Industry Diversification, Financial Development and Growth with Productivity-Enhancing Investment

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April 2007

Introduction

Industry (sector) diversification

Financial development

Less volatility   Economic growth

Related literature

- Aghion, Howitt and Mayer-Foulkes (2005) "The effect of financial development on convergence: theory and evidence" QJE
  - High level financial development: growth rate converges world technological frontier

- Aghion, Angeletos, Banerjee and Manova (2005) "Volatility and growth: credit constraints and productivity-enhancing investment" NBER
  - High level financial development: less aggregate volatility and higher growth rate

Problem: exogenous financial development

Basic model

- Holmström and Tirole (1998) "Private and public supply of liquidity" JPE

- Dynamic moral hazard overlapping generations model

- Three agents: firms (or entrepreneurs), investors (or consumers) and an intermediary (or bank)

- Two periods: first period (initial investment); end of first period (liquidity shock); end of second period (outcome)

- Each firm belongs to an industry (or sector) j

Basic model

- All firms in industry j hit by same liquidity shock c_j (or adjustment cost)

- J liquidity shocks in the economy

- One good for consumption and investment

- Risk-neutral agents with U(C)=C0+C1+C2

Basic model
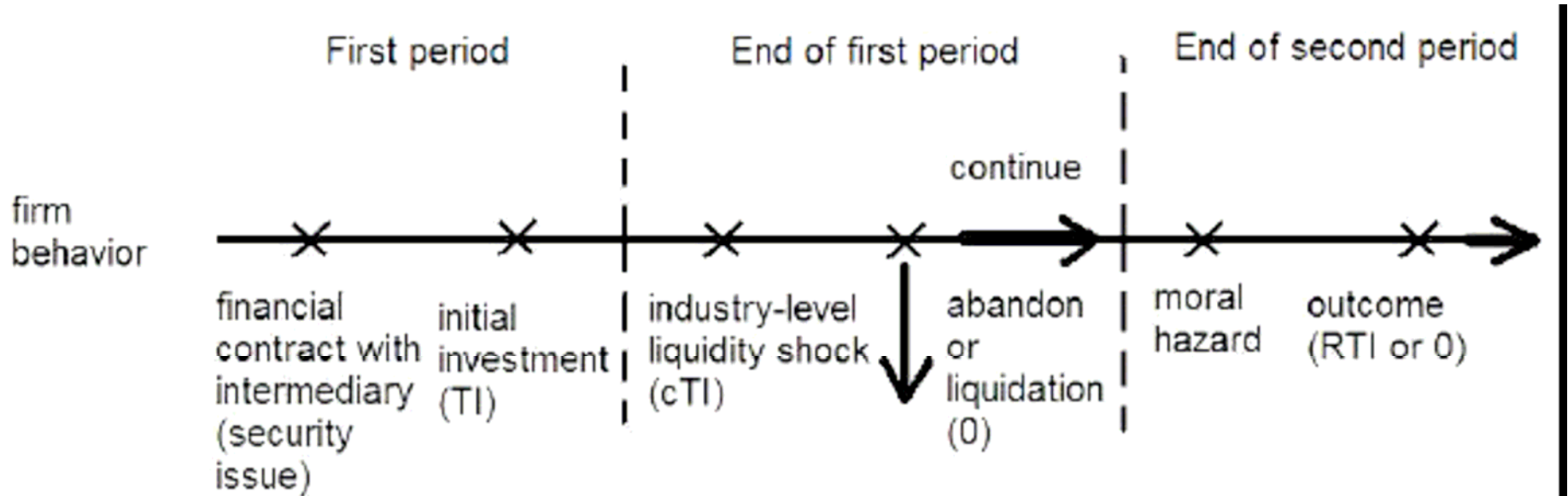
- "cutoff" threshold liquidity shock: $c \leq c^*$
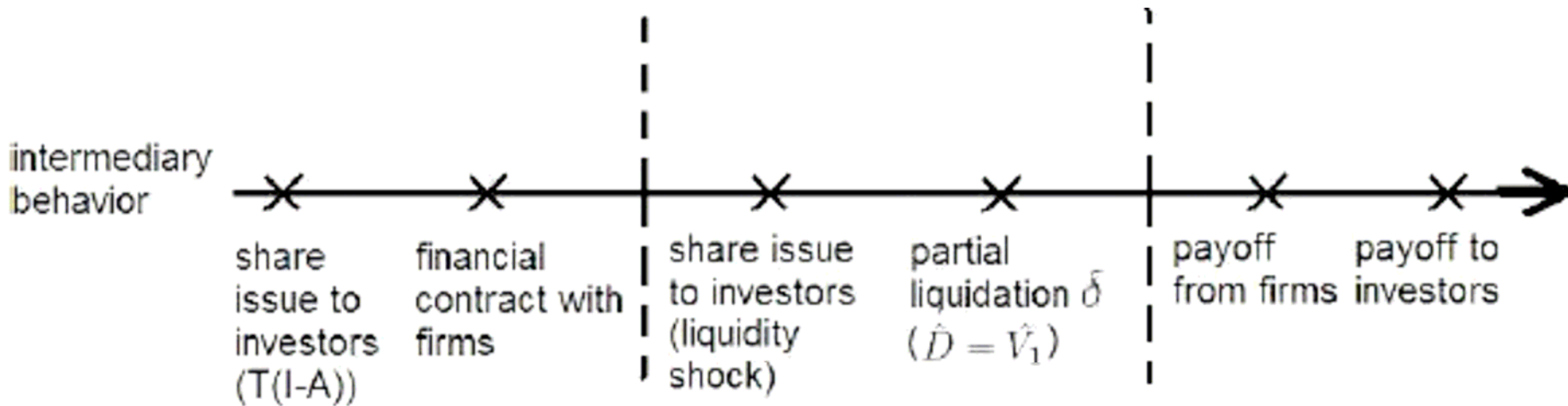
Basic model

- <u>Vertical innovation</u>: improve quality existing products

    Economic growth:
    $$\Delta T_t = \int_i vIT_t \ell_t^i$$

- <u>Horizontal innovation</u>: new products - industry diversification

    Industry growth:
    $$\Delta J_t = \int_i hI J_t \ell_t^i$$

Intermediation

intermediary behavior

share issue to investors (T(I-A))

financial contract with firms

share issue to investors (liquidity shock)

partial liquidation δ ($\hat{D} = \hat{V_1}$)

payoff from firms

payoff to investors

- Shares to investors:
  - initial investment
  - liquidity shock

- Securities from firms

Intermediation

- Value external claims firms:

$$V_1 = \frac{\sum_{j=1}^{J} L_j(c^*)}{J} c_p I \Bigg|$$
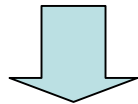
- Aggregate demand for liquidity:

$$\bar{D} = \left(\frac{c_1 L_1(c^*) + ... + c_J L_J(c^*)}{J}\right) I \Bigg|$$

Intermediation

- Value investment portfolio:

$$S_1 \equiv V_1 - \bar{D}$$

- $S_1 \geq 0$: enough aggregate liquidity for all projects

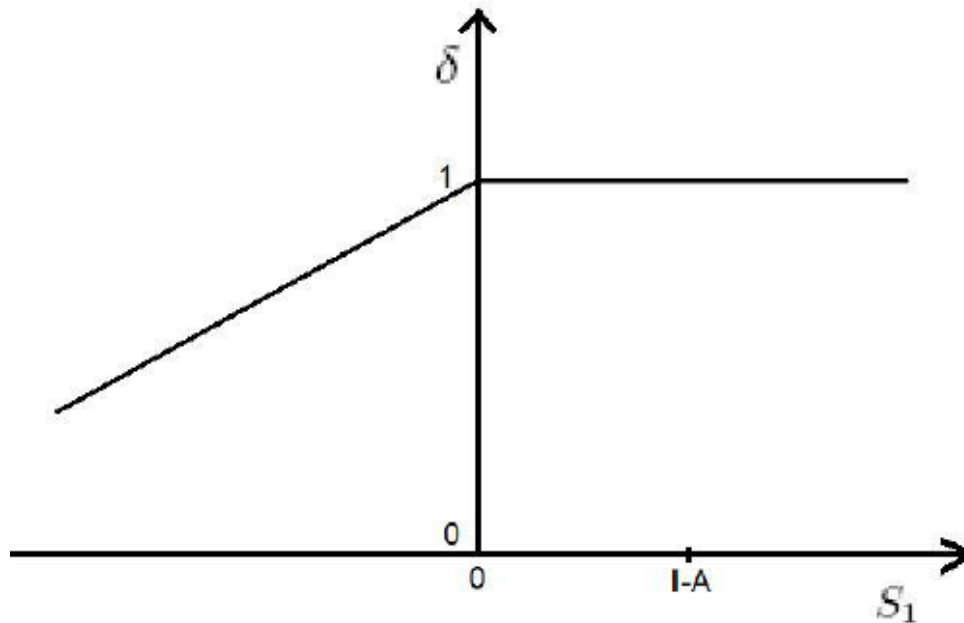- $S_1 < 0$: aggregate liquidity NOT enough for all projects

Partial liquidation (industry-level)

Partial liquidation

- Fraction of firms continuing at end first period:

$$0 \leq \delta \leq 1$$

Probability density function of S_1
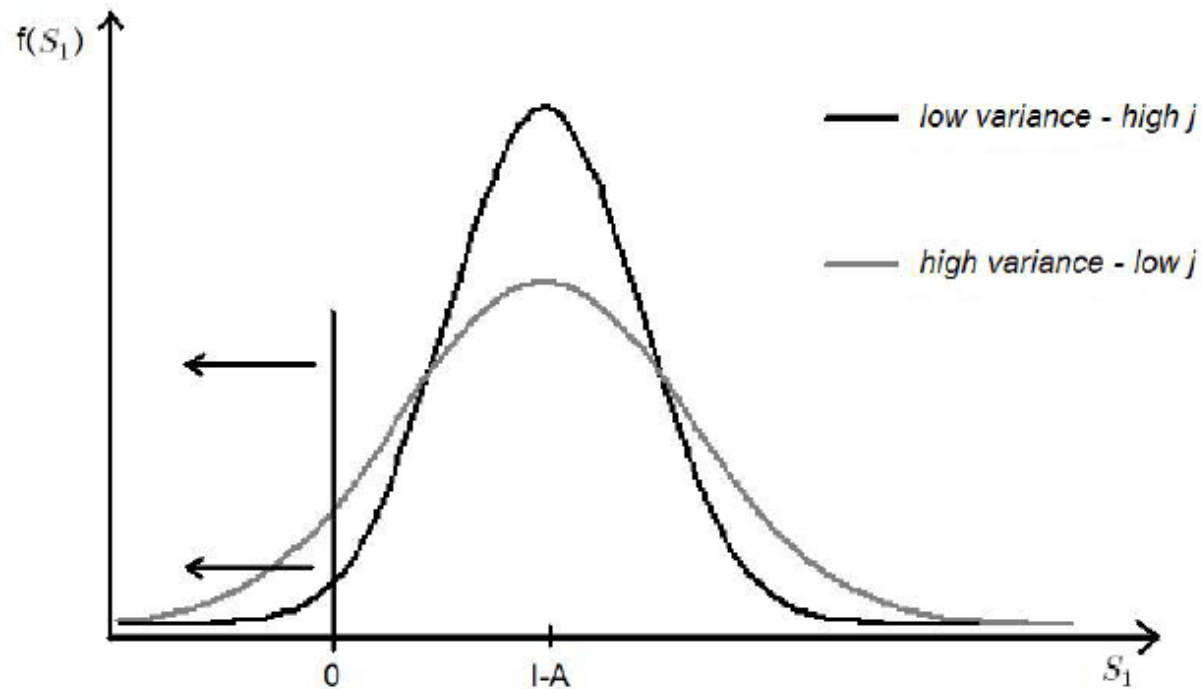
$$E(S_1|M) = I - A > 0$$

$$Var(S_1|M) = \frac{I^2}{J}\sigma_*^2$$

PDF of S_1 depends on nr. industries J

$$Var(S_1|M) \to 0 \text{ as } J \to \infty.$$

Probability density function of S_1

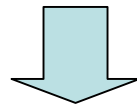- $J \to \infty$: PDF collapses to I-A
- $J \to \infty$: $Prob(S_1 < 0|M)$ smaller

Partial liquidation

- Expected fraction of firms continuing:

$$E(\delta|N) = Prob(P_j(S_1) = 1|N),$$

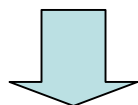- Negative relationship with $Prob(S_1 < 0|M)$

$E(\delta|N)$ increasing function of nr. industries J

Diversification and Growth

- The growth rate of the economy is (due to vertical innovation):

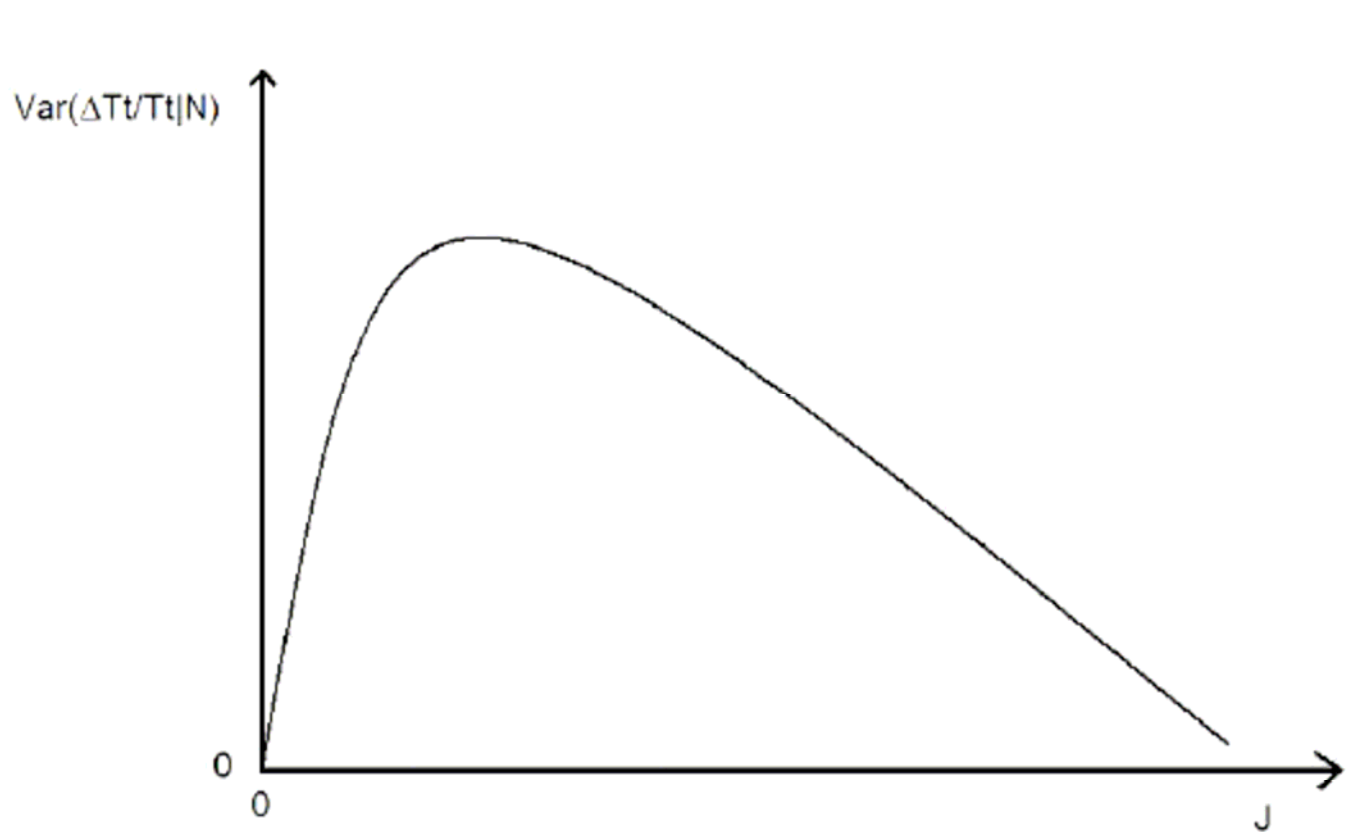$$\frac{\Delta T_t}{T_t} = \delta_t F_t^J(c^*) p_H v I$$

$E(\frac{\Delta T_t}{T_t}|N)$ increasing function of nr. industries *J*

Diversification and Growth

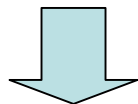$$Var(\frac{\Delta T_t}{T_t}|N)$$
quadratic concave function of nr. industries J

Var(ΔTt/Tt|N)

Diversification and Growth

- The growth rate of nr. industries J (due to horizontal innovation):
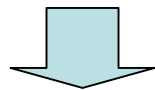
$$\frac{\Delta J_t}{J_t} = \delta_t F_t^J(c^*) p_H h I$$

$$E\left(\frac{\Delta J_t}{J_t} \Big| N\right) \Bigg|$$ increasing function of nr. industries J

Externality and horizontal innovation

- An increase in J increases $E(\frac{\Delta J_t}{J_t}|N)$

Horizontal innovation has externalities

- Higher horizontal innovation leads to higher vertical innovation indirectly through its effect on $E(\delta|N)$ (higher financial development)

Government subsidies

- If not enough aggregate liquidity, government subsidy :
  - to vertical innovation ➡ higher growth

  - to horizontal innovation ➡ more diversification, deeper financial system

- Low financial development ➡ govt. subsidy to horizontal innovation

- Government: future tax revenues as collateral

Conclusion

- Higher diversification:

  – higher growth

  – more diversification, deeper financial system

- Horizontal innovation: -externality
                                -growth (indirectly)

- Government subsidy good for growth (especially horizontal innovation)