Determinants of Intra-group Insurance in Microfinance: Empirical Evidence from Joint liability Lending Schemes in Malawi

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Abstract

Following the success of microfinance in past four decades, the poor are no longer viewed as unproductive individuals who can only be helped through welfare programs and subsidies. The success has been attributed to the ability of the joint liability mechanism to reduce problems of information asymmetry, repayment enforcement, and the ability of group members to provide mutual insurance when a member fails to repay. Thus, apart from acknowledging the importance of social intermediation variables such peer monitoring, peer pressure, and dynamic incentives, most theorist attribute the success of the mechanism to its ability harness intra-group insurance. The objective of this study was, therefore, to examine determinants of intra-group insurance among 99 credit groups of the Malawi Rural Finance Company (MRFC) from Malawi. We find that the likelihood of the willingness to provide mutual insurance among group members varies with the cost of insurance, risk pooling factors, productivity shifters, dynamic incentives and social ties, while peer monitoring is statistically insignificant.

Key words: Intra-group Insurance, Joint liability, Dynamic incentives, Malawi

1.0 Introduction

Following the success of microfinance in the past four decades, the poor are no longer viewed as unproductive individuals who can only be helped through welfare programs and subsidies. There is now, enormous evidence that indeed access to credit even at market clearing interest rate enables the poor to become viable actors in the economy. Despite such successes, microfinance faces a number of problems, amongst which the lack of insurance features highly. Considering that loan transactions are done over time, with a wide range of risks, there is need for some form of insurance for borrowers. Insurance is also important because even good investments may yield low returns in bad years leading to repayment failure. In concurrence with this notion, Sadoulet (2003) observes that insurance is particularly important for the poor for a number of reasons: First, the poor are subject and vulnerable to substantial amounts of risk. Second, to make up for income shortfalls, the poor engage in risk mitigating strategies which induce a

reduction in profitable investments. However, lending to poor households is associated with problems of information asymmetry and enforcement problems, such that lenders are unwilling to provide insurance. The main reason for the exclusion of the poor from such insurance services is that lending institutions may not be able to audit each individual borrower to separate genuine failures from false claims resulting from moral hazard. The absence of physical collateral among the poor, further contributes to the complexity of the situation. However, Sadoulet (2004) notes that the poor are usually risk constrained such that even if they have the collateral, they may not want to put their collateral at risk. This form of limited liability induces risk taking behavior among borrowers.

Microfinance practitioners have since devoted great attention on 'mutual help' in joint liability lending, while academic work on the same is rare. Most theories explain how the joint liability mechanism through the provision of intra-group insurance counteracts the limited liability problem by inducing, peer monitoring, peer support, peer auditing and peer pressure and when default occurs, the group members contribute towards the payment of the defaulted loan. The group acts as a safety net against default for each borrower and the lender by allowing members to ensure each other across project-specific downside risks. The success stories in repayment rates for institutions such as the Grameen Bank have been widely associated with the presence role of intra-group insurance. Most that cite the Grameen bank as a success story attribute its success to the ability of the joint liability arrangement to induce borrowers to provide mutual assistance in hard times (Besley and Coate 1995).

Joint liability lending has not only become a technology of choice for lending institutions, but is also favored by borrowers. Given a choice between individual; and group lending, beneficiaries usually prefer group lending. In a study on Guatemala credit groups from *Genesis* Sadoulet (2003) observes that borrowers were offered a choice between individual and group loans. Both types of loans carried the same monthly interest rate of 2.5 percent, had the same term and were for the same purpose. Sadoulet notes that the individual and group contracts were identical in every aspect except for the extra joint liability, and yet two thirds of the borrowers chose group loans. The main reason for choosing group loans stemmed from the intra-group insurance that emerges in credit groups. They note that in about 60 percent of the credit groups, at least one member needed help making payment in the past 12 months.

Understanding the way groups perform with regards to risk sharing, is particularly important for two reasons. First, for the moment, despite the high capacity of most MFIs than credit groups (composed of poor and risk-averse borrowers) to absorb credit risks, the MFIs are unwilling to take up this responsibility. It therefore appears that most certainly, groups will continue to be an important source of insurance for loan repayment among the members despite its efficiency and welfare costs.
Second, as pointed by Wydick(1999), although it is unlikely that fostering this type of intra-group insurance is one of the stated goals of group lending institutions, the positive externalities of having such insurance available to a household are obvious. Thus in the

process of establishing borrowing groups, the credit institution is also fostering the development of hundreds of miniature social-security networks that might also be exploited by other development agencies with a community approach.

In most cases it has been assumed that when ever joint liability contracts have been explained to the borrowers, signed, and loans disbursed, members should be willing to offer mutual insurance. This is, however, not true as there are situations where some group members will renege their insurance promise. In Malawi case for example, Diagne et,al. (2000) note that out of about 100 credit groups that received loans from the Malawi Rural Finance Company (MRFC) in 1999, only 89 percent reported that all group members understood at the time of group formation that they could have to repay the defaulted loans in order to regain their access to credit. Interestingly, 26 percent of them declared that non-defaulters in groups would never agree to repay the defaulted loan on behalf of defaulters, while 32 percent said that they would pay only if the defaulted loans were small enough. Only 42 percent indicated full willingness to repay loans of defaulters in their groups. This is a clear example of a situation where the joint liability mechanism is not functioning as expected. When intra-group insurance fails, it defeats the very foundations upon which the joint liability clause is built. Unwillingness to insure each other by group members is the unwillingness to pay the joint liability value of the loan, which could result into losses for the lending institution and further exclusion of the poor from financial markets.

The objective of this paper is to examine extent to which intra-group insurance occurs in credit groups and investigate determinants of the willingness to offer such insurance. This allows us to test the significance of productivity shifters, peer selection, peer monitoring, covariance of output, dynamic incentives, in enhancing mutual insurance. The rest of the paper is arranged as follows: section two reviews related research and section three presents the theoretical and empirical model. Section four describes the data used in the analysis, while results and discussions are presented in section five. Conclusions and policy implications are presented in section six.

2.0 Intra-group insurance: review of related research

While perceived advantages of group lending through mutual insurance appear to be obvious, empirical research has lagged behind. Varian (1990) notes that joint liability lending can be advantageous for lenders if group members can insure one another across states of nature that are unobservable to the lender. Group members need incentives to mutually insure against idiosyncratic risks by repaying loans for members with true failure. In an attempt to investigate incentives required to promote intra-group insurance, Wydick (1999) examines the role of social cohesion in stimulating intra-group insurance

among credit groups from Guatemala and observes that peer monitoring is a key determinant of intra-group insurance.

Rai and sjodtröm (2000) argue that joint liability is not enough to efficiently induce borrowers to help each other. If borrowers share information about productivity shocks that the bank does not possess, then efficiency requires that borrowers send reports to the bank. They note that in practice such *cross-reporting* occurs at village meetings, where loan repayments are collected by Grameen (Rahman, 1999). The implication of their argument is that, where there is no cross reporting it is more likely that members with good payoffs will renege their insurance promises as there is little incentive for them to help repay their peer's loan.

The role of dynamic incentives has been well documented in theoretical literature. Dynamic incentives are important in group contracts because they are the main mechanism available to the lender to enforce repayment through the threat of terminating a credit relationship. Meza (2000) notes that the set of incentives implicit in group contracts relies on the value of long–term relationship between funds-constrained borrowers and imperfectly informed lenders. As the relationship matures, the relaxation of the funds-constraint on the borrower's side may threaten the long term stability of the program as the incentive to repay tends to weaken. In a similar context, Diagne (1998) notes that the value of future access to loans, (dynamic incentives) is an essential element in understanding joint liability. Diagne notes that it generates interdependency among group members and in turn interdependency generates peer pressure. The knowledge that each member belongs to a group where they are supposed to insure each other in order to access loans in future creates an incentive for monitoring and auditing within group members. The significance of dynamic incentives is also acknowledged by Sadoulet (2003). Sadoulet notes that by denying access to future loans to all group members of a defaulting group, joint liability helps in making the insurance promise credible within credit groups and thus reneging on insurance promises is minimized. This is because if a partner fails to fulfill an insurance promise ex-post, the borrower too will loose access to future loans. In this way the MFI sanctions borrowers who renege on their insurance promises.

Questioning the sustainability of intra-group insurance, Wydick (2001) observes that intra-group insurance is sustainable as along as the loss of future access to credit sufficiently costly. While dynamic incentives are linked to the generation of interdependency among members, the extent to which it induces the willingness of group members to help each other in loan repayment is un determined. Above all it is not established as to whether it is through the enhancement of intra-group insurance that dynamic incentives improve repayments.

The other side of literature has attempted to explore the shortcomings of overemphasizing on intra-group insurance as a means to improving loan repayments. In this regard, Varian (1990) notes that the major problem as it relates to mutual insurance lies in its weak

insurance capacity. This may occur in groups that are homogenous in terms of wealth such that their risk sharing ability is constrained. In addition, mutual insurance is only possible when group members face idiosyncratic shocks and may be ineffective for covariate shocks. However, even for idiosyncratic shocks, group members can only ensure each other below a certain minimum level of default, otherwise joint liability may lead to the domino effect (one group member defaults and the rest follow) once members realize that the group will default, and therefore, its future access to loans likely to be terminated. However most theoretical studies still accept that mutual insurance is beneficial under any scenario. For example, Varian (1990) and Rashid and Townsend (1992) explore the significance of mutual insurance among group members in the presence of idiosyncratic shocks, and if borrower returns are not highly correlated and observe that mutual insurance is beneficial to group members.

Although the role of peer selection in enhancing repayment has been acknowledged in most literature, there are disagreements as to the extent to which it can be used to enhance intra-group insurance. Questioning the significance of peer selection at group formation, Sandoulet and Carpenter (2001), argue that group formation through self selection may lead to both homogenous and heterogeneous groups with respect to risk depending on the circumstances. They observe that when joint liability leads to heterogeneous groups, riskier members pay a premium in good states of nature to safer borrowers. In the same context Kugler and Oppes (2005) observe that by allowing transfers between members, heterogeneous formation of the group is Pareto improvement over homogenous formation, however it is not obvious that peer selection leads .heterogeneous groups.

From the discussion above it is apparent that literature is not conclusive as regards the component of the joint liability mechanism that is important in explaining the willingness of group members to offer mutual insurance. In the next section, we present a theoretical framework describing the circumstances under which intra-group insurance is feasible.

3.0 Theoretical Framework for risk sharing

There are several occasions where group members will need support from other members in order to repay their loan. After loan disbursement some borrowers may take a risky action of not investing the loan in a safe project or misuse the loan, known as *ex ante* moral hazard. This leads to repayment problems which will eventually require the

contributions from other members to settle the loan in the event that the member who misused the loan is un able to pay himself. Even after investing the money in a good project, there is a risk that a good project could fail. Once the project fails, the borrower is bound to face repayment problems that require the support his peers. Insurance is also important where a borrower with a successful project decides to willfully default (*ex post moral hazard*) because they want to maximize their private benefits. Intra-group insurance enables the lending institution to recover its money in the event of both, moral hazard, or idiosyncratic shocks.

The theoretical framework presented below illustrates how intra-group insurance can be used to harness market failure among poor households that have no collateral. The framework is mainly based Kugler and Opess (2005). We start by discussing the individual borrowing as a benchmark and then later present the case of joint liability.

3.1 Individual lending

We start by assuming a risk neutral borrower requiring one unit of capital lasting one period and that yields θ units of income. The project return is unknown at the beginning of the period, however, it is assumed that it is distributed on $^{\tau}\underline{\theta},\bar{\theta}^{o}$ according to the continuous distribution function F(θ) and satisfying $F(\underline{\theta}) = 0$. At the end of the period the borrower has to repay the principal plus interest of an amount r>*1*. When the borrower defaults he incurs a penalty $p(\theta)$ which is assumed to be a continuous and increasing function. The penalty function represents a loss to the borrower due to seizure of profits from the project by the lender and it increases with project returns. The borrower chooses the repayment option only if the cost of repayment is less than or equal to the penalty in the case of default ($r \le p(\theta)$). We relate the penalty function and the cost of repayment to the project return by specifying a critical project return at which a borrower is indifferent between repayment and default. Thus the critical project return is specified as $\theta = \phi(r)$, where $\phi(.) \equiv p^{-1}(.)$ is defined as the inverse of the penalty function, $p(.)$. Considering that the penalty function is increasing in project return, it means that the loan can only be repaid if the project return is greater than the critical project return. The probability of repayment and individual borrowing is therefore given by the following expression;

$\Pi_I(r) = 1 - F(\phi(r))$, with $F(\underline{\theta}) = 0$

The underlying assumption is that $\phi(1) \ge 0$ such that it is not possible to make repayment for every project return.

3.2 Joint liability borrowing

Taking the two borrower joint liability scenario, the two acquire a loan of two units of capital at the beginning of the period, each running an independent project. At the end of the period they earn returns θ_1 and θ_2 for individuals 1 and 2, respectively. Assume

further, that they are jointly liable to repay a total loan principal plus interest rate of $2r$ at the end of the period.

Loan delinquency is assumed to attract penalties of $p(\theta_1)$ and $p(\theta_2)$. The repayment game is explained in two stages. In the first stage of the repayment game, both borrowers decide whether or not to contribute to their share, r. If they both contribute, the loan is repaid and their payoffs are $(\theta_1 - r, \theta_2 - r)$. However, if they fail to contribute, the loan is not repaid and the following penalties are imposed on them by the lender: $(\theta_1 - p(\theta_1), \theta_2 - p(\theta_2))$. If one of the borrowers decides not to contribute at the second stage of the repayment game, the other borrower has to decide whether or not to repay the whole loan alone. Assuming borrower two decides not to contribute and the loan is repaid by borrower 1, the following pay off will result: $(\theta_1 - 2r, \theta_2)$. If they both decide not to repay, the following payoff results; $(\theta_1 - p(\theta_1), \theta_2 - p(\theta_2))$.

The former option in which borrower 1 pays his loan plus the loan of borrower 2, is advantageous to borrower 2 because he does not have to face sanctions from the lender.
A joint liability payment is only possible under two scenarios as follows;
First if the return from one of the group members is equal to or greater than the critical project returns for the two borrowers combined, thus $\theta_i > \phi(2r)$ *for either i=1 or 2.*
Second, the joint liability payment is also possible when $\phi(r) < \theta_i \leq \phi(2r)$ for both borrowers. Otherwise when ever the critical value of either of the individuals is greater than the project return for only one individual, ($\phi(r) > \theta_i$ *for either i=1 or 2)* mutual insurance will not be possible, and group default is likely to occur. The repayment under group lending can thus be expressed as follows:

$$\Pi_G(r) =^{\tau} 1 - \{F(\phi(2r)\}^{2o} + \left[F(\phi(2r) - F\phi(r)\right]^2$$

Comparing the repayment rate under joint liability lending with individual lending gives us the following equation:

$$\begin{aligned}\Pi_G(r) - \Pi_I(r) &=^{\tau} 1 - \{F(\phi(2r)\}^{2^0} + \left[F(\phi(2r)) - F(\phi(r))\right]^2 - \left[1 - F(\phi(r))\right] \\ &= F(\phi(r))\left[1 - F(\phi(2r))\right] - \left[F(\phi(2r)) - F(\phi(r))\right]F(\phi(r))\end{aligned}$$

The above equation is expression of the trade-off faced by lenders who would like to adopt group lending to improve repayment rates. Of more relevance in our analysis is the first term which represents the effect of intra-group insurance. The term is the probability that one borrower will have a return above $\phi(2r)$, when the other has a return below $\phi(r)$. Under individual lending, a return below $\phi(r)$ would lead to default. Under joint liability lending, however, a borrower with a return above $\phi(2r)$, will apart from paying his own loan also repay the loan for the other borrower with a lower return. This form insurance is the main basis of joint liability lending. The second term represents the negative spillover from individual default under joint liability. It is the probability that one borrower has a return between $\phi(2r)$ and $\phi(r)$ while the other has a return

below $\phi(r)$. While under individual lending, the borrower with a return above $\phi(r)$ would repay, under joint liability, he/she may decide to default because the cost of repaying both loans exceeds the penalty of default. This is a form of strategic default that all joint liability lending institution would like to avoid.

From the forgoing discussion, mutual insurance can be said to be directly related to borrower returns (θ_i) and the cost of repayment (r), both of which determine the critical value. The two are of interest in this study because they vary substantially with loan and group characteristics. Nevertheless, this is only one side of the story as the framework emphasizes on the issue of project returns. In reality there are situations where individuals may renege their insurance promises willfully. This is particularly likely to occur in credit groups from Malawi, where cross-reporting doesn't take place. Under such circumstances, it is likely than more than project returns, other factors that have been highlighted related to group dynamics will influence the likelihood of mutual insurance.

In order to assess the probability of mutual insurance in group lending, we relate group specific characteristics which proxy, correlation of borrower returns as a measure of risk sharing ability, productivity, and variables that reflect the cost of insurance, with the *willingness* of group members to offer mutual insurance. In addition to these variables we also include the following variables: peer monitoring, peer pressure, dynamic incentives, and variables capturing incentive match or matching problems in loan demand and supply.

4. Data

The study is based on data collected by the International Food Policy Research Institute (IFPRI) in 2000 form 97 MRFC credit groups located in 4 of the 27 satellites offices of MRFC. The four satellite offices are located in 4 different districts of Malawi. The groups were randomly selected based on information obtained from MRFC's Management information System. The four sites cover the three regions of Malawi (Central , South and North) Because of logistical constraints, the sample frame of the groups in each satellite office was restricted to 2 field offices only[1].
Using the 1996/repayment status, groups were classified into 3 categories: fully– paid groups, partially-paid groups and nothing-paid groups. A stratified random sampling procedure was then used to randomly select the sample groups from the three selected strata. A group was classified as fully paid if the 1996/97 group loan was fully paid. It was classified as a partially-paid group if only part of the 1996/97 group loan had been paid at the time of the survey. And a group was classified as nothing-paid if no member had paid anything for the 1996/97 loan. The field work consisted of three rounds. The first two rounds took place in June and November 1998, respectively, while the third round was carried out in August 1999. The data used for our analysis comes from the

[1] The average number of offices per satellite office is 5

second round of the survey. For the second round data, a group leader and three randomly selected members were interviewed for each group. One non-participant and one past participant randomly selected but living in the same village were also interviewed. A detailed structured questionnaire covering the formation, composition and repayment history of was administered to each respondent. The questionnaire specifically included questions aimed at quantifying the degree of information asymmetry within each group and the extent to which peer selection, peer monitoring and peer pressure had been taking place. Also collected using the questionnaire was the extent to which the joint-liability has been enforced in each loan cycle.

To measure insurance in groups we rely on the information provided by group leaders.
In the survey, group leaders were asked whether individuals in a group were willing to pay loans of defaulters when ever default occurred, and when ever that was possible, how much they would be willing to contribute.

As indicated in Table 1, although 91 percent of the group leaders indicated that group members understood that they were obliged to contribute to repay any defaulted loans if members in the groups defaulted, only 48 percent reported that members were always willing to provide insurance. About 21 percent reported that they would never agree to pay the defaulted loans, while 31 percent reported that they could agree to pay only if the amount was small. A comparison across credit programs indicates that members belonging to maize credit groups are less likely to be always willing to repay the defaulted loans (25%), as compared to tobacco groups (56%) and non-farm business groups (54%).

When asked how much they would be willing to contribute to pay the defaulted loans in order to maintain their access to credit, the average amount reported is 514 Malawi Kwacha (MK), which is about 12 US dollars or 24% of the average loan size per member[2]. Members belonging to tobacco groups are willing to contribute MK 839, which is higher than the amounts all other types of groups are willing to pay. Although this is beyond our interest, a detailed study on the characteristics of individuals within the group that are willing to contribute to pay defaulted loans would be a great contribution to the microfinance literature. Due to limitation in the data, we fail to explore this.

The knowledge of the value of joint liability that group members are willing to pay, is of interest to lending institutions because it is an indicator of the amount of loan portfolio at risk. For example, in this study, members are only willing to contribute about 24 percent of the total loan value to pay defaulters loan. Adding a 15 percent compulsory deposit to the contribution gives us a total contribution of about 40 percent of the loan value per person. If we take a two borrower scenario illustrated in the framework, where one member fails to raise enough to repay his loan, it means that the remaining 60 percent must be paid by the defaulting partner. Nevertheless, since the defaulting partner also has a 15 percent compulsory deposit, it means that the defaulting partner has to raise at least 45 percent of the total loan value in order to fully repay the loan. A payment of less than 45 percent for the defaulting member leads to group default and is a recipe for strategic

[2] exchange rate ??

default since the cost of repaying a loan for the members with enough returns exceeds the perceived benefits. Extending this line of thinking to a group of more than 2 members, at least half of the group members must fully repay their loan, while defaulting members must raise at least 45 percent of the loan value from their investment if group default is to be avoided.

Table1: Willingness to pay defaulters loan by type of credit group

Willingness	Tobacco (%) (n=40)	Maize (%) (n=20)	Cotton (%) (n=4)	Non-farm (%) (n=23)	All
Whether understood repayment of defaulter's loan	93	90	75	90	91
Always willing	56	25	25	54	48
Willing only if small	24	50	50	36	31
Never willing	20	25	25	10	21
Average amount willing to contribute	680 (839)**	335 (496)	210 (200)	435 (414)	514 (663)

***** Calculate as a proportion of individual loan**

In order to test the hypotheses outlined in literature regarding factors that explain the incidence of mutual insurance in groups, we start by capturing the willingness of group members to provide mutual insurance if a member defaults a loan. From there we create a dependent variable, MUTUAL, which is equal to 1 if it was reported that members were *always* willing to provide mutual insurance, and 0 if member were only will under certain conditions or never willing at all. Descriptive statistics for explanatory variables used are described in table 2.

Table 2: Descriptive statistics

Dependent Variables	Description	Mean	S.D
Productivity			
AVGLAND	Average land holding of group members in acres	3.17	1.471
EDUCATION	Average years of formal education of group members	4.72	1.533
Screening			
SCREEN	Whether some individuals who wanted to join the group rejected	0.439	0.490
FASCREEN	Group was formed by the Agricultural extension worker (1=yes, 0=no)	0.46	0.499
PEERSELECT	Whether group was initiated by peers (1=yes, 0=no)	0.241	0.428
VHSCREEN	Group was formed by the Village headman (1=yes, 0=no)	0.12	0.321
Peer monitoring			
JOINTENTERP	Members have joint enterprises (1=have joint enterprises)	0.6	0.533
GCOMPNAI	Percentage of group members not knowing group composition	0.066	0.147
GLONCNAI	Percentage of member not knowing loan characteristics		
Social ties			
VILLAGENUMBER	Number of villages from which members come	2.76	2.039
PMFAMVG	At least one member is from the family of a village headman (1=yes)	0.82	0.383
POLITCLAN	Number of members from the clan of a politician	0.61	1.083
CHAIRFAMILY	Number of members from the family of club chair person	1.50	3.012
GENDERHOMO	Whether gender composition of the group is mixed (1=yes, 0=no)	0.57	0.496
Dynamic Incentives			
CONTRIBPAY	Whether would be willing to pay full cost of defaulters loan (1=yes, 0=no)	0.46	0.500
PAYPENATY	Would only be willing to pay ten percent penalty	0.37	0.485
PAST SACA	At least one member was from past failed credit programs (1=yes, 0=no)	0.78	0.415
Incentive Match			
NEWMMBAVG	Number of new members in the group	1.41	2.732
LONCYCLE	The loan cycle for which loan was received (1-5)	2.74	1.051
Risk pooling and cost of insurance (covariance)			
COVLOSS	Measure of coincidence of idiosyncratic shocks	-0.04	0.366
COVOCCUP	Measure of Occupational homogeneity within the group	0.27	0.325
COWEALTHOMO	An index of wealth heterogeneity (1=Group is homogenous)	0.14	0.343
COVLOANVALUE	Measure of loan Variation within group members (CV)	0.35	0.293
Control Variables			
GPSIZE	Number of members at the start of the season in a credit group	16.84	5.563
CREDLIMIT	Average Credit limit in a group per individual	4642.38	3822.1
MAIZE	Dummy for maize credit group (1=maize, 0=otherwise)	0.19	0.393
COTTON	Dummy for cotton credit group (1=maize,0=otherwise)	0.042	0.201
NON-FARM	Dummy for non-farm credit group (1=maize 0=otherwise)	0.30	0.462

Source: Own calculation from IFPRI/RDD survey 2000

Covariance of out put, as a risk pooling factor

Varian (1990) and Rashid and Townsend (1992) explore the significance of mutual insurance among group members in the presence of idiosyncratic shocks, and if borrower returns are not highly correlated and observe that mutual insurance is beneficial to group members. We test the validity of their proposition by incorporating such variables in our empirical model. The covariance of out put among group members is captured by two variables. First, COVLOSS which measures the coincidence of idiosyncratic shocks such as crop loss from bad weather, illness or death among group members. It is a measure of the probability of having group members facing shocks at the same time. COVLOSS was captured by asking group leaders about whether each group member faced crop loss or income loss due to shocks in the past 2 years. The variable was constructed as a probability that two respondents chosen at random from the same group reported having economic shocks in the same year. Consider G_{sz} as the number of members in a credit group and S_{sy} as the share of group members who reported facing an economic shock in year y . The probability is equal to

$$\frac{(\sum_{y=1}^{2} s_{sy}{}^{2}) - 1/G_{sz}}{1 - 1/G_{sz}}$$

Second, COVOCCUP, which is an indicator of the occupational homogeneity within the group, measures the probability that two randomly chosen group members have the same occupation. The index is computed in the same way as above. We assume that the capacity of members to share risks increases with occupation heterogeneity as it is associated with covariance of output in the group.

COWEALTHHOMO is a proxy for wealth homogeneity of the group. It is equal 1 if the group is homogenous in terms of wealth and zero, otherwise. We expect groups with high heterogeneity in wealth to have a stronger risk pooling ability and therefore to be more willing to provide mutual insurance.

Cost of insurance

COVLOANVALUE is the measure of the cost of mutual insurance to group members once a member defaults. It is a measure of the variation in loan sizes among group members calculated as a coefficient of variation Loan size heterogeneity can work against mutual insurance because of the unequal costs of insurance. The cost can be too high if the paying members with small loan sizes are expected to pay defaulted loans for members with larger loans. In addition group loan size heterogeneity is not conducive to peer monitoring as it makes it difficult for group members to monitor their peers. We therefore expect higher loan variation to have a negative impact on the willingness of members to provide mutual insurance.

Productivity

The inclusion of variables capturing group productivity is based on the intuition that higher productivity increases the payoff which will enable members to get returns above the critical amounts required for repayment. Having returns above the critical payoff also increases the likelihood that members can pay the joint liability value when one of the group members defaults.

For this study we use two variables to capture group productivity, namely, the average land holding size of group members in acres, (AVGLAND) and the average years of education of the group members (EDUCATION).The later is also proxy for the level of human capital and is of direct relevance to productivity.
We expect that both variables will have a positive impact on mutual assistance as we expect groups with more education and more land to be more productive. This enables them to get higher pay offs, than can enable them to pay the joint liability value when one of the group members defaults.

Screening

Screening is an important aspect in group lending. We capture the extent of screening using a number of variables. First we capture whether there are some non-members that were rejected by the group at group formation,(SCREEN). Our a priori expectation is that the likelihood of mutual assistance should be high in groups with evidence of screening. In addition there are three variables that capture the extent to which peer selection is taking place during the group formation process. In theory, peer selection has been cited as an important tool for screening bad from good borrowers. We therefore, include the variable PEERSELECT as a dummy variable (1=formation through peer selection, 0=others), which is used to capture whether or not a group was self-formed by group or village members. We expect that the likelihood of willingness to provide mutual insurance will be high in groups that were formed through peer selection than in the rest of the groups.

Nevertheless, peer selection at group formation is rare. In this survey, for example, less than a third of the groups were formed by ordinary village residents (peer selection), while the rest were formed either by the village chiefs or by the agricultural officers and credit assistants. This forces us to include two extra variables to capture the extent of screening. FASCREEN is a dummy variable capturing the formation of groups by the Extension workers, while VHSCREEN is another dummy variable capturing the formation of a group by a village chief. The two (village chiefs and extension workers) have significantly different roles in the society. The expected signs for the two are undetermined because it depends on the honesty and efficiency of the screening agent.

Social ties

Coleman (1993) observes that social capital functions as a source of social control. In concurrence with this notion (Oloma 2000) notes that through social homogeneity, rule enforcement, and trust can reinforced, both of which will enhance social capital. Oloma observes that the capacity to the capacity to enforce rules (social control) in groups where members are socially homogenous is higher than in groups with membership heterogeneity. Following this proposition, there is now a presumption that groups that are homogenous in terms of wealth, social status or kinship should have lower default rates than heterogeneous groups. Floro and Yotopolous (1991) show how the success of group lending can be attributed to its ability to harness social ties between borrowers to improve loan repayment. This is based on the assumption that people with close social ties know each other better and that they are more likely to be averse to harming each other through default. Generally, we expect the willingness to offer mutual insurance to be an increasing function of social ties.
We use six variables to capture the magnitude of social ties within a borrowing group. COWEALTHHOMO is a proxy for wealth homogeneity of the group. It is equal 1 if the group is homogenous in terms of wealth and zero, otherwise. The willingness to offer mutual insurance should be incidence of moral hazard should be lower in groups that are homogenous in terms of wealth. VILLAGENUMBER measures the number of villages from which group members come. The larger the number of villages relative to the group sizes the smaller the social ties. This variable is expected to have a negative sign.

PMFAMVG measures the presence of some members that come from the clan or family of a village headman in a group. The village chiefs have considerable influence on the operations of seasonal agricultural groups because of the MRFC requirements for their signatures before the fertilizer loan packages are delivered to club officials. The presence, therefore, of a village chief in the group or indeed his/her relative will have significant effects on the quality of interactions within the group. The expected sign for this variable is, however, undetermined.

POLITCLAN measures the presence of group members that are from the clan of a politician. Political leaders in Malawi have a significant impact on the way loan are perceived by the borrowers and this can have a significant impact on moral hazard behavior and hence repayment. The collapse in 1994 of a government administered credit program, the Small holder Agricultural Credit Administration (SACA) was mainly attributed to the political influence. Politicians were blamed for sending conflicting massages to the borrowers during their political campaigns, such that most borrowers believed that the loans were donations from government. We, therefore, expect some political influence on groups that have social ties with politicians, although we don't have a predetermined expectation as their influence on intra-group insurance

CHAIRFAMILY represents the number of group members that belong to the family of a group chair person. Considering the strength of influence that the chairperson has on the

group we expect his quality of leadership to have a direct impact on the behavior of individuals within the group. His influence if further exacerbated when the chief has members of his family or clan within the groups. We don't have a priori expectations for the impact of the three variables associated with leadership

The variable GERNDERHOMO is a dummy capturing the homogeneity of gender in the group. It is equal one where the gender of the group is mixed and zero otherwise. We expect that gender homogeneity will promote mutual assistance through stronger social ties.

Peer monitoring

The inclusion of peer monitoring variables in an analysis of intra-group insurance based on theoretical propositions by Conning (1999) and Armendariz (1999), who show that peer monitoring reduces dishonest behavior promotes togetherness among group members. We construct peer monitoring indicators following Diagne (1998) who notes that in order for peer monitoring to be an effective substitute to the lender's own monitoring activities, group members must: 1) have better access to relevant information and 2) be willing to engage in peer monitoring activities to enforce proper loan use or report any incidence of moral hazard. The survey used two methods to obtain evidence of the two components.

First, the proportion of members responding "I don't know to specific questions on group composition and loan characteristic variables. The percentage of members from each group indicating that lack of knowledge of the group and loan characteristics is taken as an a measure of poor access to relevant information and the degree of information flow within groups, respectively.

As described above the variable GCOMPDNI measures the percent of group members not knowing group composition, while GLONCDNI measures the proportion of group members that don't know the characteristics of the loan. With regards to loan characteristics the variable captured the knowledge of sizes, duration and interest rates by group members. Both variables are assumed to be good indicators of monitoring. We expect the willing ness to offer intra-group insurance to increase with improved information flow within the group.

Second, the survey captured the extent of monitoring by asking members whether they owned joint enterprise at group level (PMJOINTENT). This is a dummy variable and it is equal 1 when it is reported that at least some members have joint enterprises within the group, and 0, otherwise. We expect that the willingness to provide mutual insurance to be high in groups that have join enterprises. This is because when an individual fails to repay, there will be less suspicion about his or her failure and thus members will be more willing to assist.

Dynamic incentives and further access to credit

Dynamic incentives are based on stated preferences and willingness to pay as opposed to the actual behavior. We expect dynamic incentive constraints resulting from joint liability to create incentives for peer selection peer monitoring and peer pressure. The value of future access to credit can best be captured by discounting benefits from future access to credit and comparing with benefits from not repaying. In the survey these were captured by asking the following question: If you are in a group where some members have defaulted but you have fully repaid your loan, and you were asked, in addition to loosing you 15 percent required deposit, to choose among the following three options, which one will you choose?

1. Contribute to repay in full the loans of defaulters, and be part of a new group where the defaulters are excluded
2. pay another 10% penalty and be part of a new group where the defaulters are excluded
3. Accept a lower loan size next time and be part of a new group where the defaulters are excluded

The first option is directly related to the full joint liability principle (no loans to non defaulters until all loans are paid). The two other options were aimed at exploring alternative liability options (limited liability) which would maintain the same incentives for peer monitoring and peer pressure, both of which have direct relevance to enhancing mutual insurance. Diagne (1998) notes that the key difference between the three options is that in the first one the penalty is dependent on the total amount of defaulted loans while it is not in the two other ones. The rational behind these two alternative options is that they should lead to fewer strategic defaults compared to the first option. Therefore, the first option should lead to higher penalties among non defaulters in a group where there are more defaulters. A choice of the first option is an indication that they attach a higher value to future access to credit, which would have a positive impact on enhancing mutual insurance. The inclusion of these variables in our model also helps us to explore the potential of limited liability contracts in enhancing moral hazard. The two options are entered as dummy variables. CONTRIBPAY is equal one when the first option is chosen and PAYPENATY is equal 1 when the second option is chosen.

An extra variable is included to capture dynamic incentives and the value of future access to credit. PASTACA captures the presence of at least one member in a group, who was from the past failed credit program where people defaulted and therefore the program was discontinued. The presence of such members in a group should decrease the degree of cooperation and willingness to provide mutual insurance in the group as they may not attach a high value to credit access from the current institution following their past experience in a failed program.

Incentive match

In order to capture incentive match in a group we introduce two variables in the model. First we include the a measure of the age of the group (LONCYCLE). Theoretically, the age of a credit group is negatively associated with repayment. Paxton (1996) notes that as the age of the group increases, group members acquire different skills and they develop

divergent credit requirements. The matching problems arises when the demand and supply for credit among group members can no longer match which could lead to default by some members whose supply of credit is not incentive compatible. In most cases group lending starts with high repayment rates. However, this declines with time. Therefore, we expect the willingness for members to offer mutual insurance to decrease with an increase in the loan cycles.

Second, we include a variable that captures the presence of new members in a group (NEWMMBAVG) at the beginning of the loan cycle. Screening among groups is continuous as group members continue to exclude bad risk borrowers and replace them with safe ones. However this could also lead to a matching problem sighted by Paxton (1996). The matching problem arises when credit terms and conditions are no longer appropriate for each member as credit is repeated again. Though not necessarily in the same context as mentioned by Paxton, the presence of new members in a group potentially introduces the same problem since they enter the group after their colleagues have already developed several entrepreneurship skills that also change their credit requirements. We expect that the presence of a matching problem in a group will increase the likelihood of moral hazard.

We introduce a number of control variables as follows:
GPSIZE is a measure for the size of the group**.** Theoretically group size may affect intra-group insurance and repayment in a number of ways. Smaller group sizes are good for easy monitoring and thus may lead to higher repayment rates. However, larger groups can give better insurance on their members. However we expect the willingness for mutual assistance to high in smaller groups. (CREDLIMIT), is the maximum amount of credit a group can access at any time. Its impact on mutual insurance is undetermined
We include program dummies for the maize group (MAIZE), Cotton group (COTTON), and non farm income generating activity group (NONFARM).

Following the explanatory variables stated above, the empirical strategy focuses on testing whether or not particular covariates, vector $X=(X_1 \ldots\ldots\ldots X_n)$ are associated with the willingness to offer intra-group insurance. The probability of intra-group-insurance in a specific group *g* as a function of covariates can be written as $P(I^g = 1 \mid X^g)$. This leads to the following likelihood function:

$$\prod^{G} P(I^g = 1 \mid X^g)^{Ig} [1 - P(I^g = 1 \mid X^g)^{1-Ig}$$

The repayment model $P(H^g = 1 \mid X^g)$ can thus be written as a function $P(B' X^g)$, where *B*
B is an Mx1 vector of parameters and X^g is an Mx1 vector containing group g´s values for the M covariates. We, therefore use probit model to generate estimates of the effects of the above-explained variables in mitigating or inducing moral hazard. The estimation is of the following form:

The following probit model was used to generate estimates of the effects of the above explained variables in enhancing the ability and willingness of group members to provide mutual insurance:

$$\Pr(y=1\,|\,x)=\alpha+\sum_{i=1}^{\Pr=2}\beta_{1i}x_{1i}+\sum_{i=1}^{Scr=4}\beta_{2i}x_{2i}+\sum_{i=1}^{pm=3}\beta_{3i}x_{3i}+\sum_{i=1}^{st=5}\beta_{4i}x_{4i}\sum_{i=1}^{pp=2}\beta_{5i}x_{5i}+\sum_{i=1}^{Dinc=3}\beta_{6i}x_{6i}+$$

$$+\sum_{i=1}^{\mathrm{Im}=3}\beta_{7i}x_{7i}++\sum_{i=1}^{Rikp=4}\beta_{8i}x_{8i}+\sum_{i=1}^{Ctr=5}\beta_{9i}x_{9i}$$

Where:

x_1´s are a set of variables (Pr=2) that measure group productivity

x_2´s are a set of variables (Scr=4) that measure the quality of screening

x_3´s are a set of variables (pm=3) that measure the quality of peer monitoring

x_4´s are a set of variables (St=6) that measure the strength of social ties within the group

x_5´s are a set of variables (Pp=2) that measure the quality of peer pressure

x_6´s are a set of variables (Dinc=3) that measure the quality of dynamic incentives

x_7´s are a set of variables (Im=3) that the proxy the degree of incentive match

x_8´s are a set of risk pooling variables (Rskp=4) plus the cost of insurance

x_9´s are a set of variables (Ctr=5) that are control variables

Results and discussions

The main objective of this section is to investigate the role of group dynamics on group member's willingness to provide mutual insurance among credit groups. The model results from probit estimation are presented in Table 3.

In concurrence with the a priori expectations, the within group coefficient of variation for the loan size (COVLOANVALUE), which is a proxy for the cost of insurance is negative and significant. Only one of the risk pooling variables which also measure the covariance of output returned a significant coefficient. The covariance of occupation (COOCCUP) is weakly significant and negative. A higher correlation in the occupation of group members increases the probability that they would face similar idiosyncratic shocks at the same time which would make it difficult for members to assist each other.

Among the productivity variables, the average land holding size for the group (PROARABLE) has a significant and positive impact of the willingness of members to provide mutual insurance. The results conform to the a priori expectations as households with larger land holdings are also likely to be rich, and therefore capable of providing mutual assistance in the event that one member of the group fails to repay the loan. However the average level of education has the expected sign, but its is insignificant.

All screening variables, except one perform poorly. Results indicate that members in groups that were initiated by the village chief (SCRVGHEAD) are more likely to provide mutual insurance. This explains the significance of traditional leaders in Malawi. Thus although peer selection is recommended, the involvement of a traditional leader in the

early stages of group formation appears to play a positive role in enhancing the performance of credit groups.

Table 3: Determinants of intra-group insurance-Probit Estimates

Explanatory variables	**Coefficient**	**Z-statistic**
Productivity		
PRODARABLE	0.310**	2.1
PRODLEVELSCH	0.148	1.23
Screening		
SCREEN	0.588	1.37
SCRFA	0.714	0.87
PEERSELECT	1.110	1.33
SCRVGHEAD	2.298***	2.64
Social ties		
VILLAGENUM	-0.198*	-1.67
PMFAMVG	1.271**	2.43
POLITCLAN	-0.539	-1.45
CHAIRFAMILY	0.386***	2.8
PMGENDERHOMO	-0.195	-0.5
Peer monitoring		
PMJOINTENT	-0.078	-0.21
GCOMPDNI	-1.188	-0.64
GLONCDNI	0.754	0.43
Dynamic incentives		
CONTRIBPAY	2.090***	2.76
PAYPENATY	0.405	0.65
PASTSACA	-0.717	-1.54
Matching problem (incentive match)		
NEWMMBAVG	-0.334**	-2.27
LCYCLE	-0.504	-1.62
Risk pooling and cost of insurance		
CVLOANVALUE	-1.706***	-2.69
COVLOSS	-0.589	-0.88
COVOCCUP	-1.131*	-1.94
COWEALTHHOMO	0.759	1.19
Control variables		
GPSIZE	-0.020	-0.48
MAXIDLMG	0.000	0.41
MAIZE	-1.704**	-2.13
COTTON	-1.092	-1.06
NONFARM	-0.446	-0.93
_CONS	-0.721	-0.44
Total of observation	99	
Observation with dependent =0	54	
% Correctly predicted	84.85	
Wald chi2(23)	51.59	
Prob > chi2	0.0043	
Pseudo R2	0.4944	
Log pseudo-likelihood	-34.59	
Prob > chi2	0.0043	

Source: Own calculation from IFPRI/RDD survey 2000

*** Significant at 1%; ** significant at 5 %

Three of the social ties proxies are significant. Groups composed of members from many villages (VILLAGENUM) are less likely to have stronger ties among the members and therefore the likelihood of mutual assistance is low. Groups with some members that are related to the village chief (PMFAMVG) and group chairperson (CHAIRFAMILY) have a higher probability of exercising mutual insurance. The coefficients for the two variables are positive and significant at 5 % and 1 %, respectively. The significance of the two would suggest that the presence of such members in a group increases interdependency, and problem solving, and openness, all both of which have a positive impact on group morale and group cohesion. The presence of members that are related to a politician (POLITCLAN) is insignificant, but the negative sign is expected because in most cases, political influence is associated with information distortion, and lack of openness between group members.

The peer monitoring proxies PMJOINTENT, GCOMPDNI, and GLONCDNI, perform poorly, as they are insignificant and have mixed signs. The significant and positive coefficient of full joint liability option, which is a proxy for dynamic incentives, is not unexpected. This implies that groups that value highly the access to further credit (as revealed by willingness to pay a full value of the defaulted loans in order to maintain further access), are more likely to offer mutual insurance to the members. The other two proxies for dynamic incentives, PAYPENATY and PASTSACA are not significant.

The presence of new members in the group (NEWMMBA) as proxy for incentive match is negative and significant. When new members join the group they bring in new skills that are different from the old members in the group. As a result, their loan requirements are different from the other group members. MRFC has a policy of increasing the amounts of loans for each subsequent loan cycle. In addition MRFC has observes a three-tier variable interest rate structure, in which prime customers pay the lowest rate, repeat customers pay a rate that is 2% higher than prime and first time customers pay 3% above the prime customer rate. This introduction of new members implies an increase in the variation of loan sizes, as well as an in increase in the variation of the cost of the loan as new members pay higher interest rates. A combination of the two raises the cost of insurance for some members such that they may be unable to provide mutual assistance to a defaulting individual with a larger loan.
In addition the matching problem arising from the in ability of the lending institution to much loan demand with loan supply for all the group members at once, leads to what Tuckman (1965) calls the adjourning behavior. This leads to the termination of task behaviors and disengagement from relationship, both of which have a negative impact on the willingness of group members to assist each other.

Only one of the control variables MAIZE is significant with a negative coefficient. This implies that mutual insurance in maize groups is less likely to willing to repay the defaulted loans. One reason is that the maize crop is far less profitable that tobacco, as such it is less likely that members in the maize groups will get returns that are higher that the critical values required for repayment to occur.

6.0 Conclusion

The aim of this chapter was to empirically analyze determinants of intra-group insurance using existing theoretical frameworks. Using group level data from Malawi we find out that while some variables conform to the a priori expectations, others do not. The significance of productivity shifters, social ties is not unexpected. We find that through high productivity and pre existing strong social ties, groups function as insurance networks. The significance of the willingness to accept full joint liability as opposed to limited liability reveals the importance of joint liability in strengthening cohesion. This encourages members to know and identify with one another, and I so doing building trust and interdependency. As expected, the presence of new members in the group, which potentially introduces a matching problem, works against mutual insurance

The cost of insurance, captured by the variation in loan size among group members, reduces the capability and willingness of members to provide mutual insurance. The findings on risk diversification are fairly consistent with theory and signify the importance of risk pooling factors in enhancing the group's ability to provide mutual insurance. All peer monitoring variables do not play a significant role in intra-group insurance activities

The implication of these findings for group lending as a tool for poverty alleviation is that, risk diversification, social ties, dynamic incentives and productivity shifter are a recipe for successful intra-group insurance, and that when such factors are carefully considered at the group design stage, peer monitoring will not be necessary.

The major limitation for this study, just like in other studies, is that we assumed that mutual insurance should occur in all groups. Our dependent variable is dichotomous, equal to 1 when ever the group members reported that they helped each other or than members are willing to help repay the defaulters loan.. Considering that intra-group insurance is *ex-post* internal repayment problem, it should never occur in groups that never faced internal repayment problems; therefore, an inclusion of groups that never faced repayment problems in the sample can result into misleading results. Thus future research on mutual insurance would focus on the occurrence of mutual insurance among groups that faced internal repayment problems (ex-post repayment), while correcting for the potential sample selection bias.

7.0 References