Micro-finance institutions

1. MFIs and their borrowers

1.1. The principles of group lending

- Grameen Bank
- Other MFIs
- The basic rules of micro-finance for the poor:
    - small loans at start and steep increase in loan size
    - no physical collateral
    - intensive screening and monitoring by agents
- The basic rules of group lending: same plus:
    - self-selection in groups (SS)
    - joint liability (JL)
- The usual arguments for group lending:
    - SS + JL ⇒ eliminate bad borrowers (AS)
    - SS among people that know each other ⇒ Social sanctions for enforcement ⇒ limit MH in willingness to pay and in choice of projects.

    Both allow to maintain access to the poor and high repayment rates

1.2. The lending problem

- Moral hazard in repayment:
  Could be curtailed by either collateral or dynamic incentives. Hence not such an issue. The real problem is the need for insurance.

  Investment of 1 unit ⇒ X with probability p and 0 with probability $(1 - p)$.
  Assume no other resources to repay (hence necessary limited liability).
  Repayment r (includes principal).

			Returns:	Net return Collateral	Net return Future
(1-p)	Fails	Default	0	$-C$	0
p	Success	Repay	$X-r$	$X-r$	$X-r+F$
		Unwilling	X	$X-C$	X

  MH eliminated if $C > r$ (but then limited liability is de facto cancelled) or $F > r$.
  But this does not address the fundamental risk of a bad return, and the consequent loss of access to credit.

- Limited liability and adverse selection:
  Would need differentiated contracts. With asymmetric information, cross subsidization of risky borrowers by safe borrowers. Problem to keep safe borrowers.

  - 2 types of individual

R	X_R	p_R	μ	(μ proportion in population)
S	X_S	p_S	$(1-\mu)$	

  $p_S > p_R, X_S < X_R$.

  Bank: 0 profit, cost of money : ρ (including principal)

  - First best under perfect information is interest rate discrimination: $r_i = \rho / p_i$,
  - Under asymmetric information: pooling ⇒ interest rate at an intermediate level.

  $$\mu p_R r + (1-\mu) p_S r = \rho$$

  $$\Rightarrow \quad r = \frac{\rho}{\mu p_R + (1-\mu) p_S} \qquad \text{Hence } r_S < r < r_R$$

  Cross-subsidization of risky loans by safe loans.
  Participation of borrower *i* for $p_i X_i \geq p_i r$
  If projects are just profitable, $p_S X_S = p_R X_R = \rho$, then *S* borrowers are driven out. (Lemons)

- Exercise: For reference, find an efficient separating contract.

1.3. Joint liability with a unique contract: produces interest rate discrimination, which improves efficiency and the pool of borrowers (Ghatak, EJ 2000)

- JL and SS induce assortative matching (homogenous groups)
  JL: payment of own share *r* if successful, and part of other's share *c* if other fails.
  Utility for *i* associated with *j*:
  $$U_{ij} = p_i X_i - p_i \left(r + \left(1 - p_j \right) c \right)$$

  Loss to *S* for accepting *R*: $T_S = p_S \left(p_S - p_R \right) c$
  Gain to *R* for teaming with *S*: $B_R = p_R \left(p_S - p_R \right) c < T_S$

  Hence heterogenous groups are not possible, since *R* cannot compensate *S*.
  Notice: This model has no cost to loosing access to credit. Show that heterogenous groups are possible if there is future benefit in access to credit (Sadoulet, 2000)

- Hence interest rate discrimination:
  Payment by i: $P_i = p_i\left(r + \left(1 - p_i\right)c\right)$
  Difference: $P_R - P_S = \left(p_S - p_R\right)\left(\left(p_S + p_R - 1\right)c - r\right)$ increases with c.
  As c increases, efficiency in allocation of resources improves.

  P_R however remains lower than P_S for $c < \dfrac{r}{p_S + p_R - 1}$. Hence usually cannot reach full efficiency.

- Equilibrium contract:
  Zero profit for bank: $\mu p_R\left(r + \left(1 - p_R\right)c\right) + \left(1 - \mu\right)p_S\left(r + \left(1 - p_S\right)c\right) = \rho$
  $\Rightarrow\ r = \dfrac{\rho}{\bar{p}} + c\left(\dfrac{\mu p_R^2 + \left(1 - \mu\right)p_S^2}{\bar{p}} - 1\right)$, where $\bar{p} = \mu p_R + \left(1 - \mu\right)p_S$

- Pool of borrowers:
  Payment by i: $P_i = \rho\dfrac{p_i}{\bar{p}} - c\dfrac{p_S p_R}{\bar{p}}\left(p_i - \bar{p}\right)$
  Participation constraint : $P_i \le p_i X_i$

  Hence c lowers the participation constraint for S and raises it for R
  $\Rightarrow$ improves efficiency in allocation of funds.

1.4. Joint liability as a screening device, with a menu of contracts (Ghatak, EJ 2000)

- The contract:
  Bank offers a menu $\left\{\left(r_S, c_S\right), \left(r_R, c_R\right)\right\}$
  $U_{ij}\left(k\right) = p_i X_i - p_i\left(r_k + \left(1 - p_j\right)c_k\right)$, utility to i, associated with j, in contract $\left(r_k, c_k\right)$
  Constraints:
  - zero-profit on each type of loan: $p_i\left(r_i + \left(1 - p_i\right)c_i\right) = \rho$
  - participation constraint: $U_{ii}\left(i\right) = p_i X_i - p_i\left(r_i + \left(1 - p_i\right)c_i\right) \ge 0$
  - incentive compatibility: $U_{ii}\left(i\right) \ge U_{ii}\left(j\right)$
  - limited liability constraint: $r_i + c_i \le X_i$

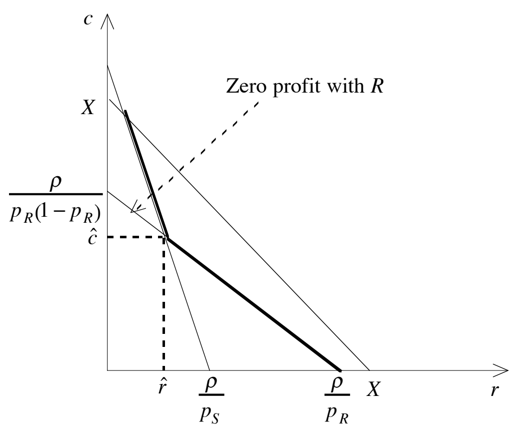
- Incentive compatibility constraint $\Rightarrow$ assortative matching:
  $U_{SS}\left(S\right) - U_{SR}\left(S\right) > U_{RS}\left(S\right) - U_{RR}\left(R\right)$

- Optimal contract:
  Let $\left(\hat{r},\hat{c}\right)$ be the efficient pooling contract solution of 1.3 above:

  $\hat{c} = \dfrac{\hat{r}}{p_S + p_R - 1}$ and $\hat{r}\dfrac{p_S p_R}{p_S + p_R - 1} = \rho$, (which satisfy: $p_i\left(\hat{r} + \left(1 - p_i\right)\hat{c}\right) = \rho$)

  Then there exists a separating contract $\left\{\left(r_S, c_S\right), \left(r_R, c_R\right)\right\}$, in which:
  $r_S < \hat{r} < r_R$ and $c_R < \hat{c} < c_S$

Notice, however, that in this contract, $\hat{c} > \hat{r}$, and henceforth $c_S > r_S$



1.5. Joint liability induces the choice of safer projects (Ghatak & Guinnane, JDE 99)

One type of borrower : X with probability p, and 0 with probability (1-p)
Borrower/agent can choose p, at cost $\frac{1}{2}\gamma p^2$
Bank/principal sets the interest rate for 0 profit.

- Individual loan without limited liability (first best):
  $p = \arg\max\left(pX - r - \frac{1}{2}\gamma p^2\right) = \dfrac{X}{\gamma}$ and bank sets $r = \rho$

- Individual loan with limited liability:
  $p = \arg\max\left(p\left(X - r\right) - \frac{1}{2}\gamma p^2\right) = \dfrac{X - r}{\gamma} < \dfrac{X}{\gamma}$
  Bank's zero profit: $pr = \rho \Rightarrow p^*$ solution of $\gamma p^2 - pX + \rho = 0$.

- Non-cooperative group playing Nash:

Reaction function:

$$p_i = \arg\max\left(p_i\left(X-r\right)-p_i\left(1-p_j\right)c-\tfrac{1}{2}\gamma p_i^2\right)=\frac{X-r-c}{\gamma}+p_j\frac{c}{\gamma}$$

Nash non-coop solution: $p_i = \dfrac{X-r-c}{\gamma - c}$

Bank's zero profit: $pr + p\left(1-p\right)c = \rho$

$\Rightarrow$ p^* solution of $\gamma p^2 - pX + \rho = 0$, same as individual.

- Cooperative group:

  Joint maximization:

  $$p_i = \arg\max\left(p\left(X-r\right)-p\left(1-p\right)c-\tfrac{1}{2}\gamma p^2\right)=\frac{X-r-c}{\gamma-2c}$$

  Bank's zero profit: $pr + p\left(1-p\right)c = \rho$

  $\Rightarrow$ p^{**} solution of $\left(\gamma - c\right)p^2 - pX + \rho = 0$.

$p^{**} > p^*$ and repayment rate of each individual is higher than under individual loans.

<u>Conclusion</u>: Group credit creates a mechanism for mutual insurance $\Rightarrow$ improves efficiency in resource allocation towards safer borrowers and safer projects.
However: transfers insurance from (risk-neutral) Bank to (risk-averse) borrowers

References:

Ghatak, M. "Screening by the Company you Keep: Joint Liability Lending and the Peer Monitoring Effect." *Economic Journal*, 2000 July, V110 N465:601-31.

Ghatak, M; Guinnane, TW. "The economics of lending with joint liability: theory and practice." *Journal of Development Economics* 1999 OCT, V60 N1:195-228.