A Model of a Micro-Credit Institution

Michael Cook
William Jewell College

Joel S. Bryce
Federal Reserve Bank of Kansas City

The paper briefly describes micro-credit financial institutions and compares such firms to charitable organizations and more typical financial institutions. It then develops a model of one type of micro-credit financial institution. Using this model, the market in which this institution functions is then examined. The paper concludes that the optimal interest rate maximizes the quantity of funds donated.

INTRODUCTION

For decades economists have argued about the importance of financial institutions in promoting economic growth. Recent studies have shown that financial access (Beck, 2004) and financial intermediation (King and Levine, 1993) are important for growth. A recent innovation is the creation of micro-credit financial institutions. The main goal of most of these micro-credit institutions is the alleviation of poverty, but they also contribute to economic growth if the businesses started with micro-credit become prosperous enough to move into more conventional credit markets (Baumol, 2007). This paper was motivated by one of the author's experiences leading a small team in starting a micro-credit facility in Croc, Mexico. During the fall of 2006, the team began to explore the possibility of opening a micro-credit facility as an extension of an existing social services organization in Croc. The team raised funds through grants and generous donations and researched various micro-credit organizations and models for administering micro-loans. In the spring of 2007, the facility, *Croc Adelante Microfinance Initiative*, officially opened and the first loan was administered in June, 2007. In the first year of operation, the facility experienced 98% repayment from its borrowers. It was this experience that motivated the authors of the present paper to explore the micro-credit market. The paper was intended to serve as guidance for *Croc Adelante* to set its interest rate, understand the implications of charging too little or too high of interest, and more broadly understand the market in which *Croc Adelante* will operate.

This paper will begin by describing micro-credit financial institutions, and how they compare to charitable organizations and to more typical financial institutions. It will then develop a model of one type of micro-credit financial institution and examine the market in which this institution functions. This model has extremely practical implications as it helps determine the optimal interest rate on micro-credit loans, specifically those administered by *Croc Adelante*.

MICRO-CREDIT FINANCIAL INSTITUTIONS

Though one of the purposes of micro-credit is to help the poor, a micro-credit facility is different from a typical charitable institution and it is important that both the administrators and the borrowers understand the differences. The administrators must also clearly understand both the similarities and the differences between a typical financial institution and a micro-credit financial institution.

There are some important similarities between charitable institutions that provide gifts to the poor and micro-credit institutions. The funds that a micro-credit institution lends are typically donated to that institution by a government or by private individuals. Micro-credit institutions typically have some of the same goals as charitable institutions.
In addition to helping the very poor, they may make the community aware of family-planning options or encourage communal projects (Armendariz, 2005). This similarity between micro-credit institutions and charitable organizations can be confusing to the borrowers (of the former) and beneficiaries (of the latter). For example, *Croc Adelante* was an extension of an existing social service organization that provided charitable gifts and interest-free loans. This posed a significant challenge to the micro-credit facility. How could it ensure that its “business loans” would not be perceived as a gift? Many residents did not distinguish between the varying branches of the social services organization and thus expected to receive loans on the same terms as charitable donations which did not have to be repaid. If the borrowers felt that they were unjustly being charged interest, the borrowers would have little interest in repaying the loans and the facility would risk high default rates.

Both the administrators and the clients needed to understand the difference between a charitable gift of goodwill that could be used to feed or clothe a family temporarily and a loan to start a business. The loan empowers the borrowers to lift themselves out of poverty while the gift simply temporarily eases the pain of that poverty. With the loan, the micro-credit facility becomes a “partner” in the business and needs to receive periodic payments just as any other partner. Helping both the administrators and the borrowers think as businesspeople is important for the success of the micro-credit institution.

In many ways micro-credit institutions are businesses and face many of the same problems that most financial institutions face. They have to screen their applicants to determine the most appropriate borrowers and they have to monitor loans and enforce debt repayment. Armendariz and Murdoch (2005) provide evidence that micro-lenders try to reduce their administrative costs, take advantage of economies of scale, improve repayment rates and reduce delinquent loans to improve their financial sustainability or increase the variety of loans to diversify their portfolios. If loans are repaid, then the financial institution has additional funds to lend. Thus, loan repayment is just as important to a micro-credit institution as it is for a more typical financial institution. Any micro-credit institution that ignores repayment rates or administrative costs is likely to fail.

The need to repay loans was an important concern to the administrators of *Croc Adelante* loans. As stated above, they were concerned that “borrowers” would assume that the loans were a gift that would not need to be repaid. Numerous questions arose. How should the facility manager decide who receives a loan and who does not? Should the borrower demonstrate a level of competence prior to receiving a loan? How would the borrower do this? How can the facility prepare the potential borrowers to be more competent? Should the borrower have an existing business or is an idea for a business sufficient?

One option available to *Croc Adelante* was to follow the example of the Grameen Bank, and other micro-lenders, who have developed some techniques that have helped reduce administrative costs. These techniques included group lending, weekly repayment schedules, and public repayments.

If the firm cannot separate applicants who are likely to repay from those who are not, it is forced to charge all borrowers the higher interest rate appropriate for high-risk borrowers. At the higher rate, many borrowers who could have successfully repaid their loans at a lower interest rate will be priced out of the market. This screening problem was one of the reasons traditional financial institutions chose not to lend to many villagers in developing nations, such as Bangladesh. In order to mitigate this problem, the Grameen Bank, and some other institutions, required individuals to form groups. While a loan would be made to one or two individuals in the group, all group members would have some responsibility for repaying the loan and other group members would not get their loans until regular payments had been established for the first loans. Since members of a village have good information about who would be likely to repay, and since each loan depends on others repaying, the members of the village would ensure that only those who were likely to repay would be members of their group. Similarly, individuals would monitor members of their group for the institution. Thus group lending reduces the costs of screening and monitoring for the micro-lender.

Financial institutions often required loans to be repaid at the end of three months or six months. To make such a repayment involves saving over that period to accumulate the funds needed at the end of the period. Such saving was difficult for many villagers because of familial or social obligations. If one has funds that a relative needs and one does not actually need those funds oneself for several months, it is difficult to refuse the relative the use of the funds. Requiring weekly or biweekly repayments helped solve this problem because the borrower never accumulated any funds that relatives could borrow. Each week's profits were used to make a loan repayment.

Finally public repayment makes it more difficult for an individual who has the funds to refuse to pay. Since each individual's non-payment makes it more likely that the village will lose access to this source of credit, the members of the village will pressure the individual to repay and public repayment means that everyone will know whether repayment has been made. Such schemes not only cause those with the means to repay, but can cause wealthier villagers to help those who are temporarily unable to pay so that village access to credit is not threatened. Furthermore, because every borrower repays at the same time and place, transactions costs are reduced for the micro-lender.

The team that started *Croc Adelante* explored the idea of starting small accountability groups, as done by the Grameen Bank; for the time being such groups are unnecessary. As mentioned, the goal of such groups is consistent loan repayment. For *Croc Adelante*, the context of the lending is relational in nature. The facility has not reached a point of lending to "unknown" applicants. All of the borrowers requesting micro-loans have a certain degree of relationship with the social services organization. Risk of default is mitigated by open and honest relationship. However, in order to grow the facility and expand operations, it will be necessary to incorporate some form of public repayment and group accountability. For the time being, the facility has found that relationally granted loans that are repaid on a weekly basis mitigate the risk of default.

A MODEL OF A MICRO-LENDING FIRM

The goal of this model is to provide an economic basis for setting an optimal interest rate that maximizes poverty reduction while keeping administrative costs low to guarantee the constant supply of funds from donors. The team administering *Croc Adelante* loans determined that a minimal interest rate should be charged. It is important for the borrower to realize that the loan is a formal transaction and not a charitable gift. In order to mitigate the risk of default, the micro-loans were clearly defined as capital loaned for the sole purpose of starting or expanding a business venture. The model intends to provide a theoretical framework to determine the optimal interest rate that a micro-credit facility, such as *Croc Adelante*, should charge.

The model will assume that the firm receives its funds from private donors. It assumes that these donors are interested in reducing poverty and thus the firm's most important goal is also reducing poverty.

It is essential that the firm satisfy its donors. Donors could save/invest their funds elsewhere and receive a financial rate of return. If the donor does not get more satisfaction from the donation than from that financial rate of return, donations will cease. Even if the donor has decided to give the funds to charity, the donor has a choice of many charities, including other micro-lenders. The firm has to give the donor greater satisfaction than these other charities.

Giving a poor individual any sum of money, including a loan, will temporarily reduce their poverty. However, donors are usually interested in a more permanent reduction in poverty. Thus the loans should be invested in such a way as to permanently raise the borrower's level of income. Donors are often unhappy if the borrower is unable to do this.

Even if the loan allows a borrower to permanently raise her income, the donor may not be satisfied. If loans are not repaid, only the initial borrower benefits from the loan. If loans are repaid, then additional borrowers can also benefit and the donor's funds will have been used more effectively. Thus donors may be interested in repayment rates. Similarly, if the administrative costs of making a loan are high, then a substantial portion of the amount donated may have to be used to pay these administrative costs and less will be loaned out. Thus donors may be concerned with reducing administrative costs. Financial sustainability occurs when the income from the interest earned on loans is sufficient to cover the cost of making and administering the loans. Financial sustainability allows all of the funds donated to be used for loans.

The model will assume that the firm can choose which individuals will receive loans and the interest rate that the firm charges. It also assumes that firms want to minimize their administrative costs, possibility by using techniques similar to those developed by the Grameen Bank.

Assuming the firm has already chosen these techniques and thus minimized its administrative costs, how should the firm make its loans and set its interest rates to best satisfy its donors and thus ensure a continued flow of donated funds?

Armendariz and Morduch (2005) report that giving loans to those in extreme poverty, substantially lowers repayment rates. Those in extreme poverty often rely on a system of family and neighbors to help sustain them. When one household in this system has extra funds, others have a claim on those funds. This type of system allows those in extreme poverty to survive.

Because household survival depends on membership in such a system, households are reluctant to disrupt the system. Thus the household that has borrowed the funds from the micro-lender has to honor the claims of the other households in the system and thus does not have the funds to repay the loan.

Armendariz and Morduch (2005) also report that giving loans at a zero or very low interest rate has very negative effects on repayment rates. The recipients tend to treat such funds as a grant or gift, rather than a loan, and often make little effort to repay. The firm may choose to lend to those in moderate poverty rather than those in extreme poverty. As noted by Copestake and others (2005), while some loans are made to the extremely poor, most borrowers are clustered just below or just above the poverty line.

If the donor expects the micro-lending firm to cover most of its administrative costs by the interest it collects, thus leaving more of the donated funds for loans, then interest rates must be high enough to cover most of these administrative costs. The goals of using funds efficiently and achieving financial sustainability will cause the firm to charge a higher interest rate than if the firm were only interested in alleviating poverty.

The Credit Market

The Supply of Funds

Micro-loan institutions depend on donations, and often on donations by foreigners. A number of factors can affect the size of these donations, and thus affect the supply of funds. Some of these factors are beyond the firm's control and some can be influenced by the firm's activities.

The donors' disposable income is one determinant of supply. Generally, as disposable income rises, there will be an increase in the amount of funds donated. Clearly, the firm has no control over the level of disposable income in other countries.

Another determinant of supply is the donor's willingness to give. As willingness to give increases, donors give a greater percentage of their disposable income to micro-loan facilities. Some of the factors determining willingness to give depend on the firm's activities, but many do not. Stories in the media may lead the donor to conclude that some country has a greater need of funds. The donors' perceptions of the country's needs may not necessarily coincide with the country's actual need. If that is the case, the supply of funds would depend not on the real need but on the perceived need. Many very poor countries still lack micro-loan facilities. The donors' perceptions of the country's political and social structures may also affect the level of donations. One donor may be reluctant to give to a country ruled by a military dictatorship; another donor may perceive the military dictatorship as a source of temporary stability and be more willing to donate. Similarly if a donor perceives the people of this country as hard workers he may be more willing to help than if the people of the country have a reputation for laziness.

The donors' willingness to give may also be influenced by the perception that the micro-lender is really reducing poverty. Similarly a low default rate on loans may lead a donor to think of the borrowers as hard workers. A high default rate may lead the donors to conclude that the people are greater credit risks and not worth further donations. Or the donors may conclude that the micro-lender is doing a poor job screening loan applicants and be reluctant to give more for that reason. These factors can be influenced, if not controlled, by the firm.

The level of donations can be influenced by the fundraising activities of the micro-lending firm. If the firm employs a fundraiser, an increase in the fundraiser's labor should result in more funds being donated. Laws and customs can complicate the fundraiser's activities. For example, if the country has a law prohibiting foreigners to engage in banking activities, then foreign donors will have to find a competent and willing local contact. This can also be part of the fundraiser's labors.

Normally, a supply curve would show a relationship between quantity and price. Is the quantity of funds donated related to the interest rate? Because donors have goals such as reducing poverty and because donors are concerned about repayment rates and administrative costs, the quantity donated may be related to the interest rate.

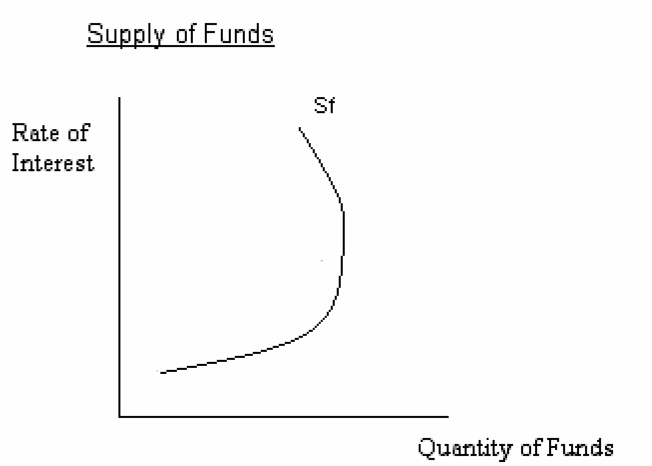
As mentioned above, Armendariz and Morduch (2005) report that giving "loans" at a zero or very low interest rate has very negative effects on repayment rates. Thus if repayment rates are important to a donor, a very low interest rate can reduce donations. Similarly if the donor expects the micro-lending firm to cover most of its administrative costs by the interest it collects, thus leaving more of the donated funds for loans, then interest rates must be high enough to cover most of these administrative costs.

Once a reasonable interest rate has been reached, in terms of administrative costs and repayment rates, the firm can moderately increase the interest rate without affecting the level of donations. On the other hand, higher interest rates make it more difficult for those in poverty to borrow. If the micro-lender's interest rates are close to those of the local money lenders, their loans will not do much to reduce poverty.

Thus donors are likely to be discouraged if interest rates are either too low or too high. This suggests that the supply of funds is backward-bending. As the interest rate rises, donors will be more willing to give because the firm's repayment rates and covered administrative costs will make the firm appear more efficient at reducing poverty. However, after a certain interest rate, raising the interest rate will reduce the firm's ability to reduce poverty and thus reduce donations.

Thus the supply of funds is a backward-bending function of interest rates that shifts with changes in donor's disposable income, with changes in the donor's goodwill which depends on the donor's perceptions, and with changes in the fundraiser's labor.

Figure 1
SUPPLY OF FUNDS



The supply of funds = F(Yd, G, L, P, r) where Yd is the donors' disposable income, G represents the donors' willingness to give, L represents the fund raiser's labor, P represents the donors' perceptions, and r is the interest rate.

The Demand for Funds

One of the most important factors influencing the demand for funds is the entrepreneurial nature of the borrowers. This entrepreneurial nature itself depends on a number of characteristics of the borrower. The entrepreneur is an individual who has an idea about starting a business; however, the ability to see an unmet community need is only part of what constitutes an entrepreneur. The entrepreneur must also have a certain level of self-esteem or self-confidence that allows her to see herself as successful. The entrepreneur must also be a person who is willing to take risks.

Another factor which can be important is the country's customs and culture. Since a majority of micro-credit borrowers are women, the society's view of the role of women is especially important[1]. If the culture discourages women from working outside the home or expects women to be engaged in tasks associated with the care of children and maintenance of a household, social pressure will limit the woman's ability to apply for loans. It may be common, for example, for a culture to permit a woman to borrow funds to start a business in which the work can be done in her home, but not permit a woman to work outside the home.

The borrower's income is another factor which can affect demand. Normally we would expect a higher income to increase the borrower's ability to repay a loan and thus an increase in income would lead to an increase in borrowing. On the other hand, one could argue that a person with a higher income could save the funds needed to start a business and thus would not need to borrow funds. In this case, lower income would lead to more borrowing. This duality persists if the income concerned comes from the business's retained earnings. As retained earnings rise, the financial institution is willing to let the firm borrow more funds, and the firm may do so if it is interested in expanding its business. However, a person with no interest in expanding her business, and a person who is confined to a business done from her home may not be able to expand her business, and thus might borrow less as retained earnings rise.

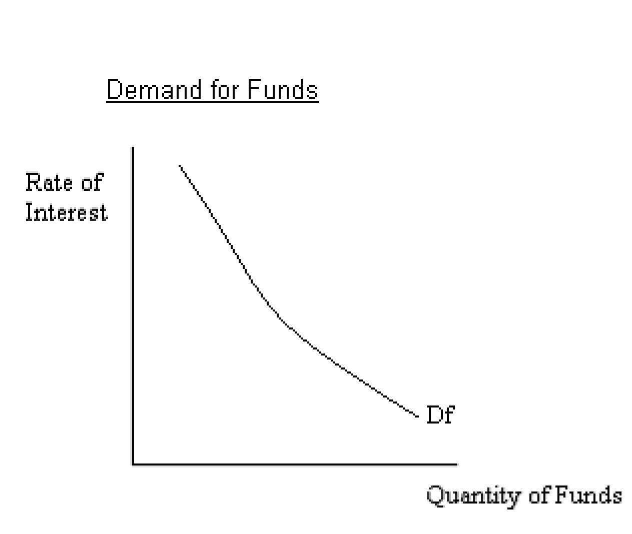
Since micro-credit loans are typically aimed at relieving poverty, there may be a limit on the borrower's income. Those with incomes above a certain level may not be eligible to borrow. Still another possibility is that the borrower's consumption may rise as income rises, and the amount borrowed would be unaffected.

The last determinant of demand that will be discussed is the interest rate. It has been argued that the interest rate is not a factor influencing the demand for credit because so many individuals continue to demand loans even when the interest rate rises. However, this paper will assume a normal relationship between the quantity demanded and the price of funds, the interest rate.

The demand for funds is a downward-sloping demand curve that shifts with changes in the borrower's entrepreneurial ability, the borrower's income, and cultural factors affecting the borrower.

[1] The *State of the Microcredit Summit Campaign Report*, which tracks micro-credit activity around the world, states that 84.2% of the 81.9 million poorest micro-credit clients were women in 2005.

Figure 2
DEMAND FOR FUNDS



The demand for funds = F(E, C, Yb, r) where E represents entrepreneurial ability, C represents cultural factors, Yb is the borrower's income, and r is the interest rate.

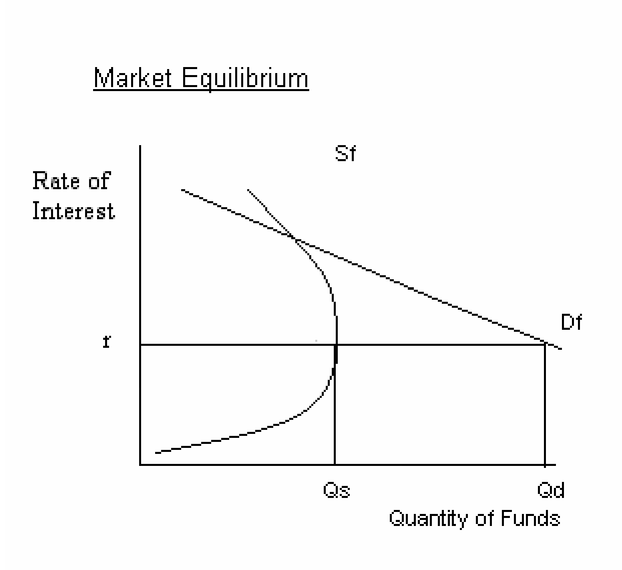
Market Equilibrium

There will, of course, be some interest rate that sets the quantity demanded equal to the quantity supplied. Traditional money lenders in developing nations may even try to charge this market-clearing interest rate.

Given the goals of the micro-credit firm, the firm almost certainly chooses an interest rate substantially below this market clearing rate because its primary goal is to alleviate poverty; the market-clearing rate would prevent most, if not all, of the poor from borrowing. At the low rate, the quantity of funds demanded exceeds the quantity of funds supplied. This shortage of funds persists even if the firm raises its interest rate slightly, and this persistent shortage has led some individuals to conclude that the demand for funds does not depend on the interest rate.

While the firm's optimal interest rate is well-below the market-clearing rate, it may or may not be different from the interest rate that maximizes the quantity of funds supplied on the backward-bending supply curve.

Figure 3
MARKET EQUILIBRIUM



SUMMARY

The paper began with a general discussion of micro-lending and then developed a model of a type of micro-credit institution. The paper continued with a discussion of the supply and demand for credit in the credit market. It concluded by discussing interest rates. The paper concluded that the firm's optimal interest rate is substantially below the market-clearing rate but may be near the interest rate that maximizes the quantity of funds donated. *Croc Adelante* will target its interest rate such that the quantity of funds donated is maximized, the risk of default is minimized, and the administrative costs are covered.

REFERENCES

Armendariz de Aghion, B., & Murdoch J. (2005). The Economics of Microfinance. Cambridge, MA: MIT Press.

Baumol, W., Litan R., & Schramm C. (2007). Good Capitalism, Bad Capitalism and the Economics of Growth and Prosperity. New Haven, CT: Yale University Press.

Beck, T., Demirguc-Kunt D., & Levine R. (2004). Finance, Inequality and Poverty: Cross-Country Evidence. NBER Working Papers 10979. National Bureau of Economic Research, Inc.

Copestake, J., Greeley M., Johnson S., Kabeer N., & Simanowitz A. (2006). Money with a Mission: Microfinance and poverty reduction. Warwickshire, UK: ITDG Publishing.

King, R., & Levine L. (1993). Finance and Growth. Quarterly Journal of Economics, 108, 717-737.