Development Economics

Lecture 23: Models of Credit

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This lecture

Models of credit markets

1. Why are interest rates so high? Because lending is risky
2. Importance of collateral: Why the poor are not served by formal sector
3. Fixed costs in lending: Why it may not be profitable for formal institutions to lend to the poor
4. Credit and Information: How bad borrowers can drive out good

Models of credit markets

- Some terms and definitions:
  - Loan size is L
  - Interest rate charged to the borrower is generally i, amount that needs to be paid back $(1+i)L$
  - Cost of funds to the lender is r
    - The lender must get at least r to be willing to lend
  - Collateral is what the borrower has to give up to the lender in case of default.
- Generally need to keep track of what the borrower's and lender's **incentives** are, and what each **knows**

Credit Markets: Lender Risk

- Why are interest rates so high? Because lending is risky.

  Loan size *L*; interest rate *i*; cost of funds *r*

Probability *p* paid back in full; *(1-p)* pays nothing

Return to lender: Expected profits

$\pi = p[(1+i)\ L] + (1-p)[0] - (1+r)\ L$

$= p[(1+i)\ L - (1+r)\ L] + (1-p)[0 - (1+r)\ L]$

Credit Markets: Lender Risk

- If competitive markets drive π to 0, what interest rate *i* will lenders charge

  solve for π=0

  $0 = p[(1+i)\,L] + (1-p)[0] - (1+r)\,L$

  $(1+r)L = p(1+i)\,L$

  $i = (1+r)/p - 1$

  risk premium (higher p means lower i)

Example: r=10%; p=½ → i=1.1/.5 – 1=1.2 = 120%

Credit Markets: Collateral

- Why do poor not use formal financial institutions? Lack of collateral makes lending to them risky.
- In simple risky lending model, the borrower defaults with some probability
  - Probability given, not under borrower's control
  - In a more complex model, the borrower may decide to default, and lender must consider whether borrower will default before making loan. *Moral Hazard*
- Collateral makes it costly for the borrower to default
  - Collateral may be valuable to borrower, but not to lender. Example: a valued heirloom
  - Collateral may be valuable to both—land

Credit Markets: Collateral

Borrower put up collateral worth

V_B to borrower

V_L to lender

extra cost of default to borrower F (reputation)

Lender gets (1+i)L if loan is paid back; V_L if default

Borrower repays loan if better than losing collateral

$(1+i)L < V_B + F$

repayment cost < default cost

Credit Markets: Collateral

Loan repayment is in the interest of borrower if

$(1+i)L < V_B + F$, then loan is given

If not true, lender knows, and would not give loan

If $V_B = 0$ → no collateral

If $F = 0$ → no social cost of default

If $V_B + F = 0$ → no lending (or even if close to 0)

No collateral?

- In formal commercial situations (banks) “social cost of default” may be zero
  - Bankers are not the local landowner, a friend, or neighbor who can bring social pressure to bear
  - So banks may not be willing to lend without collateral
  - Since poor often have no collateral, poor are often not served by formal sector
- Combination of lack of collateral and inability of bank to make default painful in some way for borrower means no lending

Small fixed cost

- Even with collateral, it may not be profitable to make loan
  - Every loan requires a cost, which is fixed compared to size of loan (paperwork, cost of paper, loan officer's time, travel and overhead to operate in village)
  - Poor people want small loans, which yield small profit per loan, even if margin is large
  - Small profit per loan may not be enough to make lending worth the cost per loan
- So formal sector may not find lending to poor profitable because of small loan sizes

Credit and Information

- Risk of default is a big problem for lenders
- Different borrowers may have different risks of default
- If lender could observe the risk of default
  - Charge high interest rate to risky borrower (or if too risky, not offer any loan)
  - Charge lower rate to safe borrower
- But what happens if cannot differentiate (lack information)?
  - Lender has to set interest rates taking into account both borrowers

Adverse selection

- If the interest rate is too high, safe borrowers may not be willing to borrow, and the lender will be left with only risky borrowers
- Key insight:
  - the interest rate determines the mix of borrowers the lender faces,
  - a lower interest rate may be more profitable than a higher rate by bringing the safe borrowers in
  - but with lower rate, there will be excess demand for credit, and so rationing

Credit and Information

Two types of borrower: Risky (R) ; Safe (S)

Both want a loan of size L

Safe always gets a return $R_S > (1+r)L$ from project

Risky gets return $R_R > R_S > (1+r)L$ with prob p

0 with prop $(1-p)$

Lender's cost of funds r

Faces no competition but cannot distinguish S or R

No moral hazard: pay back if have positive return

Demand for loans

Safe wants loan if

$(1+i)L<R_S \rightarrow \max i_S = R_S/L - 1$

Risky wants loan if

$p(R_R - (1+i)L) + (1-p)0 > 0$

$R_R - (1+i)L > 0 \rightarrow$

$\max i_R = R_R/L - 1$

Risky does not care how risky they are; want return

Risky takes loan at higher interest than Safe

$\max i_R > \max i_S$

Supply of loans

If lender charges

$i \leq i_S$ will get both Safe and Risky

$i_S < i \leq i_R$ will only get Risky

$i_R < i$ will get no one

Lender has highest profit from charging highest possible interest rate in each category

Supply of loans

If charge i_S, both Safe and Risky want loans

$$\pi_S=(1+i_S)L + p(1+i_S)L - 2(1+r)L$$

If charge i_R, only Risky wants loan

$$\pi_R=p(1+i_R)L - (1+r)L$$

If charge $i>i_R$, no one wants a loan

so $\pi=0$

What interest rate does lender charge?

What interest rate does lender charge?

if $\pi_S > \pi_R$ charge i_S

if $\pi_S < \pi_R$ charge i_R

if $\pi_S < 0$ and $\pi_R < 0$, no loans

Can "bad" borrowers drive out "good"?

Yes! If $\pi_R > \pi_S$, lender charges i_R

Safe can't get loans

But Safe has a project that would be profitable and low risk if only lender could distinguish between R and S and target interest rates