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Microfinance and dynamic incentives ☆

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ABSTRACT

Dynamic incentives, where incentives to repay are generated by granting access to future loans, are one of the methodologies used by microfinance institutions (MFIs). In this paper, I present a model of dynamic incentives where lenders are uncertain over how much borrowers value future loans. Loan terms are determined endogenously, and loans become more favorable as the probability of default becomes lower. I show that in all equilibria but one all borrowers, including the most patient ones, eventually default. I then consider an extension where borrowers can take loans from several lenders, *double-dipping*. Qualitatively, properties of equilibria with and without double-dipping are similar. In absolute terms, when borrowers are credit-constrained double-dipping equilibrium loans have to be more favorable to outweigh increased gains from default.

1. Introduction

As of December 2010, there were 3652 microfinance institutions (MFIs) reaching more than 200 million people, most of whom were among the poorest when they took their first loan (Maes and Reed, 2012). This is remarkable given the plethora of obstacles that, for a long time, have kept formal credit institutions away from financing the poor. Adverse selection, moral hazard, lack of collateralizable assets, absence of enforcement mechanisms, and high costs should have made microfinance nothing if non-existent, or at least subsidized. As an example, during pre-Grameen times in Bangladesh, loans targeting poor households by traditional banks had repayment rates as low as 51.6% in 1980, down to 18.8% by 1988–89, and were heavily subsidized by the government (Khalily and Meyer, 1993).

The microfinance methodologies that are responsible for microcredit success are well-known in the literature. They are group lending (where a small group of neighbors is jointly liable for individual loans), dynamic incentives (using access to future loans as incentives to repay the current one), regular-repayment schedules and using collateral substitutes (Morduch, 1999). Among the four, group lending has received the most attention, as it is an innovative and clever way to alleviate the problems of adverse selection and moral hazard. More recently, however, there has been a shift in focus, away from group lending and towards other aspects of microfinance loans. Fischer and Ghatak (2010) cite several factors responsible for this change, such as a decreased reliance on group lending by several major MFIs, as well as, a growing recognition of costs associated with joint liability (see also Banerjee, 2013, and references therein).[1]

The focus of this paper is dynamic incentives in the environment where no other enforcement mechanism is available. According to a standard repeated-game argument, as long as a borrower is sufficiently patient, the threat of limiting the borrower's access to future loans can serve as a punishment strong enough to deter the default. The contribution of this paper is that it demonstrates limitations of the dynamic incentives methodology despite the presence of sufficiently patient borrowers and full exclusion of defaulters.

The model is an infinitely repeated game, where a borrower faces an ex-post moral hazard, and default leads to a full exclusion of the defaulter. As in Ghosh and Ray (2001), parties cannot commit to contracts longer than one period. In a given period, loan terms are endogenously determined by the (correctly anticipated) probability of default. A lower probability of default in a given period means larger loans on more favorable terms. I assume that lenders are uncertain as to how much a borrower values future loans. I model it as uncertainty over the borrower's discount factor, δ. However, it can be also modeled as

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[1] Grameen eliminated explicit joint liability by 2002. Rhyne (2002) documents how due to increased competition, new MFIs in Bolivia, such as Caja los Andes, relied exclusively on individual loans to gain a market advantage over group loan competitors, such as BancoSol or Prodem. Currently BancoSol has switched to individual credit technology (see http://www.mixmarket.org/mfi/bancosol, accessed January 2014) and Prodem has begun to use a mix of individual and solidarity loans (see http://www.mixmarket.org/mfi/prodem-ffp, accessed January 2014). Nonetheless, de Quidt et al. (2012) report that in their sample of 715 MFIs as many as 54% of loans are made under solidarity lending, thus indicating that group loans are still widely used.

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uncertainty about the borrower's outside option (those with a lower outside option value access to future loans more), or as uncertainty over the borrower's productivity growth (those with higher growth rates have a higher value of future loans).

The model has multiple equilibria. There is an efficient equilibrium where the risk of default is eventually eliminated: the borrower's types with sufficiently high patience repay every period, and all less patient types eventually default and leave the game. Notably, such an equilibrium is unique. All other equilibria entail default by all types, including the most patient ones. First, there is a continuum of equilibria where loan terms are unfavorable in the beginning and deteriorate even further with time. When future loans are not attractive, most types quickly default, which, in turn, rationalizes lenders providing unfavorable loans. The second class of inefficient equilibria allows for a temporary improvement in loan terms. Loan terms improve at first, but eventually begin to deteriorate and all types default. In this scenario, types with intermediate patience delay defaulting until they can gain access to larger loans. In equilibrium, lenders correctly anticipate this. As soon as more types find it optimal to default, loan terms begin to worsen. This, in turn, destroys incentives to repay for the more patient types, which worsens loan terms even further. Eventually, all types will prefer to default regardless of their patience.

The existence of inefficient equilibria seems counterintuitive at first. With time, lenders are bound to learn that the borrower is sufficiently patient which should remove the risk of default. The intuition is misleading, however, since even the most patient types can find it optimal to default when future loans are expected to be small or otherwise unfavorable. Bond and Rai (2009) mention several cases where worries about MFIs' financial solvency, for example, because of an exogenous hike in default rates, rapidly destroy everyone's incentives to repay. While financial solvency is not an issue in my model, the key point remains valid. Dynamic incentives are not only about the borrower's patience, but also about the expected value of future loans.

A rapid expansion of micro-credit has resulted in a recent phenomenon called "*double-dipping*", in which borrowers take loans from several MFIs (Guha and Chowdhury, 2013, MacIntosh and Wydick, 2005). To study the effect of double-dipping on borrower's incentives, I develop an extension of the main framework where the borrower can take loans from multiple (two) lenders. I show that equilibrium structure remains the same: all equilibria but one lead to eventual default of all borrowers. I further show that when a borrower is credit-constrained, other things being equal, double-dipping (DD) equilibria lead to more favorable loans and a lower default rate than corresponding single-dipping (SD) equilibria. Intuitively, availability of the second loan has two opposite effects on repayment incentives: it increases gains from default and, at the same time, it increases gains from repayment and the value of future loans. For credit-constrained borrowers the former effects dominate. A DD-equilibrium, therefore, requires more favorable future loans to offset higher incentive to default.

2. Literature review

That unsecured debt, such as microcredit to the poor or sovereign debts, can be self-enforced in the case of repeated interactions was first formalized by Eaton and Gersovitz (1981) and further developed by Eaton (1996), Grossman and Van Huyck (1988), and many others. Bulow and Rogoff (1989) demonstrated some limitations of repeated interactions. If borrowers can save, then the rate of loan growth has to be higher than the interest rate, which eventually would become unsustainable. Among more recent papers, Albuquerque and Hopenhayn (2004) develop a model of optimal long-run lending contracts, when the debt repayment cannot be perfectly enforced. Differently from my paper, Albuquerque and Hopenhayn (2004) have no asymmetric information between the investor and the entrepreneur. Default can be avoided entirely by properly structuring the long-term debt contract.

Ghosh and Ray (2001) apply a dynamic incentives argument to the case of unsecured microcredit loans where lenders do not communicate and borrowers' repayment history is not publicly observable. There are two types of borrowers: myopic borrowers who always default, and borrowers with a positive discount factor, who do not default in equilibrium. While the history is not public, an individual lender can distinguish between *new* and *old* (returning) borrowers. If the borrower repays an initial (*new*) loan to a lender, the lender is willing to provide a better (*old*) loan to the borrower. My paper differs from Ghosh and Ray (2001) in that in my paper the borrower's history is observable by all lenders. It matters, as it removes the exclusive link between the old borrower and his lender. In Ghosh and Ray (2001), incentives to repay come from the fact that there is exactly one lender who has better information about the returning borrower and is willing to provide a better loan that is unavailable elsewhere. Another aspect where my paper is different is that I characterize all equilibria including non-stationary ones.

In the literature, dynamic incentives are often considered in combination with progressive lending. As empirical research shows, microfinance contracts typically structure the loans in such a way that the starting loans are small but increase with each cycle. Robinson (2001) describes 18 loan programs in different countries and shows that 12 of them used progressive lending with amounts rising up to 200% of the initial loan. Armendáriz and Morduch (2005) show that Grameen Bank provides a continuing and increasing series of loans to its clients. Based on a survey of 424 women in Karnataka, India, Kumar (2012) reports that the sixth consecutive loan could be as large as 684% of the initial loan.

From a theoretical point of view, progressive lending reinforces dynamic incentives, as a borrower who defaults on the current loan gives up the possibility of a larger loan(s) in the future. Ghosh and Ray (2001) can be seen as an example of a progressive lending model as new patient borrowers repay initial small loans to reveal their patience and get access to better loans in the future. Egli (2004) develops a model, where it is divisibility of a project that allows for equilibria where "*bad*" borrowers repay the first-period loans with non-zero probability. My paper is different in that in my framework the exclusive relationship between a borrower and a lender — either due to long-term contract as in Egli (2004) or due to asymmetry of lenders' information about the borrower as in the *O*-phase in Ghosh and Ray (2001) — is impossible. *Current* loan terms are fully determined by the *current* probability of default. It has a direct impact on progressive lending, as small and expensive loans in my model invariably imply a higher probability of default. That can be only rationalized by worse (or eventually worse) loans in the future, as otherwise the default rate would have to be lower. As a consequence, the only efficient equilibrium in my model has the *largest* initial loan among all equilibria.

Finally, many papers study double-dipping and its effect on borrowers' incentives. Due to an expansion of micro-credit, borrowers often have access to multiple loans from different lenders (Armendáriz and Morduch, 2005; MacIntosh and Wydick, 2005; MacIntosh et al., 2005). While double-dipping does not necessarily prevent lenders from excluding defaulting borrowers (MacIntosh and Wydick, 2005), it does weaken borrowers' incentives to repay. Guha and Chowdhury (2013) provide a model with double-dipping where borrowers face ex-ante moral hazard, and taking more than one loan is always inefficient and always leads to default. It shows that increased competition can have opposing effects on the borrower's well-being and interest rates. My paper differs from Guha and Chowdhury, in that it is a model of ex-post moral hazard *and* in that taking the second loan can be efficient, when the single-loan borrower is credit-constrained.

3. Model

3.1. Setup

Consider infinitely-repeated interactions between a risk-neutral borrower and risk-neutral lenders. The borrower has access to a project