A theoretical model of bank lending: does ownership matter in times of crises?

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Agenda

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2. Motivation

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Motivation

- Is there any role for public banks?

- Do they behave the same way during normal and crisis times?

- Is public bank lending more stable during crisis times?

- What are the reasons for the increased lending stability of public banks?

Growing empirical literature on stability of public bank lending

- **Stability over the business cycle**
    - Public banks are less procyclical, acyclical or even countercyclical, while private banks are highly procyclical
    - Micco and Panizza (2006); Foos (2009); Bertay et al. (2012); Calderon (2012); Duprey (2012)

- **Stability during crisis times**
    - Public banks increase lending or keep it constant, while private banks reduce it
    - Brei and Schclarek (2013); Bertay et al. (2012); Cull and Martinez-Peria (2012); De Haas et al (2012); Leony and Romeu (2011); Coleman and Feler (2012); Davydov (2013); Önder and Özyildirim (2013); Lin et al. (2012)

Hypothesis

Reasons more stable public bank lending in crisis times:

- Public banks' objective is not only to maximize profits but also to **avoid deepening of the crisis**; less risk averse in a crisis

- Public banks are **more likely recapitalized**; govt. has more resources than private bankers in a crisis

- Public banks suffer **less deposit withdrawals**; depositors trust more the govt. to guarantee deposits

- Public banks have **better access to short-term wholesale funds**; short-term wholesale financiers trust more the govt. to bailout the bank

Basic model

- **Firm liquidity demand model:** Holmström and Tirole (1998) 'Private and public supply of liquidity' JPE

- **Consumer liquidity demand model:** Allen and Gale (1998) 'Optimal financial crises' JF

- **Four agents:** depositors/consumers, firms/entrepreneurs, private bank and public bank.

- **Three periods:** period 0 (initial investment); period 1 (shock); period 2 (outcome)

Setup

- **Entrepreneurs:** stochastic investment project (I) but no liquid funds; outcome in period 2 (R)

- **Depositors/Consumers:** deposit initial liquid funds in banks ($D0$); risk neutral but bank leverage averse; consume in period 2 ($C2$)

- **Banks (both private and public):** initial own capital ($A0$); risk averse (γ); lend to entrepreneurs (investment project I) and/or hold liquid funds $S0$ (no return)

Uncertainty and crisis

- $E(R)$ known with certainty in period 0

- $V(R)$ NOT known with certainty in period 0:
  $V_0(R)$ variance given information in period 0

- **Shock in period 1:** New information reveal **real** variance
  $V_1(R)$

- **Normal times:** $V_1(R) \leq V_0(R)$

- **Crisis (or recession):** $V_0(R) < V_1(R) < V(\bar{R})$

- **Severe crisis:** $V_1(R) > V(\bar{R})$

Partial liquidation

- **Partial liquidation in period 1:** Investment project continued smaller scale; conversion into liquid funds; due to:
  - optimal bank decision
  - withdrawal of deposits

- **Normal times:** no partial liquidation

- **Crisis (or recession):** partial liquidation by optimal bank decision

- **Severe crisis:** partial liquidation by withdrawal of deposits

Withdrawal of deposits

- Depositors put a limit on bank leverage:

$$LE \equiv \frac{D}{A} \leq \beta 0 - \beta 1 \frac{V(R)}{A}$$

- Banks leverage limit function of:

  - Bank's own capital A (positive function):

    - Higher own funds: banks' incentives better aligned with depositors' interests (moral hazard)

  - Variance of the investment projects $V(R)$ (negative function):

    - Higher probability of default: higher risk of banks not being able to pay back deposits (higher systemic risk or less stable economic conditions)

Period 1

Consumers' objective function

$$\max_{C_2} E(C_2) \tag{1}$$

s.t.

$$C_2 \leq D1_{PR} + D1_{PU} + LF1$$

$$D1_{PR} + D1_{PU} + LF1 = D0_{PR} + D0_{PU} + LF0$$

$$D1_{PR} \leq \beta 0_{PR} A0 - \beta 1 V_1(R) \tag{2}$$

$$D1_{PU} \leq \beta 0_{PU}(A0 + A1_{PU}) - \beta 1 V_1(R) \tag{3}$$

Period 1

Private banks' objective function

$$\max_{\delta_{PR}} \delta_{PR}E(R)I_{PR} + (1-\delta_{PR})I_{PR} - \frac{\gamma}{2}\delta_{PR}^2 I_{PR}^2 V_1(R)$$

s.t.

$$D0_{PR} - D1_{PR} \leq S0_{PR} + (1-\delta_{PR})I_{PR}$$

$$0 \leq \delta_{PR} \leq 1$$

Public banks' objective function

$$\max_{\delta_{PU}} \delta_{PU}E(R)I_{PU} + (1-\delta_{PU})I_{PU} - \theta(1-\delta_{PU})I_{PU}$$
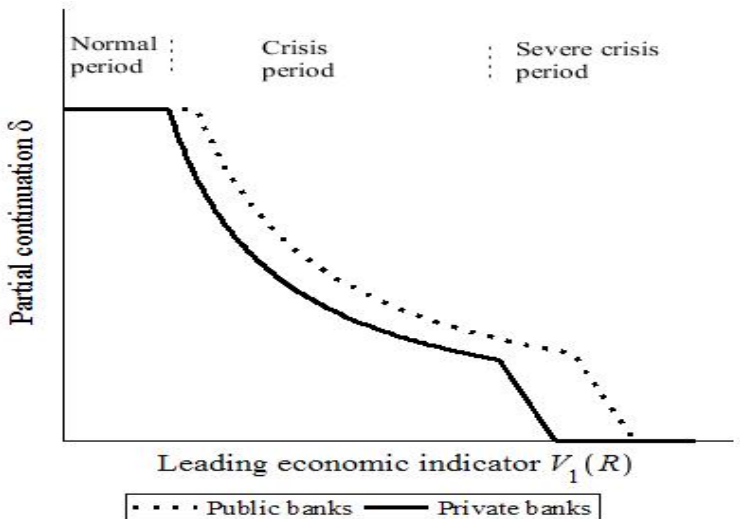$$- \frac{\gamma}{2}\delta_{PU}^2 I_{PU}^2 V_1(R)$$

s.t.

$$D0_{PU} - D1_{PU} \leq S0_{PU} + (1-\delta_{PU})I_{PU} + A1_{PU}$$
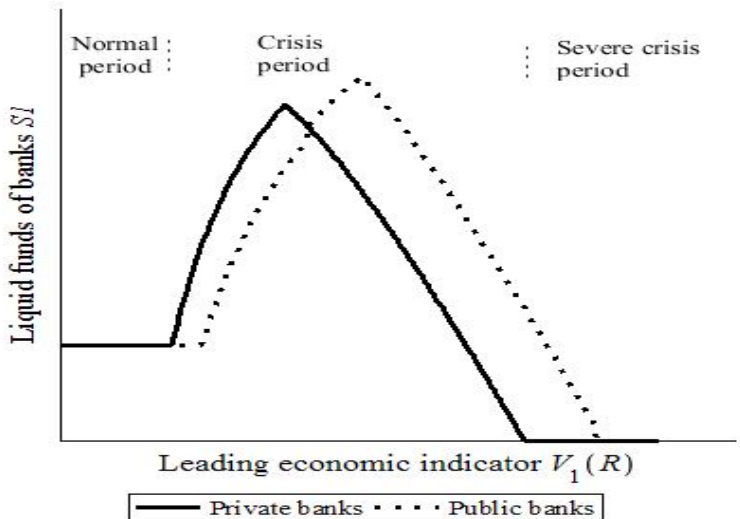
$$0 \leq \delta_{PU} \leq 1$$

Differences between Public and Private Banks

- $-\theta(1 - \delta_{PU})I_{PU}$: public banks' disutility of partially liquidating investment projects (less risk averse)

- $A1_{PU}$: higher recapitalization of public banks than private banks (obtain liquidity by taxation)

- $\beta 0_{PU} > \beta 0_{PR}$: depositors trust more public banks and accept a higher leverage (less leverage averse)
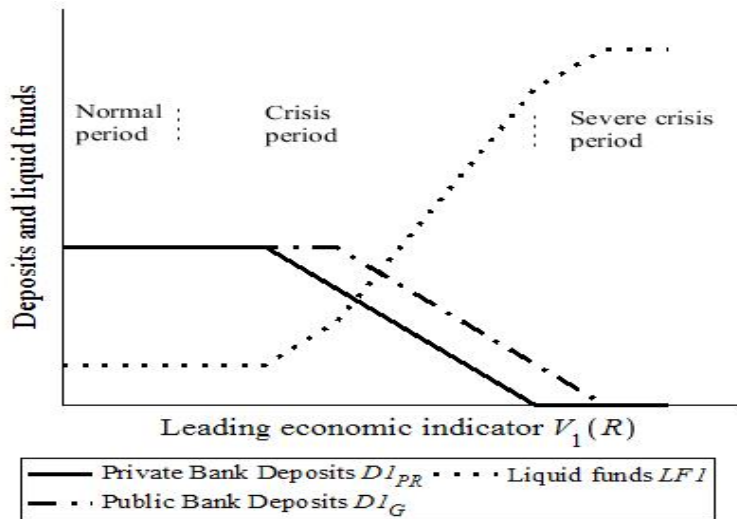
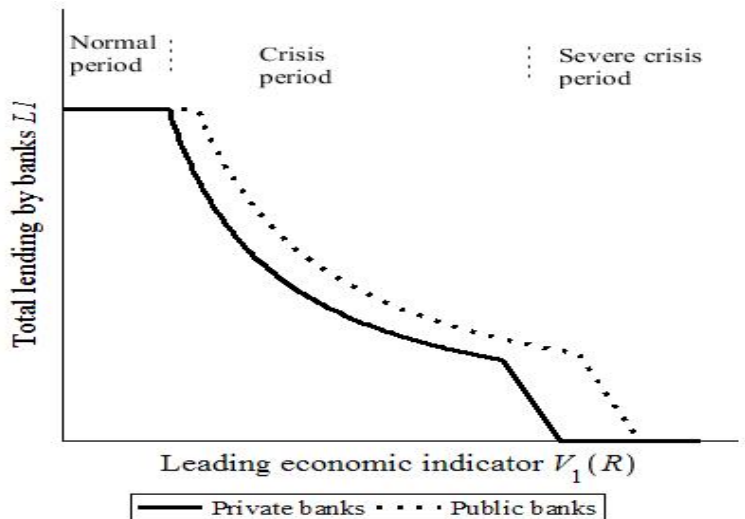## Continuation of the investment project

Liquid funds holding by banks

Normal period : Crisis period : Severe crisis period

Liquid funds of banks l

Leading economic indicator $V_1(R)$

—— Private banks · · · · Public banks

Deposits and liquid funds holding by consumers

Normal period : Crisis period : Severe crisis period

Deposits and liquid funds (y-axis)

Leading economic indicator $V_1(R)$ (x-axis)

——— Private Bank Deposits $D1_{PR}$ · · · · Liquid funds $LF1$
— · · — Public Bank Deposits $D1_G$

Lending decisions by banks

Conclusions

- Public banks lend more than private banks during crisis periods
  - public banks less risk averse
  - state higher recapitalization capacity
  - consumers and wholesale financiers trust more public banks
- Role for public banks:
  - to avoid financial crises spreading to real sector
  - in recovery of real sector *after* a crisis
- Public bank credit integral part for successful monetary and fiscal policy