CHAPTER 7

Savings, Credit, and Microfinance

Acquaintance (def.): A person whom you know well enough to borrow from, but not well enough to lend to.

– Ambrose Bierce

IN THE 1960s, Walter Mischel at Stanford University carried out an experiment to test the effects of delayed gratification in children. The subjects of his study were a random sample of 4-year-old children. The children were led into a plain room, one-by-one, where Mischel presented each with a marshmallow on a plate. Children were told that they were free to eat the marshmallow, but any child who waited to eat the marshmallow until Mischel returned from an errand, would receive *two* marshmallows.

Some of the children immediately crammed the marshmallow into their mouth with Augustus Gloop–like voracity as soon as the researcher left the room. Others were able to wait for a few moments, but then succumbed to the overpowering temptation of the marshmallow. Another group of children engaged in a variety of self-distraction exercises: covering their eyes so they could not see the marshmallow, walking over to sit in a corner, singing, and playing clapping games with themselves. When Mischel returned, he rewarded these children with their second marshmallow. Then he waited for the children to grow up.

What he found fourteen years later was astonishing. The children who had waited for the second marshmallow scored an average of 210 points higher on the SAT than those who couldn't wait. The two-marshmallow children grew up to be better adjusted, more able to get along with peers, and, by most measures, more successful young adults. In contrast, the grown-up one-marshmallow children were more likely to be stressed, disorganized, and generally less successful, not only in school but in other activities and relationships.

A good part of economic development is about not eating the marshmallow. Economic development is the product of countless decisions to restrain consumption in the present in favor of activities that yield returns in the future. The unprecedented levels of per capita capital and technology realized in industrialized nations such as the United States, Europe, and Japan didn't come about by accident but from generations of saving and investment. Wealthy economies such as these have a high level of capital and technology per person. This makes labor in these economies

scarce relative to capital and technology, creating high wages and high material standards of living.

Savings and investment, and the institutions that channel savings into investment, are critical to capital formation in a developing economy. A strong financial system redirects capital from those who wish to save to those with productive investments, returning part of the profit from these investments to savers in the form of an interest rate. Banks and other financial intermediaries play key roles in this process, and the difference in the interest rates for saving and borrowing, less administrative expenses, becomes their profit.

Banks and Saving

Astonishingly, formal borrowing and lending have existed for nearly four millennia. Archaeologists have found stone tablets of primitive loan contracts written during the peak of the Babylonian Empire around 1800 B.C. Banking became more developed in ancient Greece around 200–300 B.C., when credit and even deposit-taking emerged as a mainstream facet of Greek entrepreneurial culture. After the Roman conquest of Greece, the Romans copied much of Greek society and culture, not overlooking Greek innovations in banking. By 100–150 B.C., the Romans had incorporated many facets of Greek banking practices into their own patterns of business and trade.[1]

Peter Temin of MIT (2006) has documented how commonplace and relatively sophisticated lending and borrowing had become in Roman society by the early first century, where loans commonly financed consumption, production, and even international trade. He even cites a document written by a well-known figure of that time, Columella, who advised Roman viticulturists to view the opportunity cost of investment in a vineyard in terms of the foregone interest benefits from a perpetual annuity – an observation that if made today by a student of finance would make any professor proud. But as the Roman Empire and its economy began to slowly implode, the demand for banking likewise declined. This decline in banking was hastened during the early middle ages as the church began to exert greater influence over economic life at a time when usury was widely viewed as a sin.

Modern banking appears to have evolved from the trade of gold and silver smiths in the late middle ages in larger European cities, particularly London. The smiths discovered that they could earn additional income by storing precious coins for wealthy citizens in their safeboxes in exchange for a fee. Several subsequent innovations to this arrangement led to the development of banking as we know it today.[2] First, nearly everyone began to realize that it was easier to carry around a deposit receipt from the local smith than wear out his pockets with a collection of heavy and unwieldy coins. These "notes" of deposit came to be accepted widely and exchanged along with coins and thus paper money was born.

[1] For excellent references on early money and banking systems, see Davies (1994) and Millett (1991).
[2] Kidwell, Peterson, and Blackwell (1993).

Around the time of the Renaissance, usury became less frowned upon and the smiths began to lend some of their deposits to borrowers at interest. Moreover, some particularly shrewd smiths discovered that they could amplify their earnings by printing notes from scratch that represented claims on their coinage, floating them to their borrowers as interest-bearing instruments, while holding only a fraction of these debts in reserves as real coinage. In this way, modern reserve banking emerged, a new innovation which brought tremendous benefits – provided, of course, that depositors didn't demand their money all at once.

The problem occurred, however, when depositors *did* wish to withdraw their money all at once. Reserve banking created the possibility of bank runs, panics when many depositors wish to withdraw funds simultaneously, but the bank holds insufficient reserves to meet everyone's demand for liquidity. Many bank runs have purely psychological roots. Even a rumor of a bank run can start a bank run. Conversely, if no one has reason to think a bank run should occur, it usually doesn't. Bank runs are the quintessential self-fulfilling prophecy.

This is clearly a game with multiple possible outcomes, and it is illustrated in Figure 7.1 with two fourteenth-century London depositors, Alasdair and Chauncey. Suppose each deposits 10 crowns into "Goldsmythe Banke." The bank holds only 40 percent of its assets as coin reserves. The other 60 percent is loaned out, where it fetches a return of 33 percent per year. Thus, when Alasdair and Chauncey deposit their 20 crowns, the bank immediately lends 12 crowns to an eager borrower, Angus Hereford, who uses the money to buy some bullocks to graze until slaughter a year from now. Goldsmythe holds the other 8 crowns in reserves in the safebox. The 12 crowns become 16 crowns after one year via the interest paid by Angus, so in order to at least break even, the yearly interest the bank then can pay on deposits is 20 percent. Let's say the bank is expected to operate for two years until Goldsmythe retires. If both Alasdair and Chauncey can keep their deposits for one year, the value of each of their accounts increases to 12 crowns. If they keep their deposits for the second year, compound interest allows each of their accounts to grow to 14.4 crowns.

However, what if shortly after depositing his money, Chauncey gets cold feet. Perhaps he becomes worried about Angus's bullocks (they seem to look a little sniffy), and fears that Angus will never pay back Goldsmythe Banke its 12 crowns, much less the 16 it owes with interest. He resolves to withdraw all of his crowns from the bank immediately. Of course, he can't do this, for much of his money is tied up in Angus's bullocks. But he can demand the 8 crowns that are held in reserves, which, as he sees it, is better than losing *everything*. Alasdair, who knows a little more about bullocks, knows that Chauncey's preoccupation is over no more than the ordinary bullock nasal discharge. Alasdair is unconcerned about the bullocks, but he is concerned about Chauncey. If Chauncey attempts to liquidate his entire account, the bank will go bust, and he will be left with nothing. For him, getting four of his crowns is certainly better than nothing, so he too rushes to the bank to withdraw.

The panic causes a bank run in which everybody suffers. As seen in Figure 7.1, a bank run in the first year of our game yields a payoff to each of four, in comparison to a payoff of 14.4 if they had waited to withdraw after two loan cycles. There are several

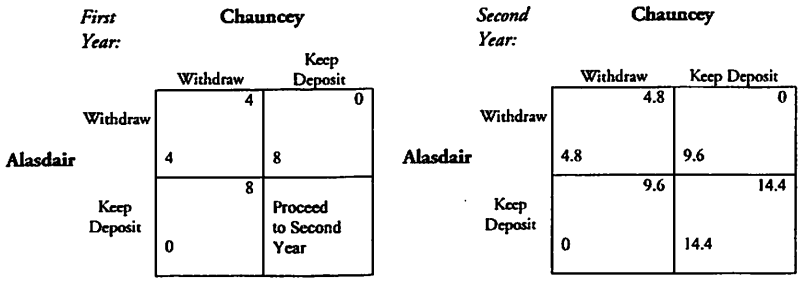

Figure 7.1. Bank Run Game

Nash equilibria to the bank-run game: There is one in which a bank run occurs in the first year and both Alasdair and Chauncey lose 60 percent of their initial deposit. Another Nash equilibrium exists in which both keep their deposit the first year but panic and withdraw during the second year. Alasdair and Chauncey are scarcely better off in this case because with a payoff of 4.8, they still lose 52 percent of their initial deposit. A third equilibrium occurs when both keep their deposits until the end of the second year, when each receives a 44 percent total return on their deposit in a payoff of 14.4.

With a bank operating for n periods, there exist n possible Nash equilibria in which a bank run can occur. Clearly, this kind of instability is undesirable. Optimism and pessimism about the economy will wax and wane over time, but it is obviously problematic that episodes of pessimism should degenerate into self-fulfilling prophesies of collapse.

Fortunately, there is a relatively straightforward institutional solution to the bank-run problem. This solution emerged from the horrendous experiences with bank runs during the Great Depression in the United Sates, in which over 4,000 banks failed between 1929 and 1933.[3] The crisis led to the 1933 Banking Act (often called the Glass-Steagall Act), which immediately established the Federal Deposit Insurance Corporation (FDIC). The act originally provided insurance of deposit accounts up to $5,000 in exchange for the right of federal regulators to monitor the activity of state-chartered banks not already directly regulated by the Federal Reserve. It was immediately successful: The year after the FDIC was established only nine banks failed.[4] In 1980, the U.S. government extended FDIC insurance to cover up to $100,000 per account.

Deposit insurance is amazingly effective at preventing bank runs. That one's account is insured means that mere economic pessimism provides little basis for panic. And knowing that others have no reason to panic over the security of their account means that no individual has any reason to panic either. Institutions that provide deposit insurance now exist commonly in most industrialized countries and

[3] Helfer (1999).
[4] Ibid.

many developing countries, including Kenya (since 1985), Nigeria (1989), Colombia (1985), and Brazil (1990).[5] In many other developing countries, governments bail out busted banks only on an ad hoc basis, if political pressures deem it necessary, or if the bank is judged to be too big to fail.

The main drawback with deposit insurance is that it may create a moral hazard. If accounts are insured, depositors have less incentive to monitor the lending activity of their bank. Also, banks may engage in riskier lending activity if their accounts are protected by the insurance safety net. The prescribed solution to this is for government regulators to ensure that banks maintain sound lending practices, a system that has worked well in most instances, the U.S. savings and loan crisis of the 1980s being one glaring exception. Nevertheless, viewed in light of game theory, the development of depository insurance is a particularly strong example of an institution that is able to solve a game (in this case, a Stag Hunt) in favor of a Pareto-superior Nash equilibrium.

Banks and Lending

On the lending side of financial transactions, there is a problem in the market for loans: Credit markets do not work the same way that most markets work. The difference between buying an apple and lending money illustrates the problem: When someone goes to a market to buy an apple, he can examine it for bruises, rotten spots, and wormholes. A bad apple is easy to spot. The same is not true for a bad *promise*. And at its most basic level, a credit transaction is an exchange of money for a promise to repay, with the desirability of the transaction to the lender depending upon the quality of that promise. Moreover, the quality of this promise is often hard to ascertain.

As a result, a credit transaction is fraught with at least three different types of problems.[6] First is an *adverse selection* problem in credit transactions. Because a borrower receives money now in exchange for a mere promise to repay in the future, it creates an incentive for risky (or dishonest) borrowers to enter the market. These borrowers may indicate a willingness to pay a higher interest rate than safe (or honest) borrowers on loans that they may never intend to repay anyway. Second is the *moral hazard* problem in credit markets; it is possible that the borrower may borrow the money and use it to bet on a proverbial three-legged horse – in other words, a risky investment, but one with a potentially spectacular payoff. If limited liability laws partially shield the borrower in the event of an inability to repay, borrowers may have the incentive to invest in riskier projects than the lender would like them to. They also may consume part of a loan rather than invest it productively, thus increasing the chances of default. Third is the *enforcement* problem. Even if the investment project turns out fine, the borrower may simply refuse to repay. Each of these shortcomings puts the lender at a disadvantage in credit transactions.

[5] Mas and Tally (1990).

[6] See Hoff and Stiglitz (1990) for detail on problems endemic to credit markets.

Because of this inherent disadvantage, the lender may not enter into the transaction in the first place, therefore hurting the borrower as well.

These are the essential insights of George Akerlof, Michael Spence, and Joseph Stiglitz, the 2001 winners of the Nobel Prize in Economics, who demonstrated that certain markets, such as the markets for credit and insurance, are plagued by asymmetric information. If it is common knowledge that one party holds an informational advantage over the other (knows something that the other party doesn't know), and can therefore take advantage of the other by virtue of that advantage, the disadvantaged party simply refuses to enter into the transaction. Consequently, a transaction that potentially could be mutually beneficial often just doesn't happen. And in the context of credit markets, this means that many potentially profitable projects will be left unfunded.

One piece of this research has been particularly influential in our understanding of the problems with credit markets, a famous article by Stiglitz co-authored by Andrew Weiss (1981), that has become one of the most cited and celebrated articles in economics. Its insights are worth reviewing, for they illustrate the fundamental conflict between the interests of borrowers and lenders. The key insights of the paper are shown in the two graphs in Figure 7.2 that represent the payoffs to a borrower and lender (in bold, respectively) as a function of the gross return to a borrower's investment, R, from a \$1 loan.

In the diagrams, r represents the interest rate charged by the lender to the borrower on the \$1 loan. Suppose there are two types of investment projects. The first is a safe one that yields a gross return of $\overline{R}$ for sure. The second one is risky. It also has an expected value of $\overline{R}$ but yields $\hat{R} > \overline{R}$ with probability $0 < p < 1$ and is a total disaster ($R = 0$) with probability $(1 - p)$ so that $p\hat{R} = \overline{R}$. If $R = 0$, we will assume the loan is unsecured and the lender loses the \$1 principle and the borrower's profit is zero.[7] Though a borrower's losses are limited to zero when R falls below $1 + r$ (assuming the lender has first claim on any returns to the investment), when R is high, the borrower earns $R - 1 - r$.

Looking at the problem from the lender's perspective, he is fully repaid if the project yields greater than $1+r$. But notice that while the borrower has a *lower limit* on losses, the lender has an *upper limit* on gains: Assuming a zero cost of capital to the lender, the maximum that he can earn on this \$1 loan is r.

Stiglitz and Weiss demonstrate how the different shapes of these payoff functions to the borrower and the lender create divergent interests over the choice of risky and safe projects. Notice in Figure 7.2, that the convex shape of the borrower's payoff function makes the risky project more appealing: Whereas the expected payoff to the borrower from the safe project is $\Pi^B = \overline{R} - 1 - r$, it is $\Pi^B = (1 - p)\,0 + p(\hat{R} - 1 - r)$ from the risky project. We know the latter is higher for the borrower, since $p\hat{R} = \overline{R}$ and $-(1 + r) < -p(1 + r)$. The lender, in contrast, wants the borrower to undertake the safe project that pays $\Pi^L = r$, entailing a higher payoff to the lender than the

[7] Stiglitz and Weiss assume that the loan carries collateral between zero and the value of the loan. To keep the example more transparent, here we will assume no collateral, fairly common with loans to the poor in LDCs.

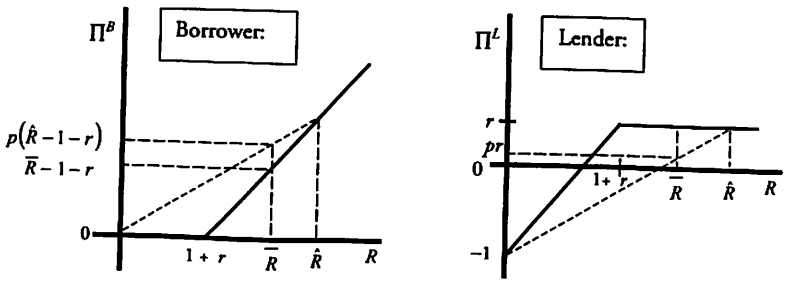

Figure 7.2. Stiglitz & Weiss: Borrower and Lender Incentives

risky project, which only allows the lender to obtain r with probability p, such that $\Pi^L = pr$.

Stiglitz and Weiss show that this basic result has several important implications. First, it means that there will be *adverse selection* in the credit market. A borrower with a risky project will be willing to pay an interest rate up to $\hat{R} - 1$ and still break even, whereas a borrower with a safe project is only willing to pay $p\hat{R} - 1$. What this means is that if the risky projects are sufficiently risky, lenders will hesitate to raise interest rates to the normally market-clearing level even if there is excess demand for capital, because by doing so it would drive safe borrowers out of the market and reduces lenders' profits. This is one widely accepted explanation for why shortages of credit seem to be so common, especially in developing countries: Not everyone who wants a loan can get one at the prevailing interest rate since the interest rate cannot be increased to eliminate shortages as prices do in a normal market. Their results also explain why moral hazard exists in credit markets. Take the example of a business with a project with a safe gross return $\bar{R}$ that is somewhere between $\bar{R}$ and $\hat{R}$, meaning that its expected return is higher than the expected gross return of the risky project, $p\hat{R}$. If the interest rate lies between $\bar{R} - 1$ and $\hat{R} - 1$, the business will choose the risky project, even though it offers a lower expected return!

While Stiglitz and Weiss provide an excellent framework for thinking about the causes and implications of credit market failure, in practice it is rare in developing countries to observe cases in which the poor find it in their interest to undertake risky investment projects. This is primarily because their model assumes that lenders and borrowers are risk neutral, whereas in developing countries the poor are notoriously risk averse. Consequently, what is more common in practice is for poor borrowers to increase risk to the lender by diverting part of a loan toward consumption rather than the promised investment. This kind of behavior may very well increase the utility of a poor borrower, for whom immediate consumption needs may be paramount, but it decreases the probability that the remaining invested capital will generate sufficient returns to repay the loan.[8] In my own experience in surveying hundreds

[8] For details of consumption-based moral hazard in credit markets, see Wydick (2001).

of borrowers taking loans from microfinance programs, I have observed only one clear-cut case of a low-income borrower intentionally investing in a risky project: a sidewalk vendor, who intentionally invested a disproportionate share of his loan in umbrellas, apparently gambling that rainy weather could result in a deluge of profitable sales but running the risk of high inventory carrying costs in the event of dry weather.

But regardless of the specific nature of the behavior, the asymmetric information problems in credit markets necessitate careful screening by lenders in order to ascertain whether a loan is likely to be repaid. In this process any *large* investment project warrants special attention, since the interest rate spread multiplied over a large loan represents a significant amount of profit to a lender. The large profit on such loans more than justifies screening costs. It is applicants for smaller loans that end up the victims of the process because the relatively small profit to lenders from such loans fails to justify these screening costs. Moreover, because it is usually the poor who require small loans, it is usually the poor who are left out of formal credit markets.

As a consequence, many investment projects of the poor must be self-financed. However, it is the poor who are least able to self-finance their investment projects because, by definition, the difference between income and consumption among those living close to subsistence is small. Yet, without access to credit, it is only through investing this difference between income and consumption that capital accumulation among the poor can occur. This forms a classic development trap – those with the least need for credit can most easily obtain it, and those with the greatest need for credit can least easily obtain it. Similar to what is witnessed in the absence of formal insurance mechanisms, the rich get richer and the poor stay poor, victims of a critical asymmetric-information-induced market failure.

How the Lending Game is Solved in Wealthy Economies

The problem with credit market transactions is solved in two important ways in more advanced economies. The first is that these economies often have sophisticated networks of credit information. Three major credit-reporting agencies in the United States, Equifax, Experian, and TransUnion, compile data on hundreds of millions of credit transactions. If a borrower is negligent in repaying a loan, it shows up in her credit score. The market as a whole becomes somewhat more wary of lending to that borrower, and loan terms she can get (interest rate, size of the loan, etc.) are less favorable the next time. In this way, a comprehensive web of credit reporting systems helps to bridge the gap of asymmetric information between borrower and lender in most advanced economies, holding borrowers accountable for their actions, and giving lenders more confidence in making loans.

The second way that more advanced economies solve the lending game is through well-established systems of property rights. In his well-known book *The Mystery of Capital* (2000), Hernando de Soto argues that property rights are the key that unlocks the power of capital markets. When the person has legal title to property,

his property not only serves a functional purpose in that on it he can build a house, cultivate a farm, or establish a business. The property, and particularly the title to the property, serves as collateral in the credit market. This, de Soto maintains, is one of the most overlooked functions of property rights in general, and land titles in particular. They facilitate a kind of leveraged capital accumulation and economic growth that would be impossible otherwise. In this light, de Soto maintains that the granting of land titles to, for example, early American settlers was one of the factors most responsible for strong historical economic growth in the United States. Yet, in most developing countries, the poor typically lack title to land on which they live and work, almost the very definition of the *informal* sector. De Soto argues that granting land title to the poor is one of the most important conditions for broadly based economic growth in developing countries.

The use of collateral in credit transactions solves even one-shot plays of the lending game, where here we focus on the enforcement problem. You can see this through a simple modification of the lending game in Figure 2.4a, in which a borrower takes a loan with principal equal to 10, owing 13 to the lender upon repayment (an interest rate of 30 percent). Continue to assume that the investment yields a 100 percent return. Suppose that the borrower offers a piece of land as collateral that is worth 14, and a bank incurs a cost of 2 for the legal hassle of repossessing the collateral. This changes the payoffs in the lending game as seen in Figure 7.3.

Now, by backward induction, (Lend; Repay) becomes the new Nash equilibrium. The bank lends because it receives a higher payoff through repossession of the collateral even if the borrower fails to repay. De Soto's point, seen in light of the game in Figure 7.3, is that the lack of formal land titles may push the value of borrower collateral to something less than 10, the principal value of the loan. This creates two problems: One, because the borrower has less to lose, it creates a disincentive to repay the loan in the first place. Two, if indeed the borrower *doesn't* repay, the bank is worse off than it would have been if it had never made the loan. In this respect, the property rights that are so commonplace in industrialized societies create security for credit transactions that makes promises to repay far more credible, thus unleashing the potential for economic growth through leveraged investments. Of course, such transactions are commonplace as well in the formal sector among the middle and upper classes in developing countries, for whom property rights and

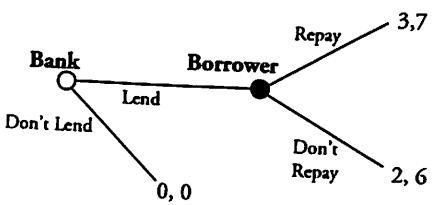

Figure 7.3. Basic Lending Game

land titles are clear. But de Soto's point is that broadly based economic growth will remain stifled without broadly based titles to land.

How the Lending Game Is Solved in Developing Economies

Often lacking formal credit reporting systems and even systems of fully defined property rights, economies in developing countries must to resort to more creative and informal means of solving the lending game. During the past twenty years, development economists have devoted a great deal of time and energy into understanding the nature of informal credit markets in developing countries. Finding the secret to channeling capital into the hands of entrepreneurial types in developing countries, many argue, may be one of the most important keys to alleviating world poverty.

Informal moneylenders are a vital source of credit in the informal economy. These characters are often stereotyped with gold-tooth smiles and scary-looking henchmen. Though a roughly accurate picture in some cases, it is important to understand the important role that moneylenders fill in the informal economy, and from whence arises the source of their power over borrowers.

For most moneylenders, moneylending is not their regular day job, as the typical moneylender is a commodity buyer, landlord, or merchant. Moneylending is often a side activity. What gives the moneylender market power in his village or urban neighborhood is that often by virtue of his profession, say as a trader or merchant, he has created a large pool of liquid wealth or gained access to formal financial markets. Via the latter, the village moneylender can serve as a conduit between the formal and informal financial systems.

In their (1997) research on moneylenders in the Philippines, Maria Floro, at the American University, and Debraj Ray, at New York University, describe the role of rice traders as intermediaries of credit to farmers in the Philippines. Called *marketing agents*, these traders engage in moneylending as a means of profiting from local rice production. Floro and Ray show how the rice traders, by virtue of their relational and informational advantages within their respective pools of farmers, serve as conduits of credit from the formal financial system into the rural, agricultural areas of the Philippines. These trader-moneylenders hold substantial advantages over other lenders from their repeated interaction with farmers through their main role as marketing agents, which also gives them an advantage in enforcing repayment.

Moneylenders tend to solidify their power in a local credit market through acquiring an informational advantage about borrowers that grows over time. As with Floro and Ray's rice traders, moneylenders often begin with the advantage of some inside information over their potential client pool originating from other types of transactions. They then frequently start clients with "test loans," and upon successful repayment, augment both the size of the loan and the types of credit offered to the borrower. Using Floro and Ray's example, a rice trader may begin by offering a farmer an advance on his harvest. If successfully repaid, the trader-moneylender may agree to a small loan to finance a new draft animal, or a new roof for the farmer's

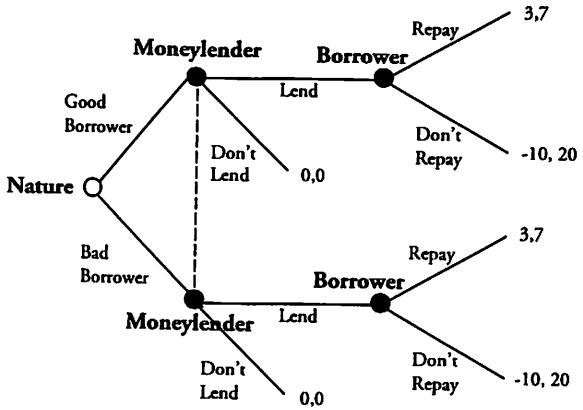

Figure 7.4. Lending Game with Moneylender

house. In this way, the moneylender is able to overcome adverse selection problems in credit markets, the difficulty with screening potentially good borrowers from bad ones. This process can be represented by an extension of the basic lending game, shown in Figure 7.4.

Suppose that there are two types of borrowers in a rural village: "good borrowers" and "bad borrowers." The good borrowers are good (from the lender's perspective) because they are patient. They have a high discount factor, δ, equal to 0.9, meaning that they place a relatively high value on the future, specifically in the future of a long-term credit relationship distinguished by borrowing and repayment. The bad borrowers are bad because they are *im*patient, possessing a discount factor of only 0.5. They care relatively more about the present benefits of absconding with borrowed capital, while heavily discounting the future repercussions of their behavior.

Though from previous dealings the moneylender possesses some inside information about borrower quality, he cannot be certain about whether nature has presented him with a good or bad borrower. (The dashed line in Figure 7.4 is typically used in game-theoretic modeling to represent a lack of information, the fact that the player does not know whether he is at one node or the other.)

Consider a sequence of loans of the same size equal to 10, and assume that the moneylender rewards a repaid loan with a subsequent loan, but withholds future loans when a loan is unpaid. Suppose the moneylender inadvertently grants a loan to a bad borrower. The bad borrower would receive a discounted payoff of $7/(1-\delta) = 7/0.5 = 14$ from repaying, but a discounted payoff of $20 + \frac{\delta \cdot 0}{1-\delta} = 20$ from not repaying. Consequently, the bad borrower doesn't repay, but doesn't get another loan either. In contrast, a good borrower receiving a loan gets a discounted payoff of $7/(1-\delta) = 7/0.1 = 70$ from repaying, but the same payoff of $20 + \frac{\delta \cdot 0}{1-\delta} = 20$ from not repaying. Thus, the good borrower repays, and the bad borrower doesn't.

The moneylender's first advantage is that he knows more than other potential lenders about the local clientele. This inside knowledge gives him a relatively higher probability that he is dealing with a good borrower on an initial loan, meaning that he is operating within the upper part of the game in Figure 7.4. If p is the probability that the moneylender is dealing with a good borrower on an initial loan, and $(1-p)$ a bad borrower, for the moneylender to expect this loan to be profitable, then $3p + (-10)(1-p) > 0$, or $p > 0.77$. Previous dealings with a potential borrower may push his trust over this threshold.

But after actually granting loans, the added discovery of which borrowers are truly good and bad is valuable information. (It is also costly information, as each bad loan costs 10 to the moneylender.) Since good borrowers continue to receive loans, and bad borrowers are quickly eliminated from the portfolio, a moneylender may begin with a small informational advantage, but he can build a portfolio over time that exhibits very high levels of repayment. Competing moneylenders from outside are placed at a distinct disadvantage: they do not know the clientele, and they suffer many painful defaults resulting from their ignorance.

As a result, what one observes when studying informal credit markets is the formation of "credit islands," with moneylenders serving a fixed pool of clients. Let's think in more detail about how this happens: Suppose a small handful of moneylenders offer credit in a given area. As before, a moneylender believes that with a first loan he is lending to a good borrower with probability p and a bad borrower with probability $(1-p)$, making his profit from an initial loan of 10 is equal to $10rp - 10(1-p)$, where r is his interest rate. Thus to break even on a first loan, he must charge $r = (1-p)/p$. However, after an initial loan is repaid, the moneylender knows he is facing a good borrower. Moreover, the borrower knows the moneylender knows that he is a good borrower, and knows that this is valuable information to the moneylender. As a result of passing the test, the good borrower may demand something of a discount on his next loan. Thus, continuing to assume that the cost of capital is zero to the moneylender, the borrower will negotiate an interest rate r on subsequent loans that falls between zero and $(1-p)/p$. The moneylender will not charge more than the latter because he does not want to lose a valuable client, and cannot charge less than the former and still break even. The quality of the deal between these two extremes that the good borrower receives depends on his bargaining skills relative to those of the moneylender. The point, however, is that once the moneylender discovers a good borrower, there is little incentive for him to leave this good borrower wanting for credit or for the good borrower to seek credit elsewhere where his quality is unproven (and face a higher interest rate). The two are stuck with each other.

This kind of exclusivity in lending is consistent with the field studies carried out by Irfan Aleem (1990) in the Chambar area of Pakistan. In his study, Aleem found that vast proportions of the portfolios of village moneylenders were made up of repeat clients that remained faithful to their lender over numerous transactions. (Apart from this phenomenon is the desire of lenders to remain the sole source of credit to any borrower so that they can remain as first claimant in the event of a problem loan.) In such situations, if there exists a limited number of lenders with

access to formal credit relative to the number of borrowers than need credit, it gives strong market power to lenders over clients.

The fact that moneylenders often *interlink* credit contracts with other contracts also can augment their market power and the surplus they receive from their borrowers. Pranab Bardhan (1984) provides an analysis for the underlying rationale and consequences of interlinked credit contracts. An employer, for example, may offer a contract to an employee that interlinks a wage for a particular type of work with a loan available at a certain interest rate. By virtue of the moneylender's dual role as the borrower's employer, it may make it easier for the lender to address the moral hazard endemic to credit transactions, as the lender can threaten to fire the borrower to enforce repayment. In other cases, an employer-moneylender may offer a day laborer a cash advance for living expenses during the off-season that is repaid in the form of a lower wage in the peak season. Bardhan and others have demonstrated in theoretical models how this type of interlinked contract can yield a greater surplus to the moneylender than individual wage and credit contracts. Intuitively, by charging interest indirectly in the form of paying lower wages, the moneylender continues to be able to induce the employee-borrower to take a large loan from him without having to lower the price of it. In a similar way, commodity buyers can extract maximum surplus on loans to farmers by offering them an interlinked contract that offers subsidized credit at the cost of lower prices paid for their output.

Sometimes in developing countries it is difficult to tell when a credit contract stops and when insurance starts. Christopher Udry at Yale University undertook a pathbreaking (1994) study on credit relationships in Northern Nigeria. In the study, he found that what existed among his sample of 400 households were not pure credit contracts, but an informal hybrid between credit and insurance arrangements. Carefully recording instances of negative shocks such as illnesses and other misfortunes to households during the term of credit contracts, he discovered that the terms of the credit contract were adjusted upon repayment to account for these shocks. He observed that the terms of borrower repayment were not only eased downward after borrowing households had experienced a negative shock but also that terms of repayment were often adjusted *upward* when the household of the *lender* had experienced a negative shock, making such contracts remarkably efficient in terms of borrower and lender welfare and the sharing of risks.

Rotating Credit and Savings Associations

Other types of indigenous institutions that mobilize credit in traditional societies have intrigued development economists. One well-known institution of this kind is the Rotating Credit and Savings Association (ROSCA). ROSCAs appear to have evolved spontaneously in many otherwise seemingly unrelated cultures in Africa, Asia, Latin America, and even among numerous ethnic communities in the United States. In Senegal, for example, they are called *tontines*, in Bolivia *pasanakus*, in India *chit funds*, in Korea *kye*, and in China *Hui*. ROSCAs are everywhere.

The arrangement works in the following way: A group of individuals agrees to make monthly (or sometimes weekly) contributions into a kitty. A ROSCA of n members meets n times for one go-round. At each meeting, each of the members takes turns receiving the entire sum contributed by the members into the kitty. Typically, a member can only win the kitty once during a ROSCA cycle. The arrangement is primarily economic, but also social. The winner of the kitty often uses part of her winnings to pick up the tab for food, drink, and festivities at the meeting. No matter who the fortunate winner happens to be, showering one member with riches can create a good excuse for a party.

Timothy Besley, Stephen Coate, and Glenn Loury (1993) analyze two different mechanisms for deciding who gets the kitty each period. The first is a *random* ROSCA, in which one member's name is drawn out of a hat each meeting. The lucky winner (especially if one's name is drawn in one of the early rounds) is then able to use the collective contributions to finance some kind of large expenditure. This could be a capital investment, such as a new machine or other equipment for a small business, or a personal expenditure such as an anniversary or wedding. The drawback with a random ROSCA, of course, is the very nature of its randomness: the time one becomes the winner may not match up well with when a member is most anxious to take home the kitty.

One alternative is a *bidding* ROSCA. In a bidding ROSCA, each period the members make either open or sealed bids, with the highest bidder taking the kitty for that period. Bids can either come in the form of higher subsequent contributions to the ROSCA or through side payments made to the other members. The advantage of the bidding ROSCA is that the kitty goes to those with the greatest willingness to pay for it. When members have heterogeneous levels of desire to win the kitty, Besley, Coate and Loury argue that the bidding ROSCA may offer greater benefits, but when groups have more or less homogeneous needs, they show that a random ROSCA may be better. The fact that most ROSCAs are random, they note, may reflect a great deal of homogeneity among their participants.

A final, and somewhat less common, type of ROSCA allocates the kitty to members based on immediate need. This type of ROSCA functions more like informal insurance than informal credit. In such an arrangement, members all contribute each meeting, allocating the kitty by consensus to the member who has suffered a great misfortune or who faces an important event such as a wedding (or perhaps both).

It would seem that those who have been winners of the kitty in early rounds would have a disincentive to continue to contribute to ROSCAs. In practice, however, this does not appear to be the case because ROSCAs are typically made up of tightly knit groups of extended family members, friends, and associates with strong social ties. The social ties that surround ROSCAs create ample incentives against defection. Since most ROSCAs are not onetime events, but are recurring in the context of a close community, moral hazard is kept in check by the repeated-game nature of the ROSCAs themselves, which in turn occur in the context of the repeated social interaction of the community. We will explore this theme as we examine the potential

for microfinance to harness this social cohesion to make credit available to the poor in developing regions of the world.

Microfinance

The growth of microfinance as a movement in international development has been both astonishing and unprecedented. The Microfinance Summit under the Clinton administration in 1997 kicked off a major effort to reach 100 million impoverished households with microfinance by 2005. By 2006, this effort resulted in 113,261,390 households taking microloans from 3,133 institutions worldwide, 81,949,036 of whom were among the poorest in their country when they took their first loan.[9] Even the Internet has joined the movement, permitting profit-minded investors and philanthropists alike to lend directly to developing country entrepreneurs via Web sites such as Kiva.org. The phenomenon has been the result of a strong consensus in influential policy and nonprofit circles that views microfinance as a key tool in the fight against world poverty and of empowerment to participate in markets.

Part of this consensus is political. Those on the rightish side of the political spectrum are attracted to microfinance because it helps people lift themselves up by their bootstraps by fostering entrepreneurialism and self-reliance, arguably in a self-sustaining manner without huge government giveaways. Those leaning toward the left are attracted by the grassroots nature of microfinance, its empowerment of women, and its ability to promote indigenous culture through the financing of artisans and other producers of locally made products. Moreover, compared to large-scale industrial investment, microfinance also tends to be blissfully neutral on the environment. Everybody loves microfinance.

Economists are not to be left out in this regard. Part of the intrigue of microfinance to economists is how it has apparently been able to harness the social ties within traditional societies to overcome the aforementioned difficulties with credit transactions, that is, solve the lending game. Two institutions have been studied particularly closely in this respect. The first is the Grameen Bank in Bangladesh, founded by the Vanderbilt-trained economist Muhammad Yunus, winner of the 2006 Nobel Peace Prize for his work in microfinance. The bank now boasts a portfolio of over 2 million borrowers, over 90 percent of whom are women. The Grameen Bank has been the flagship institution of the microfinance movement.

A second well-known institution is Bolivia's BancoSol, which was able to replicate some of the key lending methodology of the Grameen Bank in a Latin American context, and has now dispersed over US$1 billion in capital to low-income entrepreneurs in La Paz and 35 other secondary regions throughout Bolivia. BancoSol is best known for being the first major microfinance institution to become privatized, and indeed, it has been issuing dividends to shareholders since 1997.

The secret to the success of any microfinance institution is being able to solve the lending game at minimal cost in administrative overhead, since margins on

[9] Microcredit Summit, March 2007, available at www.microcreditsummit.org. (Accessed 8/15/2006.)

microfinance loans are very small. The Grameen Bank and BancoSol have achieved high repayment rates because they understand what makes indigenous credit markets work. Several tools are important to microfinance institutions in inducing high repayment rates, and through the implementation of these tools, a great many microfinance institutions have been able to achieve remarkable repayment rates, even on small loans to the poor, that often exceed 95 percent.

The first is the use of *dynamic incentives*, the carrot of future loans dangled from a stick before the borrower. As mentioned previously, village moneylenders use a version of dynamic incentives to address moral hazard issues in credit transactions by engaging clients in a repeated lending game. This works particularly well when a microfinance institution has monopoly power in a region and borrowers have scant access to alternative sources of credit. However, when credit alternatives emerge, the carrot of dynamic incentives loses its allure, and repayment discipline may break down.

A second tool is the creative use of incentive contracts for credit officers, who are responsible for their own borrower portfolios in a particular geographical region in which they typically serve between 100 and 300 borrowers. The structure of their incentives compares to the traditional American paperboy, who delivers newspapers in a defined neighborhood, advertises the paper (and his services) in the area, and prospers when the density of his customer base increases. Microfinance institutions typically compensate credit officers based on the performance of their portfolio, paying them a (fairly low) base wage but adding contractual incentives for the number of borrowers they are able to serve, the total loan assets managed in their portfolio, and borrower repayment rate. Properly structured incentive contracts induce credit officers to carry large portfolios (but not too large), and address repayment difficulties promptly. The precise nature of these contractual incentives matters: Although contractual bonuses for repayment and total portfolio assets align the incentives of credit officers sharply with the objectives of for-profit microfinance institutions, this may come at the expense of serving the poorest borrowers. Structuring credit officer incentives for institutions who want to lend to the poorest is more difficult.[10]

A third important tool in the microfinance practitioner's tool kit is *group lending*. Institutions have borrowers form self-selected groups of typically three to eight borrowers. A specific loan is granted to each member in the group, but each member of the group is financially liable for the loans to each of the other members, forming a kind of financial chain gang. Various theories have been put forth to explain the advantages of group lending over individual lending. The theories are not mutually exclusive, and each probably tells part of the story.

The first is simply economies of scale in lending. Because the idea is not very exciting, it has attracted little attention from economists, but nonetheless may be important. The simple argument goes like this: It takes x amount of time for a

[10] Theoretical work on this and other problems involved with credit officer contracts is found in Aubert, de Janvry, and Sadoulet (2004).

loan officer to attend to an individual borrower, but it simply takes less than $8x$ of time to attend to a group of eight borrowers. Based on my own experience in Central America, one credit officer can manage a portfolio of perhaps 150 individual borrowers, but often upward of 300 group borrowers. Here, time is money and less time in administrative overhead allows a nonprofit lender to reach more poor borrowers with small loans.

Most of the more interesting theories regarding the success of group lending focus on its positive effects on loan repayment. Some such as Maitreesh Ghatak (1999) have proposed that it is the self-selection of members among individuals well known to one another that is responsible for the high repayment rates observed in many group-lending schemes. Ghatak's explanation is rather like the reason that car insurance companies offer discounts to married drivers: If I am a reckless man, women may be less likely to want to marry me; the fact that I am married means I can't be *too* reckless (at least for one woman). In the context of group lending, one would expect that in the formation of jointly liable groups, safe borrowers would seek, and be allowed to join, a group with other safe borrowers, but that a group of safe borrowers would reject a risky borrower. Risky borrowers could potentially join a group only with other risky borrowers, but even a risky borrower has no interest in becoming liable for other risky borrowers' loans. (Even a reckless woman may not want to hook up with a reckless man and vice versa.) Hence, the fact that a group of people has promised to be jointly liable for one another's loans sends a signal to the lender that the group is likely to consist of safe borrowers. In his paper, Ghatak then demonstrates how this assortative matching process allows for more efficient credit contracts to be offered to the clients of microfinance institutions.

A second group of theories focuses on the benefits of group lending after group formation. Joseph Stiglitz (1990) and others have argued that the benefits of group lending accrue primarily through peer monitoring. Since it is costly for banks to supervise the use of borrowed capital, they argue that group lending encourages members to monitor one another in order to reduce the risk of group default. Mansoora Rashid and Robert Townsend (1992) claim that group lending increases repayment because it fosters the development of miniature self-insurance networks. When one member is subject to a negative shock that makes it difficult for him to repay, another member can make up the difference. Still others, such as Timothy Besley and Stephen Coate (1995), have argued that in traditional societies, it is the potential for social sanctions between borrowing group members that can create strong incentives for repayment.

Some of my own work on group lending (2001) argues that when group lending works well, it utilizes a combination of the repeated-game relationship between microfinance institutions and borrowing groups, and the social fabric that exists within a community of borrowers. Because there are so many factors at work in most group lending schemes (group selection, peer monitoring, social sanctions, the potential for self-insurance, repeated games, etc.), game-theoretic models of group lending can become complicated very quickly. However, a rough sketch of

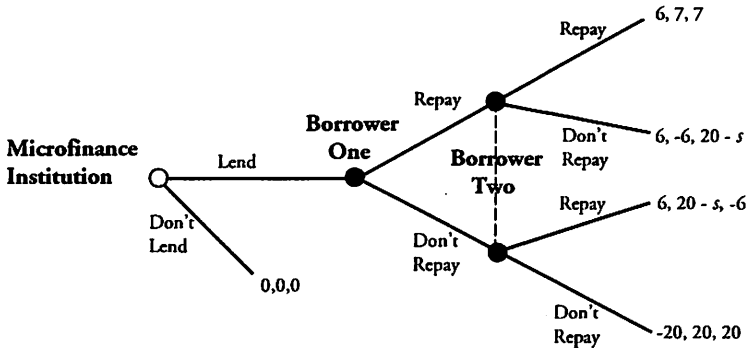

Figure 7.5. Group Lending Game

this idea is represented as a kind of hybrid between a Trust game and a mutant form of the Prisoners' Dilemma as appears in Figure 7.5.

Payoffs in the game are to the lending institution, the first borrower, and the second borrower, respectively. For simplicity, assume that all investment projects are successful, so that here we focus on the enforcement problem inherent to loan repayment. As before, assume that the lender provides loans equal to 10, this time to a group of two borrowers, where again successful projects yield a 100 percent return (a gross profit of 10). The group is jointly liable for repaying two loans of 10 each plus interest of 3 on each loan, or a total group liability of 26. If a member uniquely chooses not to repay, she receives a monetary payoff of 20 but incurs the wrath of social sanctions from the other member (and perhaps other members of the community as well) equal to $-s$. Stuck with a defecting partner, if the remaining member chooses to repay, she must repay the entire group loan, leaving her with a payoff of -6.

It makes sense that a group member might choose to repay for another member, because in order to continue receiving credit from the microfinance institution, the entire group loan must be paid off, not just a fraction. When a member has intentionally defaulted on a loan, that member is typically ejected from the group and replaced, and the group continues to receive credit, provided all previous group loans have been paid off. The repeated nature of the lending game is just as important with group lending as it is with individual lending. Now consider the incentives for a member to either repay or default on a loan; they depend both on the patience of borrowers (to refrain from eating the marshmallow), and on the potential wrath of their peers from sticking their fellow members with their unpaid debt.

Provided the other member repays, a borrowing group member will also repay if the discounted payoff from repayment, $7/(1-\delta)$, is greater than the discounted value from not repaying, $20 - s + \frac{\delta 0}{1-\delta}$. Thus either a sufficiently high level of social sanctions, s, or sufficiently high level of patience, δ, or combination of the two will induce repayment.

A *very* patient borrowing group member will repay even when her fellow group member fails to repay. Paying off a fellow member's debt results in a payoff of −6 today, but allows the faithful member to continue to receive credit in future periods, yielding a total discounted payoff of $-6 + \frac{\delta 7}{1-\delta}$. If this is greater than the payoff of 20 from joining the delinquent member in absconding with the loan, the group loan will be repaid. Perhaps this is why microfinance institutions often place a premium on strong leadership within borrowing groups. Strong leaders are likely to weigh the long-term rewards of continued partnership with the institution especially heavily relative to the short-term gains from defection, and are likely to be willing to cover for defaulting members in order to sustain their own credit access. The leader may then rally the group to replace a negligent member with a more responsible member (i.e., one with a higher discount factor). Based on what I have observed in Latin America, I have maintained that the best way to view borrowing groups is as *dynamic peer review committees*, expelling members whom they judge to have been negligent with their loans, while adding members that they judge to be better risks. Group lending therefore mitigates the moral hazard in credit transactions by placing it in the context of two repeated games: First, microfinance institutions offer the promise of future loans to groups who are functional enough to make timely payments. Second, it embeds the credit transaction in the context of the repeated game of social interplay already occurring within a closely knit community; defaulters may pay not just a pecuniary price, but also a social price for their defection.

Which of all of these theories appears to be most important in practice? Unfortunately, relatively little empirical work has been done to test the relative importance of different potential advantages of group lending. Yet, there is some empirical evidence that the ability of group lending to harness existing social ties has a positive effect on repayment. Mark Wenner (1995) of the Inter-American Development Bank found that screening of borrowers appears to have positive effects on loan repayment in Costa Rican borrowing groups. Conducting empirical tests on Guatemalan borrowing groups, I found (Wydick 1999a) that peer monitoring does appear to have some positive effects on loan repayment, but that close social ties can work both ways: They can both foster repayment but also make it hard for members to pressure one another to contribute.

Recent work such as Xavier Giné et al. (2005), Alessandra Cassar et al. (2007) and Cassar and Wydick (2008) has delved into the realm of experimental economics in search for answers. In this type of research, potential microcredit recipients play simulated "microfinance games" in the context of a controlled experiment in order to isolate how variables such as social cohesion, trust, and dynamic incentives influence loan repayment. In the latter research project, our research team from the University of San Francisco carried out a simulated group lending experiment at sites in five developing countries: India, Kenya, Guatemala, Armenia, and the Philippines. We calibrated the laboratory experiments to test how ethnic and religious homogeneity, personal trust, monitoring, and self-selection of borrowing groups each affect the repayment performance of borrowing groups. Evidence from this larger body of experimental research is mixed but seems to indicate that personal trust,

homogeneity of group members, and dynamic incentives all play positive roles in group-loan repayment.

Beyond group lending, other types of institutions have attempted to harness social ties in traditional societies to make credit available to the poor. *Village banks*, such as those used by FINCA International, consist of 20–50 members and both accumulate savings from members as well as disperse loans. Loan amounts are based largely on savings; the more a member saves, the more she can borrow. In this way village banks rely not only on external sources of funding from a government ministry or NGO (nongovernmental organization) as do many group lending schemes, but also on mobilizing the internal capital of their members.

Credit cooperatives often function in a manner similar to village banks, but they often provide other benefits for their members as well, such as marketing of commodities, or low-cost access to inputs such as fertilizer and seed. The collective gain or loss realized within the cooperative is then distributed in some manner to its members. Cooperatives have often been formed by NGOs and local governments to protect rural peasants from the market power and potential exploitation of moneylenders and commodity buyers. The recurrent problem with cooperatives, however, is that their underlying incentive structure mirrors a Prisoners' Dilemma, as discussed in Chapter Two; this kind of incentive structure invites "free-riders" and often makes leadership in a cooperative difficult.

Although researchers generally believe the impact of microfinance to be modest, but positive, obtaining specific measures of its true impact is more difficult than it would seem. There is a problem in simply comparing those who have been taking microloans for a period of time with those who haven't. Borrowers have undergone a double self-selection process that separates them from nonborrowers. Not only have they had the desire to borrow to finance the growth of a household enterprise (not all people even have this desire), but their request for a loan has been approved by the microfinance institution. Thus relative to the general population, microfinance borrowers tend to be "winners," potentially showing relative improvements in many measures of welfare over time even without microfinance. Moreover, borrowers may choose to take loans at a particular time when especially profitable opportunities present themselves. This makes it hard to separate the effect of microfinance from the positive effect that this opportunity may have bestowed on the borrower anyway. All of these factors present challenges in obtaining razor-sharp estimates of microfinance impacts.

There have been various strategies to try to control for these issues: the use of instrumental variable estimations,[11] constructing a field experiment,[12] and the use of program eligibility requirements to identify those who might have had similar characteristics to those who took credit, but were ineligible. Khandker's (1998)

[11] An instrumental variable is used in econometric studies to isolate program impacts by obtaining estimates of a treatment (such as microlending) that are a product of a third variable that is uncorrelated with welfare outcomes. See Wydick (1999b) for an example in trying to estimate microfinance impacts.

[12] See Coleman (1999) for a study in Thailand where credit was withheld from borrowers in some villages temporarily while provided to others. He finds modest impacts on those chosen to receive the credit first.

Fighting Poverty with Microcredit is the most well-known empirical study on the impacts of microfinance, and takes the latter approach. He finds significant effects from program participation on enterprise variables such as production and income, as well as on welfare variables such as child schooling, child nutrition, and household consumption, particularly when loans were made to women, where household consumption increased 18 taka for every 100 taka in lending. His later study in 2003, which is able to examine household differences using an additional round of data, finds consumption effects to be somewhat more modest, closer to 8 taka per 100 taka loaned.

Future Developments of Credit Markets in LDCs

As the number of microfinance institutions has proliferated across developing countries, competition has increased among them. Because competition in the marketplace nearly always benefits the consumer, one would suppose that competition between credit providers would be similarly beneficial. Craig McIntosh at University of California at San Diego and I (2005) argue that this may not be the case.

Our argument for the way microenterprises enforce borrower discipline is best understood by the way eBay is able to enforce discipline within its vast multitude of participating borrowers and sellers. Since its founding in 1995, eBay has dominated the online market for person-to-person transactions of people's unwanted junk that they believe may be someone else's treasure. As goods are bought and sold through eBay's online auction process, incentives arise for buyers to cheat sellers by failing to pay up, and for sellers to cheat buyers by not delivering the goods, either figuratively or literally. What keeps participants honest is an internal rating system in which buyers and sellers have the chance to rate each other after every transaction. Because of the obvious opportunity to cheat, frequent users safeguard their eBay rating like a precious jewel. They understand that it inspires other eBayers with confidence in dealing with them, a big advantage in an impersonal market. For example, a buyer knows that a seller with a 99 percent positive rating over 1000 transactions has much to lose by cheating on a single deal. But what would happen if there were not one eBay, but numerous eBays out there, online markets where goods could be bought and sold? A deceitful seller, for example, could simply renege on an eBay transaction and begin to sell in another online market. The fact that eBay is a focal point for such transactions helps to mitigate moral hazard in the market.

Similar to eBay's virtual monopoly in secondhand goods, many microfinance institutions have operated as virtual *local* monopolies in semiformal credit. Much of what keeps borrowers from succumbing to the temptations of moral hazard is the threat of having the microfinance tap turned off by their sole provider of affordable loans. But when the number of microlenders in a given region increases, the lenders' power to induce borrower repayment (via Grim Trigger–like strategies in a repeated game) diminishes. This happens because in many parts of the world, borrowers are now presented with a dazzling new array of credit opportunities.

And why should one repay Peter when he can always borrow from Paul? One result of the overwhelming proliferation of microfinance institutions in places such as Bangladesh, East Africa, and much of Central America is some entrepreneurs who have gained newfound access to credit. But we document that this has also caused credit market chaos in many of these areas; as lenders have multiplied, repayment rates have declined.

Regions such as these are at an intermediate phase in credit market development. In many cases, the borrower's personalized relationship with the moneylender has been replaced with a personalized relationship with the microfinance institution. Although few doubt the sincerity of the NGOs involved in microlending, a personalized lending relationship with a single microfinance institution still leaves the undercapitalized borrower in the position of either being exploited or patronized. Paradoxically, the maximum economic benefit to these types of borrowers occurs when lenders can share information among themselves about the behavior of borrowers. This is a key characteristic of how credit relationships evolve during the process of economic development: The credit relationship changes from a private, *personalized* one, to a more public relationship with a more or less impersonal credit *system*. Accountability for credit behavior is encapsulated in a credit rating, where multitudes of lenders compete for a borrower's business, given his publicly perceived level of risk.

Such systems have been implemented recently in a number of countries with dense microfinance activity, such as Bangladesh, Bolivia, El Salvador, Guatemala, and Nicaragua, and in many ways are a bellwether of financial development. Credit information systems have several interesting effects when they are implemented in developing countries. A screening effect mitigates adverse selection problems at the outset by kicking out high-risk borrowers with poor credit records. Moreover, when borrowers become aware that the entire market of lenders is observing their repayment performance, it produces an incentive effect against moral hazard that causes them to be more careful with their loans. A third effect of these systems, however, is that when lenders become more confident about the quality of their borrowers, they allow them access to larger loans, which partially counteracts the first two effects and tends to *increase* default problems.

In McIntosh and Wydick (2007) we use a field experiment designed around the staggered rollout of a new microfinance credit information system in Guatemala, where some borrowers were randomly informed about the new system but not others, uncovering evidence of each of these three effects. Even the screening effect alone from implementation of the information system appeared to lower default rates by about two percentage points.[13] This has important implications for the poor: When lenders compete having strong information about borrowers, lower default rates imply better loan terms to low-income borrowers, and broader access to financial services.

[13] See also Luoto, McIntosh, and Wydick (2007) and de Janvry, McIntosh, and Sadoulet (2006).