Lending to poor borrowers and incentives for micro-credit agents

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Abstract

A credit institution that seeks to lend to the poor will suffer intrinsically more from asymmetric information than a profit-maximizing institution. It will find it especially difficult —sometimes impossible— to give incentives to its agents to acquire and truthfully report information on borrowers' wealth and ability. We focus on the case where the likelihood of success of entrepreneurs increases with their wealth. Random audits are then often indispensable to restore incentives.

Contrary to usual supervision settings, a social microfinance institution that is tightly budget constrained may benefit from letting non monetary transfers occur between the agent and richer borrowers. They allow to better screen borrowers according to ability, and ultimately to lend more often to poor borrowers.

Keywords: micro-credit, social objectives, incentives.

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VERY PRELIMINARY

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1 Introduction

Although the literature on micro-credit is huge, extremely little attention has been paid to the specificity of objectives of many 'social' credit institutions. Conversely to profit-oriented institutions, that have been extensively studied, social Microfinance Institutions (MFIs) wish to select poor borrowers. This is the stated objective of many lending organizations. An important stylized fact is that poorer borrowers are usually less likely to repay loans than richer ones. This aspect makes poverty alleviation more difficult.

This paper focuses on how positive correlation between wealth and reimbursement affects the schemes used by credit institutions to select borrowers, and more precisely the contracts offered to screening agents. The polar cases of a profit-oriented MFI and of a MFI that seeks to lend as much as possible to the poorest borrowers, a 'social' MFI, are contrasted. The 'wealth' considered is illiquid, and can be interpreted as some social capital. The term of 'rich' borrowers will refer to borrowers who are poor enough not to have access to other sources of credit such as banks. The results of case studies in Uganda, Peru and Guatemala will be used to confirm the theoretical results.

The main information and enforcement problems[1] linked to micro-finance can be roughly summarized as follows:

1. Incentive problems for the agent vis-à vis the borrower: Adverse selection with respect to his ability and wealth, and moral hazard in his productive effort, as well as in his possible diversion of revenues.

2. Incentive problems for the MFI vis-à vis the agent: Moral hazard in his effort to acquire information on borrowers, in his monitoring of productive effort, in his collection effort, possible collusion at the stage of initial screening of borrowers, at the stage of collection of reimbursement, and possible theft of collected reimbursement by the agent.

The asymmetries suffered by the agent with respect to the borrower translate in asymmetries

[1] One can add incentive problems for donors and lenders vis- vis the MFI: They want to align the objectives of the MFI with their own.

for the MFI with respect to the agent[2]. We focus here on asymmetric information on borrowers' wealth and ability, together with asymmetric information on the agent's effort to acquire information. It is shown that in realistic settings, the conjunction of these problems requires to audit borrowers' wealth. The other types of information asymmetry on borrowers can be solved by using the prospect of obtaining new loans as a dynamic incentive.

Our objective is not to describe an optimal incentive mechanism that would take into account all of these problems. We concentrate on the other hand on the information problems for which a difference in objectives really has an impact. We will also focus here on the issues of inducing information acquisition and revelation when hiring a single, given, agent. The design of an adequate incentive scheme is of course more complex in practice. It includes for instance the choice between one agent effecting all tasks, and several specialized ones. Group incentives can also be used when several agents work in the same conditions: Yardstick mechanisms and peer monitoring then enable to improve contracting under asymmetric information. And the case studies we have conducted confirm that these mechanisms are widely used. But their use is independent of the objective of the MFI. Moral hazard on borrowers' effort is also an important issue. Yet the problems to which it gives rise are independent from the objectives of the MFI: Any MFI wants to induce effort so as to increase the probability of success of a project, provided it is not too costly to do so. The specificity of social MFIs is much more visible in adverse selection settings, which justifies our modeling choice.

We show that inducing a truthful revelation of information on wealth —i.e. a correct selection of borrowers, when one interprets the use of an agent as delegation— by the agent requires the use of transfers that are non monotonous in the repayment rate. These wage schemes are not robust to the introduction of either collusion at the repayment stage, or a need for monitoring of repayment by the agent. They cannot be used, in addition, when the probability of reimbursement depends on ability only, and not on wealth. Random audits yielding signals on the true type of borrowers are then necessary.

[2]For instance, the agent has to exert a monitoring effort to prevent the borrower from shirking. The level of effort of the borrower therefore becomes a function of the level of effort of the monitoring agent and the incentive problem becomes, from the point of view of the MFI, how to induce monitoring effort by the agent so as to obtain an efficient level of effort by the borrower.

Moreover that if some non monetary transfers between rich borrowers and agents are feasible, they can ultimately benefit the poor. They indeed allow to decrease the wage received by the agent. Preventing those transfers to occur would therefore be costly. Since the agent now has a direct incentive to report rich borrowers as poor —or to select more rich borrowers than he should— the wage he receives must be designed so as to give him correct incentives. The above results concerning the usefulness of a signal on borrowers' wealth apply. This result arises because agents can extract benefits, such as social privileges, recommendations useful for other transactions, etc. from borrowers who have no collateral in the traditional sense, while these benefits have no value for the MFI. Letting agents collude with borrowers is a way of using transfers that are not available to the institution.

* *Related literature*

The literature on micro-credit is extremely large (see Ghosh, Mookherjee and Ray (2001) for instance for a pedagogical survey) but only few papers consider the issue of screening on wealth. This is in strong contrast to the debate between practitioners who insist that giving incentives to agents is both difficult and crucial, and that financial viability often prevents MFIs from reaching their pro-poor objectives.

The literature on moral hazard and adverse selection on wealth differs from our paper by the perspective taken. Lewis and Sappington (2001) consider a moral hazard setting in which wealth determines the maximal amount that borrowers can reimburse. They show that the optimal mechanism exhibits a complementarity between wealth and ability. Malavolti (2001) considers how the degree of competition between money-lenders affect the screening contracts they offer to agents with moral hazard and heterogeneous wealth levels. In this paper also, wealth matters as a way of insuring the lender against failure. Our approach differs from both papers not only because of the correlation between wealth and success, but also, and primarily, because screening according to wealth is an objective for a social MFI, not a tool.

In a similar perspective but in a very different context, Cremer and Laffont (2000) study a public good allocation problem when access to the good is costly, and individuals differ in both their financial resources and their cost of access. they show that subsidizing the poor is more costly, under asymmetric information, when they have higher access costs to public goods than

richer individuals.

Empirical studies on MFIs also abound. Again, the issue of the objectives of these institutions has been much more stressed by practitioners than by academic researchers. Let us simply note the study by Amin, Rai and Topa (2000). They test empirically whether microcredit organizations lend more to more vulnerable groups. They conclude that these organizations fare relatively well in this respect and could improve their targeting by conditioning loans on observable variables such as the gender and marital situation of borrowers, single women being typically more vulnerable than others. They don't take into account the possibility that imperfect targeting be necessary for financial viability.

* *Outline of the paper*

The remaining of the paper is organized as follows: The model is presented in Section 2. Section 3 stresses the impact of a positive correlation between wealth and ability and sets up the benchmark of a profit maximizing MFI. The specific difficulties encountered by a lending institution with social objectives are analyzed in Section 4. This section also stresses how a correlated signal can be used to improve contracting. Section 5 studies the outcome when collusion between the agent and potential borrowers is a concern. Section 6 offers comments on the current concerns of MFIs and concludes.

2 The model

We consider the following structure in the remaining of the paper: A Micro-Finance Institution (MFI) lends to borrowers that have independent projects[3]. It may use agents as intermediaries to screen and deal with borrowers.

[3]The nature of the project is not further defined here. Differences can of course be made depending on the type of project considered: For instance farm projects typically show a strong variability in outcome that is in a large part independent of the farmer's effort. These aspects of a given type of project give insights at which type of incentives will be the more costly to give in practice but do not affect the general results given below.

2.1 The micro-finance institution

We will compare two types of micro-finance institutions in the following, the profit- oriented ones, and the ones with 'social objectives'. Both are subject to a viability constraint. Unless otherwise specified, the viability constraint specifies a minimal net rate of return Π^{min}. The larger the profitability target, the less freedom the credit institution will have in choosing borrowers.

MFIs aiming at maximizing profits design incentive schemes for their agents so as to maximize the expected value of repayments minus the costs of investing and rewarding the agent.

MFIs with 'social objectives' seek to reduce poverty in the area in which they are operating.

2.2 The borrowers

Each borrower has to borrow the same amount I to finance a project that yields him verifiable benefits S if it is successful, and 0 otherwise. Borrowers are differentiated according to their 'ability' and their 'wealth'.

* *Ability*

Borrowers can be

- either 'able', (A), in which case they have a high probability of success,
- or 'unable' (U), in which case their probability of success is lower, and normalized to 0.

Due to our normalization, unable borrowers get a zero monetary benefit, whether they can borrow or not. The following assumption ensures that they still prefer to borrow:

- Obtaining a loan yield a social benefit v, strictly positive but close to zero.
- Success in the project yields a non monetary benefit V to the borrower, whatever his initial wealth.

This assumption is a short-cut for the following stylized facts: In practice, a borrower that succeeds obtains some social capital and has access to credit at more advantageous terms afterwards. V represents the continuation value of the game after a success.

We consider moreover that V is large enough so that success itself helps poor borrowers getting out of poverty, whatever the monetary amount actually left after reimbursement. Technically, this assumption allows to reduce the issue of decreasing poverty to lending to poor borrowers.

* *Wealth*

Borrowers can also be distinguished according to their wealth level. Borrowers can be either 'rich', or 'poor'.

- 'Rich' borrowers have a positive initial wealth level W, $W > V$, that is not pledgeable. This wealth can be thought of as some illiquid assets, like buildings or land with shared or common property rights, or non monetary assets, like social capital.
- 'Poor' borrowers have neither wealth nor assets.

Borrowers are protected by limited liability: the net transfer they receive must be positive. They therefore reimburse their loan only when the project is successful.

It should be stressed that the 'rich' borrowers we consider are just 'less poor' than the poorest ones. We use this terminology here because of its simplicity only. The types of loan contracts offered by micro-credit institutions, entailing small sums only and at a high interest rate, are not attractive to borrowers who can have access to traditional bank loans.

The proportion of borrowers of wealth level k is denoted by μ^k, where $k = r$ for rich borrowers, and p for poor borrowers ($\mu^r + \mu^p = 1$). The variables corresponding to able and to unable borrowers will be indexed by A and U respectively. For instance, μ^r_U is the proportion of poor unable borrowers.

* *Positive correlation between wealth and ability*

We focus in the paper on situations in which wealth and assets are positively correlated with the probability of success. Two alternative assumptions are considered. In the first one, $A1$, the rich have the same probability of success but are more often able. In the second one, $A2$, there are as many able borrowers among the rich than among the poor, but rich people have a higher probability of success.

Assumption 1 *Rich borrowers are more often able:*

- The proportion of able individuals is ξ among the rich ones, and $\alpha\xi$ among the Poor, with $\alpha \in]0,1[$.

- The probability of success if independent of wealth: Able borrowers succeed with probability q.

Under this assumption, the proportion of rich able borrowers is $\mu_A^r = \xi\mu^r$ and the proportion of poor able borrowers is $\mu_A^p = \alpha\xi\mu^p$.

The alternative assumption is the following:

Assumption 2 *Rich borrowers have a higher probability of success:*

- The proportion of able individuals is the same, ξ, among the rich and the poor.

- The probability of success for able borrowers is $\overline{q}$ if the borrower is rich, and $\underline{q}$ if he is poor, with $\overline{q} > \underline{q}$.

There the proportions of able borrowers among rich individual and among poor individuals are respectively $\mu_A^r = \xi\mu^r$ and $\mu_A^p = \xi\mu^p$.

To allow for comparisons, we will assume $q = \overline{q}$ and $\alpha\overline{q} = \underline{q}$.

In practice, the probability that a project is successful will increase with the wealth of the borrower that undertakes the project if wealth implies better assets, be them related to physical, human or social capital. For instance,

- wealth is linked to some social network that makes it easier to obtain some inputs or to attract consumers to a business, for instance,
- wealth is related in a farm project with the quality of the land, or, similarly, with the location and attractiveness of premises for a shop or restaurant.
- wealth is needed to obtain better quality inputs that will favor the success of the project, or to invest small additional amounts to keep the project going after some unexpected shock,
- the project requires some skill or education level that is positively correlated with wealth. Since wealthier individuals are more likely to be more educated, their chances of success may be higher than the ones of poorer and less educated borrowers.

Last, richer borrowers may be more often able to mobilize funds ex post, at the time of reimbursement, even if they cannot commit to do so ex ante and if the probability that they do so is not enough to induce traditional banks to lend them.

To consider the most interesting case, we assume in the following that lending to poor borrowers is not beneficial on average:

Assumption 3 *The expected net present value of investing in a project is positive for rich borrowers, but not for poor borrowers:*

$$\xi \underline{q} \leq \frac{I}{S} \leq \underline{q}.$$

A profit-oriented MFI will therefore never lend to poor borrowers if it is unable to screen them according to their ability.

The observed rate of reimbursement for a given MFI will be denoted by ρ.

* *No possibility of self-selection*

Whatever the wealth level of an individual, we assume that it is not verifiable and *cannot* be pledged as collateral.

The focus of this paper being on poor households, the wealth level considered is small even for 'rich' borrowers, and often not liquid. 'Wealth' often consists in social assets that are not easily converted into monetary value. From a theoretical point of view, screening ability and wealth is quite easy if wealth can be verified —can be proved by the borrower. It is sufficient then to design stochastic contracts, in which rich borrowers pay a fixed fee in exchange for obtaining a loan with a positive probability. A menu of stochastic contracts allows to screen rich borrowers according to their ability: Able rich borrowers have to pay a fixed fee which is large enough to make the contract not profitable to unable borrowers. Unable rich borrowers pay a smaller fee (or no fee at all: it is enough that they show their collateral) and get a loan with a small probability. All borrowers get a zero utility in expectation, but screening is perfect for rich borrowers. The only issue that remains concern screening ability for poor borrowers. A profit-maximizing MFI may be quite satisfied with restraining its loan to rich borrowers in this situation ...

For similar reasons, we assume that the costs that the MFI can impose on borrowers (like queuing, coming regularly to meetings, filing forms, etc.) are not sufficient to screen out individuals according to their type —or to one dimension of their type. Otherwise, it would be possible to use a screening mechanism, to a certain degree, as in Besley and Coate (1992)[4]. The mechanism is simple: If associated costs are high enough, only individuals having the highest valuation for a loan will ask for it. In our case, such a mechanism would still not be sufficient. Indeed, able borrowers are the ones who have the highest valuation for a loan. Under assumption $A1$, able rich and able poor individuals cannot be screened since they derive the same expected value from a loan. Under assumption $A2$, able rich borrowers have a higher valuation than able poor borrowers. A mechanism composed of a menu of loan contracts associating costs to be borne with a probability of getting a loan can allow to screen them. For instance, a social MFI can offer rich able borrowers a lower repayment rate in exchange for a small probability of obtaining a loan, together with costs computed so as to deter unable borrowers from applying. Using a stochastic mechanism, in which the probability of getting a loan remains small, allows the social MFI to screen rich able borrowers 'out', and to keep most of its available funds for poor borrowers. Screening poor able and unable borrowers remains impossible.

We prefer to assume in this paper that self-selecting individuals through costs is not possible at all. Imposing high costs on borrowers would often not be accepted by the public. Field observations confirm that screening instruments are not sufficient: Although credit institutions certainly impose costs on their borrowers, this simply allows, together with upper bounds on the amounts lent and high interest rates, to screen out borrowers who have access to formal banking —thanks to collateral, in particular. Reaching the poorest of remaining individuals remains a real issue in practice.

2.3 The credit agent

Since self-selection is not possible, the MFI can hire a specialized risk-neutral agent in order to screen borrowers according to their wealth and their probability of success. This information is

[4]Besley and Coate show that aid should be made conditional on the recipient exerting some effort, even if the outcome of this effort has no value, for screening purposes, when rich individuals can pass themselves as poor. Credit in our setting is very similar to aid.

'soft', i.e. not verifiable by the MFI.

The agent is risk neutral and *not* protected by limited liability. Although this is clearly not extremely realistic, it allows to identify specific difficulties in giving proper incentives for selecting poor borrowers. The costs of limited liability are well know and mainly orthogonal to the effects we want to highlight here. The case considered here is therefore the one in which it is the easiest to induce a given behavior from the agent.

To simplify, and without loss of generality here, we consider that information acquisition is a deterministic process[5]: The agent obtains information for sure if he incurs some fixed cost. This cost is C^a for information on ability and C^w for information on wealth. It is of course likely that there are economies of scope in information acquisition, since that learning information on one of the characteristics of the borrower probably brings about information on the other. This is more or less orthogonal to our problem, but for the sake of generality, it is assumed that $\min\{C^a, C^w\} \leq C^{a,w} \leq C^a + C^w$.

The utility of this agent is $U = w - C$ when the agent incurs a cost of information acquisition C, and is paid w by the MFI.

3 Profitability and the selection of borrowers: Some benchmarks

3.1 The characteristics of the contracts offered to borrowers

Given a probability of success i, the expected return for a borrower is $i(S-t)+V$. But due to limited liability, a loan contract can only specify a positive repayment in case of success, t. Moreover, this repayment has to be lower than the value in case of success, S, so that the MFI cannot take advantage of the private value of obtaining a loan, V. We must have $0 \leq t \leq S$. There is therefore no way of inducing participation of only borrowers of certain wealth or ability levels.

A profit-maximizing MFI would like the participation constraint of able borrowers only to be

[5]Since the agent is risk neutral, introducing a stochastic aspect to information acquisition simply means that wages should be seen as wages in expectation.

satisfied. Yet, any contract that is attractive to an able borrower is also attractive to a unable one. The same reasoning applies for poor and rich borrowers. If collateral was available, or if the MFI could ask for fixed fees, self-selection of borrowers through a menu of contract would be feasible. Lending to borrowers that are poor enough —including the "rich" ones we consider here— not to have any collateral thus implies crucial information problems.

Since there is no need for informational rents — self-selection of borrowers being impossible— both types of MFI will find it optimal to set the terms of the contract so as to extract the full net present value of the project[6]. Hence, $t = S$.

The budget constraint faced by a MFI is thus:

$$(V): \quad (x^p + x^r)\xi\overline{q}S - (x^p + x^r)I - w\mathbb{1}_A \geq \Pi^{min},$$

where $\mathbb{1}_A$ equals 1 if the MFI hires a screening agent.

The budget constraint is always binding for a social MFI, whatever the information it has: If it is making extra profits on some borrowers, these profits will be used to finance unprofitable loans to poor borrowers.

3.2 The full information benchmark

* *Profit-maximizing MFI*

Under full information, a profit maximizing MFI will lend to able borrowers only. When the probability of success does not depend on wealth (assumption $A1$), it will lend similarly to rich able borrowers and to poor able ones. When rich borrowers have a higher probability of success (assumption $A2$), it will first lend to rich able borrowers, and then, if it has enough funds available —and if the rate of return is high enough, if the MFI is subject to a constraint on this rate— to poor able individuals.

* *Social MFI*

[6]This hinges on the fact that a social MFI does not care for the amount left to poor borrowers after reimbursement. It might otherwise want to keep the participation constraint of poor borrowers slack, but that would create incentive problems since rich borrowers would then try to pass as poor. As noted in the above text, self-selection is not possible here.

A social MFI will lend in priority to poor able borrowers, and then use the profits generated in this way to also lend —at a loss- to poor unable borrowers, as much as its budget constraint allows.

More precisely, it will lend to a proportion y of poor unable borrowers so that $\mu_A^p \underline{q} S - (\mu_A^p + y)I = \Pi^{min}$.

3.3 The case of a profit-maximizing MFI

* *Probability of success unrelated to wealth*

A profit-maximizing MFI cares only for ability under assumption $A1$: If it has information on ability, then it never hires an agent to learn about wealth.

If the MFI is uninformed about ability —whether it is informed on wealth or not, since this information is irrelevant— it may want to hire an agent. The problem is a standard moral hazard one: The MFI cannot contract directly on the effort made by the agent in acquiring information, but can use a verifiable variable that is correlated with this effort. Indeed, if the agent actually incurs the cost of information acquisition, and then select able borrowers as recommended by the MFI —or equivalently, truthfully reports his information— reimbursement will happen more frequently.

The Revelation Principle applies and there is no loss of generality in considering only contracts in which the MFI induces truthful reporting by the agent of his information[7]. The MFI can induce information acquisition on ability at the lowest possible cost, C^a with a mechanism as the following one[8]:

The agent receives a total wage composed of a (negative) fixed part, W, and of a fraction ω of profits, with:

$$\omega(\Pi^{info} - \Pi^{rand}) \geq C^a$$
$$W + \omega\Pi^{info} = C^a,$$

where Π^{info} is the expected value of profits when the agent obtains information and borrowers are selected as prescribed by the MFI, and Π^{rand} corresponds to a random, uninformed, selection

[7]See Green and Laffont (1977), and Myerson (1979).

[8]This is only one of the possible ways of implementing this first best outcome, since the agent is risk neutral.

of borrowers (see the appendix). The fraction of profits ω serves to align the objectives of the agent to that of the MFI, while the fixed part is adjusted to leave no expected rent to the agent.

A profit-maximizing MFI chooses to hire an agent when the total cost of being informed on ability, C^a, is lower than the associated benefits. Since the MFI would not have lent at all without information — i.e. when poor borrowers are either very numerous or very likely to be unsuccessful, as under our assumptions— the benefit from information is simply $\overline{q}S - I$ multiplied by the number of loans granted (the latter depending on the proportions of able borrowers in the population). Thus, the more costly it is to acquire information on borrowers, the more profitable they have to be to attract profit-maximizing investors.

* *Probability of success depending on wealth*

Under assumption $A2$, even a profit-maximizing MFI cares for wealth, since its expected profits are higher when lending to rich able individuals than to poor able individuals. Since the problem this MFI faces in giving incentives to agents are extremely similar to the ones faced by a social MFI, we leave a detailed analysis of the issues linked to information on wealth for the following section. It is sufficient to remember that the value of information on wealth is more limited for a social MFI, since it only allows to benefit from a maximum probability of success, $\overline{q}$, instead of an average probability of $\frac{(\mu^r+\alpha\mu^p)\overline{q}}{\mu^r+\mu^p}$.

4 The incentive issues for a social MFI

Let us now consider a micro-finance institution that wishes to lend as much as possible to poor individuals.

4.1 Asymmetric information on ability only

If the MFI is informed on wealth, it will lend to poor borrowers only. Without further information, this implies negative profits, which may not be allowed by the budget constraint. But the MFI can use an agent to reach the ideal allocation of loans it would choose under full information, to the difference that the budget available is decreased by the amount of the wage w paid to the agent.

As in the case of a profit-maximizing MFI, the agent is needed only to obtain information on ability. The same type of mechanism, relating the agent's wage to borrowers' reimbursement allows to implement the first best. The proportion of poor unable borrowers who obtain a loan, y, is just smaller than in the full information case, since the MFI has to cover the fixed cost C^a of information acquisition: $y = \frac{\mu^p \alpha \xi \overline{q} S - (\Pi^{min} + C^a)}{I} - \mu^p_A$, where $\mu^p_A = \xi \alpha \mu^p$ under assumption $A1$, and $\mu^p_A = \xi \mu^p$ under assumption $A2$. The proportion of poor unable individuals who obtain a loan is increasing in the number of able poor borrowers, due to cross-subsidization.

To summarize, asymmetric information on ability is not a major problem since wealth is correlated with reimbursement, which is assumed to be verifiable. Since the agent is risk neutral, delegation of information acquisition to an agent is not costly (the only cost is the 'physical' one of acquiring information itself).

4.2 Asymmetric information on wealth only

Inducing information acquisition on wealth is quite a different thing... The following results clearly show that information problems are —weakly— more costly to social MFIs than to profit-maximizing ones.

4.2.1 Probability of reimbursement independent from wealth

Under assumption $A1$, only the proportion of able borrowers vary according to wealth, which means that reimbursement is not correlated at all with wealth, once individuals are sorted according to their ability. In such a situation, the MFI has no correlated variable on which to make the agent's wage dependent. The conclusion is absolutely straightforward: It is then impossible to induce information acquisition.

Lemma 1 *When the probability that a borrower reimburses his loan is independent from his wealth, a MFI cannot induce the agent to exert the necessary effort to learn wealth levels.*

Since only socially-oriented MFIs care for wealth in this situation, they intrinsically suffer more from asymmetric information than profit-maximizing credit organizations.

It is clear that the agent will always select individuals randomly rather than incur cost C^w. The only case in which information may still be obtained is if the MFI can get —possibly at some

cost— an *ex post* signal on the wealth of individuals that were selected by the agent.

The use of an ex post signal is considered in subsection 4.4.

4.2.2 Probability of reimbursement correlated to wealth

Contrary to the previous result, when rich individuals have a higher probability of reimbursement, incentives schemes can be constructed. Notice that this is the only case ($A2$) in which a profit-maximizing MFI wishes to learn about wealth.

The expected reimbursement when the agent acquires information and selects y_A^p poor able borrowers and y_U^p unable poor borrowers is $y_A^p \overline{q}$ under assumption $A1$, and $y_A^p \alpha \overline{q}$ under assumption $A2$ (when poor able borrowers have a lower probability of reimbursement than rich ones). Selecting borrowers randomly will induce an average reimbursement of $\mu^p \alpha \xi \overline{q}$ (under both assumptions). It is therefore easy to spot shirking by the agent[9]. Moral hazard on the side of the agent is thus not costly, whatever the type of MFI considered.

4.3 Asymmetric information on both wealth and ability

If the social MFI is uninformed on both wealth and ability, then it has to decide whether it wishes to induce information acquisition on ability only, on wealth only, or on both ability and wealth.

4.3.1 Probability of reimbursement independent of wealth

When the probability of success of a given individual depends on his ability only and not on his wealth ($A1$), the MFI is faced to the same problem as in the previous subsection: It cannot guarantee that the agent will incur the cost of information acquisition on wealth. If no signal is available, inducing information acquisition on wealth is not be a feasible option.

[9]In practice, having agents take care of a relatively large number of loans can serve at least two purposes: First, it decreases the average fixed costs of information acquisition by agents; and then, it provides a less variable signal on the performance of the agent, thereby decreasing the amount of risk he bears, when he is risk averse —a case not considered here.

The MFI can still use incentive contracts depending on profits —or reimbursement[10]— so as to induce his acquisition of information on ability. Since ability is on average more frequent for rich borrowers, offering a wage strictly increasing with profits would not in general lead to the selection preferred by the MFI: It would allow to lend to more borrowers, but mostly to more rich borrowers. This may be necessary if the MFI faces a very strict budget constraint, but not otherwise. The optimal mix of able and unable borrowers from the point of view of a social MFI will thus in general necessitate a reward scheme *non monotonous* in profits: The wage of the agent has to be maximal for some level of profit that is not the maximal one.

This theoretical result does not seem to describe in a very satisfactory way the contracts MFIs actually offer to their agents ... Should we conclude that real MFIs do not really care for helping people out of poverty? Or that their budget constraint is too tight to allow them to do so?

Using non monotonous incentive schemes call for some comments and caveats:

* *Theft and collusion at the reimbursement stage*

Clearly, if the agent can hide reimbursement, he will collect it, keep it and pretend the project was a failure to obtain the bonus from the MFI. This is an argument in favor of separating tasks: Having different agents select and collect reimbursement may be a way of decreasing the risk of theft. It is nevertheless likely that those tasks are complementary in the sense that separating them yields higher total costs than having them undertaken by a single agent.

Even if the agent cannot hide repayment (for instance if repayment is collected in a transparent way, or by other agents), the agent and the borrower can collude at the collection stage to claim failure, the borrower keeping the revenue of the project and not reimbursing.

Collusion at the selection stage is analyzed in next Section.

* *Monitoring the borrower*

Another important case in which an incentive scheme decreasing with reimbursement is not feasible is the following: Assume that in addition to the adverse selection problem, there is some moral hazard on the side of the borrower so that the agent must be given incentives to exert

[10]Using profits to condition the agent's wage, or rate of reimbursement plus number of loans is equivalent in our setting. We can assume that the MFI totally controls the number of loans, and that the wage should depend on ρ only: $w = w(\rho)$.

monitoring. Then the incentive scheme cannot reconcile the necessity to have a bonus in case of reimbursement to induce monitoring effort, and a bonus in case of 'low' reimbursement rates to induce selection of poor borrowers. To be able to still give correct incentives to the agent, the MFI has to allocate the selection and the collection tasks to two different agents when possible. Separation is of course not sufficient if the two agents may perfectly collude. Note also that, as for collusion at the repayment stage, it may be that selecting an agent gives information, a personal relationship, etc., making monitoring and selection complementary tasks[11].

To summarize, we obtain the following recommendations in such a context:

- Selecting borrowers and collecting repayment should be allocated to different agents if collusion is possible at the collection stage.
- Moreover, selecting borrowers and monitoring should be undertaken by different agents if success also depends on the borrower's effort.

4.3.2 Probability of reimbursement correlated with wealth

Let us now turn to the case in which richer individuals are more likely to repay ($A2$). The MFI now must choose whether it induces information acquisition on ability only, on wealth only, or on both.

* *Inducing information acquisition on wealth only*

Assume that the MFI prefers to remain uninformed on ability. Then the expected probabilities of reimbursement are $\xi\overline{q}$ for rich individuals, $\xi\underline{q} = \xi\alpha\overline{q}$ for poor ones. The situation is thus identical to the one in which the MFI has perfect information on ability under assumption $A2$, taking expected probabilities. The MFI can therefore induce information acquisition at no additional cost than the physical one, C^w. Not having information on ability is of course costly since it means lower expected profits, and less possibilities of lending to more poor borrowers through cross-subsidization.

* *Inducing information acquisition on both wealth and ability*

[11] If it is not the case, a 'good guy-bad guy' effect may reinforce the benefits of separating tasks: An agent specialized in monitoring may be seen as 'tougher' than the one that selects borrowers in the first place.

Assume the social MFI wants to induce the agent to acquire information on both wealth and ability. It will recommend that the agent selects y_A^r able rich borrowers, y_A^p able poor borrowers, and y_U^p unable poor borrowers (the proportion of rich unable borrowers who receive a loan will always be zero). [12]

Then, the agent cannot, on average, hide his lack of information, since the MFI controls for the number of loans granted and can recover the proportions that are most likely to have been chosen by the agent when it observes a given profit. It is enough to ensure that the wage obtained when the profits come from random selection are lower from the expected one in case of correct selection, by (at least) $C^{a,w}$.

As before, one can obtain acquisition (and revelation) of information at no other cost than the 'physical' one, $C^{a,w}$, using a wage function that is maximal for an intermediate level of reimbursement, and whose expected value is exactly $C^{a,w}$. The proportions chosen by the MFI depend therefore only on the profitability of borrowers and on the budget constraint, and are not distorted for informational reasons. The details are given in the appendix.

The choice between inducing information acquisition on both of the individuals' characteristics rather than only on one depends on how much the additional acquisition cost (e.g. $C^{a,w}-C^w$) decreases the resources available to lending compared to the benefits of more cross-subsidization thanks to higher expected profits on able borrowers.

4.4 Signals on the true type of the selected borrowers

We have seen that giving correct incentives to agents to acquire information on wealth is impossible for social MFIs when the probability of success is not related to wealth (assumption

[12] Lending to rich able borrowers may be beneficial due to cross-subsidization effects, since their probability of success is higher. As long as $y_A^p < \mu_A^p$ (i.e. there are still poor able borrowers who haven't received a loan), lending to a rich able borrower instead of a poor able one is beneficial if the additional expected profits on this rich borrower ($(\overline{q}-\underline{q})S - I = (1-\alpha)\overline{q}S - I$) allows to lend to more than one poor borrower (i.e. is larger than I, or equivalently $(1-\alpha)\overline{q} > 2\frac{I}{S}$). If this is not satisfied, one must have $y_A^r = 0$ when $y_A^p < \mu_A^p$. Once all poor able borrowers have received a loan, lending to a rich able one is beneficial for a social MFI if $\overline{q}S - I > I$. Since this has no impact on the qualitative results regarding incentive issues, these considerations are not further studied in the text.

$A1$). In addition to that, even when mechanisms can be designed, they involve non monotonous schemes that are problematic in many circumstances. On the other hand, if some ex post signal on the performance of the agent is available, incentive issues may not matter any longer.

Assume that the MFI can observe some contractible signal σ on the proportion of poor individuals selected by the agent.

In practice, credit institutions rarely observe verifiable evidence on the wealth of selected borrowers. Yet, in interviews conducted during case studies, members of MFIs have strongly underlined the importance, when considering renewal of agents' contracts, of random auditing by the branch manager on borrowers characteristics. Officers from Genesis (Guatemala) assess for instance the wealth of some borrowers by looking at signs such as the material used for the house floor, etc. Bonuses cannot be conditioned on such non verifiable information, yet contract renewal is.

If an ex ante signal on the wealth of each individual borrower was directly available to the lending institution, it would use it when designing the loan contract. Our assumption in this paper is that obtaining ex ante signals on all potential borrowers cannot be done at a centralized level, which justifies delegation to agents.[13]

Here, the modeling chosen for the signal affects only quantitative results, not qualitative ones. More precisely, due to the unlimited liability and risk neutrality of the agent, the MFI can always fully extract the agent's information —equivalently, fully control his choice of borrowers— in the absence of collusion, provided there is a correlation between the signal and the action taken by the agent.

Let us consider the case in which the MFI is informed on ability but not on wealth, and rich and poor able borrowers have the same probability of repayment[14] $\overline{q}$ (case $A1$), and assume that the MFI wants the agent to select a proportion y^r of rich borrowers. Let us denote $y^r + x$ the

[13]If an ex post individual signal could be obtained at a low cost, the institution could in principle design a contract basing transfers on this signal, so as to make borrowing unprofitable in expectation for rich borrowers. This last result does not hold here because of the limited liability of borrowers: they are always better off borrowing.

[14]A signal can of course be used also when the probability of repayment differs according to wealth, case $A2$, but we have seen that it is not as necessary. The logic of the argument is otherwise the same.

proportion actually chosen by the agent — x represents the rich borrowers in 'excess', that the agent presents as poor ones (either because he is uninformed, or because he has been corrupt by these borrowers). Some correlated signal σ is obtained after the selection is made and can be used to condition payments w to the agent. This signal is a 'sufficient statistic' so that there is no need to condition the agent's wage on other variables (such as the repayment rate for instance), see Holmström (1979) and Shavell (1979).

The MFI wants to design a wage scheme $w(\sigma)$ such that:

- The agent is, in expectation, just reimbursed for his cost of becoming informed, C^w, when selecting the right proportions of borrowers,
- And he obtains a lower expected wage —hence a negative expected utility — when choosing any other proportion— including random selection.

The two conditions translate mathematically into:

$$\begin{aligned} \mathbf{E}(w(\sigma)/y^r) - C^w &= 0 \\ \mathbf{E}(w(\sigma)/y^r + x) - C^w &\leq 0 \quad \forall x \neq 0, \end{aligned}$$

where $\mathbf{E}(w(\sigma)/y)$ is the expected wage obtained by the agent given the distribution of the signal induced by a selection of y rich able borrowers.

This is obviously not feasible if the signal σ is not strictly correlated to the variable of interest, x —or equivalently y^r (see Crémer and McLean, 1988, and Riordan and Sappington, 1988).

For a simple exposition, consider a simple signal that is either 'truthful' or not informative at all: σ is equal to the true proportion of rich borrowers, $\sigma = y^r + x$, with probability ν, and is not informative ($\sigma = \emptyset$) otherwise.

The expected utility of the agent is

$$\nu \mathbf{E}(w/y^r + x) + (1 - \nu)w(\emptyset) - C^w$$

A possible way of implementing the optimal outcome, from the point of view of the MFI, at no

informational cost (except the physical cost C^w) is to have:

$$\begin{aligned} \mathbf{E}(w/y^r) &= \frac{C^w}{\nu}, \\ w(\emptyset) &= 0, \\ \mathbf{E}(w/y^r + x) &\to -\infty \quad \forall x \neq 0. \end{aligned}$$

Since the signal is a sufficient statistic, the mechanism is robust to both collusion at the repayment stage, and moral hazard in monitoring effort. Incentives to monitor effort can be provided, through a wage proportional to profits, in a way that is independent from incentives to reveal information, provided through the use of the signal: Even though the agent has incentives to select rich borrowers in order to benefit more often from a bonus when repayment occurs, rewards and penalties can be designed so as to ensure truthful revelation at no cost[15]. Both bonuses based on repayment, and formal or informal audit procedures, are commonly used by the same MFIs, confirming our results.

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QUELQUES EXEMPLES

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The characterization of optimal wage schemes may be more difficult with a more complex signal modeling, but the qualitative result remains unchanged:

Lemma 2 *When a correlated signal is available, the MFI can induce a given behavior by the agent at no cost, even with potential collusion at the repayment stage, or if some transfer increasing with repayment is necessary to induce monitoring effort. This result is independent from the objectives of the MFI.*

5 Collusion at the selection stage

Collusion is a prevailing concern in most developing countries, especially if there exist close links between local credit agents and borrowers: Agents that have lower costs in acquiring information, thanks to their close links with the potential borrowers, are easier to corrupt. Collusion should

[15]There would of course exist a cost, linked to the precision of the signal, if the agent were risk averse.

be understood in a broad sense: Any measure taken to favor a friend or acquaintance, or powerful individual can be considered as 'collusion'.

5.1 Scope for collusion and ability to bribe

We have seen before that loan agreements are such that borrowers reimburse on average what they earn from the project. But they benefit in the future from their initial success, thanks to new opportunities that are offered when the 'good signal' of an entrepreneurial success is observed, hence a net non-monetary value V in case of success for borrowers. They should therefore be willing to bribe the agent up to qV, if their probability of success is q.

Rich and poor borrowers are in practice not symmetric in their ability to bribe the screening agent so as to obtain a loan. Rich borrowers can often offer social favors immediately, or can use their illiquid assets —e.g. social connections— on behalf of the agent to bribe him, whereas poor borrowers can at best commit to repay the agent in the future if their project succeeds and they obtain social capital.

In this context, commitment by the agent is not a real problem, since social intervention in favor of the agent can be stopped at any time, and can even become negative[16]. Should the agent deviate from the collusive agreement, he would be immediately punished by a socially powerful individual. This of course introduces a new issue: May not an influential individual coerce an agent into granting him a loan, using threats of such punishments?[17] The possibility

[16]see Fuentes (1996) for an analysis of lending by agents that can be submitted to social pressures. Such pressures might be used to enforce the promises made by the agent. This is more likely when the agent is a member of a close society, as a village for instance.

[17]The literature on cooperation often bumps into this logical reasoning: If agents have ways of punishing deviating individuals, why don't they use these ways as threats in the first place, in order to obtain a more favorable cooperation agreement? One explanation is that punishment is costly and is therefore used as last resort only. This may no be a sufficient answer since if the punishment is too costly, it becomes non credible. Another explanation relies on norms of behavior: Society has norms that accept punishment of 'bad' actions —like not following an established agreement— while the use of these retaliation methods in an 'unjustified' way —without a socially acceptable cause— entails condemnation by society and the associated social costs. Notice that for punishment to be needed in the first place to ensure that agent i does not deviate, it must be the case that these social costs do not apply, or not sufficiently, to agent i. This may be the case if this agent does not belong to the same society as the potential punisher.

of such coercion is quickly considered later. We abstract from it for the moment.

We will assume that an individual whose assets have a value V to him can offer benefits that have a maximal value of kV only for the recipient, where $k \in]0,1]$ is a discount factor representing the fact that illiquid assets generally require specific investments that reduce their value to new owners, and/or that social capital is an *intuitu personae* thing, and cannot be fully transmitted in general. Moreover, transferring a non monetary amount of value $kV > 0$ entails cost $c(V) > 0$ for the individual, where $c(V) = V$ if the transfer concerns a physical asset, and $c(V)$ may be arbitrarily small if the transfer consists in social favors, but remains strictly positive. Indeed, although favors may seem free, they generally entail an opportunity cost since their value is linked to their rarity: Bestowing favors on the credit agent probably means not granting them to other individuals, in order to maintain their value.

5.2 Collusion and investment in information

If collusion is possible, an agent has new incentives to obtain information: more information on the ability and social assets of individuals may enable him to obtain higher bribes. In some cases, if the MFI does not ensure that collusion does not arise, it may not have to fully reimburse the cost of information acquisition since the agent may have sufficient incentives to invest in order to collect bribes. The problem faced by the MFI becomes more inducing information revelation than inducing information acquisition.

The agent also has a new tool to obtain this information. Indeed, information acquisition is no longer restricted to a search technology, which yields information when one exerts a sufficient effort. The agent can also use incentive mechanisms to obtain information revelation. Remember that such mechanisms are not available to the MFI due to its inability to impose fees on individuals. The agent on the other hand can use non monetary transfers to discriminate between borrowers.

5.2.1 No commitment in the collusive game

Assume that borrowers cannot commit to bestow favors on the agent in the future if they succeed. Then only rich borrowers have the ability to bribe the agent, by offering an immediate

favor. As soon as the credit agent asks for a too large bribe (above v, which is assumed to be small), rich unable borrowers will prefer not to bribe him. The agent will thus be bribed by rich able borrowers only.

Let us consider the competition game between rich able borrowers. Since a given borrower can obtain positive profits by outbidding others, thus obtaining a loan with probability[18] 1, as long as the necessary bid B is such that $c(B) \leq \overline{q}V$, the only Nash equilibrium of this game is the following: All able rich borrowers offer a bribe $B = c^{-1}(\overline{q}V)$, of value kB to the agent, and the agent selects randomly a proportion x^r among them, so as to maximize its profits. The same result applies if we assume that the agent has all the bargaining power in the collusive game. Notice that since the cost of social favors for the individual who bestow them is likely to be much lower than their value to the recipient, the credit agent can obtain very high bribes compared to the case of bribes consisting in transfers of physical assets.

If the MFI is a profit-maximizer only, its objectives are perfectly congruent with those of the agent. It is thus better off delegating all transactions to the agent, letting him keep all profits, but asking him to pay a fixed fee to be hired to this position. The fixed fee can be computed so as to keep the agent's participation constraint binding, by including in it not only expected monetary profits but also the value for the agent of expected non monetary benefits accruing from his power to allocate loans.[19] Investment in information acquisition is no longer necessary, so that the MFI is clearly better off allowing the agent to extract favors.

If the MFI has social objectives, on the other hand, it cannot benefit in the same way from the relationship between agent and borrowers.

5.2.2 Commitment in the collusion game

Assume now that individuals can perfectly commit to transfer resources to the agent in the future, conditionally on their success. Then poor borrowers can also bribe the agent, by pledging

[18] An agent would be better off accepting all bribes, but the MFI controls the number of loans granted.

[19] It the agent were unable, due to lack of initial resources, to pay the monetary value of social benefits, the outcome would still be similar, except that the agent would keep as a rent the non monetary part of his proceeds, the MFI being able to collect only monetary resources. The MFI would still be able to save on the information acquisition cost.

their future illiquid assets.

Under assumption $A1$, the agent will be bribed by able borrowers, whatever their wealth level, obtaining a bribe of expected value $kc^{-1}(\overline{q}V)$.

Under assumption $A2$, the agent must choose whether he accepts bribes from rich able borrowers only, or from both rich able and poor able borrowers. In the latter case, the agent can offer a menu of collusive contracts to screen able borrowers according to their wealth, since rich borrowers have a higher probability of success. But since information only affects the amount that the borrower can obtain, and has no efficiency value —no additional value is created when the agent is informed— incentive compatibility constraints oblige the agent to leave rich able borrowers an information rent exactly equal to their additional profitability. The value of the bribe obtained when lending to both type of agents is therefore the same, $kc^{-1}(\alpha\overline{q}V)$. Lending to rich able borrowers only, and getting bribes of value $kc^{-1}(\overline{q}V)$ is preferred when the amount of loans that the agent can grant is small enough compared to the number of rich able borrowers, $\xi\mu^r$.

As without commitment, a profit-maximizing MFI benefits from collusion, and can extract its value through a lower wage to the agent. One has to deduce from it not only the bribes paid to the agent by selected borrowers, $\xi\mu^r kc^{-1}(\overline{q}V)$, but also the compensation for C^a, no longer required: Investing in information acquisition is no longer necessary, since information is revealed. The role of the agent comes no longer from his technology of information acquisition, but from his ability to benefit from some non monetary transfers from borrowers.

5.3 The optimal response of a social MFI to collusion

Contrary to a profit-maximizing credit institution, a social one still needs to induce information acquisition. Its conflict of objectives with the agent is sharpened by collusion.

The MFI has no tool at its disposal to prevent the agent from receiving bribes, unless it can obtain verifiable evidence of bribery from an audit. In addition, completely preventing collusion would still not be optimal. It would not be feasible, since the audit would not show whether selected borrowers have paid bribes or not —it only shows the type of these borrowers, and the agent can extract bribes from borrowers whose type is as requested, using competition between

borrowers of the same type. And it is not in the interest of the MFI, since allowing such non monetary transfers enables it to reduce the wage it pays to the agent.

In this particular setting, contrary to most three-tier hierarchy problems[20], the Collusion-Proofness Principle (Tirole 1986) does not apply. A mechanism allowing collusion is actually equivalent to delegation to an agent with better contracting abilities. The agent benefits from contracting abilities that the MFI does not have: He can receive non monetary transfers, that can be used as an additional tool, identical to a fixed fee, to screen borrowers and this ultimately decreases ultimately the cost of inducing information acquisition for the MFI. This is why, in this case, letting collusion happen may be beneficial.[21]

A crucial aspect here is that there is no identity between the bribe offered and the profits foregone by the MFI when it lets collusion happen. The credit institution has no way of extracting the future value V of obtaining a loan for a borrower, due to limited liability and to its zero valuation for the favors that borrowers can offer to agents. It cannot replicate with a collusion-proof mechanism the outcome obtained when letting collusion happen.

* *Collusion and delegation*

This type of 'collusion' is identical to delegation of borrowers selection to the MFI. It is equivalent to interpret the mechanism as one in which the agent only reveals types, but is implicitly allowed to receive non monetary transfers from borrowers, or as a delegation mechanism, in which the amount the agent has to payback to the MFI is computed so as to give him correct incentives.[22]

We will stick to the 'collusion' interpretation below, but it should be clear that the MFI is aware of the favors received by the agent, and takes them into account when designing an incentive scheme.

[20] In those problems, as long as k is lower than 1, what is gained by ensuring collusion-proofness is larger than the value of the maximal bribe offered to the corrupt supervisor.

[21] This can be compared to an argument frequently put forward to explain the prevalence of interlinkage in credit transactions in developing economies: Individuals may have some collateral, but of a type that has value only to some other individuals, not to formal lending institutions. For instance, a worker can pledge his labor as collateral to his employer, while it has no value to a bank. The same applies for a laborer and his landowner, etc.

[22] On a related topic, but in a more complex setting of collusion with soft information, Faure-Grimaud et al. (2000) show an 'Equivalence Principle' between collusion-proof mechanisms and delegation.

The only issue faced by the MFI is how to ensure that the agent will not select too many rich able borrowers, since he now has strictly positive incentives to do so.

* *Preventing the agent from selecting too many rich able borrowers*

In what follows, we focus on the case in which a signal on the proportion of poor borrowers is available. The logic is the same without a signal, except that wages have to be made dependent on the repayment rate, and in a non monotonous way. The schemes are therefore subject to the same criticisms regarding their robustness as without collusion. The criticism based on collusion at the repayment stage becomes even more pertinent, since if collusion is possible at a former stage, it is likely to be an issue at a later stage also.

To simplify, we also assume that the agent is bribed by rich able borrowers only (as when there is no commitment in collusion, or in some cases with commitment and under assumption $A2$). If he obtains non monetary transfers from x such borrowers, the additional resources this yields to the MFI are $x[\overline{q}S - I + kc^{-1}(\overline{q}V)]$, since it will anticipate these bribes and decrease the wage paid to the agent by their value for him. This amount can theoretically be used to cross-subsidize poor borrowers.

It may be the case that, given that rich able borrowers bring such resources to the MFI, the fixed cost of information on both wealth and ability relative to that of information on wealth only, $C^{a,w} - C^w$, becomes too large relative to the value of selecting able borrowers among poor ones, so that the MFI prefers to ask the agent to learn about wealth only. We focus on this case in what follows, for exposition purposes. The reasoning is identical if the MFI wants to induce information acquisition on both wealth and ability, and to select specific proportions of able and unable poor borrowers.

Let us first consider the behavior of the agent when faced to a mechanism enjoining him to select a proportion $\hat{y}^p = 1 - \hat{y}^r$ of poor borrowers in exchange for a transfer scheme w depending on the observed reimbursement rate ρ. The agent choose by how many rich borrowers to be bribed, $y^r \equiv \hat{y}^r + x$, where x is the number of rich able borrowers that the agent passes as poor ones to the MFI.

Assume for the moment that the scheme is such that the agent prefers to incur the information acquisition instead of selecting borrowers randomly. The agent thus solves the following

program to choose how many more rich able borrowers to pick in addition to the number prescribed:

$$\max_x \{\mathbf{E}(w(\sigma)/\hat{y}^r + x) + (\hat{y}^r + x)kc^{-1}(\overline{q}V) - C^w\}.$$

This yields the 'collusive incentive compatibility constraint' for a MFI that wants to induce the selection of a given proportion $\hat{y}^r$ (i.e. $x = 0$). Inducing both information acquisition and revelation —correct selection of borrowers— means satisfying the following participation and two incentive compatibility constraints:

$$\begin{aligned}
\mathbf{E}(w(\sigma)/\hat{y}^r) + \hat{y}^r kc^{-1}(\overline{q}V) - C^w &\geq 0 \quad (PC) \\
\mathbf{E}(w(\sigma)/\hat{y}^r + x) + (\hat{y}^r + x)kc^{-1}(\overline{q}V) - C^w &\leq \mathbf{E}(w(\sigma)/\hat{y}^r) + \hat{y}^r kc^{-1}(\overline{q}V) - C^w \quad \forall x \neq 0 \quad (IC)^{revelation} \\
\mathbf{E}(w(\sigma)/\hat{y}^r) + \hat{y}^r kc^{-1}(\overline{q}V) - C^w &\geq \mathbf{E}(w(\sigma)/\mu^r) + \hat{y}^r kc^{-1}(\overline{q}V) \quad (IC)^{acquisition}.
\end{aligned}$$

As before, penalties can be designed so as to make it unprofitable to select borrowers randomly instead of incurring the fixed cost C^w: The agent must be severely punished if the signal is likely to correspond to a random selection. He must also suffer penalties if the signal corresponds to too many rich borrowers. Since the agent is risk neutral and not protected by limited liability, this can be done at no expected cost.

Since the wage of the agent is decreases, this frees resources for loans to poor borrowers, who ultimately benefit from collusion.

To summarize:

Lemma 3 *Collusion, or delegation, allows to decrease the wage paid to the agent. It ultimately benefits the MFI and poor borrowers, who receive more loans since more funds are available.*

5.3.1 Coercion by influential individuals

We have assumed in the previous paragraphs that rich individuals did not have the possibility to threaten agents from social costs in order to obtain loans. Let us here briefly discuss the implications of such a possibility. The MFI would face an additional cost, and an additional information problem whenever social costs imposed on the agent are not observable. If these costs are observable, the MFI has to compensate the agent for the costs he suffers when refusing

to grant a loan to an influential borrower —'granting a loan' may be seen as passing a rich borrower as a poor one, or an unable borrower as an able one. The MFI can decrease its costs by making it a rule never to lend to individuals known to have inflicted social costs on agent in an unjustified way.

But if social costs are not observable, a new information problem arises. An agent can pretend that he has had to suffer social costs even when he has indeed accepted to select influential borrowers. Here again, the MFI has no way of designing a revealing incentive scheme, unless an ex-post signal allows it to learn with some probability the true type of selected borrowers. In the latter case, the MFI may make it too costly for the agent to lie.

6 Confronting the theory with case studies

In order to confront the theory with facts, we have designed a survey that is currently being conducted in Uganda, Guatemala and Peru. The survey focuses

- on the objectives of MFIs in terms of global aim, and more precise objectives of market shares, targeting, increase in their loan base, etc.
- and on the incentive schemes that are designed for agents, including monetary and non monetary rewards, monitoring of agents by branch managers and conditions under which an agent is dismissed.

The monetary incentives to which agents are subjected consist in bonuses obtained when agents reach some thresholds in terms of repayment rate and number of borrowers (this corresponds to the 'ability' problem, as well as to a need for monitoring of borrowers).

After some inquiries, we finally found out that branch managers randomly select borrowers and estimate their wealth (which can be revealed by the materials used on the floor of their house, for instance) to compare it with the reports made by the agent when he recommended that a loan be granted. Dismissal of the agent follows several 'disappointing' visits —the rule for dismissal is in general implicit, but very clear to the agents themselves.

STILL WAITING FOR DETAILED RESULTS ...

Preliminary results

Everything confirms the theory, but need to interpret the answers to the survey, in particular to recognize that non monetary incentives —such as giving object (hats in Guatemala), and having receptions for the best agents, free training, etc.— are indeed incentives ...

6.1 The impact of competition between MFIs

A growing concern of existing MFIs is the increase in competition for good borrowers. We shortly discuss here the related informational issues.

* *Competition between social and profit-oriented MFIs*

Let us consider first that a profit-oriented MFI and a social one operate on the same market (geographical area). In theory, social MFIs face no longer information problems, since the profit-oriented ones can select rich borrowers, leaving only poor ones on the market. The problem becomes then one of financial viability: Cross-subsidization becomes extremely difficult and costly.

Indeed, if the social MFI wants to attract some of the rich borrowers, it has to offer loan contracts that are at least as profitable to borrowers as the one offered by a profit-oriented MFI. Multiple equilibria are possible, depending on the type of competition between the two types of MFI. The assumptions made on the commitment abilities of MFIs are crucial. The case in which both MFIs have the participation constraint of rich borrowers binding would correspond to the 'monopoly' (or perfect collusion) case. The other extreme is Bertrand competition, where the profit-oriented MFI lowers its per borrower profits until the social MFI no longer finds it feasible to follow suit.

* *Competition between social MFIs*

When several social MFIs lend to the same pool of borrowers, the nature of their behavior again determines the final outcome. There exist one 'cooperation' equilibria in which MFIs do not actually compete. In practice, nevertheless, it seems that competition for funds is sharp. Since donors play in a sense MFIs one against the other when choosing how to allocate funds, the financial viability constraint of MFIs tends to become more stringent: Π^{min} increases. MFIs must then do their best to select and keep good borrowers. In order to do so, they have to leave

them a rent, or to expend resources gathering information. At the limit, a social MFI that faces a very harsh budget constraint behaves as a profit-oriented one.

* *The role of regulations intended to lessen competition*

In a setting in which competition is wasteful — assuming that MFIs have social objectives — a regulation allocating exclusive territories to MFIs might be beneficial.

One must nevertheless be careful, since the allocation of such exclusive territories is likely to attract profit-oriented MFIs. Such credit institutions may try to pass themselves as social MFIs in order to benefit from a monopolist advantage. The reaction triggered by anti-competitive regulations has to be weighted against the benefits of less competition —and therefore more degree of freedom in borrowers selection— for the social MFIs.

6.2 Conclusion

We have shown that using screening agents to specifically selecting poor borrowers is difficult when they have a lower probability of success than richer borrowers. When collusion is possible at the selection stage, the MFI can benefit from it. The Collusion-Proof Principle does not apply. Using a signal correlated with the actual proportion of Poor in the group of selected borrowers can help giving incentives when rewards decreasing with the repayment rate are not feasible.

In practice, micro-credit institutions with social objectives try to hire agents that attach a value to helping people out of poverty, so as to have a better alignment of objectives than with agents interested only in their monetary reward. Yet such a selection is not easy, in particular due to the information asymmetry on the true type of the agent. Altruistic agents can be selected by offering low wages, but this may not be enough if the prospect of bribes by asset-rich borrowers attracts non-altruistic agents as well.

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8 Appendix

8.1 Inducing acquisition of information on ability

All that is needed is a wage scheme that aligns the incentives of the agent with the objective of the MFI. Since the agent is risk neutral, one of the possible ways of implementing the optimal outcome consists in a wage proportional to profits, with a fixed part computed so as to give the agent a zero expected rent: $w = W + \omega\Pi$ such that $\mathbf{E}(w) - C^a = 0$.

The share of profits given to the agent, ω, must be large enough for the agent to prefer to acquire information rather than choose borrowers randomly:

$$W + \omega\mathbf{E}(\Pi^{info}) - C^a \geq W + \omega\mathbf{E}(\Pi^{rand}) \quad (IC)_{Agent}$$

Selecting borrowers randomly leads to an average profit of

$$\mathbf{E}(\Pi^{rand}) = (\overline{mu}^p + \overline{\mu}^r)S - (\mu^p + \mu^r)I.$$

Selecting under information on wealth and according to the recommendations of the MFI necessarily leads to a higher profit. Having the incentive compatibility and the participation constraint of the agent both binding yields the values of the fixed and the variable parts of his wage.

There is no incentive cost for the MFI, the 'virtual cost' of acquiring information equals its real cost C^a.

8.1.1 Social MFI under assumption $A2$

Since the social MFI can control the number of loans granted, the agent has no degree of freedom: He has to give $y^p + y^r$ loans when the organization asks him to lend to y^p poor borrowers and y^r rich ones. The average profits obtained when the agent selects borrowers randomly are

$$\Pi^{rand} \equiv \frac{\mu^p \alpha + \mu^r}{y^p + y^r} \xi \overline{q} S - \frac{\mu^p + \mu^r}{y^p + y^r} I,$$

compared to

$$\Pi^{info} \equiv (y^p \alpha + y^r) \xi \overline{q} S - (y^p + y^r) I$$

when the agent gets informed and truthfully reveals his information. The incentive compatibility constraint of the agent is

$$\mathbf{E}(w/\Pi^{info}) - C \geq \mathbf{E}(w/\Pi^{rand}),$$

and will be binding in an equilibrium. There is therefore no cost to inducing information acquisition and revelation by the agent, except the 'physical' cost.