Topic 4: Credit Markets in Developing Countries

Theory

- Credit market - links savers to investors
- All forms of financial intermediation
- What is so special about credit markets?
  - Matches talents and skills with resources
  - Helps in formation of skills

- Otherwise, your economic outcome dependent on how much wealth you start out with, not innate talent.

- So credit markets important for individuals and economies to rich their full potential

- Otherwise can have poverty traps, as we saw in Lecture 1

- Another way of looking at this: a "class" system can emerge due to credit market imperfections

  - See “Why Are Capitalists The Bosses?” (Eswaran & Kotwal), Economic Journal, March 1989, 162-176.

  - It is a form of an entry barrier, so there could be other factors, such as legal or social restrictions (discrimination)

- Why are they particularly likely to be imperfect?
  - The act of buying & paying up separated in time
  - When the time comes people may be
    - Unable to repay
    - Unwilling to repay
  - Taking people to court is costly.
  - Also, limited liability - legal limits to how much you can punish (not true in pre-capitalist economies)

- Anticipating this, lenders are more careful than other sellers. They

  - Screen (corresponds to adverse selection)

  - Monitor (corresponds to moral hazard)

  - Threaten to cut out future loans (corresponds to enforcement or commitment problems)

  - Obtain collateral (like a "hostage")

  - Implications: Credit markets don't function as the textbook model implies.

Stylized facts

- High interest rates in LDCs (see Banerjee 2004): rural areas 52%, urban areas 28-68%. Compare to US rates: 6-14% during 1980-2000.

  - Can't be explained by default (explains at most 7-23% of level of the interest rates)

- Presence if informal sector

  - Timberg and Aiyar, 1984: informal lenders supply 20-30% of capital needs of small scale firms in urban/semi-urban areas in India

– In rural areas, a study (Dasgupta, 1989) professional moneylenders provide 45% of credit

- A wide range of interest rates prevailing in the same area with no apparent arbitrage

  - Siamwalla et al (World Bank Economic Review, 1990): study of rural credit markets in Thailand, found informal sector annual interest rate to be 60% whereas formal sector rate ranged from 12-14%.

- Borrowers are able to borrow only up to a limit for a given interest rate, and are not given a larger loan even if they are willing to offer a higher interest rate. The very poor are unable to borrow at any interest rate (Credit rationing)

- Evans and Jovanovic (Journal of Political Economy, 1989), found that even in the US entrepreneurs on average are limited to a capital stock no more than one and one-half times their wealth when starting a new venture, & the very poor are unable to borrow at any interest rate

- Not consistent with standard supply-demand model of credit market with interest rates adjusting to clear market

- One explanation: monopoly.
  - Can explain different interest rates (price discrimination)
  - However, why charge high interest rates since that kills loan demand?
  - What is the informal sector doing?
  - Also, public sector banks are present so monopoly power is restricted

- More convincing answer - transactions costs creates natural entry barriers

  - See Aleem, 1990, WBER for evidence from Pakistan

– Also, in their study of Vietnamese firms McMillan and Woodruff (1999) report:

".. trade credit tends to be offered when (a) it is difficult for the customer to find an alternative supplier; (b) the supplier has information about the customer's reliability through either prior investigation or experience in dealing with it; and (c) the supplier belongs to a network of similar firms, this business network providing both information about customers' reliability and a means of sanctioning customers who renege on deals. Social networks, based on family ties, also support relational contracting, although the evidence for their efficacy is weaker than for business networks.

Macro-level Evidence

1. The Debt Recovery Tribunals in India (Visaria, 2007):

- In India a bank trying to recover a secured non-performing loan must obtain a court order allowing the sale of collateral so that it can recover its dues. Delays are a part of life in the Indian legal system. In 1997 there were 3.2 ml. civil cases pending in district level courts of which 34% were pending for more than 3 years. More than 40% of the asset liquidation cases had been pending for more than eight years.

- In 1993 the government introduced DRTs that designed a streamlined procedure aimed at speeding up the process by which the bank liquidates the borrowers collateral. According to Visaria, if a case was filed in the court, summons would be issued on average after 431 days, whereas after the DRT, it was 56 days, which is significant at the 1% level.

- Debt Recovery Tribunals reduced delinquency by 6-11 percentage points (a decline of 10-20 percent). New loans sanctioned after DRTs have interest rates that are lower by 1-2 % points (7-15 percent). (Visaria, 2007)

2. Cross country evidence (Djankov, McLiesh, and Shleifer, 2006)

- Why do some countries have much bigger capital market than others?

- Study 129 countries over a 25 year period finds that legal rights of lenders (ability to force repayment, grab collateral) is positively correlated with the ratio of private credit to GDP.

- Changes in this measure are associated with an increase in the ratio of private credit to GDP.

- Study formal models of the borrower-lender relationship subject to the following problems:

  - Enforcement: Borrower can default even when he is able to repay.

  - Moral Hazard: The action of borrower that affects repayment prospects cannot be costlessly observed.

  - Adverse Selection: Borrower knows more about his type than the lender does

Enforcement Problems

- Suppose the producer uses a production technology $F(L) = \sqrt{L}$ converting loans into output.

- The production function has the standard features of positive but diminishing marginal returns.

- Let ρ be the interest rate. If he was self-financed he would solve

$$\max F(L) - (1 + \rho)L$$

- First-order condition

$$F'(L) = \frac{1}{2\sqrt{L}} = 1 + \rho$$

or

$$L^* = \frac{1}{4\,(1+\rho)^2}.$$

- But suppose people can simply refuse to repay even when they are able to.

- Can use collateral:

$$F(L^*) - (1+\rho)L^* \geq F(L^*) - c$$

- So c has to be as high as $(1+\rho)L^*$

- Otherwise, can borrow up to your assets a

- By definition rationed, as $a < (1 + \rho)L^*$

- Marginal products will vary, and will exceed interest rates

- Dynamic issues

- If there are future periods where the borrower could again need a loan, the threat of credit denial in the future might make him behave properly.

- We show even in this case credit rationing will typically arise. Let v be the per period outside option or reservation payoff of a borrower, which indicates what he will receive if he does not receive loans. Let $R = (1 + r)L$ denote the amount he needs to pay back, principal plus interest. Let δ be the discount factor. He will want to repay if

$$F(L) + \frac{\delta}{1-\delta} v \leq \frac{F(L) - R}{1-\delta}$$

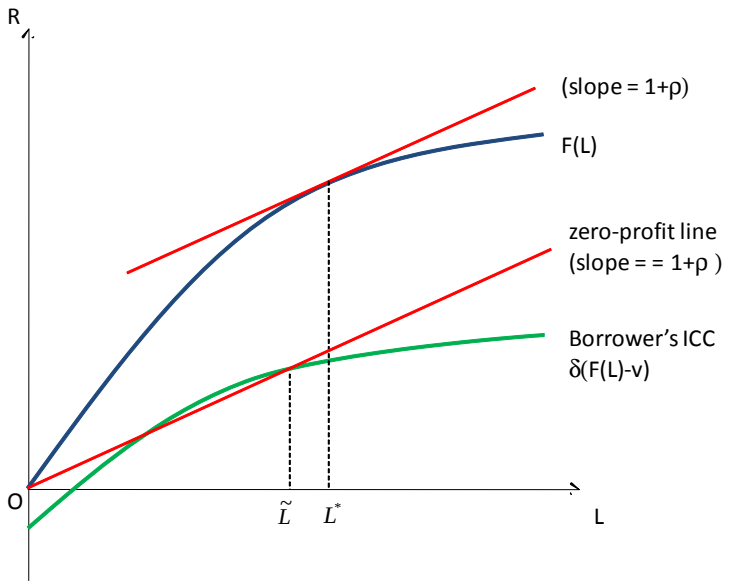


Figure 1

- The left hand side is the payoff from defaulting and the right hand side is the payoff from repaying. This can be simplified as

$$R \leq \delta \left[F(L) - v \right].$$

- The lender will break even so long as

$$z = R - (1 + \rho)L = 0.$$

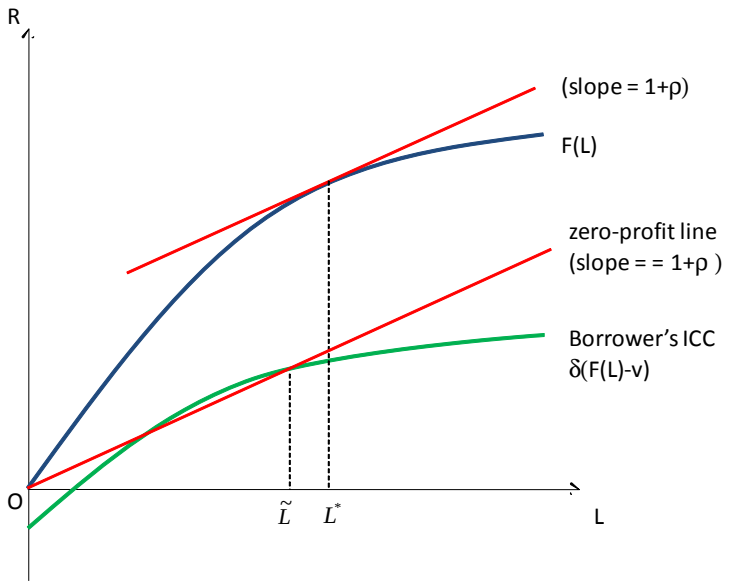


Figure 1

- It is easy to see in Figure 1 that typically, credit rationing will arise. The zero profit constraint and the incentive compatibility constraint will be satisfied at some level of loan $\tilde{L}$ which will typically be less than the efficient level of loan, L^*.

- There could be multiple solutions, but $\tilde{L}$ Pareto dominates the others.

- It is easy to see that the higher is the outside option of the borrower and the lower is δ, his discount factor, the greater will be the extent of rationing.

- On the other hand for low levels of the outside option of the borrower, and high values of the discount factor, it is possible $\tilde{L} > L^*$ in which case L^* will be chosen (it would have been chosen in the first-best, and so it becomes feasible in the second-best people should still choose it).

Moral Hazard

- Project return can take on two values, R ('high' or 'success') and 0 ('low' or 'failure') with probability e and $1 - e$ respectively.

- The borrower chooses e, ('effort'), which costs him $c(e) = \frac{1}{2}ce^2$.

- Opportunity cost of funds ρ (principal plus interest rate)

- Opportunity cost of labor, u.

First-Best (Effort Observable)

- The entrepreneur will solve the following profit maximization problem:

$$\max_{\{e)} \pi = eR - \frac{1}{2}ce^2 - \rho - u$$

  - Yields

$$e^* = \frac{R}{c} < 1.$$

- Now consider the case where he has no cash but some illiquid asset worth w.

- The lender faces a limited liability constraint: pay r when the project return is high and $-w$ when the project return is low.

- This means that the borrower's payoff is

$$\pi^b = e\,(R - r) - (1 - e)w - \frac{1}{2}ce^2 - u$$

and the lender's expected payoff is

$$\pi^l = er + (1 - e)w - \rho.$$

If the lender could observe his effort level then what they should do is find a contract that maximizes their joint expected payoff:

$$\pi^b + \pi^l = eR - \frac{1}{2}ce^2 - \rho - u$$

which is exactly the expected payoff of a self-financed entrepreneur.

- Naturally, the effort they will mutually agree to choose will be

$$e^* = \frac{R}{c}.$$

Second-Best (Effort Unobservable)

- Now the borrower will choose e so as to maximize his private payoff.

- The incentive-compatibility constraint (IC) :

$$e = \arg \max_{e \in [0,1]} \left\{ e(R - r) - (1 - e)w - \frac{1}{2} c e^2 - u \right\}$$

which yields

$$e = \frac{R - r + w}{c} \in (0, 1).$$

The IC can be rewritten as

$$r = w + R - ce.$$

- The underlying environment is that of competition: lenders compete for borrowers which drives their profits to zero.

- The optimal contracting problem:

$$\max_{e,r} e(R-r) - (1-e)w - \frac{1}{2}ce^2$$

subject to

$$er + (1-e)w - \rho \geq 0$$

$$r - w = R - ce.$$

- The expected payoff of a borrower:

$$e\{R - (r-w)\} - w - \frac{1}{2}ce^2 = \frac{1}{2}ce^2 - w.$$

- Combine the IC and the ZPC to obtain:

$$e\,(r-w)+w-\rho=e\,(R-ce)+w-\rho=0.$$

- This yields a quadratic equation in e :

$$ce^2-eR+(\rho-w)=0$$

- Solution is the bigger root, i.e.,

$$e^*(w)=\frac{R+\sqrt{R^2-4c(\rho-w)}}{2c}.$$

- Why?

  - Because, for both roots the bank earns zero profits and is indifferent.

  - But borrowers are better off, the higher is e

  - The reason is, the borrower's payoff function is $\frac{1}{2}ce^2 - w$, which is increasing in e.

- Corresponding to e^*, the equilibrium interest rate is

$$r^*(w) = w + \frac{R - \sqrt{R^2 - 4c(\rho - w)}}{2}$$

- Once again, notice that if $w = \rho$, then e is at the first-best level.

- Otherwise, the effort level is increasing in w.

- As the borrower's equilibrium payoff is increasing in e, this means that social surplus is increasing in w.

- Also, the interest rate is decreasing in w for $w \leq \rho$

- Corresponding to e^*, the equilibrium interest rate is

$$r^*(w) = w + \frac{R - \sqrt{R^2 - 4c(\rho - w)}}{2}$$

- Notice that

$$\frac{dr^*(w)}{dw} = 1 - \frac{c}{\sqrt{R^2 - 4c(\rho - w)}}$$

- This is negative as

$$1 > \frac{\sqrt{R^2 - 4c(\rho - w)}}{c}$$

  - This follows from the fact that $e^*(w) = \frac{R+\sqrt{R^2-4c(\rho-w)}}{2c} < 1$.

  - But $\frac{\sqrt{R^2-4c(\rho-w)}}{c} < \frac{R+\sqrt{R^2-4c(\rho-w)}}{2c}$ as $R > \sqrt{R^2 - 4c(\rho - w)}$ (which follows from $w \leq \rho$).

  - Therefore, $\frac{\sqrt{R^2-4c(\rho-w)}}{c} < 1$

- This result has several implications:

– In equilibrium different interest rates will be charged, and still no arbitrage will be possible even thought the credit market is competitive with free entry. In particular, richer borrowers will face more favorable interest rates and will undertake projects that will succeed more on average.

– The effort level will be less than the first-best level. That means default rates higher than first-best

– Any policy that increases the collateralizable wealth of the borrower (which could result from redistribution, or by improving the legal system that makes titling assets cheaper) will increase the equilibrium effort level.

- For wealth level sufficiently low it may be impossible to satisfy the zero profit condition of the lender and the participation constraint of the borrower in which case very poor borrowers will not receive loans. This is another form of inefficiency due to moral hazard. A necessary & sufficient condition for this to occur is if $\frac{1}{2}c\{e^*(0)\}^2 < \bar{u}$.

- Effort, and hence expected surplus is decreasing in the opportunity cost of capital. This means capital-scarce economies are more likely to be subject to inefficiencies in the credit market which suggests a vicious circle - because of these inefficiencies, income and hence savings are going to be low, and so capital will remain scarce. A subsidy to the interest rate would help in this model.

Adverse Selection

- Two types of borrowers characterised by the probability of success of their projects, p_r and p_s, where

$$0 < p_r < p_s < 1.$$

- Henceforth they will be referred to as 'risky' and 'safe' borrowers, exist in proportions θ and $1 - \theta$ in the population.

- The outcomes of the projects are assumed to be independently distributed.

- The rest similar to above section.

- Full information case: from the bank's zero-profit constraint

$$r_i^* = \frac{\rho}{p_i}, \quad i = r, s$$

- Adverse Selection: Charging separate interest rates to the two types borrowers would not work. A risky borrower would have an incentive to pretend to be a safe borrower.

- The expected payoff to borrower of type i when the interest rate is r is

$$U_i(r) \equiv p_i R_i - \ rp_i, i = r, s.$$

- Stiglitz and Weiss (1981) : risky and safe projects have the same mean return, but risky projects have a greater spread around the mean, i.e.,

$$p_s R_s = p_r R_r \equiv \bar{R}$$

- Assume that these projects are socially productive in terms of expected returns given the opportunity costs of labour and capital :

$$\bar{R} > \rho + \bar{u}. \qquad (A1)$$

- Under asymmetric information, if the bank charges the same nominal interest rate r then safe borrowers will have a higher expected interest rate:

$$p_s(R^s - r) < p_r(R^r - r).$$

- Pooling contract: $r = \theta p_r + (1 - \theta) p_s$. If

$$\bar{R} < \frac{p_s}{\overline{p}} \rho + \bar{u}. \qquad (A2)$$

  a pooling contract does not exist that attracts both types of borrowers.

- Under-investment problem in credit markets with adverse selection (Stiglitz and Weiss, 1981).

- Solutions:
  - Collateral: not feasible if borrowers are poor.
  - If feasible, then could screen borrowers by offering two contracts: one with low interest and high collateral and one with high interest and low collateral
  - Risky borrowers will self-select the latter and safe borrowers the former
  - Why? Because a risky borrowers is more likely to fail and so does not like high collateral

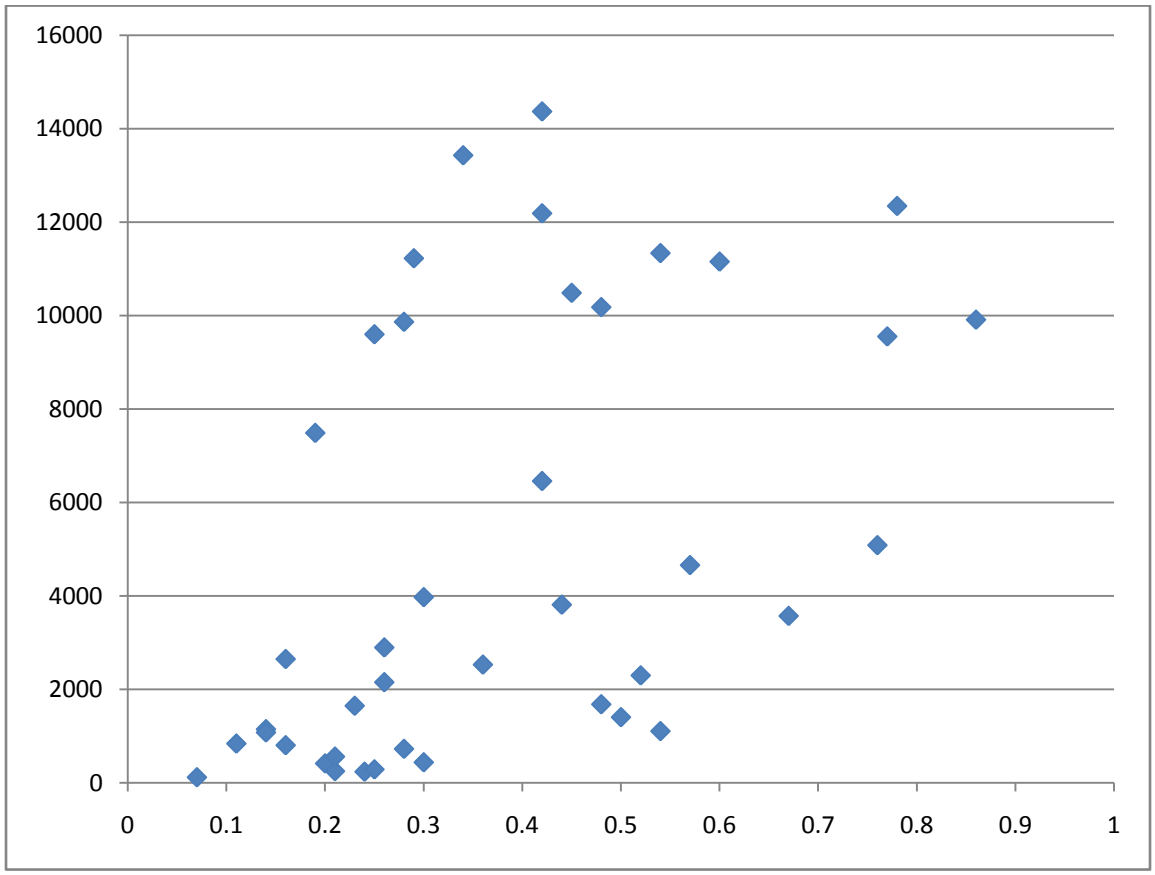
– Probability of granting loans as a screening device. Advantage over pooling debt contracts is that some safe borrowers will obtain credit at the full-information interest rate. Hence both welfare and repayment rates will be higher.

Evidence

Macro-level Evidence - Financial development & growth performance across countries

- The size of the domestic credit market is strongly positively correlated with per capita income across countries (as suggested by Figure 2 taken from Rajan-Zingales 1998)

- However, the causality could be the other way round: richer countries have larger markets for everything, including credit.



Source: Rajan and Zingales (1998)

Size of the Credit Market and Per Capita Income Across Countries

Per Capita Income(US 1980 $) on vertical axis
Domestic credit to Private Sector over GDP on horizontal axis

Figure 2

- Also, both per capita income and size of the credit market could be driven by other factors, such as good government policies, so that this correlation does not necessarily suggest a causal relationship

- Cross country evidence for the period 1960-1989 by King & Levine (1993) suggests that controlling for many country & policy characteristics, higher levels of financial development are associated with faster rates of contemporaneous & future (next 10-30 years) economic growth.

- Rajan & Zingales (1998) point out that this study could have two potential limitations.

  - Both financial development & growth could be driven by a common omitted variable such as the propensity to save.

  - Financial development may simply be a leading indicator of future development & not a causal factor - anticipating future growth financial institutions lend more.

- They propose an alternative test - do industries that are technologically more reliant on external finance (e.g., Drugs & Pharmaceuticals as opposed to Tobacco) grow faster in countries that are more financially developed?

- Roughly speaking, they are comparing the growth performance of industry A and industry B in US vs. India where A and B vary in terms of how credit-dependent they are

- Any common country level factor is taken out using the inter-industry comparison

- They find a strong positive evidence on financial development on growth of industries that are more credit-dependent. Moreover, decomposing industry growth into that due to expansion of existing firms, & entry of new firms, they find financial development has a much larger (almost double) effect on the latter.

- Still problems of interpretation remain

  - Country level factors could affect different industries differentially, in which case the "cross-country" criticism resurfaces

  - For example, the regression results could be interpreted as showing contract enforcement matters, not credit constraints per se: those industries that are credit-dependent also are R&D intensive and are more likely to be affected by institutional quality

  - Also, US might have a comparative advantage in credit-dependent industries, which means they have more innovations (notice that this argument does not apply for levels, only growth rates)

Individual level: Does wealth affect transition from worker to entrepreneur?

- If credit markets were perfect, the only thing that should affect your ability to become an entrepreneur is your ability

- Regression runs probability of becoming an entrepreneur on measures of ability (x) & wealth (w):

$$y_i = \alpha + \sum_{j=1}^{n} \beta_j x_{ij} + \gamma w_i + \varepsilon_i$$

- Wealth seems to matter. Panel data studies from the US (Evans & Leighton, AER 1989) and the UK (Blanchflower & Oswald, JLE 1998) that studied the same cohort of young men over several years

- Obviously, hard to control for all measures of ability & wealth could capture some of this omitted ability variables (families that save more work harder, families that save more earn more & so are more able etc.)

- Blanchflower & Oswald considered effects of wealth shocks which could be assumed to reasonably independent of ability - gifts & bequests.

- Wealth still seems to matter.

Firm level

- Interest rates are very high in developing countries - but could reflect scarcity.

- There are big differences in interest rates that are not being equalized by arbitrage, but that could be because the underlying risk-profiles of the borrowers and the costs of financial intermediation are different.

- You might say that rates of return to capital in firms estimated using data on firm earnings and capital stock are high, and exceed significantly the formal or informal interest rates available.

- If returns from capital significantly exceed its cost, firms should be expanding their capital stock, and if they aren't that means they are credit constrained.

- Not necessarily, critics will say.

- The ability of entrepreneurs affect both the choice of the capital stock, and the rate of return (for example, smart guys need less capital and can generate more returns), and without controlling for it, these are biased estimates.

- In particular, we don't know whether we are measuring the returns to ability or to capital and whether the capital stock is optimally chosen given the entrepreneur's ability, or the firm is credit-constrained.

- OK, since ability is notoriously hard to measure, you would think that this is the point at which economists would give up.

- Several approaches to overcome this.

Firm level 1. Random Capital Grants (de Mel, Woodruff, Mckenzie, QJE 2009)

- The authors have come up with a direct and ingenious approach.

- Why not take a random sample of firms and then randomly give some of them some extra capital and measure the difference with those who did not get it?

- This is similar to randomized control trials in medicine where some patients are randomly chosen and given a treatment and others are given a placebo and the average difference in the outcome of the two groups is attributed to the treatment.

- These studies are becoming increasingly popular in development economics.

- The authors randomly distributed small capital grants worth $100 and $200 to a sample of small enterprises (with less than $1000 in capital) in Sri Lanka.

- Since by design the grants were given randomly, both talented and not-so-talented entrepreneurs would get them.

- If we measure the effect of these grants, it will capture the average effect across all talent levels.

- In particular, we will not have to worry that the extra capital generated by the grant to a firm is correlated with the ability of its entrepreneur and so we will be measuring the effect of extra capital only.

- Table 1 suggests that the treatment and control groups are roughly similar in all respects, starting with initial level of profits, initial capital stock, various characteristics of the entrepreneur (age, education) and the firm.

- This confirms the validity of their randomization strategy.

- The authors then estimate the effect of these two types of treatments on capital stock and profits.

Table 1: Comparison of Control and Treatment Groups in de Mel et al Study

	Treatment	Control	Average
Profits (March 2005)	3919	3757	3851
Capital Invested Excluding Land and Building	25633	27761	26530
Age of Entrepreneur	41.8	41.9	41.8
Years of Schooling	8.9	9.2	9
Age of Firm	10.8	9.7	10.3

Note: All monetary data in Sri Lankan Rupees.

Table 2: Impace of Grants on Profits on Treatment Firms in de Mel et al Study

Treatment	Effect on Capital Stock	Effect on Real Profits
10,000 LKR	10781	1421
20,000 LKR	23431	775

Note: All monetary data in Sri Lankan Rupees deflated to reflect March 2005 prices.
Profits are measured monthly.

Source: de Mel et al (2009)

- The difference between the capital stock and the profit levels of the treatment firms relative to the control firms are displayed in Table 2.

- They estimate the returns to capital to be around 4% per month, or 60% per year.

- This is substantially higher than market interest rates.

- This suggests the firms are indeed credit-constrained.

Firm level 2. Are Firms Credit Constrained? (Banerjee-Duflo)

- A firm is credit constrained if marginal product of capital is higher than the market interest rate.

- If credit markets were perfect then changes in access to close substitutes of credit, such as current cash flow of a firm, should not have an effect on the decision to invest. Problem with this test: shocks to the cash flow of a firm are not always exogenous (e.g., hire a good manager)

- Banerjee and Duflo consider a policy shock in the banking sector in India.

  - All banks are required to lend 40% of their credit to the priority sector which includes small scale industry at a subsidized interest rate.

  - In 1998 the government increased the size limit for a firm to be considered a small scale unit (from $130,000 to $600,000).

- If a firm is not credit constrained (call it unconstrained) then having some extra subsidized loans is a great thing, but it would not result in a significant amount of extra investment.

- It would mainly re-organize its loan portfolio and pay off some of the more expensive loans. In contrast a firm that is constrained, will increase investment.

- While the investment levels of both constrained and unconstrained firms could go up, the rate of growth of investment should be higher for constrained firms.

- If you just look at the rate of growth of firms that were not initially covered by this policy, and was brought under it due to the policy shift, and find that they grew significantly (in terms of investment, revenue, profits etc.) that per se would not establish they were credit constrained.

- There could have been an increase in growth opportunities in the economy

- You want to take the effect of these other shocks out.

- The obvious way is to compare these firms with firms that were already borrowing under this policy and continued to do so.

- That is, BD take a difference-in-difference approach: they compare the outcome variable of interest before and after the policy change ("difference") and compare this for the group that was subject to the policy change to a control group that was not subject to the policy change ("difference-in-difference").

- They have firm-level data on profit, sales, credit lines and utilization, and interest rates from a major public sector bank in India.

- The full sample consists of 253 firms (including 93 newly eligible firms), which includes 175 firms for which they have data from 1997-1999. The main equation that they estimate is :

$$y_{it} - y_{it-1} = \alpha BIG_i + \beta POST_t + \gamma BIG_i * POST_t + \varepsilon_{it}$$

- Each observation is for a firm and in a given year. It may seem there is no firm-fixed effect but there is, in levels (the dependent variable is $y_{it} - y_{it-1}$) but not in the growth rate.

- Large and small firms could have different growth rates due to technological or selection reasons and therefore BD control for firm size (BIG_i).

- The coefficient for $POST_t, \beta$, would capture the common effect on the growth rates of small and large firms after the policy shift.

- Of key is interest is the interaction term $BIG_i{*}POST_t$: this is the difference-in-difference estimate of growth rates of how (if at all) the growth rate of large firms were affected differentially relative to small firms after the policy change.

- Did larger firms in fact experience a faster growth in loan limits after the policy change?

- Yes. In column 2 of Table 3 we see that large firms experienced a faster rate of growth

in loan limits for them in the post-reform period (the coefficient of BIG* POST is significantly positive) among those firms that experienced a change in the loan limits.

- But could it be true that this is not due to the policy change, but because for some reason the banks started treating large firms more leniently in the POST period?

- In column 1 the authors include all firms, those that experienced a change in the loan limits and those that did not, and try to see if in the POST period large firms were more likely to experience a change in the loan limits.

- The answer turns out to be negative.

Table 3 Are firms credit constrained?

Sample:	Complete sample	Sample with change in limit						No change in limit	
Dependent variables:	Any change in limit	$Log(loan_t)$ -Log(loant-1)	Log(interest rate)$_t$ -Log(interest rate)$_{t-1}$	$Log(turnover/limit)_{t+1}$ Log(turnover/limit)$_t$	$Log(sales)_{t+1}$-log(sales)$_t$ all firms	$Log(sales)_{t+1}$-log(sales)$_t$ no substitution	$Log(profit)_{t+1}$ -log(profit)$_t$	$Log(sales)_{t+1}$ -log(sales)t	$Log(profit)_{t+1}$ -log(profit)$_t$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PANEL A: OLS									
post	-0.003	-0.115	-0.008	-0.115	0.021	0.005	0.172	0.030	-0.035
	(.049)	(.069)	(.014)	(.366)	(.093)	(.096)	(.201)	(.047)	(.024)
big	-0.043	-0.218	-0.002	-0.105	-0.199	-0.191	-0.645	0.077	-0.009
	(.053)	(.079)	(.014)	(.147)	(.094)	(.101)	(.219)	(.063)	(.045)
post*big	-0.008	0.244	0.012	0.267	0.209	0.184	0.752	0.052	0.023
	(.078)	(.099)	(.019)	(.355)	(.095)	(.099)	(.387)	(.109)	(.036)
# Observations	489	155	141	39	116	105	107	253	432
PANEL B: TWO STAGE LEAST SQUARES									
$Log(loan_t)$-Log(loant-1)					0.896		2.713		
					(.463)		(1.29)		
# Observations					116		107		

Note
1-OLS regressions in panel A, 2SLS regressions using BIG*POST in panel B. The regression in panel B controls for BIG and POST dummies.
2- Standard errors (corrected for heteroskedasticy and clustering at the sector level) in parentheses below the coefficients

Table 4: Is Capital Allocated Efficiently?

Dependent variable :	ln(capital)	ln(cap-prod ratio)	ln(cap-exp ratio)	ln(production)	ln(exports)	ln(production)	
						Gounders	Outsiders
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Experience	0.165	-0.165	-0.247	0.330	0.416	0.055	0.235
	(0.034)	(0.047)	(0.048)	(0.036)	(0.043)	(0.169)	(0.121)
Experience*Gounder	-0.111	0.034	-0.005	-0.146	-0.103		
	(0.050)	(0.070)	(0.076)	(0.055)	(0.064)		
Gounder Dummy	0.918	0.258	0.512	0.656	0.378		
	(0.063)	(0.072)	(0.078)	(0.052)	(0.066)		
Experience*capital						0.062	0.048
						(0.062)	(0.069)
capital						0.221	0.308
						(0.092)	(0.101)
Constant	2.047	-1.869	-1.414	3.923	3.478	2.475	1.421
	(0.039)	(0.053)	(0.055)	(0.046)	(0.054)	(0.306)	(0.179)
R-squared	0.865	0.782	0.704	0.975	0.958	0.974	0.979
Box-Pearson Q Statistic	1.654	1.350	1.155	1.127	1.054	0.266	0.371
Number of observations	434	430	421	432	423	120	80

Note: Robust standard errors in parentheses.
$Q \sim X_1^2$ under H_0: no serial correlation. The critical value above which the null is rejected at the 5 percent level is 3.84.
Entry dummies are constructed using all the possible years of entry.
Columns 1 - 3: Capital stock regressed on experience.
Column 4: Capital-Production ratio regressed on experience.
Column 5: Capital-Export ratio regressed on experience.

- Did large firms actually take advantage of the increased loan limits relative to small firms?

- Yes. In column 4 we see that the rate of utilization of loans (turnover divided by limit) is not significantly associated with BIG*POST.

- Was this accompanied by a differential drop in the interest rate for large firms in the POST period (if that is the case, then loan expansion could be driven by a price shock rather than relaxation of a quantity constraint)?

- No. In column 3 changes in the interest rate don't seem to follow any pattern.

- Did the additional credit lead to an increase in sales & profit? Yes.

- Both in column 5 & 7 we see that BIG*POST has a significantly positive coefficient.

- Indeed, the point estimate is almost the same as that of growth in loan limits for large firms in the POST period suggesting sales grew as fast as loans.

- Profits grew much faster.

- Is it possible that profits and sales increased because cheaper loans became available, and not necessarily because firms were credit constrained?

- Unlikely. This subsidy effect should also operate on firms that did not experience an increase in the loan limit.

- But restricting the sample to such firms (columns 8 & 9) we see no significant results at all.

Firm level 3. Is Capital Efficiently Allocated Across Firms? (Banerjee-Munshi)

- Are all firms credit constrained to the same degree, or are there important allocational inefficiencies in the distribution of credit across firms.

- Interesting for two reasons.

  - Another way of approaching the question whether credit markets operate frictionlessly or not.

  - Even if we are convinced that they don't from the earlier evidence, it is of interest to know how these frictions are distributed across firms because

- In the presence of credit market imperfections, people would prefer to lend to people they trust, such as their friends and relatives.

- As a result those with strong ties with people with more money than investment opportunities will enjoy easy access to capital and will invest more than others with the same investment opportunities and abilities.

- Banerjee and Munshi (Review of Economic Studies 2004), henceforth BM, compare the investment behavior of two social groups who differ in terms of how strong their social connections are.

- Small town in the south of India called Tiruppur which dominates the national knitted garment industry.

- Traditionally dominated by Gounders, a small local community which made a lot money in agriculture, but in the absence of investment opportunities in agriculture, saw this industry as an easy outlet for their capital.

- The boom in the industry also attracted people from all over the country (in the 1990s it grew at a rate of 50% or more, driven by export demand).

- BM compare the investment behavior of these groups (let us call them outsiders) with that of Gounders.

- For Gounders this industry is the easiest place to invest money, and they can lend it to people of their own community.

- For outsiders, there are no strong local ties and they are from communities which have many other investment opportunities.

- So we would expect them to face a higher opportunity cost of capital and their businesses should have lower capital intensity than that of Gounders.

- However, merely demonstrating this is not enough because there could all sorts of reasons why Gounders could choose more capital intensive techniques than Outsiders which

have nothing to do with credit market imperfections. For example, if talent and capital are complements and Gounders are more talented in this line of business, then they could have higher capital intensity.

- BM have data on investment, output and background of 147 exporters for a four-year period from 1991-94. The basic regression that they estimate is:

$$y_{it} = \alpha EXP_{it} + \beta EXP_{it} * GNDR + \gamma GNDR + f_i + \varepsilon_{it}$$

- No direct measure of ability - so use # of years in business

- Firms entering in the same year could be subject to similar shocks, which could in

turn affects who decides to enter, and so there is a cohort dummy f_i.

- Their assumption is that time effects (arising from market and technological conditions) are the same for all firms and given this β captures the growth performance of Gounders relative to those of outsiders.

- Do Gounders use more capital than outsiders?

- Yes. Columns 1-3 of Table 4 suggest that Gounders start off with significantly more capital, both absolutely (almost twice) and relative to production and export.

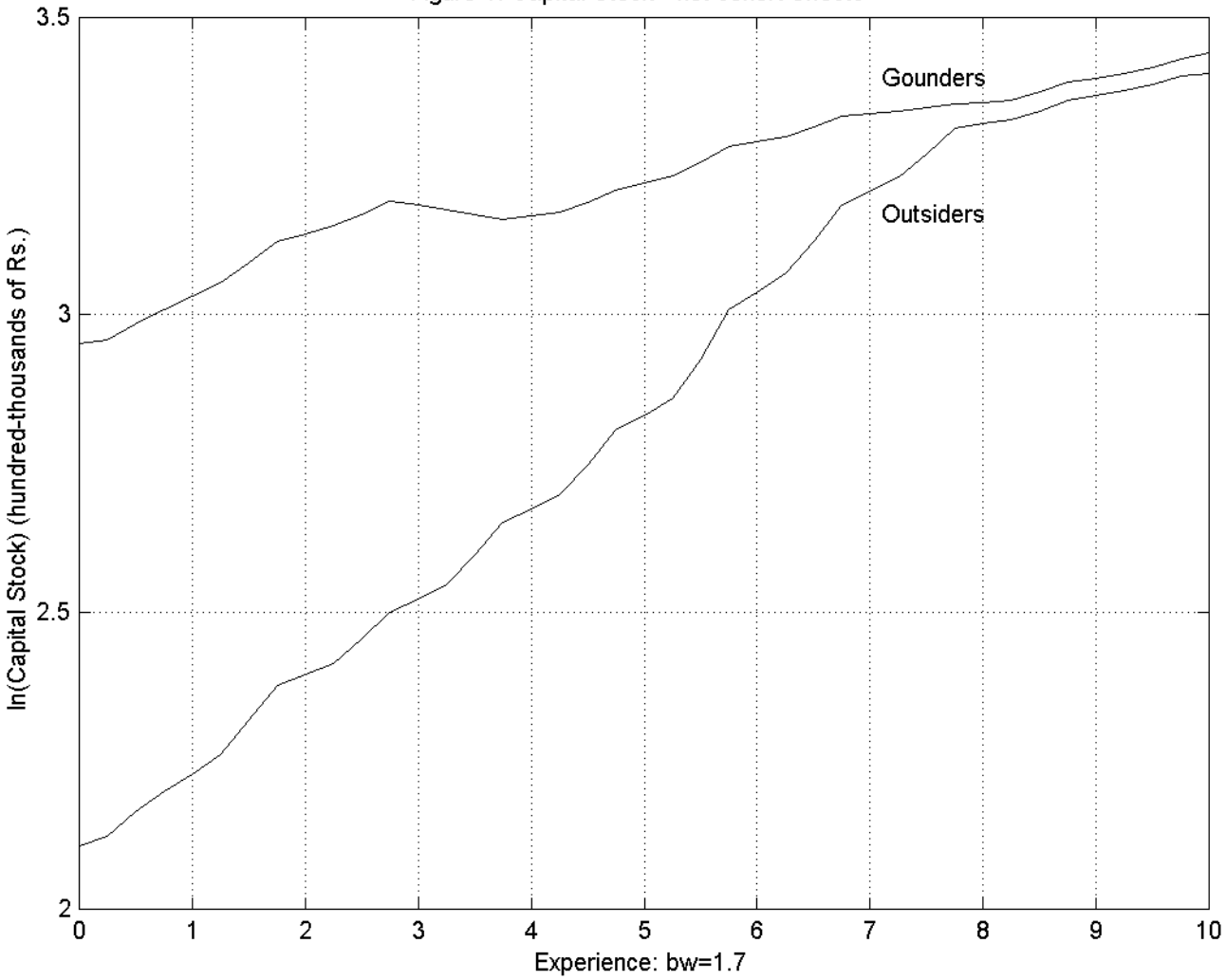
- However, they increase their capital at a slower rate over time (the only significant result is in Column 1 where the coefficient of EXP*GOUNDER is negative).

- BM show in Figure 1 (their numbering) that the capital gap remains positive for all levels of experience.

- Does this mean the Gounders make better use of capital because they are more productive?

- No. In columns 4 and 5 of Table 4 we see that the coefficient of EXP*GOUNDER is negative.

Figure 1: Capital Stock - net cohort effects



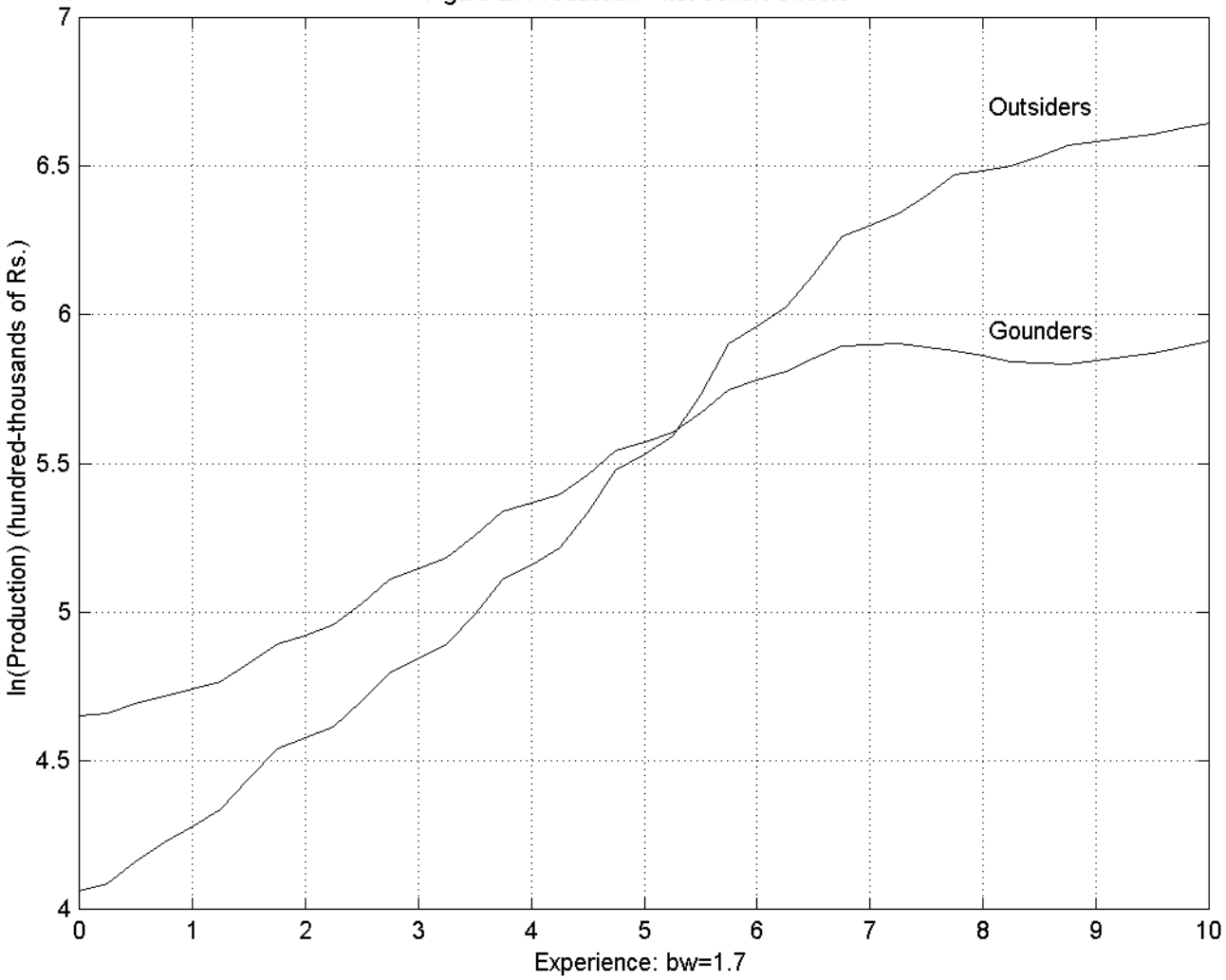
- In Figure 2 (their numbering) BM show that Outsiders start off by producing and exporting less than Gounders but grow faster and overtake the latter within 5 years or so.

- This means that the Gounders are less productive.

- Even though Outsiders are more able than Gounders is it possible they invest less not because of capital market problems but because ability and capital are substitutes?

- No. If this argument was valid then it should also operate within each community : firms that invest more should produce less. In

Figure 2: Production - net cohort effects



columns 6 & 7 they report the following regression

$$\ln X_{it} = \alpha_0 EXP_{it} + \beta_0 \ln K_i * EXP_{it} + \gamma_0 \ln K_i + f_i + \eta_{it}$$

X_{it} is output in period t and K_i is initial capital stock (subsequent capital stock would be affected by shocks to output and hence subject to endogeneity problem).

- As we can see that firms that invest more produce more and grow faster (although this effect is not significant).

- Is it possible that Gounders invest more because they have some advantages from being natives (say, they have better contacts with distributors, labor unions etc.) and this explains why they have more capital?

- That is unlikely since these advantages should be reflected in productivity and that does not seem to be the case.

- BM therefore conclude that Outsiders seem to be more productive and yet invest less and so it is likely they have a higher marginal return to capital than Gounders.

Individual level: Testing between Moral Hazard and Adverse Selection (Karlan-Zinman)

- Experimental study by Karlan and Zinman in South Africa

- Lender competes in a "cash loan" industry segment that offers small, high-interest, short-term credit with fixed repayment schedules to a "working poor" population.

- Cash loan borrowers generally lack credit history and/or collateralizable wealth - can't borrow from standard sources

- First the Lender randomized interest rates attached to "pre-qualified," limited-time offers mailed to 58,000 former clients with good repayment histories.

- Private information may be less prevalent among past clients than new clients if hidden information is revealed through the lending relationship

- Randomized direct mail offers issued by a major South African lender along three dimensions:

  - high vs. low initial "offer interest rate" appearing on direct mail solicitations (both less than lender's usual rate)

  - of those who accepted high offer rate half randomly received a low "contract" rate and the other half received the offer rate "contract interest rate"

  - a dynamic repayment incentive: some randomly chosen borrowers are offered the contract rate for future loans so long they remain in good standing.

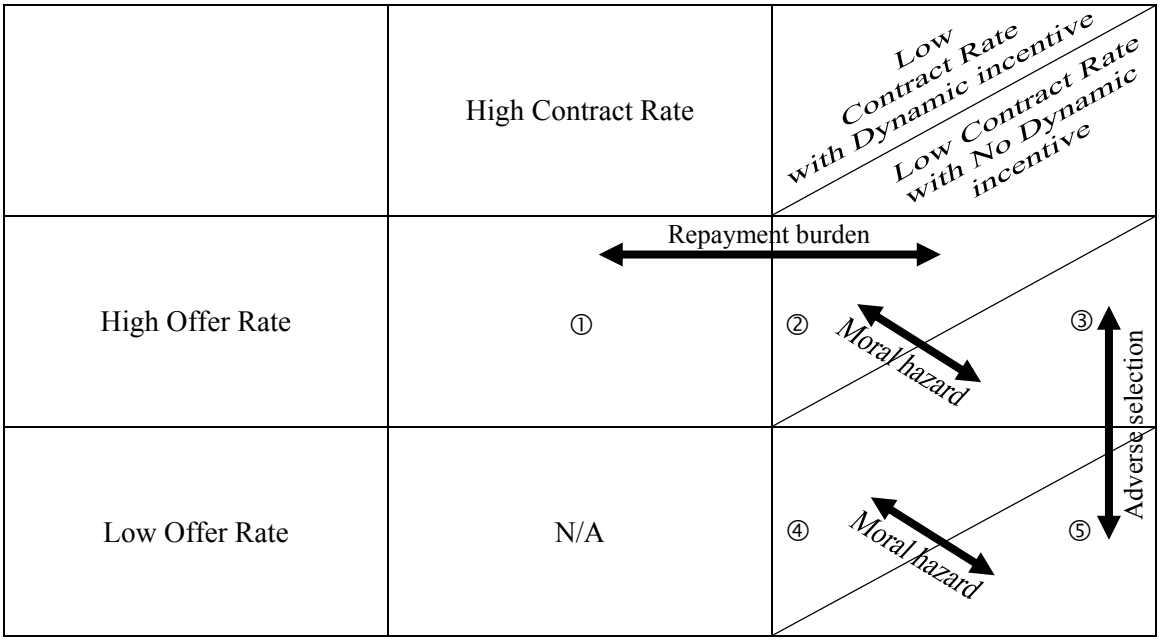
- Two key randomization assumptions
  - Borrowers did not know beforehand that the contract rate may be lower than the offer rate.
  - Lender's decision on whether to offer a loan did not depend on the contract rate
- Otherwise programme placement is not random
- See Figure 5.

- Adverse selection: comparison of those who accepted offer at high offer rates but received low contract rates and those who accepted at low offer rate

- Repayment burden: of those who were offered high rate, comparison of those who received high offer rate vs those who received low rate

- Pure moral hazard: for those who received contract rate, comparison of those who received dynamic incentives vs those who did not

Figure 5. Basic Intuition Behind the Experimental Design



Section V formally derives our identification strategy and related assumptions. This figure provides some basic intuition behind our strategy of using three dimensions of random variation in interest rates to identify the presence or absence of specific asymmetric information problems. The actual experiment generated continuous variation in two of the three rates (offer and contract), conditional on observable risk. Here for expositional purposes we label each assigned rate either "high" or "low" based on the median experimental rate for the borrower's observable risk category. This highlights that our methodology:

- Identifies adverse selection by focusing on those who borrow at the low contract rates, and comparing the repayment behavior of those who select in at high offer rates (cells 2 and 3 in the diagram) with those who select in a low offer rates (cells 4 and 5). If there is adverse selection then default will be lower in cells 4 and 5.
- Identifies moral hazard by focusing on those who borrow at low contract rates, and comparing the repayment behavior of those who received the dynamic repayment incentive (cells 2 and 4 in the diagram) with those who did not (cells 3 and 5). If the dynamic repayment incentive alleviates moral hazard then default will be lower in cells 2 and 4.
- Identifies repayment burden by focusing on those who select in at high offer rates, and comparing the repayment behavior of those who borrow at high contract rates (cell 1 in the diagram) with those who borrow at low contract rates (cells 2 and 3 in the diagram). If there is a repayment burden effect then default will be lower in cells 2 and 3.

- Design of experiment captured in Figure 6.

- In Table 5, for mean comparisons, moral hazard effect is very strong

- Similar results if one controls for lender's measure of observable risk and month dummy

- Finds evidence of both adverse selection (among women) and moral hazard (predominantly among men)

- Findings suggest that about 10% of default is due to moral hazard, the rest due to observable risk differences.

Figure 6: Operational Steps of Experiment

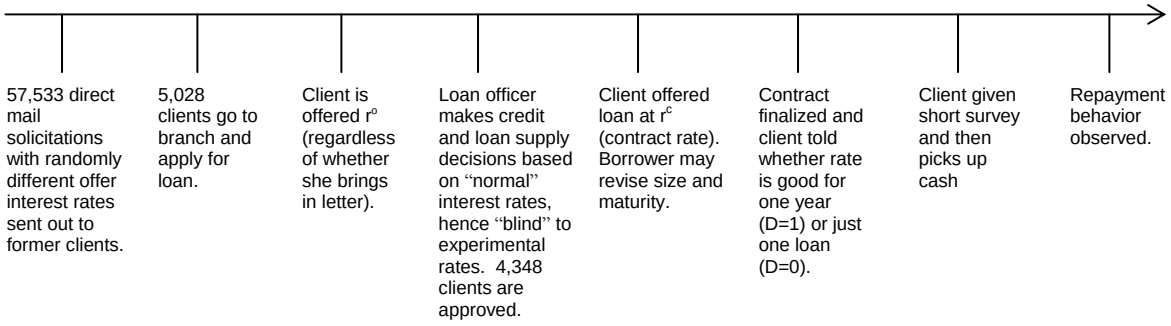


Table 5. Identifying Adverse Selection, Repayment Burden, and Moral Hazard: OLS on the Full Sample

OLS

Dependent Variable:	*Monthly Average Proportion Past Due*		*Proportion of Months in Arrears*		*Account in Collection Status*	
	(1)	(2)	(3)	(4)	(5)	(6)
Offer Rate (Selection)	0.004	0.004	0.002	0.002	0.007	0.007
	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)
Contract Rate (Repayment Burden)	-0.000	-0.002	0.007*	0.003	0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)
Dynamic Repayment Incentive Dummy (Moral Hazard)	-0.011*	0.003	-0.016**	0.013	-0.019**	0.000
	(0.005)	(0.011)	(0.008)	(0.018)	(0.009)	(0.019)
Dynamic Repayment Incentive Size (Moral Hazard)		-0.004		-0.008**		-0.005
		(0.003)		(0.004)		(0.004)
Constant	0.079***	0.094***	0.139***	0.171***	0.069***	0.090***
	(0.014)	(0.019)	(0.025)	(0.027)	(0.024)	(0.028)
Observations	4348	4348	4348	4,348	4348	4348
Adjusted R-squared	0.04	0.04	0.11	0.11	0.03	0.03
Mean of dependent variable	0.09	0.09	0.22	0.22	0.12	0.12
Prob(both Dynamic Incentive variables = 0)		0.08*		0.01***		0.05**

* significant at 10%; ** significant at 5%; *** significant at 1%. Each column presents results from a single model estimated using the base OLS specification (equation 14). Tobits and probits (not reported) produce qualitatively identical results. Robust standard errors in parentheses are corrected for clustering at the branch level. “Offer Rate” and “Contract Rate” are in monthly percentage point units (7.00% interest per month is coded as 7.00). “Dynamic Repayment Incentive” is an indicator variable equal to one if the contract interest rate is valid for one year (rather than just one loan) before reverting back to the normal (higher) interest rates. "Dynamic Repayment Incentive Size" interacts the above indicator variable with the difference between the Lender's normal rate for that individual's risk category and the experimentally assigned contract interest rate. All models include controls for lender-defined risk category and month of offer letter. Adding loan size and maturity as additional controls does not change the results. A positive coefficient on the Offer Rate variable indicates adverse selection, a positive coefficient on the Contract Rate variable indicates a reduced-form repayment burden effect, and a negative coefficient on the Dynamic Repayment Incentive variable indicates moral hazard that is alleviated by the dynamic pricing incentive.

Appendix

- How to interpret "difference-in-difference" coefficients

- Suppose

$$y = \alpha + \beta x + \gamma z + \mu xz$$

- Then

$$\frac{\partial y}{\partial x} = \beta + \mu z$$

- This captures change in y due to change in x.

- Also, change in y due to change in z is captured by

$$\frac{\partial y}{\partial z} = \gamma + \mu x$$

- How does change in y due to change in x change when z changes?

$$\frac{\partial^2 y}{\partial x \partial z} = \mu.$$

- Suppose x is policy and z is time.

	$z = 0$	$z = 1$	diff
$x = 0$	y_{00}	y_{01}	$(y_{01} - y_{00})$
$x = 1$	y_{10}	y_{11}	$(y_{11} - y_{10})$
diff	$(y_{10} - y_{00})$	$(y_{01} - y_{11})$	diff in diff

- That is x takes value 1 for those subject to policy and 0 for those not subject to policy. The variable z takes value 1 for time period after policy implemented and 0 for previous time period.

- Then the effect of change in policy is:

$$\frac{\partial y}{\partial x}$$

- Trouble: other things were changing along with policy.

- That is why, we need

$$\frac{\partial^2 y}{\partial x \partial z}$$