Expansion and Welfare in Microfinance: A Screening Model*

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Abstract

The expansion of microfinance has triggered concerns of rising indebtedness, and higher default and interest rates. Using a screening model, we show that even if interest and default rates increase due to expansion, borrower welfare may improve. This is because: (i) all borrowers previously denied credit can obtain loans, and (ii) screening costs for pre-existing borrowers go down. Hence, policies that seek to regulate interest and screening levels can be counter-productive.

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1 Introduction

Microfinance refers to the idea of providing financial services to the low-income households, who are typically defined to be "non-bankable" by the traditional banking system. While there are some operational dissimilarities across countries, the fundamental idea – collateral free lending to the poor – remains the core idea behind microfinance. Historically, microfinance originated as a benevolent institution – often with limited funds – designed to enhance the welfare of such poor households. However, over time, it has experienced high growth both in terms of access to larger funds, as well as the number of microfinance institutions (MFIs). This change in the scale of operations has led to several concerns like borrowers having easier access to credit, which, in turn, can lead to an increase in interest and default rates.[1]

The main objective of this paper is to analyze the validity of these concerns and assess whether the consequent policy responses are in the right direction. We believe this is an important objective. This is because microfinance represents an important alternative source of credit, particularly for the poorer households in developing economies. Assuming that the borrowers behave rationally, access to microfinance is presumably welfare enhancing for them. Therefore, policy interventions in this sector need to be rigorously analyzed, both theoretically and empirically. Our paper is a contribution in this direction.

There is some empirical evidence that growth of microfinance does lead to an increase in default rates. For example, in their study of the Ugandan microfinance sector, McIntosh et.al. (2005) show that default rates have risen following an expansion the MFI sector. However, the more interesting question is how the welfare of borrowers changes when the microfinance industry expands. In this paper, we develop a theoretical perspective that allows us to answer this question. Using a standard screening model, we show that increase in the scale of operations in the MFI sector can, indeed, raise interest rates and default rates. Despite this, we show that the welfare of all borrowers can improve. Hence, the expansion of microfinance can represent a Pareto improvement in borrowers' welfare.

In our model, the microfinance sector expands when a small benevolent MFI is replaced by a large number of competitive profit-maximizing MFIs. Borrowers are of two types: low risk and high risk. We first consider a situation where a benevolent but fund-constrained (small) MFI is the sole lender. In order to optimize the utilization of its loans, it may seek to restrict their availability to low risk agents by imposing certain onerous conditions which we interpret as screening costs.[2] Since lending is limited to low risk borrowers, interest rates and default rates are low. Next, we consider a competitive microfinance sector consisting of profit–motivated MFIs without any restrictions on lending abilities. We show that in the competitive sector, all borrowers, including the more risky

[1] See http://www.bbc.co.uk/news/world-south-asia-11997571. Also, see http://microfinanceafrica.net/news/a-case-of-multiple-borrowings/ and http://www.guardian.co.uk/katine/2008/jun/03/livelihoods.projectgoals1 for similar concerns expressed about microfinance sectors in Africa and Bangladesh respectively.

[2] We interpret screening cost not as a monetary amount but as the cost involved in meeting some of the onerous conditions that MFIs impose to access credit. These may take the form of a lengthy waiting period during which prospective borrowers need to complete a training program or pass an exam.

ones, obtain credit. As a result, the the default rate must increase under MFIs. To cover for the higher aggregate default rate, the interest rate must also increase. For the less risky borrowers, on the other hand the screening costs reduce. Therefore, while the more risky borrowers obtain credit, the less risky ones obtain it at lower cost. Therefore, the welfare of all borrowers improves.

Theoretically, the paper provides an intuitive understanding of the expansion of the microfinance sector and its implications on welfare of consumers. However, is there any evidence of the type of contracts we derive in our results? For evidence of screening contracts which play an important role in our results, we have looked at the loan products offered by certain MFIs in India. These MFIs offer multiple loan products with varying interest rates, repayment structures, and terms and conditions for the borrowers to choose from. For example, Madura Microfinance, an MFI based in the state of Tamil Nadu in South India, offers two loan products through the joint liability mechanism: SHG Activity Term Loan and Certified Activity Loan. SHG (self–help group) loan sizes are typically lower – Rs. 18,000 ($300) at the beginning with a tenure of three years, and group members twelve to twenty. No other restrictions are placed on these loans. On the other hand, Certified Activity Loan sizes tend to of Rs. 10,000 ($ 170) with one year tenure and smaller group sizes. However, in order to be eligible for these loans, the borrowers have to clear a Micro-Business Education, Level 1 exam with at least 60% marks.[3] This exam requires substantial time commitment and effort from the borrowers. We can, therefore, interpret this exam as a screening mechanism.[4] Further, while we are unable to provide formal evidence, conversations with these microfinance institutions have indicated that these screening norms have reduced over a period of time, as the number of MFIs in the region have increased.

There is also some evidence that the orientation of the microfinance sector has changed from benevolent to profit maximizing objectives. Bank Rakyat Indonesia (BRI) of Indonesia and BancoSol in Bolivia are couple of examples that substantiate this assumption (Bateman, 2010 – p. 14 – 15). In the Indian case too, the sector first emerged in the form of small not–for–profit SHGs which were then followed by commercial MFIs (Bansal, 2003).

The results in this paper have significant policy implications. In light of the concerns about the expansion of microfinance that we have discussed earlier, several governments have instituted steps to regulate the operations in this sector. These regulations typically take the form of interest rate caps and restricting the amount of loan a borrower is eligible for.[5] However, as our results show, attempts to cap interest rates may prevent MFIs from extending credit to more risky agents. This can reduce default but at the cost of more stringent screening norms which will adversely affect

[3] http://maduramicrofinance.com/products.html (as of 9th September, 2015).

[4] Several other microfinance institutions that we came across in India (Spandana, Grameen Financial Services Private Limited, etc) have different loan products based on joint liability mechanism with varying interest rates and repayment structures. These can be interpreted as measures adopted by the MFIs to screen various types of borrowers.

[5] For example, the Ministry of Finance of the Government of India is currently in the process of passing a bill that regulates MFIs in India. Some of the measures proposed in the bill include putting a cap on interest rates and margins charged by the MFIs, limiting a borrower to only one joint liability group and restricting the number of MFIs a borrower can approach to two. For full details of this proposed law, see: http://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/YHMR190111.pdf

the welfare of the safe borrowers as well.[6] We, therefore, argue that as long as participation by borrowers is voluntary, any regulation that seeks to intervene with the expansion of the microfinance sector may not yield the desired results. Hence, policy makers should be circumspect in imposing restrictions on interest rates and mandating high screening requirements.

1.1 Literature Review

This paper contributes to two strands of literature: competition and expansion in microfinance and the usage of screening devices in credit markets.

McIntosh and Wydick (2005) investigate a related question of whether expansion of MFIs improves borrower welfare. In their model, borrowers are distinguished by the level of income which is known to the lending agencies. A benevolent MFI, in a monopoly situation, is, therefore, able to cross subsidize poorer borrowers by charging a lower interest rate. When a new MFI enters, the incumbent's ability to cross-subsidize poor borrowers does not exist, and as a result the poor borrowers are denied loan. This harms their welfare. Our conclusion is not so stark. We identify situations where all borrowers benefit from expansion. Guha and Roy-Chowdhury (2013) also investigate certain questions that are of relevance for us; for example, whether default increases due to expansion of microfinance. Their result matches ours in that default does increase.[7]

Our analysis differs from these two studies in three crucial respects. First, these papers differentiate agents on the basis of income and assume MFIs have complete knowledge of the income of individual clients. We differentiate agents on the basis of risks and make a weaker informational assumption; that lenders only know the overall distribution of risk profiles, and not the risk characteristic of individual clients. As a result, all they can do is offer a menu of contracts from which, borrowers can self-select. They cannot thrust a contract on borrowers based upon their knowledge of borrowers' private characteristics. Nevertheless, some of our conclusions, for example, increase in default, matches existing results in Guha and Roy Chowdhury (2013). Since we do not differentiate borrowers according to income, we do not address the question that McIntosh and Wydick (2005) consider as to whether the expansion of microfinance has benefited the poor. Second, the existing literature assumes that all MFIs are benevolent entities. In most of our analysis, we have done away with this assumption. Instead, we adopt, in our opinion, the more realistic view that while the initial (typically, small) entrants into the sector may be so motivated, subsequent expansion happens through the entry of profit motivated entities.

There exists a significant literature on screening in credit markets (Stiglitz and Weiss, 1985; Bester, 1985, 1987; Besanko and Thakor, 1987). Much of this literature is based on the use of collateral as a screening mechanism. Our contribution is to extend the idea of screening to the context of microfinance where, instead of collateral, screening is based on more intangible factors

[6] A recent article in the Economist also argues that it is indeed the case.(http://www.economist.com/news/finance-and-economics/21595470-tiny-loans-are-getting-more-expensive-poor-service)

[7] The main focus of Guha and Roy-Chowdhury (2013) is on the issue of multiple borrowing in microfinance as the sector expands. Also see Lahkar and Pingali (2014) for an alternative explanation of multiple borrowing.

as discussed earlier (see footnote 2).[8]

Our results show that when the microfinance sector expands, screening costs actually go down. An interesting question here is what are the repercussions of this result on informal sector lending. While we do not consider this question formally, we can make certain conjectures based on some models of horizontal linkages between formal and informal sources of credit.[9] For example, Chaudhuri and Gupta (1996) and Gupta and Chaudhuri (1997) consider models where the paucity of funds with a formal source of credit (a bank) causes the loan seeker to bribe the bank official in order to reduce waiting time for obtaining the loan. In equilibrium, effective interest rate with the formal source of credit (actual interest rate plus the bribe paid) is equal to the interest rate prevailing in the informal sector. Extending this idea to our case, we conjecture that the effective interest rate charged by an MFI (interest rate plus the opportunity cost of waiting and the screening cost) equals the interest rate charged by the money lender. Then, if the screening cost reduces sufficiently, we may see that there is reduction in the overall interest rate charged by the informal sector as well.[10]

While our model of credit expansion in formal sector generally leads to positive effects on the welfare of borrowers, there are other models, especially related to vertical linkages between formal and informal sources of credit, in which, following credit expansion, the effect may be less benign. For example, Hoff and Stiglitz (1996) argue that as more informal lenders enter the credit market, the cost of loan enforcement raises, which in turn, may raise interest rates. Bose (1998) considers a model where both borrowers and lenders are heterogeneous. Following expansion of cheap formal sector credit, the moneylender who has better information about borrowers restricts operations to high quality borrowers. Low quality borrowers, then, end up with the poorly informed moneylender and, therefore, need to pay a higher interest rate. On similar lines, Floro and Ray (1997) argue that expansion of credit through vertical linkages may not be welfare enhancing because it creates scope for greater collusion among informal lenders through increased ability to lend.[11] More recently Chaudhuri and Ghosh Dastidar (2011) consider a Stackleberg model between an existing money lender, a bank and new money lenders in which corruption by the bank official in disbursing formal credit might cause vertical linkages to break down.[12] All these papers deal with vertical linkages between banks and money lenders. Similar concerns may arise in the case of vertical linkages between the informal sector and the MFIs. Expansion of MFIs can adversely affect the welfare of informal sector borrowers.

[8]The literature also suggests other means of screening in credit markets. For example, see Jain (1999) for screening based on loan sizes.

[9]Floro and Ray (1997) define horizontal linkages as follows: *"Formal sector banks might compete directly with village moneylenders in credit provision."* Similarly, they define vertical linkages as: *"Informal lenders are viewed as having access to formal sources of lending, and the funds thus borrowed are then re-lent."*

[10]The informal sector also uses several screening mechanisms to overcome information asymmetry problem (Sarap, 1990, 1991)

[11]This argument is similar to excess capacity being used as a mechanism to sustain collusive behavior in oligopoly (Davidson and Deneckere, 1990).

[12]These papers on formal and informal credit market linkages consider the problem from a partial equilibrium framework. It is also possible to model these linkages from a macroeconomic perspective. For example, Ngalwa and Viegi (2013) use a dynamic stochastic general equilibrium model to analyze these linkages.

Finally, we note that the welfare enhancing benefits of microfinance we refer to are benefits relative to the situation where there is no or limited access to microfinance. We do not consider the question of whether microfinance contributes to a significant improvement in living standards of the poor. There are two views on this. Bateman (2010, Ch. 4) cites several assessment studies that argue that the impact of MFIs has been quite limited (in fact, negative in some cases). On the other hand, Pitt and Khandker (1998) show that microfinance has a positive impact when women are the prime borrowers. More recently, Rashid, Yoon and Kashem (2011) find that microfinance helps build up wealth levels of the poor. These debates notwithstanding, microfinance is still a unique form of lending (collateral free debt), and forms an important source of loans for poor households with limited access to formal credit markets. Further, there is some empirical evidence to suggest that microfinance is preferred over other forms of formal loans (Lahkar, Pingali and Sadhu, 2012). Hence, our results, and the consequent policy implications, remain relevant for designing a more effective microfinance sector.

The rest of the paper is as follows. Section 2 describes our model and establishes equilibria under the two alternative regimes of a small benevolent MFI and a competitive MFI sector. We compare the two regimes in Section 3 and establish the main results of the paper, along with a discussion on policy implications of these results. Section 4 concludes the paper.

2 Alternative Credit Regimes

Consider a set of agents. Each agent has an investment opportunity that requires \$1 of financing. The investment yields a gross return of Y if it succeeds and zero if it fails. Agents differ in the probability with which they succeed in their investment. A proportion π is of type G whose probability of success is p_G. The remaining proportion is of type B and has probability of success p_B, $p_G > p_B$. Type G clients are, therefore, "low risk" while type B clients are "high risk". Agents do not have any funds of their own for the investment, and hence, they need to obtain a loan from a lending agency. Borrowers are protected by limited liability. Therefore, they do not have to repay anything if their investment fails. Further, in order to focus exclusively on the problem of adverse selection, we assume that there are sufficient mechanisms in place to curb the problem of moral hazard.[13]

Agents' utility of consumption is given by a a standard increasing and concave utility function on consumption $u(\kappa)$. If the investment succeeds and the borrower pays an interest R to the lender, then consumption is $\kappa = Y - R$. In addition, if the borrower needs to incur some other cost, for example a screening cost c, then we assume that the borrower's net utility is given by the linearly separable form $u(\kappa) - c$. We interpret screening cost not as a monetary transfer from the agent to the principal, but rather as a wasteful expenditure of time and effort that the agent has to incur to

[13]The analysis in this paper have been done under the assumption of individual liability. Even though microfinance started as a joint liability mechanism for providing loans, individual liability is increasingly becoming popular. The individual liability mechanism also has the advantage that it makes the presentation simpler. Results with joint liability mechanism, available with the authors upon request, are qualitatively very similar to the ones under individual liability.

convey her type. In the context of microfinance, these screening costs take the form of compulsory savings, mandatory attendance of group meetings, participating in compulsory training programs etc. We maintain this interpretation throughout the paper.

We now consider lending under two alternative scenarios. In the first scenario, there is only one lending agency, a small MFI with benevolent intentions. To reflect the benevolent orientation, we assume that the MFI is motivated by maximizing social welfare and, therefore, despite its monopoly position, charges a break even interest rate. However, as is typically observed, such a benevolent organization has limited lending capacity and cannot meet the entire demand for loans in the community. In order to highlight the effect of this limited lending capacity, we assume that the small MFI has only \$1 of funds so that it can lend to only one agent.

The second scenario we consider reflects the expansion of the sector. We characterize the equilibrium under the case where there is a significantly large number of profit-motivated microfinance institutions (MFIs) with sufficiently large access to funds. These MFIs, therefore, are able and willing to provide loans to any number of agents as long as they don't make loss.

2.1 Equilibrium under Credit Constrained Lender: Small Benevolent MFI

Let $\rho > 1$ be the cost the small benevolent MFI incurs in lending out \$1. We first characterize its lending policy under complete information. Suppose an individual of type T, $T \in \{G, B\}$, approaches the MFI for a loan. If the MFI is able to distinguish between the two types, and is willing and able to lend to the individual, it charges the break-even gross interest rate

$$R_T = \frac{\rho}{p_T}, \;\; T \in \{G, B\} \tag{1}$$

The payoff of a type T borrower, $T \in \{G, B\}$, is then

$$U_T = p_T u(Y - R_T). \tag{2}$$

We assume that $U_B > 0$, i.e. $p_B Y > \rho$ or $p_B > p_B^{\min} = \frac{\rho}{Y}$, so that both types have the incentive to participate in the market. However, by assumption, the benevolent MFI can only lend to one agent. The benevolent MFI is motivated by maximizing social welfare, which we measure as the total benefit U_T an agent can obtain from a loan. Since $U_G > U_B$, the MFI only lends to a low-risk individual.

This solution is not feasible under incomplete information; i.e. when the MFI only knows π but is unable to distinguish between the two types. A high risk agent, then, has the incentive to pretend to be of low risk and obtain the loan at interest R_G. This leads to a loss for the MFI and is, hence, infeasible.

One option for the MFI, then, is to provide the loan to the first individual that approaches it without seeking information about its type. With probability π, this agent is of the good type whereas with the residual probability, the type is bad. Therefore, to break even, the MFI needs to

charge the interest rate

$$\bar{R}(\pi) = \frac{\rho}{\pi p_G + (1-\pi)p_B}. \tag{3}$$

With this interest rate, the expected benefit that the \$1 loan creates is

$$\bar{U}(\pi) = \pi \left(p_G u(Y - \bar{R}(\pi))\right) + (1-\pi)\left(p_B u(Y - \bar{R}(\pi))\right). \tag{4}$$

Equation (4) is the MFI's measure of social welfare when it charges interest $\bar{R}(\pi)$. It is possible that social welfare is higher if the MFI lends only to a low-risk agent at interest R_G. For this to be feasible, the MFI must impose a screening cost in order to deter misrepresentation of type by high risk borrowers. If a high risk agent reveals her type, her payoff is zero since she is denied the loan. Therefore, the minimum screening cost, c_S, that can deter such an agent from claiming to be low risk is

$$\begin{aligned} & p_B u\left(Y - R_G\right) - c_S = 0 \\ \Rightarrow & c_S = p_B u\left(Y - R_G\right). \end{aligned} \tag{5}$$

Hence, the *screening contract* (R_G, c_S) attracts only low risk agents.[14] The MFI offers the loan to one such agent. That agent obtains payoff

$$\hat{U}_{G,S} = U_G - c = \left(p_G - p_B\right) u(Y - R_G) > 0. \tag{6}$$

The screening contract yields a total social benefit of $\hat{U}_{G,S}$. In contrast, the other contract, $\left(\bar{R}(\pi), 0\right)$, which we call the *pooling contract*, yields a total benefit of $\bar{U}(\pi)$. Since the MFI seeks to maximize the total utility that its loan creates, the loan contract it offers is as characterized in the following proposition. Since the result is straightforward, we omit the proof.[15]

Proposition 2.1 *The benevolent funds–constrained MFI offers the screening contract* (R_G, c_S) *if and only if*

$$\hat{U}_{G,S} > \bar{U}(\pi). \tag{7}$$

The default rate is then $1 - p_G$*. If* $\hat{U}_{G,S} \leq \bar{U}(\pi)$*, it offers the pooling contract* $\left(\bar{R}(\pi), 0\right)$*. In that case, the default rate is* $1 - (\pi p_G + (1-\pi)p_B)$*.*

2.2 Equilibrium Under Competitive Profit-Oriented MFI Sector

We now consider the alternative scenario of a competitive microfinance sector consisting of profit–motivated MFIs. We assume that these MFIs, collectively have unlimited funds at their disposal.

[14] To write a contract concisely, we use the notation (R, c), where R is the interest rate charged by the lending agency and c is the screening cost imposed on the agent.

[15] We make the arbitrary assumption that if $\hat{U}_{G,S} = \bar{U}(\pi)$, then the benevolent offers the pooling contract. It is also possible to characterize the contract that the benevolent MFI offers on the basis of the value of π, given (Y, ρ, p_G, p_B). We omit this result as it is not relevant for our main results in Section 3. Details of this characterization are available with the authors.

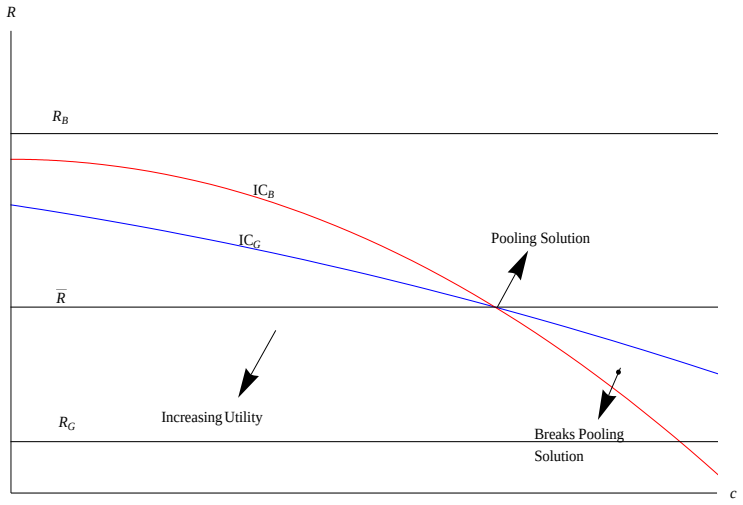

Figure 1: This figure depicts the non–existence of pooling equilibrium. IC_G and IC_B are the indifference curves of types G and B respectively in the (c, R) space, where c is the screening cost and R is the interest rate. Since both c and R are bads, indifference curves are concave and represent higher utility if they are closer to the origin. The slope of an indifference curve of type T, $T \in \{G, B\}$ is $-\frac{1}{p_T u'(Y-R)}$.

Hence, they are able to provide loans to any individual who seeks a loan. This is the key distinction between this scenario and the previous case (Section 2.1). Under perfect information, MFIs offer loans to all agents who seek the loan, charging the zero–profit interest rates R_G from low risk agents and R_B from high risk ones, where R_G and R_B are as defined in (1).

However, information is incomplete. Hence, we characterize the behavior of MFIs using a competitive screening model as in Mas-Colell et al. (1995). Possible equilibria of this model are separating, in which the two types of borrowers accept different contract, or pooling, in which all borrowers are offered the same contract. Standard arguments (see Mas-Colell et al., 1995, Lemma 13.D.1) imply that in any such equilibrium, MFIs must earn zero profit. Hence, in any separating equilibrium, MFIs must charge interest rate R_G from a low risk agent and R_B from a high risk one. In any pooling equilibrium, MFIs must charge interest rate $\bar{R}(\pi)$ defined in (3).

However, pooling equilibria does not exist in standard competitive screening models. Figure 1 adapts the argument in Lemma 13.D.2 of Mas-Colell et al. (1995) to establish the non–existence of such equilibria in the context of our model. Hence, the only possible equilibrium is a separating equilibrium in which a borrower of type T, $T \in \{G, B\}$ obtains a loan at interest rate R_T as defined in (1). Type B agents incur a screening cost of zero. Type G agents need to incur a screening cost just sufficient to ensure a payoff of U_B to type B agents who obtain a loan under the pretence of

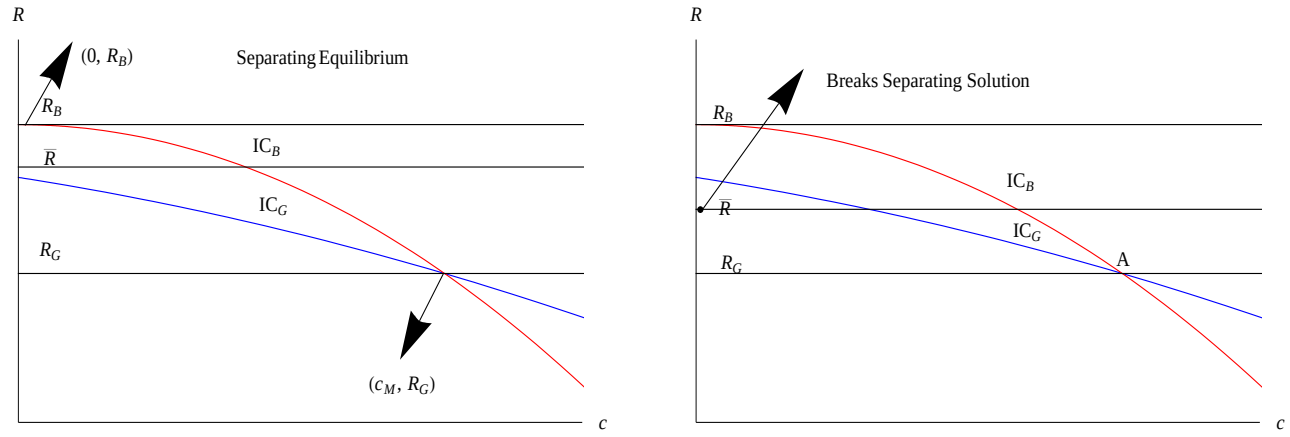

Figure 2: The left panel depicts the unique separating equilibrium with the set of screening contracts $\{(R_G, c_M), (R_B, 0)\}$. The right panel depicts a situation where there is no separating equilibrium. This happens because type G's utility with the contract $(\bar{R}(\pi), 0)$, which is $p_G u(Y - \bar{R}(\pi))$, is higher than the utility with the contract at point A, which is $\hat{U}_{G,M}$. This, in turn, is due to the fact that $\pi > \pi^*$ which brings $\bar{R}(\pi)$ closer to R_G than in the left panel.

being type G. Hence, this screening cost, c_M, is determined by the equation

$$\begin{aligned} p_B u\left(Y - R_G\right) - c_M &= U_B \\ \Rightarrow c_M &= p_B u\left(Y - R_G\right) - U_B. \end{aligned} \tag{8}$$

Therefore, the only possible separating equilibrium consists of the set of *screening contracts* $\{(R_G, c_M), (R_B, 0)\}$. Type G agents opt for the contract (R_G, c_M) which generates payoff

$$\begin{aligned} \hat{U}_{G,M} &= U_G - c_M \\ &= \left(p_G - p_B\right) u(Y - R_G) + U_B \\ &= \hat{U}_{G,S} + U_B, \end{aligned} \tag{9}$$

where $\hat{U}_{G,S}$ is as defined in (6). Type B agents obtain payoff U_B from the contract $(R_B, 0)$.

We note that $c_M = c_S - U_B < c_S$, the screening cost imposed by the benevolent MFI, and, therefore, $\hat{U}_{G,M} > \hat{U}_{G,S}$. Under the benevolent MFI, the screening cost must be high enough to reduce the payoff of high risk agents to zero, unlike under profit motivated MFIs, where that payoff is $U_B > 0$. The fact that the screening cost is lower under profit motivated MFIs proves to be important when we make welfare comparisons under the two alterative credit regimes in Section 3. The left panel of Figure 2 shows a possible separating equilibrium.

While we have characterized the only possible equilibrium in our competitive screening model, we have not shown that such an equilibrium always exists. Indeed, it is possible that an equilibrium does not exist, as is the case with all competitive screening models (see Mas-Colell et al., 1995, for an example). To establish the condition under which equilibrium does not exist, define π^* as the

solution to the equation

$$\hat{U}_{G,M} = p_G u(Y - \bar{R}(\pi)). \tag{10}$$

The left hand side of this equation is, as defined in (9), the payoff to a low–risk agent under the contract (R_G, c_M). The right hand side is the low–risk agent's payoff under the contract $(\bar{R}(\pi), 0)$.

It is straightforward to establish that $\pi^* \in (0,1)$.[16] It is also easily established that if $\pi > \pi^*$, then no equilibrium exists in our competitive screening model. The right panel of Figure 2 depicts such a situation. Here, MFIs have the incentive to deviate from the set of screening contracts $\{(R_G, c_M), (R_B, 0)\}$ to a pooling contract that is welfare enhancing for all. But we have already established that a pooling contract cannot be an equilibrium of the model.

We now summarize our discussion characterizing equilibria in our screening model of a competitive profit–motivated MFI sector in the following proposition.

Proposition 2.2 *Let the parameters (Y, ρ, p_G, p_B) be given. Define $\pi^* \in (0,1)$ as the solution to (10). Then, if $\pi \leq \pi^*$, the unique equilibrium in our screening model is the separating equilibrium in which profit-motivated MFIs offer the set of screening contracts $\{(R_G, c_M), (R_B, 0)\}$. The default rate in that case is $1 - [\pi p_G + (1-\pi)p_B]$. If $\pi > \pi^*$, then the screening model has no equilibrium.*

How do we interpret the issue of non–existence of equilibrium. The literature on screening models has explored several possible solutions to this problem. One solution is to allow for the existence of mixed strategies, as in Dasgupta and Maskin (1986). We do not apply such solutions to our model so as to keep it tractable. Instead, we choose to focus on the case where $\pi \leq \pi^*$. We believe that this is a realistic assumption as a competitive microfinance sector is more likely to emerge where most people are poor and low–skilled, and hence, face a high risk of failure of investment. The fact that equilibrium does not exist if $\pi > \pi^*$ suggests that the microfinance sector may fail to come into existence when most people are high–skilled.

3 A Comparison of Equilibria under the Two Regimes

We now compare the equilibria in Sections 2.1 and 2.2 in terms of the impact on borrowers' welfare. Formally, we are comparing two alternative scenarios; one where a benevolent funds–constrained MFI is the sole provider of credit and another where credit is provided by a competitive MFI sector. Intuitively, the results can be applied to understand how borrowers' welfare, terms of credit (interest rate and screening), and default rates change as the sector expands from being small and benevolent to being large, competitive and profit motivated.

We note that the benevolent but funds constrained MFI, by itself, is able to satisfy only a limited part of the demand for loans. However, the profit motivated MFI sector has unlimited funds at its disposal; or at least sufficient funds to meet the entire loan demand in the community. Despite

[16] Note that $\hat{U}_{G,M} = (p_G - p_B)u(Y - R_G) + p_B u(Y - R_B)$. At $\pi = 0$, $\bar{U}_G(\pi) = p_G u(Y - R_B)$. Since $(p_G - p_B)u(Y - R_B) < (p_G - p_B)u(Y - R_G)$, $\bar{U}_G(\pi) < \hat{U}_{G,M}$ at $\pi = 0$. On the other hand, at $\pi = 1$, $\bar{U}_G(\pi) = p_G u(Y - R_G) = U_G > \hat{U}_{G,M}$. The continuity of these two functions and the intermediate value theorem imply $\pi^* \in (0,1)$.

this, the competitive microfinance sector does not unambiguously enhance welfare of all agents, as compared to the benevolent but small MFI. As Proposition 3.1 shows, under the commercial MFI sector, the sole agent who obtained the loan from the benevolent MFI may suffer a loss of welfare.

Proposition 3.1 *Let the parameters $\{Y, \rho, p_G, p_B\}$ be given. Suppose the benevolent MFI offers the pooling contract $(\bar{R}(\pi), 0)$. Let $\pi \leq \pi^*$ so that equilibrium exists in the competitive profit–motivated MFI sector.*

Then, compared to the benevolent but small MFI regime, the welfare of the agent who obtained the loan from the benevolent MFI goes down in the alternative competitive MFI sector if that client is high risk. The welfare of every other agent goes up. The default rate remains unchanged but the level of screening goes up.

Proof. If the benevolent MFI offers the pooling contract $(\bar{R}(\pi), 0)$, then the sole borrower can be either type. Hence, by Proposition 2.1, the default rate is $1 - [\pi p_G + (1-\pi)p_B]$. Since $\pi \leq \pi^*$, the unique equilibrium in the competitive MFI sector is the separating equilibrium in which MFIs offer the screening contracts as characterized in Proposition 2.2. Then, instead of one interest rate $\bar{R}(\pi)$, two rates become prevalent, R_G and R_B.

If the benevolent MFI's client was low risk, then her payoff was $\bar{U}_G(\pi)$. However, in the competitive MFI sector, her payoff becomes $\hat{U}_{G,M}$. Since $\pi \leq \pi^*$, $\hat{U}_{G,M} > p_G u(Y - \bar{R}(\pi))$. Therefore, her payoff improves.

If the benevolent MFI's client was high risk, then, under the new regime of profit motivated MFIs offering screening contracts, her type gets exposed. Therefore, the interest rate she needs to pay rises from $\bar{R}(\pi)$ to R_B. Hence, her payoff declines to U_B from $p_B u(Y - \bar{R}(\pi))$.

The welfare of all other agents obviously improves because of enhanced credit access. The default rate remains unchanged. The level of screening increases from 0 to c_M for the low risk agents. ■

The conclusion of Proposition 3.1 is qualitatively similar to the ones obtained in McIntosh and Wydick (2005). In both models, as a commercial microfinance sector emerges, the benevolent monopolist loses the ability to cross-subsidize the existing borrower. In McIntosh and Wydick (2005), the existing beneficiaries are poor borrowers. In our model, if high risk borrowers are the beneficiaries of the benevolent MFI, then they are being cross–subsidized and, therefore, lose out in the commercial MFI sector once their type gets exposed.

Unlike McIntosh and Wydick (2005), however, in our model, the commercial MFI sector can represent an unambiguous Pareto improvement in borrowers' welfare. This is possible in Proposition 3.1 if the benevolent MFI's borrower is low–risk. Even more striking is our next result where the possibility of the fall in welfare of any agent does not even arise. This happens when the benevolent MFI offers a screening contract to keep out high risk borrowers.

Proposition 3.2 *Let the parameters $\{Y, \rho, p_G, p_B\}$ be given. Suppose the benevolent MFI offers the screening contract (R_G, c_S).*

Let $\pi \leq \pi^*$. Then, the unique separating equilibrium in the alternative competitive profit–motivated sector represents a strict Pareto improvement in borrowers' welfare. The default rate increases and the level of screening declines in the competitive MFI regime as compared to the small benevolent MFI regime.

Proof. If the benevolent MFI offers the screening contract (R_G, c_S), then it lends to only a single low risk client. The client obtains a payoff of $\hat{U}_{G,S}$. Every other agent, whether low risk or high risk, obtains zero payoff. By proposition 2.1, the default rate is $(1 - p_G)$.

Since $\pi \leq \pi^*$, the unique equilibrium in the competitive MFI sector is the separating equilibrium as characterized in Proposition 2.2. Every agent obtains a loan. Since the set of screening contracts $\{(R_G, c_M), (R_B, 0)\}$ is offered, every low risk agent obtains a payoff of $\hat{U}_{G,M} > \hat{U}_{G,S}$. Therefore, every low risk agent is strictly better off taking the loan from the profit motivated MFIs, including the one who had obtained the loan from the benevolent MFI. High risk agents also are strictly better off under the new regime since they obtain a payoff of $U_B > 0$. With all agents obtaining credit, the default rate increases to $1-[\pi p_G + (1-\pi)p_B]$, by Proposition 2.2. The level of screening goes down from c_S to c_M. ■

Proposition 3.2, therefore, identifies conditions under which the competitive equilibrium in the microfinance sector, provided it exists, leads to a strict Pareto improvement in welfare. This happens even as all the features for which commercial MFIs are criticized—increase in interest and default rates, and fall in screening— also become apparent. Commercial MFIs charge a higher interest rate, R_B, from some borrowers whereas the benevolent MFI would have provided loans at the lower interest rate, R_G, to all borrowers who approached it. This criticism, however, misses the point that small benevolent MFI keeps out a large number of agents from the credit market through a high screening cost. The lower screening cost under the commercial MFI sector itself contributes to the welfare of the few low risk agents who would have obtained loans from the benevolent MFI, but at a high screening cost. Finally, the default rate increases under commercial MFIs. But this is due to the greater inclusiveness of these MFIs, unlike the benevolent MFI which would have confined itself to a few low risk borrowers.

It is also interesting to note that unlike Proposition 3.1, the level of screening declines in Proposition 3.2. This suggests that if the level of screening declines following commercialization of microfinance, a point which may be subject to empirical verification, there is bound to be a strict Pareto improvement in welfare.

Since Proposition 3.2 is our main result, we need to clarify one final point about it. Does it have any meaningful content? For it may be the case that whenever $\pi \leq \pi^*$, the benevolent MFI offers the pooling contract. In that case, Proposition 3.2 would be vacuous. The following example shows that that is not so and indeed, there are situations when the competitive MFI sector represents a strict Pareto improvement.

Example 3.3 *Let $u(c) = \sqrt{c}$ and $\{Y, \rho, p_G, p_B\} = \{3, 1.1, 0.9, 0.4\}$. Using (10), we calculate $\pi^* = 0.2614$. Further, for $\pi \leq \pi^*$, $\hat{U}_{G,S} > \bar{U}(\pi)$. Hence, the benevolent MFI offers the screening contract*

(R_G, c_S) *if* $\pi \leq \pi^*$. *In that case, the competitive MFI sector leads to a strict Pareto improvement by Proposition 3.2.*

In other cases, of course, Proposition 3.2 may not be meaningful. If $p_B = 0.55$ *while the other parameters remain the same as above, then* $\bar{U}(\pi) > \hat{U}_{G,S}$ *for all* π. *Hence, the benevolent MFI offers the pooling contract* $(\bar{R}(\pi), 0)$. *In that case, Proposition 3.1 is applicable.*

3.1 Policy Implications

The results presented here have significant policy implications. Calls to regulate the microfinance sector are mostly motivated by the argument that the expansion of the microfinance industry has resulted in increase in interest and default rates. Further, as the number of MFIs increases (especially the profit motivated ones), they compete for borrowers and, therefore, weaken screening norms for borrowers making it too easy for poor borrowers to obtain credit. This, it is argued, has led to an increase in indebtedness among the poor.

The results of our analysis are, however, contrary to such a sweeping indictment of the microfinance sector. In terms of our model, if a competitive microfinance sector consisting of profit motivated firms does emerge, then it is reasonable to expect that they operate at the separating equilibrium that we have characterized in Proposition 2.2. The anecdotal evidence that we have observed (see footnote 4) certainly suggests so. In that case, Propositions 3.1 and 3.2 then imply that the competitive microfinance sector would certainly benefit a majority of borrowers, even if not all. This is despite the fact that interest rates on some loans by commercial MFIs can rise to R_B. As we have already remarked, the high interest rate, and the higher default rate (in Proposition 3.2) in the competitive microfinance sector reflect the fact that a far greater number of borrowers is able to access credit from this sector than from the small benevolent MFI. Similarly, the fall in screening level in Proposition 3.2 also contributes to welfare improvement of borrowers.

Hence, regulatory provisions that seek to artificially restrict the interest and default rates, or mandate minimum levels of screening may end up being counterproductive. Such provisions may prevent the emergence of a competitive microfinance sector and, therefore, the realization of the welfare gains that the expansion of microfinance can generate. Instead, the benefits of microfinance would remain confined to the extent that can be served by benevolent organizations.

Nevertheless, certain other forms of regulation may also be required. Our conclusions on the welfare improving effects of microfinance are based on the assumption that credit contracts are smoothly enforced. However, microfinance is almost entirely prevalent in developing countries where the institutional mechanism required for contract enforcement may not be very well developed. This may provide scope to MFIs themselves to abuse some aspects of contracts, particularly those that relate to limited liability. Critics have alleged that MFIs employ coercive tactics in securing repayment, even in cases when clients are unable to repay for genuine reasons of investment failure (see footnote 1). This is a clear violation of limited liability and in such cases, strong regulatory intervention from a centralized financial institutional authority like the central bank may be required.

4 Conclusion

In this paper, we have characterized the welfare implications of expansion in microfinance as the sector changes from being benevolent, albeit credit constrained, to being competitive and commercially motivated. Our results show that this expansion can lead to Pareto improvement in welfare despite an increase in default and interest rates and a fall in screening levels. Hence, policy measures that seek to regulate interest, default or screening levels can have detrimental consequences.

We should note that these beneficial effects of expansion in the MFI sector are more likely to be realized in the long run. In the short-run it is possible that significant imperfections (for example, loans to the underserving borrowers) remain in the market. These imperfections and the dynamics of transition are best analysed through alternative competition models in oligopoly like Cournot (where MFIs compete on number of loans given), Stackleberg (where incumbent is the leader, while the entrant is follower), etc. While we leave these topics for future research, we note that the interplay between screening cost and interest rates in differentiated oligopoly markets has been characterized in the context of formal credit markets (Villas-Boas and Schmidt-Mohr, 1999). Such models can be extended to the context of microfinance as well.

We add one caveat to our conclusions. We have argued that a fall in screening norms is a natural equilibrium phenomenon emerging from the expansion of microfinance. In this case, as our results show, fall in screening norms is welfare enhancing. However, we can identify one situation where fall in screening norms can be counter-productive. This would happen when the MFIs develop an *ex ante* perspective that governments would bail them out in case of any losses related to loan default. In such case, they may not do the necessary due-diligence before providing loans. This would represent a standard moral hazard problem which would adversely impact the long-run sustainability of the sector. We do not address this issue in this paper and leave it as a topic for future research. That said, the refusal of governments to come to the aid of MFIs in some recent crises suggests that it may not be a concern anymore.[17]

An empirical extension of this paper would be to check whether levels of screening have gone down in microfinance over time. Proposition 3.2 implies that a decline in screening leads to a strict Pareto improvement in welfare. Since we interpret screening costs as non-monetary costs imposed by the MFIs (for example, through weekly meetings, compulsory savings etc), we need to check whether such requirements for obtaining loans from an MFI have gone down. While we do not have formal evidence concerning this, our conversations with a few microfinance institutions do indeed confirm that the conditions required to be eligible for a loan (and activities that foster group commitment) have become less stringent over time. With availability of richer datasets over time, we hope that these hypotheses can be more robustly tested in the near future.

[17]For example, several MFIs have lost significantly in Andhra Pradesh in India. (Source: http://www.livemint.com/Companies/99un1M17pdKE1O6BOAB1qJ/Microfinance-crisis-leads-to-loss-of-35000-jobs.html)

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