China State-Owned Enterprises & Resource Misallocation

by Jie Cao
Agenda

- Motivating Facts
  - Data Source
  - Graphs

- Questions
  - Questions
  - Why interesting
  - Literature

- Model
  - General setup
  - Discussion
Data Source

- Chinese Industrial Enterprise Database
  - Based on Annual Survey of Industrial Production
  - Survey conducted by National Bureau of Statistics of China
  - Cover Non-SOEs with more than 5M RMB annual sales
  - Cover all SOEs
  - Enterprises covered account for 90% of total industrial value-added
  - Year 1998 to 2008

- My study focusing on manufacturing sector
  - Exclude mining and utility sector
  - Divide manufacturing sector into 4 sub-sectors
## Motivating Facts (Manu. Aggregate)

<table>
<thead>
<tr>
<th>Manu. Aggregate</th>
<th>SOE</th>
<th>Non-SOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of firms</td>
<td>↓↓</td>
<td>↑↑↑</td>
</tr>
<tr>
<td>Asset holdings</td>
<td>↓</td>
<td>↑↑↑</td>
</tr>
<tr>
<td>Average Size</td>
<td>big</td>
<td>small</td>
</tr>
</tbody>
</table>
Number of Firms (Aggregate)

Number of Firms, Manu Agg.

- NonSOE
- SOE

Year

SOE & Misallocation – Proposal
Total Assets (Aggregate)
In aggregate, in manu. sector, both in terms of number and asset holdings, SOE becomes smaller. (output is the same)
Average Size Ratio (SOE/Non-SOE)
### Motivating Facts (Industries within Manu.)

<table>
<thead>
<tr>
<th></th>
<th>Heavy Industry</th>
<th>SOE</th>
<th>Non-SOE</th>
</tr>
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<tbody>
<tr>
<td>Number of firms</td>
<td>↓</td>
<td></td>
<td>↑↑</td>
</tr>
<tr>
<td>Asset holdings</td>
<td>↓ +↑</td>
<td></td>
<td>↑↑</td>
</tr>
<tr>
<td>Average Size</td>
<td>very big</td>
<td></td>
<td>small</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th>Traditional Industry</th>
<th>SOE</th>
<th>Non-SOE</th>
</tr>
</thead>
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<tr>
<td>Number of firms</td>
<td>↓↓</td>
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</tbody>
</table>
Number of Firms (SOE)

Number, Manu, SOE

- Traditional
- Chemical
- Heavy
- HighTech

Asset Holdings

Asset Holding (RMB, M), Manu, SOE & NonSOE

SOE & Misallocation – Proposal
Average Size Ratio

Average Size Ratio (SOE/Non-SOE), Manu

- Traditional
- Chemical
- Heavy
- HighTech

Others – size ratio in terms of employment

Average Employment Ratio (SOE/Non-SOE), Manu Agg.
Others – size ratio in terms of employment

Average Employment Ratio (SOE/Non-SOE), Manu

year


Traditional Chemical Heavy HighTech
Others – Output per Firm

Value Added per Firm, Manu Agg.

- SOE_AveValueAdded
- Non-SOE_AveValueAdded


Value Added: 0, 50000, 100000, 150000

SOE & Misallocation – Proposal
Others – Profit per Firm

Profit per Firm, Manu Agg.

- **SOE_aveTotalProfit**
- **Non-SOE_aveTotalProfit**

Year:
- 1998
- 2000
- 2002
- 2004
- 2006
- 2008

Profit per Firm:
- 0
- 10,000
- 20,000
- 30,000
Others – Profitability

Profitability = Profit/Assets, Manu Agg.
Others – Labor Productivity

Labor Productivity (valueAdded/emp), Manu Agg.

- SOE_laborProductivity
- Non-SOE_laborProductivity


Value: 0, 50, 100, 150, 200
Concerns about the data

- **Data consistency**
  - Brandt, Biesebroeck & Zhang (2010)

- **Firm dynamics**
  - Non-SOE survey cutoff
  - SOE privatized to Non-SOE
  - Firms merge
Questions

- Why the observed dynamics of SOEs
  o Fast exit
  o Faster exit from traditional than from heavy sector
  o Relative to non-SOEs, average size of SOEs
    ▪ becomes bigger
    ▪ bigger in heavy sector than in traditional sector

- Resource Misallocation
  o Any frictions?
  o Effect of frictions on sector-level & aggregate TFP
Possible Explanations – SOE Reforms

- **Start at 1978**
  - Separate government functions from business operations

- **1993 – 2003**
  - Breakdown of “iron rice bowl” – lifetime employment
  - “grasping the big, and letting go of the small”
    - Firm control over large SOEs
    - Localize, privatize or shut down the small SOEs

- **2003 – Now**
  - Effective capital management system
    - Less over-dependence on the banks’ generous non-performing loans
Possible Explanations – Economics

- **Before 2003**
  - High entry cost (*)
  - Generous loans from state banks (*)
  - SOEs are heavily subsidized

- **After 2003**
  - Low entry cost (*)
  - Favorable loans to SOEs still exist (*)
    - evidence
  - Less subsidies to SOEs
    - evidence
Why is it interesting at all?

- **SOEs are important to Chinese economy**
  - SOEs are on average large
  - 10% assets share in aggregate
- **Resource Misallocation -> TFP -> Output**
- **Current challenges of SOE reform**
- **Structural changes between sectors**
- **Beyond China**
  - Effect of frictions on sector-level & aggregate TFP
  - Government favored firms & sectors
  - SOEs in other developing countries
Literature (China)

- Huge literature on SOE reform
- No model to explain the dynamics
Literature (Buera, Kaboski and Shin, 2010)

- Main Ideas & Findings
  o Financial friction - > capital and talent distortion -> sector-level/aggregate TFP - > Cross-country income differences
  o Sector with large scale is more vulnerable to financial friction
  o Size distortion: bigger establishment in large scale sector

- Model Features
  o Two sectors: manufacture and service
  o Individual characterized by initial wealth and talent/productivity
  o Occupational choice: worker or entrepreneur in one sector
  o Entrepreneurs are borrowing constrained
  o Talent/productivity evolves, so individual may switch occupation
  o Individual may self-finance through saving
  o Focus on stationary equilibrium, model solved numerically
Literature (Moll, 2009)

- **Main Ideas & Findings**
  - Financial frictions -> capital misallocation
  - May not cause substantial aggregate TFP loss
  - Self-financial may undo capital misallocation

- **Model Features**
  - One sector model
  - Entrepreneurs characterized by initial wealth and productivity
  - Entrepreneurs are borrowing constrained
  - No occupational choice
  - A large part of the model can be analytically solved
Two Sectors

- Heavy industry sector (H)
  - Production: $f_H(z, k, l) = zk^{\alpha_H}l^{\theta_H}$, $\alpha_H, \theta_H \in (0,1)$, $\alpha_H + \theta_H \leq 1$
  - Capital intensive: (*)
  - Large scale (high fixed cost of operation): $c_H^f$
  - High entry cost: $c_H^e$ (*)

- Light industry sector (L)
  - Production: $f_L(z, k, l) = zk^{\alpha_L}l^{\theta_L}$, $\alpha_L, \theta_L \in (0,1)$, $\alpha_L + \theta_L \leq 1$
  - Labor intensive: $\frac{\alpha_H}{\theta_H} > \frac{\alpha_L}{\theta_L}$ (*)
  - Small scale (low fixed cost of operation): $c_L^f < c_H^f$
  - Low entry cost: $c_L^e < c_H^e$ (*, ?)
Two Types of Firms / Entrepreneurs

- SOE
  - Less stringent borrowing constraint: $\lambda_s > 0$ (*)
  - To capture other friction: subsidy on output, $\tau_s < 0$
  - Preference: $\sum_{t=0}^{\infty} \beta^t c_H^\gamma H_t c_L^{1-\gamma}$

- Non-SOE
  - Stringent borrowing constraint: $0 < \lambda_n < \lambda_s$ (*)
  - To capture other friction: tax on output, $\tau_n > 0$
  - Preference: $\sum_{t=0}^{\infty} \beta^t c_H^\gamma H_t c_L^{1-\gamma}$
Firms / Entrepreneurs Timing

- Ex-ante firms are the same (?)
  - A mass of $4M$ firms enter ($M$ determined in equilibrium)

- Timing
  - Firms choose which industrial sector to enter and pay the entry cost of the sector chosen (?)
  - Firms draw a type with equal chance of being SOE and Non-SOE (?)
  - Firms draw initial wealth and productivity from a distribution $g(a, z)$, and $z$ evolve over time
  - Firms decide whether to produce or not
  - Firms produce and consume
Other assumptions & some conjectures

- **Borrowing constraint & firm’s budget**
  - Modeled as collateral constraint: \( k_t < \lambda_i a_t, i \in \{s, n\} \)
  - Law of motion for assets: 
    \[
    a_{t+1} - a_t = p_j f_j(z_t, k_t, l_t) - w_t l_t - (r_t + \delta)k_t + r_t a_t - p_{H,t} c_{H,t} - p_{L,t} c_{L,t}
    \]

- **Free entry condition**
  - Ex-ante firms are indifferent between two sectors (?)
  - Assuming 2M firms choose each sector

- **Decision on operating or not**
  - Cutoff productivity & initial assets: \((\hat{z}_{ij}, \hat{a}_{ij}), i \in \{s, n\}, j \in \{H, L\}\)
  - Given initial assets \(a\) and sector \(j\), \(\hat{z}_{sj} < \hat{z}_{nj}\) (?)
  - Given initial assets \(a\) and firm type \(i\), \(\hat{z}_{iH} > \hat{z}_{iL}\) (?)
  - Misallocation of talent: low \(z\) but high \(a\) may operate
Workers

- A measure $L$ of workers
  
  o Preference: $\sum_{t=0}^{\infty} \beta^t c_H^t c_L^{1-\gamma}$
  
  o Endowed with 1 unit of labor
  
  o Workers cannot save: hand-to-mouth workers
Reforms

- **Entry cost (*)**
  - Entry cost decreases with light sector decreases more (?)
  - Productive non-SOEs enter both sectors (more enter light sector)
  - Wage increases
  - Low productivity SOEs exit, but the remaining gets big
  - But ... (?)

- **Fixed operation cost**
- **Subsidy and tax**
- **Collateral constraint**
Discussion – Model

- Not modeling SOE’s entry
- Modeling frictions using taxes and subsidies on capital and output
- Less measure of SOEs