ENFORCEMENT and SAVING
PAPER 8: CREDIT AND MICROFINANCE

LECTURE 4

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Abstract. The lender has a limited ability to enforce contracts. Group lending without social sanctions may or may not improve repayment rates over individual lending. Stronger social sanctioning ability amongst the group members tilts the repayment rate in favour of group lending. The poor often do not have sufficient opportunities to save. Microfinance could contribute in poverty alleviation by offering savings opportunities along with borrowing opportunities it has traditionally offered. Offering saving opportunities in group lending leads to negative assortative matching along the wealth lines within the groups.

1. Enforcement

The objective of this course is to analyse the interaction between the *lender(s)* and *wealth-less* or *poor borrower(s)* in the context of financial markets. We have hitherto looked at how credit constraint impact the way the poor put a price on risk. We have also examined how group lending contracts solve the information problems of adverse selection and moral hazard associated with lending to the poor. In this lecture, we explore the problems associated with lender's limited ability to enforce contracts. The limited ability to enforce contracts creates opportunity for strategic or involuntary default by the borrower, which in turn, reduces the lending to the poor. Consequently, any mechanism that improves the ability to enforce contracts can help the poor in the obtain credit from the financial markets.

1.1. **The Setup.** In a typical credit market scenario, a lender offers the borrower a contract which specifies the following:

(1) The amount he is ready to loan.[1]
(2) The duration of the loan[2]
(3) The repayment obligation or the interest rate charged on the loaned amount.

Once the loan duration is over, the borrower could either meet the repayment obligation or default on the loan. If she chooses to default, it could be due to the following two reasons.

Involuntary Default. The project fails and produces insufficient output to meet the repayment obligations.

Voluntary or Strategic Default. The project produces sufficient output to meet the repayment obligations but the borrower *chooses* not to repay due to strategic considerations.

In the previous lectures we have looked at involuntary default due to adverse selection and ex ante moral hazard. This lectures examines the impact of the strategic defaults.

Even though credit markets are notorious for problems created due to lack of information, in case of involuntary or strategic default, there is actually no information problem. The borrower declares that

[1]To keeps matter simple, we assume that the borrower requires just 1 unit to capital to undertake a specific project.
[2]In the limited time available in the course, we have not looked at how the lender can use the time period of the loan to enhance the lending efficiency, though we did look at how he can use the sequence of the loans to enhance the lending efficiency.

she wants to default and the lender comprehends that fully. Although, there is imperfect information associated with the the reason for default. Without auditing the lender cannot verify the state of the project and does not know whether the default has been due to the involuntary or strategic reasons. Consequently, there is a information problem of state verification for a lender who wants to be fair. For a lender who does not care about fairness there is no information problem.

There is of course a distinct problem of enforcing the terms of the loan contract. The lender could either have offered a contract that takes into account the state of the project or could have a offered a contract that obliges the borrower to repay irrespective of the state of the contract. The student loans contract is a good example of contract that explicitly specifies the state or outcome in its terms. The student loans specify that the borrower (student) would is obliged to start repaying the loan only after she or he starts earning beyond a certain threshold. Conversely, if the borrower borrows a certain amount from the bank for an unspecified purpose, the borrower has to repay back irrespective of the outcome. The only recourse in this context for the borrower is to declare bankruptcy.

We look at the problem or enforcing the contract in this lecture. A related paper that deals with the problem of efficiency of auditing or costly state verification is Rai and Sjöström (2004), which we discuss in Section 2.4.

1.1.1. *Agents.* The lender and the borrower(s) are both risk-neutral. The borrower has zero wealth and can thus only initiate a project with a sunk cost only if the lender agrees to lend to her.

1.1.2. *Project.* A borrower's project requires an investment of 1 unit of capital at the start of period 1 and produces stochastic output x at the end of period 1.

1.1.3. *Distribution of x.* The output is a random variable here with a with a distribution function $F(x)$ defined over the support $[\underline{x}, \bar{x}]$. For any x, $F(x)$ is the probability that the value of the outcome is between $\underline{x}$ and x. As usual $F(\underline{x}) = 0$, $F'(x) > 0$ and $F(\bar{x}) = 1$. That is the probability of getting output less than $\underline{x}$ is 0, less than $\bar{x}$ is 1 and the $F(\cdot)$ is increase in x in the intervening region.

This reflects the fact that the borrower does not know what how valuable the outcome of the project would be when she invests in it. For instance, if the borrower borrows to grow a particular crop, the value of the crop would increase and decrease with the price of the crop, which cannot be forseen ex ante. It has also often been the case with borrowers borrowing to buy a house in UK. There is no way to estimate what the value of the property would be in the future.

From the perspective of information, a action by a borrower that can enhance the value of the outcome of the project would get captured as a ex ante moral hazard problem. The source of randomness in outcome in this model is exogenous and not related in any way to the borrowers action. This exogenous randomness leads to the value of the outcome x varying continuously between a minimum of $\underline{x}$ and maximum of $\bar{x}$ described the distribution function $F(x)$.

From the enforcement perspective, the idea is that the more valuable the outcome of the project, the more keen the borrower is to hold on the outcome. If the lender can affect this value ex post, then it gives the lender a handle to enforce the contract.

1.1.4. *The Loan Contract.* : The lender offers the borrower(s) a contract whereby each borrower receives 1 unit of capital investment for investing in a specific project. The contract specifies the borrower's total repayment obligation is $r(> 1)$ once the project output is realised.

To make the model extremely stark, we assume that the borrower can always meet the repayment obligations. Doing this allows us to concentrate on the enforcement problems and allows us to abstract from the problem of involuntary default that may arise due to insufficient output of the project.

We assume that repayment is an all or nothing decision, i.e., the borrower either repays r or declares default, in which case she pays nothing. Thus, once the project has been completed and the project

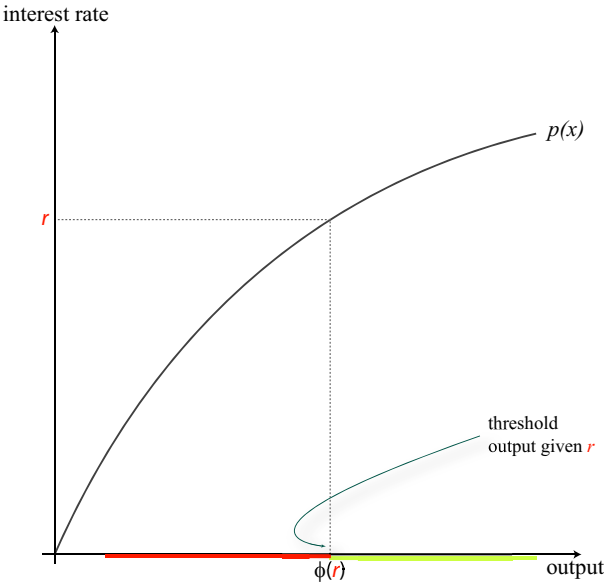

FIGURE 1. Penalty and Threshold Functions

output has been realised, the borrowers arrive upon their decision regarding the repayment of the loan by comparing the consequence of repayment with the consequence of default.

1.1.5. *Lender's Enforcement Ability.* In an ideal world, the lender would have an unlimited ability to enforce contacts (read punish the borrower for defaulting) and would obtain repayment with certainty. Of course, we have assumed away involuntary default by assuming that the borrower always has sufficient resources to repay back the loan. With limited enforcement capability, the lender would only be able to obtain repayment in the cases where the punishment meted out by the lender exceeds the borrower's benefit from defaulting. We also assume that the borrowers have an ability to sanction each other.

Aside Within the principal agent models, there is a part of the literature that looks the agents ability to side contract with each other. Side contracts are contracts that the agents can sign amongst themselves to coordinate their actions. Of course, these side contracts also have an enforcement problem. The agents need an ability to enforce the side contracts. Within the microfinance literature, this ability to side contract comes from the borrowers ability to sanction each other. The monitoring section of Aniket (2006b) discusses this in further detail. The ability to side contract can enhance (Besley and Coate (1995), Stiglitz (1990)) as well as diminish (Aniket, 2006b) the efficiency of group lending over individual lending.

We first set out the individual lending case below. Once we have analysed the individual lending case, we then explore ways in which the lender can harness the borrower's ability to social sanction each other by lending to groups of borrowers. The lender's objective remains to maximise the repayment rate by using local social sanctions amongst the borrowers to leverage his own limited ability to punish them.

2. Strategic Default

2.1. **Individual Lending.** This section presents a simplified version of the Besley and Coate (1995) model. 1 unit of capital investment yields x. x is distributed on $[\underline{x}, \bar{x}]$ according to the distribution function $F[x]$.[3]

Definition 1. Penalty Function $p(x)$ *is the output contingent penalty that the lender can impose on the borrower(s) once the project has been completed and the output* x *has been realised.*

[3] $F(\underline{x}) = 0$ and is continuous on $[\underline{x}, \bar{x}]$, .

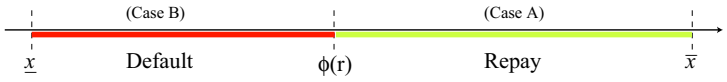

FIGURE 2. Default and Repayment Regions

We assume that $p'(x) > 0$, $p''(x) \leqslant 0$ *and* $p(x) < x \; \forall x$.

The critical assumption is that the lender's ability to impose the penalty is increasing in x, the value of the outcome of the project. The outcome of the project varies continuously between $\underline{x}$ and $\bar{x}$ described by the distribution function $F(x)$.

The borrower's decision to repay or default depends on the value of the project outcome and described as follows. The borrow repays if the penalty exceeds the interest rate due and default if the penalty is smaller than the interest rate. The decision is summarised in the table below.

$r \leqslant p(x)$	Repay	*borrower prefers to repay as r is lower than penalty*
$r > p(x)$	Default	*borrower prefers to default as penalty is lower than r*

Since the penalty is increase in x, for a exogenously given interest rate r, there is critical x beyond which the penalty exceeds the interest rate r. Thus, as can be observed in Figure 1, for every interest rate r, the borrower would choose to repay beyond a particular x.

Lets define the *threshold function* $\phi(\cdot) \equiv p^{-1}(\cdot)$ as the inverse of the penalty function. Thus, $\phi(r)$ is the *critical* project outcome at which the borrower is indifferent between repayment and default. If output is greater than $\phi(r)$, the penalty is greater than r and repayment is the more attractive of the two option. If the output is less (or equal) than $\phi(r)$, default is the more attractive of the two option.

Definition 2. Threshold Function $\phi(r)$*: Given* r*, the threshold function gives the threshold output beyond which the borrower would choose to repay. Conversely, if the project output is below this threshold output, the borrower would choose to default strategically.*

It follows that $\phi'(r) > 0$, $\phi''(x) \geqslant 0$ *and* $\phi(r) > r \; \forall r$.

Given that $\phi(\cdot) \equiv p^{-1}(\cdot)$, for every r, there is a output level that makes the borrower indifferent between repaying and defaulting. If the output is above this amount, the borrower would repay. If the output is below this amount, the borrower would default. Since the output is stochastic, for a large enough draw of the output, the borrower repays back and a small enough draw defaults.

$\phi(r) \leqslant x$	Repay	*the output is greater than the threshold given r*
$\phi(r) > x$	Default	*output is lower than the threshold output given r*

We can see from Figure 2 that under individual lending, the loan repayment has the following pattern:

Case	**Project output range**	**Loan status**
A	Greater than $\phi(r)$	Repay
B	Otherwise	Default

Given r, the borrower defaults in the range $(\underline{x}, \phi(r))$ and repays in the range $(\phi(r), \bar{x})$. As r increases, the default range increases and the repay range decreases. Π_I, the individual Lending repayment rate is given by

$$\Pi_I(r) = 1 - F[\phi(r)]$$

and it turns out that $\Pi_I'(r) < 0$, implying that as r increases, Π_I decreases. This follows from $\phi'(r) > 0$ and $F'(x) > 0$.

2.2. **Group Lending without Social Sanctions.** Groups are composed of two ex ante identical, borrowers 1 and 2. (B1 and B2 henceforth)

2.2.1. *Group Lending Contract.* : The group gets 2 units of capital for investment for the borrower's respective projects. A collective repayment obligation of $2r$ is due once the projects are completed. Both borrowers are symmetrically penalised if this repayment obligation is not met.

The group members are jointly-liable for the repayment, i.e., they are collectively responsible for repaying $2r$. The borrowers thus get penalised not just on the basis of their own output realisation but also on the basis of the realised output of their peer.

Timeline:

Borrower 1 and 2's respective project outputs x_1 and x_2 are realised.[4]
Stage 1: Borrowers decide simultaneously whether to repay r or not.
Stage 2: If the decision is unanimous, payoffs are as follows:

$$\text{Both choose to repay:} \quad x_1 - r, \quad x_2 - r$$
$$\text{Both choose not to repay:} \quad x_1 - p(x_1), \quad x_2 - p(x_2)$$

When the decision is not unanimous, the borrower who decided to repay in the first stage can revise her decision by either paying $2r$ or 0.

E.g., if B1 chooses repay and B2 chooses not repay in stage 1, then B1's final payoffs are:

$$\text{Stick to the decision and repay:} \quad x_1 - 2r, \quad x_2$$
$$\text{Revise decision and default:} \quad x_1 - p(x_1), \quad x_2 - p(x_2)$$

Under group lending, the loan repayment has the following pattern:[5]

Case	Project output range	Group Loan status
C	At least one greater than $\phi(2r)$	Repaid
D	Both between $\phi(r)$ and $\phi(2r)$	Repaid
E	Otherwise	Not Repaid

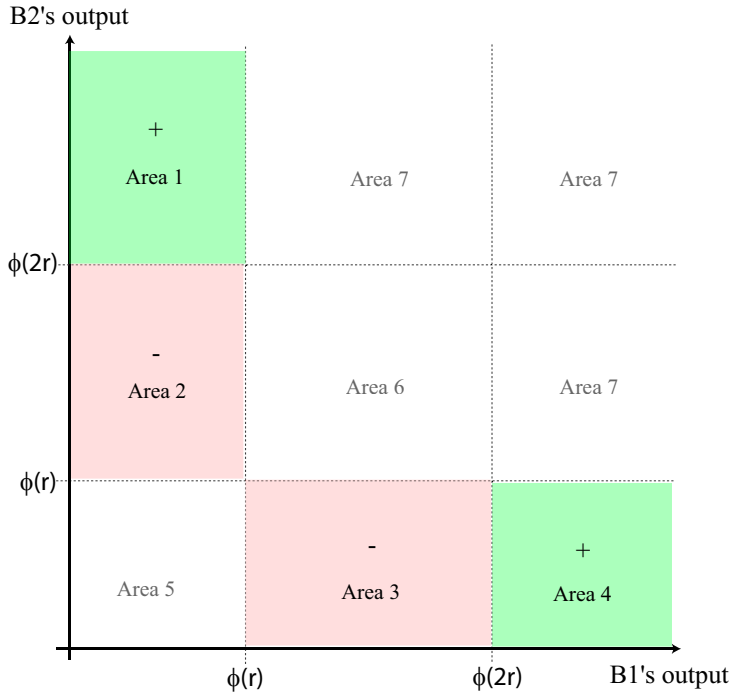

FIGURE 3. Advantages and Disadvantage of Group Lending

[4]The value of the output is common knowledge amongst the peers but unknown to the lender
[5]Under Case D, non-repayment is a possibility if both borrowers believe that the other will not repay. This coordination failure can easily be assumed away by allowing the borrowers to renegotiate after stage 1.

The group loan is repaid in Case C and D. In Case C at least one borrower's output is more than $\phi(2r)$. The borrower with output greater than $\phi(r)$ would prefer to repay $2r$ for herself and her peer rather than facing the penalty meted out by the lender. In Case D, both borrower's output is between $\phi(2r)$ and $\phi(r)$. In this case both borrower's prefer to repay back r for their own loan. In this output range, the borrower would not have repaid for her peer. The group lending repayment rate is thus given by

$$\Pi_G(r) = \underbrace{1 - \Big\{F[\phi(2r)]\Big\}^2}_{\text{Case C}} + \underbrace{\Big\{F[\phi(2r)] - F[\phi(r)]\Big\}^2}_{\text{Case D}}$$

where $F(\phi(2r))$ and $F(\phi(r))$ is the probability that the realised output is below the thresholds $\phi(2r)$ and $\phi(r)$.

Figure 3 allows us to compare group lending with individual lending. [6]

+ Under Area 1 and Area 4, B1 and B2 respectively would have defaulted under individual lending. Turns out that the loans are repaid under group lending.
− Under Area 2 and Area 3, B2 and B1 respectively would have repaid under individual lending but does not repay under group lending due to joint liability.

To compare the repayment rate under individual and group lending we would have to compare $\big(\Pi_I(r)\big)^2$ to $\Pi_G(r)$. Consequently, whether repayment rate under group lending is higher or lower as compared to individual lending would be determined by the shape of the distribution function $F(x)$.

2.3. **Group Lending with Social Sanction.** In the previous sections, the only cost to a borrower from defaulting was the lender's penalty. In this section we look at the use social sanctions within group lending. The group member's ability to social sanction each other can be used to leverage the impact of the lender's limited ability to penalise the borrowers. In group lending without social sanction, the default amongst the group was in Case E. We look at Case E further when the group member's have an ability to socially sanction each other.

Case	Project output range	Group Loan status
E1	$x_m < \phi(r)$; $\phi(r) \leqslant x_n < \phi(2r)$	Maybe Repaid
E2	Both less than $\phi(r)$	Not Repaid

where x_m and x_n are the actual realised values of the random variables x_1 and x_2, the borrower's respective outputs. In the Case E1, the group members impose a negative externality on each other, i.e., one group member would like to pay off her own loan but defaults because her peer is going to default.

Definition 3. *If a group member imposes a negative externality on her peer, she faces a social sanction s in response.*[7]

B1 imposes a negative externality B2 when B2 gets penalised from the lender for $B1$'s actions. That is B2 gets pernalised not because of her own output realisation but due to B1's output realisation. Given the threat of sanction s from her peer, a borrower would be ready to repay back under the following conditions.

$$\boxed{\begin{array}{ll} r \leqslant p(x) + s & \text{Repay} \\ r > p(x) + s & \text{Default} \end{array}} \quad \Rightarrow \quad \boxed{\begin{array}{ll} \phi(r-s) \leqslant x & \text{Repay} \\ \phi(r-s) > x & \text{Default} \end{array}}$$

In group lending with social sanctions, the group's repayment decision in Case E is as follows:

[6] Area 5: Official penalty is not strong enough to give either borrower incentive to repay. Area 6: Both borrowers prefer repaying r to incurring official penalties. Area 7: The group always repays back since repaying $2r$ is better than incurring official penalties.

[7] To keep matter simple, we assume that s is a constant.

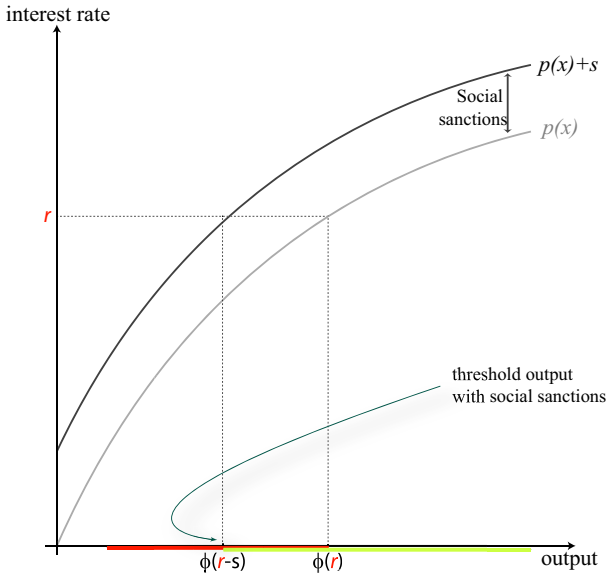

FIGURE 4. threshold Output with Social Sanctions

Case	Project output range	Group Loan status
E1a	$\phi(r-s) \leqslant x_m < \phi(r);\ \ \phi(r) \leqslant x_n < \phi(2r)$	Repaid
E1b	$x_m < \phi(r-s);\ \ \phi(r) \leqslant x_n < \phi(2r)$	Not Repaid
E2	Both less than $\phi(r)$	Not Repaid

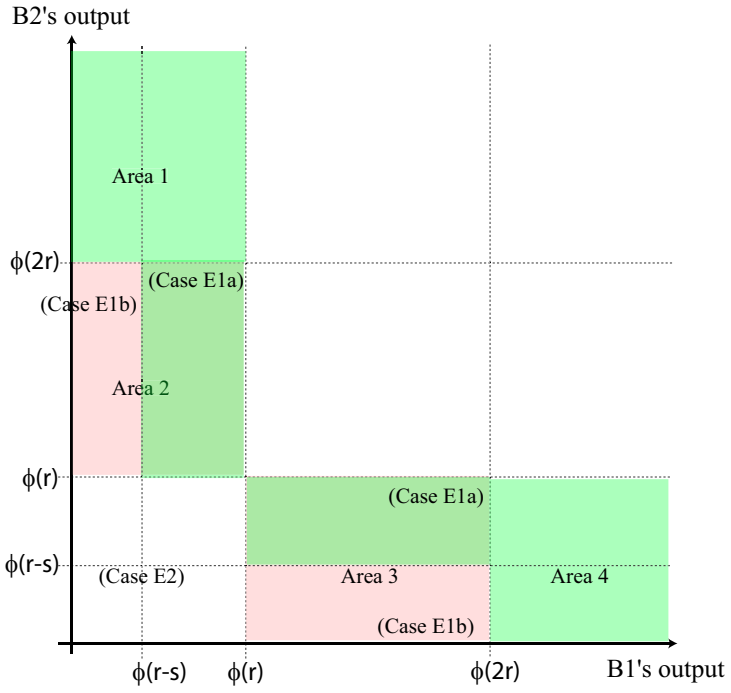

FIGURE 5. Advantages and Disadvantage of Group Lending

The repayment rate under group lending with social sanctions is given by:

$$\begin{aligned}\Pi_{G_S}(r) &= 1 - \left\{F[\phi(r)]\right\}^2 - 2\int_{\phi(r)}^{\phi(2r)} F[\phi(r-\bar{s})]dF(x) \\ &= 1 - \underbrace{\left\{F[\phi(r)]\right\}^2}_{2^{\text{nd}}\text{ term}} - \underbrace{2F[\phi(r-\bar{s})]\Big\{F[\phi(2r)] - F[\phi(r)]\Big\}}_{3^{\text{rd}}\text{ term}}\end{aligned}$$

The second term represents the likelyhood that both borrowers realise a return which is below $\phi(r)$ and hence neither has an interest in repaying the loan. The third term represents the case where one borrower would like to repay but the other cannot be induced to repay, although she is being socially sanctioned by her peer.

Under harsh social sanctions, i.e., $s \to r$, the repayment rate reduces to

$$\lim_{s\to r} \Pi_{G_S} = 1 - \{F[\phi(r)]\}^2$$

It should be easy to check that Π_{G_S} is greater than Π_G and Π_I. Thus, joint liability raises repayment rate if the social sanctions are sufficiently strong.

2.4. **Related Ideas.** The threat of punishment is to induce the borrowers to repay back. Of course, the borrowers can only repay back if they have the requisite resources to repay back. Besley and Coate (1995) assumed that the borrowers always have sufficient resources to repay back. If the borrower has a low output or her project fails and as a result she does not have sufficient resource to repay back, punishing her is a unfair as well as inefficient. A borrower should only be punished if she is trying to cheat the lender. Of course, the lender does not know when a borrower is trying to cheat him and thus may over-punish the borrower.

Consequently, one of the problems faced by people who borrow from the microfinance institutions is that get over-punished.[8] The over punishment here means that the borrower gets punished even when she is unlucky and defaults involuntarily. For a moment think of what would happen if you borrowed from the Mafia. Their enforcement mechanism is close to perfect. When the Mafioso comes knocking on your door to collect what you owe them, they would not care about your circumstances. You either pay up or they would break your bones. The perfect enforcement means that you would never ever cheat the Mafia. Thus, all punishment meted out by the Mafia would be inefficient given that no one would ever dares to cheat them.

A conscientious Mafioso might realise this and hesitate to punish. But, then she would also realise that she cannot afford to stop punishing the defaulters. Not punishing the defaulters would lead to the borrowers trying to cheat her. The problem essentially is that the Mafioso or the enforcer does not have the information about the borrower's actual ability to pay. If she did, she could condition the punishment on the borrower's ability to pay. In the absence of that information, she has no way of distinguishing the borrowers who are trying to voluntarily default from the borrower who default involuntarily.

From a social perspective, punishing a borrower who defaults involuntarily is a *dead-weight loss*. In an interesting paper, which is beyond the scope of this course, Rai and Sjöström (2004) analyse the implication of allowing the group members to cross-report on each other's project. That is once the borrowers' projects are finished, the borrowers submits reports about the outcome of each other's project.

The economic problem is one of minimising the punishment imposed in equilibrium. This is the same as the problem of providing optimal insurance to the borrowers through group lending. For a borrower, low output leads to a low payoff, which becomes even lower if the lender imposes a punishment. The borrowers could potentially insure themselves by agreeing [9] to help each other in case one borrower has low output and the other borrower has high output. A group loan contract that encourages borrowers

[8] Rahman (2001) discusses the punishment mechanisms used by Grameen Bank.
[9] signing enforceable side-contracts amongst themselves

to help each would also reduce the dead-weight loss associated with over-punishment, i.e., punishment in case of involuntary default.

A simple joint liability contract without cross-reporting encourages some amount of mutual insurance. If the collective punishment to the group is sufficiently harsh, the borrowers pool their resources and would help each other out like they did in Besley and Coate (1995). Yet, the collective harsh punishment would be imposed if the group's pooled resources is not sufficient to met the repayment obligations of the borrower. This punishment makes the mechanism inefficient, i.e., simple joint-liability loans can encourage mutual insurance only at the price of excessive punishment in equilibrium.

Rai and Sjöström (2004) shows that adding cross-reporting component to group lending leads to harsh punishment being threatened only out of equilibrium. The cross-reporting works as follows. If any member of the group default, then a particular borrower i is punished if borrower j ($j \neq i$) sends a negative report about borrower i. The negative report would suggest that borrower i is withholding output from the lender. If borrower j sends a positive report, then borrower i is not punished.

Consequently, if borrower i gets a low output from her project and borrower j gets a high output, borrower i can threaten to send a negative report about borrower j's output if borrower j does not help her out. This would induce borrower j to help borrower i out in order to avoid the punishment.[10] This threat would only work when one borrower is successful and the other borrower has been unsuccessful. When both borrowers have been unsuccessful, they will not threaten each other. Consequently, cross-reporting leads to borrowers helping each other out and there is no punishment in equilibrium. Joint liability loans without cross-reporting encourage borrowers to help out each other but have a higher expected cost of punishment associated with them. Of course, the borrowers could have agreed (signed side contracts amongst themselves) to help each other out in case of unfavourable circumstances without the group lending or cross-reporting mechanism. Group lending with cross-reporting only helps when people live in an environment where they are not able to agree[11] to help each other out. In that case, group lending with cross-reporting mechanism actually encourages people to help each other.

In a similar vein, Jain and Mansuri (2003) suggests that the microfinance lenders like to use the information and enforcement capability of the local moneylender. They do so by requiring that the borrowers repay in tightly structured instalments, which begin really soon after the disbursement of the loans. This induces the borrowers to borrow from the local moneylender in order to repay the microfinance lender. Thus, the lender leverages his own capabilities by employing the local moneylender's capabilities in his favour.

2.5. **Conclusion.** To summarise, the lender can use the social sanctions amongst the borrowers to enhance his own enforcement capabilities. In individual lending, once the output has been realised, given the penalty that the lender can impose, the borrowers deduce the *output threshold level* below which they choose to default on the repayment of the loan and attract the lender's penalty. This gives rise to strategic defaults, i.e., individual borrowers default even when their output is on one hand sufficiently high to meet the loan repayment obligations but on the other hand below the above mentioned threshold.

In group lending, joint liability enables the lender to use the local intra-group social sanctions to extract repayment when the group's output is greater than its repayment obligations but one of the group members has the incentive to strategically default. Besley and Coate (1995) show that the advantage of group lending is that a group member with really high project returns can pay off the loan of a partner whose project does very badly. This is a kind of insurance for the borrowers.

The disadvantage of group lending 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 are sufficiently strong, the net effect is positive because by defaulting wilfully, a borrower incurs sanctions

[10]The model assumes that the lender's punishment is greater than the value of the output. Borrower j's option is between helping out borrower i or facing the lender's punishment. Of course, borrower j could send a negative report about borrower i but that does not make borrower j any better off.

[11]This could because people are not able to either sign side contracts or enforce them once they have signed them.

from both the bank and the group members. With sufficiently close social ties amongst the group members, the repayment under group lending is higher than under individual lending.

The insight of the Besley and Coate (1995) model is that in absence of strong social sanctions, there is a tradeoff between group and individual lending repayment rate. As social sanctions increase, the balance starts titling in favour of group lending.

3. Savings

3.1. **Introduction.** Do poor people save? The presumption often has been that the poor are asset and income poor. There is vibrant literature in economic development that is trying to study the lives of the poor in great detail. The empirical evidence from these papers is shining the light on the lives of the poor. Banerjee and Duflo (2007) is an excellent survey of the literature in this area.

Along with having very low average income, the poor actually tend to have extremely volatile income stream. They often tend to have multiple sources of income which tend to extremely seasonal in nature. A poor person may have a continuous employment for two for three months that allows them to earn a significant amount. But then, they may have to go through a six month fallow period where they have no income source at all. This vulnerability is an important characteristics of poverty.[12] It follows that a person with stochastic income stream would like to smooth their consumption by moving resources from one period to another by both saving and borrowing.

As we have seen earlier, the poor are often credit constrained. The credit constraint not only make it more difficult to smooth consumption but also play a part in entrapping people in a poverty trap. It is striking that the poor also have extremely limited opportunities to save. In this section, we cast a cursory look at the opportunities the poor have in terms of saving instruments. We also discuss the extent to which microfinance can solve the problem by offering explicit saving opportunities.

It is widely reported that the poor often have no opportunities to save. Even if there are opportunity to save, the poor often get negative interest rates for their savings. That is, they pay a fee to person who keeps their saving deposits safe. Besley (1995) describes the *susu* men in Africa who come around to collect deposits from households. When the households want their deposits back, they have to pay a fee to the *susu* men, effectively rendering the interest rate on savings negative. Besley (1995) reports that the conjecture is that people willing to obtain a negative interest rate on their savings in return for the safekeeping service that the *susu* men provide. If the households retained the savings at home, they would feel compelled to help out their neighbours and other people in their social network who will inevitably suffer a income shock. Thus, handing over their savings to the susu men is a commitment device for which they are read to pay a service fee. Of course there are many indigenous institutions like ROSCAs (Besley et al. (1993b), Besley et al. (1993a)) which offer saving opportunities. The membership of a ROSCA can vary between 15 to 25. The ROSCA meets periodically and every member contributes a certain amount into the saving pot of the ROSCA. Then one member gets to take the whole saving pot. Who take the saving pot is either decided randomly or by a process of bidding. After each member has got the saving pot once, the ROSCA gets disbanded. We find that the institutions like these are severely limited in the saving opportunities it provides the poor, both due to their lack of geographical spread and the design of these institutions.

3.2. **Saving Opportunities in Group Lending.** In this section we explore the full implication of offering saving opportuinities in a group lending microfinance institution. We would try to pin down the optimal design of a group lending microfinance institution that offers individuals saving as well as borrowing opportunities. This section is based on Aniket (2007), which analyses the design of an microfinance institution that offers saving opportunities in a static setting.

[12] Dercon (2004) suggests that of all the income shock that poor household are hit, two third are idiosyncratic in nature and one third are covariate. Covariate shock are shock that are more widespread in nature where as idiosyncratic shocks are one that hit a specific person.

Most of the papers in the microfinance literature assume that wealth-less borrowers can borrow from the lender. Even though the rhetoric in microfinance has been that the poor can borrow without any wealth, it is not true in reality. In practice, the microfinance institutions have devised sophisticated mechanism of using wealth to ensure that the borrowers are screened in response to adverse selection or sufficiently incentivised in response to moral hazard. One popular way of doing so is to use the duration of the loan contract to ensure that the borrowers slowly acquire a stake in their project over the period of the loan. (See Aniket (2006a)) For instance, if the returns from a particular project is due over a three year period, the lenders would lend only for a period of 18 months. The repayment installments are thus due before the returns from project is realised. This would require that the borrower is forced to use her accumulated savings to repay back the loan. If the enforcement mechanism is sufficiently strong, only borrowers with sufficient wealth would choose to borrow. Once they have borrowed, they are forced to acquire stake in their projects as the repayment period progresses. This would give them the requisite incentive to ensure that the project succeeds.

The standard assumption in the literature is that microfinance institutions lend to the wealth-less without any requirement of posting any collateral. Studies like Aniket (2006a) have challenged this standard assumption.

In a departure from the existing literature, Aniket (2007) analyses the wealth threshold for accessing the service of the microfinance institutions. It derives the wealth threshold for accessing the financial services offered by the microfinance institutions rather than assuming that it is zero. The paper shows that interlinked group contracts that incorporate opportunities to save[13] can reduce the required wealth required to access the financial services offered by the microfinance institution.

In this variation of the group lending mechanism, the agents can take on the mutually exclusive roles of being a borrower or a saver. The role of borrower and saver and the implication of offering saving opportunities in group lending is described below.

(1) *The lender can only offer savings opportunities by restricting credit within the group.* Within a group, individuals cannot be borrowers and savers at the same time. The individuals can either be net borrowers or net savers. Thus, it follows that the microfinance institution would need to restrict credit within the group in order to create net savers. For instance, in a two person group, only one person may be allowed to borrow.

(2) *Restricting credit within the group creates intra-group competition for loans.* Since there are limited number of loans available within the group, the group members compete within the group for loans. This ex post competition for loans would influence the ex ante assortative matching during the group formation stage.

(3) *Borrowers choose whether they want to join the group as borrower or savers.* The two person group is now composed of one borrowers and one saver. The borrower acquires a *stake* in her own project. The savers also acquires a *stake* in the borrowers project. These stake are clearly specified by the borrower. The rest of the capital for investment into the project comes from the lender.

    If the project succeeds, both borrowers and savers get a positive payoff. If it fails, both borrower and saver get zero. This types of a contract gives the saver an explicit incentive to monitor the borrower and ensure that borrower is diligent in pursuing her project. The lender solves the maximisation problem to obtain the optimal contract that specifies the stake that the borrower and saver should acquire in the project. Depending on the wealth required to acquire stake in the project as a borrower or a saver, the agent form group and approach the lender.

We illustrate results in Aniket (2007) below with a simple numerical example .[14]

[13] see below the exact mechanism required to be able to offer saving opportunities in the group lending

[14] For the derivation of the optimal contracts, see the appendix of Aniket (2007)

3.2.1. *Numerical Example.* Lets say the borrower wants to buy a buffalo which would cost £100. For individual lending, the lender specifies that he is ready to lend £60, which implies that the borrower would have to acquire a stake of £40 in the buffalo to be able to buy it. By requiring the borrower to acquire a stake of £40, the lender is giving her the incentive to be diligent in looking after the buffalo.[15] Thus, with individual lending, everyone who has more than £40 would be able to acquire a buffalo and everyone who has less than £40 would be unable to do so.

The microfinance institution (henceforth the lender) could offer the following group contract. If a group, composed of a borrower and saver approaches the lender, he is ready to lend £70 subject on the condition that the borrower acquires a stake of £25 and the saver a stake of £5 in the buffalo. The borrower's stake goes down from £30 in individual lending to £25 in group lending because of the involvement of the saver. The saver, with a stake of £5 has an explicit incentive to monitor the borrower and ensures that she is diligent in looking after the buffalo, thus reducing the probability of the buffalo dying (read failure of the project).

Consequently, in this economy, anyone with £25 or more has the option of becoming either a borrower or a saver in the group. Any one with more than £5 but less that £25 can only join the group as a saver. With this contract, lets examine the assortative matching that would take place along wealth lines in groups.

We can leave the agents with more than £40 of wealth. They can borrow individually from the lender. Lets call an individual with a wealth between £40 and £25 *not-so-poor* and an individual with wealth between £25 and £5 *poor*. We can ignore the individuals whose wealth is below £5 since they are too poor to be able to access the lender financial services.

3.2.2. *Assortative Matching.* Who would the poor person like to group with. If she groups with another poor person, the group would turn out to be non-functional group as both group members would not have the sufficient wealth to be a borrower and initiate group lending. Conversely, if she groups with a not-so-poor individual, the not-so-poor individual would be able to take on the role of a borrower. The poor individual has clear incentives to group with the not-so poor individual.

Who would the not-so-poor individual like to group with. If she groups with another not-so-poor individual, she would have to compete for loans in the group. By grouping with poor person, she can ensure that the there is no competition for loans within the group. Thus, a not-so-poor individual would like to group with a poor individual to ensure that there is no competition for loans within the group.

To summarise, offering saving opportunities leads to restricting credit within the group. The optimal contracts that follow in Aniket (2007) are such that the wealth threshold for borrowers is higher than the wealth threshold for savers. This, is turn, leads to negative assortative matching along wealth lines within the group. The negative assortative matching ensures that there is no competition for loans within the group.[16]

If consumption smoothing is the objective, then both credit and saving opportunities can play their part. If borrowing for the investment projects is the objective, then one way to achieve this would be to allow the wealth-less to borrow. As we have seen, there are significant information problems associated with lending to the wealth-less. An alternative mechanism could be that microfinance institutions only lend to individuals who have wealth which is sufficient to solve the adverse selection and moral hazard

[15]If the borrower had no stake in the buffalo, he would have not incentive to look after it. In the previously analysed traditional group lending mechanism, in the absence of any wealth, the borrower is given this incentive through joint liability contracts. In these contracts, since the wealth-less borrowers cannot be punished for their own failure, they are punished for the failure of their peers, which in turn gives them an incentive to monitor and ensure diligence by their peers. By reintroducing wealth, we can derive the stake which would give the borrowers a sufficient incentive to be diligent. This stake also serves as a wealth threshold. Anyone above this wealth threshold would be able to borrow and anyone below this wealth threshold would not be able to do so.

[16]Even though this may sounds a bit different, this kinds of mechanism is not very different from the one we live in. Developed financial markets allow the small investors (poor) to acquire stakes in the investment projects of the better off financial institutions.

problems. For the people unable to borrow, it offers opportunity to save, which would help them accumulate sufficient wealth and become borrowers in the future.

The question remains. Is it more efficient to give people opportunities to borrow their way out of poverty or to save their way out of poverty.[17] The research in this area is still in its infancy and hopefully we would find the answer to this question in the years to come.

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[17] The stylised facts suggest that poor have relatively more borrowing opportunities (even if it is at expensive interest rates) than saving opportunities.