward FDI firms is smaller among SOEs.
   - Puzzling, since SOEs are much bigger and receive supports from government for going abroad.

(Chen, Tian and Yu)
Main Results

1 Theory:
   ▶ Consider Helpman, Melitz and Yeaple (2004) (i.e., horizontal FDI) with two (possibly asymmetric) countries.
   ▶ Private firms pay higher input price when *producing at home* (wedge).
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2 Institutional arbitrage:
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3 Selection reversal:
   - For private firms (compared with SOEs): tougher selection in the domestic market and less stringent selection in the FDI market.
Related Literature

1 FDI and MNCs:
   - Horizontal: Markusen (1984), Brainard (1997), Helpman, Melitz and Yeaple (2004);

2 Distortion and Misallocation:
   - Hsieh and Klenow (2009), Restuccia and Rogerson (2008);
   - Midrigan and Xu (2010), Moll (2012);

3 Chinese Economy, Distortion and Chinese MNCs:
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Data Source

- Annual survey of Chinese manufacturing firms from 1998 to 2008 (all SOEs+private firms with sales higher than 5 million RMB).
- Data set of Chinese MNCs’ investment transactions (e.g., time of transaction, destination country, names of parent and affiliated companies, industry code etc.).
- Data on MNCs from Zhejiang province for 2006 to 2008. It has information on investment amount for each FDI transaction.
- Orbis data on Chinese MNCs from 2005 to 2008 (merged with the first three data sets).

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### Summary Statistics

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

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

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Non-MNCs</th>
<th>MNCs</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>domestic only</td>
<td>domestic+export</td>
<td>all firms</td>
<td>with exports</td>
<td>unmatched</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>unmatched</td>
<td>matched</td>
<td>unmatched</td>
<td>matched</td>
<td>unmatched</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td></td>
</tr>
<tr>
<td>(i) Private firms</td>
<td>3.63</td>
<td>3.54</td>
<td>3.62</td>
<td>3.58</td>
<td>4.28</td>
<td>4.28</td>
<td>3.623</td>
</tr>
<tr>
<td>(ii) SOE</td>
<td>2.99</td>
<td>2.99</td>
<td>3.05</td>
<td>3.05</td>
<td>4.48</td>
<td>4.76</td>
<td>104</td>
</tr>
<tr>
<td>Difference=(i)-(ii)</td>
<td>0.63***</td>
<td>0.55***</td>
<td>0.57***</td>
<td>0.53***</td>
<td>-0.20*</td>
<td>-0.48***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(93.60)</td>
<td>(41.34)</td>
<td>(95.76)</td>
<td>(46.73)</td>
<td>(-1.67)</td>
<td>(-3.30)</td>
<td></td>
</tr>
</tbody>
</table>

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

- Consistent with distortion against private firms in credit and capital markets.
- Lower fixed cost of doing outward FDI for SOEs.

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

<table>
<thead>
<tr>
<th>Chinese Industry</th>
<th>Private MNCs</th>
<th>State-owned MNCs</th>
<th>Difference=(2)-(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(2-digit level)</td>
<td>Obs.</td>
<td>Mean</td>
</tr>
<tr>
<td>Labor Intensive</td>
<td>1,193</td>
<td>0.588</td>
<td>25</td>
</tr>
<tr>
<td>Capital Intensive</td>
<td>2,430</td>
<td>0.629</td>
<td>79</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>State-owned MNCs (1)</th>
<th>Private MNCs (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>0.368</td>
<td>0.347</td>
</tr>
<tr>
<td>25%</td>
<td>0.497</td>
<td>0.475</td>
</tr>
<tr>
<td>50%</td>
<td>0.648</td>
<td>0.608</td>
</tr>
<tr>
<td>75%</td>
<td>0.842</td>
<td>0.752</td>
</tr>
</tbody>
</table>

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

Table E.4: Size Difference by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Number of Employees (incumbent firms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Non-MNCs</td>
<td>5.173</td>
<td>5.096</td>
<td>5.057</td>
<td>4.947</td>
<td>4.685</td>
<td>4.746</td>
<td>4.685</td>
<td>4.634</td>
<td>4.556</td>
</tr>
<tr>
<td>(2) All MNCs</td>
<td>8.146</td>
<td>8.075</td>
<td>7.874</td>
<td>7.901</td>
<td>5.949</td>
<td>5.957</td>
<td>5.975</td>
<td>5.908</td>
<td>5.502</td>
</tr>
<tr>
<td>(4) Private MNCs</td>
<td>8.010</td>
<td>7.957</td>
<td>7.748</td>
<td>7.724</td>
<td>5.836</td>
<td>5.866</td>
<td>5.890</td>
<td>5.833</td>
<td>5.485</td>
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<tr>
<td>Size Difference=(3)-(4)</td>
<td>0.635</td>
<td>0.672</td>
<td>0.845</td>
<td>1.324</td>
<td>2.919***</td>
<td>2.183***</td>
<td>2.934***</td>
<td>2.986***</td>
<td>1.117***</td>
</tr>
<tr>
<td></td>
<td>(0.71)</td>
<td>(0.64)</td>
<td>(0.79)</td>
<td>(1.16)</td>
<td>(2.79)</td>
<td>(5.62)</td>
<td>(2.25)</td>
<td>(10.01)</td>
<td>(2.32)</td>
</tr>
<tr>
<td>Firm TFP (incumbent firms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8) Private MNCs</td>
<td>4.582</td>
<td>4.348</td>
<td>4.447</td>
<td>5.413</td>
<td>4.120</td>
<td>3.842</td>
<td>3.724</td>
<td>3.859</td>
<td>5.193</td>
</tr>
<tr>
<td>Size Difference=(7)-(8)</td>
<td>-0.869</td>
<td>-0.897*</td>
<td>-0.473</td>
<td>-0.774</td>
<td>1.087</td>
<td>0.312</td>
<td>0.492**</td>
<td>0.710***</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td>(-1.49)</td>
<td>(-1.66)</td>
<td>(-0.73)</td>
<td>(-1.20)</td>
<td>(1.63)</td>
<td>(1.16)</td>
<td>(2.12)</td>
<td>(3.41)</td>
<td>(0.13)</td>
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<td>Firm TFP (starting Firms)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(9) SOE MNCs</td>
<td>2.78</td>
<td>–</td>
<td>–</td>
<td>5.85</td>
<td>3.61</td>
<td>3.82</td>
<td>3.77</td>
<td>4.29</td>
<td>5.96</td>
</tr>
<tr>
<td>(10) Private MNCs</td>
<td>3.44</td>
<td>2.83</td>
<td>4.29</td>
<td>4.48</td>
<td>3.31</td>
<td>3.51</td>
<td>3.71</td>
<td>3.77</td>
<td>5.20</td>
</tr>
</tbody>
</table>

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Finding: Relative Size Premium for State-owned MNCs

Table 4: Relative Size Premium for SOEs

<table>
<thead>
<tr>
<th>Year coverage</th>
<th>Avg.</th>
<th>≤ 2001</th>
<th>≤ 2002</th>
<th>≤ 2003</th>
<th>≤ 2004</th>
<th>≤ 2005</th>
<th>≤ 2006</th>
<th>≤ 2007</th>
<th>≤ 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Private Firms</td>
<td>4.50</td>
<td>4.59</td>
<td>4.59</td>
<td>4.56</td>
<td>4.54</td>
<td>4.53</td>
<td>4.52</td>
<td>4.51</td>
<td>4.50</td>
</tr>
<tr>
<td>(2) SOE</td>
<td>5.48</td>
<td>5.65</td>
<td>5.64</td>
<td>5.58</td>
<td>5.55</td>
<td>5.53</td>
<td>5.51</td>
<td>5.49</td>
<td>5.48</td>
</tr>
<tr>
<td>Size Difference=(1)-(2)</td>
<td>-0.97***</td>
<td>-1.06***</td>
<td>-1.05***</td>
<td>-1.02***</td>
<td>-1.01***</td>
<td>-1.00***</td>
<td>-0.99***</td>
<td>-0.98***</td>
<td>-0.98***</td>
</tr>
<tr>
<td></td>
<td>(-488.1)</td>
<td>(-234.0)</td>
<td>(-283.5)</td>
<td>(-329.0)</td>
<td>(-374.1)</td>
<td>(-400.1)</td>
<td>(-430.4)</td>
<td>(-445.5)</td>
<td>(-466.6)</td>
</tr>
</tbody>
</table>
Demand

- Follow HMY (2004): Horizontal FDI; one industry; two countries; heterogeneous firms.

Utility:
\[ U = \int_{\omega \in \Omega} q(\omega) \sigma - 1 \sigma d\omega, \]  
(1)

where \( q(\omega) \) consumption; \( \sigma \) elasticity.

Demand function:
\[ q(\omega) = p(\omega) - \sigma P_1 - \sigma H_E, \]  
(2)

Revenue function:
\[ q_\beta E_1 \sigma P_\beta, \]  
(3)

where \( \beta \equiv \sigma - 1 \sigma \).

Aggregate environment:
\[ D_i \equiv P_\sigma i E_i, i \in \{ H, F \}, \]  

(Chen, Tian and Yu)

Outward FDI and Distortion
Demand

- Follow HMY (2004): Horizontal FDI; one industry; two countries; heterogeneous firms.
- Utility:

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

(1)

where \(q(\omega)\) consumption; \(\sigma\): elasticity.
Demand

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- Utility:
  \[ U = \left[ \int_{\omega \in \Omega} q(\omega) \frac{\sigma-1}{\sigma} d\omega \right]^{\frac{\sigma}{\sigma-1}}, \]  (1)
  where \( q(\omega) \) consumption; \( \sigma \): elasticity.
- Demand function:
  \[ q(\omega) = \frac{p(\omega)^{-\sigma}}{P_H^{1-\sigma}} E_H, \]  (2)
  where \( P_H \): ideal price index at home and \( E_H \): total income of Home.
Demand

- Follow HMY (2004): Horizontal FDI; one industry; two countries; heterogeneous firms.
- Utility:
  \[ U = \left[ \int_{\omega \in \Omega} q(\omega) \frac{\sigma-1}{\sigma} d\omega \right]^\frac{\sigma}{\sigma-1}, \tag{1} \]
  where \( q(\omega) \) consumption; \( \sigma \): elasticity.
- Demand function:
  \[ q(\omega) = \frac{p(\omega)^{-\sigma}}{P_H^{1-\sigma}} E_H, \tag{2} \]
  where \( P_H \): ideal price index at home and \( E_H \): total income of Home.
- Revenue function:
  \[ q^\beta E_H^{\frac{1}{\sigma}} P^\beta, \tag{3} \]
Demand

- Follow HMY (2004): Horizontal FDI; one industry; two countries; heterogeneous firms.
- Utility:
  \[
  U = \left[ \int_{\omega \in \Omega} q(\omega) \frac{\sigma-1}{\sigma} \, d\omega \right]^{\frac{\sigma}{\sigma-1}},
  \]
  where \(q(\omega)\) consumption; \(\sigma\): elasticity.
- Demand function:
  \[
  q(\omega) = \frac{p(\omega)^{-\sigma}}{p_H^{1-\sigma}} E_H,
  \]
  where \(p_H\): ideal price index at home and \(E_H\): total income of Home.
- Revenue function:
  \[
  q^\beta E_1^{\frac{1}{\sigma}} P^\beta,
  \]
  where \(\beta \equiv \frac{\sigma-1}{\sigma}\). Aggregate environment:
  \[
  D_i \equiv P_i^{\sigma-1} E_i, \quad i \in \{H, F\}
  \]
Supply: SOEs

- Three production modes: domestic production only; domestic+exporting; domestic+FDI.
- Fixed entry, production, exporting and FDI cost: $f_e$, $f_d$, $f_X$ and $f_I$.
Supply: SOEs

- Three production modes: domestic production only; domestic+exporting; domestic+FDI.
- Fixed entry, production, exporting and FDI cost: $f_e$, $f_d$, $f_X$ and $f_I$.
- Productivity draw: $\phi$.
Supply: SOEs

- Three production modes: domestic production only; domestic+exporting; domestic+FDI.
- Fixed entry, production, exporting and FDI cost: \( f_e, f_d, f_X \) and \( f_I \).
- Productivity draw: \( \phi \).
- Total variable cost features CRS. For SOEs:
  - non-FDI:
    \[
    \frac{(q_H + l_{\{q_E > 0\}} \tau q_E) w_H}{\phi},
    \]
    where \( w_H \): wage at home. \( l_{\{q_E > 0\}} \) is an indication function for exporting. \( q_H \) and \( q_F \): domestic sales and exports.
  - FDI:
    \[
    \frac{q_H w_H}{\phi} + \frac{q_F w_F}{\phi},
    \]
    where \( w_F \) wage in foreign country. \( q_F \): output produced by the foreign affiliate.
Supply: Private Firms

- For private firms:
  - non-FDI:
    \[
    c \left( q_H + \mathbb{1}_{q_E > 0} \tau q_E \right) w_H / \varphi,
    \]
  - FDI:
    \[
    cq_H w_H / \varphi + q_F w_F / \varphi.
    \]
Supply: Private Firms

- For private firms:
  - non-FDI:
    \[ \frac{c(q_H + I_{\{q_E>0\}} \tau q_E)w_H}{\varphi}, \] (6)
  - FDI:
    \[ \frac{cq_hw_H}{\varphi} + \frac{q_Fw_F}{\varphi}. \] (7)

- Distortion in input markers: \( \exists \) wedge \( c > 1 \) for private firms when they produce at home. Thus, it applies to both exporting and domestic sales.
Supply: Private Firms

- For private firms:
  - non-FDI:
    \[
    \frac{c(q_H + l_{\{q_E>0\}}\tau q_E)w_H}{\varphi},
    \]  
  - FDI:
    \[
    \frac{cq_Hw_H}{\varphi} + \frac{q_Fw_F}{\varphi}.
    \]  

- Distortion in input markers: \( \exists \) wedge \( c > 1 \) for private firms when they produce at home. Thus, it applies to both exporting and domestic sales.

- This wedge does not exist in foreign country. Thus, foreign affiliates of private FDI firm do not face this distortion.
Supply: Private Firms

- For private firms:
  - non-FDI:
    \[ c(q_H + l_{q_E>0} \tau q_E)w_H \frac{1}{\varphi} \]
    \[ \text{(6)} \]
  - FDI:
    \[ \frac{cq_H w_H}{\varphi} + \frac{q_F w_F}{\varphi} \]
    \[ \text{(7)} \]
- Distortion in input markers: \( \exists \) wedge \( c > 1 \) for private firms when they produce at home. Thus, it applies to both exporting and domestic sales.
- This wedge does not exist in foreign country. Thus, foreign affiliates of private FDI firm do not face this distortion.
- Evidence: financing cost, cost of acquiring land. No evidence on wage.
Cutoffs: Selection Reversal

- Assume $f_I >> f_X >> f_D \rightarrow$ FDI cutoff > exporting cutoff > exit cutoff among private firms and SOEs (sorting pattern).
Cutoffs: Selection Reversal

- Assume $f_I \gg f_X \gg f_D \rightarrow$ FDI cutoff $> \text{exporting cutoff} > \text{exit cutoff}$ among private firms and SOEs (sorting pattern).
- Surviving and exporting cutoffs (tougher selection for private firms):
  \[ \bar{\phi}_{PD}(= c\bar{\phi}_{SD}) > \bar{\phi}_{SD} \]
  and
  \[ \bar{\phi}_{PX}(= c\bar{\phi}_{SX}) > \bar{\phi}_{SX}. \]
Cutoffs: Selection Reversal

- Assume $f_I \gg f_X \gg f_D \rightarrow$ FDI cutoff $> \text{exporting cutoff} > \text{exit cutoff}$ among private firms and SOEs (sorting pattern).

- Surviving and exporting cutoffs (tougher selection for private firms):
  \[ \bar{\phi}_{PD} (= c \bar{\phi}_{SD}) > \bar{\phi}_{SD} \]
  and
  \[ \bar{\phi}_{PX} (= c \bar{\phi}_{SX}) > \bar{\phi}_{SX}. \]

- FDI cutoffs (tougher selection for SOEs):
  \[ \bar{\phi}_{PO} < \bar{\phi}_{SO}. \]
Cutoffs: Selection Reversal

- Assume $f_l >> f_X >> f_D \rightarrow \text{FDI cutoff} > \text{exporting cutoff} > \text{exit cutoff}$ among private firms and SOEs (sorting pattern).
- Surviving and exporting cutoffs (tougher selection for private firms):
  \[
  \bar{\phi}_{PD}(=c\bar{\phi}_{SD}) > \bar{\phi}_{SD}
  \]
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- Absent choice of exporting, FDI cutoff would be the same for SOEs and private firms.
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- Assume $f_I >> f_X >> f_D \implies$ FDI cutoff $> \text{exporting cutoff} > \text{exit cutoff}$ among private firms and SOEs (sorting pattern).
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  \]
  and
  \[
  \bar{\phi}_{PX}(= c\bar{\phi}_{SX}) > \bar{\phi}_{SX}.
  \]
- FDI cutoffs (tougher selection for SOEs):
  \[
  \bar{\phi}_{PO} < \bar{\phi}_{SO}.
  \]
- Absent choice of exporting, FDI cutoff would be the same for SOEs and private firms.
- Firm at FDI cutoff compares exporting with FDI $\rightarrow$ selection reversal.
Cutoffs: Graphical Representation

SOEs: \( \bar{\phi}_{SD} \) \( \bar{\phi}_{SX} \) \( \bar{\phi}_{SO} \) \( \phi \)

Private: \( \bar{\phi}_{PD} \) \( \bar{\phi}_{PX} \) \( \bar{\phi}_{PO} \) \( \phi \)
Testable Predictions: Likelihood of Going abroad and Average Productivity of MNCs

Proposition 1

(1). Conditioning on the initial draw, private firms are more likely to become MNCs. Next, Assume that the initial productivity draw follows the same Pareto distribution for SOEs and private firms. (2). Fraction of MNCs is higher among private firms than among SOEs. (3). Average productivity of private MNCs is smaller than that of state-owned MNCs.
Testable Predictions: Likelihood of Going abroad and Average Productivity of MNCs

Proposition 1

1. Conditioning on the initial draw, private firms are more likely to become MNCs. Next, Assume that the initial productivity draw follows the same Pareto distribution for SOEs and private firms. (2). Fraction of MNCs is higher among private firms than among SOEs. (3). Average productivity of private MNCs is smaller than that of state-owned MNCs.

- Selection reversal → productivity premium and tougher selection for state-owned MNCs.
Testable Predictions: Relative Size Premium

**Proposition 3**

Suppose the initial productivity draw follows the same Pareto distribution for SOEs and private firms. (1). Relative *domestic* size of private MNCs (i.e., compared with private non-exporting firms) is *smaller* than that of state-owned MNCs as well.
Testable Predictions: Relative Size Premium

**Proposition 3**

*Suppose the initial productivity draw follows the same Pareto distribution for SOEs and private firms. (1). Relative *domestic* size of private MNCs (i.e., compared with private non-exporting firms) is smaller than that of state-owned MNCs as well.*

- Tougher selection for state-owned MNCs. $\rightarrow$ relative size premium for state-owned MNCs.
Testable Predictions: Allocation of Output

- Allocation of output:

**Proposition 4**

*Ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs. Suppose there is a reduction in fixed cost of FDI. Conditional on initial productivity draw and other firm-level characteristics, increase in overall firm size is larger for new private MNC than for state-owned MNC.*
Testable Predictions: Allocation of Output

- Allocation of output:

**Proposition 4**

*Ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs. Suppose there is a reduction in fixed cost of FDI. Conditional on initial productivity draw and other firm-level characteristics, increase in overall firm size is larger for new private MNC than for state-owned MNC.*

- Extra benefit for private firms to invest abroad → increase in overall firm size is bigger for them.
- Private MNCs produce and sell *disproportionately more* in foreign markets owing to non-existence of distortion in that market.
Evidence for Part One of Proposition One

- Conditional on other firm-level characteristics, SOEs are less likely to do outward FDI.

Table 5: Private firms are more to undertake likely to FDI (2000-08)

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

Note: The regressand is the FDI indicator. All columns except column (1) include both 2-digit level industry dummies and year dummies. Column (1) includes foreign-invested firms whereas the rest columns drop those firms. Numbers in parentheses are t-values clustered at firm level. *** denotes significance at the 1% level. Such results are highly consistent with Prediction 1(ii): SOEs are less likely to engage in FDI whereas private firms are more likely to engage in FDI.

(Chen, Tian and Yu)
Existence of Discrimination Against Private Firms

- Private firms pay higher financing cost and land acquisition cost than SOEs.

Table 6: Distortions in Input Factors Markets

<table>
<thead>
<tr>
<th>Regressand</th>
<th>Measured Firm Interest Rates</th>
<th>City Land Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>SOE Indicator</td>
<td>-0.124***</td>
<td>-0.134*</td>
</tr>
<tr>
<td></td>
<td>(-2.58)</td>
<td>(-1.90)</td>
</tr>
<tr>
<td>SOE Intensity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One Lag of SOE Intensity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Firm Factors Controls</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Year-specific Fixed Effects</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Industry-specific Fixed Effects</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>City-specific Fixed Effects</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Number of Obs.</td>
<td>1,119,454</td>
<td>1,119,454</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Note: The regressand in columns (1) to (3) is the firm-level interest rate calculated as the ratio of firm interest expenses to current liabilities. Column (1) is the simple OLS estimate, whereas column (2) controls for year-specific and industry-specific fixed effects. Column (3) adds other firm-characteristic controls such as firm TFP, log firm labor, foreign indicator, and export dummy as well as industry- and year-specific fixed effects. The SOE indicator is shown to be negative and statistically significant. The regressand in columns (4) to (6) is the city-level average price of land purchased by firms from the government. This is defined as the ratio of government’s total land revenue to its land area in each prefectural city. The SOE intensity is defined as the number of SOEs divided by the number...
Evidence for Proposition Four

- Ratio of foreign sales to domestic sales is higher for private MNCs than for state-owned MNCs.

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

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

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

- Change in firm size is bigger for private MNC.

<table>
<thead>
<tr>
<th>Regressand:</th>
<th>FDI firms total sales (using ORBIS data)</th>
<th>FDI firm’s total capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of FDI:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log License Costs</td>
<td>-0.004* (-1.79)</td>
<td>-0.002* (-1.86)</td>
</tr>
<tr>
<td>Log License Costs × SOE Indicator</td>
<td>0.014* (1.79)</td>
<td></td>
</tr>
<tr>
<td>Log License Costs × State-capital Intensity</td>
<td></td>
<td>0.100* (1.64)</td>
</tr>
<tr>
<td>Year-specific Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Industry-specific Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year × Industry Fixed Effects</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Observations</td>
<td>229</td>
<td>180</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.45</td>
<td>0.04</td>
</tr>
</tbody>
</table>

regressand in columns (1) and (2) is the sum of Chinese parent firm’s sales and its foreign affiliate’s sales. Data on foreign affiliate ORBIS data set. As the amount of FDI volume is in US dollars, we convert it to Chinese RMB using the average exchange rate.
Discussion of Modeling Choices

• Version of subsidy to MNCs yields same qualitative result.
  ▶ In this case, private firms have relatively higher incentive of doing FDI.
Discussion of Modeling Choices

- Version of subsidy to MNCs yields same qualitative result.
  - In this case, private firms have relatively higher incentive of doing FDI.

- Difference in fixed costs?
  - Model can explain extensive margin, but cannot explain intensive margin (i.e., Prop. 4).
Discussion of Modeling Choices

- Version of subsidy to MNCs yields same qualitative result.
  - In this case, private firms have relatively higher incentive of doing FDI.
- Difference in fixed costs?
  - Model can explain extensive margin, but cannot explain intensive margin (i.e., Prop. 4).
- Discrimination in product market?
  - Model would predict selection reversal for both exporting SOEs and multinational SOEs (not true in data).
- Role of capital?
  - Could just replace labor by capital, if we don’t assume any adjustment cost.
  - When both factors (as in Bernard Redding and Schott’s RES paper) are present, distortion in capital market also affect firm’s labor choice (i.e., complements).
Calibration

- How distortions affect the share of MNCs, aggregate productivity and welfare after investment liberalization (i.e., \( f_i \) goes down).
- Consider two symmetric countries and a reduction in \( f_i \) in both countries.
Calibration

- How distortions affect the share of MNCs, aggregate productivity and welfare after investment liberalization (i.e., $f_I$ goes down).
- Consider two symmetric countries and a reduction in $f_I$ in both countries.
- Take no stance on how taxes are levied and how it affects welfare.
Calibration

- How distortions affect the share of MNCs, aggregate productivity and welfare after investment liberalization (i.e., $f_I$ goes down).
- Consider two symmetric countries and a reduction in $f_I$ in both countries.
- Take no stance on how taxes are levied and how it affects welfare.
- We do calibration by considering two symmetric countries.
  - Unknown parameters (wage normalized to one):
    $$ (f_d, f_X, f_I, f_e, \tau, c, k, \sigma). $$
Calibration

- How distortions affect the share of MNCs, aggregate productivity and welfare after investment liberalization (i.e., $f_l$ goes down).
- Consider two symmetric countries and a reduction in $f_l$ in both countries.
- Take no stance on how taxes are levied and how it affects welfare.
- We do calibration by considering two symmetric countries.
  - Unknown parameters (wage normalized to one):
    \[(f_d, f_X, f_I, f_e, \tau, c, k, \sigma).\]
  - We put higher weight on the moment related to the share of MNCs.
Moments

- Moments from the Data:

<table>
<thead>
<tr>
<th></th>
<th>Data</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pareto Shape Parameter</td>
<td>$-1.091$</td>
<td>$k$</td>
</tr>
<tr>
<td>Ratio of average productivity</td>
<td>1.2</td>
<td>$c$</td>
</tr>
<tr>
<td>Export Intensity</td>
<td>26.28%</td>
<td>$\tau$</td>
</tr>
<tr>
<td>Share of exporters</td>
<td>16.11%</td>
<td>$f_X$</td>
</tr>
<tr>
<td>Average employment</td>
<td>265</td>
<td>$f_d$</td>
</tr>
<tr>
<td>Share of MNCs</td>
<td>0.325%</td>
<td>$f_l$</td>
</tr>
</tbody>
</table>
Moments

Moments from the Data:

<table>
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<th>Data</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
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<td>$f_d$</td>
</tr>
<tr>
<td>Share of MNCs</td>
<td>0.325%</td>
<td>$f_I$</td>
</tr>
</tbody>
</table>

We exclude firms whose export intensity is higher than 70% (processing trade).
## Parameter Values

- **Calibrated parameters:**

<table>
<thead>
<tr>
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<td>Bernard et al. (2003)</td>
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<td>$k$</td>
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<td>$f_I$</td>
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(Chen, Tian and Yu)  
**Outward FDI and Distortion**  
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Counterfactual Analysis

- We consider a scenario in which $f_I$ goes down by a half while other parameters are kept unchanged.
Counterfactual Analysis

- We consider a scenario in which $f_i$ goes down by a half while other parameters are kept unchanged.
- Increase in the share of MNCs is larger when the distortions are more severe in the domestic market.
- Quantitative magnitude is high.
Share of MNCs

When distortions are more severe, the increase in the share of MNCs is larger.

Fixed Cost of FDI drops by a Half
Counterfactual Analysis (Cont.)

- Increase in aggregate productivity is larger when distortions are more severe, since more private firms circumvent domestic distortions by going abroad after reduction in $f_i$. 
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- Reduction in mass of active firms.
- Gains in aggregate productivity (i.e., reduction in ideal price index).
Aggregate Productivity

Figure 3: Distortions and Gains in Aggregate Productivity

When distortions are more severe, increase in aggregate productivity is bigger

- Fixed cost of FDI falls by a half
Concluding Remarks

Document three fascinating facts:

1. Productivity premium for state-owned MNCs.
2. Smaller fraction of MNCs among SOEs.
3. Size premium for state-owned MNCs.
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- At micro-level, how do these differences impact firm-level R&D?
- At macro-level, how do these differences affect calculation of misallocation?

(Chen, Tian and Yu)
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- Measure of welfare:

$$Welfare = \frac{1 - subtaxper(c, f_I)}{P_H}.$$
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- Different implications for aggregate productivity and welfare.
Appendix

Share of MNCs

When Distortions are more Severe, the Share of MNCs is Smaller

When Distortions are more Severe, Increase in the Share of MNCs is Smaller
Welfare and Aggregate Productivity

When Distortions are more Severe, Increase in Welfare is Bigger

When Distortions are more Severe, Increase in Aggregate Productivity is Smaller