Microfinance with a Monopoly Lender[*]

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Abstract

This paper contrasts the behaviour of lenders with market power with competitive lenders in an environment where borrowers are collateral-poor but lenders can use implicit or explicit joint liability, leveraging the social capital that borrowers might have among themselves. We show that joint liability is preferred by borrowers compared to standard loan contracts, and also by the monopolist when he can earn sufficiently high rents from the borrowers' social capital. We consider policy implications and several extensions, including investments in social capital by the borrowers and the lender and how they are affected by the lending arrangements, and allowing lenders to use coercive methods.

1 Introduction

The recent controversy about the activities of microfinance institutions (MFIs) in the Indian state of Andhra Pradesh and elsewhere in the world have stirred a lot of debates about for-profit lending and a mission drift in the microfinance industry. It has also raised the question of market power on the part of MFIs, which were so far assumed to be non-profit or competitive lenders on the part of policy-makers as well as in academic discussions (see Ghatak and Guinnane (1999)). While the success of MFIs across the world has been tremendous over the last two decades, culminating in the Nobel Peace Prize for the Grameen Bank and its founder Dr. Muhammad Yunus, these recent controversies have cast a shadow on the industry.

The main critique is that MFIs are making profits on the back of the poor, which seemingly contradicts the original purpose of the MFI movement, namely making capital accessible to the poor to lift them out of poverty. This critique is acknowledged within the MFI sector. For example, Muhammed Yunus, the founder of Grameen Bank, argues that the shift from non-profit to for profit, with some institutions going public, led to aggressive marketing and loan collection practices in the quest for profits to serve the shareholders equity. Through this he argues microcredit gave "rise to its own breed of loan sharks". This has led to calls for tougher regulations on the MFI sector, which

some have argued might stifle the sector and is akin to throwing the baby out with the bathwater.[1]

Analytically, these events raise many interesting questions. Is it possible that the same innovative methods (such as a group-based lending mechanisms) that were celebrated so much initially can become a potent tool of surplus extraction if there is a monopoly lender, as opposed to a non-profit or competitive lender? Is it possible that the social capital among borrowers that these MFIs are thought to leverage to relax borrowing constraints for collateral-poor borrowers might be a resource that a monopoly lender can tax and ultimately undermine? In this paper we analyse the behaviour of a monopoly lender offering individual and "explicit" joint liability loans, henceforth denoted IL and EJ respectively. We also introduce the possibility of borrowers implicitly guaranteeing each other's loans even when the lender does not explicitly require it, and refer to it as "implicit" joint liability, or IJ. While some MFIs have moved away from EJ in recent years, the importance of IJ is highlighted by several empirical studies, such as Giné and Karlan (2009) and Feigenberg et al. (2011).

In our model with a monopoly lender, we observe that a "for-profit" institution may be able to extract rents from borrowers that are positively related to the level of social capital that these borrowers share. The microfinance institution sets the interest rate such that it is still incentive compatible for agents to provide mutual insurance for each other. The level of social capital, and knowledge about it, are decisive for whether a lender is able to extract rents from it. These lending techniques leverage social capital to help solve enforcement problems, by essentially outsourcing the punishment to the group of borrowers. Interestingly, we find that both monopoly lenders and borrowers are better off with joint liability compared to individual liability. The intuition is that under joint liability borrowers have to be induced to pay loans for the entire group, which leads to a tighter incentive constraint and the need to give them a higher share of the surplus, while the lender benefits from the higher repayment probability that joint liability permits. We extend the model to study investments in social capital by the lender as well as borrowers and show that under-investment might occur due to the fact that the monopolist taxes away some of the social capital in the form of profits. We also show that if lenders have access to some coercive technology that can inflict a punishment on a borrower who defaults, a monopoly lender will use more of it compared to a competitive lender for the same lending arrangement, and that a monopolist who uses joint liability when coercion is not possible may switch to individual liability when he can use coercive enforcement.

The theoretical model is a model of lending where the source of friction is imperfect enforcement along the lines of Besley and Coate (1995), Rai and Sjöström (2004) and Bhole and Ogden (2010). However, in our setup the lender is a monopolist, although we do compare the outcomes with that of a competitive lender. McIntosh and Wydick (2005) do look at variation in the degree of competitiveness, but they focus on non-profit lenders. The main effect they highlight is that the lenders' client-maximizing objectives cause them to cross-subsidize within their pool of borrowers and when competition eliminates rents on profitable borrowers, it is likely to yield a new equilibrium in which poor borrowers are worse off.

In an extension, we allow social capital to be an endogenous variable. The endogenous

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[1] Abhijit Banerjee (MIT), Pranab Bardhan (Berkeley), Esther Duflo (MIT), Erica Field (Harvard), Dean Karlan (Yale), Asim Khwaja (Harvard), Dilip Mookherjee (Boston), Rohini Pande (Harvard), Raghuram Rajan (Chicago) urge caution in an op-ed in the Indian Express, 26th November 2010, accessible at `http://www.indianexpress.com/news/help-microfinance-dont-kill-it/716105/0`

nature of social capital has been pointed out e.g. Karlan (2007) and Cassar and Wydick (2010). Feigenberg et al. (2011) is a first paper that tries to identify the causal effect of repayment frequency on mutual insurance, claiming that frequent meetings can foster the production of social capital and critically may lead to more informal insurance within the group, which is exactly the channel upon which we focus. Feigenberg et al. (2011) also highlights that peer effects are important for loan repayment even without explicit joint liability through implicit insurance, and that these effects are decreasing in social distance, which is a key premise of our paper.

The plan of the paper is as follows. In the next section we briefly discuss the recent crisis in the microfinance sector in India and highlight some of the facts that motivate our theoretical analysis. In section 3 we lay down the basic model. In sections 4 and 5 we characterize the choice of the lending arrangements under competition and monopoly respectively. In section 6 we work out several extensions, namely, the conseuqences of various policies such as abolishing joint liability and regulating group formation, investment in social capital by the borrower and the lender, and the use of coercive methods to enforce loan repayment. Section 7 concludes.

2   Motivation: The Andhra Pradesh Crisis

The microfinance sector in India has expanded in the last 10 years into one of the largest microfinance industries in the world. The sector in India has only very recently started to diversify its funding sources, away from borrowing and donations and towards equity capital. This went along with a sequence of MFIs changing legal status towards more regulated legal forms. The years 2008-2009 saw a total of more than $200 Million in venture capital deals, with big investment outlets buying stakes in Indian microfinance institutions. These deals corresponded to more than 10% of the total market in 2008 according to data from the MIX market. The climax was the initial public offering of SKS India, the largest Indian microfinance institution, just before the onset of the crisis in summer 2010.[2]

The influx of capital from profit-oriented banks and venture capital funds has sparked debates on the sustainability of an institution's objective to address poverty while trying to satisfy the demand to generate returns for investors. Muhammad Yunus, one of the early critics, writes in the New York Times:

> "To ensure that the small loans would be profitable for their shareholders, such banks needed to raise interest rates and engage in aggressive marketing and loan collection... The kind of empathy that had once been shown toward borrowers when the lenders were nonprofits disappeared. The people whom microcredit was supposed to help were being harmed. ...Commercialization has been a terrible wrong turn for microfinance, and it indicates a worrying "mission drift" in the motivation of those lending to the poor. Poverty should be eradicated, not seen as a money-making opportunity."[3]

The recent Indian crisis gave rise to all these concerns once again. It started out with a sequence of media reports on excessive interest rates and of harsh recovery methods,

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[2]http://www.livemint.com/2009/07/13221413/EB14CCD2-F8CC-4906-AB45-7F3ABF121722ArtVPF.pdf

[3]http://www.nytimes.com/2011/01/15/opinion/15yunus.html

that some believe drove borrowers to suicide. This was followed by public outcry and politicians urging borrowers to not repay their loans. Eventually, it resulted in a political response that put a halt to all microfinance operations in Andhra Pradesh through an ordinance by the state government. Since then, the sector has been cut off from the single most important source of funding: borrowing from formal banks. The latter refrain from lending as loan repayment rates are still very low and political risk is high. This Indian experience is one that has been observed in many other countries with a developed microfinance sector. Among many others, in 2009, Nicaragua saw a politically motivated "No Pago" (I am not paying) movement and the microfinance sector in Bolivia experienced a similar crisis in 1999 and 2000. The Indian experience is thus not a special case. However it highlighted a lot of open questions regarding the role of regulation, customer protection, multiple lending and market power.

In India, the five biggest microfinance institutions account for more than 50% of the market and lending operations are highly concentrated in a few states in the south of the country. We do not know precisely whether and to what extent institutions can exercise their market power. David Roodman has used non-disaggregated data and observes that market concentration in India does not seem to be at an unhealthy level.[4] However, there are many caveats with these approaches as there is a lack of spatial data to get sensible estimates as to how locally competitive the sector really is.
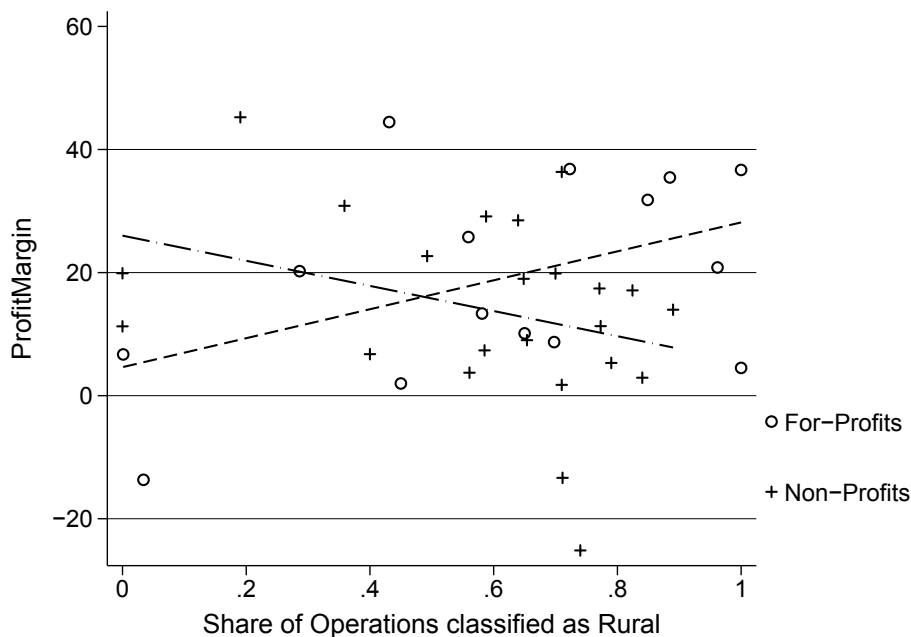

Figure 1: Correlation between profit margin and rural share of total operations, by for-profit status. Data from MIX market.

There is also some suggestive evidence about the extent of for-profit vs non-profit activity in an area and how dense social networks are, which motivates the role of social capital and its possible exploitation by a monopoly lender as a key element of our theoretical analysis. Using cross-sectional data we find that for-profits are more concentrated in rural areas where one could argue there is more social capital. Figure 1 is a scatterplot of

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[4]http://blogs.cgdev.org/openbook/2010/01/should-industry-concentration-cause-consternation.php

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profit margins plotted over a variable that measures the proportion of loans (by number, not loan size) that this MFI classifies as carried out in rural areas. The data comes from the MIX market and covers 39 institutions in 2009 which serve 15.7 million borrowers with an overall portfolio of \$2.8 billion.[5] We observe that the correlation appears to be positive for for-profit microfinance providers in India, while it is negative for MFIs that are non-profits. If we hypothesise that social ties will tend to be closer in rural areas, then with many caveats of course, this is at least consistent with higher operating costs in rural areas, offset by higher rent-extraction by for-profit lenders when social ties are stronger.

3   The Model

We assume that there are a collection of risk neutral agents or "borrowers", each of whom has access to an independent stochastic production function that produces R units of output with probability $p \in (0,1)$ and zero otherwise. The outside option of the borrower is also zero. Borrowers cannot save, and so all output is consumed each period. They also have no assets, and so must borrow 1 unit of output to finance their production. In addition, there is limited liability, namely, borrowers are liable only up to their income in a given period. Each borrower's output is observable to all other borrowers but not verifiable by any third party, and so output-based contracts are not feasible. The only such contracts that borrowers can write are with one another and these are enforced within the community by social sanctions (to be defined later). Borrowers have infinite horizons and discount the future with factor $\delta \in (0,1)$.

There is a single lender who may set interest rates under competitive conditions or alternatively may have market power in choosing interest rates. The lender's opportunity cost of funds is $\rho \geq 1$ per unit. We assume that the projects yield a strictly positive social surplus:

$$pR > \rho.$$

We assume that the lender has a fixed capacity and there is a large group of potential borrowers but the sense he can always costlessly find another borrower to replace the current one and so will be indifferent to terminating her contract at the end of the period. Therefore, we assume he just focuses on his current period expected profits out of a given borrower. We will remark later as to when the lender puts some weight on the stream of future profits earned from a given borrower.

It is very costly for the lender to observe borrowers' output and we assume no cross-reporting. Following much of the microfinance literature (with the exception of Rai and Sjöström (2004) and Bhole and Ogden (2010)) we focus on individual liability (IL) or explicit joint liability (EJ) contracts. However we also allow for IL borrowers to behave to some extent (described below) as if they were under joint liability even when there is no such stipulation on the part of the lender. We term this "Implicit Joint Liability" (IJ).

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[5]For-profit status is as reported by MIX market. Profit margin is an accounting measure computed as Net Operating Income/Financial Revenue and can be positive even for non-profits. The "rural share" is computed from the self reported number of "rural" loans relative to all loans for the MFI, and is only available for the 39 institutions plotted. Note that this is not weighted by loan size which is typically not reported although it seems that where reported, rural loans are smaller.

The IL contract is a standard debt contract that specifies a gross repayment r if the borrower is able or willing to repay. Otherwise the borrower is considered to be in default, which is punished by termination of that borrower's lending relationship. Under EJ, pairs of borrowers receive loans together and unless both loans are repaid, both borrowers' lending relationships are terminated. Social sanctions might lead borrowers to informally insure one another without any explicit joint liability terms, which we refer to as IJ (this is explored in more detail in de Quidt et al. (2011). The contract renewal terms are IL, but borrowers might voluntarily repay a partner's loan when the latter is unable. The lender is aware of this and his choice of the interest rate r takes into account his correct (in equilbrium) expectation as to whether the borrowers mutually insure each other or not.

The lender can choose which type of contract is offered, namely, individual or explicit joint liability and the interest rate, r, which then applies for the duration of the lending relationship. By manipulation of r, he may also be able to induce IL borrowers to behave cooperatively according to IJ.

3.1 Social Capital

It is well-known and understood how formal sanctions such as EJ can induce borrowers to engage in a form of informal insurance: in order to prevent the group from being cut off from future finance, a borrower may willingly repay the loan of her partner whose project was unsuccessful. Besley and Coate (1995) also pointed out the role of social sanctions in enhancing such behaviour. As mentioned above, it is possible that borrowers might insure each other even without EJ. Even though a borrower might get a new loan so long as he pays back his own loan, if he enters into an agreement with a fellow borrower to help each other out if one of them have zero project returns, then the threat of social sanctions might help them stick to the commitment.

We want to explore how a monopoly lender might take advantage of social ties between borrowers. Borrowers have an informational advantage over the lender – they can observe one another's output which the lender cannot – and are able to write contingent contracts amongst themselves. If social ties enable borrowers to better enforce such contracts, then the lender may be able to free-ride, essentially outsourcing part or all of the enforcement to the borrowers themselves.

We assume that in addition to the surplus generated within a borrowing group, pairs of borrowers possess some exogenous social capital. By standard logic, the threat of destruction of social capital may make it possible to sustain cooperation in various spheres of life where otherwise cooperation would not be incentive-compatible.

We take a bilateral and parallel view of social ties whereby each pair of individuals in the village shares some social capital which is specific to the pair. We think of this loosely as the value of a friendship. For example, suppose a pair of individuals have the choice to cooperate (C) or not (D) in a repeated social setting, where cooperation could represent helping a friend in some kind of difficulty. The game is a classic prisoner's dilemma: cooperation is efficient but non-cooperation is a stage-game dominant strategy. The payoffs are $\{0, 0\}$ when $\{D, D\}$ is played, $\{s, s\}$ after $\{C, C\}$, and $\{-c, (1 + \epsilon)s\}$ after $\{C, D\}$. To sustain cooperation they play a trigger strategy that plays $\{C, C\}$ but reverts to $\{D, D\}$ forever after any deviation. We assume that $\delta > \frac{\epsilon}{1+\epsilon}$ so that cooperation can be sustained in equilibrium. Denote the present value of the sequence of cooperation payoffs from the game by $\bar{S} \equiv \frac{s}{1-\delta}$. Note that in this interpretation, the punishment

is also costly to the punisher, since he also loses $\bar{S}$, but is a credible threat since the punishment phase is itself a stage-game (dominant strategy) Nash equilibrium.

Under this interpretation $\bar{S}$ will be higher when inter-personal relationships are more valued (fewer alternative friends who can provide the same cooperation benefits, more surplus to be had from cooperation).

Now that individuals have a shared social asset worth $\bar{S}$ they can use the threat of destruction of $S \in [0, \bar{S}]$ (a "social sanction") as social collateral to enforce informal contracts amongst themselves. For example, individual 1 could threaten to end the friendship with 2 if 2 reneges on some promise. By this logic, we can can more generally pin $\bar{S}$ down to the value of all other informal contracts that are also sustained by the borrowers' friendship. So the borrowers might have an IJ arrangement, a childcare arrangement, a disaster fund arrangement, etc, each of which are sustained by the threat of destruction of all of the others. Hence the size of $\bar{S}$ reflects the importance of informal bilateral contracting between the pair.

When considering the threat of destruction of a friendship we need to have a sense of the participants' outside options. For simplicity we assume that all pairwise ties within a community generate the same $\bar{S}$, for example because each pair cooperates in an independent manner but yielding the same payoffs. Moreover we assume that friends are valued additively; if each friend is worth $\bar{S}$ then n friends are worth $n\bar{S}$. The implication is that to a risk neutral individual with a sufficiently large stock of friends, the loss of each friend is equally costly.

To avoid hold-up type problems whereby one individual uses the threat of social sanction to extort resources from the other, we also assume a social norm whereby the friendship is automatically destroyed if such behaviour is attempted (such friends are not worth having).

We note here that there are many other ways we could model social sanctions. For example it could be that deviants can be excluded from some village public good by a collective punishment or cut off from a transfer or trading network. Greif (1993) and Bloch et al. (2008) explore social punishments such as these. In our model, the incentive to deviate from an agreement (resulting in breaking of a social tie) depends on whether a replacement friend can be found. For example, IJ borrowing relies on social sanctions to function, so an individual who loses a friend but has a replacement can continue borrowing under IJ, while an individual who is cut off from the community cannot use IJ. Assuming social ostracism as a punishment complicates the analysis without influencing the key intuition a great deal, and that is why we favour the bilateral and parallel friendship interpretation.

We also note that the more friends one has, potentially the lower the value of any individual friend. Provided all borrowers have access to a large stock of friends, and $\bar{S}$ depends on more than just the number of alternative friends available, this is not a problem for the analysis. Indeed, to the extent that we believe rural areas may be characterised by stronger social ties than urban areas, this may work in our favour. The individual mobility, population density and greater access to the machinery of formal contracting associated with urban living may indeed reduce the importance of any particular bilateral relationship.

3.2 Group dynamics

We assume that whether under EJ, IL, or IJ borrowers form borrowing groups of two individuals $i \in \{1, 2\}$. Under IL in principle there is no need to form a group, but to preserve symmetry across lending arrangements we adopt this convention. Under EJ, groups are dissolved as a whole upon default, whereas under IL or IJ if one borrower defaults she is replaced next period by another borrower from the community, sharing the same $\bar{S}$ with the surviving member. It could be that new partners are drawn from a stock of borrowers waiting for access to lending, if there is some degree of credit rationing in existence. Alternatively it could be that the surviving borrower simply joins up with another borrower whose partner also failed.

The two borrowers in a group may be able to reach an agreement to informally insure one another's repayments. While it is plausible that these informal agreements could stretch outside the boundaries of the group, for example encompassing a collection of groups, for simplicity we assume that this is not possible.[6]

Informal insurance takes the following form. At group formation, the borrowers agree a stationary repayment rule contingent on the output of both borrowers and a sanction $S \in [0, \bar{S}]$ that punishes deviations from this repayment rule. Such a rule might be "both borrowers only repay their own loans," or "borrower 1 pays both loans whenever she can, otherwise both default." We make four assumptions about the type of rule that can be agreed: 1) the rule must be feasible (a borrower cannot repay more than her output); 2) the rule must be incentive compatible when enforced only by the threat of social sanctions plus whatever exogenous sanctions are used by the lender; 3) the pair always chooses a rule that gives each borrower the same per-period expected payoff (equal division of surplus); and 4) conditional on equal division, the chosen rule must maximise the joint surplus of the borrowers.

These rules imply the following results. Firstly, social sanctions are never used in equilibrium. If a sanction is used, it must be because its threat was not sufficient to prevent the deviation that occurred. Then an alternative contract that does not punish this specific deviation would be welfare improving since it does not involve the destruction of social capital (clearly this might change if borrowers' output and actions were only imperfectly observed by their partners). Secondly, sanctions will never be threatened to enforce "inefficient" repayment, where r exceeds the discounted continuation value of the lending arrangement. This forms an important constraint on the lender that we term the "Efficiency Condition". If this condition does not hold, borrowers will always default. Thirdly, if the continuation value *does* exceed r, the borrowers will choose a rule that achieves the highest possible incentive-compatible repayment rate, since repayment is always increases joint surplus. An example of a symmetric repayment rule that maximises the repayment probability is "both repay when both projects succeed, $i \in \{1, 2\}$ repays both loans if only i succeeds, and defaults if both fail."

4 Competitive benchmark

Now we turn to characterising contracts and behaviour under a competitive benchmark. We assume that the competitive lender maximises the surplus of the borrowers subject

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[6]A simple motivation could be that there are two possible independent investments in the village, say farming and rickshaw-driving, and all investments of the same type receive the same output realisation each period. Then the optimal insurance group contains an equal number of each project.

to a zero profit condition. We work out the optimal interest rate for IL, EJ and IJ, then find the one that achieves the highest borrower welfare. For the time being we take the chosen size of social sanction, S, as given.

4.1 Simple Individual Liability

Under a simple IL contract where borrowers do not mutually insure, and where the borrower always repays her loan when successful, her utility is:

$$V^I = p(R - r^I) + \delta p V^I$$
$$= \frac{p(R - r^I)}{1 - \delta p}. \tag{1}$$

Throughout this paper we consider three key constraints on the lender. The first is the Feasibility Condition (FC), that is it must be feasible for the borrower(s) to make any repayments they are called upon to make. In this case, the FC is simply $R \geq r$.

The second constraint is the Efficiency Condition (EC): the borrower's continuation value must exceed the cost of repayment this period, r^I. Thus we require $\delta V^I \geq r^I$, or $\delta p R \geq r^I$. The expected project return next period (borrow 1 and earn $\delta p R$) must exceed the opportunity cost of repaying now, r^I. It should be clear from this interpretation that the EC will be the same whatever contract is used. Notice also, that in the case of simple IL, the EC is strictly tighter than the FC. We define r_{EC} as the interest rate at which the EC binds:

$$r_{EC} \equiv \delta p R.$$

The third key constraint is that the highest repayment expected of the borrower is incentive compatible (which implies incentive compatibility of all other possible repayments, since the borrowers are risk neutral). For simple IL the borrower only ever repays r^I, or defaults, so it must be incentive compatible to pay r^I. In the case of simple IL the IC is equivalent to the EC. Note also that the borrower's participation constraint, $V^I \geq 0$ is implied by the IC.

A competitive lender satisfies the per-period zero profit condition:

$$p r^I - \rho = 0. \tag{2}$$

which implies that the equilibrium interest rate under IL with competition is:

$$\hat{r}^I = \frac{\rho}{p}.$$

This gives us:

$$\hat{V}^I = \frac{pR - \rho}{1 - \delta p}.$$

Using the equilibrium interest rate, the FC is $pR \geq \rho$, and the EC and IC are both $\delta p^2 R \geq \rho$. The loan contract can be used if the tightest constraint (the EC/IC) is satisfied, i.e. if $\delta p^2 R \geq \rho$. Since a monopoly lender will always charge weakly higher interest rates than the competitive lender (or he makes a loss), this condition is necessary and sufficient for *any* lender to be able to profitably use simple IL, so we maintain it as an assumption.

Assumption 1 $\delta p^2 R \geq \rho$.

Notice that this assumption implies that the projects yield strictly positive social surplus under the first-best, namely, $pR > \rho$.

4.2 Explicit Joint Liability

Under EJ, the borrowers' contracts are terminated unless the total repayment is $2r^{IJ}$ in any period. Therefore both borrowers will default whenever they cannot jointly make this repayment.

We ignore any equilibria under which borrowers do not mutually insure one another's repayments. The reason for this is that without mutual insurance, the maximum possible repayment probability is p^2, i.e. repayment only when both borrowers are successful, and therefore lower than under simple IL. Such a contract would not be used since simple IL can deliver higher borrower welfare (in the competitive case) or higher profits (the monopoly case).

Instead suppose that borrowers are able to mutually insure, and therefore both loans are repaid whenever at least one borrower is successful. Thus the repayment probability is $1 - (1 - p)^2 = p(2 - p)$ which we define as:

$$q \equiv p(2 - p)$$

Since borrowers have the same per-period expected utility under our assumptions about the agreed repayment rule, their expected repayment must be qr^{EJ} each per period. Thus we have:

$$V^{EJ} = pR - qr^{EJ} + \delta q V^{EJ}$$
$$= \frac{pR - qr^{EJ}}{1 - \delta q}. \tag{3}$$

Under this repayment rule, the highest payment a borrower is called upon to make is $2r^{EJ}$, so the FC is $R \geq 2r^{EJ}$.

For borrowers to be willing to repay at all and use social sanctions to enforce their repayment rule, it must be that the EC holds. This is $\delta V^{EJ} \geq r^{EJ}$ or $\delta pR \geq r^{EJ}$, or simply $r_{EC} \geq r^{EJ}$, just as under simple IL.

When considering incentive compatibility of the repayment rule, we note that if borrower j partner is repaying her own loan, then borrower i's repayment will be incentive compatible by the EC. Thus we only need to check incentive compatibility of repaying $2r^{EJ}$ when the partner's project fails. If the repayment rule specifies this repayment, failure to make it will be punished by the destruction of S. The IC is

$$\delta(V^{EJ} + S) \geq 2r^{EJ}$$

or

$$\frac{\delta[pR + (1 - \delta q)S]}{2 - \delta q} \geq r^{EJ}. \tag{4}$$

Let us denote the interest rate at which the EJ IC binds as:

$$r_{IC}^{EJ}(S) \equiv \frac{\delta[pR + (1 - \delta q)S]}{2 - \delta q}.$$

The competitive lender sets $\hat{r}^{EJ} = \frac{\rho}{q}$ and so under competition:

$$\hat{V}^{EJ} = \frac{pR - \rho}{1 - \delta q}.$$

Evaluated at the competitive interest rate, the IC is $q\frac{\delta[pR+(1-\delta q)S]}{2-\delta q} \geq \rho$, the EC is $\delta qpR \geq \rho$, and the FC is $q\frac{R}{2} \geq \rho$. To simplify the analysis, we assume that the EC is tighter than the FC, which enables us to focus on the EC and the IC only. The following sufficient condition guarantees that:

Assumption 2 $\delta p \leq \frac{1}{2}$.

EJ can be used profitably provided the tightest of EC and IC holds. In other words:

$$\rho \leq q \min \left\{ r_{EC}, r_{IC}^{EJ}(S) \right\}. \tag{5}$$

Naturally, the higher is S the more likely this condition will be satisfied. If $\delta pR \leq \frac{\delta[pR+(1-\delta q)S]}{2-\delta q}$ then by Assumption 1, $\delta pqR > \rho$, since $q > p$, so (5) holds. If $\delta pR > \frac{\delta[pR+(1-\delta q)S]}{2-\delta q}$ then (5) reduces to $\rho \leq q\frac{\delta[pR+(1-\delta q)S]}{2-\delta q}$. Observe that even if $S = 0$, it is possible for this condition to hold. As $2 - \delta q > 1$, $\delta pR > \frac{\delta pR}{2-\delta q}$ and so in this case the condition (5) is equivalent to

$$\rho \leq q\frac{\delta pR}{2-\delta q} = \delta p^2 R \frac{2-p}{2-\delta p(2-p)}.$$

Now, by Assumption 1, $\delta p^2 R > \rho$ and so this condition is stronger or weaker than this Assumption according to whether $\frac{2-p}{2-\delta p(2-p)} < 1$ or > 1 which is equivalent to $\delta(2-p) < 1$ or > 1 both of which are possible under Assumptions 1 and 2.

Observation 1 *An important implication of $r_{IC}^{EJ}(0) < r_{EC}$ is that the availability of social sanctions always matters in the neighbourhood of $S = 0$.*

4.3   Implicit Joint Liability

Lastly, we allow for the possibility that a group of IL borrowers might still be able to mutually insure, thus behaving similarly to an EJ group. Although the lender does not punish borrower 2 for borrower 1's default, 1 could still sanction 2 if 2 does not assist with her repayment. Note that from the lender's perspective, he simply offers a contract specifying individual liability, and it is the borrowers who then agree on the informal insurance scheme.

If the borrowers cannot reach an insurance agreement, IJ is equivalent to simple IL as the borrowers simply repay their own loans. Suppose then that an agreement can be reached such that borrowers assist with one another's repayments, thus repaying with probability q. The borrower's utility is:

$$V^{IJ} = pR - qr^{IJ} + \delta qV^{IJ}$$
$$= \frac{pR - qr^{IJ}}{1 - \delta q}. \tag{6}$$

The FC and EC are identical to those for EJ. We ignore the FC by Assumption 2. By the EC it is always incentive compatible for borrowers to repay their own loans. In addition, a borrower can be incentivised to help her partner when her partner fails if:

$$\delta S \geq r^{IJ}. \tag{7}$$

Hence, we define
$$r_{IC}^{IJ}(S) \equiv \delta S.$$

The competitive lender charges $\hat{r}^{IJ} = \frac{\rho}{q}$ and so $\hat{V}^{IJ} = \hat{V}^{EJ}$. IJ can be used under a similar condition to EJ:

$$\rho \leq q \min \left\{ r_{EC}, r_{IC}^{IJ}(S) \right\}. \tag{8}$$

When the lender is competitive and EJ and IJ are usable, both are equivalent in welfare terms, but the condition for EJ to be usable is weakly more slack than for IJ, so we will ignore IJ for the time being (IJ will be important for the extension in section 6.1.1, and that is why we introduce it here).[7]

Notice that throughout we have assumed that under EJ and IJ the borrowers choose a repayment rule such that their loans are repaid whenever one or both projects succeed, which must imply that i repays both loans whenever only i is successful, and both repay r (in expectation at least) whenever both succeed. By the FC, EC and IC borrowers are able to agree and enforce through social sanctions a symmetric repayment rule that specifies repayment of both loans whenever at least one borrower is successful. By the EC, it is always welfare improving to repay a loan (provided both are being repaid in the case of EJ), so such a repayment rule is welfare maximising.

4.4 Contract choice

Now we turn to the question of contract choice by a competitive lender who maximises borrower welfare. As already noted, in this particular environment, with competition (where all the surplus goes to the borrower) IJ has no advantages over EJ. This leaves us with the comparison of EJ and IL. The following result states this:

Proposition 1 *Under Assumption 1, IL loans are always incentive-compatible and can deliver non-negative profits. Under Assumptions 1 and 2, if $\rho \leq q \frac{\delta[pR+(1-\delta q)S]}{2-\delta q}$ a competitive lender will offer EJ loans instead of IL loans. IL will be offered if $\rho > q \frac{\delta[pR+(1-\delta q)S]}{2-\delta q}$.*

Proof. Since $q > p$ it is clear that $\hat{V}^{EJ^*} > \hat{V}^{I^*}$ and therefore, EJ loans will be preferred so long as they are do not make a loss, i.e., the condition (5) is satisfied. Since $\rho < q r_{EC}$ by Assumption 1, we only need to check $\rho < q r_{IC}^{EJ}(S)$. ∎

Since borrowers are better off under EJ than IL, they will optimally choose the maximum sanction, $S = \bar{S}$, if by so doing they enable the use of EJ (recall that the sanction is never used in equilibrium so it is costless to choose a higher sanction when the lender is competitive).

5 Monopoly Lender

While the competitive lender was constrained to maximise borrower welfare subject to a zero profit condition, a lender with monopoly power manipulates the interest rate and

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[7]In our companion paper, de Quidt et al. (2011) we illustrate conditions under which IJ dominates EJ. In a model with three or more possible output realisations, sometimes a borrower may default on her EJ loan simply because her partner failed and she cannot afford both repayments. Under IJ, by not punishing the partners of defaulting borrowers she can still be given incentives to repay her own loan at least. As a result the repayment rate can be higher and the (competitive) interest rate lower under IJ.

contract type to maximise profits. As before we assume at first that S is fixed and observable to the lender when setting the interest rate.

As already mentioned, the lender will never use EJ unless he can induce the borrowers to engage in mutual insurance. The reason is that EJ without insurance must deliver a repayment probability no larger than p^2 (borrowers never repay unless their partner is repaying). This implies that borrower utility will be lower under EJ than simple IL for any given interest rate, and hence the IC for an EJ borrower just to repay her own loan, given that her partner is repaying (which corresponds to the EC) will be tighter than that for simple IL. As a result, the maximum interest rate that could be charged *and* the repayment probability must be lower under EJ than simple IL, and so EJ without insurance will not be used.

Next we note that, based on our discussion of IJ, a lender offering individual liability loans can induce the borrowers to mutually insure by setting $r \leq \min\left\{r_{EC}, r_{IC}^{IJ}(S)\right\}$. Hence we can proceed as if the lender could "offer" IJ should he wish to. The repayment probability for each contract type is fixed provided the EC and IC hold (the EC also implying the FC by Assumption 2), therefore the monopoly lender will charge the highest interest rate possible subject to these two conditions. Hence the monopoly interest rates are:

$$r^{I*} = r_{EC}$$
$$r^{EJ*}(S) = \min\left\{r_{EC}, r_{IC}^{EJ}(S)\right\}$$
$$r^{IJ*}(S) = \min\left\{r_{EC}, r_{IC}^{IJ}(S)\right\}.$$

By Assumption 1, at least simple IL will be profitable. Note that when the IC is binding the interest rate is increasing in S, and this is always the case in the neighbourhood of $S = 0$ by Observation 1 and $r_{IC}^{IJ}(0) = 0 < \delta p R$. Figure 2 plots $r_{EC}, r_{IC}^{EJ}, r_{IC}^{IJ}$ against S.
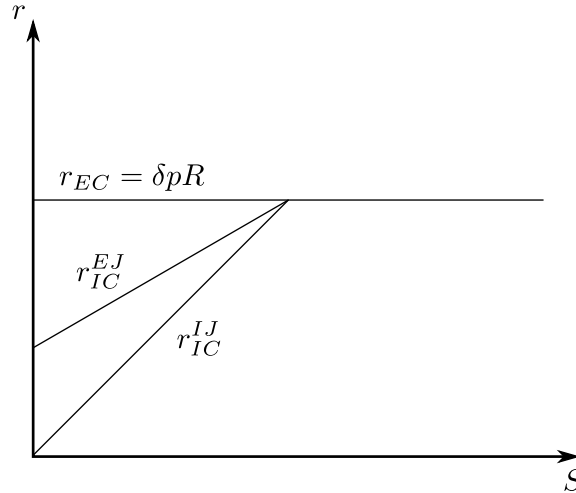

Figure 2: Interest rates

Proposition 2 *With a monopoly lender, borrowers are strictly better off under EJ than IL, and IJ than EJ if $S < pR$, otherwise they are indifferent between all three contracts.*

Proof. First, observe that borrower welfare under IL when the lender charges r^{I*} is

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$V^{I*} = pR$. Thus:

$$V^{EJ*} - V^{I*} = \frac{pR - qr^{EJ*}(S)}{1 - \delta q} - pR$$

$$= \frac{q}{1 - \delta q}(\delta pR - \min\{r_{EC}, r_{IC}^{EJ}(S)\})$$

$$\geq 0$$

with the inequality being strict when $r_{EC} > r_{IC}^{EJ}(S)$ or $S < pR$. Similarly,

$$V^{IJ*} - V^{EJ*} = \frac{q}{1 - \delta q}(r^{EJ*} - r^{IJ*})$$

$$= \frac{q}{1 - \delta q}\max\{0, r_{IC}^{EJ}(S) - r_{IC}^{IJ}(S)\}$$

$$\geq 0$$

again, with the inequality being strict for $S < pR$. ∎

This is one of the key results of the paper. It shows that contrary to what some of the recent controversies in India that we discussed earlier might suggest, it is not obvious that even with a monopoly lender using non-conventional lending methods, borrowers are necessarily worse off compared to standard loan contracts. Although EJ gives the lender the opportunity to expropriate some of the surplus generated by the borrowers' insurance scheme, which is weakly increasing in S, he is ultimately constrained by the same efficiency condition under all possible contracts and which binds under simple IL, hence the borrowers cannot be made worse off than under simple IL. The fact that they can be strictly better off compared to IL is because now the binding IC is one where a borrower has to repay two loans instead of one, and therefore, he has to be given more rents to satisfy his incentive constraint than if the binding IC was one where he had to be induced to repay one loan only.

5.1 Contract choice

Since $S = pR$ is an important threshold for the forthcoming analysis, we define

$$\underline{S} \equiv pR.$$

First, observe that the repayment probability under EJ and IJ is q but $r^{EJ*}(S) \geq r^{IJ*}(S)$. Hence the monopolist always (weakly) prefers EJ to IJ, and strictly when $S < \underline{S}$ (the opposite of the borrower's preference from Proposition 2), so again we ignore IJ for the time being. Meanwhile $r^{EJ*}(S) \leq r^{I*}$ but the repayment probability is higher under EJ than simple IL so EJ and simple IL are not ordered in general. Recall that under Assumption 2 $r_{EC} \leq r_{FC}$ and so we continue to focus on the IC and the EC. By Assumption 1 the monopolist always makes nonnegative profits from a simple IL loan with interest rate δpR. His (one-period) profits are

$$\Pi^I = \delta p^2 R - \rho$$

while from an EJ loan his (not necessarily positive) one-period profits are:

$$\Pi^{EJ}(S) = q\min\{r_{EC}, r_{IC}^{EJ}(S)\} - \rho.$$

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Clearly if (5) is not satisfied then profits under EJ will be strictly negative and the lender will use IL. Assuming then that (5) *is* satisfied, we distinguish between two possibilities. Either EJ is always more profitable than IL, or it is more profitable for sufficiently high S.

EJ is always more profitable if and only if it is more profitable for $S = 0$. As $r_{IC}^{EJ}(0) < r_{EC}$ we have:

$$q\frac{\delta pR}{2 - \delta q} - \rho \geq \delta p^2 R - \rho$$

or,

$$2\delta \geq (1 + \delta p) \tag{9}$$

which is consistent with Assumptions 1 and 2.

Suppose (9) does not hold, i.e. for some low values of S, IL is more profitable than EJ (for example, it may not be possible to break even with EJ for S close to zero). Nevertheless, EJ will always be more profitable for sufficiently high S, since EJ is strictly more profitable when the EC binds (the interest rate is the same as IL but the repayment rate is higher). In the one-period sense, EJ is more profitable when $qr_{IC}^{EJ}(S) \geq pr_{EC}$ (revenue is higher under EJ than IL). This holds for all

$$S \geq \max\left\{0, \frac{p^2R(1 + \delta p - 2\delta)}{(2 - p)(1 - \delta q)}\right\}$$

which is positive when (9) does not hold.[8]

So far we have focused on the case where the lender maximizes his one-period profits only. Suppose the lender discounts future profits earned *from a given borrower* with factor $\beta \in [0, 1)$. This could correspond to $\frac{1}{\rho}$, but could potentially be smaller or even equal to zero. This adds another margin in which EJ will be preferred by this lender - the relationship with a given borrower lasts longer than in IL due to the higher repayment rate. Now his profits under IL and EJ are:

$$\Pi^I = \frac{\delta p^2 R - \rho}{1 - \beta p}$$

$$\Pi^{EJ} = \frac{q\min\{r_{EC}, r_{IC}^{EJ}(S)\} - \rho}{1 - \beta q}.$$

Now the condition for EJ to be always more profitable than IL is:

$$\frac{q\frac{\delta pR}{2 - \delta q} - \rho}{1 - \beta q} \geq \frac{\delta p^2 R - \rho}{1 - \beta p}$$

$$(1 - \beta p)(2\delta - (1 + \delta p))\delta p^2 R + \beta(2 - \delta q)(1 - p)(\delta p^2 R - \rho) \geq 0. \tag{10}$$

We denote the left-hand-side of this expression by $A(\beta, \delta, p, R, \rho)$. When $\beta = 0$ this condition reduces to $2\delta \geq (1 + \delta p)$. This case corresponds to one where the lender has fixed capacity but can always find a new borrowing group when the current one breaks down, so is indifferent to group breakdown and only cares about his expected per-period repayment. If $\beta > 0$ the condition is more slack as ρ decreases, since this increases per-period profits and thus increases the relative value of a longer-lasting borrowing

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[8]We note here that if we allowed the feasibility condition to be tighter than the efficiency condition, there would be cases where EJ was *never* more profitable than IL, because the FC was simply too restrictive.

group. Moreover, since Assumption 1 implies that the second term is non-negative, if $2\delta < (1 + \delta p)$ the condition becomes (weakly) more slack as β increases, i.e. as the lender becomes more patient. This is because the higher repayment probability of EJ means groups survive for longer so the lower per-period revenue is earned for more periods in expectation.

Let us formally state this condition as an Assumption (but one which we do not necessarily impose throughout):

Assumption 3 $A(\beta, \delta, p, R, \rho) \geq 0$ *for $\delta, p, R,$and ρ satisfying Assumptions 1 and 2.*

Suppose $A < 0$ instead. As before, there is a threshold S such that EJ is preferred to IL for all S greater than this threshold. Since future profits are now weighted more heavily, this threshold will be lower than before. We have that $\Pi^{EJ}(S) \geq \Pi^I$ for all $S \geq \tilde{S}^{EJ}$ which we define as:

$$\tilde{S}^{EJ} \equiv \max \left\{ 0, \frac{p^2 R(1 + \delta p - 2\delta)}{(2 - p)(1 - \delta q)} - \frac{\beta(1 - p)(2 - \delta q)(\delta p^2 R - \rho)}{\delta(1 - \beta p)(2 - p)(1 - \delta q)} \right\}.$$

This threshold embeds the $\beta = 0$ threshold and is strictly smaller for $\beta > 0$ provided $\delta p^2 R > \rho$ (we assume only the weak inequality in Assumption 1). We therefore have the following result:

Proposition 3 *A monopolist always prefers EJ to IJ. Under Assumptions 1, 2 and 3 the monopolist prefers EJ to IL for all $S \geq 0$. If Assumption 3 does not hold there nevertheless exists $\tilde{S}^{EJ} > 0$ such that he prefers EJ to IL for $S \geq \tilde{S}^{EJ}$. The threshold $\tilde{S}^{EJ}$ is decreasing in β when the strict form of Assumption 1 holds.*

The intuition for this result is as follows. The trade-off between EJ and IL revolves around the fact that under EJ the monopolist has to charge a lower interest rate (due to the tighter IC) but gets paid back with higher probability. In general, the higher is S the more slack is the IC under EJ, and therefore, the monopolist can charge a higher interest rate under EJ, which makes it more attractive.

5.2 Cross-community comparisons

An interesting thought experiment is to imagine communities with varying social capital $\bar{S}$ (which by assumption is common to all pairs within the community). We assume that $\bar{S}$ is known to the lender, and assume the following timing of moves.

1. The lender observes $\bar{S}$ for the village and commits to a contract type and interest rate r for the whole village.

2. Borrowers observe the contract offered, form borrowing groups and agree on a repayment rule, specifying each borrower's repayment in each period and the sanction $S \in [0, \bar{S}]$ that will be used following a deviation from the agreed rule.

3. Borrowers take loans each period until their contracts are terminated, using social sanctions as specified in the repayment rule.

Proposition 4 *Suppose the lender observes $\bar{S}$ and commits to a contract type and interest rate. Then for all communities with $\bar{S} \geq \tilde{S}^{EJ}$, EJ contracts are offered with interest rate $r^{EJ*}(\bar{S}) = \min\{r_{EC}, r_{IC}^{EJ}(\bar{S})\}$. Otherwise IL contracts are offered at interest rate r^{I*}.*

Proof. Suppose the lender offers EJ. Since he always offers an interest rate satisfying the EC, borrower welfare is increasing in the interest rate and hence borrowers will agree a repayment rule to maximise the repayment rate. Thus for an interest rate of $r^{EJ*}(x)$ borrowers will always use a sanction $S \geq x$ if possible so as to be able to repay both loans whenever both partners succeed. If $\bar{S} < x$ they will set $S = 0$ since the IC cannot be satisfied for any feasible S. Since $r^{EJ*}(S)$ is weakly increasing in S the lender's profits are maximised at $r^{EJ*}(\bar{S})$. Borrower pairs will have $S \in [\max\{\underline{S}^{EJ}, \bar{S}\}, \bar{S}]$ guaranteeing that the IC is always satisfied.

Following this observation, it is clear from the previous Proposition that if $\bar{S} \geq \tilde{S}^{EJ}$, profits are higher under EJ, so EJ is chosen. Otherwise the lender offers an IL contract at the profit-maximising interest rate r^{I*}. ■
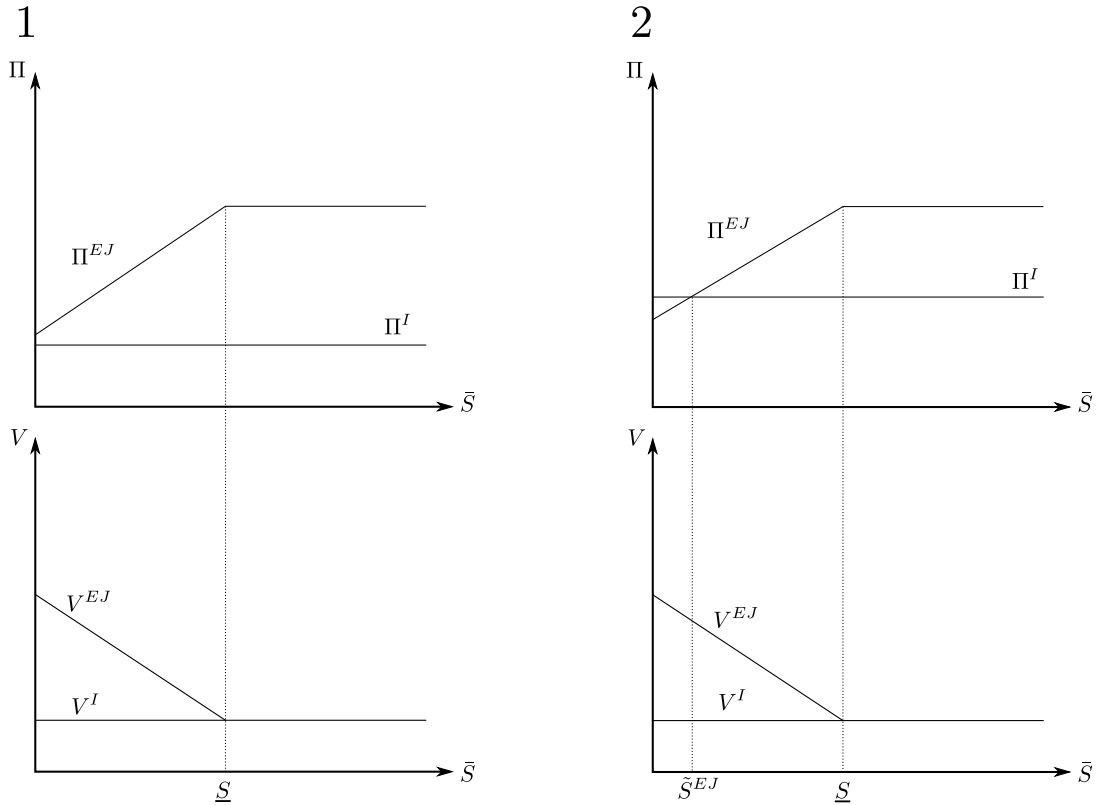

Figure 3: Profits and borrower welfare under EJ and simple IL. Panel 1: Assumption 3 holds, so the monopolist always prefers EJ. Panel 2: Assumption 3 does not hold, so the monopolist uses EJ for sufficiently high $\bar{S}$.

The borrower's utility V can be interpreted as the value of access to microfinance. We already know that $V^{I*} = pR$. Also $V^{EJ*} = pR$ when $r^{EJ*} = r_{EC}$, i.e. for $\bar{S} \geq \underline{S}$. Meanwhile if $\bar{S} \leq \underline{S}$ (so $r^{EJ}_{IC}(\bar{S})$ is charged), borrowers are strictly better off under EJ. Combining these facts we have the following.

Corollary 1 *Interest rates are strictly increasing and welfare from borrowing strictly decreasing for $\bar{S} \in [\tilde{S}^{EJ}, \underline{S})$. Therefore, within this interval, communities with high social capital benefit less from access to monopolistic microfinance lending than communities with low social capital. Communities with $\bar{S} < \tilde{S}^{EJ}$ receive IL loans and benefit strictly less from access to microfinance than all communities with $\bar{S} \in [\tilde{S}^{EJ}, \underline{S})$. They benefit the same as those with $\bar{S} \geq \underline{S}$. If Assumption 3 holds, then $\tilde{S}^{EJ} = 0$.*

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The result is clear from the diagrams in Figure 3. The intuition is straightforward. As already commented upon, social capital can be exploited by the monopolist to expropriate the surplus generated by the borrowers' informal insurance arrangement under EJ. However he is always constrained by the efficiency condition, and thus ultimately cannot make the borrowers worse off than under individual lending. Moreover, he can never expropriate the full surplus generated by higher $\bar{S}$ as demonstrated by the following result.

Proposition 5 *Higher social capital $\bar{S}$ always makes borrowers strictly better off overall.*

Proof. Under IL, or EJ/IJ when the EC binds, higher social capital does not affect the loan contract but does increase the borrowers' direct utility from their shared social capital, $\bar{S}$. Under EJ with a binding IC the total utility from access to microfinance and social capital is $V^{EJ*}(\bar{S}) + \bar{S}$ which is increasing in $\bar{S}$ at rate $1 - \frac{\delta q}{2 - \delta q} > 0$. Under IJ with a binding IC the total utility is $V^{IJ*}(\bar{S}) + \bar{S}$ which increases at rate $1 - \frac{\delta q}{1 - \delta q} > 0$. ∎

6 Policy and Extensions

Now we consider some policy implications and extensions of the basic model.

6.1 Policy

First we consider three specific policy implications: the effect of regulation that restricts or prevents the use of explicit joint liability, regulation of the borrowing group formation process, and the effect of policy on the lender's discount factor, which influences outreach.

6.1.1 Abolition of joint liability

The results established so far make it appear that a policy response to "exploitation of social capital" that banned or restricted explicit joint liability lending would make no borrowers better off and some worse off. However in fact this is not necessarily the case.

Suppose the lender is forced to lend under individual liability terms. He could certainly charge all borrowers r^{I*}, offering a single, simple IL contract. However, should he instead charge $r^{IJ*}(\bar{S})$, borrowers would voluntarily enter into implicit joint liability arrangements, choosing a sufficiently high S to insure one another's repayment burdens. Then, just as under EJ, the repayment probability is $q > p$.

The key difference between IJ and EJ is the absence of the threat of group punishment. As a result, the IC under IJ is weakly tighter than under EJ (the two conditions intersect with the efficiency condition at $\underline{S}$).

For $\bar{S} < \frac{\rho}{\delta q}$, the IC guarantees that IJ is unprofitable, so IL will be preferred. However, as under EJ, for sufficiently high S, IJ will be more profitable than IL. We define $\tilde{S}^{IJ}$ such that $\Pi^{IJ}(\tilde{S}^{IJ}) = \Pi^I$. Solving, we obtain:

$$\tilde{S}^{IJ} \equiv \frac{\delta p^2 R(1 - \beta q) + \beta p(1 - p)\rho}{\delta q(1 - \beta p)} > 0.$$

Now recall Proposition 2. This tells us that borrowers are strictly better off under IJ than under EJ or IL whenever r^{IJ}_{IC} is being charged. If EJ is abolished, all communities

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with $\bar{S} \geq \tilde{S}^{IJ}$ receive IJ contracts, of which all in interval $\bar{S} \in [\tilde{S}^{IJ}, \underline{S})$ face a binding IC. All communities with $\bar{S} < \tilde{S}^{IJ}$ receive simple IL contracts. This is summarised in the following proposition.

Proposition 6 *If the government were to abolish EJ, all communities with $\bar{S} \in [\tilde{S}^{IJ}, \underline{S})$ switch from EJ to IJ contracts and are strictly better off than before. Within this interval, the value of access to microfinance is decreasing in $\bar{S}$. Those with $\bar{S} \geq \underline{S}$ switch from EJ to IJ but continue to pay the same interest rate $r = r_{EC}$ as before and are therefore neither better nor worse off. Those with $\bar{S} < \min\{\tilde{S}^{EJ}, 0\}$ remain on simple IL contracts and are neither better nor worse off. Finally, those in interval $\bar{S} \in [\min\{\tilde{S}^{EJ}, 0\}, \tilde{S}^{IJ})$ switch from EJ to simple IL and are strictly worse off.*

The results can be seen from a Figure 4, where we add the curves corresponding to IJ. The welfare impact of abolishing EJ is non-monotonic in $\bar{S}$. EJ borrowers with low social capital are switched from EJ to simple IL and made strictly worse off. Those with higher social capital are switched to IJ, some of whom will be made strictly better off.
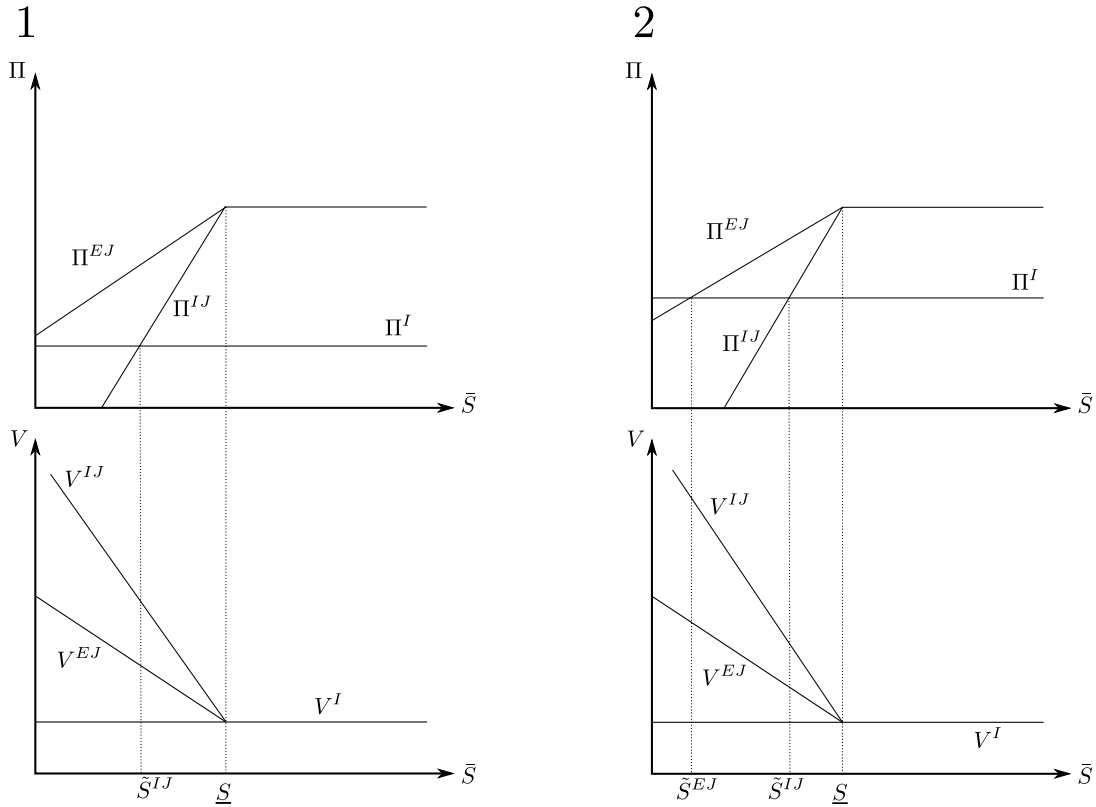

Figure 4: Profits and borrower welfare under EJ, IJ and simple IL. Panel 1: Assumption 3 holds. Panel 2: Assumption 3 does not hold.

This proposition emphasises a well-known result highlighted in our companion paper de Quidt et al. (2011). When the necessary ingredients for informal insurance are missing – in this case, when social ties are weak – explicit joint liability can play an important role in fostering insurance within borrowing groups. Here, even in the presence of a monopoly lender who can expropriate some of the surplus from this insurance arrangement, borrowers are strictly better under EJ. However, when social ties are strong enough that the external sanctions are not needed, abolishing EJ reduces the lender's ability to expropriate the borrowers' surplus, making them better off.

6.1.2 Regulating group formation

One of the key insights of our model is that a lender with market power who knows $\bar{S}$ is able to write lending contracts that induce borrowers to form groups and agree loan repayment rules involving "large" social sanctions. By doing so he is able to maximise rent extraction from the borrowers. Meanwhile higher $\bar{S}$ can only make borrowers better off under a competitive lender since it may enable him to use EJ.

So far we have assumed that all individuals in the community share the same $\bar{S}$ and choose how strongly to sanction one another once the loan contract is observed. Now suppose instead that each borrower has a large number of close friends with whom she shares $\bar{S}$, but also others with whom she shares no social ties.

With no change to the contracting environment this would not affect the results; the lender would charge $r^{EJ*}(\bar{S})$ to all EJ groups and borrowers would voluntarily form groups only with close friends. However if policy mandated "random" group formation, i.e. matching borrowers with strangers, the extent of social sanctions available to any group would be reduced, in this case to zero. As a result, the monopolist would be restricted in his ability to extract rents from the borrowers.

However, the welfare implications of such a policy are ambiguous. Under Assumption 3, the lender would offer EJ even to groups with $\bar{S} = 0$. All borrowers would then face an interest rate of $r^{EJ*}(0)$ and would attain the highest possible utility achievable under a monopoly lender. Alternatively, if Assumption 3 does not hold, EJ is less profitable (possibly loss-making) for low $\bar{S}$. As a result, all borrowers would be switched to IL contracts. Those with $\bar{S} \in [\tilde{S}^{EJ}, \underline{S})$ are strictly worse off, while those with $\bar{S} \geq \underline{S}$ are indifferent, earning $V = pR$ either way. We summarise this in the following proposition.

Proposition 7 *A policy that reduced or prevented the use of social sanctions, such as through "random" group formation, makes all borrowers strictly better off if Assumption 3 holds, as all are switched to EJ contracts with a lower interest rate. However if Assumption 3 does not hold then borrowers with $\bar{S} \in [\tilde{S}^{EJ}, \underline{S})$ are made strictly worse off, while the remainder are indifferent.*

6.1.3 Increasing the value of borrowers

One issue we have identified is that as the lender puts more weight on future revenues earned from a borrowing group (which we model by an increase in the discount factor, β) his preferences shift in favour of explicit joint liability, which may offer lower per-period returns but longer-lived borrowing groups. As a result the minimum threshold $\bar{S}$ to be offered EJ, $\tilde{S}^{EJ}$ falls. If this leads to expansion of access to EJ lending to borrowers who were previously receiving IL, these borrowers will be made strictly better off by Proposition 2. In general, EJ might be thought of as a relationship-specific investment by the lender, and becomes more attractive as he puts more weight on future payoffs.

We propose two ways that policy might influence β. First of all, we have already identified how lenders with restricted capacity relative to the scale of demand will put little weight on any individual borrowing pair, since the borrowers are easily replaceable. This implies a preference for short-run over long-run returns from any specific pair. Policy that restricts the scale of operations of for-profit lenders, such as financing restrictions or red tape may have a perverse effect, ultimately harming borrowers if there are no alternative lenders available. On the other hand, encouraging competition within the

marketplace will restrict the lender's effective demand pool and shift incentives toward client retention and long-run returns.

Furthermore, a perception of a harsh policy environment, inconsistent or unpredictable policymaking may concern for-profit lenders about their long-run prospects. If lenders expect to be heavily restricted by policy in the near future, they are likely to favour short-run returns. The lender's horizons shrink, so he discounts the future more heavily, leading to an increase in $\tilde{S}^{EJ}$.

6.2 Extensions

Lastly, we consider what happens when $\bar{S}$ is a choice variable of the borrowers or the lender, and what happens when the lender has access to an additional enforcement technology we refer to as "coercive methods."

6.2.1 Underinvestment in social capital

Here we show that the presence of a non-competitive lending market may have larger knock-on effects on society by reducing investment in social capital. We suppose that the level of social capital $\bar{S}$ within a pair is a choice variable, and show that the presence of a monopoly lender may lead to underinvestment in social capital.

If $\bar{S}$ only played a role in microfinance markets, "underinvestment" would not be a concern. In response to the lender's expropriation, borrowers would simply invest less. The concern here is that $\bar{S}$ plays two roles. Indirectly, higher social capital is valuable for enforcing informal contracts such as the borrowers' repayment rule. But $\bar{S}$ has a direct value - it makes its own contribution to the borrowers' utility which is why the threat of its destruction is salient (the borrowers' social capital may also be used to enforce other informal contracts as well but the value of these will be included in $\bar{S}$). It is in relation to this direct channel that we refer to underinvestment.

Since the social capital of the pair is shared there may already be an underinvestment problem. We abstract from this by assuming that $\bar{S}$ is assigned by a benevolent social planner (such as a village elder). Building $\bar{S}$ costs $c(\bar{S})$, with $c(0) = c'(0) = 0$, $c'' > 0$. The planner's problem for a representative borrower is

$$\max_{\bar{S}} \qquad V(\bar{S}) + \bar{S} - c(\bar{S}). \tag{11}$$

To make our point we assume the simplest possible problem. Under Assumptions 1 and 2, all borrowers receive EJ contracts and $V(\bar{S})$ is continuous and weakly decreasing. Also:

$$V'(\bar{S}) = \begin{cases} -\frac{\delta q}{2 - \delta q} & \text{if} \qquad \bar{S} < \underline{S} \\ 0 & \text{otherwise.} \end{cases}$$

Hence the first order condition for the problem is sufficient for a local maximum (but not global due to the discontinuity in $V'(.)$) and equal to:

$$V'(\bar{S}^*) + 1 - c'(\bar{S}^*) = 0 \tag{12}$$

where S^* is the maximiser.

There may be multiple solutions to (12), depending on the shape of $c(.)$. In the so-called "first best" where monopoly lending does not distort investments in S, $c'(\bar{S}^*) = 1$. Figure 5 shows three possible marginal cost curves c' and the candidate equilibrium

$\bar{S}$ associated with each. When the cost is c_1' there is always underinvestment, hence $c'(\bar{S}) < 1$. Under c_2' there are two solutions so we would need to check which was the maximiser of (11). Under c_3' the only equilibrium has the "first best" level of investment in social capital.
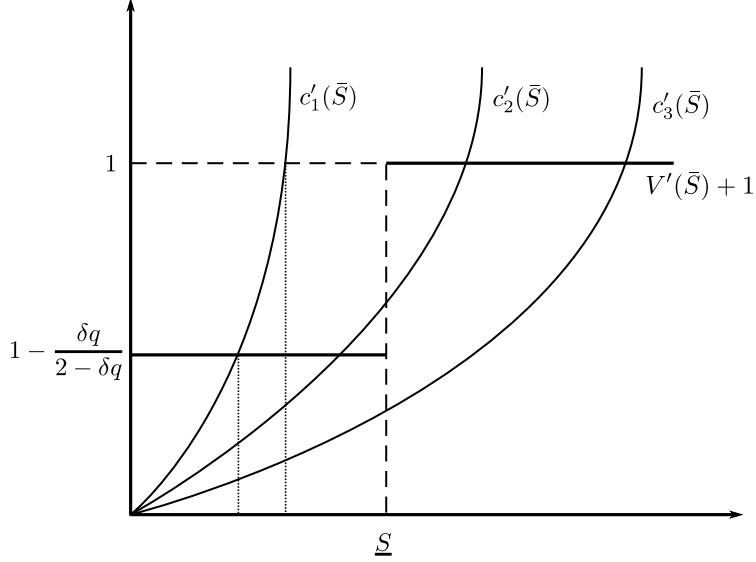

Figure 5: Underinvestment in social capital

6.2.2 Lender investment in social capital

Nonprofit or NGO lenders often accompany their lending programs with other interventions that might increase the social ties between the borrowers. For example, Feigenberg et al. (2011) show that making borrowing groups meet more frequently increases social ties within the group and seems to lead to more informal insurance between group members as well. Other interventions in public goods might increase the returns to cooperation within the pair or the ability of borrowers to sanction one another (for example by restricting each other's access).

In the context of our model it is obvious that a lender with social objectives might use interventions to increase $\bar{S}$ which has direct benefits to the borrowers and may also indirectly enable the use of EJ or IJ which is further increases borrower welfare. However, a monopoly lender might also choose to invest in social capital if by doing so he could charge the borrowers a higher interest rate.

To explore this possibility we assume that the pair starts with no social capital. We assume that the community cannot invest in $\bar{S}$, not that this is an uninteresting problem, but it would introduce strategic interactions between community and lender investment that we wish to abstract from.

The monopolist can increase $\bar{S}$ in the community at a cost of $d(\bar{S})$ with $d(0) = 0$, $d' \geq 0$, $d'' \geq 0$. His profit function is:

$$\Pi_M(\bar{S}) = \begin{cases} \Pi^I - d(\bar{S}) & \text{if } \bar{S} < \tilde{S}^{EJ} \\ \Pi^{EJ}(\bar{S}) - d(\bar{S}) & \text{if } \bar{S} \geq \tilde{S}^{EJ}. \end{cases}$$

Clearly the monopolist will never choose $\bar{S} < \tilde{S}^{EJ}$ or $\bar{S} > \underline{S}$ since over these intervals $\Pi'_M(\bar{S}) < 0$. He chooses $\bar{S}^{**} > \tilde{S}^{EJ}$ if:

$$\bar{S}^{**} = \min \left\{ d'^{-1} \left(\frac{\delta q(1 - \delta q)}{(1 - \beta q)(2 - \delta q)} \right), \underline{S} \right\} \tag{13}$$

$$\Pi^{EJ}(\bar{S}^{**}) - d(\bar{S}^{**}) \geq \Pi^I. \tag{14}$$

Condition (13) says that he will invest up to the point where either marginal revenue equals marginal cost, or $\underline{S}^{EJ}$, at which point marginal revenue drops to zero. Supposing conditions, (13) and (14) hold, the monopolist chooses $\bar{S} = \bar{S}^{**}$ and charges $r^{EJ*}(\bar{S}^{**})$. We have the following result, which is really a corollary from Proposition 5.

Proposition 8 *Investment in social capital by a monopoly lender always makes borrowers better off, despite being performed purely for rent extraction purposes.*

The result follows from the fact that social capital provides direct benefits worth $\bar{S}$ to the borrower, which cannot be "taxed" by the lender and more than offset the loss due to the higher interest rate that is now charged.

Clearly borrowers would be better off under an altruistic or de facto altruistic competitive lender who internalises all of the benefits of higher $\bar{S}$ and simply passes on his costs due to the zero profit condition. However some commentators argue that the commercialisation of microfinance is beneficial to borrowers as for-profit lenders can invest out of retained earnings to expand the scale of their operations and may benefit from scale economies. It is straightforward in this context to show that a monopolist with lower costs $d(.)$ than a competitive firm could in fact make the borrowers *better off* if, for example, the competitive firm cannot afford the necessary investments to make the jump from IL to EJ.

6.2.3 Coercive Enforcement Methods

Suppose that on top of denying future credit, the lender can costlessly commit to inflict an additional non-monetary punishment z on the borrowers in the period after a default. We assume that under EJ, both borrowers are punished unless both repay, to keep to the spirit of EJ in this paper. As before, since the IC under IJ is tighter than under EJ and borrowers cannot be made better off under IJ when the lender is competitive, neither a monopolist nor a competitive lender will use IJ so we ignore it. We also assume $S = 0$ to focus attention on the use of coercion.

How does the additional sanction affect the key constraints? Let the borrower's repayment probability be π. The borrower's utility function subject to feasibility, efficiency and incentive compatibility is now

$$V = \frac{pR - \pi r - \delta(1 - \pi)z}{1 - \delta\pi}.$$

Clearly the feasibility conditions will be unchanged. The efficiency condition (which requires that *at the point of repayment* the continuation value exceeds the interest payment) is $\delta(V + z) \geq r$ which reduces to

$$\delta pR + \delta(1 - \delta)z \geq r.$$

In the presence of coercive methods, the EC no longer implies the borrower's participation constraint, which is $V \geq 0$ or:

$$\frac{pR - \delta(1 - \pi)z}{\pi} \geq r. \tag{15}$$

Under simple IL the tightest IC is identical to the EC. Under EJ the borrower is willing to repay both loans if $\delta(V + z) \geq 2r$ or

$$\frac{\delta\left[pR + (1 - \delta)z\right]}{2 - \delta\pi} \geq r.$$

The lender can profitably use IL if $pr^{I*} - \rho \geq 0$ or:

$$p \min\left\{\frac{pR - \delta(1 - p)z}{p}, \delta pR + \delta(1 - \delta)z\right\} \geq \rho \tag{16}$$

where the first term is $r_{PC}^I(z)$ and the second is $r_{IC}^I(z)$ (which is equivalent to the EC). The FC can never bind under IL since it is slacker than the PC.

He can profitably use EJ if $qr^{EJ*} - \rho \geq 0$ or:

$$q \min\left\{\frac{R}{2}, \frac{pR - \delta(1 - q)z}{q}, \frac{\delta pR + \delta(1 - \delta)z}{2 - \delta q}\right\} \geq \rho \tag{17}$$

where the first term is r_{FC}, the interest rate that binds the feasibility condition, the second is $r_{PC}(z)$, which binds the participation constraint and the third is $r_{IC}^{EJ}(z)$.

Notice that in the neighbourhood of $z = 0$, the IC is the tightest condition under IL. Under EJ, the IC is tightest in this neighbourhood provided $\frac{\delta pR}{2 - \delta q} < \frac{R}{2}$, which reduces to $2 - \delta p(4 - p) > 0$. This is weaker than Assumption 2 which we have maintained up until this point, $\delta p < \frac{1}{2}$, and we use the weaker condition for this discussion. Then, at $z = 0$, the maximum possible interest rate is increasing in z under IL and EJ.

Assumption 4 $2 - \delta p(4 - p) > 0$.

Since coercion makes borrowers worse off under a given lending type, the competitive lender will not use coercive methods when he can break even under EJ without them. If not, he may use a minimal amount of coercion to slacken the IC, enabling him to break even, but only if the borrowers are better off under EJ with coercion than under IL without. However, since coercion is costless but increases profits, the monopolist will always use some coercion.

Observation 2 *For a given contract type, the monopolist always uses more coercion than the competitive lender.*

We proceed with Assumption 3, so that without coercion, both the competitive lender and the monopolist would use EJ, and furthermore the competitive lender uses no coercion at all.

The PC becomes tighter as z increases, and eventually either the FC or PC will bind. We denote the relevant value of z by $\underline{z}$. We have that $\underline{z}^I = \frac{pR}{\delta}$ and $\underline{z}^{EJ} = \min\left\{\frac{(\delta p^2 - 2(2\delta p - 1))R}{2\delta(1 - \delta)}, \frac{2pR}{\delta(2 - q)}\right\}$, each term corresponding to the FC and PC respectively. Note that the first term in $\underline{z}^{EJ}$ is positive by Assumption 4. Because coercion is costless

the monopolist always sets $z = \underline{z}$, so the FC or PC are always binding in equilibrium. Therefore the interest rates charged by the monopolist under IL and IJ with with coercion are:

$$r^{I*}(\underline{z}) = pR$$

$$r^{EJ*}(\underline{z}) = \min\left\{\frac{R}{2}, \frac{pR}{2-q}\right\}$$

and notice that $r^{EJ*}(\underline{z}) < r^{I*}(\underline{z})$.

Now consider contract choice by a monopolist who uses coercion. His per-period revenue πr under IL is $p^2 R$ (without coercion he earned only $\delta p^2 R$). If the PC is binding under EJ, his revenue is equal to $\frac{2-p}{2-q}p^2 R > p^2 R$, so he will use EJ for sure. However, the following proposition demonstrates that, to some extent, coercion and joint liability are substitutes.

Proposition 9 *For sufficiently low β, a monopoly lender who prefers EJ to simple IL when he cannot use coercive enforcement may prefer simple IL to EJ when he is able to use coercion.*

Proof. We need to show that revenue may be strictly higher under simple IL with coercion. We know this is not true when the borrower's PC binds under EJ, but it may be the case when the FC binds, in which case revenue under IL is higher if $p > \frac{2}{3}$. First we invoke the strict form of Assumption 3 for $\beta = 0$, i.e. $2\delta - (1 + \delta p) > 0$. Combined with $p > \frac{2}{3}$ we obtain the condition $\delta > \frac{3}{4}$. Note that these violate our maintained assumption $\delta p < \frac{1}{2}$, but nevertheless are consistent with the weaker Assumption 4, which requires $2 - \delta p(4 - p) > 0$. This is indeed satisfied for some values of $\delta > \frac{3}{4}$ and $p > \frac{2}{3}$. Finally, we need to check that the FC is tighter than the PC at $\underline{z}^{EJ}$. This requires $\frac{R}{2} < \frac{pR}{2-q}$ or $2 - p(4 - p) < 0$ which is satisfied for $p > \frac{2}{3}$. $\blacksquare$

EJ is attractive to the monopolist because it enables a higher repayment rate, but at the cost of a (weakly) lower interest rate than simple IL. When the lender can use coercion he can extract a higher interest rate under both, this may be enough to reverse his preference for EJ in favour of simple IL. Lastly, we observe that unless the monopolist is using EJ *and* the feasibility constraint binds, the borrower's PC binds and her utility is zero.

7 Conclusion

This paper was motivated by the question as to what happens if lenders are not competitive or non-profits and have market power in the context of microfinance. We focussed on the choice between standard lending contracts and lending contracts that have explicit or implicit joint liability. We studied the role that social capital plays, and also looked at the endogeneity of social capital with respect to investments by borrowers or the lender. The existing literature on microfinance starts with the premise that MFIs are motivated by borrower welfare and in this paper we showed that there are interesting implications for relaxing this assumption. A lender with market power can extract rents from informal insurance agreements between his borrowers, but is ultimately constrained from making those borrowers worse off in the process. Both a monopolist and a competitive/non-profit

lender might choose to use coercive enforcement methods, the former in order to extract ever more rents from the borrowers, while the latter simply because so doing can improve borrower welfare.

In this paper there is no "perverse effect" of joint liability, whereby one borrower who could otherwise repay, nevertheless defaults because her partner is doing so. Besley and Coate (1995) raised this issue, and we explore its consequences in detail in de Quidt et al. (2011), showing that this is the key context where implicit joint liability can generate welfare improvements.

There are several related questions that are of great interest. For example, what role does the for-profit and non-profit distinction play in the context of microfinance? Is it similar to a cost-quality trade-off as in the non-profits literature (see, for example, Glaeser and Shleifer (2001))? What happens if they operate in a fairly competitive setting? Lastly, some authors are beginning to explore the importance of external funding sources for the behaviour of MFIs, see for example Ghosh and Van Tassel (2008, 2011)). Our work suggests that the effects of market power on borrower welfare may vary considerably with the importance of social capital. We believe that more work is needed to quantify the extent of competition within the sector and better understand the behaviour of lenders who do not conform to a simple zero-profit condition.

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