Serial Entrepreneurship in China

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University of Wisconsin

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Motivation

- **Entrepreneurship**: engine of growth in developed and emerging ec.
  - What drives entrepreneurship? What frictions impede it?

- **Serial entrepreneurs** (SE): entrepr. who start more than one firm
  - Much less is known about serial entrepreneurship
  - Lack of empirical stylized facts on serial entrepreneurship
  - After Holmes & Schmitz (1995), limited theoretical SE literature

- **China:**
  - Firm entry accounts for lion’s share of TFP growth
  - Large share of new firms started by serial entrepreneurs (SE)
  - Informative about frictions and drivers of entrepreneurship
This paper

• Draw on unique data set to document SE in China
  - Document how SE differ from Non-SE (non-serial entrepreneurs)
    - size of firm, productivity, sector choice
  - Differences between 1st and 2nd SE firms
  - Decision to run SE firms concurrently or not
  - Location/sector choice of 2nd-SE firm

• Develop simple model to rationalize observed SE behavior
  - Emphasize role of equity/endowment, ability, and distortions.
Why are Some Entrepreneurs Serial?

Two views

1. **Persistent productivity:** TFP is persistent across firms started by same entrepreneur.
   - Optimal for high-productive entrepreneurs to become SE

2. **Distortions:** some individual owners have advantage in terms of subsidized inputs, market access, etc.
   - Favored individuals end up starting many firms
Data Sources

1. Business Registry of China
   - Maintained by State Administration of Industry and Commerce
   - Universe of all firms ever established
   - Information relating to:
     - year of establishment of each firm
     - investors – individuals and enterprises
     - initial registered capital
     - main line of business
     - firm exit
   - Investors identified through unique ID
     - also know year of investment

2. Firm Inspection Data
   - Self-reported sales, assets, liabilities, and profits of each firm
   - Coverage expanding over time. Extensive from 2008
Business Registry of China: Key Definitions

• **Entrepreneur**
  
  : Individual investor with the largest share at the time of firm establishment or acquired later

• **Serial Entrepreneur**
  
  : Individual who is or has been the “Entrepreneur” of more than one firm
  
  : Backward-looking definition (given info up until last year of data)
## Firms in China: Shareholder Information

### Business Registry of China, 1995-2015

- **Based on the largest shareholder**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Unregistered</th>
<th>Individual</th>
<th>Enterprise</th>
<th>Unreported</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single</td>
<td>Multiple</td>
<td>No citiz. ID</td>
</tr>
<tr>
<td>1995</td>
<td>1,430,103</td>
<td>696,360</td>
<td>167,405</td>
<td>282,714</td>
<td>23,409</td>
</tr>
<tr>
<td>2000</td>
<td>2,695,474</td>
<td>777,957</td>
<td>349,285</td>
<td>1,126,996</td>
<td>58,210</td>
</tr>
<tr>
<td>2010</td>
<td>8,344,938</td>
<td>545,334</td>
<td>1,763,082</td>
<td>5,267,974</td>
<td>193,274</td>
</tr>
<tr>
<td>2015</td>
<td>17,823,017</td>
<td>757,257</td>
<td>5,143,272</td>
<td>10,353,350</td>
<td>585,905</td>
</tr>
</tbody>
</table>

- This paper: **firms in which an individual is the largest shareholder** (single plus multiple)
# Role of Serial Entrepreneurs

<table>
<thead>
<tr>
<th>Year</th>
<th># of firms</th>
<th>SE(%)</th>
<th>Total K (trill.)</th>
<th>SE(%)</th>
<th>Aver. registered K (mill.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SE</td>
</tr>
<tr>
<td>1995</td>
<td>353,319</td>
<td>30.61</td>
<td>0.82</td>
<td>42.58</td>
<td>3.22</td>
</tr>
<tr>
<td>2000</td>
<td>1,360,283</td>
<td>33.14</td>
<td>2.74</td>
<td>46.39</td>
<td>2.82</td>
</tr>
<tr>
<td>2005</td>
<td>3,906,842</td>
<td>33.93</td>
<td>7.83</td>
<td>47.68</td>
<td>2.82</td>
</tr>
<tr>
<td>2010</td>
<td>6,971,506</td>
<td>32.90</td>
<td>18.09</td>
<td>49.48</td>
<td>3.90</td>
</tr>
<tr>
<td>2015</td>
<td>15,351,831</td>
<td>28.21</td>
<td>60.22</td>
<td>46.94</td>
<td>6.53</td>
</tr>
</tbody>
</table>

- Serial entrepreneurs are quantitatively important:
  - Fraction of SE firms slightly increased
  - Share of registered capital for SE slightly increased
- Average registered capital around 2 times higher for SE
- 83% of SE establish their second firm **concurrently** with the first firm
Simple Model Setup

- Two periods
- Fixed set of potential entrepreneurs (unit measure)
- Entrepreneurs can start one firm each period
- TFP $z_{it}$ of a potential new firm is stochastic
- TFP of 2nd firm is correlated TFP of 1st firm:
  \[ \ln(z_{i2}) = \rho \ln(z_{i1}) + \epsilon_{i2}, \]
  where $\rho \in [0, 1]$
- Entrepreneurs are risk-neutral. Consume after 2nd period.
Production and Markets

• Firm’s production function is

\[ y = z^{1-\eta} \left( k^{1-\alpha} n^\alpha \right)^\eta, \]

where \( \eta \in (0, 1) \) reflects decreasing returns to scale

• Markets:

  - Banks offer one-period loans at interest rate \( R \)
  - **Collateral constraint:** borrowing limited to \( b \leq (\lambda - 1)e \), so
    \[ k \leq \lambda e, \]
    where \( e \) is equity
  - Firms pay workers a wage rate \( w \)
Capital and Debt Decisions

- Two possibilities:
  1. Entrepreneur constrained: \( k = \lambda e \)
  2. Entrepreneur unconstrained: \( k < \lambda e \)

- Optimal capital and debt weakly increasing in \( z \) and \( e \):
  \[
  K^* (z, e) = \begin{cases} 
  \lambda e & \text{if } \lambda e < zk^* \\
  zk^* & \text{if } \lambda e \geq zk^*
  \end{cases}
  \]
  \[
  B^* (z, e) = \begin{cases} 
  (\lambda - 1) e & \text{if } \lambda e < zk^* \\
  zk^* - e & \text{if } \lambda e \geq zk^*
  \end{cases}
  \]

where (unconstrained) optimal size is \( zk^* \),

\[
 k^* \equiv \left( \frac{(1 - \alpha) \eta}{R} \right)^{\frac{1 - \alpha \eta}{1 - \eta}} \left( \frac{\alpha \eta}{w} \right)^{\frac{\alpha \eta}{1 - \eta}}.
\]
Capital and Debt-Equity Ratio

Installed Capital

Debt-Equity Ratio

Capital

Debt-equity ratio

TFP

 TF
Testable Implications 1:

1. Capital is increasing in TFP, conditional on equity

2. Capital is increasing in equity, conditional on TFP

3. Debt-equity ratio is increasing in TFP and decreasing in equity
   
   : larger equity implies that debt-equity ratio increases less steeply
   with TFP
Capital: Increasing in TFP and Equity
Debt-Equity Ratio: Increasing in TFP
Entry Decision in 1st Period

- Study entrepreneur’s entry decision

- Entrepreneur has equity $e$ and observes TFP $z$ for a potential firm. Then decides whether or not to operate the firm

- Operating the firm requires a fixed operating cost $\nu > 0$

- Optimal threshold: operate the firm iff $z \geq z^* (e)$

- Optimal entry threshold function $z^* (e)$ weakly falling in equity $e$

$$z^* (e) = \begin{cases} 
\left( \frac{\nu + R \lambda e}{1 - \alpha \eta} \right)^{\frac{1 - \alpha \eta}{1 - \eta}} (\lambda e)^{-\frac{(1 - \alpha) \eta}{1 - \eta}} \left( \frac{w}{\alpha \eta} \right)^{\frac{\alpha \eta}{1 - \eta}} & e < zk^*/\lambda \\
zk^*/\lambda & e \geq zk^*/\lambda 
\end{cases}$$

where

$$z^* = \frac{\eta}{1 - \eta} \frac{1 - \alpha}{R} \frac{\nu}{k^*}.$$
Entry Decision in 1st Period

Constrained: $\lambda e < z k^*$

Unconstrained: $\lambda e > z k^*$

No entry

Equity

TFP $z$
Serial Entrepreneurship (SE)  
Entry Decision in 2nd Period  

- Beginning of 2nd period: Entrepreneur gets option to start new firm with TFP $z_2$  
  \[ \ln(z_2) = \rho \ln(z_1) + \epsilon_2, \]  

- Entrepreneur who operates firm in 1st period can either ...  
  1. start new firm, operate new + old firm concurrently (SE)  
  2. start new firm, close old firm (SE)  
  3. not start new firm, keep operating old firm (Non-SE)  

- If no firm in 1st period: by default not serial entrepreneurs (Non-SE)  

- Assume zero cost of moving capital and labor across firms  
  Implication: if two firms operate concurrently  
  \[ \Rightarrow \text{equalize marginal product of capital and labor across firms} \]
A potential entrant with $e$ draws TFP $z_1$, deciding to pay operating fixed cost $\nu$—upon entry: a DRTS production function, facing financial constraint $k \leq \lambda e$.

Conditioning on initial entry, proceed to draw a new productivity $z_2$, $\rho(z_1, z_2) > 0$—decide whether to pay fixed costs to operate firm 1, 2, or both.
Entry if $\rho = 1$ and No Frictions

Housing bubble in this paper

Rich predictions comparing capital and TFP of non-SE, SE-1st, SE-2nd firms

▶ A subtle prediction: (under some conditions) TFP of 2nd firm is larger than 1st firm

$A$ $B$

$z_1$ $z_2$
Proposition 1: Suppose no financial frictions ($\lambda \rightarrow \infty$). Then,

- If some persistence ($\rho > 0$) then
  **1st SE firms have larger TFP & size than Non-SE firms**

  : **Mechanism:** Positive selection when $\rho > 0$
  If TFP of 2nd firm is sufficiently productive to trigger entry, then 1st-SE is likely to be productive, too

- If $\rho$ sufficiently large, then
  **2nd SE firms have larger TFP & size than 1st-SE firms**

  : **Mechanism:** when $\rho$ large then 2nd-SE firm positively selected relative to 1st-SE firm
  : Worst outcomes of $\varepsilon$ will never be observed
A potential entrant with ε draws TFP z₁, deciding to pay operating fixed cost ν – upon entry: a DRTS production function, facing financial constraint k ≤ λ ε.

Conditioning on initial entry, proceed to draw a new productivity z₂, ρ(z₁, z₂) > 0 – decide whether to pay fixed costs to operate firm 1, 2, or both.

Needed: Assumption on Equity-TFP Distn.

- If $\lambda < \infty$, initial equity and retained earnings affect selection.
- Need to make assumption on equity-TFP distribution.
- Assumption 2: Initial equity is monotone increasing in initial TFP draw $z_1$. 
Empirical Relationship TFP vs. Equity
Productivity-Persistence View w/Financial Frictions

- If Assumption 2 holds and $\rho$ sufficiently large, SE are positively selected and Prop. 1 holds
  
  : Intuition: when $\rho$ is large then productivity selection channel dominates effects from equity

- Testable Implications: If $\rho$ sufficiently high then ...
  
  : 2nd-SE firm: larger TFP & capital than 1st-SE firm
  : 1st-SE firm: larger TFP & capital than Non-SE firms
Distortions View

• Interpret “favored entrepreneur” as individual who can borrow (unlimited) at a lower interest rate
  - Favored entrepreneurs have lower TFP threshold $z(e)$

• If $\rho$ suff. low and some entrepreneurs are sufficiently favored, then the distortion-view dominates
  - SE are negatively selected
    - Intuition: since favored entrepreneurs have lower $z(e)$ they are more likely to start a firm given TFP draw $z$.
      - both lower TFP and higher likelihood of becoming SE

• Implication: lower TFP for SE firms than Non-SE firms
## Inspection Data: Prod.-Persistence Dominates

<table>
<thead>
<tr>
<th></th>
<th>Log Registered Capital (1)</th>
<th>Log Assets (2)</th>
<th>Log Equity (3)</th>
<th>Log Revenue (4)</th>
<th>Log Relative TFP (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st-SE</td>
<td>0.35***</td>
<td>0.41***</td>
<td>0.36***</td>
<td>0.33***</td>
<td>0.11***</td>
</tr>
<tr>
<td>2nd-SE</td>
<td>0.58***</td>
<td>0.68***</td>
<td>0.58***</td>
<td>0.53***</td>
<td>0.18***</td>
</tr>
<tr>
<td>age</td>
<td>0.10***</td>
<td>0.17***</td>
<td>0.12***</td>
<td>0.26***</td>
<td>0.41***</td>
</tr>
<tr>
<td>age squared</td>
<td>-0.00***</td>
<td>-0.00***</td>
<td>-0.00***</td>
<td>-0.01***</td>
<td>-0.01***</td>
</tr>
</tbody>
</table>

Observations: 12,476,788
Adj. R-square: 0.06 0.11 0.08 0.08 0.03

- Use the Firm Inspection Data, 2008-2012: Assets, Equity, Revenue, TFP
- Use the Registry Data, 2008-2012: Registered Capital
- Dependent variables computed relative to their averages of all firms in the same province-industry-year cell
- The 1st SE firm has higher values in all variables than the Non-SE firm
- The 2nd SE firm has higher values in all variables than the 1st SE firm
Predictions Concurrent vs. Non-Concurrent Firms

- Assume operating cost is paid each period.

- Entrepreneur’s choice: either operate both firms concurrently or operate just the most productive firm.

- **Proposition:** Number of firms operated concurrently by entrepreneur is ...
  - ... increasing in equity
  - ... decreasing in TFP difference $|z_2 - z_1|$

- **Intuition:**
  - more equity $\Rightarrow$ lower opportunity cost of equity, lower TFP threshold for least productive firm
  - larger TFP of most productive firm $\Rightarrow$ larger opportunity cost of equity
Predictions for Concurrent vs. Non-Concurrent

Testable Implications 3:

- TFP of 2nd-SE lower for concurrently run than for non-concurrently run 2nd-SE
- TFP of 1st-SE higher for concurrently run than for non-concurrently run 1st-SE
- SE with more equity are more likely to operate firms concurrently
### Firm Inspection Data: Concurrent SE Firms

<table>
<thead>
<tr>
<th></th>
<th>1st-SE</th>
<th></th>
<th>2nd-SE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Log TFP</td>
<td>Log Equity</td>
<td>Log TFP</td>
<td>Log Equity</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Non-concurrent</td>
<td>-0.06***</td>
<td>-0.07***</td>
<td>0.23***</td>
<td>-0.16***</td>
</tr>
<tr>
<td>age</td>
<td>0.37***</td>
<td>0.14***</td>
<td>0.62***</td>
<td>0.16***</td>
</tr>
<tr>
<td>age squared</td>
<td>-0.01***</td>
<td>-0.00***</td>
<td>-0.03***</td>
<td>-0.01***</td>
</tr>
<tr>
<td>Observations</td>
<td>2,254,408</td>
<td>2,254,408</td>
<td>1,826,093</td>
<td>1,826,093</td>
</tr>
<tr>
<td>Adj. R-square</td>
<td>0.03</td>
<td>0.08</td>
<td>0.02</td>
<td>0.04</td>
</tr>
</tbody>
</table>

- Non-concurrent 1st SE firms have lower TFP and equity than concurrently run 1st SE firms
- Non-concurrent 2nd SE firms have higher TFP, but lower equity, than concurrently run 2nd SE firms
Geographical and Sectoral Migration

- Migration patterns: **Location** and **sector** of 2nd-SE firm
  - More likely to be in the same prefecture
  - More likely to be in a different 3-digit sector

<table>
<thead>
<tr>
<th>3-digit Industry</th>
<th>Same (%)</th>
<th>Similar (%)</th>
<th>Distant (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same Prefecture</td>
<td>12.25</td>
<td>17.68</td>
<td>42.21</td>
<td>72.14</td>
</tr>
<tr>
<td>Same Province</td>
<td>1.25</td>
<td>2.30</td>
<td>5.98</td>
<td>9.53</td>
</tr>
<tr>
<td>Different Province</td>
<td>2.09</td>
<td>4.46</td>
<td>11.78</td>
<td>18.33</td>
</tr>
<tr>
<td>Total (%)</td>
<td>15.59</td>
<td>24.43</td>
<td><strong>59.97</strong></td>
<td>100.00</td>
</tr>
</tbody>
</table>
Should I Stay or Should I Go?  
(Sectoral Choice for 2nd Firm)

**Assumptions:**
- ∃ many ex ante identical sectors (same dist’n of TFP draws)
- Entrepreneur can choose sector from which she draws 2nd firm TFP
- TFP draws: higher correlation $\rho$ if same sector than in different sector

**Implications:**
- **Optimal choice:** stay iff TFP of 1st firm is large, $z_{1s} \geq E\{z_1\}$
- **Implication A:** TFP of 1st firm higher for same-sector firms than different-sector firms
- **Implication B:** TFP of 2nd firm higher for same-sector firms if $\lambda$ is large
## Test Assumption on Correlation 1st-SE & 2nd-SE

<table>
<thead>
<tr>
<th></th>
<th>Same Industry</th>
<th>Similar Industry</th>
<th>Different Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Log 1st-SE TFP</td>
<td>0.33***</td>
<td>0.24***</td>
<td>0.13***</td>
</tr>
<tr>
<td>Age</td>
<td>0.31***</td>
<td>0.34***</td>
<td>0.29***</td>
</tr>
<tr>
<td>Age Difference</td>
<td>0.31***</td>
<td>0.33***</td>
<td>0.29***</td>
</tr>
<tr>
<td>Observations</td>
<td>52,934</td>
<td>76,223</td>
<td>163,392</td>
</tr>
<tr>
<td>R-square</td>
<td>0.11</td>
<td>0.08</td>
<td>0.03</td>
</tr>
</tbody>
</table>

- *** — statistically significant at the 1% level
- similar industries — same 1-digit, but different 3-digit, codes
- different industries — different 1-digit code
## TFP for 1st- and 2nd-SE Firms, Conditional on Industry

<table>
<thead>
<tr>
<th>Similar Industry</th>
<th>log 1st-SE TFP</th>
<th>log 2nd-SE TFP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Similar Industry</td>
<td>-0.18***</td>
<td>-0.25***</td>
</tr>
<tr>
<td>Distant Industry</td>
<td>-1.08***</td>
<td>-1.11***</td>
</tr>
<tr>
<td>Distant Industry * Covariance</td>
<td></td>
<td>0.37***</td>
</tr>
<tr>
<td>Age</td>
<td>0.34***</td>
<td>0.67***</td>
</tr>
<tr>
<td>Age squared</td>
<td>-0.01***</td>
<td>-0.03***</td>
</tr>
<tr>
<td>Observations</td>
<td>292,549</td>
<td>292,549</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.03</td>
<td>0.03</td>
</tr>
</tbody>
</table>

- Use the Firm Inspection Data, 2008-2012
- Dependent variables computed relative to their averages of all firms in the same province-industry-year cell
Choice of Sector of 2nd Firm (cont.)

• Suppose entrepreneur obtains 1 draw from each sector

• Alternative theory 1: risk averse entrepreneurs + sector-specific shocks + incomplete insurance = hedging motive

• ⇒ incentive to choose 2nd SE in sector with low correlation with 1st SE firm

• ⇒ 2nd-SE must be more productive if in sector highly correlated with 1st-SE sector

• Alternative theory 2: Assume there are complementarities across firms with input-output linkages (e.g., mitigate information problems)

• ⇒ More likely that 2nd SE will be in upstream or downstream sector relative to 1st SE firm
Determinants of SE Second Firm: Downstream and Upstream Integration

Take a SE with 1st firm in ind. \( i \) and 2nd firm in ind. \( j \) (Fan & Lang, 2000)

- **Upstream index**: dollar value of industry \( j \)'s output required to produce 1 dollar's worth of industry \( i \)'s output

- **Downstream index**: dollar value of industry \( i \)'s output required to produce 1 dollar's worth of industry \( j \)'s output

- **Output complementarity index**: correlation coefficient between \( b_{ik} \) and \( b_{jk} \)
  
  \( b_{ik} (b_{jk}) \) is the percentage of industry \( i \) (\( j \)) output supplied to each intermediate industry \( k \)
  
  captures the degree to which industries \( i \) and \( j \) share outputs

- **Input complementarity index**: correlation coefficient between \( v_{ik} \) and \( v_{jk} \)
  
  \( v_{ik} (v_{jk}) \) is the percentage of inputs from each intermediate industry \( k \) used in industry \( i \) (\( j \)) output
  
  captures the degree to which industries \( i \) and \( j \) share inputs

- Use the 2007 Chinese Input-Output table to compute these indices
Determinants of SE Second Firm: Probability of 2nd Firm in Industry $j$

Computing an *excess probability* measure

- Consider SE with 1st firm in industry $i$ and 2nd firm in industry $j$
- Calculate the percentage of SE that move from $i$ to $j$ each year
  - number of SE from $i$ to $j$ divided by total SE in industry $i$
- Normalize by the share of industry $j$ in total incumbents last year
## Sectoral Choice: Business Linkages & Diversification

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream Integrated</td>
<td>0.52***</td>
<td></td>
<td></td>
<td></td>
<td>0.47***</td>
</tr>
<tr>
<td>Upstream Integrated</td>
<td></td>
<td>0.57***</td>
<td></td>
<td></td>
<td>0.46***</td>
</tr>
<tr>
<td>Input/Output complementarity</td>
<td></td>
<td>0.51***</td>
<td></td>
<td></td>
<td>0.41***</td>
</tr>
<tr>
<td>Covariance</td>
<td></td>
<td></td>
<td>-0.03***</td>
<td></td>
<td>-0.11***</td>
</tr>
</tbody>
</table>

Note: *** – statistically significant at 1%; ** – at 5%; * – at 10%.
All regressions have FE for sector 1st-SE and start-year 2nd-SE.
Conclusion

• Large literature studying entrepreneurship
  : however, much less known about serial entrepreneurship

• Draw on the universe of all Chinese firms to document key facts on entrepreneurship and serial entrepreneurship in China since early 1990s

• Build a model of serial entrepreneurship
  : financial frictions

• The model captures the main patterns in the data
Additional Slides
Capital and Debt-Equity Ratio

**Installed Capital**

- Low equity
- High equity

**Debt-Equity Ratio**

- Low equity
- High equity

TFP
Prediction: Increasing Role of SE over Time

Over time, the share of SE firms will increase. This is driven by two forces:

1. More entrepreneurs will have had time to start a second firm (given that no potential entrepreneurs had an existing firm when entering period 1)

2. Existing entrepreneurs accumulate more equity over time. This increases the probability they will start firms

Implication 4: The share of firms operated by serial entrepreneurs increases over time
Capital: Increasing in TFP and Equity

The graph shows the relationship between 

- Ln asset
- Ln average TFP

The data is categorized into different equity levels:
- lowest quarter (circles)
- second lower quarter (squares)
- second higher quarter (diamonds)
- highest quarter (triangles)
Debt-Equity Ratio: Increasing in TFP
## Debt-Equity Ratio, Capital, and Relative TFP

<table>
<thead>
<tr>
<th></th>
<th>Log Assets (1)</th>
<th>Debt-Equity Ratio (2)</th>
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</thead>
<tbody>
<tr>
<td>Log TFP</td>
<td>0.04***</td>
<td>0.16***</td>
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<tr>
<td>2nd quarter of equity</td>
<td>1.09***</td>
<td>-1.30***</td>
</tr>
<tr>
<td>3rd quarter of equity</td>
<td>1.68***</td>
<td>-1.39***</td>
</tr>
<tr>
<td>4th quarter of equity</td>
<td>3.10***</td>
<td>-2.23***</td>
</tr>
<tr>
<td>TFP*2nd quarter of equity</td>
<td>-0.00***</td>
<td>-0.03***</td>
</tr>
<tr>
<td>TFP*3rd quarter of equity</td>
<td>-0.00***</td>
<td>-0.04***</td>
</tr>
<tr>
<td>TFP*4th quarter of equity</td>
<td>-0.01***</td>
<td>-0.10***</td>
</tr>
<tr>
<td>Age</td>
<td>0.06***</td>
<td>0.15***</td>
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<tr>
<td>Age squared</td>
<td>-0.00***</td>
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</tr>
<tr>
<td>Observations</td>
<td>12,476,788</td>
<td>12,476,788</td>
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<tr>
<td>Adjusted R-squared</td>
<td>0.64</td>
<td>0.04</td>
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</table>
Entry Decision in 2nd Period (No Frictions)

A potential entrant with $e$ draws TFP $z_1$, deciding to pay operating fixed cost $\nu$—upon entry: a DRTS production function, facing financial constraint $k \leq \lambda e$.

Conditioning on initial entry, proceed to draw a new productivity $z_2$, $\rho(z_1, z_2) > 0$—decide whether to pay fixed costs to operate firm 1, 2, or both.

Overview:

- A
- B
- $z_1$
- $z_2$
Entry if $\rho = 1$ and No Frictions
Entry Decision in 2nd Period w/Frictions

A potential entrant with $e$ draws TFP $z_1$, deciding to pay operating fixed cost $\nu$ upon entry: a DRTS production function, facing financial constraint $k \leq \lambda e$.

Conditioning on initial entry, proceed to draw a new productivity $z_2$, $\rho(z_1, z_2) > 0$ – decide whether to pay fixed costs to operate firm 1, 2, or both.

Entry if $\rho = 1$ and Frictions

Rich predictions comparing capital and TFP of non-SE, SE-1st, SE-2nd firms

▶ A subtle prediction: (under some conditions) TFP of 2nd firm is larger than 1st firm

Comment: Housing bubble is a very blunt policy tool to raise revenue
Concurrent vs. Sequential

A potential entrant with draws TFP $z_1$, deciding to pay operating fixed cost $\nu$– upon entry: a DRTS production function, facing financial constraint $k \leq \lambda e$

Conditioning on initial entry, proceed to draw a new productivity $z_2$, $\rho(z_1, z_2) > 0$– decide whether to pay fixed costs to operate firm 1, 2, or both

Bubble in Tirole (1985) in an OLG model
Industrial Distribution of Entrants, 2010, Non-SE and SE

<table>
<thead>
<tr>
<th>Industry</th>
<th>2010</th>
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<th></th>
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<tr>
<td></td>
<td></td>
<td>Unconditional share</td>
<td>Conditional share</td>
<td></td>
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<tr>
<td></td>
<td>Non-SE</td>
<td>1st-SE</td>
<td>2nd-SE</td>
<td>Non-SE</td>
<td>1st-SE</td>
<td>2nd-SE</td>
</tr>
<tr>
<td>Agriculture</td>
<td>3.35</td>
<td>2.62</td>
<td>2.54</td>
<td>1.42</td>
<td>1.11</td>
<td>1.08</td>
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<tr>
<td>Mining</td>
<td>0.33</td>
<td>0.43</td>
<td>0.54</td>
<td>0.48</td>
<td>0.63</td>
<td>0.78</td>
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<tr>
<td>Manufacturing</td>
<td>18.49</td>
<td>15.86</td>
<td>18.41</td>
<td>0.73</td>
<td>0.63</td>
<td>0.73</td>
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<tr>
<td>Power</td>
<td>0.18</td>
<td>0.18</td>
<td>0.33</td>
<td>0.39</td>
<td>0.40</td>
<td>0.73</td>
</tr>
<tr>
<td>Construction</td>
<td>5.86</td>
<td>5.48</td>
<td>4.86</td>
<td>1.12</td>
<td>1.05</td>
<td>0.93</td>
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<tr>
<td>Wholesale&amp;Retail</td>
<td>39.16</td>
<td>38.23</td>
<td>34.45</td>
<td>1.15</td>
<td>1.12</td>
<td>1.01</td>
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<tr>
<td>Transportation</td>
<td>2.70</td>
<td>2.62</td>
<td>2.32</td>
<td>1.02</td>
<td>0.99</td>
<td>0.87</td>
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<tr>
<td>Accommodation</td>
<td>1.11</td>
<td>1.23</td>
<td>1.67</td>
<td>0.77</td>
<td>0.85</td>
<td>1.16</td>
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<tr>
<td>IT</td>
<td>3.35</td>
<td>3.38</td>
<td>2.89</td>
<td>0.94</td>
<td>0.95</td>
<td>0.81</td>
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<tr>
<td>Finance</td>
<td>0.30</td>
<td>0.54</td>
<td>0.95</td>
<td>1.00</td>
<td>1.79</td>
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<td>Real Estate</td>
<td>3.00</td>
<td>4.21</td>
<td>5.80</td>
<td>0.97</td>
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<td>1.88</td>
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<td>Enterprise&amp;Business Service</td>
<td>11.01</td>
<td>13.42</td>
<td>13.60</td>
<td>1.13</td>
<td>1.38</td>
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<tr>
<td>R&amp;D&amp;Tech Service</td>
<td>6.38</td>
<td>7.32</td>
<td>7.51</td>
<td>1.07</td>
<td>1.23</td>
<td>1.26</td>
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<td>Resident service</td>
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<td>1.97</td>
<td>0.97</td>
<td>0.83</td>
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- Unconditional share: distribution of entrants over industries
- Conditional share: distribution of entrants relative to the current distribution of firms over industries

[2005]
## Industrial Distribution of Entrants, 2005, Non-SE and SE

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</table>

- **Unconditional share**: distribution of entrants over industries
- **Conditional share**: distribution of entrants relative to the current distribution of firms over industries

[2010]
Detour: Measuring TFP Using Inspection Data

- From the first-order condition for labor

\[ y = z^{1-\eta} k^{(1-\alpha)\eta} \left( \frac{\alpha\eta}{w} y \right)^{\alpha\eta} \]
\[ \Rightarrow \]
\[ z = y^{\frac{1-\alpha\eta}{1-\eta}} \left( \frac{w}{\alpha\eta} \right)^{\frac{\alpha\eta}{1-\eta}} k^{-\frac{(1-\alpha)\eta}{1-\eta}} \]

- Assume wage rate \( w \) same for all firms in a province-sector-year cell

- Express the TFP of firm \( i \) relative to the average TFP of all firms in a province-sector-year cell

\[ \frac{z_i}{\bar{z}} = \frac{y_i^{\frac{1-\alpha\eta}{1-\eta}} k_i^{-\frac{(1-\alpha)\eta}{1-\eta}}}{\sum_j \omega_j y_j^{\frac{1-\alpha\eta}{1-\eta}} k_j^{-\frac{(1-\alpha)\eta}{1-\eta}}} \]

\( \omega_j \) is the relative weight of each observation \( j \)
Consider a simple portfolio model

Assume that entrepreneurs have linear quadratic preferences:

\[ a[E(r_p)] - b[Var(r_p)], \]

where \( r_p \) is the portfolio return

Assume there are entrepreneurs who operate only one firm

- the value of operating in sector \( i \) is \( V_i = aE(r_i) - bVar(r_i), \)
- \( r_i \) is the rate of return in sector \( i \)

Assume free entry across sectors and that all sectors have some single entrepreneurs. Then

\[ V_i = V_j. \]
Determinants of SE Second Firm: Diversification of Risk

- Consider entrepreneur with 1st firm in sector \( i \), looking to establish (concurrently) a 2nd firm in sector \( j \in J = \{1, 2, \ldots\} \):

\[
\max_{j \in J} a[E(r_i) + E(r_j)] - b[Var(r_i) + Var(r_j) + 2Cov(r_i, r_j)]
\]

- Since \( V_i = V_j \) for all \( i, j \), the objective function becomes

\[
\min_{j \in J} [Cov(r_i, r_j)]
\]

: entrepreneur chooses sector \( j \) with the lowest \( Cov(r_i, r_j) \)

- Measurement

: construct a measure of return on capital in sector \( i \) in period \( t \) as:

\[
r_{i, t} = \frac{\text{profits}_{i, t}}{\text{assets}_{i, t}}
\]

- Use the Inspection Data over the 2010-2012 period across industries to compute a covariance index