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Sequential lending with dynamic joint liability in micro-finance

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ABSTRACT

This paper develops a theory of *sequential lending in groups* in micro-finance that centers on the notion of dynamic incentives, in particular the simple idea that default incentives should be relatively uniformly distributed across time. In a framework that allows project returns to accrue over time, as well as strategic default, we show that sequential lending can help resolve problems arising out of coordinated default, thus improving project efficiency vis-a-vis individual lending. Inter alia, we also provide a justification for the use of frequent repayment schemes, as well as demonstrate that, depending on how it is manifested, social capital has implications for project efficiency and borrower default. We next examine the optimal choices for the MFI and derive conditions for the optimality of the group lending arrangement. Our framework also provides for some plausible hypotheses as to why there has been a recent transition from group to individual lending.

1. Introduction

This article seeks to develop a unified theory of two oft-used institutional features in micro-finance. In a framework that allows project returns to accrue over time, as well as strategic default, we show that (a) *sequential lending* can help resolve problems arising out of coordinated default, thus improving project efficiency vis-a-vis individual lending, and (b) that *frequent repayment* schemes improve dynamic incentives for repayment. We demonstrate that a socially motivated MFI opts for a higher project size, and lends to a greater number of borrowers under group lending. Finally, we show that this framework provides a rich explanation of the transition from group to individual lending occurring over the last decade or so.

We consider a model where project size is endogenous, and returns are formulated dynamically, as a stream of income accruing over a period of time. There is *ex post moral hazard* in that the borrowers can strategically default at any point of time (see Gine et al., 2011, for evidence on strategic default).

For the benchmark case of individual lending, we show that the optimal repayment scheme involves *immediate and frequent repayment* (IFR for short), with the repayment starting early, and continuing at the maximal feasible rate until the MFI recoups its loan, thereby demonstrating two features that appear to be 'near-universal' (Bauer et al., 2008), namely early and frequent repayment. Further, in the presence of either (a) risk-aversion, or (b) positive discounting, the optimal scheme may be 'gradual' in the sense that it asks for less than the maximal feasible payoff at every instant.

In the presence of a severe moral hazard problem (in a sense made formal later), however, the efficient level of investment may not be attainable, even with IFR schemes. Given this, we then examine whether group-lending with *sequential lending* can help improve efficiency.

Sequential lending, whereby loans to group members are staggered, can trace its origin to ROSCAs (Besley et al., 1993) and has been widely adopted by many microfinance institutions (henceforth MFIs), including Grameen I and its replicators.[1] While over the last decade or so there has been a move toward individual lending (Rai and Sjostrom, 2010), sequential lending continues to be widely used. In India, the Self Help Group (SHG) Linkage Program, with 54 million clients in 2008–09 (Srinivasan, 2009), provides loans in sequence (Aniket, 2006, 2009). Further, BRAC offers canonical Grameen I schemes in a number of African countries such as Liberia, Sierra Leone, Tanzania and Uganda (based on discussions with BRAC International officials, and field visits, in particular to BRAC Uganda). Even some European micro-finance programs follow sequential lending practices (see, Castri (2010), and

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[1] In Bangladesh, examination of the data collected by IFPRI in 1994 and used in Zeller et al. (1996) for 128 groups belonging to group-based credit programs of three MFIs (ASA, BRAC and RDRS) shows that sequential lending was common to all three MFIs.

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Molnar (2010)). It is therefore of interest to examine the reasons as to why it had been so widely used in the recent past, and still continues to be used in many cases.[2] Further, this allows us to develop a framework where one can endogenously solve for whether the MFIs are going to opt for group, or individual lending, in the process throwing some light on the recent move toward individual lending.

Under group lending the analysis focuses on the interaction between social sanctions and collusive possibilities. Social sanctions involve the borrowers who are adversely affected because of default, imposing some penalty on the defaulting borrower(s). While such sanctions can help prevent default, whether such sanctions are actually imposed or not, however depend on the extent of collusion among the borrowers. We consider two scenarios, with limited, and complete collusion. In the first case, borrowers cannot make transfers to one another in a bid to avoid social sanctions in case of default. Thus collusion takes a limited form and simply involves *not* invoking the social sanction whenever *all* borrowers benefit from a coordinated default. Under the second case, we allow borrowers to make transfers among one another. Complete collusion is modeled simply as the borrowers taking default decisions jointly, based on maximizing aggregate group payoff. Clearly, in case of a default, the social sanctions are never invoked.

Under the first scenario with limited collusion, we find that sequential lending necessarily improves efficiency vis-a-vis individual lending (as long as social sanctions are not too small). The basic intuition can be explained using a two member group. Let the first recipient default at a time when the second borrower is yet to receive her loan. Such a default adversely affects the second borrower, who obtains no loan, and thus imposes the social sanctions. Next at the instant when the second borrower obtains her loan, the first borrower would have already repaid a substantial amount and thus will be adversely affected if the default by the second borrower as the lender will liquidate both the projects. Consequently the first borrower will then impose the social sanction.

The possibility of limited collusion implies that the second borrower cannot obtain her loan too early in the cycle, otherwise there will be coordinated default by the borrowers. Furthermore, the second loan cannot be too delayed either since in that case when the first borrower completes her project, she will not impose the social sanction and this may then lead to defaulting by the second borrower. It is this subtle interaction of dynamic incentives, in particular between sequential lending and IFR, that ensures that a higher project return can be implemented.

We next examine the scenario with complete collusion. Given that social sanctions have no bite we find, somewhat surprisingly, that more efficient projects can be sustained compared to that under individual lending. The intuition has to do with dynamic incentives that arise since default decisions take group payoffs into account. For exposition, we again consider a two member group. At the start of the project, default payoffs involve a single project while the continuation payoff includes the total net income that arises from both these projects and thus defaulting incentives are low. Now, at the time, when the second borrower receives its loan, default can still be costly for the overall group. This is because at this point, the first project has already run its course for some time, and some repayment have already been made, the combined payoff from these two projects could be higher for the group if it did not default on their loans. Consequently, it is possible to support the no default outcome when borrowers can collude and make side transfers to avoid imposition of social sanctions.

The maximal sustainable loan size under complete collusion is however lower than that under limited collusion. There are two countervailing forces at work here. While, the fact that social sanctions have no bite under complete collusion, makes loans harder to recover, the fact that default decisions take group payoffs into account, makes loans easier to recover. Why does the first effect necessarily dominate? This has to do with the fact that under limited collusion group size is taken to be large enough making social penalties an effective threat, whereas social penalties have no bite under complete collusion.

We next consider the optimization problem facing a socially motivated MFI, i.e. one that cares for its borrowers, a natural assumption in this context.[3] Solving for the optimization problem of such an MFI under both lending regimes, we find that both project size, as well as the number of borrowers served are higher under group-lending.

Finally, we use this framework to analyze a phenomenon that is not very well understood, namely the transition from group to individual lending discussed earlier. We argue that this shift can be attributed to the increase in MFI competition that was happening around the same time, in particular to several possible effects of such increased competition, including (i) increased competition for donor funds, resulting in a higher opportunity cost of fund for the MFIs, (ii) mission-drift, i.e. the MFIs becoming more profit-oriented, (iii) increased reservation utility of borrowers, and (iv) reduced social capital. We show that all of these tend to make group-lending relatively less attractive, thus providing a possible explanation.

The next section provides a brief review of the literature, whereas Section 3 describes the model and analyzes the case of individual lending. Section 4 then examines a scenario with both IFR, as well as sequential lending, under limited, as well as complete collusion. Section 5 analyzes a scenario where the MFIs optimally decide on projects sizes, etc. Section 6 then uses this framework to analyze some questions of policy interest. Section 7 concludes.

2. Related literature

We organize our literature review around three themes that this paper relates to.

2.1. IFR

In Jain and Mansuri (2003), early repayment forces borrowers to borrow from friends/local moneylenders, thus tapping into the information possessed by these agents regarding the borrowers' credit worthiness.

In recent contributions, Fischer and Ghatak (2010, 2011) show that the presence of (i) a net continuation value in case of repayment (which may arise either because of contingent renewal, or from avoiding future punishment), and (ii) either present-biased preferences, or strict risk aversion by the borrowers (in the absence of savings instruments), tighten the incentive constraints at the earlier stages, thus providing an explanation for frequent installments. Moreover, as in the present paper, they also argue that smaller amounts may be less prone to diversion.

This paper and Fischer and Ghatak (2010, 2011) offer complementary insights though, being applicable under different scenarios. The present paper, for example, provides a theory that does not require either a positive net continuation value in case of repayment, or the borrowers to have either present-biased preferences, or strict risk aversion. Fischer and Ghatak (2010, 2011) on the other hand provide a theory that applies even when full repayment is possible in the very first period, a scenario that is not allowed for in the present paper.[4]

Albuquerque and Hopenhayn (2004) consider a repeated game theoretic model of lending with endogenous borrowing constraints, finding

[2] de Quidt et al. (2012) report that out of 663 institutions that reported to Microfinance Information Exchange (MIX) in 2009, 12.2% of the lenders offered joint liability loans (JLLs) exclusively, and 57.9% offered some JLLs. Of course, this study does not tell us whether these joint liability contracts also involved sequential lending or not.

[3] The United Nations Interagency Committee on Integrated Rural Development for Asia and the Pacific (UNICIRDAP, 1992) mentions six characteristics of an NGO, one of them being 'highly socially motivated and committed'. See Besley and Ghatak (2005, 2006) for studies on incentive provision to socially motivated agents.

[4] We would like to thank Maitreesh Ghatak and Dilip Mookherjee for encouraging us to clarify these issues.