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Adverse selection and moral hazard in group-based lending

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Chapter 7 Peer Monitoring, Social Ties and Moral Hazard in Group-Based Lending Programs¹

7.1 Introduction

As mentioned in chapter 2 the group-based lending mechanism creates incentives for individual group members to screen and monitor each other and to enforce repayment. One of the expected outcomes of group-based lending mechanism is that it reduces moral hazard behavior of the participants.

While this outcome can be shown in theoretical models (see e.g. Stiglitz, 1990; Varian, 1990), there is surprisingly little empirical evidence on this issue. This is partly due to the fact that it is difficult to obtain reliable data on the behavior of participants in group-based lending programs. In this chapter, we provide an empirical analysis of the impact of peer monitoring and social ties within group-based lending programs on the moral hazard behavior of its participants, based on data from the two Eritrean MFIs. It is important to know whether group-based lending programs help to mitigate moral hazard behavior, since this may contribute to higher repayment rates, which in turn may improve the sustainability of such programs.

A distinguishing feature of the data we collected from Eritrean programs is that we have information on more than one group member from each group.² This allows us to split our data into two – information related to the group leader and information related other members of the group – and we test this empirically.

The remainder of the chapter is organized as follows. Section 7.2 provides a review of the literature on group-based lending programs and the related

¹ This chapter is based on Hermes, Lensink and Mehrteab (2003) and Hermes, Lensink and Mehrteab (2005).

² We have data on at least two members from each group. Most empirical studies on microfinance programs use data of one individual as a representative of a group.

incentive effects on the behavior of group participants, emphasizing moral hazard behavior. Section 7.3 presents the empirical model we use to investigate moral hazard behavior in the group-based lending programs in Eritrea. Section 7.4 discusses the outcomes of the empirical analysis. Section 7.5 concludes.

7.2 Group-based lending and moral hazard behavior: a literature review

Stiglitz (1990) and Varian (1990) are the seminal publications in this area. They present models in which peer monitoring within groups reduces moral hazard behavior of individual group members. Group-based lending programs delegate costly monitoring activities to group members, reducing the costs of lending, which can be translated into lower interest rates for the borrowers (Varian, 1990) and/or larger loan contracts (Stiglitz, 1990). Banerjee et al. (1994) discuss the credit cooperatives that were common in the late nineteenth and early twentieth century in Western Europe. They show that these credit cooperatives created incentive structures similar to group-based lending, leading to monitoring among borrowers, which helped to reduce moral hazard behavior.

7.2.1 The basic model

We continue with this literature review by presenting a theoretical model, which we adopted from Ghatak and Guinnane (1999). This model shows how the joint liability lending mechanism can be useful in mitigating moral hazard. As mentioned in chapter 2, when there is a moral hazard problem the principal cannot observe the agent's behavior (actions or decisions) perfectly without incurring additional costs. The actions taken by the agent are based on his own interest and are not necessarily for the best interest of the principal. However, introducing the joint liability lending to the model changes the behavior of the agent to the advantage of the principal.

In this subsection we first present the standard individual liability argument. Subsequently, we focus on the joint liability model. We are

going to use the following assumptions: output R takes two values, high (R^h) and low (R^L), where $R^h > R^L \geq 0$. For simplicity, we normalize R^L to be equal to zero. Borrowers are risk-neutral. Output is high with probability $p \in (0,1)$. Each project requires 1 unit of capital. The repayment for the lender, i.e. principal, plus interest equals $\rho > 1$ on average. Borrowers will be interested in borrowing only if their payoff exceeds the opportunity cost of labor, \bar{u} . The project returns of different borrowers are assumed to be uncorrelated. It is assumed that all projects are socially profitable in the sense that the expected return from the project is greater than the opportunity costs of the capital and labor employed in the project, i.e.

$$pR^h > \rho + \bar{u}. \quad (1)$$

It is assumed further that there is a limited liability, which means that the borrower cannot have negative liabilities. A standard loan contract specifies an interest rate r , which is the amount of money the borrower has to pay to the bank. The following model is for the individual liability case. Borrowers incur a dis-utility cost of effort $\frac{1}{2}\psi p^2$ (where $\psi > 0$).

Notice that social surplus $pR^h - \frac{1}{2}\psi p^2$ is maximized if $p = p^* = \frac{R^h}{\psi}$. Let us assume that

$$R^h < \psi \quad (2)$$

Thus, we have an interior solution. Because of imperfect information, the bank cannot specify which p the borrower would choose, as the choice of p is subject to moral hazard. The borrower chooses p , assuming r is given, in order to maximize his private profit:

$$\hat{p}(r) \equiv \arg \max \left\{ p(R^h - r) - \frac{1}{2}\psi p^2 \right\} = \frac{R^h - r}{\psi}. \quad (3)$$

Substituting $p = \frac{(R^h - r)}{\psi}$ in the bank's zero profit condition $pr = \rho$, we get³ $\psi p^2 - R^h p + \rho = 0$. This is a quadratic equation in p and it means that it can give us two equilibrium values of p . Let us choose the equilibrium with the highest p , i.e.

$$p = \frac{R^h + \sqrt{(R^h)^2 - 4\rho\psi}}{2\psi}. \quad (4)$$

In case of joint liability, it is assumed that if a borrower is willing and able to pay his/her own loan but his/her partner is unwilling or unable to repay this loan, the former must pay an additional amount c to the bank. This payment of c for an unable or unwilling partner can be perceived as net present discounted value of the cost of sacrificing present consumption in order to pay for a partner. Although it is possible that groups have got more than two members, for the sake of simplicity we assume that groups are composed of only two borrowers who have organized themselves into a borrowing group to acquire a loan from a program. In case a borrower's project fails, his fellow group member is liable to pay for him (joint liability). If one member chooses an action p^l , then the payoff function of a borrower who chooses an action p is

$$\text{Max } pR^h - rp - cp(1 - p^l) - \frac{1}{2}\psi p^2. \quad (5)$$

Assume that the borrower chooses action p to maximize his individual payoff, taking his group member's action p^l as given. Then his best response function is given by:

$$p = \frac{R^h - r - c}{\psi} + \frac{c}{\psi} p^l. \quad (6)$$

This means that the safer the partner's project, the safer the project choice of a borrower. On the other hand, if the partner chooses a risky project,

³ In order to get the above result we first have arranged it as follows: $p\psi = R^h - r$ and solve for r , $r = R^h - p\psi$, and then substitute the last equation in $pr = \rho$.

the borrower also chooses a riskier project. This is because if he chooses a safe project while his partner chooses a risky project, the probability of ending up paying for his partner increases. Thus, if the two partners decide on their project non-cooperatively, in the symmetric Nash equilibrium the first-order condition becomes

$$p = p^l = \frac{(R^h - r - c)}{(\psi - c)}. \quad (7)$$

The bank's zero-profit condition under joint liability lending is:

$$\rho = rp + cp(1 - p). \quad (8)$$

$$r = -p\psi - pc + R^h - c \quad (9)$$

Substituting the first order condition in the bank's zero-profit condition gives,

$$\psi p^2 - R^h p + \rho = 0. \quad (10)$$

This is a quadratic equation in p which means there are two values of p consistent with equilibrium. We assume that the equilibrium with the higher value of p is chosen, i.e.

$$p = \frac{R^h + \sqrt{(R^h)^2 - 4\psi\rho}}{2\psi}. \quad (11)$$

⁴ Symmetry means $p = \frac{R^h - r - c}{\psi} + \frac{c}{\psi} p^l$.

$$p - \frac{c}{\psi} p^l = \frac{R^h - r - c}{\psi}$$

$$\frac{p\psi - cp}{\psi} = \frac{R^h - r - c}{\psi}$$

Accordingly, we see no difference in the equilibrium project choice between the standard individual liability case indicated in equation 4 and joint liability lending (without cooperation between the two partners). Consequently, joint liability does not alleviate moral hazard in this model. This is because the two partners do not take into consideration the effect of the action that they have taken on the basis of their partner's choice.

If instead borrowers decide on project choice cooperatively they will choose:

$$\bar{p} \equiv \max pR^h - rp - cp(1-p) - \frac{1}{2}\psi p^2 = \frac{R^h - r - c}{\psi - 2c}. \quad (12)$$

Substituting this expression in the bank's zero-profit condition, we get:

$$(\psi - c)p^2 - R^h p + \rho = 0. \quad (13)$$

This is another a quadratic equation in p . Again, we have two values of p consistent with equilibrium. In line with the analysis, we assume that the equilibrium with the higher value of p is chosen, i.e.

$$p = \frac{R^h + \sqrt{(R^h)^2 - 4\rho(\psi - c)}}{2(\psi - c)}. \quad (14)$$

At the beginning we assumed that $R^h < \psi$, and it is also clear that $c < \psi$, as the borrower cannot pay more than what his project yields.

For $c \in (0, \psi)$, if we compare the two equilibrium values of p , we see that the value of the numerator of the expression under joint liability is higher than the corresponding expression under individual liability,⁵ while the denominator of the former expression is lower than of the later. Therefore, the equilibrium value of p and, hence, the repayment rate, is higher under

⁵ We get the same result when the two group partners acted non-cooperatively.

group-based lending with joint liability when borrowers choose p cooperatively than individual-liability lending.

7.2.2 Extensions of the basic model

Other models elaborate on the models by Stiglitz and Varian, dealing with extensions such as the efficient organization of monitoring within groups (Armendáriz De Aghion, 1999), and the importance of repeated loan contracts in order to obtain the benefits from peer monitoring and to prevent free-rider problems from occurring within groups (Che, 2001). Some other models relax the assumption of costless peer monitoring implicit in the models by Stiglitz and Varian (Conning, 2000; Madajewicz, 1999). Conning (1996) presents a model that shows that group-based lending will only be used if group members have a substantial monitoring and enforcement advantage compared to outsiders, and if the project returns across borrowers are not highly correlated. The model also discusses the effects of collusion among borrowers on group-based lending efficiency and provides a cost-benefit analysis of group-based lending.

Some papers focus on the role of social ties in reducing moral hazard behavior by individual members. The importance of social ties is explained in terms of the consequences of non-repayment of a certain for his or her position within an existing social network, since non-repayment will have a negative impact on the other group members' current wealth and their future access to loans. Strong social ties may increase peer monitoring and peer pressure. It is believed that due to these ties members are better able to monitor and may more easily pressurize others into repaying (Floro and Yotopoulos, 1991). Others, however, have indicated that social networks may be counterproductive. Since people know each other very well and have close social ties, they may be less eager to pressurize others for repayment (Wydick, 1999). For instance, family or friends may be less eager to use pressure for fear of losing family or friends, which in such cases are valued higher than the loss of money (Conning, 2000).

Finally, some papers stress the importance of using peer pressure to enforce repayment within groups and to reduce moral hazard (Besley and Coate, 1995). An allied argument holds that once there are sufficiently strong and credible threats of the use of social pressure, this may stimulate individuals into not pursuing moral hazard behavior (Wydick, 1996).

Wydick (2001) presents a model that combines several of the abovementioned issues related to the working of group-based lending. In this model groups are created on the basis of self-selection albeit (in contrast with other models) under imperfect information. Next, monitoring takes place, and members help those who have been confronted with adverse external shocks and exclude those who have misused the money they received by using social sanctions. In the Wydick model borrowing groups are described as dynamic peer review committees.

While the theoretical literature on monitoring and moral hazard within group-based lending programs is quite extensive, there are only very few empirical studies of these phenomena. A possible explanation for this is that it is difficult to obtain reliable data on monitoring and moral hazard behavior of participants in group-based lending programs. As far as we know Wydick (1999) is the only substantial empirical study available on this issue. He uses information from group-based lending programs in Guatemala. Wydick analyzes the role of peer monitoring, peer pressure and social ties in reducing moral hazard behavior of individual group members. His findings show that while peer monitoring and (to a lesser extent) peer pressure help to reduce moral hazard and increase the repayment performance of groups, social ties do not have the same effect.⁶

⁶ Several other studies have looked at monitoring and moral hazard, but in general they lack rigorous econometric analyses. Mondal and Tune (1993) use information from the Good Faith Fund in the United States. They describe that weak social ties lead to adverse repayment performance, since group borrowers are not willing to support other group members in case of default. Van Tassel (2000) provides a descriptive analysis of the group-based lending program run by the BancoSol in La Paz, Bolivia. The questionnaire he used for his research contained a question concerning whether individual group members gave business advice to fellow group members. 75 per cent of the interviewees responded to this question affirmatively. Van

7.3 The empirical model

As mentioned in the literature review, monitoring and social ties may influence moral hazard within groups. In the empirical analysis we investigate whether peer monitoring and social ties play a role in mitigating moral hazard problems in the two Eritrean group-based lending programs we studied.

In order to investigate this, we need a measure of moral hazard behavior within groups. Following the empirical work by Wydick (1999) we included a question on misuse of borrowed money by group members. In order to get a clear picture of such instances, we decided to pose this question to just one person in the group in order to avoid conflicting information on this issue. We decided that the best person to ask this question was the group leader, since he was responsible for reporting to the program staff on the performance and sustainability of the group. Also, he has several other responsibilities within the group that make him the most reliable source of information about loan abuses. Since there were 102 group leaders in our sample, we got the same number of observations on the instances of misuse of borrowed money.

The dependent variable in the analysis is *ABUSES*, a dummy variable that may be 0 or 1, and that measures the occurrence of moral hazard behavior within a group. In particular, $ABUSES = 1$ if the group leader indicates that at least one member at one time misused a loan. By misuse we mean that a member used the loan for other purposes than he said he would when applying for the loan; such a misuse increases the probability of repayment problems. Note, however, that misuse is not the same as non-repayment at group level, since peer monitoring and peer pressure within the group may prevent the misuse of a loan from leading to non-repayment by the group.

We use a logit model to estimate the relationship between variables that measure social ties and peer monitoring within groups, and moral hazard

Tassel argues that this is indicative evidence for the fact that monitoring takes place within groups.

behavior of group members. In our data set we have information on these variables. This information allows us to distinguish between group leaders and other group members with respect to their opportunities for monitoring and the social ties they may have with other members.

From the survey we were able to use a number of (dummy) variables to measure whether monitoring takes place within groups. In particular, we used the following variables to measure monitoring.

- $\text{KNACTDUM} = 1$, if the group member knows about the activities of other group members;
- $\text{KNSELDUM} = 1$, if the group member knows the monthly sales of the other group members;
- DIST = average distance (in meters) between the group member and the other members of the group;
- $\text{VISTDUM} = 1$, if the group member regularly visits the other members.

These four variables hold information about the extent to which group members (group leaders or other members) have information about each other, giving them the opportunity to monitor each other. For KNACTDUM , KNSELDUM and VISTDUM we expect a negative sign of the coefficient: if these dummies are equal to 1, the probability of moral hazard occurring in a group falls; if group members know about each others sales and activities and if they visit each other regularly, they will also be better equipped to monitor each others behavior. For DIST we expect a positive sign of the coefficient: if the distance between group members increases monitoring becomes more difficult and thus the probability of moral hazard increases.

Next, we have a number of dummy variables to measure the existence of social ties. In particular, we have used the following variables:

- $\text{BOGROUP} = 1$, if the group member was born in the same area where the survey was held;

- KNMEMDUM = 1, if the group member knew the other group members before the group was formed;
- CHGRDUM = 1, if the group member has ever been a member of another group.

All three variables contain information about the extent to which individuals within a group are related to each other. Such relations may influence the use of peer monitoring and/or peer pressure within the group. For BOGROUP and KNMEMDUM we expect a negative sign of the coefficient: if these dummies are equal to 1, this means that group members know each other, which is assumed to indicate that there are social ties, decreasing the probability of moral hazard within a group. For CHGRDUM we expect the coefficient to have a positive sign: if this dummy is equal to 1, the likelihood of moral hazard within a group increases. If a group contains one or more people who have been a member of another group, this indicates that the members of this group do not have long-standing relationships – which is assumed to reduce social ties and the knowledge the member(s) will have of their fellow members.

In addition to these variables that measure social ties and peer monitoring within groups, we also used a set of variables that measure the personal characteristics of group members, as well as a set of other variables. The latter two sets of variables are used in the empirical analysis as control variables. In particular, we have used the following variables to measure personal characteristics (again, we have separate information on these variables for group leaders and regular members):

- AGE = age of the group member (in years);
- GENDUM = 1, if the group member is male;
- EDUCATION – ranging from 1 (= illiterate) to 4 (= secondary education);
- MOSLDUM = 1, if the group member is Muslim;
- MARDUM = 1, if the group member is married;
- INCOME = monthly income of the group member (in Nakfas).

The reason why we include these variables in our analysis is that personal characteristics may influence moral hazard behavior in groups. We have no explicit expectations on the signs of each of the variables, however.

Finally, we use the following set of other control variables:

- **PROVISIT** = 1, if a representative of the credit program visits the group regularly;
- **GRAGRDUM** = 1, if the group members use rules on how to behave within the group;
- **VFACCESS** indicates the value a group member attaches to future access to loans by the credit program, ranging from 1 (= very high) to 4 (= very low);
- **SAMESEX** = 1, if all group members are of the same sex;
- **LEADERRESP** = 1, if the other members agree that their group leader takes great responsibility;
- **ACORDUM** = 1, if a group is in the SZSCS program.

The variables **PROVISIT**, **GRAGRDUM**, **SAMESEX** and **ACORDUM** refer to the group as a whole (i.e. including the group leader and regular members). For **PROVISIT** the expected sign is unclear: it may be positive if the representative needs to visit a group regularly because there are repayment problems; it may be negative if the visiting acts as a monitoring device and is supposed to reduce the chance of moral hazard behavior. For **GRAGRDUM** we expect to find a negative sign: if a group uses rules on how to behave, this will reduce the risk of moral hazard behavior. For **VFACCESS** we also expect to find a negative sign: if group members highly value future access to loans by the program, this will encourage them to behave correctly, thus reducing the likelihood of moral hazard behavior. The **LEADERRESP** variable refers to the other group members only. We have no explicit expectations on the sign of this variable and neither on the sign of the **SAMESEX** variable⁷. The **ACORDUM** variable is included to take into account the possibility that moral hazard behavior differs between groups in the SMCP and the

SZSCS program due to differences in institutional rules and the operation of these programs.⁸

7.4 Empirical results

As indicated above, the empirical analysis focuses on testing whether peer monitoring and the existence of social ties in groups do actually reduce misuse of loans by group members. The analysis is carried out as follows. We start by estimating the entire model, which includes all of our measures of peer monitoring, social ties, individual characteristics and other variables as discussed in section 7.5. Next, we delete variables from the model for which we do not find significant coefficients until we find the best fitting model, i.e. the model that includes only significant coefficients. Thus, we are able to test for the robustness of the variables for which we have found significant coefficients.⁹

We test the model for two types of group members, i.e. group leaders and regular group members. We use this approach since in the Eritrean programs the group leader plays a prominent role in the functioning of the group. In our analysis we specifically investigate whether this distinguishing feature has any consequences for the impact of peer monitoring and social ties on moral hazard behavior in a group. We have

⁷ The list of variables used in the analysis with their expected signs is presented in the appendix to this chapter, table 7-A1.

⁸ We acknowledge that the way we have set up the empirical model is potentially problematic, since (some of) the variables on the right-hand side can be endogenous, which may bias the estimation results. In particular, individuals will use information on misuse and repayment problems of potential group candidates when selecting group members. In order to solve the potential endogeneity problem we should have used valid instrumental variables. For instance, we should have used information on past behavior of group members and/or information on the behavior of individuals who were not chosen as group members. However, our current data does not allow for us to use this kind of information.

⁹ The econometric approach we take is also known as the general-to-specific approach. Another way of approaching the econometric modeling is to take the specific-to-general (or bottoms-up) approach, which starts from a small model, including only theoretically correct variables and then test various specifications of this smaller model. There is some discussion about which of these two approaches is preferred (Brooks, 2002). One of the advantages of the approach we have taken is that "...the statistical consequences from excluding relevant variables are usually considered more serious than those from including irrelevant variables" (Brooks, 2002, pp.209-210).

102 observations to estimate the model. For the model focusing on the group leaders we use the information from the questionnaire as provided by these 102 group leaders. For the model focusing on the other group members (249 observations) we use the averages of variables of the other group members of each of the 102 groups.¹⁰

Tables 7-1a and 7-1b provide descriptive statistics of all the variables used in the empirical investigation for both the group leaders and the other group members. The table shows that the statistics for most of the variables included in the empirical model do not differ much when comparing group leaders to the other group members. The only significant differences appears to concern INCOME, EDUCATION and DIST. Group leaders seem to have a higher income, they are somewhat higher educated, and the distance between them and the other group members is longer if we compare these outcomes with the averages of these three variables of the other group members. Moreover, it appears that among group leaders there are more men than among the other group members (GENDUM).

Table 7-2 provides the results of the empirical analysis. In the table Z-statistics are given in parentheses. Equation 2-1 in the table shows the results of the complete model using information for the other group members. Interestingly, none of the variables of peer monitoring and social ties has a statistically significant coefficient while most of the other variables do, indicating that peer monitoring and social ties of other group members do not play a role in mitigating misuse of loans by group members.

¹⁰ We use averages of variables instead of medians, because the number of group members (other than the group leader) we have interviewed was 2 or 3 in most cases. Because of this rather low number and because many variables in our analysis are (0,1) dummy variables, using the average better represents the underlying data.

Table 7-1a Descriptive statistics of the variables used in the empirical analysis

	Group Leaders				
	Mean	Median	Max.	Min.	Std.Dev
DEPENDENT VARIABLE					
ABUSES*	0.23	0	1	0	0.42
PEER MONITORING					
KNACTDUM	0.90	1	1	0	0.30
KNSELDUM	0.04	0	1	0	0.20
DIST	630.1	325	5,000	5	1,056.4
VISTDUM	0.71	1	1	0	0.46
SOCIAL TIES					
BOGROUP	0.55	1	1	0	0.50
KNMEMDUM	0.84	1	1	0	0.37
CHGRDUM	0.09	0	1	0	0.29
PERSONAL CHARACTERISTICS					
AGE	45.5	44.5	75	22	11.75
GENDUM	0.53	1	1	0	0.50
EDUCATION	2.2	2	4	1	0.87
MOSLDUM	0.25	0	1	0	0.44
MARDUM	0.80	1	1	0	0.40
INCOME	1,108.8	1,000	2,000	600	385.1
OTHER VARIABLES					
PROVISIT*	0.84	1	1	0	0.37
GRAGRDUM*	0.28	0	1	0	0.45
VFACCESS	1.26	1	4	1	0.56
SAMESEX*	0.58	1	1	0	0.50
ACORDUM*	0.45	0	1	0	0.50
LEADERRESP**					

Notes:

* These variables refer to the group as a whole (i.e. including both the group leader and the other group members). Therefore, the figures in the table are similar for both group leaders and other group members.

** This variable is only relevant for the other group members; the question related to this variable was only posed to the other group members.

Table 7-1b Descriptive statistics of the variables used in the empirical analysis

	Other group members				
	Mean	Median	Max.	Min.	Std.Dev
DEPENDENT VARIABLE					
ABUSES*	0.23	0	1	0	0.42
PEER MONITORING					
KNACTDUM	0.90	1	1	0	0.21
KNSELDUM	0.05	0	1	0	0.18
DIST	377.1	240	2,766.7	5	444.4
VISTDUM	0.77	1	1	0	0.34
SOCIAL TIES					
BOGROUP	0.54	0.5	1	0	0.43
KNMEMDUM	0.82	1	1	0	0.30
CHGRDUM	0.10	0	1	0	0.22
PERSONAL CHARACTERISTICS					
AGE	46.5	47.5	68.5	22	9.11
GENDUM	0.45	0.33	1	0	0.43
EDUCATION	1.8	2	3	1	0.61
MOSLDUM	0.28	0	1	0	0.43
MARDUM	0.80	1	1	0	0.32
INCOME	957.6	900	7,250	350	697.7
OTHER VARIABLES					
PROVISIT*	0.84	1	1	0	0.37
GRAGRDUM*	0.28	0	1	0	0.45
VFACCESS	1.44	1.33	5	1	0.60
SAMESEX*	0.58	1	1	0	0.50
ACORDUM*	0.45	0	1	0	0.50
LEADERRESP**	1.53	1.5	3	1	0.45

Notes:

* These variables refer to the group as a whole (i.e. including both the group leader and the other group members). Therefore, the figures in the table are similar for both group leaders and other group members.

** This variable is only relevant for the other group members; the question related to this variable was only posed to the other group members.

Yet, if we concentrate on the group leaders only our results indicate that peer monitoring by and social ties of group leaders do play a role in mitigating moral hazard problems within groups (equations 2-2 to 2-5). In particular, the table shows that in the complete model (equation 2-2) we find a statistically significant coefficient for one of the four peer monitoring variables (DIST) and one coefficient that is very close to being statistically significant (VISTDUM). Moreover, we find statistically significant coefficients for two of the three social ties variables (KNMEMDUM and CHGRDUM). All four variables have the expected sign. Of the control variables we find statistically significant coefficients for VFACCESS and SAMESEX, while the coefficient for INCOME is almost statistically significant.

With respect to peer monitoring the results suggest that if the group leader regularly visits the other group members, the risk of moral hazard is reduced. Moreover, if the distance between the group leader and the other members increases, the probability of moral hazard increases. With respect to social ties, the results show that if the group leader has known the other group members before the group was formed, this reduces the chance of moral hazard. At the same time, if the group leader was a member of at least one other group in the past, this increases the probability of moral hazard, since switching between groups indicates that social ties are looser and also that the knowledge the group leader has of the other group members is less.

The results for the importance of peer monitoring and social ties of the group leader are robust. The coefficients for DIST, VISTDUM, KNMEMDUM and CHGRDUM remain to be statistically significant, and for all four variables the coefficients continue to show the right sign, even after three consecutive rounds of deleting variables; in the first two rounds we delete those variables for which the Z-statistic of the coefficient is less than 1 (equations 2-3 and 2-4), and in the last round we delete all variables that remain to be statistically insignificant, i.e. that have a Z-statistic of less than 1.64 (equation 2-5). Moreover, the value of the

coefficients of three of the four variables remains relatively stable,¹¹ which again suggests that the results we have found are robust.

The results presented in table 7-2 support the hypothesis that since the group leader in the Eritrean programs seems to play a prominent role in the functioning of the group, this reduces the probability of moral hazard due to the monitoring activities and social ties of the group leader. Monitoring activities and social ties of other group members do not have such consequences.

The results can be interpreted as follows.¹² To start with, they may indicate that only group leaders really do monitor and make use of social ties, which then has a mitigating effect on moral hazard behavior among group members. This means that for instance in the case of the peer monitoring variable VISTDUM, if the group leader visits the other group members this leads to peer monitoring, whereas if other group members visit other members this does not lead to peer monitoring. Similar interpretations hold for the other variables on peer monitoring and social ties. Put differently, in case of the group leaders the monitoring and social ties variables actually do measure peer monitoring activities and social ties, whereas for the other group members they do not. This may be true if group members free-ride on the efforts of their group leader to reduce the of moral hazard. As described in the Eritrean programs, a group leader plays quite an important role as the group representative to the program organization and he may generate all kinds of activities that may help improve repayment performance of the group he represents. This may mean that other group members do not make much of an effort of monitoring of group members, especially since these efforts may be costly and time consuming.

¹¹ Only the coefficient for CHGRDUM drops significantly: from 2.34 in equation 2-2 to 1.35 in 2-5.

¹² Unfortunately, our analysis does not allow us to decide which of the two interpretations is most likely to hold in practice. Future research should address this question.

Table 7-2 Logit estimation of determinants of misuse of loans by group members

	2-1	2-2	2-3	2-4	2-5
	Other group members	Group leaders	Group leaders	Group leaders	Group leaders
PEER MONITORING					
KNACTDUM	-1.508 (-1.19)	-0.882 (-0.70)			
KNSELDUM	0.807 (0.63)	1.710 (1.26)	1.168 (0.97)		
DIST	0.0001 (0.24)	0.001** (2.45)	0.001*** (2.79)	0.001*** (2.84)	0.001*** (3.06)
VISTDUM	-0.843 (-1.05)	-1.740 (-1.51)	-1.398* (-1.89)	-1.337** (-1.98)	-1.343** (-2.03)
SOCIAL TIES					
BOGROU	-0.340 (-0.49)	0.596 (0.84)			
KNMEMDUM	0.649 (0.51)	-2.511** (-2.41)	-1.958** (-2.48)	-1.677** (-2.30)	-1.709** (-2.34)
CHGRDUM	-0.248 (-0.21)	2.339** (1.99)	1.517* (1.72)	1.381* (1.64)	1.345* (1.64)
PERSONAL CHARACTERISTICS					
AGE	-0.075* (-1.79)	-0.017 (-0.30)			
GENDUM	1.365 (1.16)	-0.065 (-0.05)			
EDUCATION	0.489 (1.09)	-0.601 (-0.67)			
MOSLDUM	0.494 (0.52)	0.407 (0.49)			
MARDUM	0.482 (0.49)	1.248 (1.37)	0.877 (1.32)	0.857 (1.36)	
INCOME	-0.001 (-1.14)	0.002 (1.60)	0.002* (1.76)	0.002* (1.85)	0.002* (1.81)
OTHER VARIABLES					
PROVISIT	0.007 (0.01)	2.211 (0.97)			
GRAGRUM	0.599 (1.06)	0.967 (1.02)	0.571 (0.77)		
VFACCESS	-0.480 (-0.93)	1.039* (1.68)	0.707* (1.72)	0.718* (1.90)	0.767** (2.00)
SAMESEX	1.631** (2.50)	2.062** (2.38)	1.943*** (3.24)	1.725*** (2.98)	1.811*** (3.18)
LEADERRESP		1.173 (1.15)	0.703 (0.97)		
ACORDUM	0.895 (0.97)	0.702 (0.52)			
CONSTANT	1.751 (0.54)	-7.586* (-1.70)	-5.748*** (-2.86)	-4.523*** (-2.78)	-3.659** (-2.48)
Number of observations	102	102	102	102	102
Observations with dependent = 0	79	79	79	79	79
% Correctly predicted	87	83	82	82	76
McFadden R ²	0.13	0.36	0.31	0.29	0.28
LR statistic (degrees of freedom)	13.91 (18)	39.14 (19)	34.26 (11)	31.62 (8)	30.46 (7)

Note: Z-statistics are given between parentheses. *, ** and *** denote significant at the 10, 5 and 1 per cent level, respectively.

Another way to interpret the results is that they may indicate that monitoring by and social ties of group leaders is efficient in reducing moral hazard behavior, whereas monitoring by and social ties of other group members is not. Thus, for instance in the case of VISTDUM, if the group leader visits other group members and this leads to monitoring activities, this reduces the probability of moral hazard, whereas if other group members visit other members and this leads to monitoring, this does not reduce the likelihood of moral hazard. Apparently, group members only feel pressured to behave prudently when the group leader monitors, perhaps because he may have more means to sanction moral hazard behavior by group members due to his role as the representative of the group to the program organization.

One important issue that remains to be clarified is the question why someone would want to be the group leader, given the fact that this position may be quite burdensome and responsible, it does not generate any (financial) reward, and that other group members may try to free-ride on the monitoring efforts of the group leader. Again, there may be two different explanations for this. First, individuals may attach a high value to becoming a group leader, even if it does not lead to a financial reward. Being a group leader and carrying out the responsible task of representing the group to the program organization generates a number of (non-financial) obligations of the other group members to the group leader, which he may claim at a later date (Warning and Sadoulet, 1998). Thus, if an individual decides to become the group leader, he may count on help from the group members at some point in the future, say, when he wants to build a house or when he harvests his crops. In a rural society with underdeveloped markets and institutions such non-financial obligations may play an important role in the survival strategy of individuals.

Alternatively, the results of our empirical analysis may also provide at least a partial answer to the question why individuals seem to be willing to become group leader. One of the control variables, VFACCESS, indicates the value a group member attaches to having access to loans from the credit program in the future; a higher value for this variable shows that an individual attaches a lower value to having loans from the program in the

future. This variable appears to be insignificant in the estimations for the other group members (equation 2-1), yet it is significant and has a positive sign in the estimations for the group leaders (equations 2-2 to 2-5). Therefore, this suggests that if group leaders attach a high value to having future access to loans from the program, this reduces the probability of moral hazard. This relationship does not exist for the other group members. Our interpretation of this result is that group leaders may be those individuals who have the strongest incentives to repay the current loans, because they – more than the other group members – want to have future access to loans. This in turn may give them incentives to take the lead in making their group repay its current loan.

7.5 Conclusions

This chapter has investigated whether peer monitoring and social ties reduce the occurrence of moral hazard in the setting of two group-based lending programs in Eritrea. More specifically, in our analysis we have looked at peer monitoring and social ties of two types of group members: the group leader and the regular group members. We show that peer monitoring by and social ties of the group leader may help to reduce moral hazard behavior of group members. In particular, our results indicate that regular contact and a short physical distance between the group leader and the other members helps to reduce misuse of loans by individual group members. Moreover, if the group leader knows the other group members before the group is formed and if he has never changed groups, this reduces the probability of moral hazard within the group. We have found no link between peer monitoring and social ties on the one hand and the occurrence of moral hazard on the other hand if we use data for the other group members.

To the best of our knowledge, this study is the first attempt to investigate the different impact of monitoring efforts and social ties of different types of group members.

**APPENDIX: List of variables used in the analysis with
expected signs**

Table 7-A1 List of variables with their expected signs

INDEPENDENT VARIABLES	EXPECTED SIGNS	
	Other Group Member Variables	Group Leader Variables
<i>PEER MONITORING</i>		
KNACTDUM	-	-
KNSELDUM	-	-
DIST	+	+
VISITDUM	-	-
<i>SOCIAL TIES</i>		
BOGROUP	-	-
KNMEMDUM	-	-
CHGRDUM	+	+
<i>PERSONAL CHARACTERISTICS</i>		
AGE	+/-	+/-
GENDUM	+/-	+/-
EDUCATION	+/-	+/-
MOSLDUM	+/-	+/-
MARDUM	+/-	+/-
INCOME	+/-	+/-
<i>OTHER VARIABLES</i>		
VFACCESS	-	-
LEADERRESP	+/-	
PROVISIT		+/-
GRAGRUM		-
SAMESEX		+/-
ACORDUM		+/-