Technology Replaces Culture in Microcredit Markets: the Case of Italian MAGs∗

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Abstract

We collect data from three Italian microcredit institutions, MAG2, MAG4 and MAG6, which operate in Milan, Turin and Reggio Emilia respectively, by targeting two categories of wealthless borrowers: single entrepreneurs and organizations (cooperatives and associations). Evidence shows that organizations repay with higher probability and are charged a lower average interest rate than individuals. We use these findings to construct a lending scheme which consists of granting loans provided that borrowers form production teams (i.e. organizations). We consider a microcredit market with adverse selection à la De Meza-Webb and we verify that both repayment rate and welfare increase, while interest rate falls with respect to individual lending if the above scheme, which we refer to as production team lending, is implemented. Our instrument, like joint liability implemented in rural economies, is able to extract information from borrowers through a peer selection mechanism but, differently from joint liability, fits to urban contexts where borrowers do not know each other and social sanctions are weak.

JEL codes: D82, L31, O12, O16.

Keywords: microcredit, urban areas, production team lending.

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1 Introduction

Microcredit programmes provide both financial services and non-financial support to small-scale entrepreneurs who otherwise lack access to capital markets because not endowed with assets to be pledged as collateral.

Empirical evidence shows that these unconventional lenders have a reasonable degree of financial self-sufficiency even if they target poor people whom no ordinary commercial bank would want as customers. One of the reasons for this success is the application of joint liability: when informational asymmetry between lenders and borrowers is more severe than among borrowers themselves, this scheme of lending is able to mitigate adverse selection problems, inter alia, without requesting any pecuniary collateral (for exhaustive surveys see, e.g., Ghatak and Guinnane [6]; and Fedele [5]). Joint liability works as follows: borrowers, who differ in their ability of repayment and work on distinct projects, self-select into groups to get the loan. If the group does not fully repay its obligations, then the microlender cut off all members from future credit until the debt is repaid, so that the successful borrowers are induced to help failing partners. If borrowers have perfect information about each other’s type, then joint liability drives the good ones to choose partners of the same type, while the bad ones will have no choice but to form groups with others of the same type: this is called peer selection and enables the microlender to screen out borrowers; as a result, repayment rates and welfare rise with respect to individual lending when no ex-ante collateral is put up.

This model of lending turns out to be effective in serving clients who belong to rural communities, where networks of local information are strong and peer pressure from fellow villagers, like reputation loss of insolvent borrowers or restriction on access to inputs necessary for the business, induces discipline in repayment. Yet, many experiences show that in urban industrialized areas joint liability scheme may be a poor fit for potential clients. NEF [11] and Viganò et
al. [12], henceforth NEF and Viganò, find that of the existing microcredit experiences in Western Europe, 79% makes only individual loans, just 4% adopts group lending with joint liability and 17% makes both individual and group loans. This is motivated by the fact that people who live in cities are less likely to know each other, so that peer selection mechanism may not occur: Laffont and N’Guessan [10] show that repayment rates do not increase with joint liability if borrowers ignore the ability of repayment of partners. Furthermore, social sanctions are less important so that pressure to repay is weaker and joint liability schemes become inappropriate (Ghatak and Guinnane [6]; Ciravegna [3]). If microcredit in the poor world finds its reason to exist in the need to alleviate poverty, the most important rationales for the spread of microcredit in the developed world, where tax, legal, welfare, employment and banking systems are different, are to create employment, integrate minority groups and increase female participation in the workforce; microlending becomes thus a tool to increase social inclusion, in contrast with the original view of the underdeveloped countries where the main force leading to the successful repayment of microloans is the strong social network (Anderloni [2]; ILO [8]).

Interestingly, the institutions surveyed by NEF and Viganò declare a high average repayment rate of 90.3%, even if the majority of them charge neither joint liability nor collateral. Yet, the two reports do not mention whether alternative lending schemes help to maintain such positive results.¹

With the aim of developing a deeper understanding of contractual mechanisms responsible for the good microcredit performance in urban areas, we study

¹Armendáriz and Morduch [1] list a number of innovations in the microlending practice that go beyond joint liability and help to maintain high repayment rates also in places with scarce local information: among such innovations, progressive lending, which is adopted by around 50% of the institutions surveyed by NEF and Viganò, consists of granting an initial small amount of money, whose size increases successively only if the borrower demonstrates reliability. The scheme enables microlenders to screen out the worst clients before taking additional risk by expanding loan scale, but presents at least a disadvantage: when there is a multiplicity of microlenders, borrowers who default on a loan can turn to another financial provider if there is poor information on credit histories, so that threats to not be refinanced lose vigor.
the case of 3 microlenders which operate in northern Italian cities: MAG2 Milano, MAG4 Torino and MAG6 Reggio Emilia. They target two main categories of borrowers, single entrepreneurs and organizations (cooperatives and associations), and make individual loans without requesting collateral. We collect data on interest and repayment rates and we find that (i) single entrepreneurs are charged a higher interest rate and repay less often than organizations, (ii) among organizations, cooperatives ensure the highest repayment rate and pay the lowest interest rate. According to these findings, targeting cooperatives, rather than associations or individual firms, turns out to be a good lending strategy, at least within the MAGs scenario. Our theoretical goal is then to understand what makes the former better clients than the latter.

The Italian Civil Code helps to meet a possible explanation. It defines cooperatives any organization of people that operates for a common purpose, where each member has to answer for social obligation in case of compulsory severance or bankruptcy. In the specific case of loans received by the MAG, no pecuniary collateral is required. However, once the activity of the cooperative starts, new actors who require financial guarantees come into the picture, such as suppliers and customers. Associations, on the other hand, are organizations of people whose rights and duties are stated in the certificate of incorporation and articles of association. They identify, among other things, business name, aim, intent and role of the association, assets and resources, the way they will be administrated etc.: less emphasis is put on financial obligations. It is clear, therefore, that the first type of organization brings more pressure on the members in order that they produce a good performance, whereas single contributions within the association are less important for the success of the project.

The above observations are taken into account to develop the following theoretical model. A microcredit market is considered with adverse selection à la
De Meza and Webb [4] and Laffont and N’Guessan [10]. Two types of borrowers are present which differ in their ability of repaying. When lending is exclusively to individuals, bad borrowers, whose projects are assumed to be socially unprofitable, receive funding by the unique microlender because they are cross-subsidized by projects of the good borrowers. We show that discrimination among borrowers can be improved if the microlender grants loans provided that the borrowers form teams of production. More exactly, our lending scheme, which we refer to as production team lending, consists of two contracts. The first one contains a certain repayment and requires that the team chooses an “O-ring” technology (Kremer [9]), so that if at least one partner does not perform well the whole project fails. This function represents production processes based on a series of tasks, mistakes in any of which can strongly reduce the output value and the probability of repayment. According to the above discussion, we argue that such processes are more likely to be implemented in cooperatives than in associations. The second contract prescribes a higher repayment and the adoption of a “standard” technology, for which the value of team project is equal to zero only if all members fail. This function properly represents activities where smaller degrees of complementarity and coordination are requested among tasks.

A well-known property of the O-ring production function when members know each other is peer selection: if teams adopt it, they arise with either all good or bad borrowers. On the contrary, returns depend on the borrower type and not on the team composition, when the standard technology is adopted. As a consequence, good borrowers, who are assumed to succeed with certainty, are indifferent between the two technologies and select the first contract. Bad borrowers, who fail more often if they employ the O-ring technology, prefer the second contract even if the repayment is higher. This enables the microlender to deny credit to their socially unprofitable projects. Since only good borrow-
ers apply for the loan, both repayment rate and welfare increase, while the equilibrium repayment decreases with respect to individual lending.

The empirical finding that cooperatives (i.e. teams which employ the O-ring technology in our interpretation) repay more often than both associations and single entrepreneurs finds a theoretical justification: at equilibrium cooperatives are exclusively formed by good borrowers when production team lending is implemented.

We argue that entrepreneurs participating in a common project and focused on its success are likely to reproduce a cohesion typical of joint liability schemes, but based on financial, and not social, sanctions: this can be a useful alternative to joint liability in the urban social context. Moreover, the problem of competition among microlenders is not related to our scheme, since it does not entail threats of future denied access to credit (see Note 1).

The remainder of the paper is organized as follows. Section 2 provides further details of the NEF and Viganò surveys. In Section 3 we carry out the empirical analysis of MAGs. The individual lending theoretical model is laid out in Section 4. Section 5 introduces production team lending and Section 6 concludes.

2 Microcredit in Western Europe

The development of microcredit in Europe has been quite widespread in the last decades but it has also shown very different features from the original idea of Yunus, based on joint liability.

The literature concerning European industrialised countries is still limited with two relevant surveys as cornerstones of the existing work, the aforementioned NEF and Viganò, which help to develop a deeper understanding of the current state of microcredit in Europe: 30 organisations were contacted by NEF and 32 by Viganò, with an overlapping of 11 institution that leads to a total
of 51 interviews. Only 44% of the institutions provide non-financial support services and 59% do not ask any kind of collateral for the loan. Microcredit experiences can be found in many countries in Western Europe (Ireland, Spain, Portugal, Belgium, Finland, Italy, Germany, United Kingdom, France, Sweden and Norway) and, given the contrasting legal and regulatory environment, they seem to assume different institutional forms. The most common are Cooperatives (31%) and Foundations (25%), followed by non-bank financial institutions (19%), NGOs (9%), associations (9%) and banks (7%). As mentioned above, 79% of the surveyed organisations only make individual loans, 4% only group loans and 17% make both individual and group loans; the greatest coverage and outreach is taking place in France with 52.7% of the loans made by all the microlenders, followed by Finland with 27.3%; 90% of the microcredit institutions give loans for start-up of entrepreneurial activities. Some other relevant statistical findings by NEF and Viganò concern the financial characteristics of the loans: the average loan size around Europe is 12500€, with average loans terms of 33 months and interest rates that range from a minimum of 0% to a maximum of 19.5%, with an average of 6.8%. In addition repayment rate range from a minimum of 50% to a maximum of 100%, with average repayment rate of 90.3%.

In conclusion, as NEF states, “the microcredit industry in Western Europe is young and growing and the different entrepreneurial environments, legal and banking systems that exist across Europe mean that one microcredit model cannot be replicated in another country with the same results”.

3 The Italian MAGs: Empirical Analysis

While reviewing the existing literature on microcredit we became immediately aware of the lack of a unique and clear definition of microcredit, especially in industrialised countries where many institutions tend to call themselves mi-
cro-lenders every time they lend sums below € 25000, requiring both pecuniary and personal collateral. Therefore our first step was to choose an unambiguous definition of microcredit institution as an organization that lends money to “active poor” for start-up of business activity without asking any financial collateral and provides support services to allow the borrower to make the loan fruitful.\(^2\)

In Italy the institution that better fits our requirements is MAG (Mutua Autogestita), a national entity divided in six regional groups; of this only three provide loans to business activities: MAG2 Milano, MAG4 Torino and MAG6 Reggio Emilia. The first MAG was created in 1978 in Verona in order to satisfy the increasing need of new financial tools to support projects with a social implications that would not otherwise get funds in the traditional financial markets. MAGs are Cooperatives or, as they prefer to define themselves, self-sustainable societies of people that save and use private capital to finance fruitful projects. They are therefore authorised by the members to lend money to other members with favorable interest rates and repayment conditions, providing support services and without requiring any financial collateral.

The empirical analysis of the data available from the three MAGs is based on 337 loans for start-up of business activities. We study the difference between loans to individuals and to organizations both in terms of interest rates and repayment rates. By September 2005 the three MAGs have provided 277 loans to organizations and 60 to individuals. This recalls MAG’s original objective of financing organizations with strong participation of workers and investors in the business activity.

We first compute the average values of the interest rate for (i) individuals and organizations, (ii) within the latter, for cooperatives, from the one hand,

\(^2\)Gonzalez-Vega [7] defines active poor as those people that, even if living in poverty, prove to be technically skilled and entrepreneurial to such a degree as to enable them to develop, and autonomously run, an economic activity, or to at least produce a constant flow of resources which can be used for repayment of debt or for savings.
and associations, from the other hand. We then define repayment rate $r$ as follows:

$$r = \frac{\text{Amount repaid at time } t}{\text{Amount due at time } t}$$

and compute its average values. Tables 1 and 2 below show the outcome of our analysis on MAGs’ data.

<table>
<thead>
<tr>
<th>Number</th>
<th>Repayment Rate</th>
<th>Interest Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans to Single Entrepreneurs</td>
<td>60</td>
<td>76.47%</td>
</tr>
<tr>
<td>Loans to Organizations</td>
<td>277</td>
<td>87.36%</td>
</tr>
</tbody>
</table>

Table 1. Data analysis MAGS September 2005 (averages): single vs. organizations

<table>
<thead>
<tr>
<th>Number</th>
<th>Repayment Rate</th>
<th>Interest Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans to Cooperatives</td>
<td>165</td>
<td>88.42%</td>
</tr>
<tr>
<td>Loans to Associations</td>
<td>112</td>
<td>85.79%</td>
</tr>
</tbody>
</table>

Table 2. Data analysis MAGS September 2005 (averages): among the 277 organizations, cooperatives vs. associations

This result suggests that lending to organizations is less risky and enables the microlender to charge a lower interest rate according to the purpose of promoting employment and social inclusion through favorable financial conditions. Disaggregating the data on organizations, we find that cooperatives are better clients than associations. In the two following sections we develop a contractual scheme on the basis of these findings. As anticipated before, we argue that granting loans provided that borrowers form cooperatives implements a mech-
anism for which partners are chosen with the same ability of repaying. This helps the microlender to overcome a typical informational problem of the credit market: adverse selection.

4 Individual Lending

Consider a microcredit market with two types of wealthless risk-neutral borrowers. Borrowers of type $L$ propose projects which yield $A$ with probability $p_L = p < 1$ and zero otherwise. Projects of type $H$ borrowers yield $A$ with probability $p_H = 1$. Throughout the paper we refer to type $L$ ($H$) borrowers as bad (good). Each borrower needs one unit of capital to implement the project and applies for a loan.

Money is provided by a risk-neutral microlending institution which knows the fraction $\lambda$ of bad borrowers and the fraction $1 - \lambda$ of good borrowers in the population, but ignores which specific borrower is of which type. The opportunity cost of labor is equal to $\bar{u}$, while $\rho$ is the opportunity unit cost of capital. The two values represent the reservation utility of borrowers and microlender, respectively.

Assumption 1

\[ \frac{\bar{u}}{p} + \frac{\rho}{p_M} \leq A < \frac{\bar{u} + \rho}{p}, \]

where $p_M = 1 - \lambda (1 - p)$ is the average expected probability of repayment. Assumption 1 implies that only projects implemented by the good borrowers are socially profitable.

The microlending institution proposes a financial contract in which the following limited liability constraint is specified for the borrowers: when the project succeeds they have to repay an amount $R_i$, where $i = L, H$, that cannot exceed the realized returns, whereas if returns are zero nothing is repaid. Without loss of generality we can pose the optimal contracting problem as follows. The microlending institution chooses $R_i$ such that its unitary expected
profits are minimum for it is a not-for-profit organization, provided that its participation constraint and limited liability plus incentive compatibility constraints of the borrowers are satisfied:

\[
\min_R \lambda p R_L + (1 - \lambda) R_H \\
\text{s.t.} \\
\lambda p R_L + (1 - \lambda) R_H \geq \rho, \\
R_i \leq A, \\
p (A - R_L) \geq p (A - R_H) ,
\]

where \( IC_{L(H)} \) is the incentive compatibility constraint of type \( L(H) \). Solution to (1) is

\[
R^\circ = R_L = R_H = \frac{\rho}{p_M}. 
\]

If this contract is accepted, type \( i \) borrowers end up with

\[
p_i \left( A - \frac{\rho}{p_M} \right).
\]

Assumption 1 implies that \( p_M \) is high enough, i.e., the fraction \( \lambda \) of the bad borrowers is low enough, to induce them to participate and make a negative contribution to welfare, defined as the sum of expected values of the projects: this represents the adverse selection effect. We sum up these findings in the following

**Proposition 1** Under Assumption 1, both good and bad borrowers apply for the loan if individual lending is implemented: repayment rate is \( p_M \) and unitary welfare is \( \lambda p A + (1 - \lambda) A \).

Socially unprofitable projects of bad borrowers do receive funding because good borrowers produce an effect of cross-subsidization: the economy is characterized by overinvestment.
5 Production Team Lending

This section shows how forming productive teams among wealthless borrowers can raise both repayment rate and welfare with respect to individual lending without charging any collateral.

The microlending institution grants loans to borrowers provided that they choose partners to form teams of production. Each team must count \( n \geq 2 \) borrowers. They have perfect information about each other: we think of people who self-select to start up a business together. The microlender offers a pair of contracts. The first contract \( \{ OT, nR_{OT} \} \) requires the adoption of an O-ring technology (OT), where project of the team fails if at least one member fails, and a repayment \( nR_{OT} \), which is due by the team as a whole only in the case of success. The second contract \( \{ ST, R_{ST} \} \) prescribes the use of a standard technology (ST), where returns of the team are equal to the sum of returns of each member, and a repayment \( R_{ST} \) which is owed by the team for any success of the members. This scheme is referred to as production team lending (henceforth PTL).

In symbols, when the team consists of \( n_L \) bad borrowers plus \( n_H \) good borrowers, where \( n_L + n_H = n \), output is represented by

\[
p^{n_L}1^{n_H}nA = p^{n_L}nA, \tag{4}
\]

if the team chooses OT, and by

\[
n_LpA + n_HA = (pn_L + n_H)A, \tag{5}
\]

if ST is selected. Before proceeding, we assume that each borrower is entitled to an amount \( 1/n \) of team output and we describe the timing of the PTL model by specifying that the microlender observes the technology before the contract is signed.\(^3\)

\(^3\)Alternatively, the microlender may observe the technology after the contract is signed but before \( R \) is repaid: see Note 8.
1. At $t = 0$, the microlender proposes the above pair of financial contracts.
   Then, the borrowers form teams, choose a contract and apply for the loan.

2. At $t = 1$, the borrowers, who have no time preference, obtain funds and invest.

3. At $t = 2$, returns of project accrue and the borrowers repay in the case of success.

5.1 Peer Selection with O-Ring Technology

In this subsection we verify that borrowers choose partners of the same type when OT is selected: this is called peer selection.

If the contract $\{OT, nR_{OT}\}$ is accepted, expected profit of a team which counts $n_L$ partners of type $L$ and $n_H$ of type $H$ is given by

$$p^{n_L}n (A - R_{OT}).$$

This value is maximum when $n_L$ is minimum, i.e., $n_L = 0$ and $n_H = n$: this means that type $H$ are preferred for they increase the probability of success. It follows that type $H$ borrowers will form teams among them, while bad borrowers will try to attract preferred type $H$.

We assume that population of both bad and good borrowers is a multiple of $n$. We check whether an equilibrium where teams consist by either all good or bad borrowers is robust to bilateral deviations, where (i) a type $L$ will try to take the place of a type $H$ by making transfers to her, which must at least equalize loss of the good borrower from joining a team with all bad mates, (ii) the other borrowers (i.e. $n - 1$ type $H$ and $n - 1$ type $L$ ones who do not change team) are not allowed to make transfers among them.\(^4\)

If a type $L$ takes the place of a type $H$ in an all good borrowers’ team, her gain is given by the difference between bad borrower’s expected profit when she

\(^4\)Such transfers are not monetary because borrowers are wealthless. They rather consist, for example, of providing free labor services.
teams up with all good mates, i.e.

\[ \frac{1}{n} p m (A - ROT), \]  

(7)

and the corresponding value when mates are all bad, i.e.

\[ \frac{1}{n} p^n n (A - ROT): \]  

(8)

we get

\[ p \left( 1 - p^{n-1} \right) (A - ROT), \]  

(9)

where \( p \left( 1 - p^{n-1} \right) \) is the increased probability of success. Similarly, we can compute the loss of a good borrower from joining the team with all type \( L \) mates:

\[ (1 - p^{n-1}) (A - ROT), \]  

(10)

where \( 1 - p^{n-1} \) is the decreased probability of success. Given that (9) < (10), a type \( L \) borrower cannot compensate a good one with a side transfer to take her place in an all good borrowers’ team and simultaneously end up with a positive return. This condition is sufficient to conclude that teams arise with either all good or bad borrowers.\(^5\) The former ends up with \( A - ROT \), whereas the latter gets \( p^n (A - ROT) \). The intuition is as follows: good borrowers value good mates more than bad borrowers because they succeed with higher probability, thereby being more likely to realize gains of having a good mate.

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\(^5\)Peer selection arises even when borrowers who do not switch team are able to make transfers among them. In such a case inequality (9) < (10) rewrites as

\[ (A - ROT) \left[ p \left( 1 - p^{n-1} \right) + (n - 1)(1 - p) p^{n-1} \right] < (A - ROT) \left[ (1 - p^{n-1}) + (n - 1)(1 - p) \right], \]  

(11)

where the LHS is gain of the type \( L \) who joins an all good borrowers’ team plus gain of \( n - 1 \) type \( L \) who do not change team and the RHS is the corresponding loss of the type \( H \) who switches team plus loss of \( n - 1 \) type \( H \) who do not. It is easy to check that inequality (11) still holds.
5.2 Selection with Standard Technology

When the contract \( \{ST, R_{ST}\} \) is selected, team formation displays different characteristics. Indeed, expected profit of a team which counts \( n_L \) partners of type \( L \) and \( n_H \) of type \( H \) is given by

\[
(pn_L + n_H)(A - R_{ST}).
\]

Again, this value is maximum when \( n_L = 0 \) and \( n_H = n \): type \( H \) will create teams among them. By following the above reasoning, we compute gain of a bad borrower from leaving a team with all peers and joining a team with all good ones and loss of a good borrower from following the opposite path. The latter value is obtained by the difference between good borrower’s expected profit when the team counts all good mates,

\[
\frac{1}{n} \frac{(n-1)}{n} (A - R_{ST}),
\]

and the corresponding value when mates are all bad

\[
\frac{1}{n} [(n-1)p + 1] (A - R_{ST}).
\]

We get

\[
(n-1) \frac{(1-p)}{n} (A - R_{ST}).
\]

Similarly, gain of a bad borrower from joining all good partners is

\[
\frac{1}{n} [(p + n - 1) - np] (A - R_{ST}) = (n-1) \frac{(1-p)}{n} (A - R_{ST}).
\]

Note that (15) is equal to (16): in this case a type \( L \) borrower can compensate a good one with a side transfer to take her place in the team with all type \( H \) mates and simultaneously end up with a nonnegative return.\(^6\) With ST repayment may be due by bad borrowers even if they fail, hence they are concerned with the type of mates also in such a case. It turns out that borrowers

\(^6\)As in Note 5, it is easy to show that this result extends to the case where also borrowers who do not switch team are able to make transfers among them.
are indifferent between matching with good or bad mates, provided that (15) is transferred from the latter to the former. In such a case, good borrowers end up with \( A - R_{ST} \) and bad ones with \( p(A - R_{ST}) \) for any sort of team composition.\(^7\)

5.3 Optimal Separating Contract with Production Team Lending

In this subsection we show how the microlender is able to screen between good and bad borrowers if the above pair of contracts is accepted.

The microlender anticipates that expected profit of good borrowers is \((A - R_{OT})\) if they accept \(\{OT, nR_{OT}\}\) and \((A - R_{ST})\) if they accept \(\{ST, R_{ST}\}\). If the following condition holds

\[
A - R_{OT} \geq A - R_{ST},
\]

the microlender knows that all good borrowers will select the contract \(\{OT, nR_{OT}\}\), thereby matching among them, and that bad borrowers will have no choice but to form teams with other bad borrowers. It follows that bad borrowers will accept contract \(\{ST, R_{ST}\}\) when\(^8\)

\[
p(A - R_{ST}) \geq p^n (A - R_{OT}),
\]

where the two sides of the above inequality represent expected profits of bad borrowers if they accept either \(\{ST, R_{ST}\}\) or \(\{OT, nR_{OT}\}\), respectively. The two incentive compatibility constraints are summed up as follows:

\[
R_{OT} \leq R_{ST} \leq (1 - p^{n-1}) A + p^{n-1} R_{OT}.
\]

With no loss of generality, the optimal contracting problem can be defined as follows: the microlender sets \(R_{ST}\) to minimize his own profits on contract \(\{ST, R_{ST}\}\), subject to his participation constraint, to zero-profit condition on

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\(^7\)See the Appendix for remarks when more general types of technology are considered.

\(^8\)If the technology is observed after the contract is signed, then the IC constraint (18) can be rewritten as \( p(A - R_{ST}) \geq p(A - R_{OT} - F) \), where \(F\) is a fine charged to the bad borrowers when they adopt the standard technology after choosing the lower repayment.
contract \{OT, nR_{OT}\}, to limited liability constraints and, finally, to (19). In symbols

\[
\begin{align*}
\min_{R_{ST}} pR_{ST} \\
\text{s.t.} \\
pR_{ST} &\geq \rho \\
nR_{OT} &\neq n\rho, \\
R_j &\leq A, \\
R_{OT} &\leq R_{ST} \leq (1 - p^{n-1}) A + p^n R_{OT},
\end{align*}
\]

where \(j = ST, OT\). Rearranging,

\[
\begin{align*}
\min_{R_{ST}} pR_{ST} \\
\text{s.t.} \\
\max \left\{ \rho, \frac{\rho}{p} \right\} &\leq R_{ST} \leq \min \left\{ A, (1 - p^{n-1}) A + p^{n-1} \rho \right\},
\end{align*}
\]

where the constraint can be rewritten as

\[
\frac{\rho}{p} \leq R_{ST} \leq (1 - p^{n-1}) A + p^{n-1} \rho.
\]

If \((1 - p^n) \rho \leq (p - p^n) A\), solution to (21) is \(R^{*}_{ST} = \frac{\rho}{p}\). Remark that zero-profit condition on contract \{OT, nR_{OT}\} gives \(R^*_{OT} = \rho\). Good borrowers end up with \(A - \rho\) and bad ones with \(p \left( A - \frac{\rho}{p} \right)\). The latter value is lower than the reservation utility \(\pi\) under Assumption 1, hence only good teams will apply. This neutralizes the above adverse selection effect: the repayment rate rises to 1 and unitary welfare to \(\lambda (\bar{u} + \rho) + (1 - \lambda) A\). Note that \(R^*_{OT}\) is lower than \(R^*\), the equilibrium repayment when lending is individual. We summarize these findings in the following

**Proposition 2** Under Assumption 1 and if \((1 - p^n) \rho \leq (p - p^n) A\), PTL lowers the equilibrium repayment and raises both repayment rate and welfare with respect to individual lending for bad borrowers do not apply for the loan.
When PTL is implemented, the borrowers self-select among peers if OT is adopted. This enables the microlender to screen between good and bad clients. Indeed, good borrowers choose the contract with lower repayment for they are indifferent between the two technologies. Instead, bad borrowers prefer the standard technology even if the associated repayment is higher, because they fail often with OT. It turns out that at equilibrium socially unprofitable projects of bad borrowers do not receive funding and the repayment decreases for the pool of borrowers is better (i.e. they repay more often than when lending is individual).

6 Conclusion

Poor local information networks and weak social sanctions in urban developed areas make joint liability unable to guarantee high repayment rates to microlenders. This paper proposes an alternative microcredit instrument that, like joint liability, is able to mitigate informational problems in microcredit markets, but fits to the urban context.

We start by collecting data from MAG2 Milano, MAG4 Torino and MAG6 Reggio Emilia and we find that best clients in terms of repayment rate are represented by cooperatives, while associations and individual entrepreneurs display less reliability. On this basis, we develop a scheme where loans are granted provided that wealthless borrowers form production teams and choose between two production technologies. We show that starting from an overinvestment situation due to adverse selection when lending is individual, according loans to teams implements a peer selection mechanism that allows the microlender to screen between borrowers of different quality: at equilibrium only teams which adopt the O-ring technology (i.e. cooperatives in our interpretation) receive money for they are formed by all good borrowers. As a consequence, the equilibrium repayment decreases, while both repayment rate and welfare increase
with respect to individual lending.

While the joint liability practice emphasizes “social” liaisons among bor-
rowers of the same group, PTL attracts persons who desire to work at the same
project: their links have mainly technological and financial nature, especially
when OT is implemented. We believe that this aspect may overcome problems
of poor informational networks and weak social ties, thereby making such an
instrument more suitable to the needs of lenders and borrowers who populate
urban areas. Indeed, if expected profits of each borrower strongly depend on
the performance of potential partners, incentives to get information about the
type of mates and to repay are strong.

From a positive view point, PTL justifies on the basis of a screening mecha-
nism our empirical finding that, at least among MAGs’ clients, cooperatives are
excellent borrowers. From a normative view point, it suggests that targeting
teams with high degree of complementarity and coordination among tasks is a
good lending strategy when no collateral is put up and social capital is weak.

7 Appendix

Remark that the OT considered in the text describes a special form of per-
fected correlation among tasks, whereas under the ST the outcomes of tasks are
stochastically independent. One may therefore think that perfect correlation
is a sufficient condition for peer selection to occur. In this Appendix we show
that this is not the case.

Consider a technology for which team output amounts to

\[ q(n_H, n_L) nA, \]

(A1)

when the team consists of \( n_H \) good borrowers and \( n_L \) bad ones. Let the prob-
ability of success \( 0 < q(n_H, n_L) \leq 1 \) be increasing in \( n_H \) and decreasing in
\( n_L, q(n, 0) = 1 \) and \( n = n_H + n_L \). Note that this technology describes perfect
correlation among tasks. The OT is a special case of this technology, where
\[ q(n_H, n_L) = p^{n_L}. \]

Consider a contract \( \{n_R^o\} \), where \( nR^o \) is the repayment that the team owes to the microlender only in the case of success. If this contract is accepted, the difference between good borrower’s expected profit when the team counts all good mates and the corresponding value when she teams up with all bad mates is, under the hypothesis that each borrower is entitled to an amount \( 1/n \) of team output,

\[ [1 - q(1, n - 1)] (A - R^o). \] (A2)

On the contrary, gain of a bad borrower from having all good partners instead all bad ones is

\[ [q(n - 1, 1) - q(0, n)] (A - R^o). \] (A3)

From the analysis in the text we know that peer selection occurs only if \((A2) > (A3)\), i.e.

\[ 1 - q(1, n - 1) > q(n - 1, 1) - q(0, n). \] (A4)

This condition is satisfied with OT, but not, for example, when the probability of success is equal to the mean probability, i.e. \( q(n_H, n_L) = (n_H + p n_L)/n \).

In this case it is easy to check that both sides of inequality (A4) are equal to \((n - 1) [(1 - p)/n]\).

References


