Moral Hazard

Credit & Microfinance

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Lecture 3

Moral Hazard: actions undertaken while the project is underway.

- Project Choice Models (Stiglitz, 1990)
  - *tension between the lender's and borrower's choice of project*
- Effort Choice Models (Aniket, 2006)
  - *tension between the lender's and borrower's choice of action*

Moral Hazard: Project Choice Model – Stiglitz (1990)

Borrowers

- Risk neutral
- Wealth-less
- Choose between safe and risky project

Project	Successful		Failure		Investment		Interest
	Prob.	Output	Prob.	Output	Sunk-Cost	Scale	
Risky	p_r	$\beta_r L$	$1-p_r$	0	α	L	rL
Safe	p_s	$\beta_s L$	$1-p_s$	0	0	L	rL

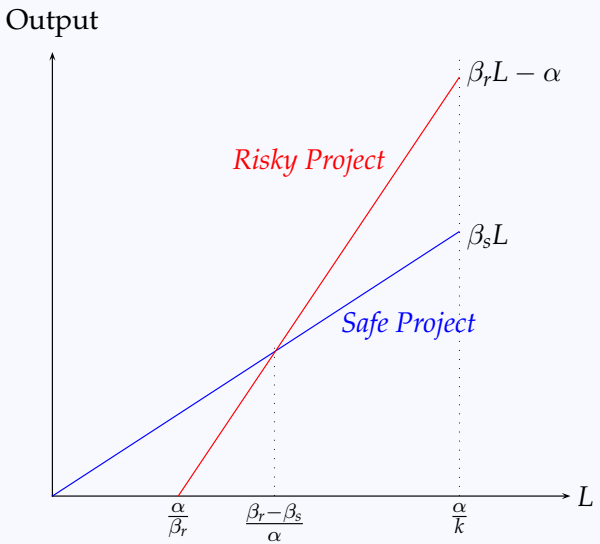

Figure: Safe and Risky Projects

Borrower's Payoff from the Two Projects

Safe Project: Lower expected marginal return & 0 sunk cost

$$V_s = p_s(\beta_s L - rL)$$

Risky Project: Higher expected marginal return & α sunk cost

$$V_r = p_r(\beta_r L - rL) - \alpha$$

Assumption

$$p_r\beta_r - p_s\beta_s = k$$

... difference in expected marginal return constant

Individual Lending Switch Line

Switch Line: Locus of contracts (r, L) along which the borrower is indifferent between risky and safe project

$$V_r > V_s$$

$$p_r(\beta_r L - rL) - \alpha > p_s(\beta_s L - rL)$$

$$L > \frac{\alpha}{\Delta pr + k} \qquad \text{(Output threshold)}$$

Northeast of the switch line: Sunk cost investment α is overwhelmed by increased expected marginal productivity of risky project k and saving on the expected interest rate payment Δpr.

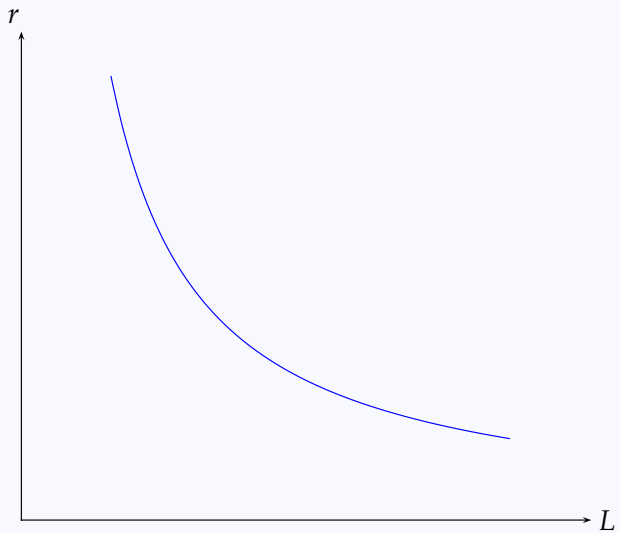

Figure: Switch Line

Lender's Zero Profit Condition

Risk adjusted interest rate

$$r = \frac{\rho}{p_i} \qquad i = s, f \qquad \text{(L-ZPC)}$$

Optimal Contract (r^*, L^*): Switch line & (L-ZPC)

Maximum loan size & Interest Rate

$$L^* = \frac{\alpha}{\Delta p\left(\frac{\rho}{p_s}\right) + k}$$

$$r^* = \frac{\rho}{p_s}$$

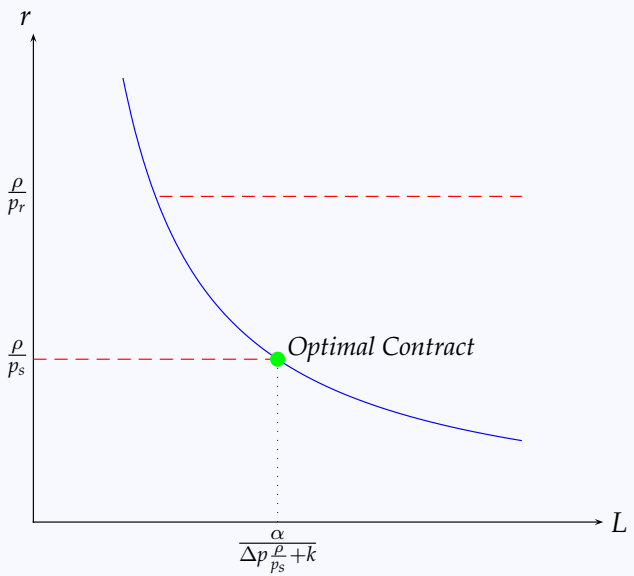

Figure: Switch Line and Optimal Contract under Individual Lending

Group Lending
Borrower's payoffs

$$V_{ss} = p_s(\beta_s L - rL) - p_s(1-p_s)cL$$
$$V_{rr} = p_r(\beta_r L - rL) - \alpha - p_r(1-p_r)cL$$

Joint liability payment c incurred with probability $p_i(1-p_i)$

- Payoffs ↓ due to the joint liability payment c
- Payoffs ↑ due to larger loans

Group Lending Switch Line

Group Lending Switch Line:

$$L = \frac{\alpha}{\Delta p r + k - \Delta p(p_s + p_r - 1)c}$$

Lender's Zero Profit Condition:

$$r = \left(\frac{\rho}{p_s}\right) - \left(\frac{1-p_s}{p_s}\right)c$$

Maximum Loan Size in Group Lending:

$$L^* = \frac{\alpha}{\Delta p\left(\frac{\rho}{p_s}\right) + k - \varphi c}$$

where $\varphi = \Delta p\left(\frac{1-p_s}{p_s} + (p_s + p_r - 1)\right)$

- Joint liability payment lets borrowers get larger loans

… L^* *is increasing in* c

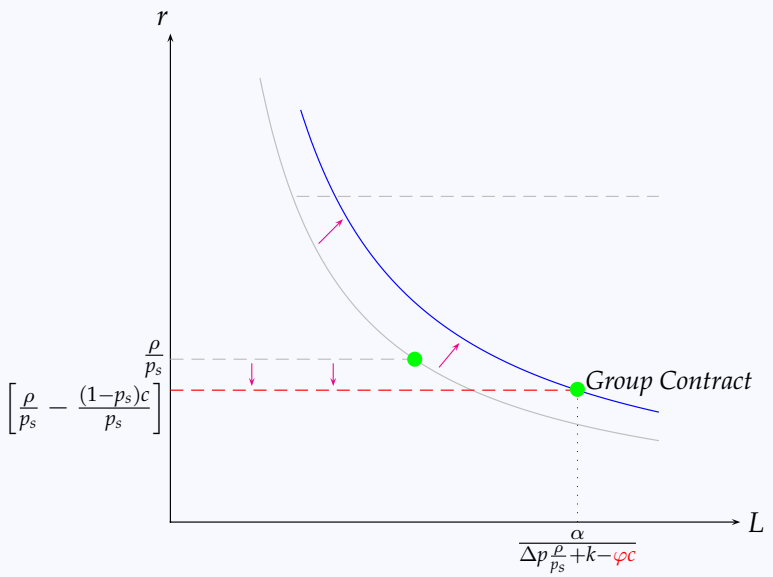

Figure: Switch Line and Optimal Contract under Group Lending

Project Choice Summary

Lender curtails loan size to prevent borrowers undertaking risky loans with significantly high sunk cost

Individual liability loans

1. Borrower pay ρ
2. Lower risk exposure
3. Small Loans

Joint liability group loans

1. Borrower pay ρ
2. Higher risk exposure
3. Larger Loans

May explain why we find the poorer section of our society are not able to undertake profitable investment

Borrowers interact cooperatively and not strategically amongst themselves

Can lender do better by making the borrowers interact strategically amongst themselves

First Best

Project: $-1 \rightarrow \begin{cases} x & \dots \ \pi^i \\ 0 & \dots \ 1-\pi^i \end{cases}$

Borrower chooses π^i where $\pi^h > \pi^l$
Private Benfits B with π^l

Borrower's Participation Constraint

$$\pi^h(x-r) \geqslant 0$$

Lender's Zero Profit Constraint

$$r \geqslant \frac{\rho}{\pi^h}$$

Figure: First Best

Second Best

Borrower's Participation Constraint

$$\pi^h(x-r) \geqslant 0$$

Lender's Zero Profit Constraint

$$r \geqslant \frac{\rho}{\pi^h}$$

Borrower's Incentive Compatibility Constraint

$$\pi^h(x-r) \geqslant \pi^l(x-r) + B$$

$$x - r \geqslant \frac{B}{\Delta\pi}$$

Figure: Second Best

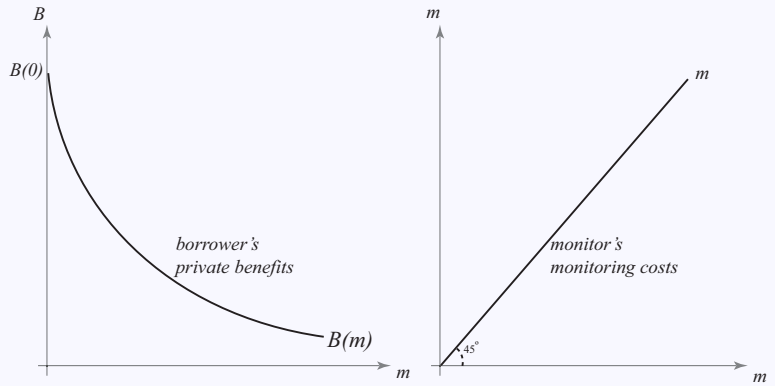

Figure: Monitoring Function

Delegated Monitoring

Borrower's Participation Constraint

$$\pi^h(x-r) \geqslant 0$$

Lender's Zero Profit Constraint

$$r \geqslant \frac{\rho}{\pi^h}$$

Borrower's Incentive Compatibility Constraint

$$\pi^h(x-r) \geqslant \pi^l(x-r) + B$$
$$x - r \geqslant \frac{B}{\Delta\pi}$$

Monitor's Incentive Compatibility Constraint

$$\pi^h w - m \geqslant \pi^l w$$
$$w \geqslant \frac{m}{\Delta\pi}$$

Figure: Delegated Monitoring

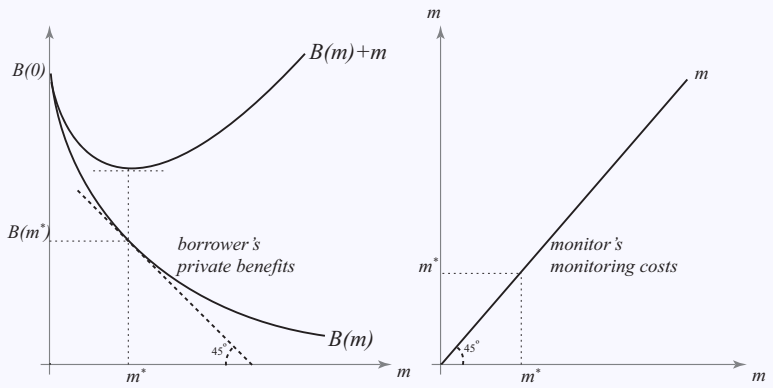

Figure: Optimal Monitoring Level

Simultaneous Group Lending

Multi-task environment:
Monitoring and exerting effort

Borrower's payoff + when both projects succeed. Otherwise 0.

The contract space is determined by the following two constraints.

1. The individual borrower's ICC for high effort when her peer exerts high effort and both choose m.
$$\pi^h\pi^h(x-r) - m \geqslant \pi^l\pi^h(x-r) + B(m) - m$$
2. The group's collective compatibility condition such that the group has the incentive to undertake both tasks collectively.
$$(\pi^h)^2(x-r) - m \geqslant (\pi^l)^2(x-r) + B(0)$$

$$\twoheadrightarrow \quad r \leqslant x - \frac{1}{\pi^h\Delta\pi}\max\left[B(m),\ \alpha(B(0)+m)\right] \text{ where } \alpha = \frac{\pi^h}{\pi^h+\pi^l}$$

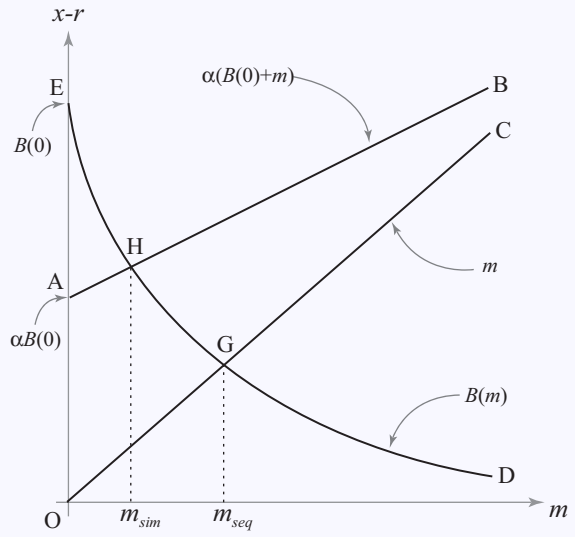

Figure: Monitoring Intensities in Group Lending

Sequential Group Lending: Aniket (2006)

- Borrower 1 gets the loan while Borrower 2 is waiting for loan
- ⇝ Borrower 2 only gets loan if the Borrower 1 succeeds
- ↷ Contract space determined by following constraints:

$$r \leqslant x - \frac{1}{\pi^h \Delta\pi} \max \left[B(m), m \right]$$

Only the more expensive individual task has to be incentivised
Group's collective incentive constraint does not have to satisfied.

- *Borrowers are interacting strategically and not co-operatively*

Borrower's obtain lower rents and a larger surplus is created

Sequential Group Lending with almost Perfect Information

- As monitoring becomes more efficient, we get closer to the first best world or to *almost* perfect information.

Simultaneous Lending

- Payoff driven down to $\alpha B(0)$
- Far from First Best

Sequential Lending

- Payoffs driven down to 0.
- First Best

- Lender is able to reduce rent by lending sequentially
- A greater range of project would be financed under sequential lending

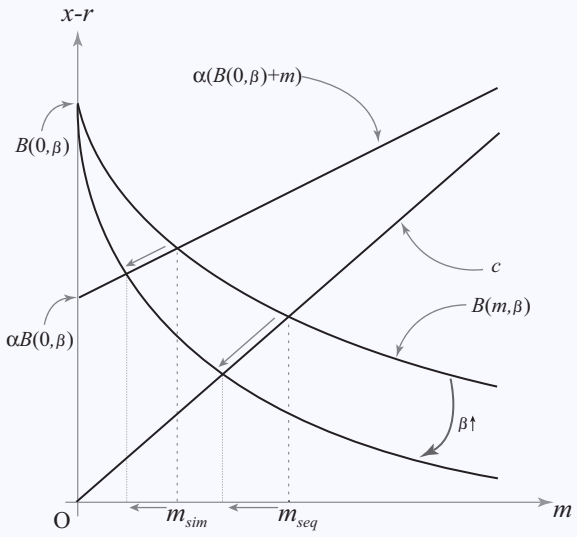

Figure: Monitoring Intensities as Monitoring Efficiency Increases

Conclusions

Stiglitz (1990)

- Shows that cooperative group lending increases loan size

Aniket (2006)

- With almost perfect information, cooperative group lending relatively inefficient
- shows sequential lending lower the productivity threshold to finance the projects
  - Especially useful if poorest have extremely low productivity project