Global Economy & Finance Journal
Vol. 2 No. 2 September 2009. Pp. 64-80

Microfinance: Debt or Equity? What are the Implications for Profitability and Social Welfare?

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We provide a new evidence on a potential best way for a microfinance institution (MFI) to alleviate poverty while remaining financially profitable. Results show that equity contract generate more social welfare and profit than debt contract. By becoming a stakeholder in the micro-venture rather than a lender, the MFI is in a more tightly coupled relationship, providing knowledge and guidance necessary for ensuring success of the venture. A MFI providing micro-equity receives equity in the micro-business in return for his investment, the return on which is entirely dependent the success of the micro-venture, where as a MFI providing a loan gets paid first whether there is any profit or not. Results also show that microcredit financing places a heavy cash drain on micro-enterprises because the coupon is a precious resource needed to nurture and sustain the growth of micro-enterprises to propel them to the next stage of their development.

Field of Research: Microfinance, Financial Contracting, Financial Self-Sufficiency, Social Welfare

1. Introduction

Over the past decade, governments and donors concerned with the eradication of poverty and the job growth that the microfinance sector has apparently spurred in most underprivileged societies have sought to stimulate this financial intermediary to foster self-employment for financially and socially excluded persons to elevate their socio-economic status. In filling this vacuum, microfinance institutions (MFIs) must provide cost-effective financial services to guarantee their financial sustainability, which not only allows further outreach but also promotes freedom from reliance on government and donor subsidies.

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Despite the proliferation of these programs, they have received little academic scrutiny. This appears to be an important omission, particularly in light of the current major controversy as to whether to solely improve the socio-economic status of the underprivileged of society without being financially sustainable or to fulfill both goals, i.e. increase social welfare and financial viability. Moreover, this omission is surprising given the purported successes of some of these MFIs. To our knowledge, no academic study has examined this central question. My article intends to fill this gap. This paper takes the first step towards reconciling these seemingly divergent goals of microfinance. It attempts to determine the appropriate financial instrument to nurture micro-enterprises that would allow MFIs to be more profitable while reducing poverty within the financially and socially excluded population. To do so, we use an adverse selection game where the ability of the micro-entrepreneur (ME) to run a successful micro-enterprise is known only to him or herself. We find that to achieve their core objetives, microfinance institutions should nurture micro-entreprrises with equity instead of debt and simultaneously target high-ability and low-ability micro-entrepreneurs because the highest profits and social welfare are obtained from the equity's pooling equilibrium. Our findings suggest that the ability to replace debt contract with equity contract may lead MFIs to be financially sustainable, to substantially increase the well-being of the people that are severely financially constrained and to attain freedom from reliance on subsidies and gifts from governments and other donors to cover their costs. Micro-equity is to micro-finance, what venture capital is to banks. A venture capitalist receives equity in the venture in return for his investment, the return on which is entirely dependent the success of the venture, where as a bank providing a loan gets paid first whether there is any profit or not. By becoming a stakeholder in the venture rather than a lender, the micro-equity provider is in a more tightly coupled relationship, providing knowledge and guidance necessary for ensuring success of the venture. We suggest here that access to knowledge is essential for success.

Consistent with this interpretation, the results of this article represent the first step in rethinking the delivery of microfinance. The results are also potentially important for understanding and promoting microfinance investment because they provide new evidence on how this form of microfinance delivery could improve the standard of living without putting the financial viability of MFIs at risk. Our article contributes to the growing literature on microfinance, characterized by two broad approaches. The first approach contends that MFIs do not necessarily have to be financially self-sufficient because donors are social investors that are willing to accept a lower expected financial return than that of an index fund in return for a social return (see, e.g. Woller et al. (1999), and Morduch (2000)). This approach puts relatively greater weight on depth of outreach relative to breadth of outreach, and gauges institutional success primarily according to social metrics (Brau and Woller (2004)). The second approach argues that financial self-sustainability is the foremost condition that MFIs have to fulfill to achieve the microfinance promise (see, e.g. Gonzalez-Vega (1994), Bennett and Cuevas (1996), Woller et al. (1999), and Morduch (2000)). Thus, the eradication of poverty is grounded in the need to build a viable financial system for the poor to support micro-enterprise formation and growth. Our article adopts the latter approach. The findings in our article suggest that a more financially profitable MFI is more apt to alleviate a pronounced deprivation in well-being.

The rest of the article is organized as follows. Section II provides a selective survey and synthesis of the related literature. Section III describes the general setup of the model. Section IV presents the design of the different financial contracts and the choice of the optimal contract. Section V describes the socially optimal financial contract. Section VI

concludes the paper. The proofs appear in the Appendix.

2. Literature Review

The purpose of this section is to provide a selective survey and synthesis of recent microfinance findings that are related to our paper and to put them into perspective, suggesting a new avenue for microfinance delivery that would achieve its core goals. The objective of the section is not to survey all published work on microfinance exhaustively.
Two recent papers, taken together, provide a comprehensive overview of the field. First, Brau and Woller (2004) address the issues of MFI's sustainability, products and services, management practices, clientele targeting, regulation and policy, and impact assessment. Second, Khawari (1994) published a survey paper that has a more managerial orientation than does that of Brau and Woller. The two papers contain 192 references on microfinance. In addition to those papers, Aghion and Morduch (2005) provide an updated analysis of the economics of microfinance, intended to bridge the gap between the existing academic literature and practitioners' view.

To raise the standard of living of society's most vulnerable members, microcredit has sought to enable entrepreneurs in the most underprivileged social segment to launch small businesses that generate sufficient profit to repay the original loan and to boost their social welfare. To achieve these goals, MFIs must invest in sound viable micro-entrepreneurial projects by providing not only the necessary capital but more importantly the business acumen that the MEs lack (Ayayi and Noël (2007)). In this respect, MFIs' managers have to be skillful investors that nurture micro-entrepreneurial firms with both their funds and their managerial and financial acumen. As Ayayi and Noël (2007) point out, MFI managers must be able to provide appropriate contacts for the MEs and refine their managerial practices and strategies to eliminate undue risks. At the heart of this debate is the financial instrument used to nurture micro-enterprises. Why? Because today, the classical debt instrument used to nurture micro-businesses does not lend itself to the fund managers' involvement in the decision making process designed to improve micro-business management and render micro-enterprises more capable of generating profits. Moreover, contrary to classical debt contract, MFI borrowers most often are not required to pledge collateral to secure the money borrowed because microcredit was created to provide access to credit to the poor and the poorest of the poor who have nothing at all. Thus, in case of default or bankruptcy, MFIs are left with nothing. The key point is that since MEs do not have to bear bankruptcy costs, debt does not act as a bond that MEs post to assure MFIs that their funds will not be completely misappropriated. Thus, contrary to Grossman and Hart (1982) and Jensen (1986) the choice of debt is not influenced by its incentive effect and the risk that MFIs would have to carry.

To counter this drawback, MFIs resort to social collateral via group lending. Under joint liability, the group carries out the monitoring, bonding and enforcement of the unsecured debt contract (Aghion (1999), Ghatak and Guinanne (1999) and Aghion and Gollier (2000) Chowdhury (2007)). In fact, it is the reputational effect at the heart of the group-lending that encourages repayment of the debt because of the group members' desire to maintain their social standing in the group and community (Ghatak (1999) and Woolcock, (2001)), thereby making the debt contract more secure. Simply put, joint-liability contracts have the advantage of increasing access to financial services for people whose only collateral is their moral guarantee founded on faith in a group or trust in the individual and the financial viability of the entrepreneur's project . Despite the vaunted reputation of group lending overall, MFIs' group lending tends to draw comparisons with the free rider problem raised

by Alchian and Demsetz (1972) and to the impossibility of group members to criticize ineffective members because the loyalties of the group lie firmly within the household, the extended family and the community. Marr (2003) points out that MFIs' group lending has failed to solve the original problems of information asymmetries because the information gathered through peer monitoring is distorted, hidden or simply not voluntarily transferred to the MFI officers. A fundamental reason for this is that the group members' relation is rooted in deep-seated power structures that arise from blood connections and shared social values (Marr, (2003)). An immediate drawback of these strong family and community relational ties is the non-credibility of peer monitoring and more importantly peer auditing, to determine the causes of unwillingness and/or the lack of financial means to pay back the debt. In fact, MFIs continue to struggle with the substantial arrears of their investees, which jeopardizes their financial self-sufficiency and sustainability. Morduch (2000) points out that only about one percent of MFIs are financially self-sustainable and no more than five percent would ever be. To overcome the arrears, Norell (2001) contends that MFIs have to follow up late loans quickly, update and enforce credit policies, concentrate credit officers' services in a specific geographic area and provide financial incentives for credit officers. He goes on to assert that in a critical situation, MFIs have to determine their clients' ability and eagerness to repay in order to design suitable repayment strategies and suspend lending to new clients until their portfolio quality improves.

3. The General Setup of the Model

To examine MFI sustainability, we focus on one-shot financing because standard microcredit consists of one-period small financing granted to individuals that lack any type of guarantee or asset to launch a micro-business or to alleviate the precariousness of the micro-business with the aim of augmenting the social well-being of the ME and indirectly that of the entrepreneur's family. Furthermore, the moral collateral, founded on faith, provided to back up the micro-credit and the poverty relief goal are, de facto, two other arguments that preclude MFIs' extending their loans beyond the single required period to facilitate start-up of the micro-enterprise. Finally, the small amount required to launch the business and the non-technological content of micro-enterprises are other potential reasons for the one period financing. To achieve the paper's objective, we focus on an adverse-selection-driven contract because the imperfect MFI first attempts to screen MEs and to maximize its utility while the ME is held to a given utility level. In this setting, we question the appropriateness of the financial instrument to nurture micro-enterprises because gains from improving the contractual relation ex-ante primarily accrue to the MFI and the incentive to optimize the contract is adverse-selection-driven.

3.1. Sequence of Actions and Events in the Game

The game we design is a one-period game with incomplete information under uncertainty. We concentrate on the critical adverse selection problem that the MFI tends to resolve at the outset of its contractual relation with the ME. In the game, there are three steps with the following sequence of moves. In step one, the uninformed MFI offers an incentive scheme to the ME. In step two, the ME accepts or rejects the incentive scheme. If he rejects the contract, he gains reservation utility. In step three, the ME that subscribes to the incentive scheme plays the game stipulated by the mechanism.

3.2. Endowments, Preferences, Time Horizon and Investment

The economy we consider has two dates, indexed by t=0 and t=1, and two agents. The agents are the MFI and the ME. Following the principal-agent literature, we assume that

the MFI that acts as a principal is risk neutral. As for the ME, who acts as the agent, we assume that he is risk neutral because we are not concerned with improving the allocation of risky wealth and having profound effects on MEs' ex-post behavior. Instead, the game is intended to maximize the informativeness of the financial instrument contract chosen by the ME by "eventually" revealing his ability and by allowing the MFI to realize the highest possible profit. At date t=0, the ME has access to a risky project that yields a random pay-off at t=1, if it is undertaken. A fixed investment of $K is required to activate the project. Due to personal wealth constraints, the ME approaches the monopoly MFI to raise $K because in the poorest communities, more specifically in remote villages the MFI tend to be in a monopoly position. The ME may have assets in place, but since they play no role in activating the project, we assume that they are worthless.

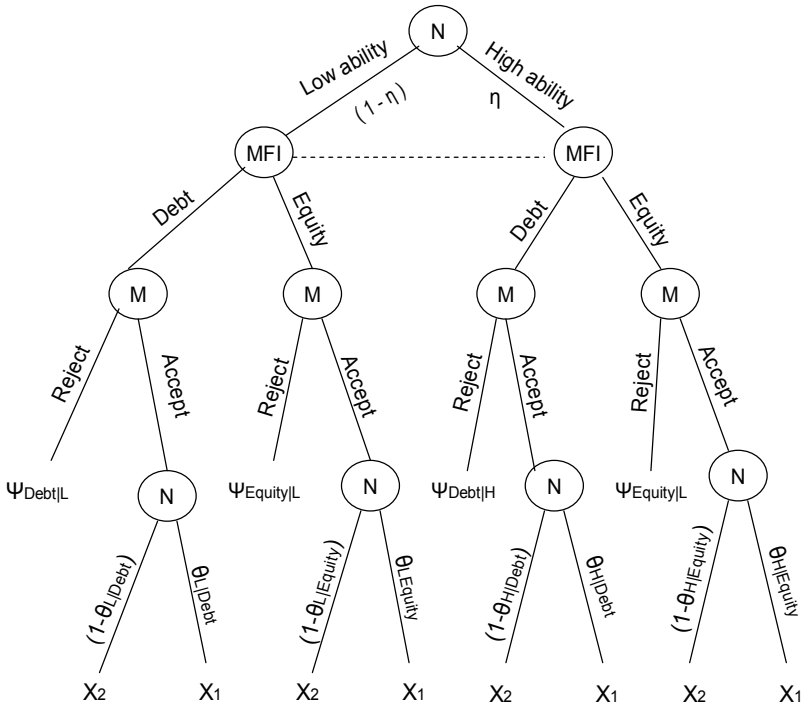
3.3. Information Structure and ME Character*i*stics

At t=0, we assume that two types of observationally identical MEs exist: high-ability and low-ability MEs. we denote the ME's type by i$\in$ {H, L}. The ME knows his type but the MFI does not. At t=0, if the ME undertakes the project, then at t=1, it yields a return of X_1 with probability $\theta_i \in$(0 1) and X_2 with probability (1-θ_i). A realization of X_1 will be referred to as project success and a realization of X_2 will be considered project failure such that $0 < X_2 < K < X_1$. Let $\theta_H > \theta_L$ such that the high-ability ME has a higher probability than the low-ability ME of realizing X_1. The economy comprises high-ability MEs in measure η with $0 < \eta < 1$, and low-ability MEs in a proportion of (1-η). We also hypothesize that both types of MEs can engage in another job market and earn $\psi_i > 0$. ψ_i represents the H-type and L-type MEs' opportunity cost if they do not participate in an alternative labor market. We denote the level of utility associated with ψ_i, the reservation utility. For simplicity, we normalize the ME outside opportunity level of utility to ψ_i.

4. The Types of Contracts

Given the required fixed investment $K to activate the micro-enterprise, the MFI, ex-ante, is looking for the optimal financial contract that would enable it to achieve its two core goals. To this effect, it can either design a debt contract or an equity contract. We compute the optimal contract that stems from each financial security and then compare the results to find the best optimal contract. To illustrate how the algorithm we adopted to solve each contract, one at a time, fits into the MFI's problem, we turn the incomplete information game into an imperfect information game by introducing nature. Figure 1 provides the extensive form of the game.

Figure 1: Game Tree



Where N=nature, MFI=Microfinance institution and M=micro-enterprise. $\psi_{Debt|L}$ is the reservation utility of the low-ability ME that rejects the debt contract. The same applies to the rest of the reservation utility. The dotted line shows that the MFI is assured of the type of the ME it faces, but attaches a probability of η that the ME is high-ability.

In each contract, the MFI's expected profit consists of what is left over from what it receives in each contract and what it gives the ME. Each contract proposed by the MFI satisfies the high-ability and low-ability individual's rationality constraints in order to be sure that both types of MEs will participate. Moreover, to avoid the misrepresentation of the ME, the policy proposed by the MFI must also satisfy the incentive-compatibility constraints. Thus, the MFI must restrict its attention to the menu that induces the ME to reveal his type. Therefore, the MFI's optimization problem is to find the optimal policy in each type of contract by maximizing its expected profit, subject to both incentives--compatibility constraints and participation constraints.

4.1. Debt Contract

To formally prove that a collateral has no added value in an MFI and an ME contract, we derived two propositions. Before formulating these propositions, we present the debt contract. The debt contract consists of the coupon value ρ_i if the project returns X_1 and C+ X_2 if it returns X_2, where C is the value of the collateral. The collateral is an additional asset that the ME will lose in the event of default, i.e. when the project returns X_2. In such a case, since MEs are among the poorest people in a society, the ME assigns as collateral assets that would not ordinarily be lawfully appended. In this respect, I assume that, aside from the transaction costs that the MFI will incur to collect and liquidate the collateral, the

MFI and the ME could have different opinions or beliefs about C. To capture this disparity, let β be the disparity factor of the valuation of C such that βC represents the MFI's valuation of C, with $\beta \in [0,1]$.

A key point regarding β is that depending on its value, i.e. either $\beta \in [0,1[$ or $\beta = 1$, the equilibrium that stems from the debt contract will differ. To take this into account, we derive two propositions from the debt contract. However, before formulating these propositions, let us set the incentive-mechanism designed by the MFI for the ME.

$$MAX\,\Pi_{(\rho_i, C_i)} = \eta[\theta_H \rho_H + (1-\theta_H)(X_2 + \beta C_H) - K] + (1-\eta)[\theta_L \rho_L + (1-\theta_L)(X_2 + \beta C_L) - K] \quad (1)$$

Subject to:

$$\theta_H (X_1 - \rho_H) - (1-\theta_H) C_H \geq \theta_H (X_1 - \rho_L) - (1-\theta_H) C_L \quad (2)$$

$$\theta_L (X_1 - \rho_L) - (1-\theta_L) C_L \geq \theta_L (X_1 - \rho_H) - (1-\theta_L) C_H \quad (3)$$

$$\theta_H (X_1 - \rho_H) - (1-\theta_H) C_H - \psi_H \geq 0 \quad (4)$$

$$\theta_L (X_1 - \rho_L) - (1-\theta_L) C_L - \psi_L \geq 0 \quad (5)$$

$$C_i \geq 0 \quad (6)$$

where i=H, L.

In this contract, equation (1) represents the MFI's profit. Inequality (2) and inequality (3) stand for the high-ability and the low-ability ME's incentive-compatibility constraints. Their individual participation constraints are given by inequality (4) and inequality (5), respectively. Inequality (6) is the collateral condition.

4.1.1. Debt contract when the disparity factor of the valuation of the collateral is: $\beta \in$ [0; 1[

When the MFI and the ME disagree on the valuation of the asset pledged as collateral, the optimal debt policy is that of the pooling equilibrium. In this pooling equilibrium, the high-ability ME passes himself off as the low-ability ME because what he gives up by doing so is less than what he would give up if the MFI knows that he has high ability.

Proposition I

Under the debt contract, when $\beta \in$ [0; 1[, the MFI's optimal credit mechanism (denoted by the asterisks) relative to the type of ME is the pooling contract, as shown by

$$C_H^* = C_L^* = 0 \qquad \rho_{PD}^* = X_1 - \frac{\psi_L}{\theta_L} \quad (7)$$

$$\Pi_{PD}^* = \eta(\theta_H - \theta_L)(X_1 - X_2 - \frac{\psi_L}{\theta_L}) + (V_L - \psi_L - K) \quad (8)$$

Proof: see Appendix

$C_H^* = C_L^*$ and ρ_{PD}^* are obtained by maximizing equation (1), subject to inequality (2), to inequality (6). Π_{PD}^* is the pooling profit corresponding to ρ_{PD}^*, which is the pooling-equilibrium debt coupon. Conversely to what one might think, i.e. that the debt contract might separate low-ability from high-ability MEs, Proposition I shows that the debt contract does not allow the MFI to solve the adverse-selection problem when the MFIs and the MEs disagree on the valuation of the collateral. A remarkable attribute of the optimal debt scheme is that the collateral of each ME type is zero, confirming that an MFI cannot rely on collateral when lending money to ME because microfinance has been primarily

designed to bolster the socio-economic conditions for people that can pledge only trust for collateral. In this regard, the intuition behind this result is that the MFI's objective is to extract the maximum rent from the project rather than rely on the collateral in case of default because the MFI knows it is dealing with the most socio-economically vulnerable people who lack any type of traditional asset-based guarantees. This is probably the reason that MFIs tend to charge high interest to offset the lack of asset-based collateral.
Technically, it should be possible to sort MEs by offering a lower coupon rate to MEs that provide more collateral. This is not feasible, however, because starting from the full-information solution, the MFI may simultaneously raise the collateral and lower the coupon rate for low-ability ME. High-ability ME will thus have even more incentive to choose the low-ability ME contract instead of the high-ability ME contract. The reasoning behind this argument is that high-ability MEs actually prefer the lower coupon rate but are not as concerned about the higher collateral requirement because their probability of failure is low. In this respect, collateral is not an efficient sorting mechanism and is optimally set as equal to zero. This finding contradicts the general view that collaterized debt alleviates the asymmetrical-information problems between investors and entrepreneurs because it reduces investors' welfare loss in case of bankruptcy. As a result, when $\beta \in [0;1[$ one cannot follow the general wisdom of raising the collateral and lowering the interest rate for the high-ability ME, and doing the opposite for the low-ability ME, in order to distinguish them.

4.1.2. Debt contract when the disparity factor of the valuation of the collateral is: β=1.

Turning to the case where the MFI and the ME have the same valuation of the collateral regardless of the nature of the asset pledged, we derive the next proposition that MFIs use the debt contract to distinguish MEs' abilities.

Proposition II

For β =1, the optimal debt-incentive mechanism that allows the MFI to separate the high-ability ME from the low-ability ME is given by

$$C_L^* = 0; \qquad C_H^* > 0 \tag{9}$$

$$\rho_L^* = X_1 - \frac{\psi}{\theta_L}; \qquad \rho_H^* = \rho_L^* - \frac{1-\theta_H}{\theta_H} C_H^* \tag{10}$$

$$\Pi_{SD}^* = \eta[(\theta_H - \theta_L)(X_1 - X_2 - \frac{\psi_L}{\theta_L}) - 2(1-\theta_H)C_H^*] + (V_L - \psi_L - K) \tag{11}$$

where Π_{SD}^* stands for the separating-equilibrium profit that results from the collateral-debt contract. For proof: see Appendix

From Proposition II, it follows that the coupon contained in the high-ability ME contract is less than the coupon embodied in the low-ability ME incentive scheme. An interesting attribute of Proposition II is that the collateral of the high-ability ME is not only greater than zero but is a decreasing function of the coupon. This relation, which does not exist in the low-ability ME contract, clearly shows that the high-ability ME enjoys having a low coupon because he knows he has the necessary dexterity to succeed at his project. For the low-ability ME, there is no difference between the contracts designed for him by the MFI under Propositions I and II. As a result, it follows that the optimal menu of the debt contract combining repayment and collateral when the MFI and the ME have the same valuation of

the collateral is such that the low-ability ME pays a high interest rate but is not required to put down any collateral, whereas the high-ability ME puts down some collateral but pays a lower interest rate. However, since the ultimate goal of the MFI is to enhance the social welfare of the poor and the poorest and to generate enough profit to be financially sustainable, the main question remaining is as follows: does being able to separate MEs by their abilities contribute to the highest profitablity? To answer this question, we compare the profit obtained by the MFI under the two considerations, i.e. when $\beta \in$ [0; 1[and when β=1.

Corollary

Ceteris Paribus, a microfinance institution is better off under the pooling equilibrium than a separating equilibrium because Π^*_{PD} is greater than Π^*_{SD}.

Proof

By comparing the profit that the MFI derives when $\beta \in$ [0;1[with the profit that the MFI earns when β=1, one can easily verify that the profits that stem from Proposition I, i.e. Π^*_{PD}, is higher than the profits that stem from Proposition II, i.e. Π^*_{SD}. Therefore, it is clear that, while knowing the ME's ability is good it does not allow the MFI to achieve its foremost objectives, i.e. reaping the highest possible profit to be financially sustainable and consequently extend more loans to the poorest households and the disadvantaged segments of society in a cost-effective manner.

4.2. Equity Contract

Turning now to the equity contract, we assume that the equity contract is a proportion ϕ_i of the micro-enterprise's value $V_i = \theta_i X_1 + (1-\theta_i) X_2$ that the MFI receives from the high ability ME or from the low ability ME for the fixed investment amount of \$K. As in the debt contract, the MFI's aim is to maximize its profit, subject to the incentive-compatibility constraints and the participation constraints of both types of MEs. Therefore, the profit-maximizing decision of the MFI is obtained by solving the following program:

$$MAX\,\Pi_{(\phi_i)} = \eta(\phi_H V_H - K) + (1-\eta)(\phi_L V_L - K) \quad (12)$$

$$subject\ \ to:\ (1-\phi_H)V_H \geq (1-\phi_L)V_H \quad (13)$$

$$(1-\phi_L)V_L \geq (1-\phi_H)V_L \quad (14)$$

$$(1-\phi_H)V_H - \psi_H \geq 0 \quad (15)$$

$$(1-\phi_L)V_L - \psi_L \geq 0 \quad (16)$$

In this contract, the MFI's profit is given by equation (12). Inequality (13) and inequality (14) are the high-ability and the low-ability MEs' self-selection constraints. Inequalities (13) and (14) state that telling the truth is better than lying because the benefits derived from revealing one's true nature is always greater than those obtained from disguising yourself.
Inequality (15) and inequality (16) are the participation constraints of both types of MEs. If they are not satisfied, the MEs will not undertake the project. Therefore, the optimization of the objective function requires that the MFI maximizes its profit, subject to both types of MEs' incentive-compatibility constraints and participation constraints.
In solving the MFI's optimization program for the equity contract, we obtained the optimal equity contract as stated in the following proposition.

Proposition III

Under the equity contract, the optimal policy, i.e. the proportion of the micro-enterprise received by the MFI and its corresponding profit denoted by the asterisks is expressed by:

$$\phi_{PE}^{*} = 1 - \frac{\psi_L}{V_L} \tag{17}$$

$$\Pi_{PE}^{*} = \eta[V_H - V_L - \psi_L(\frac{V_H}{V_L} - 1)] + (V_L - \psi_L - K) \tag{18}$$

For Proof: see Appendix

ϕ_{PE}^{*} is the pooling proportion of the micro-enterprise's equity that is given up by the ME. It is obtained by maximizing equation (12), subject to inequality (13) and to inequality (16). Π_{PE}^{*} is the profit corresponding to ϕ_{PE}^{*}. First, from proposition III, it follows that if the MFI uses an equity device to separate the high-ability ME from the low-ability ME, it will achieve a pooling result. Moreover, note that the high-ability ME will always prefer to be pooled with the low-ability ME because what he gives up in the pooling contract is less than what he would sacrifice if the MFI knows he is a high-ability ME i.e. $\phi_{PE}^{*} < \phi_{H}^{*} = 1 - \frac{\psi_H}{V_H}$.

Unlike the debt contract, the equity contract gives the MFIs the right to participate in the key decision making process that may change the course of the micro-enterprise's profitability. As informed shareholders, MFIs are no longer the lenders whose aim is to extend small loans to very poor people for self-employment projects to counter the effects of social and financial exclusion. Instead, they have to use their partnership and their experience to be skillful investors that nurture micro-enterprises with the funds they raise and with their business, managerial and financial acumen.

4.3. Choice of the Optimal Contract

To characterize the optimal contract, we compared the MFI profit under the equity contract with the MFI profit under the debt contract. For the comparison, we used the profit of the debt-pooling contract instead of the profit derived from the separating debt contract because of the dominance of the debt-pooling equilibrium over the debt-separating equilibrium (see the corollary).

Proposition IV

The optimal financial vehicle for an MFI's nurturing a micro-enterprise is an equity contract since

$$\forall \eta \qquad \Pi_{PD}^{*} \leq \Pi_{PE}^{*} \tag{19}$$

Proof:

From equation (18) in proposition III and from equation (8) in proposition I, it is straightforward to verify that for all η Proposition IV holds.

From Proposition IV it follows that it is in the MFI's best interest to use an equity contract instead of a debt contract. First, an investment in equity places the MFI on the same level as the ME. As a result, the ME will view the MFI as a co-partner in the quest for the success of his micro-venture. The intuition behind this argument is that the equity-mechanism design emphasizes the partnership relation between the MFI and the ME and, thus, will probably reduce agency problems they could face in their contractual relationship. Secondly, by using the equity mechanism, the MFI will be able to manage its unsystematic risk exposure by working closely with the ME. This argument is based on the fact that, by holding shares of the micro-entrepreneurial venture, the MFI has a right to participate in the guidance of the micro-enterprise. Again, it should be noted that it is only

by being a co-partner that the MFI can behave in such a manner. By becoming a stakeholder in the venture rather than a lender, the micro-equity provider is in a more tightly coupled relationship, providing knowledge and guidance necessary for ensuring success of the venture. We suggest here that access to knowledge is essential for success. Finally, a debt contract somehow slows down the growth rate of micro-enterprises because the coupon is a precious resource needed to nurture and sustain the growth of micro-enterprises and thus propel them to the next stage of their development.

5. Welfare analysis and policy implication of Incomplete Financial Contracts

5.1. Welfare Analysis

In this section, we compare the properties of the two financial contract menus to determine the most socially optimal one. For this purpose, the expected social welfare is defined as the sum of the expectations across types and states of MFI profits and ME utility. More precisely, the expected social welfare is defined as the sum of the objectives of MFIs and high ability MEs. Note that we do not need to consider the social surplus derived from the low ability ME because we know that we will implement the ME's first best solution in each incomplete financial contract.

Under the equity contract, the expected social welfare, ESW, is defined as

$$ESW = \Pi^*_{PE} + f(\phi^*_{PE}) \tag{20}$$

$$= \eta[V_H - V_L - \psi_L(\frac{V_H}{V_L} - 1)] + [V_L - \psi_L(\frac{V_H}{V_L} - 2) - K] \tag{21}$$

where $f(\phi^*_{PE})$ is the profit obtained by the high ability ME's concealing his attributes. Under the collateral-debt contract, the expected social welfare, DSW, is defined as

$$DSW = \Pi^*_{PD} + g(\rho^*_{PD}) \tag{22}$$

$$= \eta(\theta_H - \theta_L)[X_1 - X_2 - (\frac{\psi_L}{\theta_L} - 1)] + [V_L - \psi_L(\frac{\theta_H}{\theta_L} - 2) - K] \tag{23}$$

where $g(\rho^*_{PD})$ is the profit derived by the high ability ME's concealing his nature.

By comparing the expected social welfare under the two contracts, we can clearly identify which contract contributes more to the general social welfare. To do so, we compute (ESW- DSW) i.e. the difference between the welfare under the equity contract and the welfare under the debt instrument contract.

Proposition V

Ceteris paribus, the equity contract generates more social welfare than the debt-linked contract i.e.

$$ESW - DSW = \eta\{[V_H - V_L - \psi_L(\frac{V_H}{V_L} - 1)] - (\theta_H - \theta_L)(X_1 - X_2 - \frac{\psi_L}{\theta_L})\} + \psi_L(\frac{V_H}{V_L} - \frac{\theta_H}{\theta_L}) > 0 \tag{24}$$

Proof

For all η greater than zero, it is easy to see that the first part of the right-hand side of equation (24) is positive. Moreover, for all ψ_L, the second part of the right-hand side of equation (24) is positive. Therefore, it follows that the sign of the right-hand side of equation (24) is positive. This shows that the social welfare that is derived from the equity contract exceeds the social welfare that is obtained from the debt contract.

This result reinforces the conclusions we drew from the choice of the optimal contract. In other words, the welfare analysis indicates that MFIs should use equity contracts instead

of debt contracts in order to fully play their role, whose ultimate purpose is to increase the social welfare via the alleviation of poverty by enabling the poor and the poorest to launch their micro-enterprises by the use of microfinance. It is only by using the equity financial vehicle that an MFI can act as a knowledgeable adviser that shares its business acumen. In addition, it is only by nurturing the micro-enterprises with equity that an MFI can share its myriad experiences of success and failure with the micro-entrepreneurs.

5.2. Policy Implication

An important policy implication from this article is that debt may be a harmful binding constraint to promoting entrepreneurship among the poor and the poorest that see microfinance as a device to generate income to care for themselves and their families. While resorting to equity may not completely root out all the impediments to build a sound MFI, it is by all means a good mechanism to begin to put in place to ensure the financial sustainability of MFIs. Additionally, MFIs must develop more sophisticated managerial training to help successful micro-entrepreneurs advance their entrepreneurial businesses from a supervising co-worker to that of small and medium-sized enterprises that require more managerial skill in order to sustain their growth. This will ultimately have a profound effect on poverty reduction and economic growth. To achieve this goal, MFIs should provide incentives to their staff and clients.

Regarding their staff, MFIs may have to opt for payment by results. The idea is to motivate the staff by making them more accountable for the consequences of their own actions, for instance through funding proposals that increase the MFIs' performance. In our case, this means that the MFIs should link the substantial part of the staff's remuneration to their workload and to the overall performance of the MFI. This could be achieved by a system of bonuses, profit sharing, profit-related pay, payment by commission and the issuance to staff of shares in the MFIs. These mechanisms provide the staff with incentives to maximize the MFI's performance, since they gain a share in the MFI's profits. In return, MFIs must provide substantial incentives to micro-entrepreneurs. These incentives include future eligibility for access to substantial funds to move the business from micro-enterprise to small and/or medium enterprise. Additionally, depending on the project and the amount required to launch it, MFIs have to commit only a fraction of the required capital and tie subsequent financings to the successful completion of intermediate objectives. By creating this abandonment option, MFIs increase the value of the investment and reduce the overinvestment problem. Indeed, the micro-entrepreneurs know that if they mislead the MFIs, they will be denied access to future funds and that additional funds will be committed only after they demonstrate in deed, rather than in words, that an interim result is achieved as postulated in the contract.

6. Conclusion

In this article, we attempt to determine the appropriate financial instrument to nurture micro-enterprise to allow MFIs to be more profitable and to reduce poverty among financially and socially excluded persons.We first show that depending on the disparity factor of the valuation of the collateral, the debt mechanism could achieve a pooling or separating equilibrium. However, for the MFI's own best interest, we have shown that the pooling contract dominates the separating contract. In this pooling contract, we have shown that the collateral is not valuable. As a result, it follows that collateral in microfinance contracts does not play a useful role in making the loan riskless, and in discouraging the poorest entrepreneurs from applying for capital.

Furthermore, we have demonstrated that the equity contract dominates the debt contract in the sense that it serves the MFI's best interest because the profits it generates are higher than the profits derived from the collateral-debt contract. In addition, we have proven that the social welfare that results from the equity contract is higher than the social welfare resulting from the debt contract. Therefore, the equity contract is more socially beneficial than the debt contract. A MFI providing micro-equity receives equity in the micro-business in return for his investment, the return on which is entirely dependent the success of the micro-venture, where as a MFI providing a loan gets paid first whether there is any profit or not. By becoming a stakeholder in the venture rather than a lender, the micro-equity provider is in a more tightly coupled relationship, providing knowledge and guidance necessary for ensuring success of the venture. We suggest here that access to knowledge is essential for success. Our paper provides new evidence of how microfinance may be delivered to achieve its core objective of ending the vicious circle of poverty by enabling the poor to set up a small business that generates enough revenues to not only repay the loan, but also to raise their standard of living without putting the financial viability of the MFI at risk. The results of the paper are important for policy development, for development practitioners that seek to understand the long term impacts of MFIs and for financial legislators that design regulation to guide MFIs.

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Appendices

Proof of Proposition I

In solving the MFI's debt-contract problem, we ignore the low-ability ME incentive-compatibility constraint and the high-ability ME individual-rationality constraint. As in the equity contract, we will resolve the MFI's optimization problem, subject to the high-ability ME incentive-compatibility constraint and the low-ability ME individual-rationality constraint. Having solved the less constrained problem, we show that the solution satisfies both of the constraints that we ignored. The Lagrangian for this less constrained problem can be expressed as:

$$L = \eta[\theta_H \rho_H + (1-\theta_H)(X_2 + \beta C_H) - K] + (1-\eta)[\theta_L \rho_L + (1-\theta_L)(X_2 + \beta C_L) - K] \quad \text{(A1)}$$

$$+ \mu\{\theta_H (X_1 - \rho_H) - (1-\theta_H) C_H - \theta_H (X_1 - \rho_L) + (1-\theta_H) C_L\} \quad \text{(A2)}$$

$$+ \lambda\{\theta_L (X_1 - \rho_L) - (1-\theta_L) C_L\} + \psi_L + \tau_1 C_L + \tau_2 C_H \quad \text{(A3)}$$

where μ stands for the Lagrangian multiplier for the high-ability ME incentive-compatibility and λ stands for the multiplier for the low-ability participation constraint. The Lagrangian multipliers τ_1 and τ_2 are the multipliers for the non-negativity constraints on C_i for $i = L, H$. The first order condition for ρ_i and C_i for $i = H, L$ gives:

$$\partial L / \partial \rho_H = \eta\theta_H - \mu\theta_H = 0 \Rightarrow \mu = \eta \quad \text{(A4)}$$

$$\partial L / \partial C_H = \eta(1-\theta_H)\beta - \mu(1-\theta_H) + \tau_2 = 0 \Rightarrow \tau_2 = \eta(1-\theta_H)(1-\beta) \quad \text{(A5)}$$

$$\partial L / \partial \rho_L = (1-\eta)\theta_L + \mu\theta_H - \lambda\theta_L = 0 \Rightarrow \lambda = (1-\eta) + \eta\theta_H\theta_L^{-1} \quad \text{(A6)}$$

$$\partial L / \partial C_L = (1-\eta)(1-\theta_L)\beta + \mu(1-\theta_H) - \lambda(1-\theta_L) + \tau_1 = 0 \quad \text{(A7)}$$

$$\Rightarrow \tau_1 = (1-\theta_L)(1-\eta)(1-\beta) + \eta[(1-\theta_L)\theta_H\theta_L^{-1} - (1-\theta_H)] \quad \text{(A8)}$$

Condition (A 5) implies that $\tau_2 > 0$. In condition (A 8) we have: $(1-\theta_L) > (1-\theta_H)$ and $\frac{\theta_H}{\theta_L} > 1$ $\Rightarrow (1-\theta_L)\frac{\theta_H}{\theta_L} > (1-\theta_H)$. Thus, it follows that condition (A 8) implies that $\tau_1 > 0$. Since $\tau_1 > 0$ and $\tau_2 > 0$; it follows that:

$$C_H^* = C_L^* = 0 \quad \text{(A9)}$$

Condition (A6) implies that the low-ability ME individual-rationality constraint is binding. So, since $C_L^* = 0$

$$\theta_L (X_1 - \rho_L) - (1-\theta_L) C_L - \psi_L = 0 \quad \text{(A10)}$$

$$\rho_L^* = X_1 - \frac{\psi_L}{\theta_L} \quad \text{(A11)}$$

Condition (A 4) implies that the high-ability ME incentive-compatibility constraint is binding. Thus, since $C_H^* = C_L^* = 0$ and $\mu = \eta$, I have:

$$\theta_H (X_1 - \rho_H) - (1-\theta_H) C_H - \theta_H (X_1 - \rho_L) + (1-\theta_H) C_L = 0 \quad \text{(A12)}$$

$$\rho_{PD}^* = X_1 - \frac{\psi_L}{\theta_L} \quad \text{(A13)}$$

where $\rho_{PD}^{*} = \rho_{H}^{*} = \rho_{L}^{*}$. To prove that the solution for the less constrained problem holds for the low-ability ME incentive-compatibility constraint, note that:

$$\theta_L(X_1 - \rho_L^*) - (1-\theta_L)C_L^* - \theta_L(X_1 - \rho_H^*) + (1-\theta_L)C_H^* = 0$$

To prove that the high-ability ME individual-rationality constraint holds for the solution for the less constrained problem, note that:

$$\theta_H(X_1 - \rho_H^*) - (1-\theta_H)C_H^* - \psi_H = \psi_L \frac{\theta_H}{\theta_L} - \psi_H > 0 \qquad \text{(A14)}$$

To compute the corresponding profit for the pooling contract, we substitute: C_H^*=C_L^*=0 and $\rho_H^* = \rho_L^* = X_1 - \frac{\psi_L}{\theta_L}$ in

$$\Pi = \eta[\theta_H\rho_H + (1-\theta_H)(X_2 + \beta C_H) - K] + (1-\eta)[\theta_L\rho_L + (1-\theta_L)(X_2 + \beta C_L) - K]$$

we get, after algebraic manipulations:

$$\Pi_{PD}^{*} = \eta(\theta_H - \theta_L)(X_1 - X_2 - \frac{\psi_L}{\theta_L}) + (V_L - \psi_L - K) \qquad \text{(A15)}$$

Proof of Proposition II

From (A 5) it is straightforward to verify that by setting β=1, τ_2=0. As a result, it follows that $C_H^* > 0$. From (A 8), it is also straightforward to check that $\tau_1 > 0$ for β=1. Therefore, it follows that $C_L^* = 0$. Since from (A 6) we do know that $\lambda > 0$, it follows that the low-type ME individual-rationality constraint is tied up. In this respect, one can easily check, after some algebraic manipulations, that:

$$\rho_L^* = X_1 - \frac{\psi_L}{\theta_L} \quad for \quad C_L^* \qquad \text{(B1)}$$

From (A 4), we know that $\mu = \eta > 0$. From this, it follows that the incentive compatibility constraint of the high-ability ME is tied up. Now, by substituting C_L^*=0 in the high-ability ME incentive compatibility and by performing the appropriate algebraic manipulations, it is straightforward to obtain

$$\rho_H^* = \rho_L^* - \frac{1-\theta_H}{\theta_H} C_H^* \qquad \text{(B2)}$$

To obtain the profit corresponding to the pooling contract, we substitute ρ_L^* and ρ_H^* in $\Pi = \eta[\theta_H\rho_H + (1-\theta_H)(X_2 + \beta C_H) - K] + (1-\eta)[\theta_L\rho_L + (1-\theta_L)(X_2 + \beta C_L) - K]$ and after some algebraic manipulations, we get:

$$\Pi_{SD}^{*} = \eta[(\theta_H - \theta_L)(X_1 - X_2 - \frac{\psi_L}{\theta_L}) - 2(1-\theta_H)C_H^*] + (V_L - \psi_L - K) \qquad \text{(B3)}$$

Proof of Proposition III

In solving the MFI's equity problem, we primarily ignore the low-ability ME incentive-compatibility constraint and the high-ability ME participation constraint. In this less constrained problem, we optimize with respect to ϕ_H and ϕ_L. Having solved the less constrained problem, we show that this solution indeed satisfies the low-ability ME incentive-compatibility constraint and the high-ability ME participation constraint. The Lagrangian for the less-constrained problem is

$$L = \eta(\phi_H V_H - K) + (1-\eta)(\phi_L V_L - K) \qquad \text{(C1)}$$

$$+\mu\{(1-\phi_H)V_H-(1-\phi_L)V_H\} \quad \text{(C2)}$$

$$+\lambda\{(1-\phi_L)V_L-\psi_L\} \quad \text{(C3)}$$

where μ and λ stand respectively for the Lagrangian multipliers for the high-ability ME incentive-compatibility constraint and the low-ability ME participation constraint.
The first order condition for ϕ_H and ϕ_L yields the following implications:

$$\partial L/\partial\phi_H=\eta V_H-\mu V_H=0\Rightarrow\mu=\eta \quad \text{(C4)}$$

$$\partial L/\partial\phi_L=(1-\eta)V_L+\mu V_H-\lambda V_L=0\Rightarrow\lambda=(1-\eta)+\eta\frac{V_H}{V_L} \quad \text{(C5)}$$

Conditions (C4) and (C5) imply that $\mu>0$ and $\lambda>0$. Thus the high-ability ME incentive-compatibility constraint and the low-ability ME participation constraint are tied up together.
From the low-ability ME participation constraint it follows that:

$$\phi_L=\phi_P^*=1-\frac{\psi_L}{V_L} \quad \text{(C6)}$$

and from the high-ability ME incentive-compatibility constraint it follows that:

$$V_H(\phi_L-\phi_H)=0 \quad \text{(C7)}$$

Since $\theta_H V_H>0$, it follows that: $\phi_H=\phi_L=\phi_{PE}^*$ To verify that the solution to the less constrained problem satisfies the low-ability ME incentive constraint, note that:

$$(1-\phi_L)V_L-(1-\phi_H)V_L=0 \quad \text{(C8)}$$

since $\phi_H=\phi_L=\phi_{PE}^*$.
To verify that the high-ability ME participation constraint is satisfied, note that:

$$(1-\phi_H)V_H-\psi_H=\psi_L\frac{V_H}{V_L}-\psi_H>0 \quad \text{(C10)}$$

To compute the corresponding profit to the pooling contract, we substitute $\phi_P^*=1-\frac{\psi_L}{V_L}$ in $\Pi=\eta(\phi_H V_H-K)+(1-\eta)(\phi_L V_L-K)$. After some algebraic manipulations, we get:

$$\Pi_{PE}^*=\eta[V_H-V_L+\psi_L(1-\frac{V_H}{V_L})]+(V_L-\psi_L-K) \quad \text{(C11)}$$