Contract Enforcement and Capital Misallocation in Less-Developed Economies

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April 15, 2015
Capital Misallocation in Less-Developed Economies:

- **Banerjee and Duflo (2005)**
  - Output/Worker, USA vs. India:
    - Data: 11:1
    - Estimation from Aggregate Variables: 6.5:1
  - Explaining by Heterogenous Access to Credit

- **Hsieh and Klenow (2009)**
  - Wide range of plants’ TFP in India/China with respect to USA
  - Explaining by distorted prices of output/capital for plants
    - 30-50% TFP Loss in China
    - 40-60% TFP Loss in India
Capital Productivity in Iran:

**Figure:** Average Growth of Capital Productivity (%) in Manufacturing Sectors, 2000:2007. source: Nili et al. (2012)
What is the Role of Contract Enforcement in Capital Misallocation of Less-Developed Economies?
The Model

- OLG model with Imperfect Financial Market
- Endogenous Household/Entrepreneur Population
- Financial Market Frictions:
  - Asymmetric Information on Borrower’s Productivity
  - Poor Contract Enforcement, Strategic Default
Main Findings

1. Equilibrium Loan Interest Rate diverges, everyone defaults
2. 50% increase in degree of Contract Enforcement:
   - 85% gain in Average Capital Productivity (given aggregate level)
   - 40% decrease in 90/10 Income Inequality Ratio
   - 40% increase in share of Hired Labor in Capital Intensive Sector
Model Setup

Population:
- The Young:
  - Supply Labor Force
- The Old:
  - Potential Firms with Different Productivities
    1. Supply Capital
    2. Operate Firm + Demand Capital/Labor
Model Setup

Markets:

- Financial Market:
  - Competitive
  - No friction between depositors and intermediaries
  - **Asymmetric information** on borrower/firm’s productivity
  - The possibility of **strategic default**:  
    - Borrowers may default on their loans.
    - The proportion $\theta < 1$ of their wealth is accessible for intermediaries.

- Labor Market:
  - Frictionless
  - Exogenous wage
Timing and Actions Set:

1. The young supply labor.
2. The old pick up a productivity ($A_i$) from a known distribution.
3. Intermediaries set returns on deposits ($\bar{R}$).
4. The old decide whether to operate firm or not.
   - Inactive agents: supply loan to financial intermediaries.
   - Businessmen: demand labor, decide on external financing.
5. Intermediaries set return on loans ($R_i$).
6. Intermediaries distribute loans ($l_i$) between borrowers.
7. Borrowers decide whether to default or not.
8. Intermediaries pay the returns on deposits.
9. The young consume and save ($s_i$) for the next period.
10. The old consume and die.
Model Setup

Equilibrium Definition:

*Bayesian Nash Equilibrium*
Agent i’s Problem:

\[
\begin{align*}
max & \quad \log(c_1) + \beta \log(c_2) \\
\text{s.t.} & \quad c_1 + s \leq w \\
& \quad c_2 \leq s(1 + \rho_i)
\end{align*}
\]

→ Inelastic Aggregate Capital Supply
• **Agent i’s Problem:**

\[
\max \rho_i \\
\text{subjected to 4 possibilities}
\]

1. Making Deposit
2. Running Business, without taking loan
3. Running Business, demanding loan, paying the loan
4. Running Business, demanding loan, defaulting on the loan

\[
s(1 + \rho_i) = \begin{cases} 
  s(1 + \bar{R}) \\
  s(1 + r_i) \\
  [s + l(s)](1 + r_i) - l(s)(1 + R_i) \\
  (1 - \theta)[s + l(s)](1 + r_i)
\end{cases}
\]
The Old

- **Agent i’s Decision:**

  \[ r_{0,i} = \frac{s_i}{l_i + s_i} \frac{1 + \bar{R}}{1 - \theta} - 1 \]

  \[ r_{ndc,i} = \frac{l_i}{l_i + s_i} \frac{1 + R_i}{\theta} - 1 \]

  \[ l_i / (l_i + s_i) \]

  \[ r_i \]

  1. Make Deposit
  2. Run Business
  3. Run Business Demand Loan
  4. Run Business Demand Loan Default

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Firms

- **Firm i’s Problem:**

\[
\max_{\{h\}} \pi_i = A_i k^\alpha h^{1-\alpha} - wh
\]

s.t. \(k \leq k_i\)

- **Firm i’s Decision:**

\[
h_i = \left(\frac{(1 - \alpha)A_i}{w}\right)^{1/\alpha k_i}
\]

- **Firm i’s Profit:**

\[
\pi_i = r_i k_i
\]

\[
r_i := \frac{\alpha}{1 - \alpha} \left(\frac{(1 - \alpha)A_i}{w}\right)^{1/\alpha w}
\]
Intermediaries

- Monopoly’s Profit:

\[
\pi_m(\tilde{R}, R) = \max_{l(w)} \sum_i l_i [R - P_D(\tilde{l}_i)(1 + R - \theta(1 + \bar{r})/\tilde{l}_i)] - \sum_i l_i \bar{R}
\]

\[s.t. \; \sum_i l_i \leq N_s s\]

→ \( l_i = l(w_i), \; \tilde{l}_i = l_i/(l_i + w_i), \; w_i: \) Agent i’s Wealth Demanding for Loan.

- Proportional Loan.
Intermediaries

- Symmetric Competitive Equilibrium:

\[ z_c = (\bar{R}_c, R_c, l_c(w)) \]

Theorem

1. \( \pi_m(\bar{R}_c, R_c) = 0 \)
2. \( N_s s = N_d l_c(s) \)
3. \( \bar{R}_c \) and \( R_c \) maximize \( \pi_m(\bar{R}, R) \) subjected to \( \bar{R} \geq \bar{R}_c \).
Intermediaries

Definition ($R^*$)

$$1 - F(R^*) = \theta$$

Theorem

$$\bar{R}_c \geq R^*$$
$$R_c \geq R^*$$

Proof.

- For $\bar{R} < R^*$, Loan to Wealth is less than $\tilde{\theta}$.
- No Default: $\pi_m = (R - \bar{R})L.$
Theorem

For $R^* \leq \bar{R}$ and $R^* < R < r_{max}$,

$$\frac{\partial \pi_m(\bar{R}, R)}{\partial R} > 0$$

Proof.

- For $R^* \leq \bar{R}$, Loan to Wealth ratio is more than $\tilde{\theta}$.
- Marginal defaulting firms are small.
Theorem

- $R_c = r_{max}$
- $R^* < R_c < r_{max}$

Proof.

1. $\frac{\partial \pi_m(R^*, R)}{\partial R} > 0$, $\pi_m(R^*, R^*) = 0$: $\pi_m(R^*, r_{max}) > 0$
2. Everyone Defaults: $\pi_m(r_{max}, r_{max}) < 0$
Average Capital Productivity

Productivity Distribution: Pareto ($\sigma$), Average: 0.5-1

- $\sigma = 5$
- $\sigma = 3$
- $\sigma = 2$
- $\sigma = 1.5$
- $\sigma = 1.2$
90/10 Income Inequality Ratio

Productivity Distribution:
Pareto ($\sigma$), Average: 0.5-1

$\sigma = 5$
$\sigma = 3$
$\sigma = 2$
$\sigma = 1.5$
$\sigma = 1.2$
Results

Numerical Results

Share of Hired Labor in Capital Intensive Sector

Productivity Distribution:
Pareto (σ), Average: 0.5

\[ \alpha = \frac{1}{3}, \beta = 0.5 \]

\[ \sigma = 5, \sigma = 3, \sigma = 2, \sigma = 1.5, \sigma = 1.2 \]
Thanks
References

