Microfinance loan portfolios and the social investor

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Abstract

We model a capital investor in microfinance who raises subsidized external funding from donors who are imperfectly informed about the impact of the microfinance institution's lending program. A pooling equilibrium emerges in which a subsidized institution may decline more profitable lending opportunities in favor of maintaining a portfolio of small loans that have little or no social impact. The institution's asset selection is improved in two different ways. One is through the availability of sufficiently profitable new loan opportunities and the second is through a reliance on arms-length external funding.

JEL Codes: G21; D82; D86; O12

Key words: microfinance; adverse selection; subsidies; external funding

1. Introduction

A well known problem in the developing economies is that small firms face difficulties in accessing credit. Empirical studies point to a variety of obstacles, such as no verifiable credit history, a lack of collateral, poorly defined property rights and a slow and expensive legal system.[1] Against these odds, one success has been microfinance. These financial institutions have proliferated in market settings that commercial banks traditionally ignored. While microfinance originated as a social program, this class of financial intermediary has grown into an increasingly diverse set of institutions. Along with the small loans for which microfinance is known, a growing number of institutions have started issuing larger loans, offering deposit accounts, and begun raising external debt in international markets.

Despite the changes, subsidies continue to be an important part of microfinance funding. In a survey of microfinance institutions from around the world, Cull et al. (2007) find that on average, 20% of an institution's funding is in the form of a subsidy. While years back this was rarely questioned, a growing number of analysts are arguing that continued reliance on subsides is detrimental to microfinance.[2] A handful of empirical papers, such as Caudill et al. (2009), Hudon and Traca (2011) and Bogan et al. (2012) have started to investigate this question. While the results are a bit mixed, there is evidence that higher subsidies can be associated with persistent inefficiencies. This may not be a big surprise. Its implications however, are important. Given the difficulty small businesses have in getting credit, microfinance lending offers one of the few viable strategies for closing this credit gap. If subsidies are not "smart" as Morduch (2005) puts it, then there could be a lost opportunity to help remedy a rather long running problem.

In our paper, we build a theoretical model in order to try and better understand how external subsidies interact with the lending behavior of a microfinance institution (MFI). At the center of the story is a capital investor who owns the MFI and raises external funding from donors. Both the investor and donors value a "blended return", consisting of a financial return and a social return based on income earned by poor borrowers.[3] The MFI acts as an intermediary, transforming funds into loans. A moral hazard problem surrounds a decision by the MFI whether to lend prudently or not, and this is solved through endogenous capital requirements. Furthermore, when making loans, we give the MFI a choice between issuing small loans or large ones. As part of our story, the size of the large loan opportunities is assumed to reflect the maturity of the institution. Only small loans generate a social return.[4] The trade-off with regard to loan size is that operating cost per dollar is assumed to fall as loan size increases, implying that the financial return on capital rises with the size of the loan.[5]

The main question in our model is whether the MFI will choose to issue larger loans or not. We study this question under the assumption that the external donors cannot observe the social impact of the MFI. Hence,

[1] See Beck and Demirguc-Kunt (2006), Beck et al. (2006) and Allen et al. (2012).

[2] For discussion on this see Morduch (2005) and Bruck (2006).

[3] The importance of the social investor in microfinance is reviewed by Reille, Forster and Rozas (2011). Also see Garmaize and Natividad (2010).

[4] In practice, loan size is frequently used as a guage to determine whether an MFI targets the poor or not.

[5] A number of empirical studies document relatively high operating costs per dollar in microfinance. For example, in their survey Cull et al. (2009) find that the median NGO has a loan size that is less than a quarter the size of the average loan provided by a commerical microfinance bank, and correspondingly, operating costs as a fraction of loan value are roughly double that of the bank. Also see Beck et al. (2009).

while both players value a blended return, their interests do not always coincide. Under imperfect information, we look at two feasible contracts that donors might use. One is where donors closely monitor asset selection, and other is where they unable to monitor. These two types of contracts offer a simple way of modeling how funding has been allocated in practice. While historically, external funding for microfinance often was supplied by a single donor who closely monitored the MFI, in more recent years, Reille, Forster and Rozas (2011) argue that MFIs increasingly rely on a more diversified, international based collection of donors that arguably are less capable of monitoring the MFI's portfolio choices.

When donors do monitor asset selection by the MFI, we identify a few possible market outcomes. In one case, we find a pooling equilibrium in which all types of MFI specialize in making small loans, even when an MFI has little or no impact on poverty. Imperfectly informed donors, who value social return but have a hard time observing it, demand specialization in small loan assets. These donors subsidize their funding based on an average social impact calculation. This distorts the MFI's portfolio choices and lowers the expected return on capital. In another case, we describe a separating equilibrium where donors offer subsidized debt to the MFI if he issues small loans, and market priced debt to the MFI if he elects to issue larger, more profitable loans. From these results we get several testable predictions. One is that the smaller the loan size the higher the necessary capital requirement. Second, the deeper the subsidy the longer it should take MFIs to transition to portfolios with larger loans. Third, the larger the MFI's capital ratio, the more quickly the MFI will turn down external subsidies to pursue larger, more profitable lending opportunities.

In contrast, when donors are unable to monitor the MFI's asset selection, MFIs always specialize according to what they are good at in equilibrium. The specialization by the MFIs raises the expected return to capital. While this can potentially have negative implications for poverty reduction, it turns out that this negative effect is minimized through the endogenous behavior of the MFIs themselves. However, when external donors exercise less monitoring, this leads to imperfectly priced debt, which can distort the MFI's selection of loan assets. One implication is that an MFI that is effective at poverty reduction winds up paying too much for its external funding, and consequently, the MFI prematurely abandons its small lending program.

Interestingly, the possibility that MFIs may be engaged in lending with little or no social impact has recently taken center stage in microfinance discussions. As surveyed by Bauchet et al. (2011), several randomized control trials have found that the poverty reduction or social benefits from selected microfinance lending programs appear much lower than what many had believed. These results have startled the literature. As an example, using a randomized evaluation of the impact of microcredit in India, Banerjee et al. (2013) find that there is little or no effect on the profitability of a borrower's business, consumption, health, or education.[6] A silver lining to these impact studies is that while average treatment effects appear low, a subset of the clients do indeed benefit. Aside from Banerjee et al. (2013) this has been documented elsewhere, such as de Mel et al. (2008) and Field et al. (2013). In their survey, Bauchet et al. (2011) emphasize this effect on the tail, and argue that an important agenda is how to better identify ex ante, the high capacity type of borrower.

One possible answer to this question comes from the relationship lending literature. In lending relationships, where public credit histories, collateral and the legal system have little influence, information between the borrower and loan officer can be vital.[7] The importance of soft information to lending relationships is documented

[6] The authors do find some effects, such as a higher consumption of durable goods and lower consumption of "temptation goods".
[7] See Boot (2000) for an overview.

by Peterson and Rajan (1994), Agarwal and Hauswald (2010), Behr et al. (2011), Uchida et al. (2012) and Canales and Nanda (2012), among others. This kind of lending is certainly relevant to microfinance and may offer lenders a means of identifying and servicing the credit needs of faster growing small businesses. In our model, we consider the larger loan opportunities facing the MFI to be the direct result of relationship lending practices of the MFI and its loan officers. That is, due to the information accumulated through managing small loan portfolios, the MFI naturally comes across opportunities to issue larger, more profitable loans. Faced with these opportunities, we look at how the MFI's funding influences its incentives to purse the larger loans.

In general, the link between a bank's lending strategy and the composition of its liabilities has been explored in a number of different ways. Song and Thakor (2007) argue that a bank may prefer to fund opaque, relationship based loan assets using core deposits due to their sluggishness even when their are disagreements about the value of the loan assets. Thakor (2012) examines a bank's choice between earning profit on innovative loans and earning zero on standard loans. In the model, the author argues that the bank prefers the innovative loans, but faces a chance that investors will disagree with the bank's valuation of the innovative loan types and withdraw funding.

Most existing models on microfinance treat the intermediary and external funds as one and the same.[8] The result is that there is never any tension on the supply side. For example, Mcintosh and Wydick (2005) explain how a lender prefers to issue larger loans as a means of cross subsidizing smaller loans, to poorer clients. However, when one differentiates capital and debt funding, switching from one kind of loan to another can be trickier. Since the supply of subsidized funding to microfinance is justified by social impact, one cannot ignore the funding implications of a lender's asset choices. Our study highlights this point by introducing imperfect information between the MFI and its external funders. In particular, we assume that while external investors value social impact, they cannot verify exactly what impact an MFI has.[9]

To a certain extent, the story we tell in our paper is a dynamic one. Namely, over time, a subsidized MFI will learn how effective it is at reducing poverty and second, it should start uncovering opportunties to make larger, more profitable loans. Rather than use a dynamic model, we have opted to rely on a more compact, one-period model. The advantage of this is that the analysis is simplified. In turn, this allow us to more easily digest the comparative statics and equilibrium conditions.

We have organized our paper as follows. In Section 2 we describe the basic model. The main players are the capital investor, who runs the MFI, and the donors who supply external funds. In Section 3 we examine the portfolio choices facing the MFI, once all funding has been raised. We then turn to the contracting between the MFI and the external donors. In Section 4 we examine a case where donors are able to closely monitor the MFI's selection of assets for its loan portfolio. In this section we identify three different equilibrium outcomes, depending on the size of the larger loan opportunities. In Section 5 we focus on a different contract, where the external donor cannot contract on the MFI's asset choices. Under this arms-length contract, we describe equilibrium behavior and contrast its implications with our results from Section 4. Finally, in Section 6 we have the conclusion.

[8] For example, see Rai and Sjostrom (2004), Bhole and Ogden (2010) and Ahlin and Waters (2012).

[9] While the question whether the MFI itself is aware of its impact is open to some debate, most models that do incorporate a social impact assume it is common knowledge, so in this sense, our paper goes part way in relaxing this assumption.

2. The Model

There is a single capital investor with funds X. The capital investor faces a choice between investing X in a microfinance institution, or investing X elsewhere to earn a return ρ. If the investor chooses microfinance, then the investor can choose to leverage his capital using external debt. Debt is made available by an external donor at an interest rate i.

The capital investor, or equivalently, the MFI, uses his funding to issue loans. The MFI has a choice between issuing small loans, of size \$1, and larger loans, of size b, where $b > 1$. For both types of loans the MFI charges an interest rate r, which is exogenous.

When the MFI issues loans, he also must choose whether to use *prudent lending practices* or not. If the MFI lends prudently, then the loan is repaid with certainty and the MFI faces an operating cost of m per loan, regardless of the loan size. If the lender does not lend prudently, then the operating cost is 0 and the loan is repaid with probability λ, where $\lambda \in (0, 1)$. To simplify things, we assume that under imprudent lending, the loan repayments are perfectly correlated. We use m to represent the transaction costs of screening and monitoring, and make the following assumptions.

Assumption A1 $\quad m < (1 - \lambda)(1 + r)$

Assumption A2 $\quad m > (1 - \lambda)rb$

These assumptions imply that in order to persuade the MFI to adopt prudent lending, he must have some capital invested, though it need not equal the actual size of the loan.

The lender uses the loan repayments from the borrowers to cover operating costs and external debt obligations. Any repayment revenue net of these costs belongs to the capital investor. Aside from this financial return, we assume that the capital investor derives social benefits from lending. On every \$1 loan issued by the MFI, implicitly, there is some income or benefit for the borrower. This is viewed as poverty reduction. The value of the poverty reduction to the MFI from a \$1 loan is Δ_j, where j indicates the type of MFI making the loan. There are two possible types of MFI. If the MFI is type $j = h$, then the loan has a large effect, with value Δ_h, and if the MFI is type $j = l$, then the loan has a small effect, with value Δ_l, where $\Delta_h > \Delta_l$. We assume that $\Delta_l = 0$. On big loans, of size b, any income earned by the borrower does not count as poverty reduction.

In the model, we assume debt is supplied by an external donor who like the capital investor, values both financial and social returns. On the funds supplied by the donor, the donor earns an interest rate i, as well as social benefits arising from small loans. We restrict our attention to cases where $i \geq 0$. Specifically, for every \$1 in funds supplied by the donor, the donor derives a payoff of $1 + i + \Delta_j$ if the MFI issues small loans, and a payoff of $1 + i$ if the MFI issues large loans.[10]

[10] One might note that there is a bit of double counting for the social return. The MFI itself earns Δ_j on each \$1 loan and from the same loan, the donor earns a fraction of Δ_j that corresponds to the fraction of debt funding. We offer two justications for this. First, because the social benefit is derived from "watching" the borrower consume, clearly Δ_j can have non-rivalry properties. Second, in practice, we feel most MFIs assume full responsibility for any postitive social impact, regardless of how leveraged they are. In contrast, donors calculate their social return as a function of what they contribute, otherwise a \$2 donation to the Red Cross would entitle the donor to claim responsibility for everything the Red Cross accomplished.

We assume that the opportunity cost of debt for the donor is calculated using a parameter we call the "market interest rate", denoted as i_m, where $i_m \geq 0$.

Assumption A3 $\quad 1 + r - m - (1 + i_m) > 0$

Assumption A4 $\quad \lambda(1 + r) < 1 + i_m$

Under Assumption A3, the loan repayment collected by the lender is sufficient to cover his costs. Assumption A4 implies that imprudent lending practices effectively translate to a project that does not cover its costs.

The game works as follows. First, the capital investor decides whether to invest in microfinance or not. If the investor chooses microfinance, then Nature moves next by assigning the MFI a type. The MFI is assigned type h with probability α, and type l with probability $1 - \alpha$. After observing its type, the MFI chooses how much external debt to solicit. To solicit debt, the MFI demands a quantity of funds and proposes an interest rate to pay on the funds. Unable to observe MFI type, the donor either agrees with the request or denies the MFI funding. After external funds are allocated, the MFI chooses its loan portfolio. This amounts to issuing either small loans or big loans, and whether to follow prudent lending practices or not. To simplify things, we assume that with each of these choices, the MFI must make one decision for the entire portfolio. Hence, the MFI has four possible portfolios to choose between. After the portfolio is selected, the loans are issued and returns are realized. At this point the game ends.

3. The microfinance loan portfolio

Working backwards, we begin our analysis with the portfolio choices facing the MFI. At this point in the game, the MFI must select both a loan size and whether to lend prudently or not. On a small loan, under prudent lending practices, the lender earns a payoff per loan of $1 + r - m - (1 + i)(1 - x) + \Delta_j$, where x denotes the amount of capital dedicated to the \$1 loan. If instead, the MFI issues a small loan under imprudent lending practices, then the expected payoff is $\lambda[1 + r - (1 + i)(1 - x) + \Delta_j]$. Thus, the MFI prefers prudent lending as long as

1 $\qquad x \geq \frac{m}{(1-\lambda)(1+i)} - \frac{r-i+\Delta j}{1+i}$.

This inequality indicates that the minimum capital required to induce prudent lending depends on Δ_j. Clearly, the higher Δ_j is, the less capital is required. However, we assume that Δ_j is private information which cannot be observed by anyone other than the capital investor. With this in mind, we adopt capital requirements that do not reflect the social return earned by the lending institution. That is, minimum capital requirements are based on $\Delta_j = 0$. For a small loan asset, this means that to ensure prudent lending, the MFI must use at least $x_s(i) \equiv \frac{m}{(1-\lambda)(1+i)} - \frac{r-i}{1+i}$.

The other option for the MFI is to issue big loans. The payoff on a big loan under prudent lending is $(1 + r)b - m - (1 + i)(b - x)$, where x denotes the capital allocated to the loan. If a big loan is issued under

imprudent lending, then the expected payoff to the MFI is $\lambda[(1+r)b-(1+i)(b-x)]$. Thus, the MFI prefers prudent lending as long as

2 $$x \geq \frac{m}{(1-\lambda)(1+i)} - \frac{r-i}{1+i}b.$$

We define the capital requirement for the big loan as $x_b(i) \equiv \frac{m}{(1-\lambda)(1+i)} - \frac{r-i}{1+i}b$.

Lemma 1. $1 > x_s(i) > x_b(i) > 0$.

Our earlier assumptions ensure that the minimum capital requirements lie somewhere between zero and one, and that the small loan requires more capital than the big loan, for a given interest rate.[11] Throughout this paper, the MFI always satisfies the minimum capital requirement for each loan type. This is due to Assumption A4 and implicitly, because we assume that the capital requirement is enforced by a state regulator.

To calculate the payoff to the capital investor, we add the payoffs from the individual loan assets in the portfolio. On a portfolio of small loans that are managed prudently, assuming the MFI allocates a capital of x to each loan, the payoff is $\frac{X}{x}[1+r-m-(1+i)(1-x)+\Delta_j]$. Since Assumption A3 implies this is decreasing in x, the MFI prefers full leverage. Plugging $x = x_s(i)$ into the portfolio payoff yields

3 $$\pi_j(s;i) \equiv X(1+i)\frac{\lambda m+(1-\lambda)\Delta_j}{m-(1-\lambda)(r-i)}.$$

Alternatively, if the MFI issues big loans and uses capital $x_b(i)$, then the expected payoff from the loan portfolio is

4 $$\frac{X}{x_b}[(1+r)b-m-(1+i)(b-x_b)], \text{ or } \pi(b;i) \equiv X(1+i)\frac{\lambda m}{m-(1-\lambda)(r-i)b}.$$[12]

For a given interest rate on external debt, it is constructive to compare the payoffs from the two different portfolios. In this case, the MFI prefers to issue big loans only if $\pi(b;i) > \pi_j(s;i)$. We can rewrite this inequality in terms of b, which yields

5 $$b \geq \frac{m(\Delta_j+\lambda(r-i))}{(r-i)(\lambda m+(1-\lambda)\Delta_j)}.$$

Hence, there is a cutoff in terms of loan size where the MFI prefers to switch from small loans to big loans. If we define $b_j(i)$ as the size of the big loan where the MFI is just indifferent between small and large loans, then it is straightforward to confirm the following.

[11] It obviously follows that the capital ratio, $x_b(i)/b$, is also less than the ratio for the small loan.

[12] Note that we have dropped the subscript on π indicating MFI type because for a portfolio of big loans, type does not influence the payoff.

Lemma 2. $b_h(i) > b_l(i) = 1$.

The advantage of the large loan is that it involves less operating cost per dollar. This raises the financial return on capital for the MFI. Of course the trade-off is that the large loan does not produce any social return. If it turns out that the MFI is not effective at reducing poverty, then this trade-off is irrelevant. Hence, the better the MFI is at reducing poverty through its small loan program, the larger b needs to be in order to make the big loan a desirable. As we discuss later, an immediate implication of this is that the degree of subsidy on the interest rate impacts the loan cutoff size for a type h MFI.

4. Monitored debt funding

In this section we look at a case where external funding is supplied by a single donor or a small number of donors who can closely monitor the lender. While the donor cannot observe the social impact Δ_j, we assume that the donor can observe and contract on the size of the loan that the MFI issues. With this information, the donor can condition both the availability and interest rate of his funds on the type of loan assets selected by the MFI. We use this kind of contract as a means of modeling a market setting where the donor can withdraw his debt funding if the MFI makes "unacceptable" portfolio choices. For example, if the MFI solicits subsidized debt with the intention of issuing small loans to the poor, but decides to issue large loans instead, the donor can costlessly withdraw all his funding.

With this kind of contracting, two different interest rates are acceptable to the donor. If the MFI issues big loans, then the MFI must pay the donor the market rate, i_m. If the MFI issues small loans, then the donor is willing to accept a subsidized interest rate, where $i < i_m$. The degree of the subsidy depends on what the donor believes about the MFI's type.

A natural way to organize the analysis is according to the size of the parameter, b. As we mentioned in the introduction, the size of a b loan that the MFI can successfully issue and manage, can be argued to depend on the lending experience of the MFI. In our paper, we take the stance that a less mature institution tends to be limited to value of b that is relatively close to the size of the small loans. Over time however, as the institution acquires more lending experience, this constraint eases, and the institution can issue loans characterized by a larger value of b.

First, we look at behavior when b is relatively close to 1. In this regard, we have the following result.

Proposition 1. In a pooling equilibrium, both types of MFI issue small loans and pay $i = i_m - \alpha\Delta_h$, as long as $b \leq b_1$, where $b_1 \equiv \frac{(1-\lambda)(1+i_m)(r-i_m+\alpha\Delta_h)-\alpha\Delta_h m}{(1-\lambda)(r-i_m)(1+i_m-\alpha\Delta_h)}$.

Proof. Since both types of MFI issue small loans, the donor does not accept an interest rate less than $i = i_m - \alpha\Delta_j$. At this rate, the type j MFI earns a payoff of $\pi_j(s; i_m - \alpha\Delta_h)$. If either type of MFI deviates by choosing big loans, then the donor will not accept an interest rate less than $i = i_m$. At this rate, the deviating MFI earns a payoff of $\pi(b; i_m)$. This deviation is not worthwhile as long as

6 $X(1+i_m-\alpha\Delta_h)\frac{\lambda m+(1-\lambda)\Delta_j}{m-(1-\lambda)(r-i_m+\alpha\Delta_h)} \geq X(1+i_m)\frac{\lambda m}{m-(1-\lambda)(r-i_m)b}$.

Clearly, if this inequality holds for $j=l$, then it also holds for $j=h$. At $j=l$, the inequality reduces to $b \leq \frac{(1-\lambda)(1+i_m)(r-i_m+\alpha\Delta_h)-\alpha\Delta_h m}{(1-\lambda)(r-i_m)(1+i_m-\alpha\Delta_h)}$, implying that neither MFI will deviate. *QED*

This market outcome identifies a dilemma that may be associated with social investment in microfinance. In this case, the type l MFI chooses to solicit external funds by proposing to specialize in a kind of lending that it is not good at. The availability of cheap external funding tempts the less effective MFI into copying the portfolio of an MFI who is more effective at poverty reduction. This means that all types of MFI specialize in issuing small loans to the poor. The problem is that this is inefficient. The type l MFI would earn a higher return on capital by pursuing large loans. Furthermore, since $\Delta_l = 0$, the deviation would not have negative implications for poverty reduction. Of course the reason the MFI will not deviate is that he knows the donor would respond by withdrawing the subsidy.

The pooling behavior offers one explanation for how subsidies can distort lending behavior. In this case, a segment of the industry engages in lending practices that accomplish little or no poverty reduction. This is relevant when socially minded external donors have a hard time verifying the actual impact of the MFI. These donors supply subsidized funds based on an average impact value, and this subsidy encourages all MFIs to turn down larger, more profitable lending opportunities. Exactly how long this will last, or more specifically what kind of loan sizes will be denied, depends on the cutoff value. At a certain point, when loan size opportunities are sufficiently large, the MFI will turn down the subsidized funding. In general, this depends on what the cutoff value b_1 is.

Corollary 1. $\frac{\partial}{\partial\alpha}b_1 > 0$ *and* $\frac{\partial}{\partial\lambda}b_1 < 0$.

When α is closer to 1, external donors are more confident that an MFI is effective at reducing poverty. This translates to a lower interest rate, and thus, a higher subsidy. The implication is that the MFI derives a relatively larger payoff from keeping its portfolio of small loan portfolio and thus, the cutoff point b_1 is higher. Of course, a higher α means MFIs are better at poverty reduction, on average, which is good for the poor. The downside to this is that the deeper subsidy further distorts the behavior of those MFIs who in fact should be targeting more profitable loan opportunities. Another potential problem is that a bias in donors' beliefs might further aggravate this distortion. If we interpret the findings of Bauchet et al. (2011) to mean that beliefs about α have been inflated, then this means b_1 is too high. In this sense, excessive optimism on the part of external donors to micofinance may stall institution's incentives to cater to more profitable, faster growing small businesses in their credit markets.

As λ rises, the expected return from imprudent lending rises. Thus, as λ rises, $x_j(i)$ rises. To see the impact this has on the MFI's behavior, note that the cutoff value b_1 is defined as the large loan size where the type l MFI is indifferent between issuing small and large loans. Since $b_l(i) = 1$, i.e., the MFI prefers the big loan all else equal, the only reason the MFI issues small loans is because of the subsidy he gets on the interest rate.

That is, the MFI is motivated soley because of the discount offered on external funding. If $x_j(i)$ rises, due to an increase in λ, then external funding plays less of a role in the MFI's profit, and so, he is more willing to issue larger loans. This is why an increase in λ lowers b_1.

This establishes a link between the leverage of the MFI and the types of loans it will issue. In general, the lower λ is, the more important it is for the MFI to screen and monitor its borrowers. The implication is that leverage rises and so, the span of large loan sizes that will be turned down in equilibrium widens. Namely, b_1 increases. Given this finding, we might argue that in markets where close monitoring of borrowers is crucial to maintaining low default rates, MFIs may take longer in transitioning to larger loans.

Presumably over time, the MFI will find that it is faced with increasingly larger and more profitable loan opportunities. Again, this should be a natural result of the relationships that the lender builds with its small lending portfolio. As the size of b increases, the incentive to switch to a big loan intensifies. This is most acute for the MFI that is least effective at reducing poverty. In this regard, we have the following result.

Proposition 2. In a separating equilibrium, the type h MFI issues small loans and pays $i = i_m - \Delta_h$*, while the type l MFI issues large loans and pays* $i = i_m$*, as long as* $b_2 \leq b \leq b_3$*, where* $b_2 \equiv \frac{(1-\lambda)(1+i_m)(r-i_m+\Delta_h)-\Delta_h m}{(1-\lambda)(r-i_m)(1+i_m-\Delta_h)}$ *and* $b_3 \equiv \frac{(1-\lambda)\lambda(1+i_m)(r-i_m+\Delta_h)-\Delta_h m(\lambda m+(1-\lambda)(\Delta_h-(1+i_m)))}{(1-\lambda)(r-i_m)(1+i_m-\Delta_h)(\lambda m+(1-\lambda)\Delta_h)}$.

Proof. At an interest rate $i = i_m - \Delta_h$, the type $j = h$ MFI issues small loans are earns $\pi_h(s; i_m - \Delta_h)$. If this type of MFI deviates and offers big loans, he must pay $i = i_m$, and will earn $\pi(b; i_m)$. Thus, the MFI will not deviate as long as $\pi_h(s; i_m - \Delta_h) \geq \pi(b; i_m)$, or $b \leq \frac{(1-\lambda)\lambda(1+i_m)(r-i_m+\Delta_h)-\Delta_h m(\lambda m+(1-\lambda)(\Delta_h-(1+i_m)))}{(1-\lambda)(r-i_m)(1+i_m-\Delta_h)(\lambda m+(1-\lambda)\Delta_h)}$.

The type $j = l$ MFI issues big loans and pays an interest rate $i = i_m$ on its debt. This gives the MFI a payoff of $\pi(b; i_m)$. If the MFI deviates and offers small loans, then when the donor believes the MFI is type $j = h$ with probability 1, the interest rate becomes $i = i_m - \Delta_h$. In this case, the deviation earns the MFI a payoff of $\pi_l(s; i_m - \Delta_h)$. Hence, the MFI will not deviate as long as $\pi(b; i_m) \geq \pi_l(s; i_m - \Delta_h)$, or $b \geq \frac{(1-\lambda)(1+i_m)(r-i_m+\Delta_h)-\Delta_h m}{(1-\lambda)(r-i_m)(1+i_m-\Delta_h)}$. *QED*

Once the type l MFI is capable of successfully issuing large enough loans, it becomes worthwhile to forgo the subsidies and turn to market priced debt. The critical tipping point is b_2, as defined above. When loan opportunities exceed b_2, the type l MFI can earn a higher return on capital by relying on market priced debt to issue large loans. If the size of b correlates with the maturity of the lending institution, we can argue that in time, microfinance lenders should start to specialize according to what they are good at. Lenders that cannot accomplish much poverty reduction switch gears and explore more profitable loan opportunities. These lenders are better off using market priced funding to issue larger loans. In contrast, lenders that have effective small loan programs continue to issue such loans, and now access subsidized external funds at the rate $i = i_m - \Delta_h$. Since this rate is lower than the one in Proposition 1, the deeper subsidy should induce these lenders to further leverage their loan portfolios, as $x_s'(i) < 0$. This is one clear advantage of separation. Namely, that external funding is priced according to exactly what the MFI accomplishes with its loans.

Note that with regard to the tipping point, $b_2 > b_1$. This is because to sustain separation, b needs to be sufficiently large to persuade the type l MFI to not deviate back to a portfolio of small loans, which are now being funded at relatively lower interest rate of $i = i_m - \Delta_h$.

Corollary 2. There are no big loans issued by the lender until $b > b_2$.

Just to emphasize, microfinance will not issue large loans as part of an equilibrium until the industry is at a point where it can handle $b > b_2$. This means that donors are unable to separate MFIs for an interval of large loan sizes. When $b < b_2$, efforts by donors to properly charge MFIs according to what they accomplish will be fruitless. The subsidies based on average social impact are simply too generous to encourage MFIs to specialize according to their relative abilities. Clearly this kind of incentive can have harmful implications for the industry. In a more generalized model, one can imagine a case where lenders gain experience through gradual increases in loan size. If subsidies discourage the institution from issuing such loans, microfinance might find it difficult to groom selected institutions into more profitable, market based financial intermediaries.

The extent of this problem depends on what the cutoff value is. The loan size b_2 determines exactly when institutions will begin to turn down external subsidies and start using market priced debt. Like with b_1, the cutoff point b_2 depends on several different parameters in the model. One can easily confirm the following.

Corollary 3. $\frac{\partial}{\partial \alpha} b_2 = 0$, $\frac{\partial}{\partial \lambda} b_2 < 0$ and $\left|\frac{\partial}{\partial \lambda} b_1\right| > \left|\frac{\partial}{\partial \lambda} b_2\right|$.

These comparative statics are roughly consistent with what we found in Corollary 1. Under separation, donors' beliefs about the average quality of the MFI are irrelevant. This implies that once MFIs are at a point where they can offer loan sizes such that $b > b_2$, the earlier mentioned problems associated with optimism about what α is disappear. In this sense, bias in donors' beliefs should not interfere with the conditions necessary to support the separating equilibrium as an outcome in the microfinace market.

The degree of leverage impacts whether the economy can support separation or not. In our model, the institution's leverage is a function of λ. As λ falls, prudent lending is more important and hence, capital requirements rise, which decreases the importance of external funding in the rate of return on capital. Thus, the fall in λ pushes the MFI towards issuing large loans. We do note that this effect is now less pronounced that it was in Corollay 1, as indicated by the absolute values. This is just because the subsidy on the interest rate is now relatively more generous, so this pushes against the incentive for the MFI to issue big loans.

From a practical standpoint, microfinance is often characterized as form of lending which involves rather high costs of screening and monitoring. Absent public credit history or the threat of collateral loss, borrowers must be persuaded into repayment through constant monitoring. For example, Field et al. (2013) find evidence that introducing more flexible contract terms, which say, imply with less monitoring, leads to a significant increase in default rates. Also, based on their empirical findings, Bauer et al. (2012) argue that some microfinance loans can be viewed as a kind of structured savings device. Basically, clients are unable to save on their own, so they use the microfinance loan, along with the intensive monitoring by the lender, as a means of effectively saving money.

These studies suggest that microfinance, relative to other credit markes, is characterized by a relatively low λ value. If this is true, then our model suggests b_2 should be relatively high. All else equal, because a low λ implies a high b_2, microfinance is particularly likely to be stuck in a state where there is no exploration of larger loan sizes. This works as follows. The necessity for costly screening and monitoring means moral hazard is

less of a problem, implying that capital is low and thus, external debt is a more important component of the MFI's payoff. Hence, the subsidy game is that much more relevant.

There are various reasons why λ might increase. One is through state invention. For example, the government can establish a public credit bureau or reform collateral laws. Both of these might serve to increase λ. The question though is how they impact m. To a certain extent, these reforms act as substitutes for prudent lending practices. Hence, if reforms raise λ by encouraging loan repayment, this might lower m. In this case, the effects on capital requirements are more ambigous. One might extend our model and say that as λ rises, operating cost falls to θm, where θ lies between zero and one, depending on the degree to which the MFI can reduce its costs of prudent lending practices.

Lastly, at some point the type h MFI finds that the large loan opportunities funded with market priced debt are more attractive than small loans. In this event, both types of MFI switch to larger loans and we have the following result.

Proposition 3. In a pooling equilibrium, both types of MFI issue big loans and pay $i = i_m$, as long as $b \geq b_3$.

Proof. Since both types of MFI issue large loans, the donor will not accept an interest rate less than $i = i_m$. At this rate, the type j MFI earns a payoff of $\pi(b; i_m)$. If either type of MFI deviates and proposes small loans, then the interest rate acceptable to the donor depends on the donor's beliefs off the equilibrium path. Suppose the donor believes the deviator is type $j = h$. Thus, the deviating MFI can raise debt at the rate $i = i_m - \Delta_h$. From the deviation, the type j MFI earns a payoff of $\pi_j(s; i_m - \Delta_h)$. This deviation is not worthwhile as long as

$$7 \qquad X(1+i_m)\tfrac{\lambda m}{m-(1-\lambda)(r-i_m)b} \geq X(1+i_m-\Delta_h)\tfrac{\lambda m+(1-\lambda)\Delta_j}{m-(1-\lambda)(r-i_m+\Delta_h)}.$$

Clearly, if this inequality holds for $j = h$, then it also holds for $j = l$. At $j = h$, the inequality reduces to $b \geq \frac{(1-\lambda)\lambda(1+i_m)(r-i_m+\Delta_h)-\Delta_h m(\lambda m+(1-\lambda)(\Delta_h-(1+i_m)))}{(1-\lambda)(r-i_m)(1+i_m-\Delta_h)(\lambda m+(1-\lambda)\Delta_h)}$, implying that neither MFI will deviate. *QED*

5. Arms-length external debt contracts

In this section we look at a different kind of contracting for the supply of external debt. Now we assume that the supply of funding is not conditional on the type of loan assets selected by the MFI. Once the MFI acquires debt funding at a specified interest rate, the MFI is free to use the funds for small or large loans. With this contract we have in mind a market setting where the MFI pulls from a diverse set of uncoordinated suppliers. The investors who supply the debt still value a social return, but lack the ability to monitor and enforce asset selection by the MFI. Keep in mind that we continue to assume that a third party, such as a regulator enforces capital requirements.

The interest rate that the donor charges on debt depends on what kind of portfolio the donor expects the MFI to select.[13] While the donor cannot observe asset selection, the donor is able to observe b and knows what the feasible Δ_j values are. Hence, the donor makes an expected value calculation for the interest rate based on an expectation of how the different types of MFI will behave. The type l MFI should always choose big loans, as indicated by Lemma 2. The type h MFI issues small loans as long as $b \leq b_h(i)$, as explained in Section 3.

Proposition 4. If $b \leq b_h(i)$, then in equilibrium the type h MFI issues small loans and the type l MFI issues big loans, where $i = i_m - \alpha\Delta_h$.

Proof. At the interest rate $i = i_m - \alpha\Delta_h$, the type h MFI issues small loans are earns $\pi_h(s; i_m - \alpha\Delta_h)$. If this type of MFI deviates and offers big loans, then he earns $\pi(b; i_m - \alpha\Delta_h)$. Thus, the MFI will not deviate as long as $\pi_h(s; i_m - \alpha\Delta_h) \geq \pi(b; i_m - \alpha\Delta_h)$, or $b \leq \frac{m(\Delta_j + \lambda(r - i_m + \alpha\Delta_h))}{(r - i_m + \alpha\Delta_h)(\lambda m + (1-\lambda)\Delta_h)}$. Since the type $j = l$ MFI prefers to issue big loans regardless of their size, i.e., $b_l(i) = 1$, there is no incentive for this type of MFI to deviate by selecting small loans. *QED*

When the interest rate on external debt is not sensitive to the type of loans in the MFI's portfolio, once the funds are allocated, the MFI selects the portfolio that maximizes its expected return on capital. This creates an outcome in the market where lenders specialize according to what they are relatively good at. The MFI that turns out to be ineffective at poverty reduction pursues larger, more profitable loan opportunities, while the MFI that is good at poverty reduction focuses on small loans. The donor who provides the external funding faces a gamble in terms of how his funds will be used. In this case, the donor charges a pooling interest rate that reflects the probability that the MFI will specialize in each loan type.

It is worthwhile comparing how the different kinds of debt contracting influence lending behavior. First, consider the case where b is sufficiently close to 1. As indicated by Propositions 1 and 4, under both kinds of debt contract the interest rate and expected poverty reduction are the same. However, under the arm's length contract the expected return on capital is relatively higher. This is because the type l MFI issues big loans for all $b > 1$. Furthermore, this portfolio choice has no negative implications for poverty reduction. This is due to our assumption that $\Delta_l = 0$. If instead, we adopted $\Delta_l > 0$, then obviously when the type l MFI selects big loans there would be less poverty reduction. However, a higher Δ_l would imply a higher $b_l(i)$, meaning that for all b where $b \leq b_l(i)$, the type l MFI would in fact choose small loans under the arms-length contract.

The point here is that the potential downside of a setting where donors cannot monitor the asset choices by the MFI is minimized through the endogenous behavior of the MFIs themselves. This implies that when external donors exercise less control, as the trend appears to suggest, while there may be less poverty reduction, it is a problem that is minimized. Less scrutiny by external donors can lead to an efficiency gain for the microfinance industry. Keep in mind that this gain only emerges when it is not feasible for the donor to monitor asset selection by the MFI. If given a choice, the donor would prefer ex post, after he observes the MFI's portfolio choice, to withdraw funds or alter the contract if he observes that the MFI plans to not issue small loans. In

[13] To ease the discusssion and maintain continuity with the previous section, when talking about the supply of debt we will refer to a singular "donor".

this sense, the gains from less monitoring only emerge when the suppliers of funds are incapable of monitoring asset choices by the MFI.

That monitoring by the external donor can have negative implications for the return on capital does not mean monitoring is always a problem. At higher values of b, namely where $b > b_2$ everything changes. As described in Proposition 2, monitoring by the donor is consistent with separation, such that MFIs select loan sizes that coincide with ex post maximization of the return on capital. Furthermore, the two interest rates described in Proposition 2 reflect exactly how the MFI plans to use the debt. The MFI that issues small loans pays a low, subsidized interest rate, and the MFI that issues big loans pays a market interest rate. In contrast, under Proposition 4, the MFIs both pay the same interest rate on debt. Thus, when external debt is supplied by diversified donors who are unable to monitor asset choice, MFIs specialize according to what they are good at, but pay an interest rates that does not accurately reflect their asset selections. The type h MFI is pays too high of an interest rate and the type l MFI pays too low of an interest rate. In this case, the MFIs that are more effective at poverty reduction end up cross-subsidizing the MFIs that are less effective.

Corollary 4. $\frac{\partial}{\partial \lambda} b_h(i) > 0$.

This is different from what we found regarding type l MFI in Section 4. In this case, under the arms-lenght contract, as λ increases, making prudent lending practices less relevant, this increases the cutoff loan value facing the type h MFI. The intuition is as follows. Under the arms-length contract, the interest rate on external funding doesn't change when the MFI changes the loan size. This is different from Section 4. The implication is that an increase in λ only affects the MFI's payoff through the higher capital requirement, which impacts both the small and large loan in the same way. However, since it does not impact Δ_h and only small loans generate Δ_h, the increase in λ works to make the small loan porfolio more attractive. From a practical standpoint, this means that efforts to raise λ in credit markets can complement an MFIs incentive to stick with its effective small lending program. Just to emphasize, this effect is only present when MFIs rely on arms-length external funding.

Another point concerns how the debt contract influences exactly when microfinance chooses to stop issuing small loans. When the donor closely monitors asset choice, neither type of MFI issues small loans past b_3, while under the arms-length contact the cutoff point is $b_h(i)$. One can easily confirm the following.

Corollary 5. $b_3 > b_h(i)$ *at* $i = i_m - \alpha \Delta_h$.

This implies that when the suppliers of external funding cannot monitor asset choice, MFIs will be tempted to issue large loans at a relatively lower cutoff value for loan size b. The reason for this is that under the arms-length debt contract the type h MFI receives a smaller subsidy than it does in Proposition 2. The smaller subsidy, under the pooling rate, implies that the return on capital derived from small loans is relatively less attractive. Hence, the MFI is willing to decline the subsidy at relatively lower values of b. This suggests that when microfinance uses funding from diverse, uncoordinated suppliers, MFIs may transition more quickly to portfolios composed of larger, more profitable loans.

Also note that when the type h MFI chooses to issue big loans at the cutoff value $b_h(i)$, this change in the portfolio can be viewed as premature. The deviation in this case is due to an interest rate on external debt that does not properly reflect the quality of the MFI's small loan portfolio. If instead, the MFI was able to raise external debt at $i = i_m - \Delta_h$, the MFI would continue to issue small loans. In this sense, the lack of information on the part of external donors regarding portfolio choices drives MFIs with effective small lending programs to prematurely abandon the programs.

6. Conclusion

Throughout the developing economies, microfinance intermediation has proved surprisingly adept at connecting micro-sized businesses with several different types of external funding. A common characteristic to many of these funding sources is that they value a blended return. Historically, this social aspect to microfinance investment has been critical to the industry. Inherent to the idea of a blended return is a trade-off between a financial return and a social one. To a certain extent, this is what is at the heart of an ongoing debate about a trend towards "mission drift" in microfinance. The concern among analysts is that institutions are choosing to abandon their small lending programs, which benefit the poor, in order to chase higher financial returns on larger loans. A counter argument states that since microfinance has proved itself viable, it is time to take a more profitable orientation and decrease dependence on subsidies. Looking at data from Bangladesh, Salim (2013) attempts to measure some of these trade-offs and finds that two larger MFIs, BRAC and the Grameen Bank, have given up 51.4% and 35.2% of potential profits, respectively, to focus on poverty minimization.

While these numbers may persuade external donors that microfinance institutions do in fact value poverty reduction, it leaves open the question of just how much financial return should be sacrificed for social objectives. This is perhaps even more relevant given the recent empirical studies that point to rather low social returns from microfinance. In this context, our paper proposes one way to organize the discussion.

Our model focuses on a basic choice faced by a lending institution about whether to continue issuing small loans to the poor, or to pursue larger, more profitable loan opportunities. The institution weighs the advantages of accessing cheap external funding against the return on capital from making larger, more profitable loans. The results of our paper suggest that different sides of the argument can make sense within the right context. For example, we find that when external donors lack perfect information about the impact an MFI has on poverty, there may be tendency for MFIs to put too much emphasis on small loans. The availability of subsidies distorts the portfolio choices of certain lenders in a negative way. One worry is that this disincentive to explore larger loan opportunities might hurt the development of the microfinance industry by preventing a learning-by-doing process. We identify two possible remedies for this problem. One is that when larger loan opportunities become profitable enough, external funding can be supplied through a pair of separating contracts that encourage institutions to specialize. This suggests time itself may help, in that as institutions gain experience, eventually resource allocation should improve. A second solution is for microfinance to access external funds through a more diverse set of donors, who exercise less control over an MFI's portfolio choices. However, less monitoring has trade-offs itself. In particular, less informed external funding leads to less precise interest rates, which can encourage lenders to prematurely abandon effective small lending programs.

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