

Group Lending and Financial Intermediation: An Example

Edward S. Prescott

Imagine a small group of people, each of whom borrows money from a financial intermediary. The intermediary does not require collateral because the borrowers are relatively poor and do not own much property. Instead, the intermediary requires group members to be jointly liable for each other's loans. That is, if a member defaults on a loan, the rest of the group is liable for the remainder of the loan. If the group does not honor this joint obligation, then the entire group is cut off from future access to credit.

The lending arrangement I just described is not fictitious. Two million villagers, most of whom are female and poor, borrowed in this way from the Grameen Bank in Bangladesh. In Bolivia, 75,000 urban entrepreneurs, roughly one-third of the banking system clientele, borrowed money via group loans from BancoSol. Even in nineteenth-century Ireland, many rural residents took out loans similar to group loans.

Motivated in part by group lenders in less-developed countries, organizations in the United States have developed similar programs. The *1996 Directory of U.S. Microenterprise Programs* lists 51 organizations that issue group loans. The programs operate in both rural and urban areas. Often they are run by nonprofit organizations.

The underlying idea of group lending is to delegate monitoring and enforcement activities to borrowers themselves. Borrowers who know a lot about each other, such as those who live in close proximity or socialize in the same circles, are the most promising candidates for group lending. For example, the rural villages that Grameen lends in would seem ideally suited for group lending,

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because they are relatively self-contained communities, and people live close to each other and interact regularly. In such an environment, residents should be better than outsiders at assessing and monitoring the creditworthiness of fellow residents. They should also be better able to apply social pressure on potential defaulters.

The first goal of this paper is to analyze group lending, particularly as a potential method for lending to the poor in the United States. Studying alternatives to traditional lending is important because there is economic evidence that the poor in the United States have an unmet demand for finance. Zeldes (1989) finds that the poor are borrowing-constrained; that is, they would like to borrow more money at existing rates than they can. Evans and Jovanovic (1989), even after accounting for possible correlation between entrepreneurial ability and wealth, find that the lack of wealth affected the poor's ability to engage in self-employment activities. Bond and Townsend (1996), reporting on the results of a survey of financial activity in a low-income, primarily Mexican neighborhood in Chicago, find that bank loans are not an important source of finance for business start-ups. In their sample, only 11.5 percent of business owners financed their start-up with a bank loan. Furthermore, 50 percent of the respondents financed their start-up entirely out of their own funds.

Two services provided by financial intermediaries are delegated monitoring and asset transformation. Banks provide both of these services and, maybe surprisingly, groups do too. Group members monitor each other and through joint liability, transform the state-contingent returns of its members' loans into a security with a different state-contingent payoff. Consequently, groups can be interpreted as financial intermediaries, albeit small ones.

Interpreting groups as financial intermediaries is an important part of my second goal: to place group lending in the context of the rest of the financial intermediation sector. In this paper, groups have a comparative advantage at some types of financial intermediation. Understanding comparative advantage and specialization in financial intermediation to the poor is important because it can help answer questions such as: Which financial intermediary is best at what activity? How are different intermediaries financially linked? Do legal and regulatory restrictions, through their effect on the organization of financial intermediation sector, change the services they offer? These are the questions that underly the assessment of legislative acts aimed towards lending to the poor, like the Community Development Financial Institutions Act (CDFIA) and the Community Reinvestment Act (CRA).¹

¹ The two acts take different views on the importance of the structure of the financial intermediation sector for lending to the poor. The recently enacted CDFIA seems to take the view that alternatives to traditional financial institutions are needed to provide financial services to low-income communities. (See Townsend [1994] for a critical discussion of the act.) It funds institutions that specialize in providing financial services to low-income communities. In contrast,

Theoretical Framework

The theoretical framework I use is the delegated monitoring model developed in Diamond (1984, 1996). In his work, there are lots of small lenders and a smaller number of borrowers. Lenders lend to borrowers through a financial intermediary in order to economize on monitoring costs.

My model makes two additions to this framework; the major one is to allow some borrowers to monitor each other at a lower cost than outsiders. The heterogeneity in monitoring costs drives the coexistence of two types of financial intermediaries, large ones like banks and smaller ones like groups. Both types transform assets and provide monitoring services. In my model, just like in Diamond's model, lenders' funds flow through a large financial intermediary. But in my model, the large financial intermediary does not directly lend to all borrowers. Instead, for those borrowers who can monitor each other at a low cost, it lends to groups that in turn lend to their members.

I use Diamond's framework for three reasons. First, delegated monitoring is an important feature of group lending. Second, it allows for the embedding of groups into the financial intermediation sector. Finally, it demonstrates the similarities between groups and other financial intermediaries.

There is a small economic literature on group lending. This literature examines group versus individual lending but not in a model designed to study the existence of financial intermediaries. Stiglitz (1990) examines a problem where group members can assess whether other members are shirking. Varian (1990) examines the important screening role groups may provide, that is, their use of their prior knowledge about others to form groups. He also examines learning from fellow members as a potential advantage of groups. Besley and Coate (1995) examine the potential enforcement advantages groups may have. For example, social ostracism of defaulters is an option available to groups but not to outsiders. These penalties can reduce incentives to default but not in all cases. Sometimes, they increase the chance of default. While all of these features of group lending are important, I abstract from them.

In the following section, I provide background on group lending in practice, after which my model is developed and analyzed. Then I analyze the portability of group lending to the United States in the context of the model.

the CRA seems based on the premise that lending to low-income people is best done by existing financial institutions but that these institutions underserve low-income communities because of neglect, or even discrimination in the most egregious cases. The CRA works by requiring regulators to evaluate banks on criteria such as financial services provided to low-income communities. Banks that score poorly are subject to sanctions such as limits on merger activities.

1. GROUP LENDING IN PRACTICE

Microfinance is the provision of financial services to the poor. The prefix micro is used because the amounts involved in transactions are small. Often, microfinance is provided by nonprofit organizations; their targets are people who have not participated in the formal financial sector. The financial services that their clients *do* use tend to be supplied by relatives, or in some parts of the world, by moneylenders. Formal financial institutions have avoided this market because the loan sizes are small, administrative costs per dollar lent are high, and they perceive the risk of default to be significant. It is the absence of the formal sector from these markets that has led nonprofit organizations, often with the goal of poverty alleviation instead of profit maximization, to supply financial services. It is also the inappropriateness of traditional financial products that has led to the introduction of financial products such as group lending.

Group lending is not the only tool used to provide microfinance. Many microfinance organizations make loans only to individuals while others make loans to both individuals and groups. Others provide savings and insurance services. Much microfinance is provided informally, by rotating savings and credit associations, or between friends and family. While these issues are important, I do not discuss them because this paper is a study of the narrower question of what conditions favor group lending.

Group Lending in Less-Developed Countries

The most famous group lender is the Grameen Bank, which was founded in Bangladesh in the mid-1970s. This bank makes loans to groups of five unrelated individuals who are poor. Most groups consist of landless women from the same village. Loans are made sequentially with remaining members not receiving their loans until other members repay their loans. Loan size is increased after the group has successfully repaid earlier small loans.²

The bank has grown tremendously. In 1992, it lent to 2 million people at real interest rates of around 12 to 16 percent. Their repayment rate is high, around 97 to 98 percent. The bank even shows a profit, though it would not do so without the low-interest loans and grants it has received (Morduch 1997).

The Grameen Bank is far from the only institution to make group loans. Even in Bangladesh, there are at least two other organizations, Bangladesh Rural Advancement Committee (BRAC) and Thana Resource Development and Employment Programme (TRDEP), that make group loans (Montgomery,

² There are several other interesting features of the bank's organization. For example, collections of six groups are formed into Centres. All payments are made at Centre meetings in public view of other Centre members. Savings funds are also developed to provide for contingencies like death or disability. See Rashid and Townsend (1993) and Fuglesang and Chandler (1987) for more details.

Bhattacharya, and Hulme 1996). Like Grameen, BRAC is a sizable institution, lending to over 600,000 borrowers in 1992. Other countries with lending institutions that make group loans include Kenya (Mutua 1994), Malawi (Buckley 1996), Costa Rica (Wenner 1995), Columbia, and Peru, just to name a few.

One of the most successful group lenders is BancoSol, located in Bolivia. It is a chartered bank, subject to the supervision of SIB, the Bolivian bank regulatory agency. It makes uncollateralized loans for periods of 12 to 24 weeks. Repayments are made frequently, every week or two. Loans are made to what they call solidarity groups, each of which can have four to ten members. The group takes a loan from the bank and apportions it among its members. Like Grameen's groups, group members are jointly liable for each other's debts. Loans are usually made to provide working capital for small-scale commercial activities. Also like Grameen, the majority (77 percent) of clients are women. But unlike the Bangladesh bank, most of the borrowers are located in urban areas. Nonetheless, borrowers still have good information about each other because BancoSol requires all members of a solidarity group to work within a few blocks of each other. Most borrowers are market vendors, though half of the portfolio is lent to small-scale producers like shoemakers, bakers, and tailors (Glosser 1994). Lending is not the only financial service provided by BancoSol. It also offers deposit services in both boliviano and U.S. dollar-denominated accounts.³

BancoSol's growth has been extraordinary. In 1996, it lent to about 75,000 people, roughly one-third of the people who use the Bolivian banking sector. In 1996, BancoSol had a loan portfolio of \$47.5 million. It also earned \$1.1 million on revenues of \$13 million (Friedland 1997). Two important reasons for this success is that the bank charges real interest rates of 34 percent and has a default rate of less than 1 percent (Agafonoff 1994). The high interest rates are no doubt required to cover the high administrative costs required by its lending strategy. As a basis of comparison, 80 percent of BancoSol's costs are administrative, while the comparable number for the rest of the Bolivian banking industry is only 20 percent (Glosser 1994).

³ BancoSol is a chartered bank because Bolivian law requires deposit-taking institutions to be chartered banks subject to governmental supervision. BancoSol was created by PRODEM, a nonprofit organization that specialized in making loans. Its operations were financed mainly by grants, usually from foundations and USAID. The organization felt that grants were an insufficient source of capital, so it decided to create a regulated bank in order to have the legal right to collect deposits. Interestingly, the bank's nontraditional activities complicated the granting of the charter. For example, existing Bolivian banking law required that uncollateralized credit be less than twice paid-up capital. Unfortunately, for BancoSol, uncollateralized credit is all they supply! The bank negotiated a compromise in which loans under \$2,000 do not count towards this total. The costs of the conversion were not trivial. They exceeded \$500,000, according to one estimate (Glosser 1994).

Group Lending in the United States

Recently, several lenders have tried group lending in the United States. These lenders are nonprofit organizations whose main goal is to assist the poor—in particular, women and minorities—by financing self-employment. Since these efforts have started relatively recently, published information is still limited.

One source of information is a study by Edgcomb, Klein, and Clark (1996), who examine seven microenterprise programs. Of the seven, four make group loans.⁴ Each program provides services other than group lending. Several lend to individuals, others provide training, and some provide all three services.

All four programs followed Grameen's example but with modifications. Each agency started with groups of five members. However, the agencies found that if an individual dropped out of the group, the rest of the group would disband. Currently, three of the agencies allow more flexibility in group size. One program allows four to ten members, while another allows four to six businesses per group.

The scale of the agencies' operations are still small. For example, the number of loans made by the programs in 1994 ranged from 27 to 103, and average loan sizes ranged from about \$2,100 to \$4,900. Making these loans is expensive. The average cost per loan varied from \$4,500 to \$15,300, so these programs are far from self-sufficient. However, when compared with job training and other assistance programs, their costs seem more reasonable. I discuss possible reasons for the high costs after I describe the model.

Historical Group Lending

Group lending is often considered a recent innovation, and its recent popularity certainly is connected with the success of the Grameen Bank. There are, however, at least two types of institutions that existed long before the Grameen Bank and that used variants on group lending.

To the best of the author's knowledge the earliest institutions that used a form of group lending were the Irish Loan Funds (Hollis and Sweetman 1997a, b).⁵ The funds developed in the early 1700s, peaked in size in the early 1800s, and then slowly declined throughout the rest of the nineteenth century. Interestingly, Hollis and Sweetman trace their development to Jonathan Swift, the Anglican priest best known for writing *Gulliver's Travels*.

⁴ The four that made group loans were the Coalition for Women's Economic Development (CWED), based in Los Angeles; the Good Faith Fund (GFF), located in Pine Bluff, Arkansas; the Rural Economic Development Center (REDC), which lends throughout North Carolina; and the Women's Self-Employment Project (WSEP), based in Chicago.

⁵ All reported information about the Irish Loan Funds is taken from Hollis and Sweetman (1997a, b).

The Irish Loan Funds were usually located in rural areas, took deposits, and made small loans. The institutions generally made uncollateralized loans to finance a small investment project, such as the purchase of an animal. As a rule, the loans were repaid on a weekly basis. These loans most resembled present-day group loans in that all borrowers were required to obtain two cosigners for each loan, and both cosigners were liable for repayment.⁶ While each fund was independent, the funds were regulated by a Central Loan Fund Board.

Another historical example of European group lenders was that of the German credit cooperatives that developed in the late nineteenth century (Guinnane 1993; Banerjee, Besley, and Guinnane 1994). They were often located in rural areas where individuals knew each other well. These cooperatives provided credit services, and importantly, many had a policy of unlimited liability. That is, if the cooperative failed, any member could be sued for the entire amount owed by the cooperative. Interestingly, these credit cooperatives were the inspiration for the credit union movement in the United States.

2. THE MODEL

The model in this paper is designed to study the following three features of group lending and the financial intermediation sector:

- the existence of joint liability groups
- the existence of more traditional financial intermediaries
- large financial intermediaries lending to the groups

Analysis of these issues requires a model in which it is possible to lend funds either directly to an individual or indirectly through a financial intermediary. With two additions, the framework in Diamond (1984, 1996) provides an environment that satisfies these conditions.

Diamond considered an economy where there are borrowers and lenders, and funding each borrower's project requires the resources of several lenders. Borrowers' returns are unobserved by a lender unless he spends resources to monitor the borrower. Lenders face the choice of whether to lend directly to borrowers or to lend to them indirectly through the financial intermediary. In equilibrium, lenders lend to the financial intermediary and the intermediary in turn lends to the borrowers. The reason that lenders lend through the financial intermediary is that it avoids costly duplicative monitoring.

This paper operates in the same framework but with two additions, heterogeneous monitoring costs and screening costs. The important addition is the former. In particular, some borrowers are given the ability to form small groups,

⁶ The loans are much like the ones Swift made. Using his own money, he made small uncollateralized loans, required cosigners on loans, and required frequent repayments.

and in these groups they can monitor their fellow members. This ability is potentially valuable because group members monitor each other at a lower cost than a more traditional financial intermediary. People who live close to each other, those who work near each other, or those who socialize together would be most likely to satisfy these conditions. As in Diamond's model, it is optimal for lenders to lend to a traditional financial intermediary, but in this paper the financial intermediary lends to groups that in turn lend to their members. As we will see, the incentive problem underlying the contract between lenders and the large financial intermediary is the same as the incentive problem underlying the contract between the large financial intermediary and the groups. It is in this sense that groups and institutions, such as banks, are financial intermediaries for the same reason.

Environment

The model in this section is really a numerical example that closely follows Diamond (1996). In this economy, there are two main types of people, lenders and borrowers. Both types are risk-neutral, and consumption cannot go below zero. Each lender is endowed with $1/m$, $m > 1$, units of the investment good. The investment good cannot be consumed, but it can be used to create the consumption good. Lenders have access to a safe but low-return investment technology. Their investment technology takes x units of the investment good and turns it into $1.05x$ units of the good, receiving an interest rate of 5 percent.

The borrowers are better at producing the consumption good, but they start without any units of the investment good. Each borrower's investment technology requires an input of exactly 1.0 unit of the investment good. An investment of less than 1.0 produces an output of zero and any investment over 1.0 unit is wasted. The former assumption means that for each borrower it takes the funds of at least m lenders to finance his investment. Their investment technology is also riskier than that of lenders. In this example, an investment of 1.0 unit produces an output of 1.0 with a probability of 0.2 and an output of 1.4 with a probability of 0.8. Expected output for a borrower is $(0.2)1.0 + (0.8)1.4 = 1.32$, which is greater than 1.05, the return on the safe investment. However, 20 percent of the time output is less than what it would have been if the lender's investment technology had been used. Finally, I assume that each borrower's return is independent of other borrowers' returns.

In this model, the owners and the productive users of the investment good are different people. As the problem presently stands, the initial mismatch between owners and users is easily rectified through simple loan contracts. Lenders would lend to borrowers as long as their expected repayment was equal to 1.05. There is no role for intermediaries.

To introduce intermediaries requires the addition of complications to writing and enforcing contracts, complications that intermediaries are better able

to overcome than lenders. I now describe four features to the model that affect the feasibility and desirability of various contracts and ultimately lead to a role for financial intermediaries, both large ones like banks and smaller ones like groups. The four features are private information on borrowers' returns, liquidation costs, costly monitoring, and costly screening.

Private Information

It is assumed that borrowers' returns are private information. That is, a borrower is the only person who knows the success of his project; lenders do not observe it, nor do other borrowers. Private information makes some contracts infeasible. For example, consider a contract where lenders receive 1.0 if the low output is produced and 1.0625 if the high output is produced. If lenders knew that the contractual terms would be honored by the borrower, they would make the loan because their expected return is $0.2(1.0) + 0.8(1.0625) = 1.05$. Under private information, however, they cannot be sure that this contract would be honored. The reason is that lenders do not know the true value of the output so the borrower could always claim that he received a low output. That is, if the lender received the high output the borrower could claim he received the low output, pay 1.0 to the lender, and keep the difference. Lenders would be powerless to stop this deception; they cannot find out if he is telling the truth, and as things are presently specified, they cannot punish him. All they can do is refuse to lend, despite the acknowledged quality of his project.

Liquidation Costs

A contract with the option of liquidation is one way out of this dilemma. In this model, a liquidation cost serves as an ex post penalty imposed by the lender on the borrower. If the borrower does not meet the terms of his agreement, the lender can liquidate the borrower's assets. In this model, I interpret liquidating as meaning that the borrower and the lender receive zero. This means, among other things, that there are no assets that the lender can seize and sell. (In microfinance, projects are so small that one would gain very little from seizing and selling physical assets.)

The penalty imposed on the borrower by liquidation is important because it prevents him from always claiming he received the low output, as in the contract described above. For example, consider a debt contract with a face value F of 1.3125. If the borrower does not repay 1.3125, he has defaulted. When the output is 1.4, the borrower pays 1.3125. When the output is 1.0, the borrower cannot pay the full amount, so the lender liquidates, giving the borrower (and the lender) zero. The expected return to the lender is $(0.8)(1.3125) = 1.05$, so the loan is made and the borrower receives zero in the low-return state and 0.0875 in the high-return state. The threat of liquidation is enough to force repayment in the high-return state. The cost of liquidation is that output, which

is 0.2 in expected value terms, is destroyed. But in this example, the benefits of financing the loan outweigh the liquidation costs.⁷

Costly Monitoring

Costly monitoring is the other way to make lending feasible. In this paper there are two types of monitoring: costly monitoring by a lender and mutual monitoring within a group. Monitoring by a lender is identical to monitoring in Diamond's model; the lender pays an ex ante cost that allows him to observe a borrower's output. In essence, the lender uses resources to observe the private information. The resource costs could be as simple as spending time with the borrower or as complex as receiving regular reports on the project's financial status.

Observing output is valuable because then repayment can be made dependent on output, which avoids the need for liquidation. For example, consider the following contract: the lender monitors and the borrower pays 1.0 if the low output is realized, and 1.2 if the high output is realized. The expected return for the lender is $0.2 + 0.96 - K$, where K is the cost of monitoring. If the cost of monitoring is $K \leq 0.11$, then a lender's expected return (assume for the moment there is only one lender) is greater than 1.05, making monitoring worthwhile. Furthermore, this contract with monitoring is better for the borrower than the liquidation contract. (In both cases the borrower keeps zero in the low state, but under the monitoring contract, he keeps more in the high state.)

The second type of monitoring, mutual monitoring within a group, is the main departure from Diamond's model. I assume that within a subset of borrowers there are pairs of borrowers who know each other well, maybe because they live near each other or maybe because they are in the same social or ethnic circles.⁸ Each one of these pairs may form a group at a per-person cost of K_g . Membership in a group allows a group member to observe the other group member's output. Furthermore, because of the close social ties within a group, or maybe even because their time is less valuable than a loan officer's, I assume that the cost of being in a group is lower than the cost of anyone else monitoring them, that is, $K_g < K$.

At this point I should say more about what it means to be a group and how that affects the group's interaction with nongroup members. I am assuming that group members observe each other's outputs and act cooperatively or collude. In many models where people can collude, their interaction is complicated

⁷ There is no advantage from a contract that liquidates for the high output but not for the low output. Under such a contract, the borrower would always claim the low output, avoiding liquidation and keeping the difference between the high-output and the low-output payment. More generally, if the technology allows for more than two realizations of the output, even a continuum, then the optimal contract will still be a debt contract. The optimal contract will require a constant payment and liquidation if that payment is not made.

⁸ For simplicity, I assume that groups consist of only two people.

and even disadvantageous.⁹ In this model, there are no such disadvantageous effects. Furthermore, the analysis is simple because the borrowers are risk-neutral and thus utility is transferable. In this model, transferable utility eases the analysis because it means that the division of output between the group members does not affect the group's decisions. That is, regardless of how the group shares their returns, the group acts as if it is maximizing total expected output. In this paper, I assume that they share the returns equally. Besley and Coate (1995) examine a group-lending arrangement where there is an element of strategic play between group members, and they show that this can be a problem in some cases. I abstract from this consideration.

Screening Costs

The last element, and the remaining addition to Diamond's setup, is the addition of a screening cost. What I have in mind is a preliminary form of monitoring. A lender needs to meet with the borrower, discuss his project, and record and verify information about the borrower. In contrast with the previously discussed monitoring costs, screening costs do not reveal the final output. They only represent the effort that goes into ensuring that the project has a chance of success. To model these ideas, I assume that there is a fixed cost of K_s per lender to screen a borrower. I do not model what happens if the lender or lenders do not screen a borrower; I simply assume that they must screen a borrower before they make a loan.

I also assume that screening is only necessary for lending to borrowers. By borrowers I mean the second type of people, those who have access to the high return and risky technology, and not any entity that receives funds for investment. In particular, there is no need to screen a financial intermediary, though the financial intermediary still needs to screen any borrowers to whom it lends. This assumption is admittedly strong but not without merit. It seems reasonable to assume that it is harder to do a preliminary evaluation on small, idiosyncratic investment projects than on a large, well-known institution such as a bank. The only role of this assumption is to ensure that lending to groups is done by the financial intermediary and not directly by lenders.¹⁰

Where I am going . . .

In this economy there are lenders who have funds and borrowers who do not. The productivity of borrowers' investment projects creates a demand for

⁹ See, for example, Holmström and Milgrom (1990), Itoh (1993), Ramakrishnan and Thakor (1991), or Prescott and Townsend (1996).

¹⁰ There are other ways to ensure that lending to groups goes through the large financial intermediary, though they add additional issues that complicate the analysis. For example, making lenders risk-averse would be sufficient, since then each lender would want to lend directly to more than one group. Consequently, each lender would screen several groups, raising screening costs.

finance. Private information, however, precludes lending unless there is monitoring or the penalty of liquidation. Before describing how these elements create a demand for financial intermediation, it is helpful to show what the lending flows will be and where each type of financial intermediary fits into the flow pattern.

Figure 1 describes the direction of lending flows in the model. Arrows indicate the direction of lending and an M indicates whether or not there is monitoring. The lenders, who start with the investment good, make unmonitored loans to the large financial intermediary.¹¹ This financial intermediary makes two types of loans, monitored loans to individuals and unmonitored loans to groups. Groups, the smaller financial intermediary, in turn make monitored loans to its members.

My strategy for analyzing the model is to split the analysis into two sections. In the first section, I take as given that there is one large financial intermediary and analyze its decision of whether to make a loan to an individual or to a group. To do this analysis, I consider each type of loan the financial intermediary may make to the borrowers and enumerate the trade-offs of lending to a group versus lending to individuals and also whether or not it is beneficial to monitor the loans. Next, I consider the lending decisions for lenders and show that it is indeed optimal for them to lend to borrowers through the financial intermediary rather than to lend to them directly.

Lending by the Financial Intermediary

The large financial intermediary has three options for lending funds:

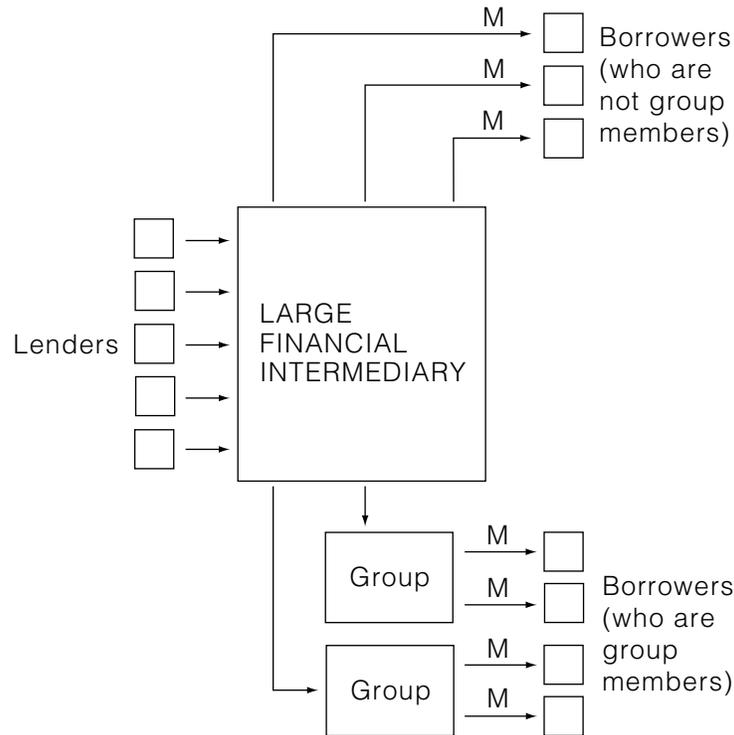
- It can lend to borrowers, not monitor them, and use the threat of liquidation;
- It can lend to borrowers and monitor them; or
- It can lend to borrowers through groups.

For this last case, we need only concern ourselves with unmonitored loans to the groups, since if the bank monitored them, it might as well bypass the groups altogether.

Recall that for each borrower who invests 1.0 unit of capital, he produces the low output of 1.0 with a probability of 0.2 and the high output of 1.4 with a probability of 0.8. Also, borrowers need 1.0 unit of the good to invest and for reasons explained later, the large intermediary requires an expected return of 1.05.

The expected returns to a project can be broken into five components: the expected payment to the financial intermediary R , the expected utility (return)

¹¹ There can be more than one large financial intermediary as long as each one has a sufficiently large portfolio. For our purposes, it is simplest to assume there is only one.

Figure 1 Lending Flows in the Model

Notes: M indicates that the loan is monitored. Arrows indicate direction of lending flows.

of the borrower U , the liquidation costs L , the monitoring costs M , and the screening costs S . These will sum to 1.32, the project's expected output. In the following sections, when each contract is analyzed, I will list the values of the five components for each contract. Also, I assume that the financial intermediary receives 1.05, the opportunity cost of the lenders' funds. Thus, any excess accrues to the borrower. Under this (unimportant) assumption, maximizing social welfare is equivalent to maximizing the utility to the borrower.

Individual Lending with Liquidation but No Monitoring

The enforcement device used for this contract is liquidation. Since there is no monitoring, a state-contingent contract without liquidation cannot be offered. Instead, a debt contract with a face value of F is written. Under this contract the borrower must pay F , or his project is liquidated. To make the problem interesting I assume that the parameters are such that $1.0 < F < 1.4$. This means that if the borrower receives the high return he pays F , but if he receives

the lower return, his project is liquidated, and both he and the intermediary receive zero. An F guaranteeing that the intermediary receives 1.05 in expected return is the solution to the following equation:

$$1.05 = (0.2)0 + (0.8)F - K_s.$$

The intermediary receives a zero payment 20 percent of the time, it receives a payment of F 80 percent of the time, and this return has to be high enough to cover the screening costs K_s and the opportunity cost of the funds 1.05. The solution to the equation is $F = 1.3125 + K_s/(0.8)$. The borrower's expected utility is $U = (0.2)0 + (0.8)(1.4 - F)$. Calculations for utility and the other variables of interest are as follows:

$$U = 0.07 - K_s,$$

$$R = 1.05,$$

$$L = 0.20,$$

$$M = 0, \text{ and}$$

$$S = K_s.$$

Notice that these values sum to 1.32, the project's expected return.

Individual Lending with Monitoring

There is no need to liquidate when monitoring because output is observed by the financial intermediary. For simplicity, I assume that 1.0 is paid out if the low return occurs, and F is paid out if the high return occurs. A face value of debt F that gives the intermediary a return of 1.05 is the solution to the following equation:

$$1.05 = (0.2)(1.0) + (0.8)F - K - K_s.$$

Compared with the previous contract, the intermediary now receives 1.0 if the low output is observed but must also bear the monitoring cost K . The solution to this equation is $F = 1.0625 + (K + K_s)/(0.8)$. The borrower's expected utility is again $U = (0.2)0 + (0.8)(1.4 - F)$. Carrying out the calculations for the variables produces the following numbers:

$$U = 0.27 - K - K_s,$$

$$R = 1.05,$$

$$L = 0,$$

$$M = K, \text{ and}$$

$$S = K_s.$$

Comparing the utilities from a loan with monitoring and a loan using liquidation shows that the former is preferred when $0.27 - K - K_s > 0.07 - K_s$, or equivalently, $K < 0.20$.

Group Lending

The group-lending contract includes elements of monitoring and liquidation. The group members monitor each other, but since the large financial intermediary does not know the results of their monitoring, it needs to include a liquidation provision in the contract. As I mentioned earlier, the two members of a group pool their resources so the group's distribution of returns is

return	probability
2.0	0.04
2.4	0.32
2.8	0.64

The assumptions made concerning group membership are that group members observe each other's output and act cooperatively. In this context, acting cooperatively means they maximize the expected value of the group's return. Thus, the contract needs to be written in terms of the total returns to the group, since the group can always move funds around to pay off a debt. Therefore, the optimal contract will again be a debt contract, with liquidation if the face value of the debt is not repaid. To facilitate comparison with the other contracts, we put the face value of the debt in per-group-member terms, that is, the face value of the group's debt is $2F$.

For the intermediary to receive an expected payment of 2.10 (1.05 per group member), F needs to solve the following equation:

$$2.10 = (0.04)0 + (0.32)(2F) + (0.64)(2F) - 2K_s.$$

I assume that the large intermediary rather than the group bears the screening cost. This assumption is not important.

At this point, it is necessary to make one more assumption. I assume that 2.4 units of output is enough to pay off the face value of the group's debt, $2F$. The value of $2F$ will depend on the other parameters, so I am assuming their values are such that this condition holds. Under these assumptions, the solution to the equation is $F = 1.09375 + K_s/(0.96)$. Each borrower's utility, assuming equal division of returns, is calculated from $U = (0.04)0 + (0.32)(2.4 - 2F - 2K_g)/2 + (0.64)(2.8 - 2F - 2K_g)/2$. I include the monitoring cost in this equation because the group pays it themselves. The values of the variables in per-group-member terms are

$$U = 0.23 - (0.96)K_g - K_s,$$

$$R = 1.05,$$

$$L = 0.04,$$

$$M = (0.96)K_g, \text{ and}$$

$$S = K_s.$$

Special attention should be paid to the liquidation cost, L . Under group lending, $L = 0.04$, which is dramatically lower than the case where the intermediary lends but does not monitor. (Recall that the liquidation cost in that case was 0.20.) The reason for the dramatic reduction is that the distribution of the group's output is different from the distribution of the individual's output. In particular, the group's distribution has less variance. The decreased dispersion of group returns reduces the incentive problem caused by the private information. In turn, a weakened incentive problem means that liquidation is invoked less often than a liquidation contract between the intermediary and an individual.

The argument is easier to understand if we compare two borrowers borrowing F each as a group with the same borrowers borrowing F each as individuals under the unmonitored liquidation contract. Also, assume that $1.0 < F < 1.2$. When the funds are lent to the individuals, each borrower's project is liquidated 20 percent of the time. This means that 4 percent of the time both are liquidated, 32 percent of the time one is liquidated, and 64 percent of the time neither is liquidated. Now compare these liquidation probabilities with those of the group. Under the group contract, 4 percent of the time both are liquidated, but 96 percent of the time neither is liquidated. The reason is that if one borrower gets a bad return and the other gets a good return, then the latter bails out the former. The transfers between the group members, in effect, alter their distribution of returns. This change reduces the probability of liquidation, which is beneficial.

One more way to view this problem, and an argument I will return to when discussing the large intermediary, is to consider a group consisting of a very large number of borrowers. (More formally, assume there is a continuum of them.) Because there are so many group members, the law of large numbers means that the group's total return is $1.32 - K_g$ with probability 1.0. All idiosyncratic risk averages out. In this case, there is never a need to liquidate since any claim that total output was less than $1.32 - K_g$ would not be credible.

To reiterate, groups greatly reduce the probability of being liquidated. Still, they have to pay a monitoring cost, and the relative size of these two costs (along with the intermediary's monitoring cost) determine whether group lending is better than the other types of lending. In this example, group monitoring is better than individual lending with monitoring if $0.23 - (0.96)K_g - K_s > 0.27 - K - K_s$; that is, the utility accruing to a borrower from group monitoring is greater than the utility accruing to a borrower from an individual lending with monitoring contract. Rearranging terms, the condition is

$$(0.96)K_g + 0.04 < K. \quad (1)$$

Equation (1) says that group monitoring is better if the sum of the group monitoring cost K_g and the liquidation cost of 0.04 is less than the intermediaries

monitoring cost K . This is not strictly true because K_g is multiplied by 0.96. That number, however, is only in the equation because groups bear the cost of monitoring; if their projects are liquidated, they receive zero and do not have to bear the monitoring cost.

I can now provide conditions under which the large financial intermediary will lend according to the pattern described by Figure 1. First, I assume that monitoring by the intermediary satisfies $K < 0.20$ (so individual lending with monitoring is better than individual lending without monitoring). Second, I assume that for some pairs of borrowers K_g is small enough to satisfy equation (1) and for other pairs of borrowers it is not. The former borrowers could be those who live near each other like Grameen's clients or work near each other like BancoSol's clients. For parameter values satisfying these conditions, borrowers who cannot form a group borrow as individuals with a monitored loan, while other borrowers who can form a group do so and borrow from the intermediary as a group, using the liquidation contract.

Lending to the Large Financial Intermediary

Now return to the lenders' lending decision. In equilibrium, as indicated by Figure 1, lenders lend to the large financial intermediary rather than directly to individuals or groups. Most of the pieces are already in place to demonstrate why this is the case. Lenders can either transform the asset themselves by using the low return but riskless technology, or they can choose one of the following four lending options:

- Lend directly to borrowers and use a liquidation contract;
- Lend directly to borrowers and monitor them;
- Lend directly to the group and use a liquidation contract; or
- Lend to the large financial intermediary.

The last option, lending to the large financial intermediary, is the optimal arrangement. I will demonstrate this by first showing that the costs to lenders of lending directly is greater than the same costs faced by the large financial intermediary making the same loans. Then, I will show that the lenders can lend to the large financial intermediary at no cost. This will mean that lending through the large financial intermediary is better than direct lending. Finally, if the large intermediary receives a return of 1.05, as was assumed in the previous analysis, and the intermediary adds no costs to lending, then it is optimal for lenders to lend to the large intermediary.¹²

The first three cases listed above are the direct-lending options available to lenders. Each one of these options corresponds to one of the cases worked

¹² Technically, lenders are indifferent between this option and using the safe investment technology. Among these two choices, I assume that the lenders choose the socially optimal one, which is to lend to the large financial intermediary.

through earlier in the section. The difference is that now monitoring and screening costs have to be borne by $m > 1$ lenders rather than just the large financial intermediary. The algebra is easy enough to work through but it is simpler to use the following observations. The incentives faced by a borrower do not depend on whether his funds are obtained from lenders or via the large financial intermediary. Consequently, the problem is unchanged from the earlier analysis except that screening costs (in all three cases) and monitoring costs (in the second case) are $m > 1$ times as much under direct lending. Therefore, it is cheaper for lenders to lend through the large financial intermediary rather than directly.

However, there still remains the issue of whether or not lenders need to monitor and screen the financial intermediary. If they do not, they can lend to the intermediary, which in turn lends to borrowers (either directly or indirectly through groups). This flow of funds will economize on monitoring and screening costs relative to direct lending.

By assumption, there is no need to screen the intermediary. However, some work is needed to demonstrate that lenders do not need to monitor the large financial intermediary. How do lenders know that the intermediary actually monitors the borrowers? How do they know the return of the intermediary? (At this point, it is helpful to think of the large intermediary as a person, possibly a lender, who if he did not monitor would save himself monitoring costs.)

In the previous section's analysis of lending to the group, the increased size of the group made the liquidation contract more effective. The larger the group, the more effective a liquidation contract was. If the group consisted of a continuum of members, then there was no need to monitor because the group's return is certain.

The same logic applies to the problem facing the lenders lending to the intermediary. If the intermediary lends to a continuum of borrowers, then the intermediary's return is certain. Thus, the optimal contract between lenders and the large financial intermediary is an unmonitored debt contract of face value $F = 1.05$. As part of the debt contract, the lenders liquidate the intermediary's assets if it claims its return is less than 1.05. But in equilibrium, the intermediary's portfolio is so diversified that its assets are never liquidated. Thus, there is no liquidation cost to lending through the financial intermediary, and there is no need to monitor it. The entire return of 1.05 that the intermediary receives from borrowers can be passed to the lenders. Lending through the large financial intermediary is better than direct lending.

To summarize, the large financial intermediary economizes on monitoring and screening costs while the groups economize only on monitoring costs. Relative to direct lending, both types of intermediaries economize on monitoring costs in the same way. Lending through the intermediaries avoids the duplicative monitoring of borrowers by lenders while the intermediary's diversification

reduces the need for lenders to monitor it. Thus, total monitoring is lowered in the economy. The reduction of these costs is the financial intermediary's special role in transforming assets.

There is, however, one way in which the two types of intermediaries differ in how they economize on monitoring costs. Compared with monitoring by the large financial intermediary, the groups save on monitoring costs because they have a cost advantage. It is efficient for the large financial intermediary to lend through groups if this cost saving outweighs the liquidation cost from using the group. The remaining observation—that lenders lend to groups through the large financial intermediary—occurs to economize on screening costs.¹³

3. ANALYSIS

Ideally, the model would be used in the following way. We would start with measurements of parameters in the model, such as distribution of returns, costs of monitoring, etc. These measurements would come from economies, like villages in Bangladesh or urban areas in Bolivia, where group lending is successfully used. Using these measurements we would evaluate the model on the criterion of whether or not it predicts there will be groups. If it does predict groups, the experiment proceeds by solving the model using parameter values taken from low-income U.S. communities. Then, the model could be used to evaluate the potential of group lending in the United States.

Precise measurement of many of these values is beyond the scope of this paper. Indeed, measurement of a concept like monitoring is a research project in and of itself. Consequently, the following discussion is necessarily sketchy, guided by what little information is available. Still, it is valuable, and one can gain some broad ideas about the role group lending and financial structure may play in channeling credit to the poor. The discussion should be considered a starting point, particularly for researchers and practitioners who are looking for guidance as to what variables to measure.

Business Opportunities

The model analyzes the problem of financing investment projects. It takes as given that potentially profitable investment projects exist. The financing

¹³ One difference from the Diamond (1984, 1996) setup is worth mentioning. In his paper, financial intermediaries exist only to economize on monitoring costs. In this paper, the large financial intermediary economizes on monitoring costs, but it also economizes on screening costs. The latter costs, in fact, are sufficient in this model for the large intermediary to exist. In this paper, monitoring costs serve the role of obtaining a nontrivial trade-off between individual and group lending. They are necessary to generate the existence of the small financial intermediaries, that is, the groups.

problem, however, is irrelevant if there are no profitable microenterprise projects to finance.

The evidence presented in the introduction suggests that there are profitable investment projects in the United States that would be financed in the absence of information constraints. There are, however, reasons to think that there may be less of these opportunities in the United States than in Bangladesh or Bolivia. For example, in less-developed countries 60 to 80 percent of the labor force is engaged in self-employment (Edgcomb, Klein, and Clark 1996), while in the United States only about 12 percent of the labor force is self-employed (Segal 1995). Ultimately, of course, the existence of profitable self-employment opportunities must be determined by empirical investigation.

A related issue, applicable to most microfinance programs, is what type of investments can be financed with group lending or any other microfinance program. For example, one key feature of the studied lending programs is the required frequency of repayments. Frequent repayment requires that an investment produce cash flow for the entire course of the loan. If it does not, then the borrower will default. This time path would seem to preclude loans for investments that pay off sometime in the future. For example, a planting loan to a farmer is poorly suited for frequent repayment because planting does not generate income until harvest.

A cursory examination of the type of loans made by Grameen, BancoSol, or the Irish Loan Funds bears out this observation. Despite their rural location, planting loans are not made by Grameen nor were they frequently made by the Irish Loan Funds. Many loans tend to be for investments that produce a flow of income. The purchases of a cow that produces milk or a chicken that lays eggs are examples of such an investment. BancoSol's loans, while in a different context, serve a similar purpose. They tend to be made for working capital.

Conceivably, there are many valuable investments that do not produce the steady cash flow demanded by group and other microfinance lending schemes. The important question here is why are the loans made with these terms? Are frequent repayments an important part of monitoring? The answers to these questions are important not just to the evaluation of group lending in the United States but also for the evaluation of lending in less-developed countries.

Source of Funding and Comparative Advantage in Lending

The source of funding is important because it can limit the activities of a financial intermediary, and it can influence the optimal structure of the financial intermediation structure. In the model, there were many lenders per borrower. This ratio was responsible for the existence of the large financial intermediary since the number of lenders needed to finance a borrower determines the costs of direct lending, and consequently the savings in monitoring and screening

costs from intermediation. For microfinance programs it is reasonable to ask if there are lots of lenders per borrower. First, the loans are for small amounts, and second, many lenders are donors with large amounts to lend.

BancoSol receives some of its funding from deposits. Agafonoff (1994) reports that in 1994 BancoSol's average loan was \$499 and its average deposit was \$225. (The majority of the bank's loans and deposits are denominated in U.S. dollars rather than Bolivian bolivianos.) These numbers are consistent with the model's assumption.

Still, many investors are large organizations whose investments are much higher than the amount any single individual borrows. In terms of the model some modifications would need to be made to ensure that donors lend through an intermediary rather than directly. The simplest, and most obvious, would be to assume that donors do not have the expertise to lend themselves. Consequently, K and K_s are much higher if they lend themselves rather than through an intermediary. Another possibility is that donors, particularly those overseas, find it expensive to monitor because of physical, linguistic, and even cultural distance from the borrowers. (See Boyd and Smith [1992] for a model in which people at different locations have a comparative advantage in lending in their home location.)

A comparison of the United States and Bolivia suggests that a group lender may desire different sources of funds in the two countries. In Bolivia, BancoSol raises some of its funds from deposits, but it is a country where a large fraction of the population does not use the banking sector. The banking sector, and more generally the financial structure, is much more extensive in the United States. Consequently, raising deposits might not be a group lender's comparative advantage. Instead, debt or equity might be a better source of capital for a group lender in the United States.

In the United States, group lenders' comparative advantage should be in lending rather than in collecting deposits. Lending to the poor likely requires a different set of skills than other types of lending. BancoSol's high administrative costs relative to the rest of the Bolivian banking sector is supportive of the latter conjecture.¹⁴

Indeed, it is not difficult to imagine a highly specialized financial system where traditional financial intermediaries collect deposits and then direct funds to specialists in microfinance, who in turn lend to groups (or individuals). There is no reason to think that traditional financial intermediaries are the best institutional vehicles for delivering credit to the poor.

¹⁴ In the model, groups save on monitoring costs, yet in the data, group lenders spend a lot of resources on monitoring. This is not a contradiction. The issue is how much more resources would have to be used to monitor in the absence of groups. That is what the model captures.

Costs to the Large Intermediary

In the model, for some parameter values the large intermediary saved costs relative to direct lending. In practice, monitoring and screening costs may be so high as to make any form of financing unprofitable. The problem is particularly acute for microfinance because loans are for small amounts, and they require frequent repayments. In the context of the model's parameters, K and K_s might be much higher in the United States than in less-developed countries.

The data bears out the importance of these costs. Eighty percent of BancoSol's costs are administrative while the cost figures for the U.S. agencies exceed the face value of the loans. BancoSol has surmounted these problems through a combination of a low default rate and a high interest rate (about 34 percent per year). In 1994, their average cost per dollar lent was 0.16; their borrower-to-loan-officer ratio was about 320.

Any microfinance program in the United States that desires to even approach self-sufficiency will need a similar strategy and results. None of the four agencies have reached BancoSol's scale. No agency made more than 107 loans in 1994. Their loan-loss ratios vary from about 2 to 17 percent, and their costs per dollar lent uniformly exceed one. These programs are far from self-sufficient. Of course, these programs are relatively new and any activity takes time to learn, not to mention the time needed to obtain economies of scale. It would be interesting to compare these agencies' default rates with those of Grameen or BancoSol in their early years of operation.¹⁵

Still, self-sufficiency may be too strong an evaluative criterion. Many services and transfers are distributed through the social welfare system and these programs are the right basis for comparison. Under this interpretation, microfinance is unusual in that it directs aid to specific people in the population; those who are willing to start businesses. Furthermore, unlike most social welfare programs, the recipients face the explicit incentive to perform or lose their aid. Under this criterion, group lending may very well be an effective method for targeting aid to the poor, particularly since these agencies' costs are comparable with those of job-training programs.

Monitoring within Groups

One of the most critical issues concerning group lending is how high is K_g , the cost of group monitoring?¹⁶ There are reasons to think that K_g is higher in

¹⁵ A potential problem for any program with the goal of self-sufficiency is that the interest rates necessary to cover costs may be illegal, violating usury laws in many states of the union.

¹⁶ In the model, monitoring was an either-or proposition. The only options available were to pay the monitoring costs and observe fellow members' output or to not pay the cost and not see the output. In practice, there are degrees of monitoring. Still, for the purposes of our discussion, K_g provides a useful way to summarize these degrees.

the United States than in developing countries. There is more anonymity, the costs of being excluded from a group are smaller in a rich country, and people do not necessarily work in such close quarters.

Edgcomb, Klein, and Clark (1996) provide some indirect evidence in support of this view. They conclude that the group-lending programs have had the most trouble in rural areas. The programs found that rural residents do not tend to know each other well enough to be able to support groups, in part because of the low density of the population and in part because of the low number of self-employed people in rural areas. One agency has even resorted to purchasing credit reports on fellow members for potential groups.

Another complication is that self-employment opportunities are more diverse in the United States than in less-developed countries (Edgcomb, Klein, and Clark 1996).¹⁷ Group members engaged in similar activities can learn from each other and can evaluate the borrowing proposals of fellow group members. It probably also makes monitoring easier. This is another reason K_g may be higher in the United States. Some of the resources used on training by the U.S. programs may be designed to compensate for this.

4. CONCLUSION

Lending groups are financial intermediaries, albeit small ones. The model shows how groups, as well as larger financial intermediaries, economize on monitoring costs and transform assets. Through diversification, financial intermediaries alleviate incentive problems and reduce the costs of monitoring and screening.

Throughout the paper, I provide extensive description of existing group-lending programs to demonstrate that group lending is a type of intermediation that is viable in at least several environments, including some of older origin than many probably realized. Whether it is viable in the United States is an open question, though the conditions here appear to be less favorable for it than in less-developed countries. Still, while the narrow focus of this paper is on the relative merits of group lending, the broader goal is to study financial structure. Understanding financial structure is a necessary prerequisite to the proper formulation of policy involving financial intermediation and low-income communities.

¹⁷ However, different activities may have less-correlated returns. In my model, group lending is more valuable when returns are less correlated.

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