

Enforcing Repayment in Lending without Collateral: An Empirical Survey on Group Lending Microfinance

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Abstract: In this study, we are exploring factors affecting repayment in group lending microfinance. Theoretically, it is generally claimed that joint liability obligation in group lending enforces repayment. Though our empirical survey find that joint liability creates peer pressure and peer monitoring and very often helps ensuring repayment, it is not free from weakness and is not necessary at all lending the poor. We see that dynamic loan incentive can ensure repayment even in absence of joint liability. We also find other factors that affect repayment. The study thus, shows that joint liability is neither necessary nor sufficient in enforcing repayment rather there are scores of innovations in group lending microfinance, like dynamic and progressive lending that help MFIs to boost up repayment.

Key words: Microfinance, group lending, joint liability, dynamic loan incentive, repayment rate, lending without collateral, limited liability of the poor

INTRODUCTION

Group lending microfinance, widely familiar nowadays in the developing world in financing the poor, are characterized traditionally by two features: lending without collateral and enjoying higher rates of repayment. Prior to the microfinance revolution, it is vehemently considered by the formal lending institutions that poorer people can not be banked and very specifically, can not repay since poorer people can not offer collateral to guarantee a loan and repayment is in doubt thereby. To the formal financial institutions, this leads to a common consensus like, 'no collateral, no loan' and poorer people are simply excluded from the formal banking system as a result (Aghion and Morduch, 2005; Bakshi, 2008).

Rural credit markets in developing countries are seen to have three characteristic problems: screening, monitoring and enforcement. Under the imperfect information paradigm, formal lenders discriminate against small borrowers because of costly information and weak enforcement capacity, even in liberalized interest rate regimes (Wenner, 1995; Bakshi, 2008). Obviously, it is difficult for the distant lenders to truly justify the probability of default and to monitor how borrowers use the loan proceeds. Borrowers may not take safe projects that render a safe return, instead can take a risky project with uncertain return or may shirk what we call as the problem of moral hazard. The problems further aggravates when the lender can not pressurize a borrower to repay in case of a default due to weak legal systems and

sociopolitical pressure. While at the same time the presence of local moneylender charging unusually high interest rates is seen all over the developing world (Zeller, 1998). The challenge for the development practitioners, for government agencies and formal financial institutions therefore remains to design appropriate credit delivery system to address these issues.

One potential solution to these problems is pioneered during the late 1970s as group lending microfinance with joint liability, thanks to Professor Yunus (1994) of Grameen Bank from Bangladesh. With joint liability group lending, borrowers of a group are supposed to be responsible for the total loans taken by all the group members, i.e., borrowers of a group are jointly liable to repay their entire group loan obligation. Thus, if a member of a group does not repay her loan installment, others have to contribute to ensure repayment. In the classic Grameen Bank model, however, non-repayment of loan by the group generally results that the group will be denied from future loan access (Yunus, 1994). In this way, group lending creates pressure and incentive for the group members to monitor over other's investment projects and to enforce repayment. Joint liability group lending is thus, generally believed to be the key factor working behind the higher rates of repayment and the success story of many microfinance institutions (Wenner, 1995; Zeller, 1998).

Group lending addresses the asymmetric distribution of information by transferring the burden of default risk to the contracting borrowers, thus transfers the costly screening to be done by the borrowers themselves

(Aghion and Morduch, 2005; Bakshi, 2008). Screening borrower's risk is critical since it affects loan repayment and lender's profit thereby. Group lending schemes induce borrowers to engage in assortative matching wherein local knowledge about each other's assets, capabilities and character traits are used to sort and self-select. The 'better risks' signal their creditworthiness by forming a jointly liable credit group. On the other hand, the 'poorer risks' find it too costly to 'signal' so, they are excluded from the incentive scheme and are either forced to do without credit or seek loan contracts with higher interest rates. Secondly, group lending provides a potential solution to the monitoring or incentive problem by inducing members of the credit group to monitor their peers. Specially, if the group is relatively small and the members live close to each other, it is not difficult to detect diversion of funds if any or to assess whether borrowers were shirking or appropriate production techniques are employed. Thirdly, group lending associated with dynamic lending opportunity improves enforcement capacity through the termination threat (Wenner, 1995). Since, the entire group is denied from credit access in case of default by any borrower, it creates pressure on the group to monitor every single project of the borrowers to ensure repayment.

Another, feature of the group lending microfinance is that borrowers are rewarded with dynamic loan incentive, that is, borrowers are rewarded with increasing amount of loan access for their successful repayment of earlier loans (Aghion and Morduch, 2005). Once borrowers are repaying their loans, they are allowed larger loans suitable to carry out large scale investment projects yielding higher returns in turn. Skilled borrowers, looking for maximum possible returns, are therefore inclined to repay their initial loans in order to secure the subsequent larger loan contracts. Dynamic loan incentive, in this way, works as a successful enforcement mechanism for the microfinance institution (Marie, 2004; Abbink *et al.*, 2006).

Since microfinance institutions across the developing are largely seen to enjoy higher rates repayment, it catches attention to the academics to the issues like factors affecting repayment.

Some argue (Wenner, 1995; Zeller, 1998; Sharma and Zeller, 1997) that it is the joint liability of the group lending system that induces borrowers to closely monitor over each other's investment projects, over the project outcomes and to ensure repayment as well. Others (Marie, 2004; Abbink *et al.*, 2006) consider that the dynamic loan incentive by the lending MFIs contributes in ensuring repayment, even in the absence of joint liability, it can induce borrowers to repay. The argument of the later

thought also claims that a good borrower and a good repaying group should not be punished from the default of a single borrower and if so, it will eliminate safe borrowers from the market or will lead to a collision among the borrowers to default simultaneously (Bakshi, 2008). In this context, it is important to see what determines repayment in group lending microfinance is it joint liability or dynamic loan incentive or are there other factors that affect repayment. We are exploring these issues in this study, through empirical survey.

Research questions: The overall research question of this study is to study factors affecting repayment in group lending microfinance. The specific research questions are:

- What role joint liability has in ensuring repayment in the group lending contract? Are there any empirical evidences about the effectiveness of joint liability in enforcing repayment?
- Is joint liability a pre-requisite in ensuring repayment in lending without collateral? What happens to repayment if we drop joint liability obligation while lending without collateral?
- What role the dynamic loan incentive has in ensuring repayment?
- Can dynamic loan incentive ensure repayment even in absence of joint liability?
- What are the other factors that affect repayment in the group lending microfinance?

MATERIALS AND METHODS

The study is an empirical survey about the factors affecting repayment in group lending microfinance. The characteristics, however and the limitation of the study is that it is solely based on surveying scientific publications from peer reviewed journals in the respected field. We are neither developing nor estimating any model that affects repayment in group lending rather we are surveying across a collection of published works in this vibrant arena.

RESULTS AND DISCUSSION

Factors affecting repayment in group lending microfinance: empirical survey: In lending without collateral, there is the enforcement problem, that is, even if everything goes perfect and the investment project yields a good return, the borrower may decide not to repay. This is the third agency problem as mentioned by Bakshi (2008), for which the poorer people are excluded from the formal financial system. Since borrower pledges

no collateral, she can simply take the money and run. This is quite trivial when lenders can not observe borrower's profit and the borrowers are protected by limited liability. Borrower in this case, might falsely claim a loss in her investment project and default in repayment. Besley and Coate (1995) and Stiglitz (1990) developed models explaining that joint liability can ensure repayment even in absence of collateral. Dominik (2004) and Tedeschi (2006) later presented models showing that dynamic and progressive loan incentive can ensure repayment in group lending microfinance even in absence joint liability and collateral requirement. Here, we are presenting empirical findings from published works to justify these models and to see the factors affecting repayment in group lending microfinance.

Empirically, repayment rate is a continuous dependent variable with a lower bound of 0 and an upper bound of 100. In this case, an ordinary least squares model will lead to biased and inconsistent estimates (Greene, 1993). Use of a probit or multinomial model would forego valuable information because of using a dummy instead of a continuous variable (Maddala, 2002). For these reasons, most of the researchers including Sharma and Zeller (1997), Zeller (1998) and Marie (2004) are seen to estimate repayment models by using Tobit maximum likelihood technique although, a highly inconsistent maximum likelihood estimator can generate heteroskedasticity (Greene, 1993). In this study, we are summarizing empirical results from the works that are published in peer reviewed journals.

Joint liability as an enforcement mechanism: Joint liability group lending implies that borrowers of a group are supposed to be responsible for the total loans taken by all the group members, i.e., all group members are jointly liable for their entire group loan (Aghion and Morduch, 2005; Bakshi, 2008). The theoretical models suggest that joint liability leads to peer monitoring (Stiglitz, 1990), mitigates adverse selection (Maitreesh, 1999; Aghion and Gollier, 2000) and enforce repayment (Besley and Coate, 1995). Empirical findings, however, are not that straightforward. Wenner (1995) provides one of the pioneer empirical works on the determinants of repayment for groups with joint liability. He examined whether delinquency was affected by the informal screening of the borrowing groups or by the written code of regulations by using Multinomial Logit and Probit models. It also investigated whether credit groups were using any latent information about borrower characteristics and creditworthiness that were not used in usual lending process, that is, whether group lending contract used more information than the individual

Table 1: Frequency of Key Variables (N = 36)

Variable	Value	Frequency	(%)
Informal screen	0 = no	22	61.10
	1 = yes	14	38.90
Written code	0 = no	19	52.80
	1 = yes	17	47.20
Internal delinquency	0 = no	9	25.00
	1 = yes	27	75.00
External delinquency	0 = no	25	69.40
	1 = yes	11	30.60
Composite delinquency	1 = none	9	25.00
	2 = internal	16	44.40
	3 = both internal and external	11	30.60

Source: Wenner (1995)

lending scheme did. The study covered 25 FINCA credit groups from Costa Rica of which 36 loan periods and 118 borrowers were studied. He found groups were using more of formal screening (47.2%) than informal screening (39%). His results showed, that about three-fourth (75%) borrowers were internal delinquent (i.e., delinquency of the members to the group), while 30.6% were delinquent externally (delinquency of the group to the lending institution). The results also demonstrated, that delinquency rate decreased when groups were using written codes. The rules covered measures of screening, monitoring and enforcement activities that took place within the group. It was also found that group lending used more information than individual lending did to reduce internal delinquency. The hypotheses tested in Wenner (1995) were whether formal and informal screening affected delinquency rates. We can see here that Wenner (1995) did not studied repayment as a function of joint liability directly. Rather, it investigated whether formal and informal screening played any role in improving repayment in a jointly liable group lending contract. We can see, the delinquency frequency from Wenner (1995) in Table 1.

The results from Table 1 showed that a large number of groups were using written codes than the groups using informal screening (47% groups comparing to 39%). It can be seen that 75% of the borrowers were internally delinquent but external delinquency was 30.6%. That is, more than half of the internal delinquent borrowers were protected by their group from external delinquency (11 frequency comparing to 27). Since, borrowers in the FINCA lending model were jointly liable for their entire group loan and the entire group was supposed to be denied from further access to loan in case of a default, the static thus, reveals the fact that borrowers were helping their fellow peer to repay. Wenner (1995) further found evidences that written codes promotes discipline within the group, promotes peer selection, monitoring and enforcing. Informal screening, however, seems not be significant implying that written codes might have already contributed to peer selection and peer monitoring.

What we see from Wenner (1995) is that group lending model used better information which might improve efficiency in the lending contract. This informational advantage associated with better organizational skill reduces delinquency rate in joint liability group lending. Finally and most importantly, we see that joint liability group lending induces borrowers to use group savings and peer pressure to improve repayment in order to secure further loans from the lending institution. Since, with group lending all the borrowers are denied from further access to credit if someone delinquents, a group is considering all sorts of option (e.g., using group savings here) to repay. All these induce non-delinquent borrowers to take initiative to repay for the group as a whole. In Table 1, we thus see that although, internal delinquency was 75%, external delinquency (i.e., delinquency of the group to FINCA) was fewer and groups were able to repay for their delinquent peer in more than half the cases (11 external delinquency comparing to 27 internal defaults). In conclusion, we thus can say that joint liability group lending induces borrowers to repay, clearly evidenced in this analysis. One limitation of Wenner (1995) is that it uses Tobit model which is not suitable to estimate a continuous variable like delinquency rate. Using a Probit model in this case, would result to forego valuable information by using a dummy instead of a continuous variable, as we have mentioned earlier. A suitable estimator in this case could be tobit maximum likelihood technique (Maddala, 2002).

Zeller (1998) also mentioned that in joint liability group lending repayment increases when groups are formed endogenously and groups have internal rules and regulations. Furthermore, he mentioned that 'groups with higher levels of social cohesion have a better repayment rate..... and it is not the level of physical and human assets but the degree of variance of risky assets of the group members that contributes to better loan repayment'. His results thus, show that repayment rate in joint liability group lending improves when groups are able to diversify risks.

Zeller (1998) studied 146 groups from 6 different lending institutions in Madagascar. Groups of his study were mentioned to form endogenously. He however, mentioned that there were external rules set by the MFIs defining member's eligibility and functioning of the group. Groups vary in size with the highest members of 37 but the average was around 10. Lending institutions were found not asking land as an eligibility criterion for the members but groups could internally set any provision. Accordingly, Zeller (1998) found 17% groups required that borrowers must possess land. Minimum required land

set by these MFIs was 36 acres which was less than the regional average. This implies that loans were extended to the below average earners of the community. However, three programs required that members cultivate cash crops which were usually done by richer farmers. It was found that 85% of the borrowers belong to same ethnicity, while 75% from the same village and 40% from the same hamlet. Groups thus, were supposed to possess stronger social ties.

It is important to note that only two of these programs offered savings services. Other four lending institutions thus, had no options of savings and consequently groups were unable to use group savings as an alternative source of repayment when someone was defaulting, which we have seen in Wenner (1995). Loans were given for a period of 4-7 months in line with the agricultural seasons. Average loan sizes were between USD 34-107 comparing to average income of USD 100-250. This again demonstrates that borrowers were relatively poorer, requiring small amount of loans. Zeller (1998) found loan repayment on due date as 69%, while it was 82.2% at the date of survey. That is, there were late repayment cases too and with grace time period repayment increases. He also, mentioned that there were 9% cases in which default loans were paid by their peer. It thus, reflects that borrowers were helping each other in crisis in order to promote repayment. Groups were found to confiscate and sell defaulting borrower's assets in 2% cases to repay their loan obligation. That is, joint liability of repayment certainly prompted borrowers either to confiscate assets of the defaulting borrowers or to extend help for them to repay on their behalf. There were 27% cases in which repayment occurred by other means like insurance scheme by the lending MFI in case of a bad harvest. Borrowers were thus protected from unavoidable negative economic shock. Effectively, this means that lender could expect repayment either from the group or from the insurance scheme. Furthermore, Zeller (1998) evidenced that 6% late paying borrowers were sacked from the group while other one-third was deprived from next year's lending share. All these reflect that joint liability induces borrowers to take stern action against the defaulting borrowers to maintain a good repayment record.

Zeller (1998) used tobit maximum likelihood technique to model repayment. Since, repayment is a continuous dependent variable, this estimator is a suitable technique in this case. We can see, the empirical findings of Zeller (1998) about factors affecting repayment in Table 2. The results show that repayment increased when groups had internal rules of conduct. Zeller (1998) mentioned that these rules focused about functioning of their group, loan recovery and use of fund. Accordingly,

Table 2: Variables and results (N = 141)

Variable	Mean	S.D.	Expected sign	Coefficient	t-value
Repayment rate	87.17	24.57			
Program characteristics:					
Provides savings services (1 = yes, 0 = no)	0.19	0.39	(+)	1.397	2.174*
Gives only cash loans (1 = yes, 0 = no)	0.28	0.45	(+)	0.28	0.797
Group characteristics:					
Initiated by member (1 = yes, 0 = no)	0.17	0.38	?	-0.015	-0.040
Size of group	10.23	4.76	(+)	0.135	2.641**
Mean Land area possessed	49.38	48.51	?	-0.0007	-0.147
Mean share of low land	0.30	0.15	(+)	4.13	3.369***
Coefficient of Variation for upland	80.53	41.86	(+)	0.041	3.264***
Number of common bonds	3.13	1.34	(+)	0.216	2.024*
Member can read (1 = yes, 0 = no)	0.94	0.11	(+)	0.35	0.182
Loan disbursed in time (1 = yes, 0 = no)	0.67	0.47	(+)	0.445	1.595
keep accounting records (1 = yes, 0 = no)	0.36	0.48	(+)	0.032	0.080
Internal rules of conduct (1 = yes, 0 = no)	0.62	0.49	(+)	0.643	1.719*
Intercept				-5.173	-2.3
Log Likelihood					-249.63

***Significance at 1% level; **Significance at 5% level; *Significance at 10% level; Source: Zeller (1998)

with internal rules group could enforce discipline among borrowers in order to ensure accountability and integrity which ultimately results good repayments. We also see that when groups were formed endogenously repayment was higher. This means that when group lending invokes self selection, as we know from Bakshi (2008), borrowers are selecting their peer cautiously considering entrepreneurship skills, financial honesty and repayment risk. This self selection resulted from group lending thus, ultimately results in better repayment, confirmed by our results here.

We further see that repayments were positively correlated with number of common bonds and coefficient of variation of upland (that is, when groups had different risk exposure). It is typical that under joint liability group lending when borrowers have social bonds and are facing different level of risks in their investment, they are better able to support each other when someone's project fails and others secure safe returns. In socially cohesive groups, borrowers feel very much ashamed in case of a default, specially in case of any strategic default. Borrowers in a socially tied group thus, always try to repay in time. On the other hand, if the borrowers are facing heterogeneous risks in their assets holdings, a group can manage to repay when not all borrowers are facing negative economic shock so that the successful borrowers are able to help others. In group lending, heterogeneous pooling of risks thus improved repayment as Zeller (1998) found here. We also notice that possession of low land, which is fertile in Madagascar yielding better and secure returns were associated with higher repayment. This is expected that borrowers with better crops are better able to repay. However, the variable mean land area possessed was found to affect repayment negatively, although, the result was not statistically significant. This as Zeller (1998), mentioned

'implies that repayment does not depend on capacity to repay, rather on the willingness to repay'. Savings was found to improve repayment significantly. As we see in Wenner (1995), savings were used to repay when borrowers of the group default. Zeller (1998) further mentioned that 'savings promotes financial discipline among borrowers which affects repayment'. Finally, we see that repayment increased with the size of the groups. It is evident that increasing group size opens scope to the group to take larger investment project in order to reap economies of scale. Group size also permits to diversify investment projects, which we already have mentioned to positively affect repayment.

Zeller (1998) however, mentioned that incentive to repay by a borrower diminishes under joint liability if there is any possibility that some of the group members will default. He also mentioned that under joint liability contract, the burden of default by the borrower is shouldered by her peers; hence, it is likely that a borrower may be inclined to undertake a riskier project which she would not consider in case of an individual loan contract. Since, borrowers are protected by limited-liability (of their current flow of income) delinquency increases in such a case. Zeller (1998) however, did not present any empirical support for this. In conclusion, we thus can say from Zeller (1998) that joint liability groups were seen to use internal rules and regulations, diversify their risk portfolio, select their peer, to use accumulated savings and reap economies of scale to ensure group repayment. All these rewarded them further access to credit from the lending MFIs. Since, borrowers were protected by limited liability and possessed no collateral, if the groups were defaulting, the only punishment a lending MFI could execute was the denial of further credit to the defaulting group. This dynamic incentive of further credit thus, inspired joint liability groups to monitor their

fellow peer, to diversify their investment projects and to use group savings in order to promote repayment.

There are however, other studies which found joint liability to be ineffective in ensuring repayment. Wydick (1999) for example, stated that group pressure had little effect in urban areas where alternative credit sources were open. Accordingly, borrowers in this case are not caring of loan repayment as denial of future credit from a particular MFI does not necessarily mean deprivation from next period finance from all the sources. Wydick (1999) however, found that group pressure research in rural areas where sources of alternative financing are strictly limited. Accordingly, a credible threat of no future loan access brings financial discipline in this context. Diagne *et al.* (2000) also found that peer monitoring, peer pressure and joint liability had little or even a negative impact on repayment performance (Matir, 2004). In a similar study, Ahlin and Townsend (2007), found that a higher degree of joint liability, measured by the landless borrowers as the percentage of the group in their study, lowers repayment rate. Empirical evidences thus, demonstrate mixed results about the effectiveness of joint liability in promoting repayment although in many cases joint liability is found to enforce repayment.

Dynamic incentive as an incentive mechanism: Dominik (2004) and Tedeschi (2006) stated that dynamic and progressive lending can enforce repayment even in absence of joint liability and without collateral requirement. Bakshi (2008), nicely presented a shorter version of their models, respectively showing how dynamic loan incentive research in ensuring repayment even in absence of joint liability. Here, we will see whether their views are justified by the empirical evidences or not and under what circumstances dynamic incentives are found to be effective and what pre-requisites, if any, it requires.

Abbink *et al.* (2006) conducted an experimental study to see repayment pattern in an experimental study. In their experimental set up individuals were forming groups exogenously and borrowed money to invest in their individual projects. The authors assumed following assumptions to formalize their model:

- Individuals are investing in their own projects, earn by their own.
- Investment returns are uncertain and independent across borrowers.
- Project outcome is private: a borrower can not see whether other borrower's projects are successful or not and thereby can not see whether a default is strategic or due to the project failure.

- Borrowers are assumed to have no initial wealth so that when investment is a failure, a borrower defaults automatically.
- Individuals repay their own obligation only when all the group members are repaying. However, if someone defaults, repayment burden of the group is evenly shared by the borrowers who wish to repay.
- A group enters into the next phase of lending only when it repays all its repayment obligations.

The authors, further assumed that investment project yields zero return when fails but yields 420 taler (used as experimental currency unit) if it succeeds. The probability of success was given by 5/6 implying that 1/6 was the chance that it would result a failure with zero return. Repayment obligation was 210 taler per person and $210n$ for a group of n borrowers. Since, the authors assumed that project outcome is private and borrowers have no initial wealth, borrowers thus could not force anyone to repay. It was individual's wish whether she was repaying or not and a group could not create pressure in this regard. The only incentive for the borrower here to repay is the dynamic loan access: borrowing group will move to the next round of lending with a successful repayment. Abbink *et al.* (2006) constructed groups with 8 members. Accordingly, repayment requirement for the group was $210 \times 8 = 1680$ taler. However, since a successful borrower earned an amount of 420, it is clear that at least 4 members were required to repay for the entire group. By assumption, a group enters into the next round of lending phase with a successful repayment of entire joint obligation.

Abbink *et al.* (2006) had 10 periods in total in their experimental set up. According to game theoretic prediction, since the subjects know that the game ends in 10th period, it is not wise for them to contribute in the last period. We can therefore, expect no contribution at all in the last period. Consider now the penultimate period, i.e., the 9th period here. Suppose that a borrower is able to repay and she is in a position to decide whether or not to repay. Since, we have already assumed that decision is private and independent across borrowers, at the end of a period borrower only knows how many subjects have repaid and whether the group is able to repay its full obligation in order to move on to the next round of lending. That is, they learn how many default cases are there, if any, but do not know who those defaulters are and whether defaults are strategic or not.

However, Abbink *et al.* (2006) found in their study that groups were repaying against the game theoretic prediction. It is to be noted that since 5/6 is the probability of success, individual lending would generate

Table 3: Repayment decisions and average rounds of play

Treatment	IR 2 (2 members) (%)	IR 4 (4 members) (%)	IR8 (8 members) (%)	GR 4 (4 members) (%)
YES, all rounds	78.80	77.90	72.40	75.50
YES, 1-9 rounds	81.10	80.80	72.40	79.20
YES, round 1	84.40	86.50	81.30	98.10
Average number of rounds played	7.50	7.00	5.10	7.00

Source: Abbink *et al.* (2006); IR = Individual Recruitment; GR= Group Recruitment

Table 4: Repayment rates across different lending institutions

Repayment rate	MFIs	BRAC	BRDB	Grameen	Others
ROT	0.50	0.37	0.50	0.55	0.14
RTG3	0.76	0.65	0.65	0.84	0.37
RTG6	0.84	0.74	0.77	0.89	0.43
RTG12	0.94	0.90	0.90	0.96	0.60

ROT Dummy = 1 if the borrower repaid her loan on time; RTG3, RTG6, RTG12: Dummy = 1 if the borrower repays her loan with 3 months or 6 months or 12 months arrears, respectively; Source: Marie (2004)

a repayment rate of $5/6 = 83.3\%$, while the game theoretic prediction is that borrowers will try to ‘free-ride’ since there are information asymmetry and consequently group lending would generate a zero repayment. Interestingly, Abbink *et al.* (2006) found that repayment in their group lending set up were well above this benchmark level of individual lending repayment rate in the initial periods, as shown in Table 3. It reached even to 98% in GR4 treatment. Since, by assumption borrowers decisions were private and no one knows who were defaulting, if there were any default the defaulting borrower had nothing to worry in this case. Borrowers, who were repaying, were thus, essentially induced by the dynamic loan incentive. Moreover, we see that average numbers of rounds played by the subjects in this study were 7 or higher in 3 of their 4 treatments, whereas game theoretic prediction says that the game could finish in the very first round. This implies that dynamic loan incentive in this case were able to carry on the game even in against of the game theoretic prediction. Abbink *et al.* (2006) however, mentioned that repayment fell as the dynamic incentive to further credit reduced in the later periods.

In this experimental set up, we see that borrowers could not see who were defaulting and if there was any default, whether it was strategic. Borrowers thus could not monitor each other over their investment project as we see in Wenner (1995) and Zeller (1998). In Wenner (1995) and Zeller (1998) borrowers were helping others in their group if there were any genuine crisis. Groups were found to use group savings or confiscate borrowers assets in order to repay the lender. Here, we see that borrowers were even unable to detect who were defaulting, therefore could not pressurize someone to repay. Furthermore, they did not have any group savings or any other assets or collateral that could be used to repay the entire group obligation. The groups here thus, were repaying only from the incentive that they would secure a new loan if they

could fully repay. Repayment in this case was thus, fully due to the dynamic incentive of further credit access. Findings of Abbink *et al.* (2006) thus, clearly justifies dynamic incentive as an enforcement mechanism in the joint liability group lending.

One particular feature of this set up is that the borrowers receive their loans at the same time. If the group repays its entire loan in the first round, all of its members are entering into the next round of the game securing further loan. This allows researcher to disentangle the dynamic incentive effect of microfinance from joint liability. But in the classic Grameen Bank format, a typical group of 5 gets loan in an order of 2/2/1, which essentially leads that the group leader will get the loan at the end and only when her fellow group borrowers repay duly. It thus, creates pressure on the group leader to monitor her peer automatically which is absent in this experiment. Here, groups are repaying only from the incentive that they will secure a new loan if they repay in full.

Another, study conducted by Marie (2004), who studied 2349 loan observations in Bangladesh from three different MFIs, namely Grameen Bank, BRAC and BRDB also focused on dynamic incentive as an enforcement mechanism. Marie (2004) compared loan repayments of these three MFIs comparing to other government commercial banks operating in same areas. We can present repayment rates, she found across different lending institutions in Table 4. We can see from the Table 4 that repayment rate on time was around 50% across all MFIs. However, with grace period ranging from 3-12 months, it reached even to 96%. Repayment rates of MFIs were significantly higher than that of other lending institutions. In this study, a good repayment was rewarded by a new and larger amount of loan. Loan amount thus, differed across loan cycles, but on an average it increased as the loan cycle proceeded starting from a relatively smaller amount. That is, there existed dynamic loan incentive across all MFIs: successful repayments were rewarded with larger amount of new loans. This can be seen from Table 5.

From Table 5 we can see that the mean amount of loan, the minimum and the maximum amounts were all increasing across all MFIs as the loan cycle proceeded on. This is compatible with Dominik (2004) and Tedeschi (2006) models that in absence of collateral, dynamic

Table 5: Loan amount in different cycles

	Mean	S.D.	Min	Max	N
BRAC loan cycle					
1	2048.6	1147.1	1000	6000	274
2	2888.6	1411.7	1000	8000	150
3	3707.3	1600.7	1500	7000	41
4	3785.7	1155.5	1500	5000	14
5	3750.0	758.3	3000	5000	6
BRDB loan cycle					
1	2036.1	727.7	1000	6000	266
2	2828.5	1093.8	1000	6000	137
3	3552.6	1289.9	2000	6000	19
4	5800	2167.9	3000	8000	5
5	6000	1732.1	5000	8000	3
Grameen Bank loan cycle					
1	2253.7	947.0	1000	10,000	300
2	2963.7	929.0	1000	6000	273
3	3727.8	1192.7	1000	10,000	237
4	4202.5	1148.3	1000	6500	158
5	4777.1	1003.8	2000	6,500	83
6	5166.7	784.5	4000	6500	27
7	5333.3	1154.7	4000	6,000	3

Source: Marie (2004)

incentive of larger new loans are working as an incentive mechanism to improve repayment. In Table 5, we thus see that the mean loan amount of BRAC borrower was 2048 Taka in round 1, while it increased to 3750 in round 5. For Grameen Bank the mean loan amount increased more than double: from 2253.7 taka to 5333 in just 7 loan cycles. Minimum loan amount in Grameen Bank was 1000 taka at the beginning which rose to 4000 in 7th cycle. For BRDB, the mean loan was 2036 taka which rose to 6000 taka in a 5 cycle loan period. All these demonstrate a clear dynamic loan incentive from the lending MFIs in Bangladesh.

Marie (2004) further mentioned that MFI borrowers in Bangladesh had access to non-financial services like primary health, primary education, occupational and skill training and access to marketing information. A large number of borrowers were getting non-financial services like basic health and primary education. All the MFIs were providing these services to their clientele. Providing marketing information and skill training were also seen across all the MFIs which could enhance productivity and could open borrower's opportunity to get favourable market prices for their products and inputs contributing higher repayment rates for the MFI. Marie (2004) further evidenced that loan size affected repayment negatively as it increased benefit of ex-ante and ex-post moral hazards. However, as we see earlier that repayment rate crossed 90% with a grace time period, Marie (2004) explained that borrowers were perhaps taking long maturity projects with larger loans for which they were found to default on time but repaid later in grace period.

Finally, Godquin found that credit rationing, used as a proxy for dynamic incentive, positively affects repayment, although, the result is not significant.

The limitation of this study is that it estimates repayment by using Probit model. As we already mentioned that repayment is a continuous variable and using Probit model would exclude valuable characteristics of the variables by using dummy. Variables like group homogeneity, measured by same education or same age; social tie measured by age of the group might not always correctly represent the usual variable characteristics. A carpenter and a grocery shopkeeper with same age or education can not ensure to have clear monitoring over each other's project. Similarly, presence of friends or relatives in a group can better represent social tie than the age of the group. Finally, we say that the effect of dynamic loan incentive is not clear in this study.

Other variables affecting repayment

Peer monitoring: Monitoring each others' project by the borrowers improves repayment, as mentioned by Stiglitz (1990). Peer monitoring can also check strategic default when the project of a borrower is successful, we see in Besley and Coate (1995). Wydick (1999) found evidence that the average distance between group members negatively affects repayment rates. He used average distance as a proxy for peer monitoring because the higher the distance between borrowers living is the weaker is monitoring. Wydick (1999) further mentioned that the knowledge of the borrowers in his study about the sales revenue of other borrower's shops positively affects repayment performance. This implies that effective peer monitoring eliminates informational deficiency which in turn helps borrowers checking ex-ante and ex-post moral hazards we discussed in the study.

Social ties and social connections: Sharma and Zeller (1997) found that social tie affects monitoring and repayment enforcement negatively. They show that repayment problem increases when there are more relatives in a group. This is because with stronger social tie, creating pressure or punishing through social sanction are not seen very often. Wydick (1999) also, mentioned that social tie within groups reduces peer pressure which affects repayment negatively.

Zeller (1998) on the other hand, found evidence that social tie affects repayments positively. Accordingly, groups with stronger social cohesion enjoy higher repayment rates. Woolcock (1999) mentioned that social relations among group members, between borrowers and staff and even among staff themselves are very important in improving repayment. Accordingly, social relation affects peer screening and monitoring and thereby affects repayment. Woolcock (1999) further stated that social tie is also crucial when there is a default and groups are

considering whether a sanction will be imposed. Karlan (2007) also, mentioned that borrowers with stronger social connections are more likely to repay their loans. He mentioned that with stronger social ties borrowers can closely monitor each other. This in turn enforces repayment. Most importantly, he mentioned, that with stronger social connections borrowers can verify whether a default is strategic or due to negative economic shocks. It thus, becomes easier for the group to decide to whom they should impose a sanction and whom to help. Cassar *et al.* (2007) studied repayment effect of social capital. The authors conducted an experimental study and found that repayment by individual borrowers depend on their belief that other members will repay too. They mentioned that specific trust between group members is crucial for group performance than trust in the society as a whole. They also found evidence that groups with social and cultural homogeneity perform better. The empirical findings about how social ties and social connection affect repayment are thus not conclusive and we can not say that social ties affect repayment in a very specific way.

Self selection: Maitreesh (1999) states that joint liability leads to a segregate outcome: safe borrowers form group with safe types leaving risky borrowers to form group with risky types only. Groups, however, can be formed by the borrowers themselves endogenously and can be formed exogenously. In the classic Grameen model borrowers form their group endogenously. They are thus, able to select their peer and include those with entrepreneurship skill, motivated to work hard, sincere in loan obligations and so on. Repayment is supposed to improve in such a case. Sharma and Zeller (1997) and Zeller (1998) found in their study that groups that were formed endogenously show better repayment than the groups formed exogenously by the MFI staff. Their findings support that self-selection leads to better repayment through peer monitoring and peer pressure.

Income shocks covariance: In the joint liability group lending a simultaneous fluctuation of income of the borrowers can disrupt repayment, particularly when all or a large numbers of borrowers are hit by any negative economic shock. In an earlier study, Bratton (1986) found evidence that groups are repaying better in years of good harvest comparing to draughts. Zeller (1998) also evidenced that the variance of risky assets of the members positively affects repayment. Accordingly, diversified portfolio helps borrowers to pool risks which in turn improve repayment. Similarly, Ahlin and Townsend (2007) found that covariance of income shocks (measured

by the inverse of the correlation between borrower's returns) is positively associated with repayment. All these results thus, indicate that heterogeneity in asset holdings among members and related intra-group diversification in on and off-farm enterprises improves repayment.

Social sanction and cooperation: Besley and Coate (1995) presented a model stating that punishing a delinquent borrower or at least a credible threat to punish can improve repayment. Repayment can also be boosted up by cooperation between borrowers in the investment projects, marketing products, collecting better seeds, farming equipments and so on. In an empirical study Wydick (1999), for example, found that helping those who are in genuine crisis while punishing the risky borrowers improves repayment. Ahlin and Townsend (2007) however, evidenced that cooperation among the borrowers like sharing of free labor and coordination to collect inputs (measured by the degree of intra-group sharing) are negatively associated with repayment. They found, on the other hand, that social sanctions (measured by the lending shutdown) are positively associated with repayment. They mentioned further that this is specially seen in the poorer, low-infrastructure rural areas where alternative sources of financing are limited. Similarly, Casar *et al.* (2007) found evidence that cooperation by the group members in time of negative shocks inspires others repaying loans in future. The effectiveness of social sanction and cooperation in improving repayment are thus, quite evident empirically.

Loan size: Repayment can be tough with increasing loan size, since the bigger the loan is the bigger is repayment obligation. With smaller loan size borrower can meet repayment obligation from her personal income even though her project fails. It is also possible, in converse, that the larger loan size can improve repayment instead of undermining it. Bigger loan size opens scope for large scale project yielding higher level of profit which can improve repayment.

Empirically, Marie (2004) evidenced that loan size affects repayment negatively. Marie (2004) stated that when loan size is bigger it increases gain from ex-ante and ex-post moral hazards. It may be the case too that the larger is the loan, more difficult, it is for the borrower to productively use the loan proceeds. Ahlin and Townsend (2007) also supported this view. They however explained that this might be due to the fact that the return of the investment project diminishes with increasing investment size. Loan size thus, we see empirically affects repayment negatively.

Infrastructure and local economic environment:

Infrastructure and local economic environment can significantly affect repayment. Improved local infrastructure increases scope for higher income for the borrower that may increase repayment rate while at the same time, it can open greater access to alternative sources of finance which may lead to higher delinquency. Empirically, Paxton *et al.* (2000) found in their study that repayment problems were more likely to occur in the remote rural areas. Accordingly, rural borrowers main income source was agriculture which depended on weather condition. This implies that income of these borrowers were likely to be instable which affects repayment. On the other hand, according to Wenner (1995) groups located in relatively remote area with limited alternative sources of financing stimulate group repayment. Wenner (1995) explained that the groups located in the remote areas were caring to repay in order to ensure further credit as they were not taking any risk of their only source of finance.

On the other hand, Khandker *et al.* (1995) found that repayment is positively associated with local economic environment that widens economic opportunity and raises income of the borrowers. Ahlin and Townsend (2007) mentioned that the regional difference of repayment performance was largely due to factors like physical or legal infrastructure. Accordingly, strategic default was severe in low-infrastructure area where it was difficult for the lender and the borrower to verify the nature of the default. On the other hand, they mentioned that information problem was severe in the relatively developed area.

Empirical findings are thus not robust, the successful repayment rate can not be attributed to any level of infrastructure or local economic environment, rather adjustment of lending program with the local economic environment might have a better impact.

Rules and regulations: Wenner (1995) conducted an extensive study about the factors affecting repayment under joint liability. He found that repayment performance of the group improved when groups had written and formal rules about functioning of the group. The rules in his study covered measures of screening, monitoring and enforcement procedure within the group. Zeller (1998) also mentioned that groups with internal rules and regulations perform better. Hung (2006) also stated that joint liability along with program rules lead to effective peer group screening and monitoring which in turn contributed to higher repayment.

Group size: Group size represents the number of borrower in a group. Theoretically, the bigger the group the more

imperfect is informational flows between members leading monitoring and enforcing costly which may decline repayment. Sharma and Zeller (1997) supported this hypothesis. They also found evidence of increasing delinquency as the loan sizes were increasing.

Contrary to this, Zeller (1998) mentioned that repayment rate improves with increasing group size. Accordingly, larger group offers scope for economies of scale like collecting inputs and selling outputs in the local markets. However, the average group of his study was 10 where a typical FINCA group contains around 30 borrowers. Zeller (1998) therefore, admitted that a very large group could potentially increase management, coordination and monitoring costs of the group leading to ex-ante and ex-post moral hazard problems. Abbink *et al.* (2006) on the other hand noted that group size was no matter in repayment. Accordingly, 'though the larger groups manifest a higher tendency toward shirking, their superior dispersion of risk makes them perform at least as well as smaller groups'. Empirical findings thus demonstrate that a bigger group size does not necessarily help in improving repayment and may even affect negatively.

Age of the group/ties within group: When a group grows over time, social relationships between borrowers and between borrower and lender also grow. This can lead to better cooperation in one way and in other, can make difficult to impose a social sanction against a delinquent borrower. Incentives for progressive lending can diminish too if borrower's investment project already meets the investment demand. Thus, the group age can affect repayment in either way. Khandker *et al.* (1995) found that default rate increases with the age of the branch. They mentioned that this might be the case of decreasing profitability of newer projects. This could also be the case that a relationship between the borrowers and the MFI grows and consequently defaulting borrowers are not punished or sanctioned enough. Marie (2004) also mentioned that the age of the group has a negative impact on repayment performance. He explained that as groups are working longer, the relationship between borrowers grows and it becomes difficult for them to impose a sanction if someone takes a risky project or defaults strategically. Empirical literature thus, confirms a negative relationship between age of the group and repayment.

Kind of loan: Loan can be disbursed in cash and in terms of commodity like seeds, fertilizers, farming, housing equipments and so on. Sharma and Zeller (1997) found that programs that extended cash loans enjoyed higher repayment. They explained that borrowers seemed

to value cash loans more than the in-kind loans. Furthermore, when the in-kind loans were not desired by the borrowers, repayment rate went down.

Financial and non-financial services: Financial and non-financial services offered by the bank affect repayment. Zeller (1998) found evidence that savings contributed to improve repayment of the group. As Zeller (1998) mentioned, 'savings increases financial discipline of the group member, essential to improve repayment'. Wenner (1995) also supported this view. Khandker *et al.* (1995) found non-financial services to affect repayment positively. They also mentioned that incentives and benefits to the bank staff improved repayment. Paxton *et al.* (2000) further mentioned that groups were performing better when got training from the MFI staff about their investment project.

Wealth and human capital: Physical and human capital implies that borrowers are better able to earn and to repay thereby. Zeller (1998), however, mentioned that physical and human capital did not improve repayment. He mentioned that 'the capacity to repay seems no matter in actual repayment, it is rather the willingness to repay that matters'. Marie (2004), on the other hand found that access to basic literacy services had a positive impact. The author explained that literacy helped borrowers to undertake projects generating higher profits. She also, mentioned similar argument for physical capital that larger physical capital opened scope to the borrowers to carry on larger projects yielding higher returns. She further pointed out that richer households possess greater ability to cope with negative economic shocks.

Sex: One of the features of most MFIs is that most of their clients are women and are observed with exceptionally high repayment rate. Is there any specific relationship between repayment rate and sex? Khandker *et al.* (1995) found that repayment was affected by gender too: men on average are more likely to be irregular and struggling than women. According to Marie (2004), sex is of no importance. The fact that, as Marie (2004) mentioned, 'on average women have lower default rates could be explained by their lower loan sizes requiring lower amount of regular repayment and reducing gains of delinquency'. The findings are thus not straightforward to draw any singular conclusion whether sex matters in repayment.

Regular installments: Yunus (1994) and Jain and Monsur (2003) recognized that weekly installment system of repayment contributed to the Grameen Bank's high repayment. This is because regular weekly installment

excludes long-gestation projects and seasonal working capital needed for agricultural production. Rather, it encourages projects that generate immediate returns like shop-keeping, poultry raising and vegetable gardening. The small amount of weekly installment also reduces borrower's gains from default comparing to the social disgrace in the group meeting.

Local cultural/institutional factors: Exploiting local institutional and cultural characteristics can help MFIs to improve repayment. Hulme (1990) found evidence that AIM in Malaysia used Islamic lessons and obligations to repay one's loan. Islam there was thus used as an enforcing institution to ensure borrower's loyalty to AIM which resulted higher rates of repayment.

Group homogeneity: Paxton *et al.* (2000) mentioned that repayment rate went down when borrowers of the group came from same ethnicity, occupation and income strata. This might be the fact that borrowers with homogenous characteristics could have lower incentives to screen, monitor and enforce. Homogenous group might also face similar negative economic shocks resulting to lower repayment.

Role of group leader: In the classic Grameen framework, role of a group leader is very important in screening, monitoring and enforcement and to ensure repayment thereby. Paxton *et al.* (2000) mentioned that the characteristics of the group leader was significant in improving repayment performance. They mentioned that repayment rate increased when group leader was found to be motivated. Hermes *et al.* (2005) found evidence that monitoring and social ties of the group leader reduced moral hazards of the group members. They mentioned that the incidence of moral hazard reduced when the group leader visited other group members regularly. They, however, did not find similar results for the other group members. That is, group leader's potential role is important in peer screening, monitoring and enforcement. Hermes *et al.* (2006) also supported that the role of the group leader was important in enforcing repayment.

CONCLUSION

We started this study with two versions of thoughts in group lending microfinance: in one side the theoretical models stated that dynamic incentive (Tedeschi, 2006) and progressive lending incentives (Dominik, 2004) can ensure repayment. Conversely, other thought was that joint liability group lending promotes peer monitoring over borrower's effort in their designated investment

projects, ensures safer and higher yield thereby and combined with social sanction this ensures group repayment by eliminating strategic default. The empirical studies mentioned in this study, present interesting results on how and why joint-liability group lending works and ensures better repayment rates.

Wenner (1995) and Zeller (1998) found strong empirical evidences supporting that joint liability among the group members makes repayment possible in lending poorer without collateral. Accordingly, when borrowers are tied with joint liability, they have interest to monitor one over other's investment project, to force others to take safer projects and to extend efforts and finally to repay when project outcome is a success. Wenner (1995) found that it is joint liability that leads borrower to help in time of need and to punish when there is shirking or indiscipline. Wenner (1995) found that joint liability leads group to formulate rules on screening, monitoring and enforcement activities that took place within the group. These rules, he found, contributed to improve repayment. In his study, it was also found that jointly liable group lending used more information than individual lending did to reduce internal delinquency. He also, evidenced that under joint liability more than half of the internal delinquent borrowers were protected by their group from external delinquency, i.e., delinquency to the lending MFI. Wenner (1995) further found that joint liability gives unique access to new information on credit worthiness of the borrowers, which in turn helps to reduce delinquency. He also, evidenced that joint liability group lending induces borrowers to use group savings and other measures to repay outstanding loans, in order to secure further loans from the lending institution. Zeller (1998) on the other hand mentioned that in joint liability group lending repayment increases when groups are formed endogenously and groups have internal rules and regulations. Furthermore, he mentioned that 'groups with higher levels of social cohesion have a better repayment rate. He further evidenced that the degree of variance of risky assets of the group members contributes to better loan repayment.

The effectiveness of joint liability is, however not free from critic. There are studies mentioning that joint liability works in relatively remote areas where alternative sources of financing are not available and defaulting means denial of future access to credit. We also found evidences that joint liability can instigate shirking.

There are however, empirical supports that dynamic incentives affect repayment rate positively as we learn theoretically from Dominik (2004) and Tedeschi (2006). From Abbink *et al.* (2006) and Marie (2004), we see empirically that dynamic incentive can ensure repayment

even in absence of joint liability and collateral requirement. Borrowers are seen to capture larger future access to credit with good repayment records.

In the experimental set up of Abbink *et al.* (2006), borrowers were unidentified and information was private. Borrowers thereby could not identify who was defaulting who was not. In Wenner (1995) and Zeller (1998), borrowers were helping others in their group if there were any genuine crisis; groups were found to use group savings or confiscate borrowers assets in order to repay the lender. In Abbink *et al.* (2006), since information was private borrowers therefore could not pressurize someone to repay. Furthermore, there were no provisions of using group savings or any other collateral to repay. The groups thus were repaying only from the dynamic loan incentive. Repayment in this case was thus, fully due to the dynamic incentive of further credit access. Findings of Abbink *et al.* (2006) thus, clearly justifies that dynamic incentive can enforce repayment in group lending and it works successfully in ensuring repayment even in absence of joint liability. Findings of Abbink *et al.* (2006) thus, shows that joint liability is not necessary at all to ensure repayment and dynamic incentive can ensure repayment without joint liability obligation.

We find in this study that there are other factors too to affect repayment. Empirical evidence tells us that when groups are self selected, repayment rate increases. It is also found that when groups have written rules and regulations, group performs better in repayment than the groups without such rules. There are empirical supports that borrowers value financial and non-financial services from MFIs. Borrowers reward MFIs with higher repayments if they get such kind of services. Regular installment is another variable that is found to affect group repayment. Accordingly, it prevents borrowers from taking long gestation projects and helps to monitor borrower's efforts. Similarly, it is also found that role of group leader is very important in promoting repayment. Empirical literature, however, does not support the same role for other group members. There are evidences that use of local institutional factors, like religious faith and cultural norms helps to improve repayment. It is also found that borrower prefers cash loan instead of commodity loans. Repayment rate is found higher for cash loans comparing to commodity loans. On the other hand, it is found that loan size affects repayment negatively. Larger loan sizes increases ex-ante and ex-post moral hazard and repaying a larger amount over a shorter period of time leads borrowers to default. Negative impact on repayment is also evidenced by the variables like larger group size, age of the group and group homogeneity. With larger group, information asymmetry goes up making

it difficult to monitor over each other. This affects repayment negatively, as we see from Stiglitz (1999) that peer monitoring is important in promoting repayment. While, as the group grows over time, the inter-relationship also grows making it difficult to use social sanction in case of default. In line with Besley and Coate (1995), repayment rate thus falls, as evidenced empirically. For the homogenous group, our empirical literature also suggests that it inversely affects repayment. Theoretically, homogenous group has lower incentive to screen, monitor and enforce. According to Stiglitz (1990), Ghatak (1999) and Besley and Coate (1995), this leads to lower the repayment rate. Our empirical results support this hypothesis.

Overall, our empirical evidences confirm that joint liability results peer monitoring and self-selection which in turn improves repayment and dynamic incentive works to ensure repayment even in absence of joint liability and collateral bindings. Group lending, thus, we see to be successful in eliminating agency problems, stated by Bakshi (2008), poorer people face and brings back the poorer clientele in the credit market efficiently by ensuring repayment for the lender without any collateral requirement. All these demonstrate that lending to the poor and without collateral, need not to be charity rather have strong theoretical and empirical support to become a 'win-win' business for both the borrowers and the lending microfinance institutions.

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