The economics of lending with joint liability: theory and practice

 Maitreesh Ghatak, Timothy W.Guinnane

Institutions that rely on joint liability to facilitate lending to the poor have a long history and are now a common feature of many developing countries. Economists have proposed several theories of joint-liability lending that stress various aspects of its informational and enforcement advantages over other forms of lending. This paper analyzes how joint-liability lending promotes ***screening, monitoring, state verification and enforcement of repayment***.

INTRODUCTION

Considerable evidence now shows that in many circumstances, an unconventional lender such as the Grameen Bank can lend to poor people no ordinary commercial lender would want as a customer and do so with a reasonable degree of financial self-sufficiency and repayment rates that are significantly higher than for comparable loans by conventional lending institutions. The literature identifies two distinct but complementary reasons for this success:

1. These lending programs ask borrowers to form a group in which all borrowers are jointly liable(Joint Liability Lending Institutions – JLLI or Micro-lenders)for each other’s loans.
2. Most micro lenders engage in intensive monitoring of clients and rely heavily on the promise of repeat loans for borrowers who perform well.

Why group lending helps an institution such as the Grameen Bank operate successfully?

1)It reduces the transaction costs, which can be relatively large for borrowers who take only small loans.

2)‘‘peer pressure’’ or similar terms that capture the general idea that people with connections of shared locality or other bonds based on kinship and occupation may be able to support credit contracts that would be impossible with conventional banking practices.

**Problems a well structured JLLI can deal with**

a. to ascertain what kind of a risk the potential borrower is, *adverse selection*.

b. to make sure she will utilize the loan properly, once made, so that she will be able to repay it ,*moral hazard*.

 c. to learn how her project really did in case she declares her inability to repay ,*auditing costs*.

d. to find methods to force the borrower to repay the loan if she is reluctant to do so, *enforcement.*

 JLLIs can do better than conventional bankers *in some social contexts* for two distinct reasons.

 First, members of a community may know more about one another that is, each other’s types, actions and states, as suggested by points a.–c. above. than an outside institution such as a bank.

 Second, a major source of market failure in credit markets is that a bank cannot apply financial sanctions against poor people who default on a loan, since by definition they are poor. Poor people’s neighbors, on the other hand, may be able to impose powerful non-financial sanctions at low cost. An institution that gives poor people the proper incentives to use information on their neighbors and to apply non-financial sanctions to delinquent borrowers can out-perform a conventional bank.

**Theories of Joint liability contracts**

We only discuss the joint-liability aspect of these lending programs, our argument is Complementary to the transactions-costs argument. According to the transactions-costs argument, under many circumstances, it is only slightly more expensive to administer a group of *n* loans than to administer a single loan, so group lending enables a reduction in transactions costs per loan.

If the projects to be funded are *simple* and *similar* in terms of their characteristics, the time path of their returns, and the geographic location of their activities, then coordinating the lender’s dealings with these borrowers by putting them together in a group can save on processing, screening and loan collection costs. Put this way, transaction cost-based theories and joint-liability-based theories can be combined, where we see that the bank can avoid the cost of performing a costly audit every time an individual borrower claims she has low output by inducing her partner to undertake liability for her and audit only when the whole group declares inability to repay.

**THE MODEL**

The model shows how joint liability affects group formation, induces group members to influence the way other members select their projects, helps the lender avoid costly audits, and encourages borrowers to repay their loans without the lender imposing costly sanctions. In the rest of this section, we first outline our model, and then take up each of these problems sequentially and use the model to show how joint liability

alleviates the four lending problems.

1. Output Y takes two values, high YH and low YL where

 YH > YL > 0.For simplicity we normalize YL to 0.

1. Output is high with probability p Є (0,1).
2. Each project requires 1 unit of capital and the lender need to be paid back an amount ρ > 1 per loan, principal plus interest, on average. Lender earns zero economic profits by assumption.
3. Borrowers will borrow only if their payoff exceeds the opportunity cost of their labor, ū.
4. The project returns of different borrowers are assumed to be uncorrelated.
5. All projects are socially profitable in the sense that expected return from the project is greater than the opportunity cost of the capital and labor employed in the project i.e. pYH > ρ + ū
6. We refer outside lender as ‘bank’ throughout the paper. By this, we mean an individual or an institution who has the resources to lend to a certain group of borrowers either on an individual basis or to a self-formed group.
7. We also assume limited liability, in the sense that the lender can only seize assets that the borrower has specifically pledged as collateral for a loan. Or lender has no recourse in case of a defaulting borrower.
8. A standard loan contract specifies an interest rate r (gross interest rate, principal plus net interest rate) which is the amount borrower must repay to the bank. This can be interpreted as *individual liability* of the borrower.

10)We model joint liability in the following way: if a borrower is willing and able to repay her loan but her partner is unwilling or unable to repay her loan, then the former must pay an additional amount c to the bank. Here c can be interpreted as the net present discounted value of the cost of sacrificing present consumption for the paying partner.

11)The form of joint liability for defaults in actual group-lending programs often takes the form of denying future credit to all group members in case of default by a group member until the loan is repaid.

 Adverse selection

* Adverse selection arises when borrowers have characteristics that are unobservable to the lender but affect the probability of being able to repay the loan.
* The typical method for separating good risks from bad risks is to ask the borrower to pledge collateral. If the bank offers two different contracts, one with high interest rates and low collateral and other with the opposite, the risky borrowers will select the former and safe borrowers the latter.
* But the problem persists if borrowers are poor and do not have assets that make useful collateral.

In our framework, borrowers know the characteristics of each other’s projects relevant to their creditworthiness, but the bank does not. (From now on, we will refer to these characteristics as a borrower’s ‘type’, risky or safe). While all borrowers prefer to

have safe partners because of lower expected joint-liability payments, safe borrowers value safe partners more than risky borrowers because they repay more often, and as a result more likely to realize the gain of having a safe partner. This implies that in equilibrium, borrowers end up with partners of the same type. As a consequence, the bank can screen borrowers by varying the degree of joint liability. This is because risky borrowers have risky partners and, hence, will prefer a contract with less joint liability than will a safe borrower.

* Assume borrowers are risk neutral and of two types, safe (a) and risky (b).
* With a project of type i, output takes two values, YiH and 0, and the probability of high output is pi, i = a,b.
* We assume pb < pa

If the bank does not a know a borrower’s type, and if standard screening instruments such as collateral are not available, then the bank has to offer loans to all borrowers at the same nominal interest rate. Under such a contract, safe borrowers have to cross-subsidize the risky borrowers because both types of borrowers repay the same amount when they succeed, but safe borrowers succeed more often. The presence of enough risky borrowers can push the equilibrium interest rate high enough to drive the safe borrowers away from the market.

Alternatively, the presence of safe borrowers subsidizes some undeserving risky projects. If borrowers know each other’s types, a joint-liability contract can restore full efficiency.

**Under joint liability (borrowers know each other’s types)**

The expected payoff of type i borrower when her partner is of type j is:

 EUij(r,c) = pipj(YiH – r) + pi( 1 – pj)(YiH – r – c)

The net expected gain of a risky borrower from having a safe partner is

 EUba(r,c) – EUbb(r,c) = pb(pa – pb)c

Similarly, the next expected loss for a safe borrower of having a risky partner is

EUaa(r,c) – EUab(r,c) = pa(pa – pb)c

If c > 0, the latter expression is larger than former as pa > pb.

Although a risky borrower also prefers a safer borrower but the net return of a safer borrower is higher if she is paired with a safer borrower.

As a result there could be seen an automatic segregation in groups if contract is laid under joint liability.

This shows that the assortative matching property allows the bank to screen borrowers ‘by the company they keep’ because risky borrowers are less willing than safe borrowers to accept an increase in the extent of joint liability. If the bank offers two contracts, one with high joint liability and low interest rates and the other with low joint liability and high interest rate, safe borrowers will select the former contract and risky borrowers the latter. Thus, the repayment rate and efficiency are higher under joint-liability contracts as compared to conventional individual-liability contracts because the former exploits a useful resource

that the latter does not: the information borrowers have about each other.

**Enforcement**

The final problem, enforcement, arises not from informational asymmetries but from the lender’s limited ability to apply sanctions against a delinquent borrower. Even if the borrower’s project succeeds so that she is able to repay, she may still refuse to repay if the legal system does not work very well.

Group lending has two opposing effects on repayment rates.

1. The advantage of groups is that they allow a member whose project yields very high returns to pay off the loan of a partner whose project does very badly.
2. The disadvantage is that a moderately successful borrower may default on her own repayment because of the burden of having to repay her partner’s loan.

However, if social ties among members are sufficiently strong, the net effect is positive because by defaulting willfully a borrower incurs sanctions from both the bank and the community. With sufficient social capital, a borrowing group enforces repayment better than would take place with individual liability.

* The borrowers are risk-averse and the only departure from the first-best is that borrowers can default intentionally even when they are capable of repaying.
* The punishment a bank can impose on a delinquent borrowers is limited and consists entirely of never lending to her again.

* If a borrower’s project yields output *Y ≥ r so that she is able to repay, she will repay only if the benefit of* defaulting, the interest cost, is less than the discounted net benefit of continued access to credit ,

  (\*)

* In this infinitely repeated game we are restricting attention to stationary equilibrium of the super game between the borrower and the lender where cooperation is achieved by trigger strategies, namely, both parties revert to the worst subgame perfect equilibrium of the super game if one of the parties misbehave.
* If the borrower defaults once, the bank never lends to the borrower again, and the borrower never repays if she receives a loan again.
* The bank does not pre-commit to future interest rates and hence  is independent of the interest rate r. Even if it depends on r, the argument goes through: for a given r, there will be some critical Y(r) such that borrowers will repay if Y≥Y(r).
* Let Y(r) be the income level that satisfies (\*) with strict equality. If there is diminishing marginal utility of income, then for a given r, the borrower will repay only if Y≥Y(r).

Joint-liability contract

* The group members are considered to be in default unless every loan is repaid and in the event of a default no one gets a loan in the future.
* A borrower will choose to repay even if her partner defaults given that she is able to repay, i.e., Y≥2r , if: 
* If Y ≥ Y(2r) ,[and Y(2r) ≥ Y(r)] she will pay for both her own and partner’s liability.
* Assume for simplicity Y(r) ≥ 2r and that if both members have an income Y≥Y(r), then they repay under joint liability.

 There will be two distinct cases:

* One group member is unable or unwilling to repay i.e. has an income realization Y ≤ Y(r) and the other member is willing to repay both her own and her partner’s obligation i.e. has income Y ≥ Y(2r) . In this case, joint liability is beneficial compared to individual-liability lending.
* One member is unable or unwilling to repay her own debt i.e., Y < Y(r)and her partner is willing to repay her own debt but not both of their debts i.e. Y(r) < Y < Y(2r). Now individual liability is better than joint liability.
* Hence social sanctions alter the effect of joint liability. Suppose a default by one borrower that hurts the other group member because she is cut off from loans in the future elicits some punishment from the community (‘social sanctions’).

* Social sanctions reduce the attractiveness of the payoff stream in the case when one party defaults intentionally r < Y <Y(r), and the other party waswilling to repay her own loan but not her partner’s Y(r)<Y<Y(2r) . In this case, repayment would definitely be higher under joint-liability contracts.
* If repayment decisions are taken cooperatively, repayment behaviour under joint liability is identical to repayment behaviour with individual liability.

These problems are:

a. to ascertain what kind of a risk the potential borrower is *adverse selection*.

b. to make sure she will utilize the loan properly, once made, so that she will be

able to repay it *moral hazard*.

c. to learn how her project really did in case she declares her inability to repay *auditing costs*.

d. to find methods to force the borrower to repay the loan if she is reluctant to do so *enforcement*.

* Output *Y* takes two values, high (*Y* H .) and low (*Y* L .) where *Y* H>*Y* L>0.
* For simplicity, we normalize *Y* L to zero.
* Output is high with probability *p* ε (0,1).
* Each project requires 1 unit of capital and the lender needs to be paid back an amount ρ>1 per loan,
* Principal plus interest, on average.
* Borrowers will borrow only if their payoff exceeds the opportunity cost of their labor, ǖ.
* The project returns of different borrowers are assumed to be uncorrelated.
* We assume that all projects are socially profitable in the sense that the expected return from the project is greater than the opportunity costs of the capital and labor employed in the project pYH > ρ + *ǖ*

 *Moral hazard*

* Once a borrower has taken a loan, the project’s payoff depends in part on the borrower’s actions, including levels of labor and other inputs.
* Ordinarily, we would expect the borrower to choose these actions such that the marginal benefit of each action equals its marginal cost.
* That is not necessarily the case with asymmetric information.
* In the absence of collateral, the lender and borrower do not have the same objectives because the borrower does not fully internalize the cost of project failure.
* Moreover, the lender cannot stipulate perfectly how the borrower should run the project, in part, because some of the borrower’s actions are not costlessly observable.
* Theories of peer monitoring are motivated by the fact that group members have an incentive to take remedial action against a partner who mis-uses her loan because of joint liability.
* With group lending, individual borrowers are made to bear liability for themselves and for others in their group, but the savings in the form of better project choice allows the bank to pass on some benefits to the borrowers in the form of reduced interest rates.
* Thus, group lending increases welfare and repayment rates.

We illustrate this idea with the following simple model.

* Borrowers are risk-neutral, as before.
* But the borrower’s actions determine the probability of success.
* So output is *Y* H with probability *p* and 0 otherwise.
* Borrowers choose actions, which can be thought of as a level of effort *p ε [0, 1]* for which they incur a disutility cost of ½ ϒ p2
* The borrower’s choice is unobservable to the bank.
* Notice that social surplus pYH - ½ ϒ p2
* Maximising Surplus with respect to P :
* We get P\* = YH / ϒ

Moral hazard 3

* Assuming YH < ϒ for interior solution .
* With perfect information, the bank could specify that the borrower choose ***p=p****\**
* and charge an interest rate r = ρ /p\*
* But if the choice of *p* is subject to moral hazard, then taking the interest rate *r* as

given, the borrower chooses *p* to maximize her private profits:

* Notice that <  The interest rate is like a tax on success, since it has to be paid only when output is high and the higher the interest rate, the lower is *p*.
* Substituting in the bank’s zero-profit condition *pr = ρ*, we get

* . This is a quadratic equation in *p* which means there are two values of *p* consistent with equilibrium. We assume that the equilibrium with the higher value of *p* is chosen since the bank is indifferent and the borrower is strictly better off

 Moral hazard 4

* Under joint liability, when the borrower’s project fails, her partner is liable for the amount *c*.
* If a borrower’s partner chooses an action p’, then the payoff function of a borrower who chooses an action *p* is
* Suppose the borrower chooses *p* to maximize her individual payoff taking the partner’s action *p’* as given. Then her best response function is given by :

* That is, the safer the partner’s project choice, the safer the project choice of a borrower.
* If a borrower chooses a risky project, this choice reduces the attractiveness of high returns to her partner because of expected joint-liability payments.
* Thus, the borrower also chooses a more risky project. If borrowers take decisions about project-choice non-cooperatively then in the symmetric Nash equilibrium,
* The banks zero profit condition under joint liability is
* Substituting in the first-order condition, we see that
* Hence, a borrower’s equilibrium project choice will be the same as with individual liability: mere joint liability does not alleviate moral hazard in this model.
* This result follows because a borrower does not take into account her actions effect on her partner’s choice of action.
* This similar to the fact that if the borrower internalized the effect of the choice of her action on the interest rate under individual-liability lending (namely, we incorporated the bank’s zero profit condition *pr=*ρ in the borrower’s objective function) she would choose the first-best level of *p*.

Moral hazard 5

* If instead borrowers decide on project-choice cooperatively they choose:
* Substituting this expression in the bank’s zero-profit condition

,

We get:

* Solving similarly as before we have
* Recall that  *>Y* H and since the borrower cannot pay more than what his project yields, it must be the case that *c*< . For *c* (0,.
* The numerator of the expression for the equilibrium value of *p* under joint liability is higher than the corresponding expression under individual liability, while the denominator of the former expression is lower than that of the latter.
* The equilibrium value of *p* and, hence, the repayment rate, is therefore higher under is therefore higher under joint-liability lending when borrowers choose *p* cooperatively compared to individual-liability lending.

Moral hazard 6

* The above formulation of joint liability assumes that borrowers can contract on *p* among themselves: i.e., they can observe each other’s actions perfectly and costlessly, as well as enforce any agreement regarding their levels.
* However, if monitoring is costly, then borrowers must be given incentives to monitor.
* Suppose that if a borrower chooses a level of monitoring *a*, then with probability *a*, she can observe the true action chosen by her partner, and with probability 1-*a*, she receives a completely uninformative signal.
* If the action undertaken by her partner is different from that agreed on, then she can impose a non-monetary punishment of *S* which stands for social sanctions.
* The cost of monitoring is given by the increasing and convex function *M(a)*.
* Let denote the individual best response of a borrower given that her partner chooses
* The incentive compatibility constraint of a borrower to choose and not deviate to *p*D is :

Moral Hazard 7

* Since monitoring is costly, the minimal level of monitoring consistent with the above constraint will be chosen.
* This implies that the constraint will be satisfied with equality in equilibrium.
* Let the corresponding level of *a* be denoted by .
* One must ensure that a borrower has the incentive to undertake the requisite level of monitoring to ensure her partner chooses *p* =.
* That is

Or

* As long as social sanctions are effective enough i.e., *S* is large or monitoring costs are low enough i.e., *M*() is small., joint-liability lending will improve repayment rates through peer monitoring even when monitoring is costly.

Costly State Verification -1

* Formal lenders sometimes cannot lend to poor borrowers because such lenders cannot easily verify whether borrowers who say they cannot repay are indeed unable to do so.
* We are assuming that all parties are risk-neutral, which implies that the ideal contract is one in which the borrower pays a fixed fee such as an interest rate.
* Regardless of what happens.
* But because of the borrower’s limited wealth there may be situations where the borrower cannot pay very much,
* For the bank to accept partial repayment is like charging a lower interest rate to the borrower, and if the bank applies this lower fee to all states of the world it cannot break even.
* At the same time, any other option introduces some degree of state contingency in the contract.
* Since states are costly to verify, a state-contingent contract creates an incentive for the borrower to
* report those states of the world where her repayment obligations are the least, irrespective of the true state. To solve the twin problems of false reporting and costs of state verification the optimal contract takes the following simple form
* As long as the borrower is willing to pay a fixed fee, the bank does not audit, but if she reports that she is unable to pay this fee, the bank audits her and takes away all her returns.
* With this kind of contract, if the borrower claims her output was too low to repay, the bank audits her and takes all her output.
* But if the costs of auditing borrowers are too high, there may be no contract which allows the bank to break even on loans.

Costly State Verification -2

* Here, we propose a simple model to show that joint-liability contracts reduce expected audit costs and improve efficiency.
* The intuition is that if group members face a lower cost of verifying each other’s output say, because they live close to each other’s workplaces
* Then the bank can avoid the cost of performing its own audit every time a borrower claims she has low output by inducing her partner to undertake liability for her.
* The partner has the incentive to audit a borrower since she is partly liable for her repayment.
* Only when the whole group announces its inability to repay will the bank have to incur auditing costs.
* Assume that all projects are identical and the only departure from the first-best is costly
* output verification: the outside lender has to pay ϒ>0 to verify the return of each
* Individual project.
* There are no problems of moral hazard, adverse selection or enforcement of contracts.
* The financial contract specifies three numbers: the transfer from the borrower to the bank when the project succeeds *r* and the probabilities of an audit λh and λl , when output is high and low.
* As before, everyone is risk-neutral and there is a limited-liability constraint.

Costly State Verification-3

* Formally, the optimal contract then solves:
* Optimal Problem becomes :
* *Subject to :*
* The first constraint is a “truth-telling’’ constraint which says that given the contract, the borrower will have an incentive to repay the loan when output is high rather than announce that output is low and risk an audit (with probability λl) in which she could lose all the output to the bank.
* The second constraint says the bank should break even on the loan under the contract.
* Since there are no risk-sharing issues, the optimal contract has a very simple structure: it minimizes auditing costs by auditing with positive probability λ>0.
* When the borrower claims output is low and the bank takes all output. Otherwise, the borrower pays an interest *r* in which case, there are no audits.
* From the two constraints, we get:
* To ensure
* This condition means that the expected return from the project less the expected costs of auditing has to be at least as large as the opportunity cost of capital.
* Which also implies :
* Thus we have:
* Finally, substituting in the borrower’s payoff, we see that an optimal contract exists if
* That is, the borrower’s expected return net of interest payments has to be as large

as the opportunity cost of her labour.

**Costly State Verification – IV**

Assume that the borrowers can write side-contracts with each other costlessly and that there is no cost for a borrower to observer her partner’s project returns.

 This means that all members make the same announcement about the state of the world.

There relevant truth-telling constraint.

If borrowers own project yields high returns and her partner’s project yields low returns, she has the incentive to report this state truthfully and repay her own loan as well as joint liability for her partner.

The bank’s zero-profit condition is now:

**Costly State Verification – V**

* Solving the truth-telling and the zero-profit constraints, we get:

* Note :
* The equilibrium rate of interest will be lower under joint liability.
* Also note :
* Audits take place less often under joint liability
* Hence, social surplus is always higher under joint-liability contracts.
* Even if banks would not lend to borrowers under individual-liability contracts due to high audit costs which happens if Eq.

>0 is not satisfied, a joint-liability contract might make lending possible.