Financial Intermediaries and wealth

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Role of wealth

- What is the role of (intermediary) wealth in financing?

The role of net wealth

- Explore how entrepreneur's and bankers wealth can affect the availability of outside funds (financing)
- Holmström and Tirole (1997)
- Entrepreneur requires a fixed investment I
- Has some initial wealth (assets) A
  - $A \sim G(A)$
- Needs to borrow the remaining $I - A$
- Lenders and borrowers are risk neutral
  - Perfect competition among lenders
    - Lowest interest rate that allows for non negative profits
- One period model

The project

- In case of success the returns (gross) are R
  - 0 if default
- The probability of success is p
  - p_H if the entrepreneur works hard
  - p_L if the entrepreneur shirks
  - BUT there are private benefits of B if shirk (misbehave)
    - You can think as disutility saved by not working hard
- This is the Moral Hazard problem of entrepreneur

The contract direct finance

- Because of limited liability if project fails
  - Borrower-Entrepreneur receives 0
  - Lender receives 0
- If project does not fail
  - R_B goes to borrower-entrepreneur
  - R_L goes to the lender

The contract

- Assumption
  - Project only has positive NPV if entrepreneur behaves

$$\begin{aligned} p_H R - I &> 0 \\ p_L R - I + B &< 0 \end{aligned}$$

- Then misbehaving would never a choice when financing

$$\underbrace{p_L R_L - (I - A)}_{\textit{Lender}\text{ profit}} + \underbrace{p_L R_b + B - A}_{\text{Borrower profit}} < 0$$

- It can not be that Lender or Borrower have negative profits

The contract

- Let us assume that the entrepreneur behaves (works hard) p_H
  - We will show that it will be the case
  - if not the project is not valuable by assumption $p_l R + B < I$
- Then, because of perfect competition among lenders, profits of the lenders go to 0
  - If not the borrower would go to another lender that asks for lower rate
- Zero profit condition for lenders is

$$p_H R_L = I - A$$

Lender Credit Analysis

- The contract has to enforce high effort
- This can be done by making the borrower risk part of its money
  - If borrower misbehaves
    - Earns B
    - But has a stake R_b and reduces p_H to p_L
- Behave if **"incentive compatibility constraint"** holds

$$\begin{aligned} p_H R_b &\geqslant p_L R_b + B \\ \Delta p R_b &\geqslant B \end{aligned}$$

Lender Credit Analysis

- Note that in order for entrepreneur to behave has to be satisfied that

$$\begin{aligned} p_H(R-X) &\geqslant p_L(R-X)+B \\ X &\leq R-\frac{B}{\Delta p} \end{aligned}$$

- Maximum income that can be pledged by a borrower so that it behaves (**pledgeable income**) is

$$R-\frac{B}{\Delta p}$$

- Then the expected pledgeable income, is

$$p_H\left(R-\frac{B}{\Delta p}\right)$$

Lender Credit Analysis

- In order to break even it must be that the borrower behaves and also that the lender does not loose money
- Hence the pledgeable income has to be higher or equal to the amount lent

$$p_H \left(R - \frac{B}{\Delta p} \right) \geqslant I - A$$

- This is the lenders **participation constraint**
- If it does not hold the lender knows that the borrower will not behave
- For financing to exist it must be that

$$A \geqslant \bar{A} = I - p_H \left(R - \frac{B}{\Delta p} \right)$$

Role of wealth

- Borrowers with wealth smaller than $\bar{A}$ do not receive a project
- They have a potentially profitable project
- However the lenders know they will not behave so they do not grant loans to them
- If it does not hold the lender knows that the borrower will not behave
- They are credit rationed
  - Borrowers would be willing to give higher fraction of returns to the lenders (pay higher interests)
  - But lenders do not grant the loan because of the moral hazard problem

Role of wealth - Checking that the entrepreneur behaves

- Borrowers with wealth higher than $\bar{A}$ receive a project
- They offer a promised payment so that lenders break even

$$p_H R_l = I - A$$

- Borrower keeps a stake

$$R_b = R - R_l = R - \frac{I - A}{p_H} \geqslant R - \frac{I - \bar{A}}{p_H} = \frac{B}{\Delta p}$$

- Recall that it behaves if $R_b \geqslant \frac{B}{\Delta p}$
- Hence we have found that for $A \geqslant \bar{A}$ there is a contract such that
  - The entrepreneurs behave
  - The lenders break even
  - Hence lenders finance the entrepreneur

Firm financing with intermediaries

- Banks and other financial intermediaries (venture capitalists) differ from other financiers
- Intermediaries have knowledge about the industry they lend to
- They have the ability of making entrepreneurs behave
- Who would be funded by them?

Role of monitoring

- Let us now analyze our previous model with the possibility of monitoring by banks
- Monitoring has a cost of c per unit/loan but reduces B to b
  - Without monitoring private benefit is $B > b$
- Then let see who goes for intermediaries or for arms length finance.
  - Arms length is non specialists (not banks) that do not monitor
- Holmström Tirole (1997) and Repullo and Suarez (2000)
- Moral hazard problem

The model - Entrepreneurs

- Each entrepreneur has an amount A of cash which differs across entrepreneurs
  - Entrepreneurs differ in their wealth
- They have the opportunity of undergoing a project
- The size of the investment is I
  - Entrepreneurs with wealth A need finance for the amount $I - A$
- Returns of the project are

$$R \text{ if the project succeeds } p$$
$$0 \text{ if the project fails } 1 - p$$

The model - Entrepreneurs' Moral Hazard

- Probability of success p is a private choice of the entrepreneur
  - p_h if the entrepreneur behaves
  - $p_l < p_h$ if the entrepreneur shirks
  - when she shirks she receives some private benefits
    - B if she is not monitored
    - $b < B$ if she is monitored
- This is the moral hazard problem entrepreneurs can choose to shirk if their private benefits are big enough

The model - Entrepreneurs

Project	Good	Bad (low private benefit)	Bad (high private benefit)
Private benefit	0	b	B
Probability of success	p_H	p_L	p_L

The model - Entrepreneurs

- Only those projects that are run with high probability of success are economically viable

$$p_h R - I > 0 > p_l R - I + B$$

The model - Financial sector - Intermediaries

- It is composed of multiple financial intermediaries who have the ability to monitor the entrepreneur
  - They compete a la Bertrand
  - Lowest possible loan rate is charged
  - (Endogenous) cost of funds $\beta > 1$
- Monitoring in reality can be a lot of things as previously explained
- In our model it means that private benefits go from B to b
  - Makes shirking less attractive

The model - Financial sector Moral Hazard

- Importantly monitoring is costly for the intermediaries
- It has a cost of c per contract
- This is unverifiable so there is also a moral hazard from the part of intermediaries
- Intermediaries will only monitor if it is profitable for them to do so
- This is not contractible
- Double moral hazard!

The model - Intermediaries

- Intermediaries can help a capital constrained firm
  - Entrepreneurs with $A < \bar{A}$
  - How?
- Monitoring reduces the attractiveness of misbehaving by reducing B to b
  - This lowers the incentives to misbehaves and reduces the moral hazard problem
  - In the extreme case of $b = 0$ then it would reduce all the incentives to misbehave
- Now we have 3 parties: entrepreneur, intermediary and uniformed investor

The model - Intermediaries -bank

- In the case of success the return has to be split into

$$R = R_E + R_I + R_u$$

- Where R_E is the return to the entrepreneur and R_I is the return to the financial intermediary $R_u$is the return of the depositor (uninformed)
- If k is the amount that a bank lends and I_u what the uniformed lends
- The uninformed investors return has to satisfy

$$\begin{aligned} pR_U &= I_u \\ pR_U &= I - A - k \\ R_U &= \frac{I - A - k}{p} \end{aligned}$$

The model - Intermediaries - Moral hazared

- Let us assume that the intermediary monitors. In such case the incentive compatibility constraint for the firm is

$$R_E \geqslant \frac{b}{\Delta p}$$

- In order for the intermediary to monitor the incentive compatibility constraint is

$$\begin{aligned} p_h R_I - c &\geqslant p_l R_I \\ R_I &\geqslant \frac{c}{\Delta p} \end{aligned}$$

- And the participation constraint of the intermediary is

$$p_h R_I - c \geq \beta k$$

The model - Splitting the surplus

- Given the high cost of bank finance $\beta > 1$ firm will use as little bank financing as possible

$$p_h R_I - c = \beta k \rightarrow k = \frac{p_h c}{\beta \Delta p}$$

- Then uniformed investors have to lend the remainder $I - A - \frac{p_h c}{\beta \Delta p}$
- For which they have to receive $R_u = \frac{I - A - \frac{p_h c}{\beta \Delta p}}{ph}$
- It must be the case that returns in case of success are enough to repay all players bank monitors entrepreneurs behave

$$\begin{aligned} R - R_E - R_I - R_u &> 0 \\ R - \frac{b}{\Delta p} - \frac{c}{\Delta p} - \frac{I - A - \frac{p_h c}{\beta \Delta p}}{ph} &> 0 \\ p_h \left[R - \frac{(b+c)}{\Delta p} - \frac{c}{\Delta p} \right] + \frac{p_h c}{\beta \Delta p} - (I - A) &\geqslant 0 \end{aligned}$$

When is monitoring going to help firms

- Only firms with $A \geqslant \underline{A}$ can receive intermediated financing

$$\underline{A} = I - p_h \left[R - \frac{(b+c)}{\Delta p} \right] - \frac{p_h c}{\beta \Delta p}$$

- Monitoring is going to help firms whenever $\underline{A} < \bar{A}$
  - This is not necesarily the case (e.g. $c > B - b$)
- Also we need to solve for the equilibrium β

Endogenous cost of bank capital

- Exogenous supply of bank capital $\overline{K}$
- Recall we assume that risk free rate $R_f = 1$
- Demand of bank capital $K(\beta, 1) = [G(\bar{A}) - G(\underline{A})] \frac{p_h c}{\beta \Delta p}$
- Downward slopping demand on β!
- Unique market clearing $K(\beta, 1) = \overline{K}$

Some questions

- What is the effect on aggregate investment of
  - (i) A proportional reduction in entrepreneurs' wealth
  - (ii) A reduction in aggregate bank capital
  - (iii) An increase in the opportunity cost of depositors' funds R_f

Some answers

Proposition Any of the above-mentioned shocks to the financing capacity of the agents in the economy leads to:

- 1. A fall in the measure of entrepreneurs whose wealth is sufficient to guarantee the financing of their investment projects
- 2. A fall in aggregate investment
- Proof As an exercise. Hints:
- For shock (i), one needs a proper formalization:
  - Consider a family of cdfs $G_\mu(w)$ parameterized by $\mu > 0$ such that $G_\mu(w) = H(\mu w)$, where $H(\cdot)$ is also a cdf
  - Check that (i) is equivalent to an increase in μ
- For shocks (ii) and (iii), the results follow from the slides and the way in which $\overline{A}$ and $\underline{A}$ depend on $\overline{K}$ and R_f

Other models of bank monitoring

- Monitoring as a substitute for reputation [Diamond (1991)]
- Bank monitoring is valuable for firms with insufficient reputation:
  - Monitoring ameliorates moral hazard problems, making the investment feasible at an early stage
  - As good firms' performance makes them gain reputation, they can gradually access the market for unmonitored finance
- Two main predictions:
  - There is a financial life cycle: mature firms are less bank-dependent
  - Highly rated firms (Diamond's proxy for reputation) borrow proportionally less from banks

Other models of bank monitoring

- The disciplinary role of liquidation threats [Repullo-Suarez (1998)]
- What is the exact nature of "monitoring" in real-world banking?
- Two sides of monitoring
  - Observing the decisions/performance of the borrower
  - Taking disciplinary actions when the observed actions/performance are unsatisfactory
- If the bank cannot directly manage the firm's activities, the disciplinary action may consist on forcing it into liquidation:
  - Liquidation punishes the entrepreneur
  - Liquidation may allow bank to recover part of its investment
- The paper formalizes the idea that the bank can threaten the firm with "pulling the plug" when things go awry

Other models of bank monitoring

- However:
  - The liquidation threat must be credible (otherwise is useless)
  - The bank must get a sufficient liquidation payoff:
- Bank loans must be senior to other borrowings and must be secured with assets of sufficient liquidation value
- Projects with not much liquidation value may have to rely on mixed financing
  - Liquidatable assets guarantee the bank's stake in the project
  - The remaining funds come from unmonitored/direct financing

Conclusions

- The existence of financial intermediaries can be useful for firms
- Firms have to pay for the services of this financial intermediaries
  - Financial intermediaries obtain positive profits
- BUT by using financial intermediaries some firms can obtain finance
  - Those firms would not obtain finance without financial intermediaries
- Financial intermediaries help alleviate the moral hazard problem by monitoring firms
- Informed intermediaries can have value for society by alleviating moral hazard problems and hence credit rationing