

DETERMINANTS OF SUCCESSFUL GROUP LOAN REPAYMENT:
AN APPLICATION TO BURKINA FASO

DISSERTATION

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ABSTRACT

The success of the Grameen Bank in Bangladesh has shown that it is possible to provide a large number of low income people with financial services using a group lending methodology. As a result, group lending programs funded by international donors have proliferated at a rapid pace throughout the world. The mechanisms of group lending, such as peer pressure and group solidarity are touted as instruments to attain favorable repayment rates. However, repayment rates vary dramatically from one program to another, suggesting an inherent instability in the financial technology.

Based on the work of Besley and Coate, a model for group lending repayment has been devised. The model incorporates stabilizing and destabilizing determinants of group loan repayment. Influences that can increase the probability of loan repayment include the effective use of group dynamics (*ex ante* and *ex post* peer pressure and group solidarity) as well as other factors such as appropriate training and leadership. The degree to which pressure versus solidarity occurs is shown to be dependent on the reason given for the repayment problem and can be formulated as an “intragroup contract” for insurance purposes.

Negative externalities can diminish the probability of successful group loan repayment. The “domino effect” occurs when one or more members of a credit group

default due to the default of other members. Another negative influence on repayment occurs when the credit terms and conditions are no longer appropriate for each member as credit cycles continue, creating an inherent “matching problem” as group lending is repeated over time.

In order to evaluate the prevalence of these positive and negative externalities, a survey of 140 groups was accomplished in Burkina Faso. A mean and covariance structural model was used to test the determinants of repayment problems arising and whether or not the loans were recovered. This econometric method allowed for the use of latent variables with multiple indicators, a more complex error structure, and non-metric categorical variables. The results indicated that urban, homogenous groups with good leadership and training and prior history of working in groups had the highest probability of repaying the loan. However, the domino effect and matching problem were significant factors influencing loan default, creating a destabilizing effect on overall repayment. The results of the empirical model suggest that modifications to project design could enhance loan recovery.

To my husband

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CHAPTER 1

INTRODUCTION

1.1 Statement of Problem

Group lending has gained notoriety from both the donor community and the non-governmental organizations (NGOs) in the past decade. Encouraged by the reported success of the Grameen Bank, over 100 replications have sprouted up worldwide with widespread financial support from donor agencies. Yet ironically, the group lending technology does not have a commiserate level of formal academic study. Why has the group lending technology attracted so much attention? Three major justifications for group lending often are given: 1) It reduces transactions costs. 2) Poor people prefer to work in groups for financial as well as social reasons 3) Repayment rates are more favorable in a group lending scheme. While these justifications appear in the vast majority of group lending articles, they have not been rigorously tested and their validity relies on anecdotal evidence. The proposed dissertation attempts to analyze the common assumption that group lending leads to higher repayment rates by examining what countervailing processes may affect group loan repayment.

Both theoretical models and empirical studies make assumptions about the elements of successful group lending programs throughout the developing world. A common prescription for solid repayment performance is to form homogeneous credit groups which exhibit group solidarity and group pressure in order to repay the loan. The philosophy behind this concept is that groups who have similar characteristics and know each other well will cover for each other in hard times and use social pressure to encourage repayment. The most famous group lending project, which has motivated numerous replications, is the Grameen Bank of Bangladesh. Nevertheless, little research has been performed on how these group dynamics may function differently in settings outside of Bangladesh.

“Grameen style” lending is characterized by loans to small groups of borrowers that are jointly liable for the loans granted to each member of their group. The loans are intended for clients who do not meet the wealth requirements of the formal banking system. Since the clients have little material wealth, no collateral requirement exists. The only guarantee on the loan is the joint liability.

While the repayment rate in many of these type of projects has been favorable, the role of group dynamics in influencing loan repayment is largely undetermined. For instance, the degree to which group solidarity, group homogeneity, and group pressure exist and to what extent they influence loan repayment is difficult to measure and as a result, few studies have been conducted which try to capture this. In addition, little is known about the relative magnitude of group dynamics as a determinant of group loan repayment. While group dynamics often are touted as the engine of high group

repayment, other explanations of group loan repayment may also be important elements, such as the domino effect, the “matching” problem, repayment seniority, economic environment, or the history of group activity.

1.2 Research Objectives and Hypotheses

The overall goal of the study is to better define and understand the mechanisms within a lending group that affect repayment. The proposed exploration of group loan repayment is intended to meet theoretical, empirical, and methodological objectives. First, the dissertation will describe the group loan repayment puzzle based on Besley and Coate’s repayment game. Based on the theoretical foundation, an empirical estimation applied to Burkina Faso will be implemented with the purpose of creating an empirical model capable of better isolating and defining the mechanisms influencing loan repayment including the relative magnitude of group dynamics, the domino effect, the “matching” problem, repayment seniority, location, and the history of group activity in determining successful repayment. A final objective of the dissertation is to employ a statistical technique gaining more and more recognition in econometrics to test the model. The model will be formed as a simultaneous mean and covariance structure model using latent variables. This technique allows for an error term for latent variables with multiple indicators and therefore gives a much more accurate estimation and a more appropriate treatment of variables measured with error.

By performing this analysis, several hypotheses will be tested. These include:

- 1.) The presence of opposing forces affecting loan repayment can result in an inherent instability in group loan repayment.
- 2.) The reason for having arrears is an important determinant of whether the group will exert peer pressure or help the group member with arrears.
- 3.) Other determinants of loan repayment may overshadow the role of peer pressure and group solidarity. These factors include the domino effect, the matching of consecutive loan terms and conditions with the same five members through time, the presence of other debt, whether or not the borrowers live in rural or urban settings, and the whether or not members have previously participated in groups.

The usefulness of this type of information cannot be understated. A clearer understanding of these group dynamics can contribute to the formulation of more concise economic models of group loans. More importantly, application of this type of empirical model to different settings can help determine the type of problems that may arise in a group lending scheme. The model can be used to fine tune training, monitoring, and screening procedures from an institutional perspective in an attempt to create stronger, more sustainable institutions for the poor.

1.3 Group Lending Literature Review

Foundations of Group Lending

The explosion of group lending programs around the world is a recent phenomenon. While a few group loan institutions were operating in the 1970's, a proliferation of such programs occurred in the 1980's and continues to accelerate in the 1990's. Nearly all of the programs are NGO sponsored credit-first approaches. Interest in the utilization of groups originated from an increased knowledge of informal financial arrangements using groups.

Rotating Savings and Credit Associations (ROSCAs) are one form of informal finance used all over the world to provide a steady form of savings, insurance, and in some cases, loans. A regular contribution is collected from members of a selected group over a period of time. Loan terms and group characteristics vary dramatically, as this type of informal finance tends to permeate different cultures and all socio-economic classes. ROSCAs and other types of informal self-help groups have been well documented in all regions of the world. (Ramalingam (1987), AFRACA (1987), Bouman (1988), Graham (1989), Schrieder and Cuevas (1989), Adams and Canavosi (1992), Von Pischke (1992), Shipton (1992) , Munshi (1992)).

ROSCAs have several unique features that contribute to their stability over time. First, the organizer of the ROSCA typically is someone with social stature or a solid reputation whom participants trust. Secondly, the mobilization of funds come directly from the participants savings and therefore the use of funds is under group scrutiny.

Finally, the groups utilize self-selection of members so that a strong degree of promise, trust and consent exists among members. (Von Pischke, 1992)

While ROSCAs and other informal financial technologies have proven their longevity and stability in risky environments, NGO sponsored group lending programs, attempting to replicate some of the group functions of informal groups, have had mixed success. This is not surprising given that two of the key elements of ROSCAs no longer exist. First, the organizer of the group is external, rather than internal. Even if the NGO allows for self-selection, the NGO itself is a principal rather than an agent. Typically in ROSCAs, the group organizer is a member of the group and shares the same set of risks and incentives as the rest of the group. Secondly, most NGOs use external funds to sponsor group lending, rather than mobilizing funds from the group. These two key differences change the group dynamics and incentive structures.

Empirical Studies in Development Finance Literature

The prevailing adulation of group lending stems from its reported empirical success and its favorable review in the development finance literature. Most papers on group lending accept the assumption that peer pressure and group solidarity are enigmatically causing groups to function properly and bolstering repayment rates in developing countries. After all, each of us has experienced the effects of group pressure or of helping each other.

Many advantages to group lending are cited in the literature. An often cited justification for group lending is that it provides pecuniary returns, especially to women

who have no other means of exerting their independence. (Berenbach and Guzman (1993), Khandker, Khalily, and Khan (1994), Goldberg and Hunte (1995)). The argument is that group credit gives women self-esteem, mutual trust, empowerment, and other “psychic benefits.”

For rural women who have very limited knowledge about the outside world except through family members, participation in group activities may mean information gathering...(Khandker, Khalily, and Khan (1994), p. 61)

Most of these studies presume the existence of these “psychic benefits,” but only a few studies (Goldberg and Hunte (1995) have attempted to test this theory empirically.

Without more empirical testing, generalizations about the preferences and self-esteem of poor women are invalid and paternalistic. Adams (1979) points out that most people would prefer individual loans given the increased freedom, lack of joint liability and the appropriate matching of credit demand.

Other benefits attributed to group lending are the access to credit, training, and organizational inputs, reduction of lending and borrowing transaction costs (Adams (1981), Braverman and Guasch (1993), Khandker, Khalily, and Khan (1994)) and higher repayment rates than under individual lending programs (Bratton (1986),Harper (1995)).

Several perceptive authors have drawn attention to the potential pitfalls of group lending. Hossain (1988) explores the cultural roots of group activity and warns of the need for group credit programs to be sensitive to varying cultural norms, values, and cognitive structures. Also, some of the critics question assumptions that transactions

costs are indeed lower to borrowers and lenders under group lending. The time commitments of group members is enormous and group mobilization and training cause high administrative costs (Huppi and Feder (1989), Khandker, Khalily, and Khan (1994)).

In addition, Huppi and Feder (1989) challenge the notion that repayment rates are truly higher for group lending operations. Instead, they suggest that loan repayment performance is a function of counteracting negative and positive externalities. The domino effect is one that has been witnessed in a variety of group lending programs. In numerous cases, group lending starts strong with 100 percent repayment, but after a few months or years, certain areas experience widespread default. This may be explained by an inherent “matching problem” causing certain individuals to default, followed by a domino effect of borrowers defaulting due to their loss of effective incentives.

Bratton (1986) illustrates the domino effect in Zimbabwe. In a good year, group lending institutions had better repayment rates than individual loan programs. However, in a bad year, the opposite was true. The same domino effect was witnessed in the Philippines (Matienzo, 1978) and in Burkina Faso by the author. This illustrates an important risk of joint liability.

While most anecdotal and empirical studies report high degrees of group pressure, particularly in Asia, some studies have found peer pressure to play an insignificant role in credit groups (Matienzo (1978), Hulme (1993), preliminary findings in Chile by Sprodofsky (1995)). In one Malaysian program, Hulme found a common village sentiment that “in Malay villages, one shouldn’t intervene in a neighbour’s business even if others would lose privileges.” (Hulme (1993), p. 12) Results from Burkina Faso suggest

that neighborhood harmony is prized above access to future loans and therefore peer pressure was minimal. Montgomery points out the high costs of peer pressure including a 'heightened perception of risk, an erosion of mutual trust, and an increased likelihood of excluding the poorest and most vulnerable' (Montgomery (1995), p. 1).

The common wisdom about group lending has several basic tenets. Group lending reduces costs, increases repayment, and uses homogeneous groups that exert peer pressure and help each other in times of need. Upon closer examination, each of these gossamer tenets pulls apart in some instances. The challenge to economists and develop finance practitioners is to develop a better understanding of when group lending functions well and when traditional assumptions about group dynamics do not hold.

Mathematical Formulations in Economics

In addition to empirical evidence supporting different hypotheses about group lending, several mathematical models in economics have helped to explain various facets of groups and group lending. Some of the primary critical thinking in this field has concentrated on such issues as optimal amounts of collective goods, principal/agent relationships, peer monitoring, and mutual insurance.

In The Logic of Collective Action, Mancur Olson describes the paradox of groups to be "the very fact that the objective or interest is common to or shared by the group entails that the gain from any sacrifice an individual makes to serve this common purpose

is shared with everyone in the group.” (Olson (1982), p. 18) In other words, individuals may not form groups and pursue a collective action if they can share in the benefits of the collective action without contributing. If all agents share this perspective, no collective action is implemented.

In order to encourage collective actions, selective incentives are important. These are mechanisms that apply to group members selectively based on whether or not they contribute to the provision of the collective good. In the case of group lending, if the collective good is thought of as future access to loans, then correct repayment is necessary. Selective incentives may include group pressure if an individual does not contribute his/her loan repayment or social harmony if correct repayment occurs. However, a non-selective incentive typically is used in group loans. That is, even if only one person defaults, the rest of the group has no future access to loans. This non-selective incentive becomes a catalyst for the social selective incentives to function. Free-riding takes place in group lending when an individual does not contribute the weekly repayment, allowing the rest of the group to cover the arrears, or when an individual does not carry an appropriate share of the screening and monitoring costs incurred by the group.

Olson explores the optimal amount of the collective good to be provided through a mathematical formulation:

C = cost of collective good

T = level at which good is provided

V = value of good (i=to individual, g=to group)

S = size of group

F_i = fraction of V enjoyed by ith individual

A_i = net advantage that ith individual obtains from purchasing collective good

relationships:

$$C = f(T)$$

$$V_g = T * S$$

$$A_i = V_i - C_i$$

$$\frac{\partial A_i}{\partial T} = \frac{\partial V_i}{\partial T} - \frac{\partial C}{\partial T}$$

since at a maximum:

$$\frac{\partial A_i}{\partial T} = 0$$

and

$$\frac{\partial V_i}{\partial T} = F_i \left(\frac{\partial V_g}{\partial T} \right)$$

then

$$0 = \frac{\partial V_i}{\partial T} - \frac{\partial C}{\partial T}$$

$$F_i \left(\frac{\partial V_g}{\partial T} \right) = \frac{\partial C}{\partial T}$$

This finding shows that as the as the fraction of the individual's value of the group diminishes, the less the individual will want to contribute to the provision of the collective good. In group lending, this may indicate that an individual would be more likely to free-ride in a large group compared to a small group. Empirical and anecdotal evidence seem to support this notion.

Other economic models have been formulated around the basic principal-agent problem underscoring problems of asymmetric information. Hart and Holmström offer a standard principal-agency model with incentive compatibility and participation constraints. In this model, one agent and one principal exist and the agent must decide between a best action (b) and an alternative action (a) based on probability distributions (\mathbf{p}) and costs (c). The principal maximizes utility by maximizing the difference between output (x) and the incentive payment (s).

$$V = \max \sum_{i=1}^n \mathbf{p}_{ib} (x_i - s_i)$$

subject to:

$$\sum_{i=1}^n \mathbf{p}_{ib} u(s_i) - c_b \geq \sum_{i=1}^n \mathbf{p}_{ia} u(s_i) - c_a \quad \text{incentive compatibility constraint}$$

$$\sum_{i=1}^n \mathbf{p}_{ib} u(s_i) - c_b \geq 0 \quad \text{participation constraint}$$

Varian (1989) elaborates on this model by showing mathematically that a monitor is better off by lowering the cost of the preferred action as opposed to increasing the cost of the alternative action. Thus the carrot is preferred to the stick. This is shown by a

simple Lagrangian problem, differentiating with respect to the cost of the best solution and the alternative.

$$L = \sum_{i=1}^n p_{ib}(x_i - s_i) - I[c_b - \sum_{i=1}^n p_{ib}u(s_i)] - m[c_b - c_a - \sum_{i=1}^n u(s_i)(p_{ib} - p_{ia})]$$

$$dV/dC_a = m$$

$$dV/dC_b = -(I + m)$$

In a group lending model, Varian shows that agents insure themselves to obtain the best outcome, but it is the principal who gains the surplus of mutual insurance. Arnott and Stiglitz (1987) show that mutual insurance may make agents all worse off in the competitive insurance industry.

Stiglitz (1990) creates a peer monitoring model based loosely on Grameen-style group lending. In the simplified model with only one individual, the individual chooses between a safe and a risky project, each with different probabilities (r_s, r_r). If either project fails, they yield a return of zero and cost one unit of capital. The interest rate is given by “R” and at some R*, the individual always chooses the risky project. Individual utility is given by:

$$V(R) = \max\{ r_s u(Y_s - R), r_r u(Y_r - R) \}$$

Stiglitz builds on this model by incorporating two borrowers, each revealing which project that will be undertaken. If one project fails, the other borrower is liable for the

loan and must pay an amount l . Adding this variable to the model complicates the utility function slightly and it now is represented by:

$$V(R,l)=\max\{ \mathbf{r}_s^2 u(Y_s - R) + (1 - \mathbf{r}_s)\bar{u} + \mathbf{r}_s(1 - \mathbf{r}_s)u(Y_s - R - l), \\ \mathbf{r}_r^2 u(Y_r - R) + (1 - \mathbf{r}_r)\bar{u} + \mathbf{r}_r(1 - \mathbf{r}_r)u(Y_r - R - l) \}$$

The conclusion of the model is that joint liability and peer monitoring encourage safer projects. However, this formulation does not truly model joint liability or peer monitoring simply by adding the variable l . The same variable just as easily could be added to the individual borrower's utility function with a different interpretation. Since the model does not capture the complexities of joint liability and peer monitoring, it is no surprise that the conclusion often does not hold empirically.

Despite the accolades of peer monitoring in some models, Besley (1992) remains skeptical of group lending. Like Olson, he points out the problem of free-riding in the case of large groups. Also, collusion is another danger of group lending. Finally, a domino effect can occur when recalcitrant borrowers inflict negative externalities on good borrowers, causing incentives for others not to pay. These considerations alter the simplified assumptions of the basic principal/agent problems.

Group Loan Repayment Models

While much controversy exists in the literature regarding whether or not group lending increases or decreases repayment rates, few models specifically have been

designed to test for the determinants of group loan repayment. However, none of them incorporate group dynamics into the model despite the overwhelming amount of empirical evidence that suggests that peer pressure and group solidarity are the key elements to successful repayment.

Khandker, Khalily and Khan (1994) devise a model of group loan repayment. In their econometric model, loan default, gender, electrification, road length, secondary schools, primary schools, dispersion of rainfall from mean, average rainfall, and the presence of other banks. Of these variables, the most significant were found to be electrification, road length, and schooling.

Another interesting finding was that the longer a branch operated in a given region, the higher the default rate. This parallels the experience in Burkina Faso, as well as other countries, and suggests a “matching problem” found over loan cycles. In the first meeting, everyone agrees to given loan terms and conditions. Finding a group of people with equal credit demand once is difficult enough, but the probability of the same group desiring consecutive loans with similar conditions diminishes through time. Thus, matching the supply and demand for credit among group members becomes more and more challenging through time and may result in default as one or more members are not satisfied.

A second model of group loan repayment behavior applies factor analysis to examine credit risk areas. Viganò (1993) uses data from a CNCA group lending project in Burkina Faso to create a credit scoring model. Viganò argues that five factors affect credit risk including ability to repay, willingness to repay, favorable external conditions, quality of information upon which analysts base their judgment, and the bank’s ability to

ensure the customer's willingness to repay through an effective incentive structure. The most significant variables in the factor analysis were the borrower attitude, profitability and revenue stability, and ability to manage several borrowing contracts.

Viganò's model uses factor analysis so that various correlated indicators can be used to measure model repayment behavior through factor loadings. Each of the factors is a latent variable and in order to capture them in the survey, proxies were used. For example, for seriousness and stability, Viganò hypothesized that older people had larger and more stable incomes and therefore the binary variable of "retirement" was a proxy for stability. However, it was the author's experience that older, retired people in Burkina Faso had the lowest income streams and were one of the highest risk groups surveyed. Viganò also reported that the variable contained a high amount of missing data due to the complexity of collecting income data in Africa. Therefore, this variable also contained measurement error. In addition, gender was used as a proxy for morality and character. One of the shortcomings of factor analysis is the arbitrary selection of proxies to represent concepts.

1.4 The Besley and Coate Repayment Game

Analyzing strategies and equilibria in credit groups through game theory has been attempted using a variety of techniques. Besley, Coate and Lounsbury (1993) utilized a mathematical formulation to solve for optimal ROSCA (rotating savings and credit association) group size and payment. Like Olson, they found that larger group sizes led to a breakdown of repayment. Armendáriz de Aghion (1995) develops an optimal

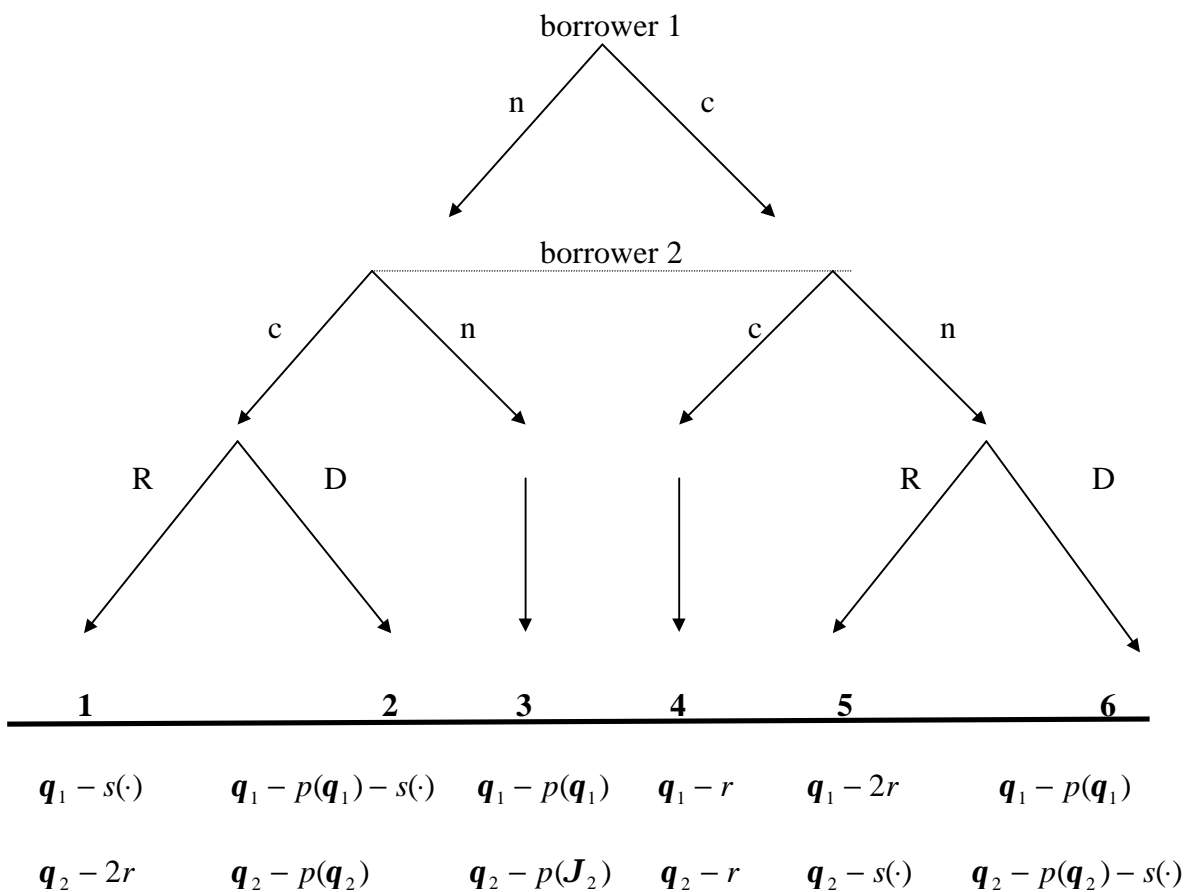
contracting model of group credit with peer monitoring. Schreiner (1994) incorporates dynamic participation and default to solve an intertemporal optimization problem for ROSCA members.

A relatively simple, yet very insightful model of group loan repayment was created by Besley and Coate (1993). The authors set up a “repayment game” for group lending which illustrated how the formation of a group led to both positive and negative effects of repayment compared to individual loans. Of all the theoretical models, this formulation most aptly captures the opposing forces of group loan repayment and demonstrates the potential instability of group lending.

Because of its ability to incorporate numerous facets of group lending, a variation of the Besley and Coate model will be used as the theoretical foundation of the empirical model for this study. In its simplest version, the repayment game includes two homogeneous borrowers who attain a return (q) on their project, depending on a random probability distribution. The individuals each borrow one unit of capital and must pay back the unit plus interest at the end of the period (r). The individuals can encourage each other to repay by inflicting social sanctions (s) against one another in the case of arrears. Finally, the bank can charge penalties (p) for arrears by confiscating property or by hassling recalcitrant borrowers. Figure 1 illustrates the possible outcomes and pay-offs of playing the repayment game.

Given their project returns, each individual decides to contribute (c) or not to contribute (n). In the case that one individual pays and the other does not $\{c,n\}$, the repaying member decides whether or not to repay, R , for both or to default (D). In this

final stage, two interesting processes are evident. Firstly, it is possible to have group solidarity (helping a member who cannot/will not repay) to maintain correct repayment. Secondly, the domino effect can occur when an individual who independently would repay the loan decides to default based on the default of the other member.



N.B. When the strategy pair is $\{n, (c, R)\}$, $s(\cdot) = s(r, q_1)$; when it is $\{(c, R), n\}$, $s(\cdot) = s(r, q_2)$; when it is $\{(c, D), n\}$, $s(\cdot) = s(p(q_1) - r, q_2)$, and when it is $\{n, (c, D)\}$, $s(\cdot) = s(p(q_2) - r, q_1)$.

Figure 1: Besley and Coate Repayment Game (1993)

While the game theory models continue to become more complex and better able to replicate group loan processes, they still must rely on an extremely simplified view of how group lending occurs. The game outcome is a reflection of the assumptions made and the models have not been able to accurately mirror the spectrum of decisions and strategies facing different individuals. Empirically, it would be valuable to discover if indeed the mechanisms described in the Besley and Coate repayment game exist, and if they do, to what degree do they influence repayment behavior.

In order to test the various group dynamics presented in the Besley and Coate model, the process of repayment and the related determinants must be elaborated and clarified. At what point does group pressure occur? Do group pressure and group solidarity appear simultaneously? What other factors that have been omitted from this simplified game may be important determinants of repayment? As each of these are explored, an empirical model of group loan repayment will be devised and tested.

1.5 Shortcomings of Current Models

While several important contributions have been made, the study of group lending is still in its infancy. For each assertion, a counter-argument is provided in another study. Most of the literature accepts the common wisdom that group dynamics positively affect loan repayment. However, more critical studies have questioned the very foundations of the group lending programs. Few studies have tried to dissect the complex process of group loan repayment in a systematic and rigorous fashion. Most of the empirical studies are based on anecdotal evidence rather than a more scientific approach.

Several theoretical economic studies have advanced our understanding of group loans. The mathematical formulations and proofs contribute to our understanding of basic principal/agent processes. Game theory highlights different strategies used in groups as well as optimal incentives. Nevertheless, simplifying assumptions limit the ability of these models to replicate the multitude of simultaneous processes occurring within a group loan process. Furthermore, the models have not been tested with empirical evidence.

Econometric group loan repayment models have allowed for empirical testing, giving a degree of richness and variety to the models. Nonetheless, the specification of the models appears to be ad hoc without a systematic technique for incorporating the empirical and theoretical findings. The following offers one suggestion of a more comprehensive model of group loan repayment that is based in economic theory and has the capability of being tested empirically using latent variables.

1.6 Outline of Chapters

Chapter 2 examines how a group may respond to repayment problems under different circumstances. Depending on the reason for default, the group may choose to either help a group member or to pressure her. The reward and punishment mechanism is based on a series of contingent contracts. This "intragroup contract" will vary from group to group and may or may not heavily influence loan recovery.

A three stage decision tree for loan repayment is presented in Chapter 3 with an accompanying econometric formulation to test the determinants of loan repayment for

group lending programs. The model is presented in a general way so that it could be adapted to a variety of contexts and does not provide rigid definitions of model variables.

Chapter 4 highlights the key features of Sahel Action, a group lending program in Burkina Faso. The econometric model formulated in Chapter 3 is then applied to Burkina Faso data. Chapter 5 includes the results and discussion of the group lending econometric study. Finally, Chapter 6 summarizes findings, draws conclusions, and points to further research that could provide additional insight into group lending.

CHAPTER 2

THE INTRAGROUP CONTRACT

The Besley and Coate repayment game points out several important dynamics that may occur in a group lending scheme, including peer pressure and group solidarity (helping others who do not pay). However, several questions arise when considering the effects of peer pressure and group solidarity on loan repayment. Do peer pressure and group solidarity occur simultaneously or are they mutually exclusive? Under what circumstances are these mechanisms employed? How do these techniques vary by groups or by contexts? In order to incorporate the group dynamics specified in the Besley and Coate repayment game into a group lending econometric model, more thorough analysis of these questions is in order. Insights into how group dynamics may reduce risk and provide a mutual insurance mechanism can be gained from contract theory.

2.1 Contract Theory

Under joint liability, members of a peer lending group must have some way to ensure that the other members of the group repay their portions of the loan so that all have future access to loans. Each group devises implicit and explicit rules and norms that can

diminish the risk of default, provided that repaying the loan is a utility maximizing outcome for group members. Risk management includes identifying and evaluating exposure to loss as well as selecting optimum methods of reducing exposure to risk (Mehr, 1985). A formal or informal contract between group members is a risk management method.

One way in which the seriousness of the members is proven is by attending regular meetings (Adams, 1992). An implicit opportunity cost exists by attending the meetings, as well as fines for tardiness or absenteeism in many cases. Not only does attendance at these meetings show a seriousness of intent, but it provides a forum in which mutual trust is built, ideas are shared, and strategies are discussed.

In standard neoclassical economic theory, an optimal contract is a principal-agent problem that is comprehensive in that it specifies each parties' obligations under each state of nature (Hart, 1995). The complete state-contingent contracts do not involve renegotiation since each state of nature could be thought of in the beginning time period. However, in practice, it is unrealistic to define each state of nature and contracts are renegotiated frequently.

There are several reasons why complete state-contingent contracts are not feasible due to high transactions costs. First, it is difficult for people to imagine all contingencies. In addition, it is costly to negotiate each state of nature so that each member of the group has a mutual understanding of the contract under each state. Finally, it is hard to write a legally binding contract for each state of nature. Each of these costs make a comprehensive state-contingent contract prohibitively expensive (Hart, 1995).

In developing countries with an infinite number of potential reasons for default, an incomplete complete contract is a more realistic tool for risk management. Incomplete contracts differ from neoclassical complete contracts in that unanticipated disturbances may arise which result in renegotiation. Thus, the incomplete contract is an elastic, flexible tool. Also, incomplete contracts allow a "tolerance zone" that allows for a looser interpretation of the states of nature. This flexible type of contract can be thought of as a "framework which affords a rough indication around which such relations vary, an occasional guide in cases of doubt, and a norm of ultimate appeal when the relations cease in fact to work" (Llewellyn, 1931, p.737).

In solidarity groups, typically members have some idea *ex ante* about what would happen if a member defaulted for a certain reason (state of nature). For example, if a member were sick on repayment day, certain groups might require that a family member pay for her while other groups may contribute her part until she is able to repay. Usually in the case of severe illness, the group refrains from intense peer pressure, instead showing more compassion towards the woman. The exact reaction of the group will vary from group to group and from context to context. Nevertheless, an incomplete contract may exist detailing the general consequences for a defaulting member under various scenarios. Rarely would this contract be written, however often times, an oral agreement has been reached as to the group reaction under various states of nature. In other cases, the contract may be an implicit social contract (Fafchamps, 1991) where no promises have been made either in writing or orally, yet group members understand the probable consequences of defaulting in different states of nature.

Ex ante, an explicit or implicit incomplete contract exists in solidarity groups that define the general reaction of the group to a defaulting member. This **intragroup contract** defines how the group will react, either by punishing or assisting the defaulting member given different reasons for default. The ex ante intragroup contract provides a framework which may curtail shirking and encourage correct repayment. Since the ex ante intragroup contract is incomplete, the contract may be modified ex post as unforeseen states of nature are revealed.

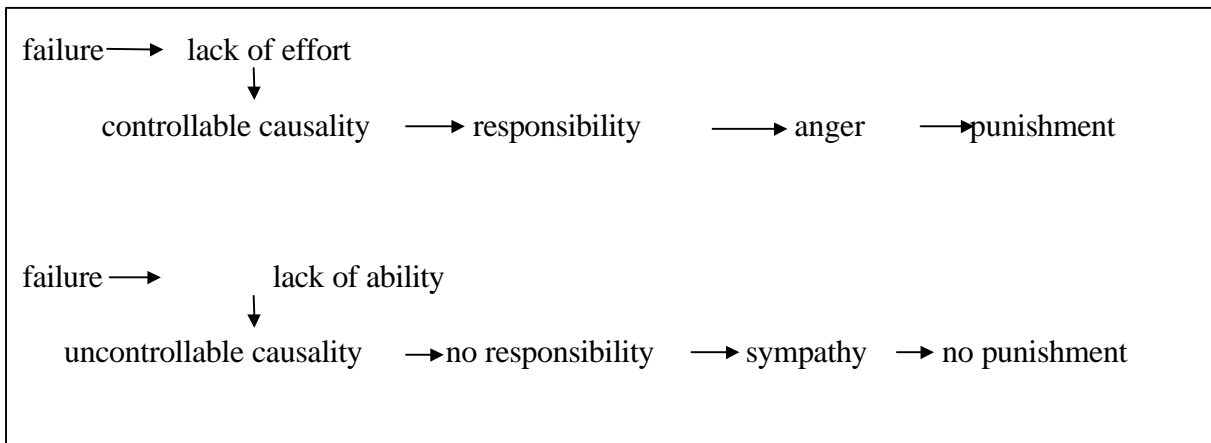
For a closer examination of the intragroup contract, psychological literature highlights how groups may react to different states of nature by either punishing or helping group members. The model of perceived responsibility and social motivation helps clarify the degree to which groups may react to default under different circumstances.

2.2 Perceived Responsibility and Social Motivation Model

In most of the group lending literature, there is an implicit assumption that peer pressure and group solidarity are the foundations of well functioning groups. However, rarely are these mechanisms studied in the development finance literature despite the fact that the predominance of one type of group dynamic may influence the way in which group lending institutions may choose to train their clients and bank workers. Insights into why a group might employ solidarity or pressure can be gleaned from psychological literature on perceived responsibility and social motivation. Akerlof (1991) argues that behavioral pathology is within the appropriate scope of economics since it affects the performance of individuals and institutions in the economic domain. Indeed, as economic

studies become more complex and realistic, the incorporation of findings from other social sciences can strengthen economic models.

Despite religious admonitions against judging others, individuals regularly determine the culpability of their peers for their given plights (Shultz, Scheifer, and Altman (1981), Shaver (1985)). Psychologist Bernard Weiner (1993) examines how failure, perceived as being caused by a lack of effort rather than a lack of ability, results in either punishing or helping behavior (Figure 2). On one hand, a failure that is judged to be the result of a lack of effort is perceived as having controllable causality, resulting in the determination that the individual is responsible for the failure. The perceived personal responsibility elicits anger and punishing behavior. On the other hand, if the failure is caused by a lack of ability then one perceives that the individual has no control over the situation (uncontrollable causality) and therefore is not held responsible. The lack of control that they have over their situation is met with sympathy and helping behavior.



Source: Weiner (1993), p. 959

Figure 2: Causal Sequence of Failure

This paradigm was used to test the relationships between stigma, perceived responsibility, affect (ranging from anger to sympathy), and willingness to help (Weiner, Perry, and Magnusson (1988)). Respondents in this study rated stigmata in terms of responsibility, affect, and willingness to help. Stigmata such as blindness, cancer, and Alzheimer’s disease tended to register low personal responsibility, pity, and helping behavior. Meanwhile, AIDS, obesity, and drug addiction typically registered high personal responsibility, anger, and lack of help. Moral condemnation on the part of the respondents played a significant role in determining inferences about responsibility, emotion, and intended help-giving. For example, if an AIDS victim was presented as

having contracted the disease through a blood transaction rather than from unprotected sex, the disease was perceived as uncontrollable, eliciting sympathy and help.

The measured correlations from stigma to perceived responsibility, responsibility to affect, and affect to help averaged 0.63. This logical progression of causality more clearly illustrates the progression of human thought and emotion than merely measuring the correlation between stigma to help, which only measured 0.38 (Weiner (1993)). This same type of analysis can be applied to group credit to determine if certain reasons for an individual not repaying elicit anger or sympathy resulting in either help (solidarity) or pressure.

2.3 A Hypothetical Intragroup Contract Formulation

While this theory has been utilized for various applications in psychology, it has never been used to test group loan repayment behavior. In order to test whether perceived responsibility results in different amounts of group solidarity or peer pressure, an experimental survey was created for Ohio State University students in which respondents rate responsibility, affect, pressure and willingness to help (Appendix A). By doing so, the students provided insight into how intragroup contracts might be formed.

In the Ohio State survey, a hypothetical group loan situation was described where one member of the group defaults for one of eight reasons. The reasons were adapted from actual reported reasons for default in the PPPCR survey in Burkina Faso. Reasons reported in the field survey include recession, bad harvest, illness, funeral, wedding,

traveling, not working enough hours, and no reason and thus similar reasons were given in the experimental survey. Several versions of the survey, changing the order of the reasons for default, were given to avoid any order effect in the responses. The survey was administered to 50 male and 50 female juniors and seniors with different disciplinary backgrounds at the Ohio State University in April, 1995.

Like the Weiner study, correlations between causality, perceived responsibility, affect and response (peer pressure or group solidarity) were examined. This relationship is illustrated in Figure 3. This model tests the afore stated hypothesis that the reason for having arrears is an important determinant of whether the group will exert peer pressure or help the group member with arrears. The Ohio State survey was designed precisely for this exercise and therefore includes a measurement for each of the variables. In actual group lending operations, it is possible to measure the true response of the group given various reasons for default. For the Burkina Faso data, a variable called "intragroup contract" records the amount of pressure and/or the amount of assistance that was actually provided to a defaulting member.

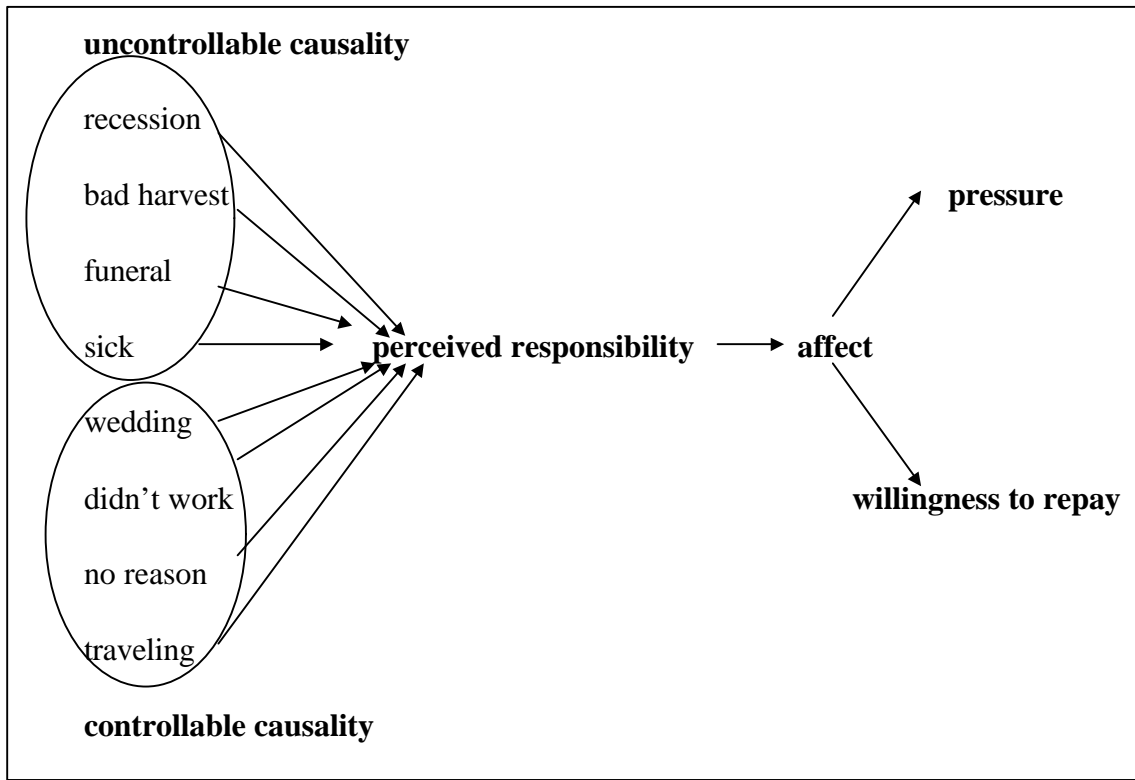


Figure 3: Group Lending Model

Performing a survey using a hypothetical situation in a U.S. university provides one example of how an incomplete state-contingent contract might be formulated, however it does have obvious limitations. Most group loan programs are in developing countries, targeting a low income, working clientele. Repaying one's own portion of the loan regularly may put a strain on the household budget during certain weeks. However,

repaying for another member of the group may mean sacrificing basic family needs. In Burkina Faso, members of credit groups typically repay for a lagging member for a few weeks before allowing the whole group to default. In contrast, many of the U.S. college students are still reliant on their parents' incomes and have never supported themselves or a family. Likewise, for the most part, their basic needs are met and offering to help repay a hypothetical loan for a hypothetical friend may seem like a good idea with no adverse consequences while filling out a brief questionnaire. Therefore, we would expect the reported number of weeks that the respondents would be willing to repay for a group member to be higher than empirical data from developing countries. Despite this problem, however, the relative willingness to repay under different circumstances and among different groups provides evidence that individuals do indeed take causality into account when deciding whether or not to repay or to pressure (or both).

Another context specific question relates to pressure. College students at a large university come into contact with many other students and if one friendship dissipates, many others can replace it. Therefore, willingness to pressure may be a useful strategy in a group loan situation. However, in small villages where everyone knows each other well and village harmony is essential, the benefits of strong peer pressure may cause friction. Village harmony may be a more valued asset than future access to credit. In villages where several credit projects have appeared suddenly and disappeared just as suddenly, the threat of no future access to credit is a weak one. There exists a strong possibility of a new financial institution appearing and offering the individuals credit despite their repayment record. Within the past few decades, several governmental and non-

governmental financial institutions have offered credit to many of the clients of the PPPCR. Each of these projects experienced widespread default, but no action was taken against the defaulters.

Finally, perceptions of fairness vary from one context to another. College students may be expected to borrow money from their parents if they cannot repay a loan. In countries where the woman shares in managing the family budget, it may be common for the group to expect her to use family funds to cover any shortcoming in her own economic activity. However, in countries where men and women have distinctly separate funds, borrowing from a spouse may not be feasible. This was the case in Burkina Faso where the women rarely turned to their husbands for their financial needs.

Despite shortcomings in the survey, it lays an interesting foundation for examining different strategies used for maintaining successful credit repayment. Recognizing that reasons for default influence the group's willingness to repay is an important step to understanding credit group dynamics. Thus, Wiener's perceived responsibility and social motivation framework provides a useful paradigm for examining the chain of causal relations as the foundation of the intragroup contract.

2.4 The Role of Information and the Domino Effect

Groups that are close, both in social and spatial terms, are more likely to have perfect information about the activities, risks, and income shocks of their members. The degree to which perfect information is available to group members will affect the intragroup contract. At one extreme, groups with perfect information would know with

certainty when a problem with uncontrollable causality arises for one of its members. Therefore, the other members know with certainty the true cause of the problem and if it was uncontrollable, the reaction of sympathy and helping behavior is plausible. Likewise, if it is known that the reason for arrears is due to irresponsible behavior of one of the members, anger is elicited and pressure is applied.

At the other extreme, if little information is available about the group members' activities, then the intragroup contract must be modified. Group solidarity no longer becomes a viable option since moral hazard can arise. If members believed that the group would aid them in cases of uncontrollable causality, it would be possible for some members to shirk in their responsibility, default on their loan and hope that the group would repay for them by telling them that an uncontrollable situation had arisen. In order to prevent such behavior, in contexts with imperfect information, group solidarity can not be an integral part of the intragroup contract. Rather, these groups would have to treat nearly all arrears excuses as controllable, thereby enforcing group pressure. One may expect the use of peer pressure as the primary mechanism of the intragroup contract in groups that are dispersed over a large geographical area or are large, making perfect information difficult.

Another facet of the group context which could affect the intragroup contract is the prevalence of the domino effect. Given the knowledge that each of the other group members will repay her part, the individual maximizes the utility of repaying her part of the loan. However, if it is known that another member is experiencing repayment problems, then the individual will compare the present value of her continued relationship with the

lending institution plus the cost of paying for another to the present value of defaulting on the loan. As the number of defaulters increases, so do the incentives for defaulting on the loan. In addition, as the marginal benefit of repaying lessens as more members default approaches zero and becomes negative, the intragroup contract mechanisms will become irrelevant.

2.5 Empirical Variations of the Intragroup Contract

While the Ohio State survey illustrates how an ex ante, hypothetical intragroup contract might function, it is possible to examine the true reasons for default in group lending programs ex post to see what the actual response of the group was under different states of nature. A survey of ex post group response to repayment problems was performed in two group lending organizations in different contexts: Burkina Faso (Sahel Action) and Guatemala (CARE). Interestingly, the nature of the intragroup contract was strikingly different for both programs.

In 1996, 30 groups in CARE Guatemala were interviewed. While not a large survey, the results did show a strong correlation (0.935) between affect (anger vs. sympathy) and group response (pressure vs. solidarity). The village banking program had relatively large groups of 30 to 70 women and therefore the groups themselves were not as intimate. Not surprisingly, little tolerance of repayment problems was exhibited. In fact, most reasons for default led to group anger and therefore group pressure. For example, failed businesses, unexplained default, and sick husbands all led to group anger and pressure. Only a very sick child or death of the group member resulted in group

sympathy. However, while the group did not pressure the individual with such problems, only a relatively insignificant amount of financial assistance was given by the group. Instead, the families of the individual were responsible for repayment.

Due to the predominance of group pressure in the intragroup pressure ex post, it is understandable that most women with relatively minor repayment problems in Guatemala did not approach the group, but rather solved the problem themselves. Several of the women had even turned to informal moneylenders at a much higher interest rate than the group loan rather than face the group. In cases where a woman defaulted for a seemingly invalid reason, the village bank members had gone to her home to threaten her to pay. Thus, both ex ante and ex post pressure dominated the intragroup contract in Guatemala. This is not surprising given that the Guatemalan village banks were significantly larger than the Burkina Faso groups, with an average of 50 members. Therefore, the existence of imperfect information made group solidarity an impractical contract due to the danger of moral hazard.

An entirely different intragroup contract was witnessed in Sahel Action in Burkina Faso in 1994. Rather than peer pressure driving the intragroup contract, group solidarity was much more decisive in forming the intragroup contract. These groups were from small villages and were formed of only five members. Nearly perfect information existed among members who were unable to shirk their responsibilities without the other members knowing. Like, the other examples, a strong correlation between the reason for default, feelings of the group, and group response was measured. Unlike the Guatemalan women

who demonstrated a high perception of personal responsibility for most arrears, the Burkinabe women tended to be more sympathetic to most reasons for default.

In developing countries which experience frequent income shocks, (family sickness or death, droughts, war, devaluations, etc.) uncontrollable causality may significantly outweigh controllable causality. Therefore, instead of focusing on peer pressure, financial institutions should be fostering cooperative behavior and solidarity among their clients. In addition, it would be difficult to maintain large groups that do not have reliable information about the economic activities of their members. If such groups were created, they would have to rely on peer pressure, but given a systemic shock, the entire group would collapse.

The reported reasons for repayment problems in Burkina Faso are presented in Chapter 5. Not surprisingly, the abundance of “uncontrollable” justifications for repayment problems and the resulting sympathy suggests that information is readily available about the group members leading to the effective use of group solidarity and that *ex ante* pressure prevented widespread moral hazard. A positive correlation between the emotion expressed in the face of repayment problems and the resulting behavior (pressure or solidarity) suggests that the perceived responsibility and social motivation model accurately describes how the group reacts. Therefore, the model is used as a justification for incorporating “emotion” into the equation for group pressure in the group loan repayment econometric model.

CHAPTER 3

GROUP REPAYMENT CONCEPTUAL ECONOMETRIC MODEL

Relatively few models of group lending have appeared in the economic or development finance literature. The purpose of this chapter is to present a model of group lending that incorporates the theoretical constructs of Besley and Coate as well as the contributions to the understanding of groups that have been presented in Chapter 2, including the concept of the intragroup contract. To date, most of the econometric models of group lending focus on just one group dynamic, typically peer pressure. An elaboration of the Besley and Coate repayment game offers a more comprehensive way of incorporating a wide range of group dynamics as well as other explanatory variables for group loan repayment.

Rather than fitting a model around the collected data, this chapter presents the model in a pure form without regard to any available data. A straightforward application of this model to the Burkina Faso data is not possible since some model variables were not collected and therefore, the model was adapted accordingly. While most variables were collected, a few concepts were refined further once the survey had been completed.

3.1 Model Structure

The following model is based on the principal/agent problem previously specified where repayment is a function of the processes laid out in the Besley and Coate repayment game. In addition to the variables specifically given in their model (such as group homogeneity, the domino effect, group solidarity, and social sanctions) additional variables that have been supported by other theoretical and empirical research have been added to the vector of variables influencing loan repayment (leadership/training, the matching problem, repayment seniority, rural/urban factors, and former experience working in groups). Furthermore, a distinction between the *ex ante* and *ex post* contract is given to distinguish between the threat of social sanctions and realized social sanctions.

By incorporating each of these variables, the model is capable of showing what influences are the most important in determining loan repayment in different settings. The model is flexible enough to use data sets from other regions of the world, although additional variables may be appropriate depending on cultural and regional factors.

The model takes on the structure of a decision tree which is shown in . Several stages in the repayment process exist. First, the individual may or may not have problems repaying the loan. If she does, she must decide whether to solve the problem independently or tell the group. If the group finds out about the problem, group peer pressure and/or group solidarity may affect whether or not the loan is repaid.

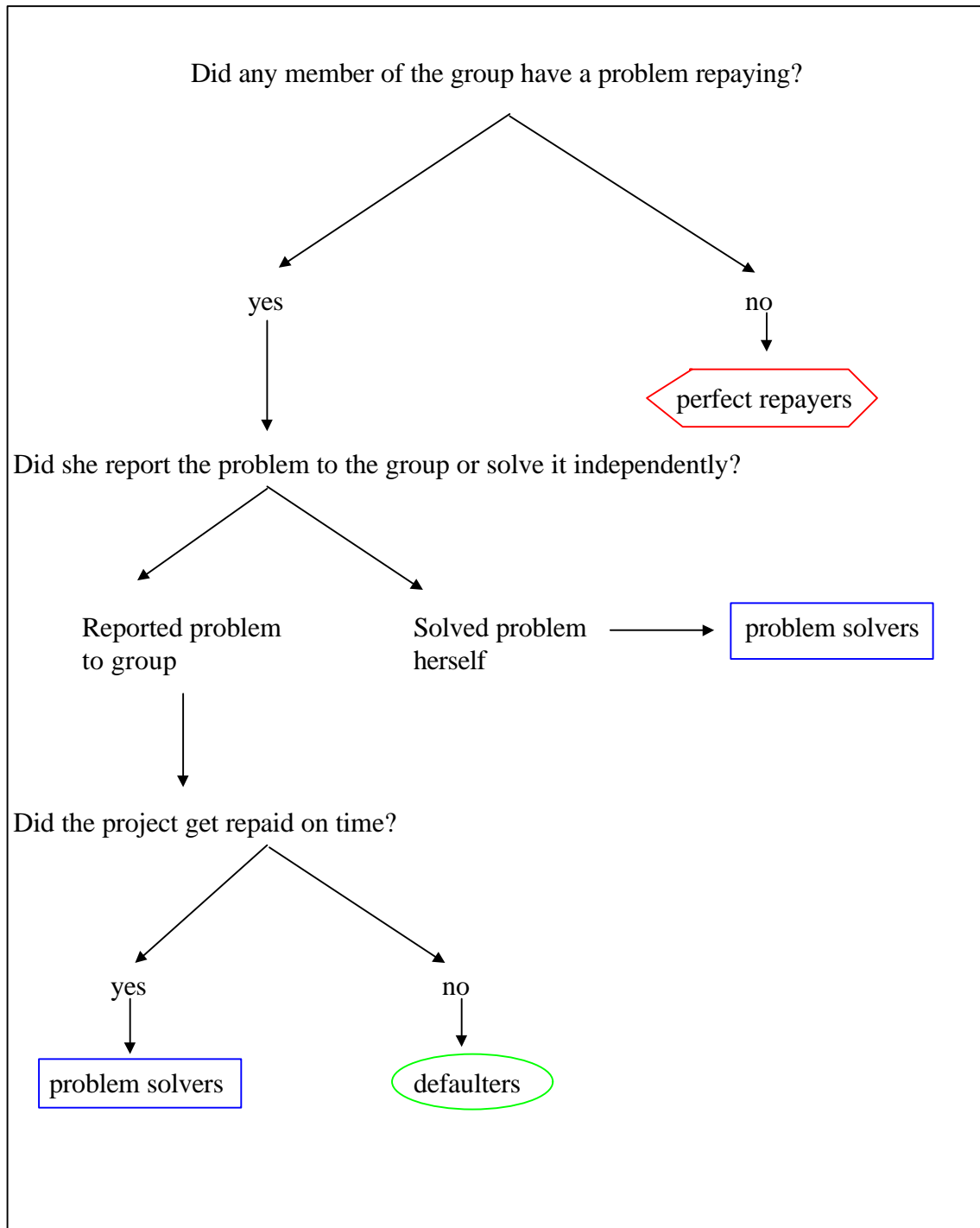


Figure 4: Group Lending Decision Tree

The first stage in examining repayment behavior is to know whether or not any individual in the group ever had a problem repaying her part of the group loan. A "problem" could range from an external income shock, to laziness affecting the generation of income, to outright unwillingness to repay even if resources are available. In addition, a problem could be resolved outside of the group by relying on family/friends or it could be reported to the group in hopes that the group will help repay the loan. According to this definition of "problem", if all members of a group report to having no problems, the interpretation is that loan is repaid in full with no arrears.

Those respondents who report having a problem proceed to the second stage of the decision tree as is illustrated in . Those with a problem must determine whether to try to solve the problem themselves or to inform the group of the problem. Before a problem arises, each member of the group has a sense of what the consequences might be for a member that cannot meet her contractual obligation. Ex ante pressure refers to the sense of shame or intimidation a group member believes she will feel if she does not repay her portion of the loan. If ex ante pressure is high, the individual may opt to solve the problem herself so that others in the group do not get angry or exert pressure on her. The project is repaid promptly as if no problem had occurred. However, if the individual has confidence in the group or no other remedy is possible, she may report the problem to the group. It is then the intragroup contract that will determine whether or not the loan is repaid.

The third stage of the decision tree reveals whether or not the credit program is repaid given that a group member has presented herself to the group as unable or

unwilling to repay her portion of the loan. It is in this third stage that group dynamics may allow for successful, timely repayment of the group loan whereas the individual would have defaulted. If the intragroup contract functions well, there are several ways in which the project could be reimbursed. First, the individual might feel so ashamed about her inability to repay that she does not even mention it to the group and secures the payment from friends, family, or an informal source of credit. Second, the individual might report the problem to the group and the group may pressure her to the point that she is forced to get the money from a secondary source, but the loan is still repaid. Finally, the group may decide to pay the individual's part of the repayment. If all of these options fall through, the project is not repaid resulting in arrears or default as indicated in the final stage of .

Given these definitions of a "problem" and subsequent repayment status, three different classes of borrowers can be derived. The first group can be labeled "perfect repayers" who emerge in the first stage of the decision tree. These are the groups with individuals who never have had any problems repaying themselves and never had to be pressured or helped by others. There are several factors that influence "perfect repayers." One reason that no problems have occurred could be that the individual places a high value on the future access to loans and will make every effort to repay the loan, including plans to have sufficiently remunerative activities and backup sources of funding. Another possibility is that a good harvest or business year allows the individual to repay the loan. In addition, ex ante pressure may be high enough to induce a high level of effort from the initiation of her economic activity, resulting in higher income levels and the ability to repay the loan without problems. This group could also be labelled "perfect planners."

A second group is the "problem solver" group as shown in the second and third stages of the decision tree. These groups had individuals with problems, but were still able to repay the project on time through group solidarity, other financial sources, or through peer pressure. The groups whose members solve problems independently can be termed "problem solvers" as well as the groups who exert the intragroup contract to facilitate repayment. It is relevant to note that most group lending institutions cannot distinguish between "perfect repayers" and "problem solvers."

Finally, there is the "defaulter" group which contains the groups that had at least one member neglect to pay her part. This group appears in the third stage of the decision tree shown in .

In order to reflect these stages, three main equations can be utilized in the group lending repayment model. One equation attempts to measure the weight of independent variables influencing whether or not a group will have problems. The second equation examines the characteristics of groups that solve problems independently versus those implementing the intragroup contract to resolve problems. The third equation is utilized to measure the determinants of loan repayment given that a problem exists and the group is aware of it.

In words, the model can be expressed as a set of relationships. Figure 5 outlines a generalized specification of the group lending econometric model that can be adapted to different contexts.

The first two stages of the model have two equations in triangular recursive form. The final stage is a simultaneous system since repayment and the domino effect have two

directional effects on each other. The variables in the intragroup contract equations are exogenous and therefore, the contract equations can be measured independently and subsequently entered into the "problem," "tell group," and "repayment" primary equations. The ex ante and ex post contracts are variables in each primary equation since the intragroup contract will influence each stage through group pressure and solidarity. Several of the explanatory variables such as homogeneity, loan cycle, domino effect, and history of groups affect more than one equation within one stage. A single equation model would omit these interrelationships and therefore be unsatisfactory.

STAGE 1: Existence of Repayment Problem

Problem = $f(\text{ex ante contract, domino effect, loan cycle, other debt, income}) + \text{error}$

Ex ante contract = $f(\text{domino effect, loan cycle, homogeneity, leadership/training, rural/urban, history of groups, potential reasons for problems, value of future access to loans}) + \text{error}$

STAGE 2: Informing Group or Solving Independently

Inform group = $f(\text{ex ante contract, other debt, homogeneity, income, reason}) + \text{error}$

Ex ante contract = $f(\text{domino effect, loan cycle, homogeneity, leadership/training, rural/urban, history of groups, potential reasons for problems, value of future access to loans}) + \text{error}$

STAGE 3: Repayment in Case of Problem

Repayment = $f(\text{ex post contract, other debt}) + \text{error}$

Ex post Contract = $f(\text{domino effect, loan cycle, homogeneity, leadership/training, rural/urban, history of groups, value of future access to loans, reason, ability to repay}) + \text{error}$

Domino effect = $f(\text{repayment, loan cycle, history of groups, sectoral wealth}) + \text{error}$

Figure 5: Outline of Group Lending Econometric Model

3.2 Conceptual Explanation of Model Variables

The three main stages of the model are comprised of numerous inter-related variables. In this section, the concepts behind each variable are described. It should be noted that each of the variables focuses on the group, rather than the individual. The model is designed to test groups as units rather than the individual behaviors within the group. For the application of this model to the Burkina Faso data, a more precise definition is necessary to explain how each variable is measured. The measurement criteria for each variable is discussed in Chapter 5 in the context of the Burkina Faso data. In general, the exact measurement of each variable may change from context to context so that local or regional variations can be incorporated into the definition.

In Stage 1, the "**problem**" variable is a binary variable that measures whether or not any individual in a group ever has had any type of problem repaying the loan during the course of the loan cycle. Problems can include either an inability or an unwillingness to repay.

The "problem" variable is a function of the **ex ante contract**. As shown in the previous chapter, the intragroup contract contains mechanisms for group pressure and/or group solidarity depending on the strength of the group contract and on the reason for not being able to repay. The ex ante contract is the threat of what might happen if an individual does not pay and the ex post contract is the realization of pressure and/or solidarity once a problem has arisen. The ex ante contract therefore contains ex ante pressure and ex ante solidarity. If strong ex ante pressure exists, an individual may be so worried about the reaction of the group in the case of an inability to repay, that the

individual may try to ensure that no problems arise. This could involve engaging in safe projects, finding insurance mechanisms, or having alternative sources of income to cover income fluctuations. If ex ante solidarity is very strong, an individual may feel comfortable reporting certain problems to the group if she feels that there is a good chance that the group will assist her.

The second stage's principal equation has a dependent variable titled "**inform group**" that simply records whether or not an individual with a problem went to the group to tell them about the problem or solved it independently. The reason that this variable is crucial to understanding group dynamics is that an individual who solves a problem independently without even telling the group may still be influenced by psychologically internalized group pressure. However, if she feels comfortable about the potential response of the group, she may feel more inclined to reveal the situation to the group.

Repayment is the dependent variable in the main equation of the third stage and is treated as an endogenous variable. This variable isolates the response of the group when a member comes to them with a problem. The repayment variable answers the question, "if problems occurred and the group was informed, did the group still repay on time by paying for the member or by forcing her to get the money from other sources?"

Rather than depending on the ex ante contract, the repayment behavior of the group once a member reports a problem is dependent on the **ex post contract**. Since the problem has already been revealed, the group knows the reason for the arrears and then makes the decision to utilize group solidarity and/or group pressure to resolve the problem. Rather than being hypothetical or assumed as in the case of the ex ante contract,

the ex post contract is a realized variable with measurable levels of help and/or pressure in each case of a problem reported to the group.

The **domino effect** is an endogenous variable in the third stage. Some group lending programs enforce group joint liability among members while other programs utilize individual liability. In addition, some programs not only enforce group liability, but sectoral liability. If even one group has a late repayment, the entire village or sector is ineligible for further loans until the loan is repaid. The domino effect is present whenever joint and/or sectoral liability is enforced.

The domino effect is a negative externality created by the group lending technology which results in some members defaulting who may have repaid perfectly under individual lending. Even if sufficient income exists to repay the loan, an individual may still decide not to repay the loan if others default, thus causing a "problem" for the group. This may be more pronounced when several members of the group decide not to repay thereby jeopardizing the entire group's future access to loans. If sectoral liability is also present, then whether or not some groups have defaulted will play a role in determining the repayment of other groups. Not only does the domino effect have an effect on repayment, but repayment influences the domino effect. If the group surveyed defaults on the loan, then this can create a domino effect in the rest of the sector. Due to these cross-directional influences, the third stage is set up as a simultaneous system of equations.

The household **income** level also determines whether or not repayment problems may occur. Diversified incomes may allow for regular repayment even when income

shocks occur. In addition, the income of an individual may influence her ability to solve a problem independently rather than turning to the group. This variable is similar to Besley and Coate's return on investment concept.

The **homogeneity** of the group may influence the intragroup contract (both ex ante and ex post) as well as whether or not an individual decides to tell the group about a repayment problem. The degree to which members of the group are close-knit or have similar incomes may affect their exposure to problems, their ability and willingness to repay, and the form of the intragroup contract. The variable itself is difficult to measure in its pure form so most studies offer several different measures, scales, or proxies. The definition used in this study is discussed in Chapter 5 and contains measures of wealth, demographic characteristics, and intragroup relations.

Proper **leadership and training** may avoid problems from surfacing and may teach groups to develop a stronger intragroup contract, leading to better repayment rates. The program may train groups very effectively so that they learn how to create a system of contingent contracts to obtain or cover the repayment of an individual experiencing problems. Likewise, a strong leader will emphasize these techniques for dealing with adversity.

As discussed in Chapter 1, the **loan cycle** reflects a matching problem in group lending in which members who originally agreed to the terms and conditions of the loan cycle evolve financially and have diverse financial needs as time passes. Therefore, the replication of the group loan, even if the terms and conditions change, may lead to indifference by one or more of the members. A counterargument to this is that groups

function better after working together over time and therefore repayment should increase. Therefore, either sign could appear on the coefficient of this variable. This variable affects the intragroup contracts as the loan cycle may influence the amount of pressure or solidarity the group exerts. In addition, it may affect whether or not a problem arises since, if the matching problem exists, an individual may deliberately default if she never really wanted the loan in the first place but felt obligated to take it because the rest of the group depended on her. Finally, this variable affects the domino effect since widespread default often occurs in areas that have had numerous loan cycles.

The inclusion of the “**other debt**” variable tests the debt seniority theory that states that faced with several types of debt, individuals prioritize debt repayment. It may be the case that the group lending institutions do not take precedence over informal contracts. In this case, the presence of other debt may lead to a decline in repayment. Shipton (1992) observes that in rural areas of The Gambia, “any lending institution, formal or informal, faces competition from other formal and informal creditors when it comes time for collection.” (Shipton, 1992, p. 29)

However, there is an alternative explanation based on empirical evidence suggesting that the presence of other debt indicates the creditworthiness and stability of the individual. Viganò (1993) found the ability to manage several borrowing contracts reflected borrower seriousness and increased the probability of repayment. Which of these two theories predominates can be seen in the coefficient for “other debt”. This variable may affect whether or not a problem arises since some individuals may have other obligations that take precedence over the group loan or may have sources of funding to

help repay the group loan. In addition, it may influence the individual to inform the group of the problem (if the individual has too many other debts) or to solve it independently (if the individual has potential alternative funding sources).

In different contexts, groups are often more common in certain areas. In many cases, informal financial groups are much more common in urban settings. The **rural/urban** variables are important in capturing this effect and is measured in the intragroup contract equations.

The **history of groups** variable refers to the groups' prior experience of working in groups. For example, the participation in ROSCAs, work groups, social groups, or NGO groups could be a key factor in determining how successful the group will perform. The group history can affect the intragroup contract and the domino effect. If this variable is correlated closely to the rural/urban variable, it should be omitted.

As examined in Chapter 2, the **reason** given by an individual to the group explaining why she cannot repay is a determinant of how the group will react. If the group feels that the problem is unavoidable, there is a better chance they will assist the individual. However, if the group believes that the individual is personally responsible for their plight, pressure may be exerted. The exact mechanics of the intragroup contract will vary from group to group, but regardless, the reason for the problem is a central issue. The "reason" variable is included only in the ex post contract because it refers to the actual reason given to the group by a member with a problem. In the ex ante contract, the **potential reasons for problems** are key factors in influencing how the group would react if such problems arose.

In some cases, group solidarity cannot work if the group does not have the **ability to repay**. For example, if several members of the group default, the remaining members may not be able to cover the arrears of all the defaulters. Even if the intention of helping exists, financial constraints may limit the group's ability to repay. This is a variable that affects the ex post contract.

A final variable related to the intragroup contract is the **value of future access to loans**. If the credit program is not interesting to the members or the clients have experienced former failed programs or loans that were never rigorously collected, there may be little incentive to develop a strong intragroup contract. In such cases, widespread default without pressure or solidarity may be witnessed.

3.3 Statistical Methodology: Simultaneous Mean and Covariance Structure Model

Models examining only one facet of group dynamics or not fully explaining the simultaneity of these variables cannot fully capture the complexities of group lending repayment behavior. This model incorporates the theoretical findings of the Besley and Coate repayment game as well as tests for anecdotal and observed evidence of other influences of group loan behavior. There are several econometric techniques that could be used to test this model. The econometric model must be able to incorporate binary and categorical variables. In addition, the model must be able to capture the two stage nature of the model. One possibility is to use a nested logit model. Another possibility used in this analysis is to use a mean and covariance structure model that incorporates multiple indicators of latent variables and allows for a more complex error structure.

Due to its use of non-traditional variables, simultaneity, and categorical variables, a standard regression using conventional econometric techniques cannot accurately estimate the model. Therefore, a more comprehensive covariance structure model will be utilized for estimation. In the 1990's, agricultural economists increasingly are turning to latent variable models to describe complex relationships that incorporate variables measured with error.

More and more attention has been given to the analysis of microeconomic data using latent variables. Bollen (1989) gives the following definition of latent random variables.

Latent random variables represent unidimensional concepts in their purest form. Other terms for these are *unobserved* or *unmeasured variables* and *factors*. The observed variables or indicators of a latent variable contain random or systematic measurement errors, but the latent variable is free of these. Since all latent variables correspond to concepts, they are hypothetical variables. (p. 11)

In the standard least squares regression, economists assume that no random or systematic measurement errors are present in the variables. The error term for each equation is a random variable that is assumed to be independent of the explanatory variables. Under OLS, the error term has a conditional mean defined by:

$$u = \mathbf{b} Y + \Gamma X$$

from the standard relationship:

$$\mathbf{b} Y + \Gamma X + u = 0$$

Traditional econometric models such as the one just presented are mean structure models due to the fact that they estimate the conditional means of the dependent variables given a set of exogenous variables, although they are rarely referred to as such. The fixed number of estimated parameters characterizes the mean structure.

However, with the latent variable model, a more complex error structure arises and therefore, more information from the moment structure is needed to estimate the model parameters. Since each variable has its own error structure, it is no longer valid to claim that the equation's error term is independent of the variables. The latent variable model illustrates the relationship between structural equations incorporating latent variables. The structural equation for the latent variable model is given by:

$$\mathbf{b}\mathbf{h} + \Gamma\mathbf{x} + \mathbf{e} = 0$$

where

$$E(\mathbf{h}) = 0$$

$$E(\mathbf{x}) = 0$$

$$E(\mathbf{e}) = 0$$

\mathbf{x} uncorrelated with \mathbf{e}

The measurement model varies from the standard OLS notation in that \mathbf{h} replaces Y as a vector of endogenous latent variables rather than standard endogenous variables and \mathbf{x} is a vector of latent exogenous variable instead of X , the exogenous variables with no measurement error. In order to define the nature of the latent endogenous and exogenous variables, a measurement model so that the entire structure can be written as:

$$\mathbf{b}\mathbf{h} + \Gamma\mathbf{x} + \mathbf{e} = 0$$

$$Y = \Lambda_y \mathbf{h} + \mathbf{f}_y$$

$$X = \Lambda_x \mathbf{x} + \mathbf{f}_x$$

Note that this reduces to the common OLS formulation when we assume that the variables are measured without error ($\mathbf{d} = 0$) and when the parameter values (Λ) are assumed to be unitary.

Another name for the latent variable model comprised of structural equations with an embedded measurement model is a *covariance structure model*. Covariance is central to these models since the covariance structure now includes not only the covariance matrix of \mathbf{e} , but also the covariance matrix of \mathbf{d} . With this more complex covariance structure, the covariance of indicators is not determined in the model and the population indicator covariances can be positively related to the error terms. Therefore, it is necessary to examine the sample estimates of variances and covariances in order to estimate the population covariance structure. The sample covariance matrix is used to determine the estimates of the structural equation models. The covariance structure

model attempts to minimize the difference between the true population covariance matrix (Σ) and the sample covariance matrix $\Sigma(\mathbf{q})$ which is a function of the model parameters.

$$\text{Min} [\Sigma - \Sigma(\mathbf{q})]$$

The covariance structure is needed to estimate the measurement model which is a factor analytic model. The estimation of the structural equation, once the measurement model has been incorporated, relies on the more traditional mean structure analysis. Combining the measurement and structural equations into a single model can therefore be termed a mean and covariance structure model.

To fully understand the usefulness of using a covariance structure model for empirical applications, it is necessary to highlight the estimation problems that can occur with a traditional errors in variables model using proxy variables that are assumed to be perfect indicators. Firstly, if measurement error exists, the proxy variable error term can be correlated with the equation error term. This can lead to biased, inconsistent estimates. Furthermore, an errors in variables model has no way of indicating how close the proxy is to the latent variable, since it assumes it to be a perfect indicator. Furthermore, problems can arise from the fact that the scale and the variance of the proxy may differ from the latent variable. The errors in variables models assume both the scale and the variance to be identical. In addition, the presence of measurement error can affect the coefficients of all the other variables in the system and therefore, by ignoring it, incorrect analyses can

occur. Not only can biased coefficients result, but they may be the wrong sign, resulting in a false interpretation of the estimation.

Krasker and Pratt (1986) showed how easily a wrong signed coefficient can be obtained. By regressing the latent variable on the exogenous variables and then the exogenous and the endogenous variables and comparing the goodness of fit, the minimum correlation between the latent variable and its proxy is given in order to have the correct sign on the coefficient. Given the model:

$$y = \mathbf{b}X + \mathbf{g}Z + u$$

where z is unobserved with proxy $p = z + e$

the correct sign of the coefficient can be tested using:

$$(r^*)^2 > R_{px}^2 + 1 - R_{p^*yx}^2$$

For example, if $R_{ps}^2 = 0.3895$ and $R_{p^*yx}^2 = 0.6193$, then the correlation between the latent and the proxy variables must be larger than 0.878. The conclusion is that in order to have the right sign, we need higher quality proxy variables than could be hoped for in most contexts.

Maddala (1988) emphasizes these dangers of not accounting for measurement error and concludes that it may be better to omit poor proxies from errors in variables

models. Omission may be the most appropriate when the errors in variables assumptions of the error terms are violated, when proxies are dummy variables, or when other model variables are measured with error. Using a latent variable model avoids these complications.

Goldberger (1974) gives an example of the problem of measurement error in a standard economic problem. He uses a traditional supply and demand model assuming that the income variable is measured with error. The model is defined as follows.

Supply and Demand Model:

$$Y_1 = \mathbf{a}_1 y_2 + \mathbf{a}_2 x_1^* + u_1$$

$$Y_1 = \mathbf{b}_1 y_2 + \mathbf{b}_2 x_2^* + \mathbf{b}_3 x_3^*$$

where:

Y_1 = quantity

Y_2 = price

x_1^* = income

x_2^* = wage

x_3^* = raw material price

Suppose income has a random error:

$$x_1 = x_1^* + \mathbf{e}_1$$

$$x_2 = x_2^*$$

$$x_3 = x_3^*$$

Using data, the structural parameters were estimated:

	a_1	a_2	b_1	b_2	b_3
with error	-1.71	0.2	-0.32	-0.28	0.6
without error	-4.85	0.53	-0.41	-0.2	0.64

Not only are the coefficients different on the latent variable, but the measurement error has affected the analysis of every model parameter. The estimated error variance contributed to 15% of the total variance. The most appropriate analysis corresponds to the estimation incorporating measurement error.

While the econometric foundations of covariance structure models are solid, their application in economics and agricultural economics has not been widespread. Instead, their application has been more confined to biometrics, psychometrics, and other social sciences that frequently use latent variables. However, as economic models become increasingly complex, covariance structure models have become not only appropriate, but the most sound and legitimate statistical technique for estimating latent variable models. In the 1990's, more and more economists have utilized covariance structure models since they give a more realistic portrayal of the error structure, they allow for correlated error terms, and they allow for multiple indicators of a given latent variable.

A 1993 study, Gao and Shonkwiler challenged the findings of Alston and Chalfant that no structural change was evident in the demand for meat in the United States. Alston and Chalfant argued that the decline of meat demand could be explained by price and quantity variables rather than by a structural change parameter to measure changes in consumer preferences. Typically, the proxy for structural or technical change is time.

Obviously, time is only an indicator for the latent variable “structural change” and therefore, it should be measured using a covariance structure model. Gao and Shonkwiler reestimated the demand using a latent variable model, incorporating the new error structure and found that taste change was a contributing factor for the decline of meat demand.

Many economic variables, such as tastes/preferences, consumption, income, expenditure, are likely to be measured with error. In any case where measurement error is anticipated, latent variable models are the most appropriate technique for estimation. In 1992, Udry reports on the difficulty of collecting credit data in Africa and how standard economic assumptions and models may not apply. Certainly, latent variables are appropriate in cases where even the most basic data, such as household income, is enigmatic and measured with error.

For the proposed group lending model, most of the variables are latent variables. The only variables measured with certainty are repayment, sectoral default, and the loan cycle. Otherwise, the other variables, both endogenous and exogenous, have an error term attached. The model can therefore be expressed as the following:

Simplified Matrix Notation:

$$\left[\begin{array}{l} \mathbf{bh} + \Gamma\mathbf{x} + \mathbf{e} = 0 \\ Y = \Lambda_y \mathbf{h} + \mathbf{f}_y \\ X = \Lambda_x \mathbf{x} + \mathbf{f}_x \end{array} \right.$$

Writing out the structural equations in a three stage fashion, the full model is obtained and is given by:

Complete System

Stage 1

$$\begin{aligned} \mathbf{h}_0 &= \mathbf{b}_{01}\mathbf{h}_1 + \mathbf{g}_{00}\mathbf{x}_0 + \mathbf{g}_{01}\mathbf{x}_1 + \mathbf{g}_{02}\mathbf{x}_2 + \mathbf{g}_{03}\mathbf{x}_3 + \mathbf{g}_{04}\mathbf{x}_4 + \mathbf{z}_0 \\ \mathbf{h}_1 &= \mathbf{g}_{10}\mathbf{x}_0 + \mathbf{g}_{11}\mathbf{x}_1 + \mathbf{g}_{12}\mathbf{x}_2 + \mathbf{g}_{15}\mathbf{x}_5 + \mathbf{g}_{16}\mathbf{x}_6 + \mathbf{g}_{17}\mathbf{x}_7 + \mathbf{g}_{18}\mathbf{x}_8 \\ &\quad + \mathbf{g}_{19}\mathbf{x}_9 + \mathbf{g}_{110}\mathbf{x}_{10} + \mathbf{z}_1 \end{aligned}$$

Stage 2

$$\begin{aligned} \mathbf{h}_2 &= \mathbf{b}_{21}\mathbf{h}_1 + \mathbf{g}_{20}\mathbf{x}_0 + \mathbf{g}_{23}\mathbf{x}_3 + \mathbf{g}_{24}\mathbf{x}_4 + \mathbf{g}_{25}\mathbf{x}_5 + \mathbf{g}_{211}\mathbf{x}_{11} + \mathbf{z}_2 \\ \mathbf{h}_3 &= \mathbf{g}_{30}\mathbf{x}_0 + \mathbf{g}_{31}\mathbf{x}_1 + \mathbf{g}_{32}\mathbf{x}_2 + \mathbf{g}_{35}\mathbf{x}_5 + \mathbf{g}_{36}\mathbf{x}_6 + \mathbf{g}_{37}\mathbf{x}_7 + \mathbf{g}_{38}\mathbf{x}_8 \\ &\quad + \mathbf{g}_{39}\mathbf{x}_9 + \mathbf{g}_{310}\mathbf{x}_{10} + \mathbf{z}_3 \end{aligned}$$

Stage 3

$$\begin{aligned} \mathbf{h}_4 &= \mathbf{b}_{45}\mathbf{h}_5 + \mathbf{g}_{40}\mathbf{x}_0 + \mathbf{g}_{43}\mathbf{x}_3 + \mathbf{z}_4 \\ \mathbf{h}_5 &= \mathbf{b}_{56}\mathbf{h}_6 + \mathbf{g}_{50}\mathbf{x}_0 + \mathbf{g}_{52}\mathbf{x}_2 + \mathbf{g}_{55}\mathbf{x}_5 + \mathbf{g}_{56}\mathbf{x}_6 + \mathbf{g}_{57}\mathbf{x}_7 + \mathbf{g}_{58}\mathbf{x}_8 \\ &\quad + \mathbf{g}_{510}\mathbf{x}_{10} + \mathbf{g}_{511}\mathbf{x}_{11} + \mathbf{g}_{512}\mathbf{x}_{12} + \mathbf{z}_5 \\ \mathbf{h}_6 &= \mathbf{b}_{64}\mathbf{h}_4 + \mathbf{g}_{60}\mathbf{x}_0 + \mathbf{g}_{62}\mathbf{x}_2 + \mathbf{g}_{68}\mathbf{x}_8 + \mathbf{g}_{613}\mathbf{x}_{13} + \mathbf{z}_6 \end{aligned}$$

where

$$\begin{aligned} Y_0 &= \Lambda_0 \mathbf{h}_0 + \mathbf{d}_0 & Y_4 &= \mathbf{h}_4 \\ Y_1 &= \Lambda_1 \mathbf{h}_1 + \mathbf{d}_{y1} & Y_5 &= \Lambda_5 \mathbf{h}_5 + \mathbf{d}_5 \\ Y_2 &= \Lambda_2 \mathbf{h}_2 + \mathbf{d}_{y2} & Y_6 &= \mathbf{h}_6 \\ Y_3 &= \Lambda_3 \mathbf{h}_3 + \mathbf{d}_3 \\ X_0 &= \mathbf{x}_0 \\ X_1 &= \mathbf{x}_1 & X_7 &= \mathbf{I}_{x7} \mathbf{x}_7 + \mathbf{d}_{x7} \end{aligned}$$

$$X_2 = \mathbf{x}_2$$

$$X_3 = \mathbf{l}_3 \mathbf{x}_3 + \mathbf{d}_3$$

$$X_4 = \mathbf{l}_4 \mathbf{x}_4 + \mathbf{d}_4$$

$$X_5 = \mathbf{l}_5 \mathbf{x}_5 + \mathbf{d}_{x5}$$

$$X_6 = \mathbf{l}_6 \mathbf{x}_6 + \mathbf{d}_6$$

$$X_8 = \mathbf{l}_8 \mathbf{x}_8 + \mathbf{d}_{x8}$$

$$X_9 = \mathbf{l}_9 \mathbf{x}_9 + \mathbf{d}_{x9}$$

$$X_{10} = \mathbf{l}_{10} \mathbf{x}_{10} + \mathbf{d}_{10}$$

$$X_{11} = \mathbf{l}_{11} \mathbf{x}_{11} + \mathbf{d}_{11}$$

$$X_{12} = \mathbf{l}_{12} \mathbf{x}_{12} + \mathbf{d}_{12}$$

Endogenous variables

h_0 = problem

h_1 = ex ante contract

h_2 = tell group

h_3 = ex ante contract

h_4 = repayment

h_5 = ex post contract

h_6 = domino effect

Exogenous variables

x_0 = constant

x_1 = domino effect

x_2 = loan cycle

x_3 = other debt

x_4 = income

x_5 = group member homogeneity

x_6 = leadership/training

x_7 = rural/urban

x_8 = history of groups

x_9 = potential reasons for problems

x_{10} = value of future access to loans

x_{11} = reason for problem

x_{12} = ability of group to repay

Numerous computer programs have been created for the estimation of covariance structure models¹. MECOSA (Mean and Covariance Structure Analysis), a 1992 program created by Arminger, analyzes complex microeconomic data with complicated mean and covariance structures and can handle metric and nonmetric dependent variables. In the case of the group loan repayment model, all of the indicators are categorical. MECOSA allows for nonlinear restrictions on parameters and metric, censored, classified, dichotomous and ordered categorical variables. Its foundations are based in simultaneous equations systems, factor analysis, and threshold measurement relations.

¹ EQS, LISCOMP, LISREL, RAMONA, AMOS, CALIS, SOSAN, and SEPATH

CHAPTER 4

GROUP LENDING IN BURKINA FASO: THE CASE OF SAHEL ACTION

In order to apply and interpret the group lending econometric model for a specific group lending program, it is important to have a thorough understanding of the characteristics of the program and the context in which it operates. Not only does such background information shed light on the results of the analysis, but it also assists in the definition and measurement of model variables and equations. This chapter provides an overview of a group lending scheme in the Sahel region of Burkina Faso.

The following examines key features of the Le Projet de Promotion du Petit Credit Rural (PPPCR), also known as Sahel Action, based on a three month on-site stay in 1994 as well as the use of client and staff interviews and secondary literature. An analysis of the country and regional context is followed by a description of the PPPCR's place within the formal and informal financial markets in Burkina Faso. The performance of the PPPCR is evaluated within this framework in terms of outreach, growth, cost, and profitability. This background information allows for a more thorough analysis of the group lending model to be discussed in Chapter 5.

4.1 Country and Regional Context

Macroeconomic conditions

The PPPCR is attempting a difficult feat: to create a sustainable financial institution in a high risk, low income region. This relatively young institution, founded in 1988, has been adapted from the Grameen bank model and each year continues to create context specific innovations to overcome obstacles. While repayment rates have been noteworthy, self-sustainability is still not in sight as the PPPCR struggles with the high costs of providing credit to a widely dispersed, very poor clientele in a financially repressed country.

Burkina Faso is one of the poorest countries in the world with an average GNP per capita of only \$300 annually, compared to \$520 for the sub-Saharan region.² Due to the pegging of the CFA to the French franc, inflation has averaged a mere 3.3 percent during the period 1980 to 1993. During this period, the average annual growth rate of 0.8 percent stands out in sub-Saharan Africa, averaging -0.8 percent during the same period.

Although Burkina Faso is considered a relatively tranquil country, its economy has experienced weather related and currency related shocks in recent years. Droughts, most critically affecting the northern part of the country, cause large variations in agricultural production in a country that is predominantly agrarian based. The drought in 1984 was particularly severe, leading to famine, deforestation, and a massive exodus of people to the coastal areas. In addition, the devaluation of the CFA in 1993 altered the economy by leading to increased cattle exports to the Ivory Coast, unfavorable domestic consumer prices, and a reduction in the real value of domestic savings. In addition to these effects, inflation rates since 1993 have risen, approaching 30 percent annually.

² 1993 data from World Development Report, The World Bank, 1995.

Within the relatively stable period of 1980 to 1993, a monetization of the economy occurred with money and quasi-money³ increasing by an average of 9.8 percent annually. While this figure is somewhat lower than most developing countries during the same period, it is a representative figure for West Africa. With inflation levels low, commercial bank interest rates on deposits from 1980 to 1993 averaged 4 percent in real terms while lending rates averaged 15 percent annually. This 11 point spread is the highest registered in West Africa, raising questions of transaction costs, efficiency, and sufficient competition within the formal financial sector.

Informal finance is active throughout Burkina Faso. In the regions served by the PPPCR, the most common type of informal finance is the tontine, otherwise known as a ROSCA (rotating savings and credit association). A typical tontine in Burkina Faso includes 5 to 10 people that contribute a fixed amount of savings every one to four weeks with the sum going to a different member each week. Tontines in Burkina Faso extend from large, sophisticated ones in urban commercial districts to relatively simple ones in rural settings. In some of the most rural areas, however, tontines have had limited success. Tontines were much more predominant in larger villages with markets whereas smaller, isolated villages often reported failed attempts at keeping tontines operational.

In 1994, a survey of 150 clients of the PPPCR was carried out by the author. Questions referring to household finance reveal that when an individual earns any type of income, it is common to share the income with family members. Therefore, in order to protect an individual's income, it is customary to place it in a savings scheme immediately

³ Money is defined as currency outside banks and demand deposits, quasi-money as time and savings

or to hide it, before it is spent. In addition, loans between family members usually are thought of as gifts and rarely repaid. It is therefore not surprising that nearly all of the 150 women surveyed reported that it was rare for them to receive funds from their husbands or families for their businesses.

Regulatory and legal framework for financial institutions

While commercial interest rates were positive in real terms during 1980-1993, the sudden change in economic conditions coinciding with the currency devaluation led to an erosion of positive real interest rates. Banking regulations have capped commercial lending rates since 1993 at rates ranging from 18 to 29 percent annually. Meanwhile, inflation has exceeded these ceilings, causing the entire financial system to operate with negative real interest rates. The Central Bank, the Caisse Nationale de Credit Agricole (CNCA), lends at a rate of 9 percent to government supported financial institutions which, in turn, lend at a maximum rate of 18 percent. While these institutions still maintain a 9 point spread, the clients are borrowing at a real rate of close to negative 0 percent. This repression leads to financial distortions on both the lending and deposit mobilization sides of the formal financial sector and for those institutions, such as the PPPCR, attempting to operate within the legal environment.

The different interest rates charged to various financial institutions and the imposition of a market interest rate ceiling are exemplary of interest rate strategies often present in developing countries. This type of financial repression is especially detrimental

deposits and other liquid bank accounts. World Development Report, The World Bank, 1995.

to the development of viable institutions since the distorted interest rates reduce savings, slow capital formation, cause inefficient investment allocation, and reduce access to credit in rural areas (Gonzalez-Vega (1983)). On the lending side, clients no longer have to choose highly remunerative activities in order to repay their loans since they can borrow at negative real rates. In addition, nominal interest rate ceilings are particularly destabilizing during inflation shocks, (Fry (1982)) like the sudden increase in inflation caused by the recent devaluation of the CFA.

Another difficulty presented by the legal financial framework in Burkina Faso is the inflexibility of the laws pertaining to financial institutions. Until this year's passage of the *Loi Portant Reglementation des Institutions Mutualistes ou Cooperatives d'Epargne et de Credit* by the West African Monetary Union that formally regulates credit unions and cooperative movements in West Africa, the only other legitimate financial institution recognized in Burkina Faso has been a formal bank. For those microfinance institutions that fall beyond the definition of a credit union or formal bank, there is no legal structure to recognize, regulate or insure their loans and deposits. Thus, in order to be a legal financial program, an institution such as the PPPCR must convert into one of two rigid definitions of a financial institution. As the PPPCR grows, their status becomes an increasingly important concern.

Regional conditions

Burkina Faso is primarily an agrarian economy, with a large percentage of rural households. The PPPCR chose the rural environment to operate since a high percentage

of rural people are very poor and have had little or no access to formal credit. The PPPCR started operations in 1988 on a trial basis in the northern province of Yatenga because it posed a great challenge: it contained some of the most difficult conditions for a microcredit program and therefore would provide a laboratory for experimentation.

The village of Banh, in the northern part of the Yatenga province along the Mali border, was selected for the first trial credits. While this region pertains to Yatenga, it is geographically and economically more representative of its neighboring provinces of Oudalan and Soum than of the central and southern parts of Yatenga. According to a 1993 USAID vulnerability assessment of the country, out of the 34 provinces, Oudalan and Soum ranked second and third worst off respectively in terms of long-term indicators of general level of development. Oudalan had the highest infant mortality rate in the country and Soum had the highest overall death rate and lowest medically assisted births in the country.

The inhabitants of Yatenga traditionally have raised livestock as their main source of income, with some cereal subsistence agriculture. However, the population of 600,000 is confronted with the problem of irregular rainfall, characterized by a two month rainy season and a ten month dry season. During the dry season, farmers and livestock breeders must turn to non-agricultural activities to supplement their family incomes. The problem has been exacerbated by frequent severe droughts. One of the worst droughts occurred in 1984 which severely damaged the cattle industry.

Before the drought of 1984, a system of barter was in place, based on the complementarity of economic activity. The system was self sufficient and only weakly

monetized, thus characteristic of fragmented and isolated markets. Animals were used primarily for family savings and were rarely sold except for emergency funds or special holidays. In addition, savings were held in the form of cereals, and gold jewelry.

Following the 1984 drought, Banh entered a phase of rapid transformation. The drought reduced grazing land, milk production, and millet harvests. To cope with the shortage of pasture, cattle herders led their animals farther south where the animals were exposed to trypanosomiasis, leading to a high mortality rate. In order to feed their families, savings were depleted, cattle were sold and replaced with less expensive livestock (goats and sheep) that could serve as smaller units of savings and exchange. People diversified their economic activities as the cattle herds declined. These events led to an accelerated monetization of the economy (Ellsasser, 1989).

Problems linked to the 1984 drought included famine, loss of income and savings, lack of start-up capital, as well as environmental problems stemming from overpopulation and poverty, such as deforestation, overgrazing, and erosion. The most severe problem identified by a French assessment⁴ was an income and start-up capital shortage following the drought. In order to address this problem, a credit scheme was devised that emulated the Grameen experience.

After successful repayment in the Yatenga province, the PPPCR was formally established and expanded to three other provinces. One of these provinces is Soum, an isolated Sahelian region with low population density and characteristics similar to the

⁴ In 1988, the Caisse Francais de Developpment (CFD) sponsored K. Ellsasser to perform a territorial management analysis of northern Yatenga.

northern Yatenga province. The other two provinces of Ganzourgou and Tapoa have quite different socioeconomic and climatic characteristics.

Ganzourgou is located in the central region of Burkina Faso, close to the capital of Ouagadougou. It is south of the desert-like conditions of the north and has a climate more favorable to agricultural production. Of the four provinces served by the PPPCR, Ganzourgou has the highest average family income, mostly from agricultural production (USAID, 1993). Due to the proximity to the capital, inhabitants of Ganzourgou have a large market for the sale of their produce.

The province of Tapoa is located on the far eastern side of Burkina Faso. Because it borders Niger and Benin, several large markets exist with a thriving export market. However, according to the 1993 USAID Vulnerability Assessment, Tapoa was ranked the fourth most famine vulnerable province out of the 30 provinces. This analysis was based on the extreme fluctuations in agricultural output measured in Tapoa due to the susceptibility to climatic variation. While agricultural income is higher than in Soum or Yatenga, the variance of income puts the inhabitants at risk.

Profile of the PPPCR clients

In order to qualify as a client of the PPPCR, an individual must have no other formal or semi-formal loans. The per capita incomes of the clients are well below the national average of \$300 annually. As previously mentioned, in some of the most remote villages, the economies are barely monetized. Most of the clients have had very little formal education and are illiterate. The economic activities vary depending on the season.

During the rainy season, almost all clients are involved directly or indirectly with cultivation. During the other 10 months of the year, economic activities vary. Initial loans were granted for the following activities:

47 % livestock, agriculture
32% small trade
13% soap production
6% artisanry
2% other
100% TOTAL

A 1993 study by Colliot and Nguyen examined how differences across households in the village of Banh affected the demand for financial instruments. They divided household types by ethnic group, sedentary vs. transitory, and economic activity. The poorest household type was ‘cultivators without animals’ which represented 15 percent of the village and received only 3.5 percent of the PPPCR credits in the village. The authors found that the household types with the greatest demand for credit were sedentary households performing market activities. On the other hand, transient households with cattle were more in need of savings facilities so they were better able to sell at peak market prices and save the income for consumption smoothing throughout the year.

A unique feature of the PPPCR clientele is that they belong to a multitude of ethnicities with the major ones including Mossi, Rimaibe, and Peulh. Numerous languages are spoken by the clients and few of the clients in isolated rural regions speak French. Therefore, bank officers must be multi-lingual in order to provide financial services to each ethnic group. Of course, this presents interesting and complex relationships between

bank agents of one ethnicity serving clients of another ethnicity, however, bank agents report that this does not affect loan repayment significantly.

Currently 98 percent of the PPPCR's clients are women. The initial objective of the project was to target the most disadvantaged people in Burkina Faso, which often include women. The donors were supportive of working with a predominantly female clientele. Also, it is most commonly the women who engage in commercial activity at the local markets. After the drought of 1984, the role of women as contributors to household income became more pronounced as off-farm income became increasingly important. In addition, several village agents reported that women clients required less of the agents' time than men since they accepted the rules and regulations of the project more readily, without time-consuming questions and arguments with project personnel. Therefore, bank employees believed that working with women led to lower bank transactions costs, even though the repayment rate for men versus women was not significantly different in the trial credit cycles.

Another logical reason for providing women with credit is that migration of Burkinabe men to neighboring Ghana and Ivory Coast is a pronounced phenomenon. In fact, in bad harvest years, male labor is Burkina Faso's primary export (Economist Intelligence Unit (1988)). Burkinabe women, who traditionally perform most of the agricultural and household duties, are assuming even more responsibilities as more men leave (Savane (1986)).

Indeed, the PPPCR is operating in one of the most difficult environments for microfinance. Not only is the entire financial system repressed and the legal structure

restrictive, but the project has chosen difficult economic environments for its operations. It is no wonder that numerous attempts to provide these regions with credit in the past (PPI, CNCA, ODR, CRPA, etc.) have failed due to low repayment. This failure is in part due to politically motivated credit pushes with no emphasis on repayment, misguided targeting of economic activities, and inappropriate terms and conditions (Ellsasser and Diop (1990)). The combination of low incomes, sparse population density, ethnic diversity, and susceptibility to shocks makes any type of microfinance particularly challenging. The following section analyzes how these obstacles have been addressed in the PPPCR.

4.2 The PPPCR and the System of Financial Intermediation

Institutional history

Like the Grameen Bank, the foundation and direction of the PPPCR have stemmed from a charismatic leader, Dr. Konrad Ellsasser. However, while Professor Yunus of the Grameen Bank is indigenous to Bangladesh, Dr. Ellsasser's efforts have been sponsored primarily by an outside French development organization, CIRAD (Centre de Cooperation International de Recherche Agronomique pour le Developpement). Dr. Ellsasser traveled to Burkina Faso to perform agronomic research. In 1988, he was asked by the CFD (Caisse Francaise de Developpement) to prepare a development project for the drought stricken area of Yatenga.

In 1988, after assessing that the drought prone northern Yatenga region was credit constrained, 30 trial loans were granted in the villages of Banh and Ziga in the Northern province of Yatenga. One hundred percent of the loans were repaid in full and thus the Caisse Central de Cooperation Economique of France (the principal aid agency of the French government since renamed the Caisse Francaise) contributed 3 million CFA to start a full scale lending operation with the PPPCR as the operations branch for loan distribution under the auspices of the administrative unit, SAHEL ACTION. This unit collaborates with the principal agricultural development bank in Burkina Faso, the Caisse Nationale de Credit Agricole (CNCA) and the Burkina office of CIRAD. The interrelationships of this system are illustrated in Figure 6.

The PPPCR was created as an attempt to enhance financial security to some of the most disadvantaged people in drought prone areas of Burkina Faso. The stated objective of the PPPCR is to “study and implement financial products responding to the needs of a resource constrained clientele... and to create a system of financial intermediation at a low cost that is balanced and durable” (Faye and Bonkongou, 1993).

Since 1988, the PPPCR has expanded to Tapoa, Ganzourgou, and Soum. In 1991, it began an urban and peri-urban expansion to include the women of Ouahigouya. Ouahigouya was divided into 8 sectors, each from 800 to 1500 inhabitants. Each sector then was subdivided into zones which are the equivalent to quartiers. This expansion of the project was accompanied by a continual adaptation of the Grameen model to the Sahelian context.

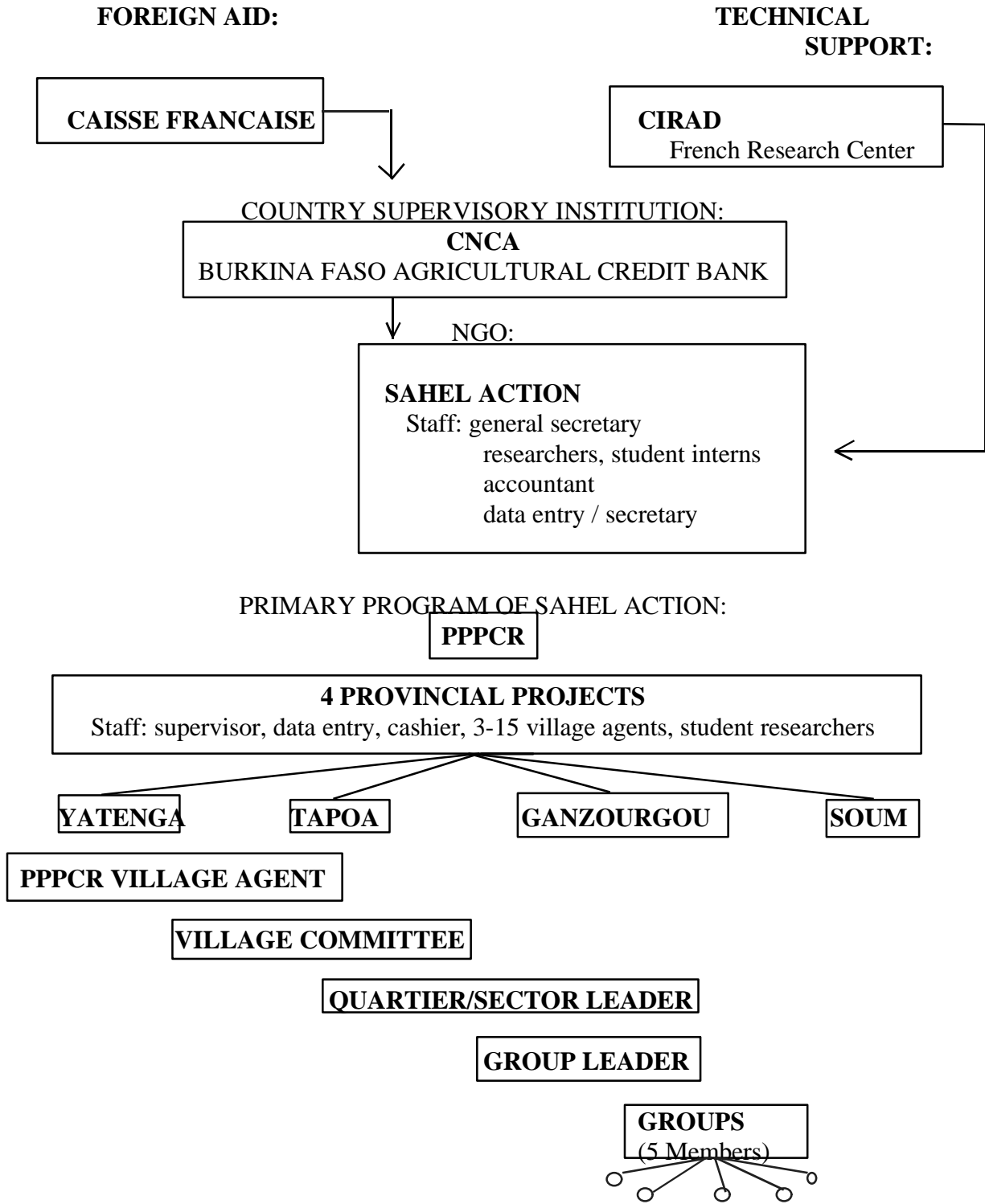


Figure 6: The PPPCR Hierarchy

Operational structure

Given the failed attempts at providing rural credit in Burkina Faso, a different methodology was sought to ensure a higher rate of repayment. In 1988, the Grameen Bank was becoming more widely known and group credit offered such an alternative. Specifically, group credit was seen as an opportunity to lower bank transaction costs in such an isolated area. Therefore, group credit was granted in the experimental phase and adopted formally by the PPPCR given the initial high recovery rates.

The PPPCR parallels the Grameen Bank in several ways. Poverty alleviation through a credit first approach supported by external funds has been the primary mandate for both institutions. Both the Grameen Bank and the PPPCR target the poor excluded from the formal banking system by establishing credit facilities in the area of intervention. Also, like the Grameen Bank, the PPPCR has a participatory managerial style which allows for a flow of information from village agents to bank managers. Each Wednesday, all the village agents meet with the province manager to discuss weekly issues and ideas.

In addition, the belief that group solidarity, peer pressure and homogeneity contribute to loan repayment and act as a collateral substitute exists in both programs. The PPPCR also has emulated the Grameen credit group of five members, although varying sized groups were tested. Groups of five were found to perform best in Burkina Faso because: 1.) tontines are often based on five members; 2.) a base five counting method is common in some areas, and; 3.) groups of five were large enough to reduce bank transactions costs while small enough to preserve unity and solidarity within the group.

Finally, both the PPPCR and the Grameen Bank direct a large portion of the loan portfolio to strictly female groups. The PPPCR has continually increased its share of loans to women so that it currently lends almost exclusively to females. In the Yatenga province, 100 percent of the 1994 loans were granted to women, however, there are more incidents of loans to men in the other provinces.

Despite the similarities, the PPPCR has diverged from the Grameen Bank in several important ways as it attempts to overcome some of the challenges of working in a different context. Managing a sparsely populated area, tailoring to specific economic activities, and facing the challenge of a multi-lingual and cultural clientele have led to several innovations.

Some of the modifications of the Grameen model have resulted from the particular context of Burkina Faso. In an attempt to lessen the high transactions costs arising from a dispersed population and the remoteness of certain villages, a hierarchical style of bank management was implemented. Villages are divided into quartiers (neighborhoods) and then subdivided into groups of five, with group leaders, quartier leaders, and village committee leaders. As in the Grameen bank, the formation of groups relies on the assumed effectiveness of peer pressure and group solidarity. This feature is particularly important in the African setting since each village agent collects weekly repayments from 200 to 500 clients and therefore cannot evaluate and monitor the groups to the extent that their Grameen counterparts can.

Loans are distributed by a village agent who is a salaried employee of the PPPCR. The village agent, in collaboration with a village committee, determines which groups

receive loans. Each group member reimburses the group leader who in turn passes the repayment to the sector leader. On repayment days, the village agent arrives at the village or sector by motorcycle, collects the weekly repayment from the sector leader, and registers the repayment of each individual in a written log. In this way, both the group and the sector leader see who does not repay and this acts as a re-enforcement mechanism. In the case of late repayment, the village agent personally visits the delinquent group member(s) to determine the cause of the delay and to encourage expedient repayment.

Perhaps the most outstanding characteristic of the PPPCR has been its ability to evolve and adapt to different settings through various financial innovations. The Grameen model was not merely artificially transplanted into the African setting, but each characteristic was tested for its feasibility in Burkina Faso. During the experimental phase, different group sizes, loan sizes, loan types, and terms and conditions were appraised. Group loans versus individual loans to both men and women were tested in different regions of the country. In addition, loans targeted for specific occupations were examined as well as loans with no explicit stipulations on how they would be used.

As previously mentioned, the project determined that it was most advantageous to work with women in groups of five. Additionally, it was ascertained that no strict guidelines should be placed on how the loans should be used. While loans are targeted for profitable economic activities according to the guidelines of the PPPCR, in practice, much of the credit evaluation is left to the discretion of the sector leader. This relaxed approach to project evaluation on the part of the project coincides with the concept of the fungibility of money (Von Pischke and Adams (1983)). Since money received from a loan is identical

to money obtained from other sources, it is difficult to determine the final destination of any given loan amount, regardless of what is promised at the credit screening session.

Many innovations have emerged from the PPPCR in the form of loan types adapted to local activities. The most common type of credit given is a one year loan for commercial activities granted to a group of five in which weekly repayments are made. Weekly repayment corresponds to the regular and modest repayment of market women. In addition, frequent repayments allows women to repay their loans without holding the money at home where it is at risk of being used by family members.

Commercial loans have been granted for artisan activities, food production, soap production, and sales of food products and cigarettes. Typically, the ethnic caste of the borrower determines which types of economic activities are acceptable for the borrower to pursue. However, with the introduction of credit, these rigid cultural norms are changing slowly. (Ellsasser, 1989)

A second credit line has been introduced for the fattening of animals for resale. These loans typically span a five to six month period and have only one repayment at the end of the period when the animal is sold. These loans are small, averaging around US \$25, in order to purchase small livestock. This type of loan frequently has been offered to men and women of different ethnic groups. Monitoring this type of loan has proven difficult since tracking the health and sale of an individual animal is laborious.

Another type of loan has been designed for clients to buy grain during the harvest period when the price is low and then to consume it or to sell it during the off season. These loan sizes are larger, reaching up to US \$300 for a group of five. This has proven

profitable for the clients and has reduced the need for grain intermediaries who had previously engaged in similar types of speculation.

Not only has the PPPCR utilized loans for specific purposes, it has also been innovative in its research. Each year, students from France and other parts of Africa have come to perform studies on various aspects of the project. These include economic and agronomic studies, as well as the feasibility of new economic activities that could be financed by the PPPCR. The PPPCR continues to experiment with loan instruments tailored to specific economic activities. Ongoing research by student interns ascertains the feasibility of credit for weaving, the cultivation of onions, potatoes, rice, and vegetables, exports, and the purchase of farm implements. Each type of new credit is designed with terms and repayment schedules that match the seasonality of the activity.

It has been demonstrated in many developing countries that one of the keys to financial development is providing deposit facilities for the poor (Graham and Von Pischke (1994)). The ability and willingness of low income people to save is often underestimated and constitutes the “forgotten half of rural finance” (Vogel, (1984)). Like the Grameen Bank, the PPPCR has a compulsory savings program generated through its common fund. At the granting of each loan, the clients contribute to a common fund which can take the form of a group or village fund, depending on the region. However, there has been much confusion on the part of the clients regarding this fund. Sometimes the entire village common fund has been used to cover the arrears of a few groups and has not been returned at the end of the loan. Furthermore, there exists confusion between the role of a savings fund versus an insurance fund. A clearer understanding of the function and proper

administration of compulsory savings is vital to the trust between the institution and the clients.

While the amount of voluntary savings is growing in the Grameen Bank, there has been little emphasis on this service in the PPPCR. At one point, voluntary savings were collected, but returned to the clients as a result of administrative turnover in the project. This violation of trust and instability will make future savings mobilization more difficult.

One of the main reasons that savings have not been stressed in the PPPCR relates to cost. There is little interest among bank workers to collect savings since it adds to the responsibilities of each village agent. Even at the managerial level, savings are perceived as a highly labor intensive, low profit activity. In fact, the nature of small daily transactions, often on the order of pennies and nickels, can lead to the conclusion that savings mobilization is indeed a financial service with potentially elevated transactions costs. While there is no question about the benefits of savings facilities among clients, the financial viability of savings mobilization in the African setting is an area requiring more research.

Traditional formal banks operating in Burkina Faso have required literacy so that the clients are capable of completing applications and documents. However, in rural regions, nearly all women over the age of forty are illiterate. As a compensation for the lack of written communication, many rural African areas have an impressive oral tradition. The PPPCR has capitalized on this oral communication by verbally explaining the terms and conditions of the loans in an open town meeting. The village leaders are intimately involved in the loan process as monitors, evaluators, and motivational leaders.

While the absence of written guidelines for the clients is a logical step given the rural context, it presents certain risks. For example, the interpretation of the rules and regulations may vary across village agents. This problem has been lessened by a one year training period for all new village agents. In addition, the region is characterized by the presence of numerous languages thus requiring a multilingual staff which the PPPCR does have.

The careful thought and preparation that went into creating a Grameen replication adapted to the African setting is evident. Indeed, to a certain extent, the development and evolution of the PPPCR exemplified the institution building approach (Schmidt and Zeitinger, 1994). The vision and structure of the PPPCR was conceived and implemented, just as the institution building approach dictates. Following the framework of a 10 year transformation into a formal financial intermediary, the PPPCR projected its growth and financial viability in the early stages of operation. The sample institution provided in Schmidt and Zeitinger's work breaks even in the third year while the PPPCR projected sustainability by year five following similar projection techniques (Figure 7).

These projections were made after a long experimental phase from 1988 to 1992. In the projections, "Year 1" could be interpreted as 1992. Therefore, Ellsasser and Nguyen predicted that interest income would not cover administrative costs until at least 1997. At the time of their analysis, there was no central administrative office, only four regional offices active in providing credit. The projections indicate a steady growth of interest income while administrative costs level after only the third year.

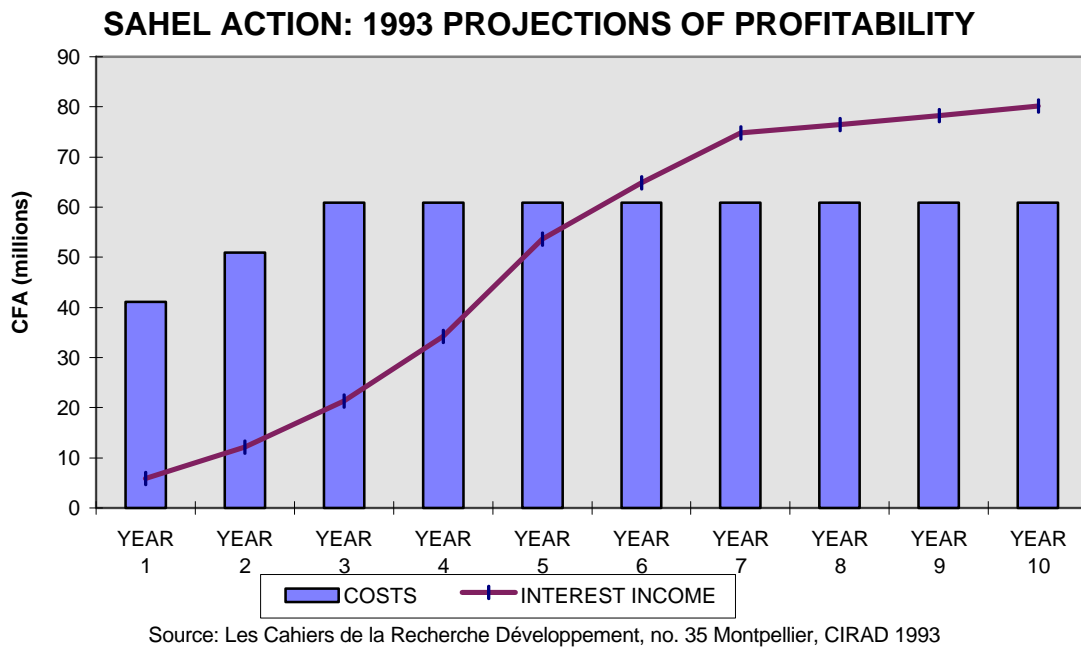
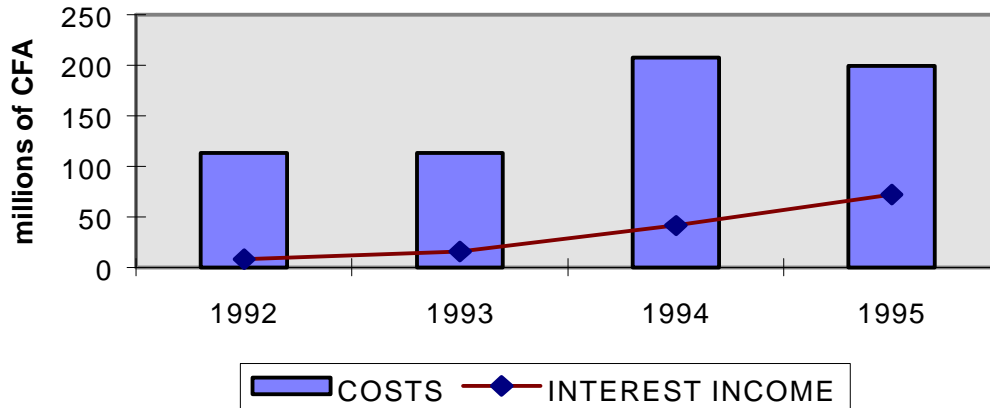


Figure 7: Sahel Action Profitability Projections

While the PPPCR founders were careful to plan for the growth of the institution, considering cost implications, the project already has diverged from these predictions in its first four years (Figure 8). The main unanticipated problem has been the high costs of operation and institutional growth.

SAHEL ACTION: REALIZED PROFITABILITY TRAJECTORY



N.B. Interest income for 1995 and costs for 1992 and 1995 are estimates

Figure 8: Sahel Action Realized Profitability

By the fourth year, the projections estimated that interest income would be nearly 60 percent of administrative costs. However, in the fourth year of operations, interest income is only 36 percent of interest income. Interest income has grown at a rate slightly more than anticipated. The average projected growth rate of interest income was 92 percent per year while the realized rate of growth has been 112 percent annually. The dramatic annual doubling of interest income was planned by project designers so that self-sustainability could be reached at an early stage in the institutional development. While the institution has been able to support such growth, it has been accompanied by

skyrocketing internal costs. Even when accounting for the devaluation of the CFA, administrative costs have been nearly double the predicted amounts in 1994 and 1995.

The following section analyzes in what ways the PPPCR has deviated from these projections. While still very much in its infancy, the PPPCR has confronted several obstacles which have changed its course somewhat. The degree to which costs can be covered given the difficult financial environment is key to the performance and future viability of the PPPCR.

4.3 Performance

Outreach

Intimately linked to the rapid increase in interest income has been the number of clients reached. By the end of 1994, the PPPCR had already served 10,000 clients and already in 1995, this figure is well on its way to doubling again. In October of 1995, it was projected that by year's end, the cumulative number of credits, including repeat borrowers, would reach 51,270 loans⁵. The associated cumulative amount of credit totals \$2.35 million. All of the clients are borrowers that must maintain a fixed group savings account. However, no voluntary savings are being collected currently. While the original target clientele was situated in rural areas, now nearly half of all loan activity occurs in urban settings.

Another possibility of obtaining increased interest income is by increasing the loan size. As more credit groups complete successful loan cycles and qualify for higher loan

amounts, the PPPCR has begun this process. In addition, the program's expansion into more urban areas with different types of loan terms and conditions has allowed for higher loan amounts. Currently, the average loan size to an individual in a group is \$33⁶, with \$7.50 of the amount comprising the interest payment, as the average annual interest rate equals 23 percent.

Repayment

The PPPCR has been lauded in Africa as a success story due in part to its innovations and its high reported repayment rate. Indeed, the 1993 balance sheet shows the following repayment rates, defined as the total amount of arrears late by at least one day divided by the total outstanding loan balance, for the following regions:

Yatenga	93.1%
Tapoa	100%
Ganzourgou	99.6%
Soum	99.9%

As of August 1995, a total of 14,576 loans were outstanding while only 160 of them had recorded arrears. The repayment rate, defined as the total sum of loans with arrears divided by the total loan amount outstanding, was 98.3 percent.

While these repayment rates are impressive, in some cases, they may be inaccurate due to the variation in accounting practices and understandings of the insurance fund from

⁵ Projections made by "Responsable du Service Réseau", Jacques Marzin in letter to author dated October 17, 1995.

⁶ However, using the 1995 projections, the average loan size \$45 per individual.

one province to another. A group or village fund is collected as a form of mandatory savings. In some regions, an insurance fund is collected to be used in case of default in addition to a group fund which is supposed to be returned with interest at the end of successful repayment. However, in villages with widespread default, the group fund has been used to erase long standing arrears. Figure 9 illustrates how arrears were erased on the computer by an accounting move that eliminated arrears in two problem areas.

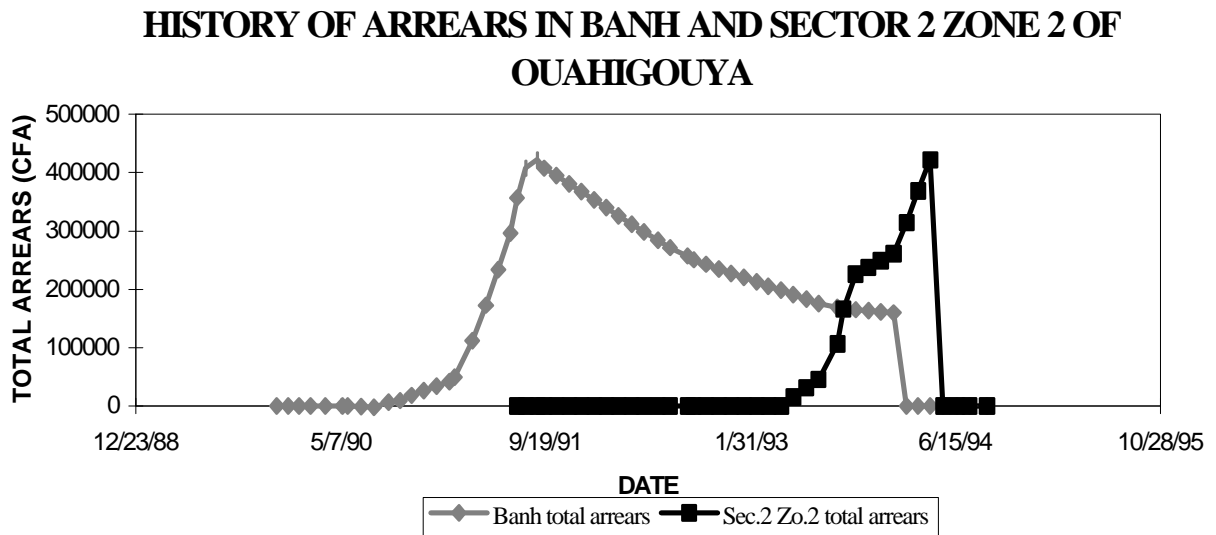


Figure 9: Sahel Action History of Arrears

In Figure 9, new loans were terminated as the arrears reached their apex. The following steady decline in arrears for Banh illustrates a gradual repayment. The drop in

arrears to zero for both curves is an accounting artifact in which the director of the province used the group fund to erase the presence of arrears in the official records rather than reflecting individual or group repayment behavior. It is worth mentioning that accounting practices in many group lending schemes are largely unregulated and unstandardized, often reflecting misleading repayment rates. Nevertheless, even with these variations, in most of the sectors analyzed, the true repayment rate did approach 100 percent.

Cost Containment

One of the biggest challenges for the PPPCR is to contain its costs of operation. High repayment rates on loans are needed, but can only go so far to cover the relatively high costs of serving a widely dispersed clientele, especially when the average loan brings in approximately \$12 annually of interest income. Figure 10 shows the relation between administrative cost and interest income. In no province is the branch fully self-sustaining, however Ganzourgou nearly covers its costs.

ADMINISTRATIVE COST VERSUS INTEREST INCOME 1993, PPPCR

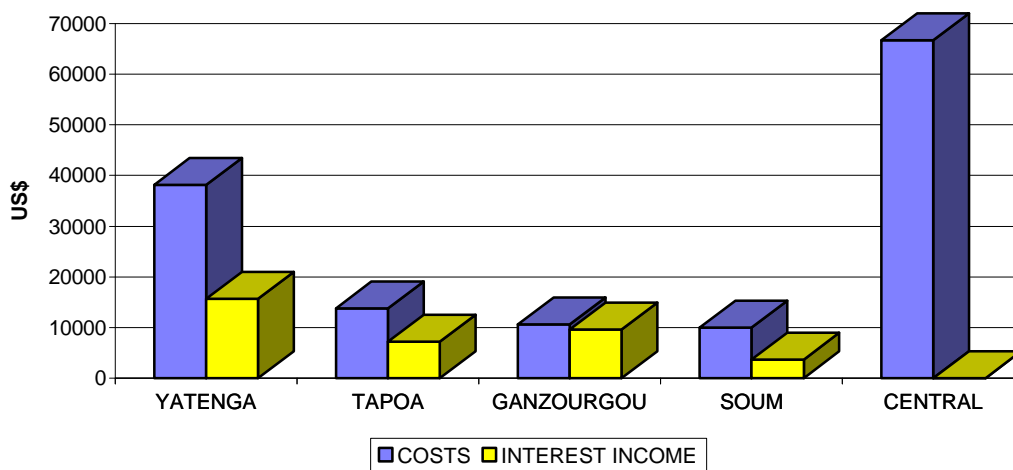


Figure 10: Sahel Action Administrative Cost

Even by the early projections, the PPPCR had not intended on covering costs until 1997, and therefore it is premature to judge the institution as financially unsound.

However, costs are much higher than the projections indicate. There are several reasons for the soaring costs.

After the initial 30 trial loans were issued in 1988, the CDF donated funds for 500 more loans. However, in order to secure this funding, an NGO had to be created in order to administer the funds and work with the CNCA development bank of Burkina Faso. In order to gain legitimacy, the NGO bought vehicles, machinery and office space which set a precedent of heavy overhead expenses which has been difficult to control.

While access to low or no interest loans has helped cover start-up costs, it has been linked to spending deadlines which have forced the PPPCR to grow very quickly.

Often donors earmark funds for expansion which must be used within a given period of time so as to meet their internal disbursement deadlines. This causes pressure for the management to spend the money quickly, resulting in high overhead costs, increased loan sizes, and premature loan activities for selected clientele. For example, in the 1994 PPPCR budget, 10,000 loans were committed while only 6,000 were granted. Only 95 million CFA were granted instead of the committed 154 million.⁷ As a result of this pressure, some project managers have argued for granting significantly larger loans and spending the funds on additional office space, salaries, vehicles, etc. As this phenomenon occurs, the project diverges from its initial goal of using resources prudently to service clientele at the frontier and it also loses the potential of self sufficiency as costs rise.

Donor funding has led to a paradoxical situation for the PPPCR. On the one hand, donors preach self sufficiency implying that a financially viable institution would no longer need low interest donor funds in order to survive. On the other hand, as soon as an institution shows promise of being a viable institution, it is inundated with external funds which typically leads to soaring overhead costs and an unsustainable disbursement of loans.

When the projections in Figure 7 were made, it was assumed that each province would grow to be an independent, self-sustainable branch with no central offices. However, soon afterwards, a central office was opened in Ouagadougou to coordinate regional activities, perform research, and maintain central accounting, training, and supervision. While any financial institution needs to perform these activities, the creation

⁷ “Aide Memoire de la Mission de Supervision du Projet Petit Credit Rural au Burkina”

of such an office in the capital led to unexpected cost increases. In fact, the overhead costs of the central unit make up nearly 50 percent of the institutional overhead cost. High central office costs have been generated for a number of reasons. Firstly, the cost office space and salaries are significantly higher in Ouagadougou than in the rural areas. Secondly, the central office does not offer any financial services in Ouagadougou and thus must be subsidized by the provinces. With such a small margin of interest income on the microloans, it is difficult enough for the provinces to be self-sustaining, but much more challenging to support a high cost central office. Thirdly, since it takes a couple of hours by car to reach the other offices, there are high transaction costs for the personnel at the central office to travel to the provinces. Therefore, more vehicles have been purchased, another significant expense.

A final cost stumbling block for the PPPCR has been the demand for comparatively high salaries among project personnel. Although salaries for indigenous employees account for just 5 percent⁸ of the 1993 budget, compared to the Grameen Bank, employee costs are high in Burkina Faso.

In 1993, GDP per capita averaged U.S. \$225 per year while salaries for the PPPCR bank workers, none of whom had post secondary education, averaged approximately \$1000 per year while the annual salary of managers, also with no post secondary education, reached nearly \$5000. The starting salary for a loan officer is currently \$620 per year, 2.7 times the GDP per capita. The salary demanded by college

educated technicians has been relatively unaffordable to the project, although the PPPCR currently supports a few as interns and consultants. This is in stark contrast to the Grameen Bank in Bangladesh, where bank workers typically are college educated and work for an approximate average annual wage of U.S. \$500 compared to a 1990 income per capita of U.S. \$180. (Egbeto and Bender) The ample supply of labor of qualified labor willing to work for relatively low salaries has been one of the key advantages of the Grameen Bank facilitating its sustainability.

As previously mentioned, high administrative costs have been a thorn in the side of the PPPCR. Nearly one half of the total administrative costs are generated by the central office. Certainly, unexpectedly high costs create an obstacle for the provincial offices to overcome as the PPPCR strives for self-sufficiency. At this point, several options exist for future viability. First, the central office could be moved to a regional branch, allowing for the sharing of office space and equipment and lowering travel costs. Second, the central office could also become active in providing revenue generating financial services in Ouagadougou. If neither of these options were desirable, then the only alternative is for the regional offices to generate enough interest income through growth of the loan portfolio to be fully self-sufficient at the provincial level with enough profit to fully support a central unit.

Certainly the relatively high costs of the PPPCR can not solely be attributed to the presence of the central office. The cost of providing loans to an isolated, rural clientele is

⁸ The highest salaries going to foreign assistants are not measured in the budget. With the inclusion of permanent foreign staff members and technical assistance, the percentage of the total operating expenses dedicated to personnel would reach over 50 percent.

very high when one considers that loan officers must travel hours through the desert each week to collect a few cents from some of the clients. In order to cover just the annual salary of a starting loan officer, nearly 90 loans must be successfully collected. In 1994, salaries comprised only 22 percent of operating expenses. When adding very high institutional transactions costs incurred from serving a dispersed and distant clientele in the most rural areas, the number of clients needed to cover costs may exceed the capability of the loan officers.

Population density and geographic isolation are obvious, but often overlooked, factors which affect the structure and viability of a financial institution. In contrast to the 1991 population density of 810 people per square kilometer in Bangladesh, the northern region of Yatenga in Burkina Faso has a 1991 population density of only 14 people/km². This contrast represents one of the most fundamental disparities between the two regions and constitutes a serious obstacle for financial institutions operating at the financial frontier.

The PPPCR has been particularly innovative and adaptive to contextual conditions in West Africa. However, despite the care and intellectual prowess guiding the project, it has not been able to achieve any level of sufficiency in its short history despite some recent inroads in covering costs. As the project grows and strives to adhere to its projections of sustainability, it faces several challenges.

Making changes in the regulatory and legal frameworks is vital to the viability of the PPPCR. Interest rate ceilings and other types of financial repression have the power to suffocate a small program's future. In addition, a greater degree of flexibility at the

federal level is needed in terms of legal acceptance to legitimize and protect the PPPCR and its clients. The option of being either a bank or a credit union may be too limited and would impose operating and salary restrictions that may not make sense in rural areas. Therefore, corresponding government legislation must be altered to promote microfinance in its various forms.

Another challenge for the PPPCR is to maintain high rates of repayment while minimizing costs. In order to become self-sufficient, program officers have made an attempt to maintain a high rate of growth of interest income. However, this quick growth has also led to unexpected administrative costs.

One of the ways in which group lending projects try to minimize cost is by allowing the groups to perform screening, monitoring, and collection functions. However, the extent to which this is successful depends on how inexpensively groups can be trained and organized and how well the group dynamics function. One way to test the role of group dynamics is by applying the group lending repayment model discussed in Chapter 3. The following chapter applies the group lending repayment model to the case of the PPPCR.

CHAPTER 5

5. EMPIRICAL ESTIMATION OF GROUP LENDING REPAYMENT MODEL USING BURKINA FASO DATA

The Besley and Coate repayment game outlined in Chapter 1 detailed some of the most important features of group lending including social sanctions (peer pressure), the possibility of one member paying for another (solidarity), and the domino effect occurring when good repayers are enticed to default due to other members' defaults. Chapters 2 and 3 expanded on and more thoroughly described some of the concepts presented in the Besley and Coate model. The introduction of the intragroup contract and a three stage repayment model sharpen our understanding of group dynamics. The resulting group lending repayment model incorporates these advancements. This chapter first examines the overall trends and results of a survey of groups in the PPPCR and then empirically tests the degree to which various factors influence the repayment behavior of the members.

5.1 Data Collection

In an attempt to study the role of group interaction on loan repayment in the PPPCR, a survey was conducted in which one member from 140 different credit groups was interviewed, using the group rather than the individual as the basis for questioning. The survey questions (Appendix B) invoke both open ended and categorical types of responses. Half of the interviews were in rural villages while the other half were conducted in the larger town of Ouahigouya. The survey was designed to capture other sources of credit, the history of working with the PPPCR, group homogeneity, credit repayment behavior, group solidarity, and group pressure.

One of the most important elements of the survey was to determine the actual group dynamics that were used during the course of the repayment cycle. The repayment behavior of the group had been recorded by the PPPCR during the weekly collections. However, even if the group had repaid perfectly, the degree to which the group had difficulty in meeting its obligation was not known. For example, certain groups may have had one or several group members with repayment problems and due to the usage of peer pressure or group solidarity, the loan was repaid. Therefore, it was necessary to ask if any member of the group had had a personal situation arise making her portion of the repayment difficult. In these case, the survey sought to determine who helped the members with repayment problems, how many members had problems, the reaction of the group, and the eventual resolution of the problem. This type of probing is unique in that

typically, group lending projects only have records of repayment, but often do not have detailed information about the inner workings of the groups.

Upon arriving in Burkina Faso, the author spent several weeks at the Ouahigouya regional PPPCR office interviewing bank personnel and reading bank literature in order to get a better understanding of the true nature of the repayment process and to fine tune the survey questions with bank workers. Certain questions were perceived to be offensive and had the potential to end the interview immediately. These included specific questions about wealth and age. These questions were modified to: “Are the members of your group roughly the same age?” and “Do the members of your group have roughly the same level of wealth?” While these questions reduce continuous variables to binary variables based on perceptions, they are still valid measures of group homogeneity since group homogeneity can be thought of as a perceived similarity to other group members.

Next, the questionnaire was tested in the field with numerous modifications. PPPCR clients were particularly reticent about answering questions about other sources of credit since one of the prerequisites of the PPPCR is that none of its clients have access to formal credit. However, with very specific questions and patience, some of the informal lending activity was revealed, although almost certainly underestimated. Another difficulty was that group leaders often tried to cover any repayment problems that an individual may have had during the credit cycle since the leaders are responsible for the group. Much more transparent answers were given by group members as distinct from group leaders. Therefore, the majority of interviews were performed with group members. Finally, clients were reticent to reveal their emotions about other members in

the group or sector who had defaulted, causing the entire group to forego future loans. However, with patience, reassurance, and several rephrasings of the questions, their sentiments became evident.

The data was collected during the summer months of 1994. These months represent the rainy season in Burkina Faso when cultivation is taking place and most of the clients are in the field. Therefore, surveys often were performed very early in the morning or in the evening once the women had returned from the field. Most of the PPPCR clients are farmers during the rainy season and engage in market activities during the other months of the year.

The interviews were performed within the Yatenga region, one of four regional offices of the PPPCR. The selection of Yatenga was based on the fact that it is the oldest regional office with clients who have obtained several credits. Also, it is the region with the most arrears and thus the group dynamics become more interesting. The general pattern in Yatenga is that a village or urban sector has 100 percent repayment or very poor repayment. Therefore, neighboring rural villages were selected, one with perfect repayment and one with dismal loan recovery, as well as several urban sectors randomly chosen. Within these villages or sectors, clients to be surveyed were chosen randomly. Thus, the survey results are not indicative of the entire PPPCR, but just the Ouahigouya office in the northern Sahelian region of Burkina Faso.

When working in such a culturally diverse environment with numerous ethnic groups and traditions, it is paramount not to generalize results of the study to the entire country. While some characteristics may be present in most groups, cultural norms and

individual personalities dictate how group dynamics will affect group performance. Thus, these findings can not be generalized to all of Burkina Faso or to Africa, but can shed light on how groups of Mossi and Fulani in northern Yatenga operate. This type of study provides a tool for better understanding groups in various contexts and one would expect quite different results in other contexts.

5.2 General Survey Results

The survey responses yielded numerous insightful results that shed light on group dynamics. In order to effectively illustrate the group dynamics discussed in previous chapters, several charts and figures highlight trends and averages from survey results. Concepts such as the matching problem, debt seniority, the domino effect, and the intragroup contract are exemplified in the following graphics. These figures provide an overview of the data and a justification for their inclusion in the structural model that follows.

Group Lending Decision Tree

As was presented in Chapter 3, the repayment model can be thought of as a three stage decision tree. First, an individual may or may not have a problem. If a problem exists, the individual may or may not inform the group of the problem. Finally, if the group is informed, the group may or may not assist the individual. Using these terms of reference, it is possible to divide groups into three categories: those that never had problems (perfect repayers), those that had problems but still were able to meet their obligations (problem solvers), and those that did not repay their debt (defaulters). Using

this criteria, the Burkina Faso observations were divided into these three groups. Since a disproportionate amount of defaulting groups were interviewed, the data was adjusted to reflect the true proportion of defaulting groups. Figure 11 shows the repayment behavior of the sample of 235 groups.⁸ Fifteen percent of the groups had defaulted on the loans while nearly one third were problem solvers and 54 percent were perfect repayers. However, it might be suspected that some of the perfect repayers had experienced repayment problems but chose to hide them from an interviewer.

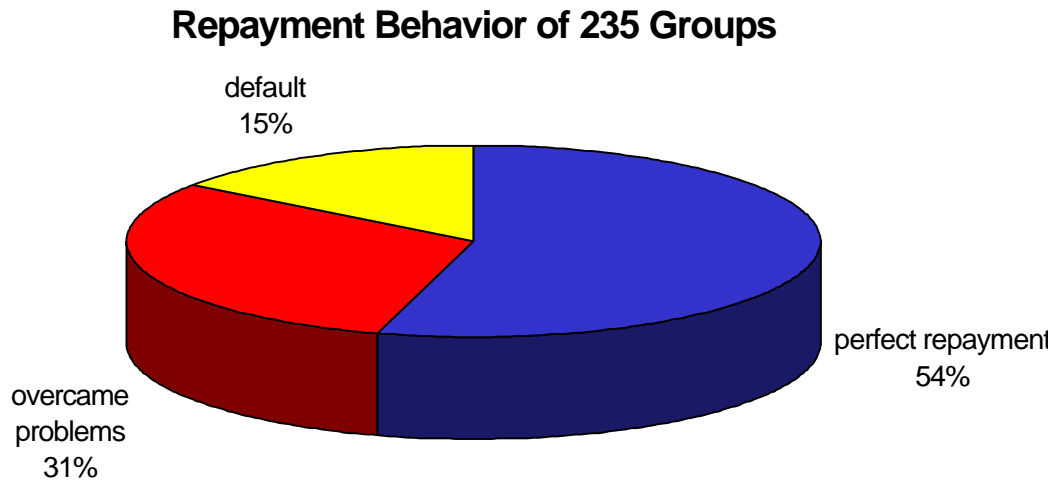


Figure 11: Total Sample Repayment Behavior

⁸ The original set of 140 groups was not a representative sample of repayers and defaulters. The sample was reweighted by randomly replicating observations of repayers so that the sample reached 235 groups.

The Matching Problem

Given this breakdown by repayment behavior, several other variables are of interest to examine. Figure 12 illustrates the matching problem in which members of a group may be more likely to repay the loan in their first credit cycle rather than in subsequent loan cycles since in the first time period, each member has explicitly sought a loan and agreed to the terms and conditions. However, as loan cycles pass, some individuals may continue with the group and accept the subsequent terms and conditions even if they do not match their individual preferences. This matching problem is exemplified by the percentage of the groups in different loan cycles. Figure 12 indicates that perfect repayers and problem solvers tend to be in their first credit cycle. Fifty percent of problem solvers are in their first loan cycle compared to only 34 percent of defaulters. However, default is more likely to occur in subsequent credit cycles. Forty-three percent of the defaulters are in their second loan cycle compared to only 29 percent of problem solvers.

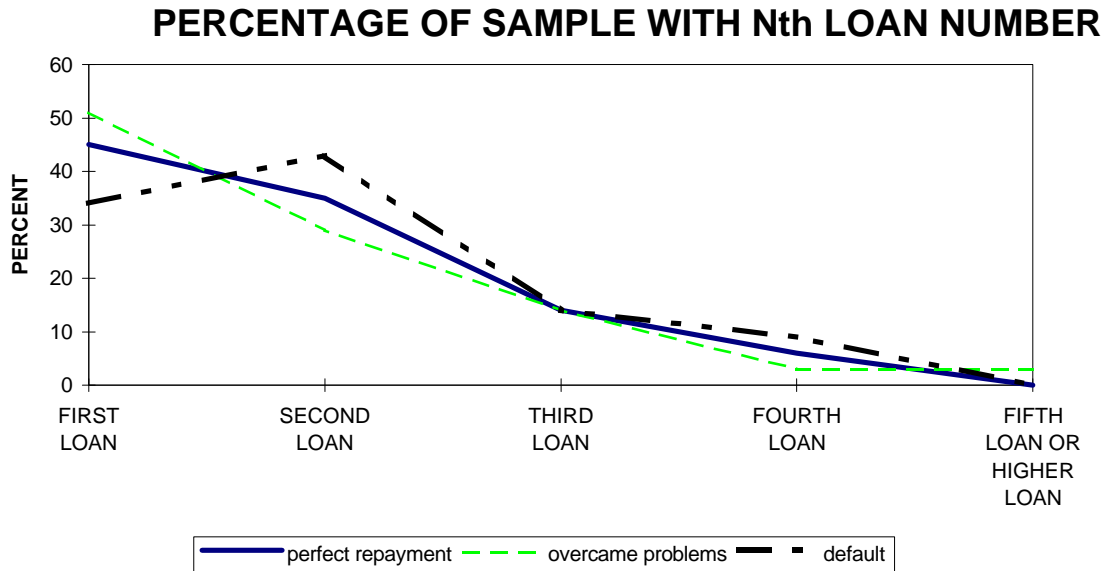


Figure 12: Percentage of Sample with Nth Loan Number

The matching problem can also be seen in Figure 13 which gives the percentage of default which occurred in different loan cycles. It is evident that an upward trend of default exists as time passes. This supports anecdotal evidence that group loan programs often start with strong repayment rates and then experience difficulties.

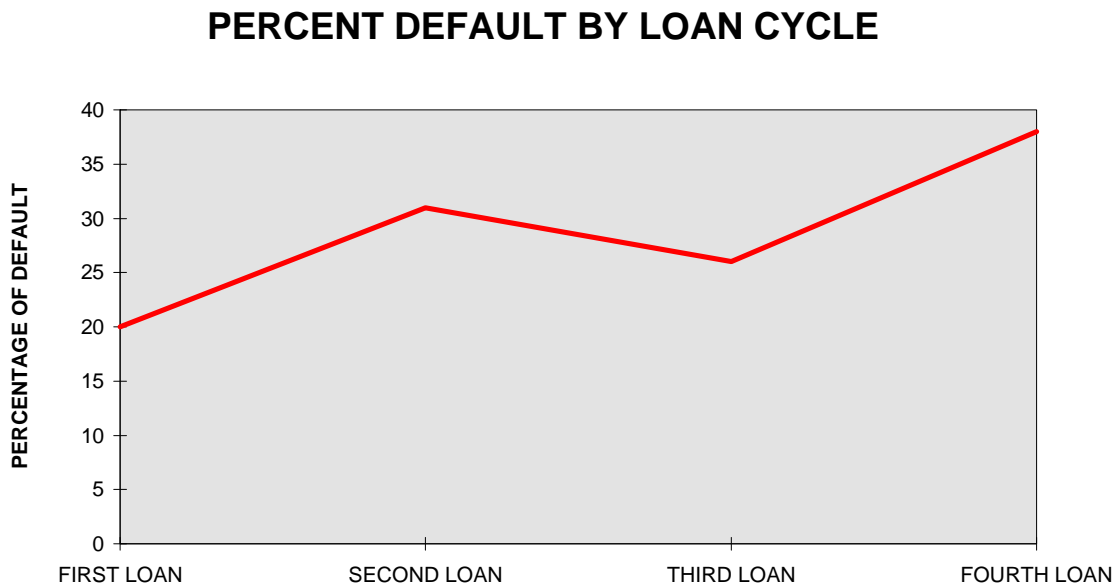


Figure 13: Percent Default by Loan Cycle

History of Group Activity

Upon speaking with the clients of the PPPCR, one trend that stood out among groups with perfect repayment patterns was that many of them had previously worked in groups. Informal work groups, tontines (ROSCAs), civic groups, and social groups were common in Burkina Faso. The most common type of group was the tontine which is a savings group commonly comprised of 5 members in Burkina Faso. A history of working in groups, particularly in tontines, seemed to be correlated with high repayment. The tontines were most frequently observed among groups operating in urban markets,

however, the village of Madougou also utilized tontines effectively. Interestingly, in the village of Banh where default prevailed, tontines had rarely been used and those women who had been a member of a tontine in the past said that they had fallen apart. Not surprisingly, the PPPCR group lending project had a similar fate in many groups in Banh.

Figure 14 supports these observations. The first grouping shows the percentage of surveyed groups that belong to tontines. Thirty-five percent of perfect repayers belonged to tontines whereas less than 10 percent of the defaulters participated in tontines. The center grouping indicates that only 5 percent of defaulters had ever participated in successful tontines that did not break-up over time. Meanwhile, perfect repayers and problem solvers had had positive experiences working in tontines. Finally, the last grouping shows that perfect repayers and problem solvers were much more likely to have participated in a tontine with the other members of their PPPCR credit group. This experience is an important variable for group lending projects to be aware of as they target clients that have potential to be successful in their repayment. Due to the significance of the clients' history of working in groups (including tontines), this variable was incorporated into the group lending econometric model.

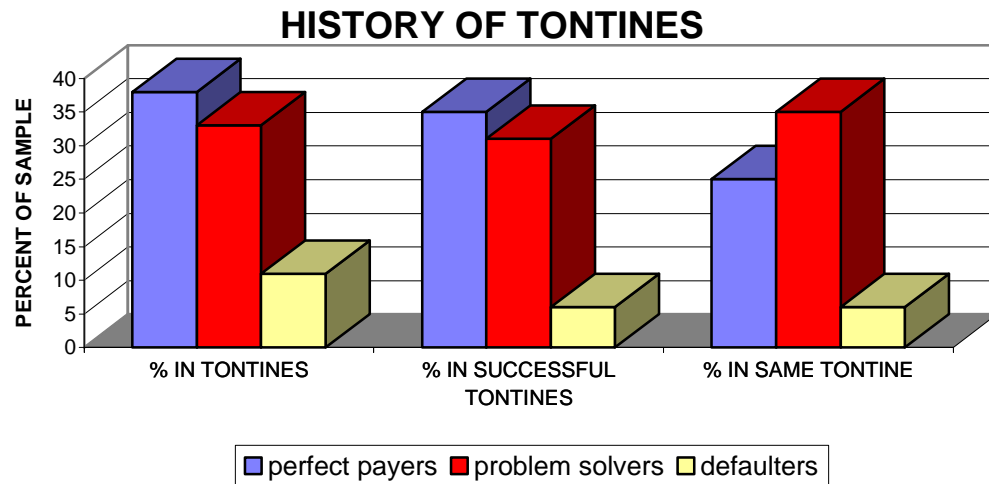


Figure 14: History of Tontines

Group Member Turnover

Conflicting accounts of the effectiveness of group member stability exist. One argument could be that groups should be encouraged to change members as their individual preferences change or as delinquent members are asked to leave the group. Another argument could be that cohesive groups maintain strong social bonds that encourage repayment and that they are used to working with one another and understand the process.

Figure 15 supports the latter hypothesis for the case of Burkina Faso. Groups that defaulted experienced a high degree of volatility while perfect repayers were more likely to maintain the same group members. It could be argued, however, that the reason that the

perfect repayers did not change members was because they self-selected the most honorable, credit-worthy people in their groups from the beginning when the PPPCR asked them to select the other members of their groups⁹ .

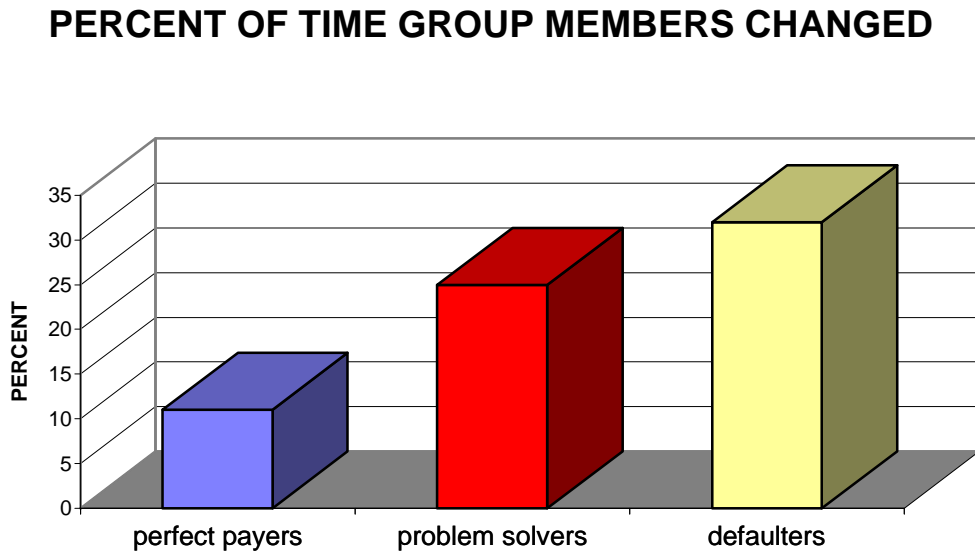


Figure 15: Group Member Turnover

Other Debt

Another issue which can be argued in two ways is whether a client that has other debt represents a good or bad credit risk. Viganó (1993) argued that the ability to manage

⁹ While it is probable that groups vary in their repayment capacity due to the process of self-selection, this model assumes homogeneity of groups.

several loan contracts was an indication of a good credit risk in Burkina Faso. A counter-argument is that multiple loan contracts may place other demands on potential clients and that the presence of debt seniority may make a group loan a lower priority than other informal contracts.

Interestingly, the presence of other debt for the surveyed clients tended to indicate creditworthiness and may be one of the tools used for the self-selection of groups. The first grouping of Figure 16 shows that approximately 40 percent of clients that are either perfect repayers or problem solvers have one other debt compared to 20 percent for defaulters. However, perfect repayers are less likely to have more than one contract (see second grouping) whereas problem solvers are the most likely to have two or more other contracts. Defaulters are unlikely to have any other contracts, a result that is not surprising since their village counterparts know they are a high risk. Also, defaulters may under-represent the number of contracts that they have if other contracts are delinquent.

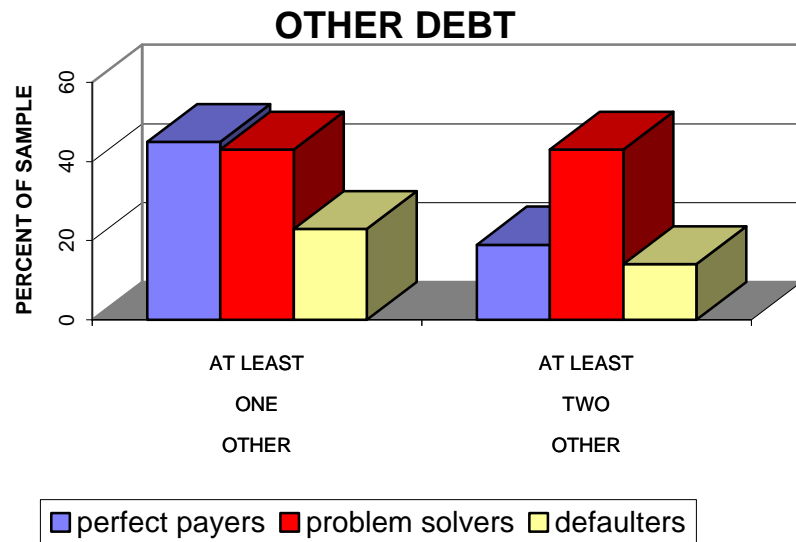


Figure 16: Other Debt

The Domino Effect

Besley and Coate’s repayment game illustrated that group lending may result in lower repayment rates than individual lending if some individuals that would have repaid under an individual lending scheme decide to default since other members of their group have defaulted. The domino effect can be manifested in several ways. As in the case of the PPPCR, sectoral liability exists so that if one group in a village or sector defaults, all other groups in the same sector have new loans suspended. This phenomenon occurred in the PPPCR which had most sectors with 100 percent repayment and other sectors with poor repayment and a total suspension of loan activity. Secondly, the domino effect can occur within the group. As more members default, it may be difficult for the remaining

members to cover for them. Finally, if the same individual continues to default over time while asking the group to continually cover for her, then the group may default. Each of these types of the domino effect was evident during the interview process.

The domino effect mentioned in Besley and Coate shows how when one or more members of the group default, the entire group may default. This question was asked in the survey and the results are presented in Figure 17. Obviously, the perfect repayers did not have any problem with default. The defaulters averaged 2.7 members out of a group of 5 who had repayment problems. Given that it would have been a financial strain for the remaining 2 members to pay the entire loan, the group defaulted. Meanwhile, the problem solvers reported that only 1 person on average had repayment problems. It was therefore possible for the remaining 4 members to cover their arrears.

NUMBER OF MEMBERS WITH REPAYMENT PROBLEMS

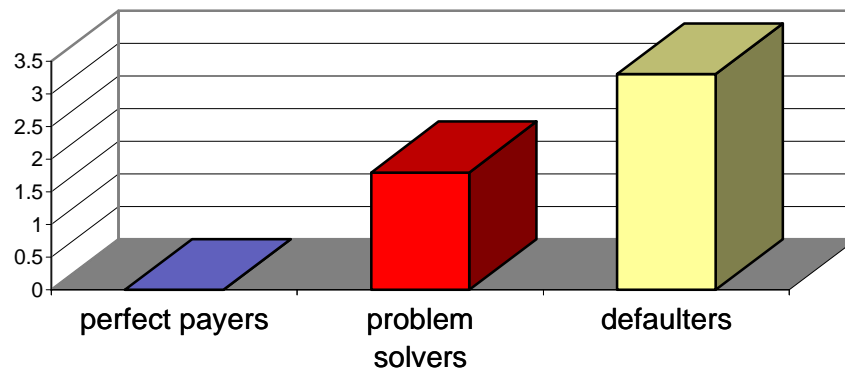


Figure 17: Number of Members with Repayment Problems

The Intragroup Contract

As shown in Chapter 3, the reason for the repayment problems that is given to the rest of the group by a member experiencing difficulties is a key factor in determining how the rest of the group perceives her personal responsibility, what type of emotions the other group members feel, and how the group will respond to the problem. If the group feels sympathetic, it is more likely that they will respond with helping behavior. However, if the other members are angry, they tend to exert more peer pressure. While each stage of this logical progression was not captured in the survey, the respondents were asked for the reason that a member had repayment problems. The final stage of the perceived responsibility-social motivation was captured using the Burkina Faso data. Feelings of sympathy were correlated (0.478) with group solidarity while feelings of anger were correlated with peer pressure (0.235).

Figure 18 groups the stated reasons for repayment problems into several categories. It is interesting to note the contrasting reasons stated for problem solvers versus defaulters. The excuses given to problem solving groups included multiple reasons, sickness, and the absence of a member due to traveling. In these cases, the rest of the group helped the individual, resulting in repayment. The defaulters were more likely than the problem solvers to have excuses such as slow business, poverty and “other.” Also, some defaulting groups did not even know the reason for the problem, indicating a general lack of knowledge about the other members’ affairs.

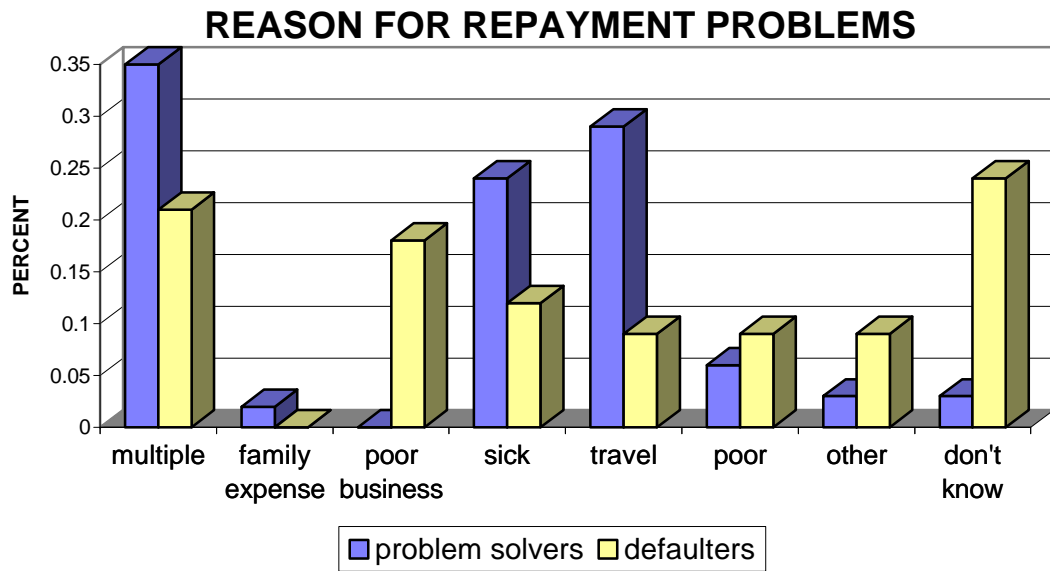


Figure 18: Reason for Repayment Problems

Supporting the intragroup contract, Figure 19 shows a link between the emotion that the group feels and the resulting behavior. When the group feels more sympathetic, the members are more likely to help the individual with the problem. Indeed, the problem solvers felt more compassion towards their colleagues with problems. Although perceived responsibility was not measured, it can be presumed that the problems stated were uncontrollable, resulting in compassion and helping behavior. On the other hand, the defaulting groups expressed more anger and exerted more peer pressure while refusing to help repay. In these groups, the problems were seen as more controllable with a higher degree of personal responsibility.

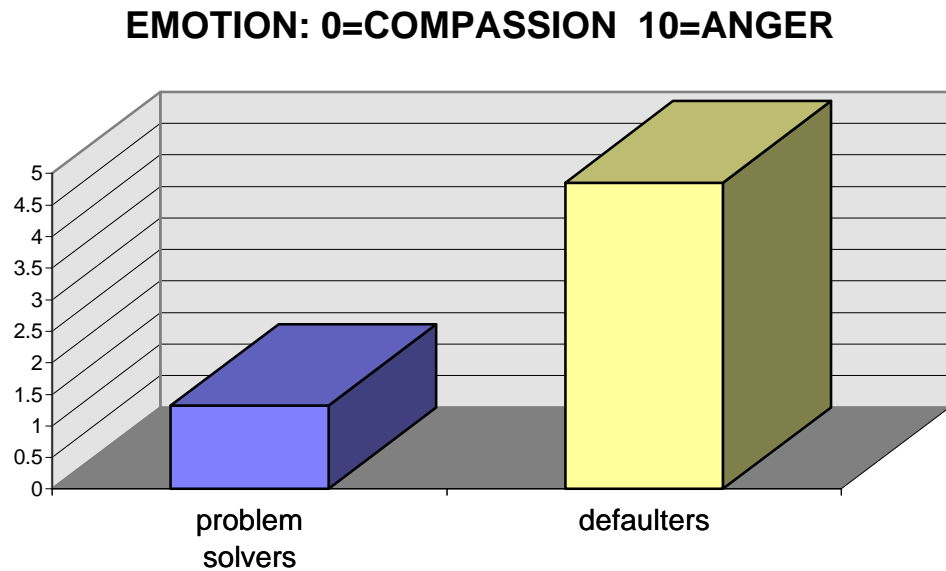


Figure 19: Emotion Associated with Repayment Problems

Given that the problem solvers are more sympathetic to the members with repayment problems, it is not surprising that they help more often. Figure 20 illustrates the different sources of funding that individuals with repayment problems turn to when necessary. The problem solvers can turn to the group, presumably because they know *ex ante* that their reason is legitimate and the group will help. However, an individual may feel compelled to obtain funding from other sources if they believe that the group will not respond favorably to their plight. Defaulters may turn towards their husbands or family to support them, and if both their family and group denies them, then no one helps and the group defaults.

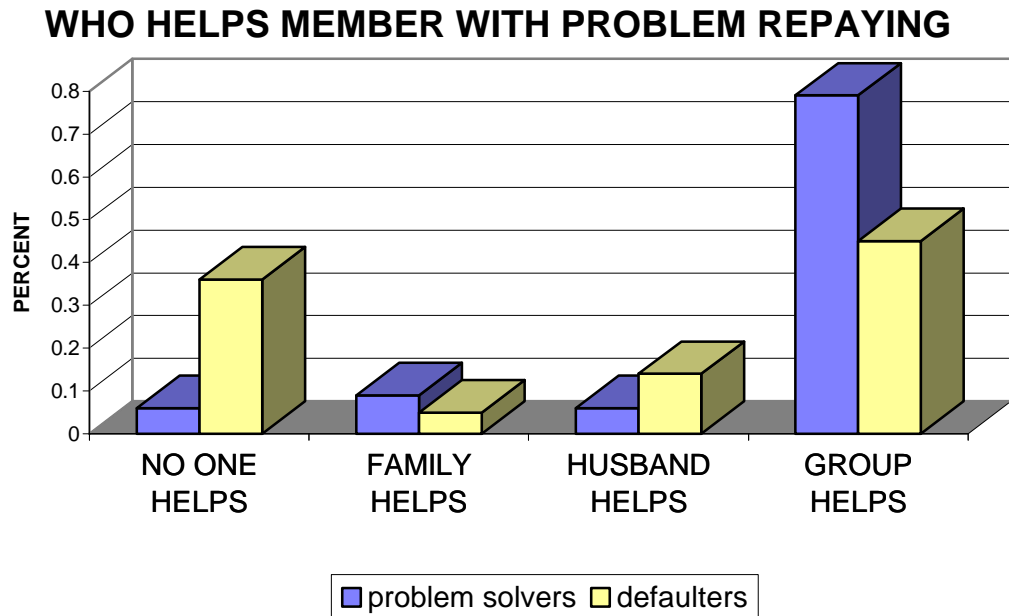


Figure 20: Who Helps Member with Problem Repaying

A final observation worth noting is that the mechanisms for group solidarity vary from group to group (Figure 21). Access to funds from the group depends on the intragroup contract that specifies the different states of nature that would elicit group help. The most common method that was used to cover the arrears of a group member was by each member contributing an equal amount. In other cases, either the leader or a group member paid for them and was later reimbursed. While the mechanisms did not vary

greatly between problem solvers and defaulters, the problem solvers had a few more options. One of the most innovative approaches was seen among market women in Ouahigouya. These groups formed their own tontines that had small weekly contributions. If one of the members ever had a repayment problem, she was free to borrow from the pot and repay it the following week.

MECHANISMS FOR GROUP SOLIDARITY WHEN REPAYMENT PROBLEM AROSE

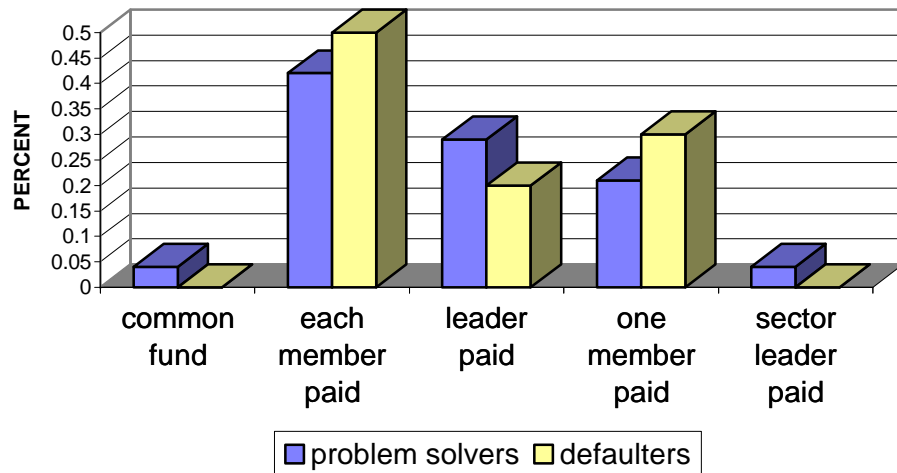


Figure 21: Mechanisms for Group Solidarity

Each of these general results contributes to the understanding of the clients of the PPPCR. Such an understanding can enhance the formulation of the structural model and

incorporate program specific trends to make the analysis more rigorous and better able to describe the data.

5.3 Adaptation of Econometric Model

The general econometric model of group lending repayment behavior presented in Chapter 3 can easily be modified so that it accurately represents the context where the sample data was collected. As mentioned, the three stage decision tree has three main phases: whether or not a problem arises, whether or not the individual informs the group of the problem, and whether or not the group assists the individual. In the Burkina Faso case, the groups tended to be quite knowledgeable about the actions of the other individuals in the group. Therefore, the second stage of the decision tree (whether or not to inform the group of the problem) was not a significant construct.¹⁰ Thus, only the “problem” and “repayment” stages were estimated. In addition, no measures of *ex ante* pressure (as discussed in Chapter 3), value of future access to loans, and sectoral wealth were collected and were not included in the modified model.

¹⁰ However, subsequent testing of this model in Guatemala showed that clients of CARE Guatemala were able to hide some problems from the group for fear of retribution. In this case, the second equation was an important part of the model.

The estimated structural model can be written in simplified notation as:

Stage 1

$Problem = f(domino\ effect, group\ homogeneity, urban, other\ credit)$

$Domino\ effect = g(problem, loan\ cycle)$

Stage 3

$Repayment = f(group\ homogeneity, domino\ effect, urban, loan\ cycle, other\ credit, history\ of\ working\ in\ groups, group\ leadership)$

$Pressure = g(repayment, emotion)$

Description of Variables

Problem was measured as a dummy variable. In the survey, each respondent was asked if she or any other member of the group had ever had some type of problem that made paying her portion of the loan difficult. The reasons for these problems are listed in Figure 18. Patience in the interview was needed so that the respondent clearly understood that a problem did not necessarily lead to default.

One of the determinants of having a problem was the **domino effect**. If other members of the group or the sector had already defaulted, other members may choose to shirk. By spending less energy ensuring that their businesses go well, problems could arise as a result. The domino effect is measured as a latent variable since two indicators of the

domino effect were collected. One indicator was whether or not the sector had default (a binary variable). This is relevant since if even one group in the sector defaults, then all of the groups are barred from receiving future loans. This would provide incentive for consistent payers to default. The presence of this linking of groups leads to a domino effect where the whole sector has 100 percent repayment or the sector has widespread default. The other indicator measured the number of individuals in the group with repayment problems (a metric variable from 0 to 5 members). Therefore, two equations in the measurement model were used to calculate the domino effect.

The domino effect is an endogenous variable. It is a function of whether or not the group has problems. In addition, it is a function of the **loan cycle**. As previously discussed, the loan cycle can be an indication of a matching problem. The data suggests that as loan cycles progress, more default occurs. This in turn can lead to the presence of the domino effect. In general, the loan cycle ranged from 1 to 6.

Another variable that potentially could affect loan repayment is the **homogeneity** of the group. A series of 10 yes/no questions asked if all of the members of the group were of the same ethnic group, had the same occupation, had similar incomes, lived in the same neighborhoods, etc. Since homogeneity is a pure concept, the use of latent variables is particularly appropriate for its measurement. Two indicators of homogeneity were used. One indicator was a homogeneity index constructed out of the 10 homogeneity questions. The other indicator of homogeneity was a metric variable measuring the number of different families that comprised the group of 5 women. In Burkina Faso,

where large families and polygamy exist, it was common to have several immediate family members or co-wives in the same group. Certainly this would be another indication of homogeneity.

An **urban** dummy variable was added to capture any effect of location on the prevalence of problems or repayment problems. Given the higher dependence on agriculture in the rural areas, higher risk factors could heighten the existence of problems. Likewise, the diversified economic activities in the urban areas may be more conducive to loan repayment.

Yet another variable which may be significant in influencing loan repayment is the use of **other sources of credit**. As illustrated in the general results, defaulters tend to have fewer numbers of other credit, possibly because they are less credit-worthy. However, if someone has too many other debt contracts, then they may pay back the informal loans to friends or to informal lending groups before they repay the PPPCR. Many of the women had no other debt, however in the certain sectors, a significant percent of the borrowing groups regularly used other types of credit.

Repayment was measured as a binary endogenous variable: either the group had arrears at the time of the interview or maintained its designated repayment schedule. Like the equation for “problem,” repayment is also a function of group member homogeneity, urban, other credit, the loan cycle, and the domino effect. However, in this equation, the domino effect is reduced to one indicator since sectoral default and repayment are nearly

perfectly correlated. Instead, the domino effect is measured only by the number of members within the group that experience repayment problems.

Since past experience working in groups seemed to influence loan repayment, a final variable called “**history of groups**” was incorporated into the model. Each survey participant was asked if she has received previous group loans with the PPPCR, participates in tontines, or belongs to other social or work groups. A categorical variable measuring the number of previous or current groups captures any prior exposure to working in groups.

Leadership and training of the group was another variable that may lead to effective group loan repayment. Typically, the sectors with large amounts of arrears had a weak organization both at the group and village levels. Strong group leaders arranged weekly meetings with their groups, encouraged loan repayment, and explained provisional plans for inability to repay. In one sector with arrears, most group members did not even know who their group leader was. In addition, training by the PPPCR and the village leaders seemed to impact repayment levels. When the village leadership took an active role in screening and monitoring loan activity, repayment rates increased. Part of this village level integration was based on the degree to which village bank workers trained the clients and village leadership.

The leadership/training variable is an exogenous variable formed as an index. The survey questions related to whether or not the group members felt that the group leader was effective and whether or not the sectoral or village leadership had an integral part in

loan monitoring and had met to discuss options and strategies for members who were unable to repay on a given repayment date.

The definition of *ex post* group **pressure** was that the individuals of the group pressured borrowers with arrears by saying something to them, by letting them know that they would face consequences if they did not repay, or by letting them know that they were angry. Thus, it was failure to repay that could invoke pressure and therefore, the repayment variable is included in the pressure equation. On the other hand, *ex ante* peer pressure could be a determinant of repayment, but this variable was not available. The *ex post* pressure variable was collected through a series of open ended questions and indexed on a pressure scale. According to this definition, group pressure could only be exhibited in the cases where one of the members had difficulty in repaying. Therefore, several of the groups (especially in the “good” sectors) did not have any reason to exert pressure. Pressure was lacking in groups that felt that failure to repay was not their problem, but the problem of the PPPCR, and who said they would never pressure the slow paying members because they were poor and could never pay.

As explained in Chapter 2, the use of pressure or help is directly linked to the emotion that the other group members feel. This was supported by the results of the Burkina Faso study. Since the strongest correlation exists between emotion and action, rather than reason and action, pressure was written as a function of **emotion**. The emotion variable was an index based on the answers to several questions on group reaction.

The intragroup group contract includes both pressure (as a punishing technique) and group solidarity (as a reward technique). For the purpose of this analysis, group solidarity was defined as whether or not the group members helped a member of the group if she had difficulty in paying her portion of the loan on one of the repayment days. For example, if a member was sick or had to travel on the repayment day, the other group members actively paid her portion of the debt. The survey question was ‘Has your group ever helped pay the repayment of one its members?’. Groups with or without default could qualify as having group solidarity. Due to the nature of the three-stage model, only those respondents that had had problems and had informed the group reached the third phase of the analysis. Therefore, when groups responded to a problem by engaging in group solidarity, the loan was repaid. Due to the strong correlation between group solidarity and repayment, solidarity was omitted from the model. However, since pressure and solidarity were typically opposite responses, the variable “pressure” was a good proxy for the *ex post* intragroup contract.

Written in as a set of structural equations with a measurement model, the system can be specified as:

Matrix Notation:

$$\mathbf{b}h + \Gamma\mathbf{x} + \mathbf{e} = 0$$

$$Y = \mathbf{n} + \Lambda \mathbf{h} + \mathbf{f}$$

Writing out the structural equations, the full model is obtained and is given by:

Model:

Stage 1

Structural Equations

$$\mathbf{h}_0 = \mathbf{b}_{01}\mathbf{h}_1 + \mathbf{b}_{02}\mathbf{h}_2 + \mathbf{g}_{00}\mathbf{x}_0 + \mathbf{g}_{01}\mathbf{x}_1 + \mathbf{z}_0$$

$$\mathbf{h}_1 = \mathbf{b}_{10}\mathbf{h}_0 + \mathbf{g}_{12}\mathbf{x}_2 + \mathbf{z}_1$$

Measurement Model

$$Y_0 = J_0 + I_0\mathbf{h}_0$$

$$Y_1 = J_1 + I_1\mathbf{h}_1 + \mathbf{d}_1$$

$$Y_2 = J_2 + I_2\mathbf{h}_1 + \mathbf{d}_2$$

$$Y_3 = J_3 + I_3\mathbf{h}_2 + \mathbf{d}_3$$

$$Y_4 = J_4 + I_4\mathbf{h}_2 + \mathbf{d}_4$$

Stage 2

Structural Equations

$$\mathbf{h}_3 = \mathbf{b}_{35}\mathbf{h}_5 + \mathbf{g}_{33}\mathbf{x}_3 + \mathbf{g}_{34}\mathbf{x}_4 + \mathbf{g}_{35}\mathbf{x}_5 + \mathbf{g}_{36}\mathbf{x}_6 + \mathbf{g}_{37}\mathbf{x}_7 + \mathbf{z}_3$$

$$\mathbf{h}_4 = \mathbf{b}_{43}\mathbf{h}_3 + \mathbf{g}_{48}\mathbf{x}_8 + \mathbf{z}_4$$

Measurement Model

$$Y_5 = J_5 + I_5\mathbf{h}_3$$

$$Y_6 = J_6 + I_6\mathbf{h}_4 + \mathbf{d}_6$$

$$Y_7 = J_7 + I_7\mathbf{h}_4 + \mathbf{d}_7$$

$$Y_8 = J_8 + I_8\mathbf{h}_5$$

Endogenous variables

h_0 = problem

h_1 = domino effect

h_2 = homogeneity (first stage)

h_3 = repayment

h_4 = homogeneity (third stage)

h_5 = ex post pressure

Exogenous variables

x_0 = urban (first stage)

x_1 = other credit (first stage)

x_2 = loan cycle (first stage)

x_3 = domino effect (third stage)

x_4 = loan cycle (third stage)

x_5 = other credit (third stage)

x_6 = history of groups (third stage)

x_7 = leadership and training (third stage)

x_8 = emotion (third stage)

5.4 Estimation Results

Due to the inclusion of latent variables, such as homogeneity and the domino effect, that have multiple indicators and are measured with error, a covariance structure model is appropriate for the estimation (see Chapter 3). In addition, the usage of categorical endogenous variables, such as repayment, problem, and sectoral default make running a LISREL type model impossible since currently, the LISREL program does not

incorporate threshold models for latent, categorical and binary variables. Therefore, the model was estimated using MECOSA (Mean and Covariance Structure Analysis).

MECOSA is a flexible program for the estimation of mean and covariance structure models. With the specification of no measurement error and no latent variables, a model is identical to a traditional OLS estimation. With the incorporation of a measurement model, the equations are enhanced by allowing for latent variables. In addition, the use of threshold models links categorical endogenous variables to an underlying continuous structure.

The estimation process is based on the work of Muthén and Küster in the 1980's on the specification and estimation of mean and covariance structures. The estimation consists of three steps (Schepers. and Arminger, 1992) and is based on the assumption of multivariate normality of the latent endogenous variables. First, the reduced form is calculated so that each endogenous variable is written as a function of the exogenous variables. All categorical and latent variables must be specified as endogenous variables.

Each element of the observed endogenous vector is linked to an underlying latent endogenous variable through threshold models. For example, if the variables are metric, then a simple linear relationship is used $y = y^*$. However, when non-metric variables are used (metrically classified, censored, ordered categorical) a more complex threshold model is used. For instance, a one sided censored endogenous variable would entail a threshold model where the threshold of the variable is known *a priori* and therefore can be written as:

$$y_i = y^* \text{ if } y^* > \mathbf{t}_{i,1}$$

$$= y^* \text{ if } y^* \leq \mathbf{t}_{i,1}$$

In the case of this group lending data set, several endogenous variables were ordered categorical variables. The threshold values for such variables are not known *a priori* and must be calculated. The observed endogenous variable takes on K+1 ordered categories while the underlying continuous structure that it is linked to has the following structure:

$$y_i = k \Leftrightarrow y_i^* \in [\mathbf{t}_{i,k-1}, \mathbf{t}_{i,k})$$

$$\text{with } [\mathbf{t}_{i,0}, \mathbf{t}_{i,1}) \text{ and } \mathbf{t}_{i,K+1} = +\infty$$

Because the threshold values are not known and the variance of an ordered categorical variable is not defined, some restrictions must be imposed in order to achieve identification. The variance of the categorical variable is set to 1 and either the constant or the first threshold is set to 0. The parameters for each equation are estimated separately by applying Maximum Likelihood Estimation (MLE) and are collected in a vector.

In the second step, correlations and covariances are calculated for each pair of endogenous variables. In addition, an asymptotic covariance matrix is estimated from the reduced form parameters and collected in a vector $\hat{\mathbf{k}}$. For categorical variables, polychoric correlations or polyserial covariances are utilized since they account for variables that are not continuous.¹¹ The structural parameters are estimated by a technique

¹¹ The traditional Pearson correlations can not be used since the ordered categorical variables may not have equidistant scale steps and since a relatively few number of categories can distort the product moment correlations and covariances. (Munthén, 1984)

known as minimum distance estimation (MDE) in which a consistent estimator of the asymptotic covariance matrix of the reduced form is estimated.

The third step estimates the structural parameters. The reduced form parameters are collected in a vector ($\mathbf{k}(\mathbf{u})$) which is a function of the structural parameters (\mathbf{u}). In order to arrive at the structural parameters, it is necessary to minimize the difference between the sample asymptotic covariance $\hat{\mathbf{k}}$ and the constructed covariance $\mathbf{k}(\mathbf{u})$. This is achieved through minimization of the quadratic form (Schepers and Arminger, 1992):

$$Q(\mathbf{J}) = (\hat{\mathbf{k}} - \mathbf{k}(\mathbf{J}))^T \hat{W}^{-1} (\hat{\mathbf{k}} - \mathbf{k}(\mathbf{J})) \text{ where } \hat{W}^T = \text{COV}(\mathbf{k}(\mathbf{u}))$$

The resulting structural parameters are asymptotically normal and consistent.

The reduced form parameters can be compared to the constructed model parameters that are a function of the structural parameters. The structural parameters are estimated by minimizing the difference between the sample covariance structure and the constructed covariance structure. The model with the estimated parameters can now be written as:

Stage 1

Structural Equations:

$$E(\text{Problem}) = 0.8585 \text{ domino effect} + 0.0822 \text{ homogeneity} - 0.6791 \text{ urban} \\ \text{standard error} \quad (0.2729) \quad (0.0480) \quad (0.2666) \\ + 0.0410 \text{ other credit} \\ (0.0400)$$

$$E(\text{Domino effect}) = 0.6295 \text{ problem} + 0.1018 \text{ loan cycle} \\ (0.0662) \quad (0.0394)$$

PSI COVARIANCE MATRIX (Stage 1)			
	COL_1	COL_2	COL_3
ROW_1	0.2272	0.0000	0.0000
ROW_2	0.0000	0.0000	0.0000
ROW_3	0.0000	0.0000	2.3154

Table 1: Stage 1 Psi Covariance Matrix

Measurement Model:

$$E(\text{Sectoral domino effect}) = 1.0 \text{ domino effect}$$

$$E(\text{Individual domino effect}) = 2.2699 + 1.8679 \text{ domino effect} \\ (0.1629) \quad (0.1509)$$

$$E(\text{Family Homogeneity}) = 0.5332 + 0.3574 \text{ homogeneity} \\ (0.0867) \quad (0.1488)$$

$$E(\text{Homogeneity Scale}) = 1.0 \text{ homogeneity}$$

THETA COVARIANCE MATRIX (Stage 1)					
	COL_1	COL_2	COL_3	COL_4	COL_5
ROW_1	0.0000	0.0000	0.0000	0.0000	0.0000
ROW_2	0.0000	0.5445	0.0000	0.0000	0.0000
ROW_3	0.0000	0.0000	0.6727	0.0000	0.0000
ROW_4	0.0000	0.0000	0.0000	0.9886	0.0000
ROW_5	0.0000	0.0000	0.0000	0.0000	0.1358

Table 2: Stage 1 Theta Covariance Matrix

Stage 3

Structural Equations:

$$E(\text{Repayment}) = 0.5856 \text{ homogeneity} - 0.0940 \text{ domino} + 0.2358 \text{ urban}$$

(0.5452) (0.0421) (0.1716)

$$- 0.2845 \text{ loan cycle} + 0.5884 \text{ other credit} + 0.0436 \text{ group history} + 1.0302 \text{ leadership}$$

(0.0704) (0.0852) (0.1707) (0.1619)

$$E(\text{Pressure}) = 0.8770 \text{ repayment} + 0.1618 \text{ emotion}$$

(0.1015) (0.0346)

PSI COVARIANCE MATRIX (Stage 3)			
	COL_1	COL_2	COL_3
ROW_1	0.5576	0.0000	0.0000
ROW_2	0.0000	0.0259	0.0000
ROW_3	0.0000	0.0000	0.0000

Table 3: Stage 3 Psi Covariance Matrix

Measurement Model:

$$E(\text{Family Homogeneity}) = 1.0 \text{ homogeneity}$$

$$E(\text{Homogeneity Scale}) = 2.3658 + 6.3723 \text{ homogeneity}$$

(0.0764) (1.8669)

THETA COVARIANCE MATRIX (Stage 3)				
	COL_1	COL_2	COL_3	COL_4
ROW_1	0.0000	0.0000	0.0000	0.0000
ROW_2	0.0000	2.8087	0.0000	0.0000
ROW_3	0.0000	0.0000	0.0000	0.0000
ROW_4	0.0000	0.0000	0.0000	0.0000

Table 4: Stage 3 Theta Covariance Matrix

5.5 Discussion

The interpretation of a mean and covariance structure model can be divided into the covariance structure model specified by the measurement model and the mean structure model specified by the structural equations. However, the parameters of primary interest to the overall interpretation of the group lending model are the in the structural equations since they frame the entire analysis.

To begin the parameter analysis, the measurement model is examined. In the measurement model, the latent variables with multiple indicators are specified. This is equivalent to confirmatory factor analysis (CFA). In factor analysis, several indicators of

a latent variable are tested to determine their significance in influencing the latent variable. The coefficients on each indicator are called factor loadings. These factor loadings show how each observed indicator contributes to the change in the latent variable. The combination of these indicators with their individual coefficients combine to create the latent variable in the measurement model. The single latent variable is then inserted into the structural equation as if it were a single observed variable.

In the first stage of the model, two latent variables are included: the domino effect and group member homogeneity. The number of members within a group that experienced repayment problems was one indicator of the domino effect. Whether or not any other group in the sector had arrears was a second indicator of the domino effect. By setting the constant equal to zero and the coefficient equal to one in the sectoral domino effect equation, it is possible to scale both domino effect indicators so that they may be compared and the model is identified. With these restrictions, the individual domino effect has the same expected value as the sectoral domino effect. Also, a one unit change in the latent variable domino effect has a one unit expected change in each of the indicators.

The latent variable domino effect has the same scale¹² as sectoral domino effect. Given that the coefficient (factor loading) on the domino effect in the individual domino effect equation is 1.8679, then a one unit change in the latent variable domino effect will increase the expected value of the individual domino effect by 1.8679.

¹² Scaling of all latent variable indicators to a single indicator is useful for interpretation since each indicator may have a different measurement scale. The latent variable itself is put on the same scale as one of its indicators and then all other indicators can be compared to that reference scale.

The same type of interpretation can be given to the latent variable homogeneity. Its two indicators include the number of different families in the group and a scale of 10 questions relating to member wealth, family, age, etc. The homogeneity scale was set as the basis for comparison, with a zero intercept and coefficient of one. As homogeneity changes by one unit, the expected value of family homogeneity changes by 0.3574. Each of the parameters estimated in the measurement model were highly significant at the $\alpha = 0.01$ level.

The structural parameter estimates provide insight into the factors that cause repayment problems and successful repayment behavior. In the first stage, respondents were asked whether or not a problem had arisen during the course of the repayment cycle for any member of the group. Because the dependent variable in both stages was binary, the mean structure model is a structural probit model and its parameters can be interpreted equivalently to a probit model.

The probit model, based on the normal distribution can be written as:

$$\begin{aligned} \text{PROB}(Y = 1) &= \int_{-\infty}^{\mathbf{b}'x} \mathbf{f}(t) dt \\ &= \Phi(\mathbf{b}'x) \end{aligned}$$

The coefficients \mathbf{b} are not marginal effects typical in other estimations. In order to calculate the marginal effects, the standard normal density function is evaluated so that:

$$\partial E[y] / \partial x = f(b'x)b$$

The model coefficients versus the marginal effects are given in Table 5.

Variable	STAGE 1		STAGE 3	
	Coefficient	Slope, Elasticity	Coefficient	Slope, Elasticity
Homogeneity	0.0822	0.1798 * 0.3266	0.5856	0.1136 * 0.2022
Domino Effect	0.8585	0.0172 * 0.0311	0.094	-0.0182 * -0.0660
Urban	-0.6791	-0.1422 * -0.0920	0.2358	0.0457 * 0.0292
Loan Cycle	--	--	-0.2845	-0.0552 * -0.1180
Other Credit	0.0410	0.0086 * 0.0070	0.5884	0.1142 * 0.0920
Group History	--	--	0.0436	0.0085 * 0.0030
Leadership/ Training	--	--	1.030	0.2000 * 0.1208

* elasticity at mean value

Table 5: Estimated Coefficients, Marginal Effects and Elasticities

The slopes given in Table 5 are measures of the derivatives of the conditional mean function. These derivatives are more relevant and meaningful for continuous variables than dummy variables (Greene, 1990). In this case, several variables are either dummy or categorical variables. Nevertheless, the slopes provide an approximation to the change in probability as the dependent variable equals one at the regressor means. It is useful to

calculate the marginal effects of a probit model since they can be utilized to show how a unit change in one of the variables will affect the probability of the dependent variable equaling one. For example, a one unit change in the variables homogeneity, other credit, or leadership and training have the largest effects on the probability that repayment will occur (Table 5).

The elasticities are measured at the mean values of the independent variables. Highly elasticity indicates that a slight variation in the variable's value will result in a significant change in the probability of the dependent variable equaling one. The domino effect is the most elastic variable in Stage 1 while homogeneity, loan cycle, and leadership/training were relatively elastic in Stage 3 (although homogeneity in the third stage was not significant). Thus, a program wanting to reduce the number of problems that their groups have should examine ways to reduce the domino effect. Those program managers interested in increasing the probability of repayment could increase leadership and training and pay attention to loan cycles.

While member homogeneity was associated with repayment problems, it was associated with correct repayment. Two explanations for why homogeneity was linked to problems are offered. First, homogeneous groups are more likely to have information about the other members' repayment problems, no matter how minor and may be more likely to report them. Also, more problems could arise to due the relatively higher covariance in income in homogeneous groups. It is therefore no surprise that homogeneous groups reported more problems.

However, the homogeneity variable was highly variable and not significant in the repayment equation due to the relatively high standard error. The measurement of homogeneity remains one of the most challenging variables to capture in econometric models. A positive coefficient on the homogeneity variable could indicate that homogenous groups tend to repay better than heterogeneous groups due to their advantage in monitoring and coordination. However, in some cases, one would expect a greater likelihood of strategic default among homogeneous groups. Also, in the face of systemic shocks, homogeneous groups with covariant income could simultaneously default. This interview was performed during a favorable rainy season. Even though homogeneous groups had relatively more problems, they were able to overcome them using group solidarity. The coefficient on homogeneity may be different under harsher conditions when group solidarity no longer is feasible.

Not surprisingly, the urban dummy variable was negative with a low standard error and strongly significant. Problems tended to occur more in rural areas. A recent study on African finance finds micro-credit to be more effective and appropriate in urban African areas. (Abugre, 1993) Firstly, the rural clients have a higher dependence on agricultural activity as the base of the rural economy. In conjunction with the reliance on agriculture comes a higher degree of income variation, risk, and covariant incomes. While the Grameen Bank avoids such agricultural loans, the rural PPPCR clients are almost entirely dependent on agriculture. Even the market activities are strongly linked to agriculture as food preparation and grain sales predominate.

In addition, the rural Burkinabe villages studied rely heavily on a barter economy. The villages are very isolated from urban markets and self-sufficiency prevails over product diversification and specialization. Given the lack of monetization, informal finance is not as common in rural Burkina Faso as it is in the urban centers. In the rural village with high default, tontines had been tried, but had collapsed and disappeared. Given this failure of informal groups, it is not surprising that the PPPCR groups also failed in some of these areas.

The urban areas sampled in Ouahigouya reflected a more sophisticated financial landscape. The market women were familiar with monetary transactions and many of them regularly participated in tontines and other groups. In addition, their proximity to formal lending sources gave them a greater familiarity of financial tools. The urban dummy variable reflects this contrast.

The homogeneity variable was significant at a $\alpha = 0.05$ level. The coefficient on homogeneity was positive indicating that the more homogeneous the group, the more problems occurred. There could be several explanations for this. Firstly, the most homogeneous groups know each other so well that they easily are able to report the problems of the others during the interview. In addition, due to the domino effect, if one member of a tight-knit group sees the others experiencing problems, she also may shirk her responsibilities, leading to problems for herself.

The domino effect had a significant positive influence on having problems as expected. As other groups and members defaulted, more problems arose. Part of this

effect could be due to the breakdown of the intragroup contract and shirking as members decide that the marginal benefits of repaying exceed the marginal costs of repaying.

Likewise, having other credit was positive, but not highly significant. Despite its relatively high standard error, its positive sign indicates that having numerous credit contracts is a determinant of repayment problems. Its impact was also more relevant for the third stage of the estimation.

The equation for the domino effect was interesting. It was constructed as a simultaneous equation dependent on the “problem” equation. Understandably, the coefficient on problem was significant and positive. A more fascinating result was the impact of loan cycle on the domino effect. The coefficient on loan cycle was significant and positive implying that groups in their first loan cycle have fewer problems than groups in later loan cycles. This supports the notion of a matching problem.

Perhaps the most relevant stage of the model is the third stage since it describes the determinants of group lending repayment behavior. Several factors indicate the instability of group lending repayment rates. One of the most important obstacles to successful repayment was the domino effect. As more members of the group experienced repayment problems, it was no longer viable to continue repaying the loan. The bank workers at the PPPCR reported this as a common occurrence. According to them, a group can survive one or two repayment problems, but as more arise, the group members refuse to assist those with problems.

Another negative impact on repayment was the loan cycle. Due to its association with the domino effect, it is hardly surprising to witness its negative relationship with loan repayment. While it can be argued that some groups grow stronger over time, in the PPPCR, the matching problem resulted in a deterioration of repayment rates as loan cycles passed. Both negative effects on loan repayment were highly significant.

Turning to positive influences on loan repayment, the coefficient on leadership and training was strongly positive and significant. Those groups who had been trained well by the bank workers, had been taught contingency plans for when problems occurred, and had a trustworthy, strong leader were more likely to repay their loans. This supports the usage of effective training and leadership, especially given the presence of the domino effect leading to instability of group lending. Group lending can not afford to have even one group default or a climate of default might be created. Appropriate leadership and training is one such safeguard against this.

In the most sophisticated groups, contingency plans for numerous possible problems were discussed. For example, a traveling woman would leave her repayment in advance, a sick woman would pay when she was better, and the use of tontines and other savings devices were used to cover the arrears. In other cases, the leadership was so weak that many women did not know who their group leader and other members of the group were.

As in the first stage, the urban variable was positive. However, the significance of the urban dummy was higher in the equation for problem than for repayment, as one might

expect. In addition, the history of working in groups was a positive determinant of repayment. This includes the use of tontines and other social and financial group arrangements. Groups tended to be concentrated more in urban areas, but those rural areas that had functioning groups also had favorable repayment rates. However, the high standard error associated with group history led to a low significance level.

Finally, the variable “other credit” had a positive, significant coefficient. This supports the hypothesis that having other contracts is an indication of creditworthiness rather than having obligations spread too thin. This is the same finding that Viganó found in Burkina Faso in 1993.

The positive coefficient on emotion in the pressure equation upholds the relationships described in the perceived responsibility-social motivation model. Even though a link exists between emotion and pressure, the use of *ex post* pressure was not an effective technique for strengthening repayment rates. However, the use of *ex ante* pressure no doubt encourages favorable repayment rates.

Ex post pressure was influenced greatly by whether or not repayment had occurred. Obviously, *ex post* pressure is only applied when a member has reported repayment problems. Rather than stimulating repayment, *ex post* pressure usually occurred at a time when the loan was already in arrears. The pressure in Burkina Faso was much more subtle than in other areas¹³. In rural areas of Burkina Faso where most village members are related and very much interconnected in their daily lives, village harmony is important. In addition, the existence of a hierarchical social system giving

¹³ Intense and explicit pressure was recorded in CARE Guatemala by the author, 3/1996.

certain caste members and elders a privileged social position makes peer pressure difficult in some situations. In fact, some elderly women who had defaulted were never pressured even though the other women felt resentment. The only time that ex post pressure arose was when the entire group and sector were barred from additional loans. Even in these cases, several women responded that they felt no anger towards the other group members for defaulting since it was the project's money and it is the project who should be angry.

Discussion of Besley and Coate model

The game described by Besley and Coate varies from the reality of the group lending scheme studied in Burkina Faso. Firstly, the Burkina Faso groups were comprised of five members rather than two. This would increase the threshold of the critical project return where the borrower is indifferent between repaying and defaulting when all of the other members of the group do not repay. In other words, an individual would have to have an extremely favorable project return and a strong desire to maintain a relationship with the bank in order to cover the repayment of the entire group.

In addition, the repayment game ignored the possibility that an individual would be financially incapable of repayment. Instead, they focus on strategic default. In sub-Saharan Africa, inability to repay could outweigh unwillingness to repay. However, this feature could easily be incorporated into the Besley and Coate model.

Also, the PPPCR project could be described as a repeated game. Since the clients have the possibility of a continued relationship with the PPPCR, that relationship becomes

part of the incentive structure of loan repayment. In addition, the repetition of the process facilitates coordination. Under a given range of project returns $\{ f(r), f(2r) \}$ two game equilibria result: either both repay or both default. While both repaying is Pareto-superior, a coordination problem exists since the players must trust each other to repay. This coordination problem can be solved through renegotiation and repetition of the game.

The Besley and Coate repayment game illustrated that the use of joint liability in group lending led to two effects that are not seen in individual lending. A positive effect occurs when individuals cover the arrears of a member who does not repay his/her portion of the loan. This type of group solidarity is not a feature of individual lending. In addition, if social collateral is high enough, members that may have defaulted under individual lending will repay in order to avoid penalties imposed by other group members (social collateral). On the negative side, a group member may default if others do so since the correctly repaying member's net benefit of repaying more than his/her share may be negative. Due to the presence of joint liability, the individual will default even though he/she would have repaid under individual lending. This default domino effect within the group is a form of strategic default.

The structural model of group lending sheds light on each of these influences. Firstly, group solidarity was indeed present. Approximately one third of the sample successfully repaid their loans by allowing some group members to make up the arrears of a member with repayment problems. Whereas under individual lending, these loans may

not have been recovered, they were promptly repaid by the other group members, thus resulting in more favorable repayment.

Nevertheless, strategic default was found to be a significantly negative influence on loan repayment. This domino effect at both the group and sectoral levels was one of the most important determinants of loan repayment. It had an overall negative influence on loan repayment.

Besley and Coate suggest that if social collateral is high enough, its positive effect on loan repayment might mitigate the negative influence of the domino effect. They suggest that a high degree of social connectedness will lead to an effective social penalty function, increasing the members' willingness to repay. This collateral substitute acts as a non-market enforcement mechanism. The Burkina Faso sample included groups with a high degree of social connectedness, but a low *ex post* penalty function. Part of this phenomenon can be explained by the near perfect information that exists among these tight-knit groups. Since information is available, shirking or lying became more difficult. As a result, most of the reasons for default were "uncontrollable" reasons, resulting in sympathy rather than anger from the rest of the group. In this sense, strong *ex ante* group pressure (social collateral) influenced members to repay if possible. In cases of uncontrollable default, the *ex post* social penalty function was low.

Even in the few cases of "controllable" default, the close communities and groups preferred to maintain village harmony than to impose strict social sanctions. Besley and Coate conclude that group lending is superior to individual lending if social sanctions are

large enough. In the case of Burkina Faso, social sanctions were not strong enough to counteract the domino effect. The strong presence of the domino effect indicates a default/default equilibrium as a game strategy and therefore illustrates an inherent instability of group lending for this sample.

An alternative explanation for the presence of all members in a group defaulting is that the defaulting groups have experienced a covariant income shock that simultaneously affected their ability (rather than willingness to repay). However, after extensive questioning, this possibility was determined to be unlikely since no systemic shocks were measured during the months of the interviews (in fact, most agreed that favorable economic conditions prevailed) and most importantly, the members themselves reported the presence of strategic default. However, the possibility of such systemic shocks is a likely prospect in the sub-Saharan context in other instances. This proves the point that if group lending repayment is unstable in good years, it could be devastating in bad years.

Modifications of the repayment game based on the results of this study could include a higher degree of complexity. The three stage decision tree could be incorporated to show the logical progression of having a problem, telling the group, and deciding whether or not to repay. In addition, the intragroup contract could be incorporated so that various states of nature elicit group solidarity or peer pressure.

Implications for Project Design

Three areas of project design could be enhanced by a better understanding of group dynamics and loan repayment behavior. First, the project structure could be modified to support the intragroup contract that functions within a given context. In the case of Burkina Faso, the availability of information within the relatively small groups facilitated monitoring and enforcement. As a result, most of the reasons for default could be classified as “uncontrollable” and thus strict social sanctions were not imposed. Instead of pressure, the groups felt sympathy for the member with arrears and offered assistance. While this type of help can be termed group solidarity, it is a form of mutual insurance for all members. By understanding the nature of these group dynamics, the PPPCR could modify its structure.

The inclusion of sectoral liability in the project design was intended to enhance peer pressure. Given the relative lack of *ex post* social sanctions, sectoral liability does not appear to increase loan repayment. In fact, the data suggest that sectoral liability has a net negative effect on loan repayment. Once a village or sector has had been banned from future loans, it is within the best interest of all groups to forego repayment. By eliminating sectoral liability, a major source of the domino effect can be alleviated.

Eliminating group liability is not as clear cut for the PPPCR. Some of the benefits of working in groups could be maintained even under individual lending. For example, to reduce institutional transaction costs, the hierarchical organization of groups and sectors could be maintained so that bank workers could still collect repayment from only one individual per sector. However, the loans would not have joint liability. In this way,

defaulting individuals could be eliminated without punishing the rest of the village or sector. In addition, when group solidarity is thought of as an insurance mechanism for future access to loans, it could also function under individual lending that utilizes groups as the basis for organization. This would allow the individuals to have access to a group fund in case of idiosyncratic shock. Due to the availability of information, the group would only allow such use in cases of uncontrollable default. One of the advantages of maintaining the group structure while abolishing joint liability would be greater flexibility of individuals to take loans as they need them rather than merely “going along with the group.” The more individualistic approach could reduce the negative effects of multiple loan cycles on repayment.

While these positive mechanisms of working in groups do not rely on joint liability per se, the existence of social sanctions is connected to joint liability. Under conditions of nearly perfect information, *ex ante* group pressure may enhance loan repayment by encouraging safe activities and hard work so as not to disappoint the rest of the group. Without joint liability, even if groups are used for organization, social pressure would be eliminated. The design question hinges on whether the domino effect outweighs this *ex ante* peer pressure (which was not explicitly measured) in the case of Burkina Faso. If the domino effect prevails, then joint liability at the group level should also be eliminated.

Another area of project design that could be improved based on the results of this type of empirical analysis is client training. Since the Burkina Faso intragroup contract relied on group solidarity rather than coercive behavior, then training should be in line

with the empirical reality. Rather than using the belief that in order to be effective, group members should be pressuring one another, project managers should examine the predominant group dynamics and encourage them. For the PPPCR groups, solidarity was a key feature in overcoming problems. Therefore, bank workers could train groups on how to most effectively use group solidarity to their advantage. This type of training could include contingency plans, the formation of tontines, and explanations of how other groups have successfully harnessed group solidarity. This training would be different for projects with imperfect information that relied more on peer pressure to ensure repayment.

A final improvement in project design could be implemented in the area of choosing the target group. By performing this type of survey, information about the creditworthiness of different types of groups is available. For instance, in Burkina Faso, groups of urban market women performed exceptionally. Their experience dealing with monetary contracts and daily monetary transactions led to higher repayment rates. In addition, groups that had successfully engaged in other group activities, primarily tontines, had more favorable repayment rates. Finally, groups that had alternative sources of credit were more successful in their repayment. The access to other credit suggested an increased creditworthiness. However, if too many other contracts exist, debt seniority may favor the repayment of other contracts before the PPPCR.

CHAPTER 6

CONCLUSIONS

The primary goal of this research has been to better understand the mechanisms of group lending in relation to repayment behavior. Using a theoretical game theory background by Besley and Coate, some conflicting influences on repayment were identified. While group dynamics were shown to be able to prevent default in some cases, the presence of the domino effect exacerbated default in the game theory setting. However, the degree to which these influences exist empirically has not been rigorously tested.

In order to create an empirical model of group lending repayment behavior, the mechanisms in the Besley and Coate model had to be expanded and elucidated. One of the least understood elements of group dynamics has been the actual functioning of peer pressure and group solidarity in the face of repayment problems. These two effects are classified as an intragroup contract which acts as an insurance mechanism to encourage repayment. The contract has an *ex ante* expected outcome and an *ex post* realized outcome. Before problems arise, the group members have an implicit or explicit understanding of the consequences of defaulting under various states of nature. In small

groups that know each other well, nearly perfect information is available, making moral hazard difficult. Because of the existence of nearly perfect information, monitoring is facilitated and therefore it is known with relative certainty if the reason for repayment problems is controllable or uncontrollable.

In the village setting of Burkina Faso, the presence of good information led to the ability for the groups to engage in group solidarity (helping behavior) for those members that had uncontrollable situations. In these cases, the other members felt sympathy and displayed no pressure. Also due to the presence of nearly full information, controllable excuses for arrears were rarely stated. The collapse of the groups had more to do with the domino effect than the failure of group dynamics.

Another contribution to the understanding of group lending has been the observation and result that groups tend to experience repayment difficulties after several loan cycles. This is termed a “matching problem” since it becomes increasingly unlikely that all members of a group will desire the same loan terms and conditions repetitively through time.

Several other elements were added to the basic game theory framework in order to create an econometric model. These variables included the presence of other debt (debt seniority), client location, the history of working in groups, and leadership and training. While the game theory model assumes member homogeneity, this model tested for it.

The main influences discussed in the Besley and Coate repayment model were tested. In the game, group lending repayment rates can surpass individual rates if the

positive externalities of group lending can outweigh those negative externalities such as the domino effect. In the case of Burkina Faso, negative influences on repayment were witnessed, including the domino effect and the matching problem. Both of these strongly significant factors lead to the conclusion that group stability is a concern in the West African context. However, these negative externalities may be counteracted by reducing sectoral liability, increasing group training and contingency plans, and targeting groups with sufficient economic diversification and experience working with groups.

Another goal of this research was to employ an advanced statistical methodology known as mean and covariance structure analysis. The technique allowed for the incorporation of latent variables with multiple indicators, resulting in a more complex error structure. In addition, the estimation included appropriate treatment of non-metric variables using the program MECOSA. The technique allow for measurement error in the indicators for the latent variables and therefore gives a more accurate estimation.

The results of the empirical model of group lending repayment clearly show the presence of negative externalities associated with group lending. Both the domino effect and the matching problem were highly significant and decreased the probability that the loan would be repaid. The existence of these variables shows an inherent instability in group lending in Burkina Faso.

Despite the negative influences on repayment, much can be learned from the positive determinants of group loan repayment. Groups in urban areas that manage other credit contracts and have good leadership and training have a higher probability of

repaying loans. Group member homogeneity and prior experience in groups were both positive influences on repayment but were not highly significant.

Knowing how groups utilize the intragroup contract and what factors increase the probability of repayment are critical factors for project management and training.

Knowing the characteristics of good clients helps with expanding markets. Training of credit groups could include offering suggestions of how to explicitly formulate the intragroup contract. For example, if perfect information exists, then contingency plans for sickness, travel, death, etc. could be designed and agreed upon *ex ante*, thus developing the group solidarity mechanisms. However, in groups with imperfect information, techniques and contingencies for when group pressure would be applied may be more appropriate.

Future work in this area may attempt to capture the *ex ante* intragroup contract. This could be accomplished by asking hypothetical questions about what would happen in the case of various states of nature. Also, each individual step of the perceived responsibility and social motivation model could be tested. In addition, this type of survey could be accomplished in a variety of settings to show the variation in how groups interact in different contexts.

The use of latent variables and mean and covariance structure models may be used increasingly in the field of economics. As models become more complex, mirroring reality to a greater degree, using proxy variables with no measurement error become increasingly limiting. Especially for field work in developing countries, the use of latent variables is

appropriate. Even the collection of a simple variable such as income can have numerous definitions in the African context. Multiple indicators provide more flexibility in attaining an appropriate measure of such variables.

While this work examines only repayment, other areas are closely linked. For example, the degree to which cost and repayment are associated is an important facet of group lending that is understudied. A more thorough examination of covariant income and strategic default would be insightful to better understand the domino effect. Also, more studies documenting the cost of group lending versus individual lending are needed. Through a better understanding of the mechanisms, benefits, and dangers of group lending, more effective programs can be implemented to provide financial services to low income clients.

BIBLIOGRAPHY

- Aburgre, C. "When Credit Is Not Due: Financial Services by NGOs in Africa" Small Enterprise Development, Vol. 4, No. 4, Dec. 1993.
- Adams, D. And Canavosi, M.L. "Rotating Savings and Credit Associations in Bolivia" Informal Finance in Low-Income Countries ed. Adams, D.W. and Fitchett, D.A., Westview Press, Boulder, CO., 1992.
- Adams, D.W. and Romero, A.A.P. "Group Lending to the Rural Poor in the Dominican Republic: A Stunted Innovation" Canadian Journal of Agricultural Economics July, 1981.
- AFRACA, "The Role of Informal Groups in the Rural Financial System" Report of the Workshop on the Role of Informal Groups in the Rural Financial System, Harare, Zimbabwe, 1987.
- Akerlof, George A., "Procrastination and Obedience," Working Papers Series No. 13, Institute for Policy Reform, Washington, D.C., June 1991.
- "Aide Memoire de la Mission de Supervision du Projet Petit Credit Rural au Burkina"
- Alip, J.A.B., Marcial, T.P. and Yedra, R.C., "Development Assistance Program for Cooperatives and People's Organizations: An Innovative Approach to Group Lending," Studies in Rural Finance and Development, Vol. 1, ACPC, Manila, Philippines, Dec., 1990.
- Armendáriz de Aghion, B. "On the Design of a Credit Agreement with Peer Monitoring" London School of Economics, 1995.
- Appleton, S., et. Al. "Public Services and Household Allocation in Africa: Does Gender Matter?" Institute of Economics and Statistics, University of Oxford, Oxford, England, 1991.

- APRACA, Selected Documents of APRACA Regional Experts Consultations on the Survey of Self-Help Groups” Regional Experts Consultations on the Survey of Self-Help Groups, Yogyakarta, Indonesia, 1987.
- APRACA, “Self-Help Groups: Meeting the Credit Needs of the Poor” Asia Pacific Rural Finance Vol. 4, No. 3, Bangkok, 1992.
- Armbruster, P.G., Kirsch, O.C., and Kochendoerfer-Lucius, G., “Self-help Institutions in Developing Countries: Cooperation Involving Autonomous Primary Groups,” Verlag Breitenbach Publishers, 1984.
- Arminger, G., Clogg, C.C., and Sobel, M.E., eds. Handbook of Statistical Modeling for the Social and Behavioral Sciences, Plenum Press, New York, 1995.
- Axelrod, “The Emergence of Cooperation Among Egoists” American Political Science Review 75:306-318, 1982.
- Barnard, W.A., Baird, C., Greenwalt, M., Karl, R. “Intragroup Cohesiveness and Reciprocal Social Influence in Male and Female Discussion Groups” The Journal of Social Psychology 132(2), 179-188, April 1992.
- Bedard, G., Klower, G.G., and Harder, M. “The Importance of Savings for Fighting Against Poverty by Self-Help” German Foundation for International Development, West Germany, 1987.
- Berenbach, S., and Guzman, D. “The Solidarity Group Experience Worldwide” The New World of Microenterprise Finance: Building Healthy Financial Institutions for the Poor Otero, M., and Rhyne, E. Eds., Kumarian Press
- Besley, T. “Savings, Credit and Insurance” Draft, Handbook of Development Economics Center for International Studies, Princeton University, New Jersey, 1992.
- Besley, T. and Coate, S. “Group Lending, Repayment Incentives and Social Collateral” Woodrow Wilson School of Public and International Affairs Princeton University, 1993.
- Bollen, K.A. Structural Equations with Latent Variables, John Wiley & Sons, New York, 1989.
- Bratton, M. “Financing Smallholder Production: A Comparison of Individual and Group Credit Schemes in Zimbabwe” Public Administration and Development (6), 1986.

- Braverman, A. And Guasch, J.L. “Administrative Failures in Government Credit Programs” The Economics of Rural Organization Theory, Practice, and Policy ed. Hoff, K., Braverman, A., and Stiglitz, J., The World Bank, Oxford University Press, New York, 1993.
- Burkett, P. “Group Lending Programs and Rural Finance in Developing Countries” Savings and Development, Vol. XIII, No. 4, FINAFRICA, Italy, 1988.
- Colliot, E. and Nguyen, T.D.P. “Le Credit Rural et l’Economie Villageoise a Banh (Burkina Faso)” Recherche Developpement, CIRAD-SAR, Montpellier, France, No. 34, 1993.
- Economist Intelligence Unit 1988-89 Country Profile: Niger, Burkina Economist Intelligence Unit, London, 1988.
- Egbeto K.I. and Bender, A.R. “Controverse”, Cahiers de l’Institut d’Etudes Sociales de Lyon, No. 8, Jan. 1990.
- Ellsasser, K. and Nguyen, G., “Réflexions sur la Construction d’un Système Bancaire Durable Autour d’un Modèle d’Equilibre Financier” Les Cahiers de la Reserche Développement Montpellier; CIRAD No. 35, 1993.
- Faye, J.(CIRAD) and Bonkongou, P.(CNCA) “Organisation et Gestion du Projet de Promotion du Petit Credit Rural” Caisse Nationale de Crédit Agricole, Rapport de mission, July 1993.
- Fry, M. “Models of Financially Repressed Developing Economies” World Development X, September, 1982.
- Gao, X. M. And Shonkwiler, J.S. “Characterizing Taste Change in a Model of U.S. Meat Demand: Correcting for Spurious Regression and Measurement Errors” Review of Agricultural Economics, Vol. 15, May 1993.
- Goldberg, M. And Hunte, P. “Financial Services for the Poor: Lessons on Group Based Models from Five South Asian NGO’s” presentation for Conference on Finance Against Poverty, University of Reading, England, March, 1995.
- Gonzalez-Vega, C. “Arguments for Interest Rate Reform” Rural Financial Markets in Developing Countries: Their Use and Abuse, The Johns Hopkins University Press, 1983.

- Graham, D., "Informal Rural Finance in Niger: Lessons for Building Formal Institutions" Informal Finance in Low Income Countries Westview Press, 1992.
- Graham, D., "Reflections on Savings-First and Credit-First Institutional Designs in the Sahel" prepared for USAID Niger, March 1994.
- Graham, D. and Von Pischke, J.D. "Factors and Strategies that Lead to a Sustainable Supply of Financial Services for the Rural Poor" IDB Workshop of Financial Services for the Rural Poor, Dec. 1994.
- Harnett, Donald L. and Murphy, James L. Statistical Analysis for Business and Economics Third Edition, Addison Wesley Publishing Company, 1986.
- Harper, A. "Community Micro-banks: the Management of Village On-Lending Groups in Northern Pakistan" Cranfield University, 1995.
- Hart, O., and Holmström, B. "The Theory of Contracts" Advances in Economic Theory ed. T. Besley, Cambridge University Press, Cambridge, 1987.
- Hoff, K. And Stiglitz, J. "A Theory of Rural Credit Markets with Costly Enforcement" draft, 1992.
- Holmström, B. "Moral Hazard and Observability" Bell Journal of Economics, No. 10, 1979.
- Holt, S. "The Village Bank Methodology: Performance and Prospects" The New World of Microenterprise Finance: Building Healthy Financial Institutions for the Poor ed. Otero, M., and Rhyne, E., Kumarian Press
- Holt, S. And Ribe, H. "Developing Financial Institutions for the Poor and Reducing Barriers to Access to Women" World Bank Discussion Paper 117, 1991.
- Hosmer, David W. Jr and Lemeshow, Stanley, Applied Logistic Regression John Wiley & Sons, Wiley Interscience Publication, New York.
- Hossain, M. Credit for Alleviation of Rural Poverty: the Grameen Bank in Bangladesh International Food Policy Research Institution, Research Report 65, Washington D.C., 1988.
- Hulme, D. "Replicating Finance Programmes in Malawi and Malaysia" Small Enterprise Development, Vol. 4, No. 4, Dec. 1993.

- Huppi, M. And Feder, G. “The Role of Groups and Credit Cooperatives in Rural Lending” World Bank Economic Review, 4, Sept. 1990.
- Johnston, J. Econometric Methods Third Edition, McGraw-Hill Book Company, New York, 1984.
- Judge, George G. et al. Introduction to the Theory and Practice of Econometrics Second edition, John Wiley & Sons, New York, 1988.
- Khandker, S., Khalily, B., and Khan, Z. “Is Grameen Bank Sustainable?” HRO Working Paper 23, World Bank, Washington D.C., 1994.
- Küsters, U. & Arminger, G. “Specification and Estimation of Covariance Structures” Handbook of Statistical Modeling for the Behavioral Sciences ed. Arminger, G., Clogg, C. and Sobel, M., Plenum, New York, 1992.
- Loehlin, J.C. Latent Variable Models: An Introduction to Factor, Path, and Structural Analysis Lawrence Erlbaum Ass., Publishers, Hillsdale, New Jersey, 1992.
- Montgomery, R. “Disciplining or Protecting the Poor? Avoiding the Social Costs of Peer Pressure in Solidarity Group Micro-credit Schemes” Working Paper for Conference on Finance Against Poverty, Reading University, March 1995.
- Munshi, M. “Informal Finance in Africa: A Survey of Group-Lending Schemes” Draft paper, U.K., Sept. 1992.
- Muthén, B. “A General Structural Model with Dichotomous, Ordered Categorical, and Continuous Latent Variable Indicators” Psychometrika 49, 1984.
- Muthén, B. “Latent Variable Structural Equation Modeling with Categorical Data” Journal of Econometrics, 22, North-Holland Publishing Co., 1983.
- Olson, M. The Rise and Decline of Nations Yale University Press, New Haven, 1982.
- Osner, K., Muser, A., and Schock, K., “Approaches to Overcoming Poverty Through Self-Help and Target-Group-Oriented Financial Instruments” Federal Ministry for Economic Cooperation, Boon, West Germany, June 1984.
- Otero, M. “A Question of Impact: Solidarity Group Programs and Their Approach to Evaluation” Private Agencies Acting Toether, (PACT) New York, Oct. 1987.
- Pindyck, Robert S. and Rubinfeld, Daniel L. Econometric Models and Economic Forecasts, Second Edition, International Student Edition, McGraw-Hill, 1981.

“Projet de Decret D’ Application de la Loi Portant Reglementation des Institutions Mutualistes ou Cooperatives d’Epargne et de Credit”, WOCCU, Niger, 12-30-93.

Ramalingam, C., “Studies on Self-Help Groups of the Rural Poor in India” 18th Executive Committee Session and 10th Foundation Anniversary of APRACA, Thailand, 1988.

Ryan, P. “Barriers to Introducing Effective Group Based Financial Services: The Case of Small Farmers in the Accelerated Mahaweli Development Programme, Sri Lanka” Development and Project Planning Centre, University of Bradford, England, March, 1995.

Savané, Marie Angélique “The Effects of Social and Economic Changes on the Role and Status of Women in Sub-Saharan Africa” Understanding Africa’s Rural Households and Farming Systems Westview Press, Boulder 1986.

Schaffernicht, M. “La durabilité d’un système financier rural vue come un problème d’interaction stratégique dans des situations non coopératives” Finance et développement rural en Afrique de l’Ouest Séminaire d’économie rural, Burkina Faso, October 1991.

Schepers, A. and Arminger, G. MECOSA (Mean and Covariance Structure Analysis) A Program System for the Analysis of General Mean and Covariance Structures with Metric and Non-Metric Dependent Variables: User Guide, Systeme für Logistik und Informationstechnik, Switzerland, 1992.

Schepers, A., Arminger, G., Küsters, U.L. “The Analysis of Non-Metric Endogenous Variables in Latent Variable Models: The MECOSA Approach” Econometric Decision Models: New Methods of Modeling and Applications ed. J. Gruber, Springer-Verlag, Berlin, 1989.

Schmidt, R. and Zeitinger, C.P. “Critical Issues in Small and Microbusiness Finance” IPC, International Donor Conference of Financial Sector Development, Sept. 1994.

Schreiner, M. “The Economics of Rotating Savings and Credit Associations: Incorporating Dynamic Participation and Default” unpublished, 1994.

Schrieder, G., and Cuevas, C. “Informal Financial Groups in Cameroon” Informal Finance in Low-Income Countries ed. Adams, D.W. and Fitchett, D.A., Westview Press, Boulder, CO., 1992.

- Shaver, K.G. The Attribution of Blame: Causality, Responsibility, and Blameworthiness Springer-Verlag, New York, 1985.
- Shipton, P. "Borrowing and Lending in The Gambia" African Finance, Institute for Contemporary Studies, San Francisco, 1993.
- Shipton, P. "The Rope and the Box: Group Savings in The Gambia" Informal Finance in Low-Income Countries ed. Adams, D.W. and Fitchett, D.A., Westview Press, Boulder, CO. 1992.
- Shultz, T.R., Schleifer, M., & Altman, I. "Judgments of Causation, Responsibility, and Punishment in the Assignment of Moral Responsibility" Canadian Journal of Behavioral Science, 17, 97-108, 1985.
- Slover, C.H., "The Club Theory Model for Self-Help Groups: A Zairian Experience" Ohio State University, unpublished, Dec. 1994.
- Stiglitz, J. "Peer Monitoring and Credit Markets" World Bank Economic Review, 4, Sept. 1990.
- Suits, Daniel B., "Dummy Variables: Mechanics V. Interpretation," Review of Economic Studies Vol. 66, 1984, 177-180.
- Tohtong, C. "Joint Liability Groups for Small-Farmer Credit: The BAAC Experience in Thailand" Rural Development in Practice Vol. 1, No. 1, August 1988.
- Udry, C. "On Collecting Data on Credit in Africa" Northwestern University, 1992.
- USAID, "The Burkina Vulnerability Assessment Methodology for 1993" FEWS/BF Occasional Paper Series: No. 13, May, 1993.
- Varian, H.R. Microeconomic Analysis W.W. Norton & Co., New York, 1992.
- Varian, H.R. "Monitoring Agents with Other Agents" Journal of Institutional and Theoretical Economics, 146, 1989.
- Viganò, L. "A Credit Scoring Model" Savings and Development, No. 4, XVII, 1993.

- Vogel, Robert C. "Savings Mobilization: The Forgotten Half of Rural Finance" Undermining Rural Development with Cheap Credit ed. Adams, D., Graham, D., and Von Pischke, J.D., Westview Press, Boulder, 1984.
- Von Pischke, J.D. "ROSCAs: State-of-the-Art Financial Intermediation" Informal Finance in Low-Income Countries ed. Adams, D.W. and Fitchett, D.A., Westview Press, Boulder, CO., 1992.
- Von Pischke, J.D. and Adams, D., "Fungibility and the Design and Evaluation of Agricultural Credit Projects" Rural Financial Markets in Developing Countries: Their Use and Abuse ed. Von Pischke, J.D., Adams, D., Gordon, D., The Johns Hopkins University Press, 1983.
- Von Pischke, J.D. Finance at the Frontier: Debt Capacity and the Role of Credit in the Private Economy EDI Development Studies, The World Bank, 1991.
- Weiner, B. "On Sin Versus Sickness: A Theory of Perceived Responsibility and Social Motivation" American Psychologist Vol. 48, No. 9, 957-965, Sept. 1993.
- Weiner, B., Graham, S., Chandler, C. "Pity, Anger, and Guilt: An Attributional Analysis" Personality and Social Psychology Bulletin Vol. 8, No. 2, 226-232, June 1982.
- Weiner, B., Perry, R., & Magnusson, J. "An Attributional Analysis of Reactions to Stigmas" Journal of Personality and Social Psychology 55, 738-748, 1988.
- Wispé, L. The Psychology of Sympathy Plenum Press, New York, 1991.
- Yunus, M. "Group-Based Savings and Credit for the Rural Poor" Inter-Country Workshop on Group Based Savings and Credit for the Rural Poor, Dhaka, Bangladesh, 1983.
- Zucker, G.S., & Weiner, B. "Conservatism and Perceptions of Poverty: An Attributional Analysis" Journal of Applied Social Psychology 23, 925-943, 1993.

APPENDIX A

OHIO STATE PERCEIVED RESPONSIBILITY SURVEY

4/14/95

SEX: _____

Answer the questions based on the following scenario:

You and four friends get a one year loan together. All of you are liable for its full repayment and will not receive future loans in case of default. Each of you has to repay his/her part of the loan once a week. Paying for yourself is financially feasible, but contributing to anyone else's repayment puts a strain on your budget. Suppose one of your friends can't pay for one of the following reasons:

- a.) He/she works on a farm and it has been a bad year
- b.) He/she has been laid off due to an unexpected recession
- c.) He/she hasn't worked very many hours
- d.) He/she is paying for a wedding
- e.) He/she is paying for a funeral
- f.) He/she has been sick
- g.) He/she has been traveling
- h.) You don't know of any particular reason why he/she is not repaying

1.) Rate (from 0 to 10) how personally responsible your friend is for his/her problem.

0=completely responsible

5=somewhat responsible

10=not responsible

a.) _____

e.) _____

b.) _____

f.) _____

c.) _____

g.) _____

d.) _____

h.) _____

2.) Rate (from 0 to 10) how you would feel about your friend not repaying in each of the scenarios described above. 0=very angry

3=a little bit irritated

5=neutral

8=understanding

10=very sympathetic

a.) _____

e.) _____

b.) _____

f.) _____

c.) _____

g.) _____

d.) _____

h.) _____

3.) How much pressure (from 0 to 10) would you exert on your friend so that he/she comes up with the money?

0= angry exchanges occur and the friendship isn't maintained

3= I verbally and nonverbally express my dissatisfaction regularly

5=he/she definitely knows I'm upset and the friendship is somewhat strained

7= he/she may suspect that I want repayment, but the friendship is maintained

10= no pressure

a.) _____

e.) _____

b.) _____

f.) _____

c.) _____

g.) _____

d.) _____

h.) _____

4.) If your friend doesn't pay, what is the maximum number of weeks (from 0 to 52) that you would contribute to his/her repayment? Assume the rest of the group follows your decision.

a.) _____

e.) _____

b.) _____

f.) _____

c.) _____

g.) _____

d.) _____

h.) _____

APPENDIX B

GROUP LENDING QUESTIONNAIRE

QUESTIONNAIRE FOR PPPCR CLIENTS

Name of interviewer:

Name of interpreter:

Date of interview:-

Name of client:

Is your husband currently living with your household?

Quartier:

Village:

PPPCR Village Agent:

Sources of informal credit

1.) Respond by yes or no:

a.) Do you receive credit from any other source than the PPPCR?
(family, husband, friends, usury, other projects)
If yes, what are the conditions of the loan?

b.) Are you a member of a tontine? If yes, what are the conditions?

c.) Have you ever received commercial credit?

History with the PPPCR

2.) Respond with 0,1,2,3,4, etc.:

a.) How many times have you had a loan from the PPPCR?

b.) How many times have the members changed in your credit group
since its first loan?

3.) How was your current group formed. Why did you choose these women and

not others?

4.) How and why did you choose the group leader. _____

5.) How many members of your group have been the same since the group's first loan?

- a.) All, because it's our first credit
- b.) All are the same since the first credit
- c.) Four different, one the same
- d.) Three different, two the same
- e.) Two different, three the same
- f.) I'm in a new group

6.) Does the group meet for any other reason than for loan servicing?

Group homogeneity

7.) Concerning the characteristics of your group...

*How many different families make up your group? (1,2,3,4,5)

Respond by yes, no, or don't know

- a.) The members belong to the same ethnic group
- b.) The members live in the same quartier
- c.) The members are roughly the same age
- d.) The members are the same sex
- e.) The members engage in the same types of occupations throughout the year
- f.) The members have participated in the same tontine
- g.) The members have roughly the same level of wealth
- h.) Their families have roughly the same number of members
- i.) The members all belong to another group in the village, town (occupational group, youth group, etc.)

Credit Repayment

- 8.) During the repayment cycle of this current loan, has any member of your group missed a week of repayment or had to borrow their portion of the repayment from someone else? (yes, no, or don't know)

If answer is 'no', go to question 10 and stop

If answer is 'don't know', go to questions 9 and 10 and stop

If answer is 'yes', go to questions 11-19

- 9.) *If the answer to question 8 was 'don't know', why don't you know (i.e. you have forgotten, you don't know the other members of your group, you don't know the other members' repayment schedules)* _____
-

- 10.) *If the answer to question 8 was 'don't know' or 'no', prior this last loan, how many times did your group encounter a problem with any of the members of your group? (0,1,2...times) Explain.* _____
-

Comment: Hypothetically speaking, do you think your group would cover for one of its members if she had difficulty in paying ?

stop

- 11.) *If the answer to question 8 was 'yes', how many people in your group have not been able to pay for themselves one or more times? (1,2,3,4 or 5)*

- 12.) In your opinion, why have these member(s) had difficulty in repaying?

- a.) bad harvest
- b.) lost one of the animals of the herd
- c.) large family expense (marriage, funeral, baptism, etc.)
- d.) no particular reason
- e.) don't know
- f.) sickness
- g.) out of town
- h.) other _____

- 13.) Who helped the member(s) who had difficulty in repaying?
- a.) no one, the PPPCR was not repaid
 - b.) family
 - c.) husband
 - d.) the group
 - e.) friends
 - f.) shopkeeper

Group solidarity

- 14.) Has the group ever paid for one of its members who had difficulty in repaying?
- a.) yes
 - b.) no, we simply paid our part and left one part of our group loan in arrears
 - c.) no, we all stopped paying
 - d.) other _____

- 15.) *If the answer to question 14 is 'yes',* How did the members cover for the member who couldn't pay?
- a.) common fund
 - b.) each member contributed
 - c.) the group leader paid
 - d.) one member paid

Group pressure

- 16.) *If the answer to question 14 is 'yes',* How does your group react if one of its members can't repay?
- a.) We pay for her and then exclude her from the group
 - b.) We pay for her and then force her to repay
 - c.) We pay for her but never get our money back
 - d.) We pay for her and she remains a member of our group
 - e.) We pay for her out of compassion and hope that some day she can repay us
 - f.) others _____

- 17.) Has your group ever turned to an authority (the PPPCR, the committee, the village agent) to resolve a repayment problem within the group?
- a.) yes, and the authority helped us
 - b.) yes, but the authority didn't do anything
 - c.) no
 - d.) don't know
- 18.) In general, what type of problems does a person with arrears face?
- a.) none
 - b.) She's excluded from the credit group
 - c.) She's forced to repay by the members of her group
 - d.) She loses her reputation at the village level (ashamed)
 - e.) other
- 19.) In general, what are the consequences for a group with arrears?
- a.) The members with arrears are replaced by other members
 - b.) The members with arrears are kicked out of the group, but not replaced
 - c.) The arrears are eventually repaid and the group continues to receive credit
 - d.) The group does not receive more credit
 - e.) other

Comments:

If the group has always repaid on time, Do they try to exert pressure on the other groups with arrears? How do they exert pressure? Are they mad at the groups in their sector with arrears?

If the groups has arrears, What happened? Do they receive any pressure from the other groups in the sector to repay? Has anyone ever said anything to them? Do they feel ashamed? Do they feel like the others are mad at them?