Geographic distance and credit market access in Niger[1]

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February 2009

[1]We would like to thank Hinh Truong Dinh, Amadou Ibrahim, Peter Lanjouw and Peter Siegenthaler for helpful comments and discussions. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily reflect the views of the World Bank, its Executive Directors, or the countries they represent.

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Abstract

Distances involved in accessing basic services can constitute a major barrier to development. This paper analyzes the relationship between the distance separating households from microfinance institutions' offices in Niger, and the low levels of development and performance of the microfinance sector in the country. To cope with the effects of geographical distance, microfinance institutions adapt their policies through more restrictive loan conditions, higher interest rates and more intensive screening. This then leads us to discuss the tension between access and sustainability in the context of financial services for the poor.

Keywords: Credit access, distance, Niger.

4600 words

1 Introduction

This paper explicitly investigates the impact that distance can have on the development of microfinance institutions (MFIs) in Niger. Distance is defined as the geographical space by road between households and the MFI's office. Low population density might involve long distances for households to cover in order to access facilities and services such as microfinance institutions, health centers, or schools. The intensity of this effect will be determined by factors such as the development of the country's transportation infrastructure and services, eventually affecting multiple aspects of households' livelihoods.

Our study will focus on Niger, a landlocked country in the Sahara-Sahel region of West Africa, with a vast surface of 1,267,000 square kilometers. The country is a member of the West African Economic and Monetary Union (WAEMU), and the Economic Community of West African States (ECOWAS). In 2006, Niger's population was estimated at 14.4 million (United Nations, 2007). In 2005, rural population accounted for 83% of the total (United Nations, 2006). The country's GDP grew at a 6% rate during the period 2005-2007. However, it remains one of the poorest nations in the world, with an average per capita income estimated at US$280 in 2006 with 61% of the population living on less than one dollar a day. In 2007, Niger ranked 174th out of 177 countries according to the United Nations Development Program's Human Development Index. One of the main features of Niger is its population density. In Table 1 we see that on average, the population density of 11 people per

square kilometer makes Niger one of ECOWAS lowest-density countries. Most of the population (90%) concentrates in the Southern regions and the northern part of the country consists of the Ténéré desert.

As we can see in Table 1, one important feature of the microfinance sector in Niger is its low level of development compared to other ECOWAS countries. With the lowest number of MFI offices, the MFI network is less developed than in neighboring countries. With the second highest rate of credit at risk per beneficiary, MFIs' portfolios are also of comparatively poor quality. When we look at the number of employees per 1,000 beneficiaries we nevertheless see that the sector employs a relatively important labor force. With only one institution serving 26% of the clients, mobilizing 14% of the deposits and granting 10.6% of the loans, we could consider that the sector is fairly concentrated, even though Niger seems to have the least concentrated rural-finance market among ECOWAS countries (SFD BCEAO, 2004). Nguyen (1999) argues that one of the main reasons Niger's microfinance sector is less developed than other countries with similar population density (e.g. Mali), was the institutional difficulties the country experienced during the 1990s. The policy debate now focuses on restructuring the microfinance sector in order to improve sustainability (République du Niger, 2001).

Some organizations contend that distance may be an important factor restraining access to finance in some countries (Seep Network, 2006), including in the United States (Petersen and Rajan, 2002). When considering an economic transaction be-

tween two agents -in our case between a household, and individual or group of individuals and a microfinance institution- the effect of distance translates into a physical cost that agents need to pay in order to be able to realize the trade. In this paper, we analyze three models of credit markets: a complete information framework, one with adverse selection and one with moral hazard. We postulate that distance interacts with credit markets in several ways. *First,* there is the direct transaction cost: the actual transportation cost to deliver financial services to the borrower. We show that under competitive financial markets, the costs are borne by the borrower in the form of more intense screening of borrowers and higher interest rates. A *second* implication is an increase in monitoring costs: whether the lender needs to collect pre-loan-approval information on the borrower (adverse selection), or monitor the borrower after the loan is made (moral hazard), monitoring comes with costs that at the margin can influence the decision whether to monitor or not. This in turn translates into even stricter lending restrictions and higher interest rates in equilibrium. *Finally*, we postulate that at larger distances, the demand for credit changes as underlying characteristics (e.g. education) are negatively correlated with distance. Our selection models then predict patterns of borrower and loan profiles that are the conjunction of MFI screening practices and the underlying spatial distribution of characteristics. In particular, we find evidence that distance is also associated with higher interest rates, lower loan amounts, but also lower frequencies of monitoring, lower default rates and a higher prevalence of female group lending despite the fact

that female literacy is much lower than male literacy (the ratio of young literate females to males is 83% for individuals aged 15-24, World Bank, 2008). We argue that these results are consistent with the view that (i) MFIs pass on transaction costs onto their clients in the form of higher interest rates and more active screening, and (ii) credit markets are characterized by moral hazard, with an agency cost that is decreasing with distance. We speculate that an increasingly monopolistic power of MFIs acts as a disciplining device as reputation for creditworthiness is more important when there are fewer alternative sources of credit.

We would like to acknowledge several shortcomings of our paper. First, our paper is essentially descriptive as we focus on explaining the correlation between distance and access to finance, while acknowledging that distance can itself be correlated with different underlying characteristics relevant to credit market access. Second, data quality has been a limitation in our study. The survey took place at the peak of the 2005 famine, and availability and attention of households have certainly affected the quality of the data collected. The high costs related to transportation also limited the number of households that could be visited. Third, in both theoretical and empirical discussions, we will take the institution of group lending as given, and will not privilege one specific model of group lending (for a theoretical discussion see Ghatak, 1999 and Armendariz and Morduch, 2000, for empirical evidence). Thus, while the existence of group lending is consistent with our theory, we will be agnostic about the relationship between groups and geographic distance.

Our paper belongs to the literature on geography-based economic development (see e.g. Fujita et al. 1999, Redding and Venables, 2002), and the interplay between geographical isolation and development. However, micro-econometric evidence is scarce. A large part of the literature dealing with isolation and its relationship to economic development has discussed the impact of infrastructure on access to public services and markets (see e.g. Jacoby, 2000). By its descriptive nature, our paper relates to Fafchamps and Wahba (2004) who look at the spatial distribution of child labor in Nepal. Fafchamps and Moser (2003) also find that isolation is a source of weaker law order and enforcement. Our paper is thus an attempt to look at the effect of geographic isolation on access to financial services. Finally, by testing credit market models, our paper is close to Edelberg (2004) who looked at evidence of adverse selection and moral hazard on the consumer loan market in the US or to other efforts to detect adverse selection in credit markets (see e.g. Calem and Mester, 1995, and Ausubel, 1999).

The paper is organized as follows: Section 2 introduces different credit market models to describe the potential mechanisms that would induce distance to affect microfinance development; Section 3 will present the data and empirical results, and Section 4 concludes.

2 Testing credit market models

In this section, we present three different models of the credit market: a complete information model, and credit market models characterized by adverse selection and moral hazard respectively. We emphasize the behavior of the equilibrium of the economy as geographical distance between borrowers and lenders increases.

2.1 A model of credit markets with complete information

In this setting, there is complete information between lenders and borrowers. We use the representative borrower to model group lending. Entrepreneurs have no collateral and raise I units of capital from the microfinance institution - the lender. Borrowers are characterized by a vector θ of observable attributes that include education, distance to the microfinance institution and other relevant characteristics. The project cycle is as follows: at time $T = 0$, a loan of size I is granted and invested. By construction, we assume that returns to capital drop to zero above a given threshold $\bar{I}$. At time $T = 1$, the project is successful with probability $p\pi(\theta)$ and yields $R(\theta) I(\theta)$, and fails with probability $1 - p\pi(\theta)$ with zero returns. We separate the probability of success $p\pi(\theta)$ into an endogenous component p that will later depend on borrower's effort and an exogenous component $\pi(\theta)$ that is specific to each borrower of type θ. The probability of default on a loan is thus

$$\delta(\theta) = 1 - p\pi(\theta).$$

Under complete information, the lender observes θ perfectly so that loans can be made contingent on θ. Under the condition that lenders break-even in equilibrium, if $r(\theta)$ is the interest rate charged by lenders, credit supply is given by

$$p\pi(\theta) r(\theta) R(\theta) = 1$$

Borrowers choose the amount of loan to apply for in order to maximize their surplus so that

$$I(\theta) = \arg\max_{I} p\pi(\theta) R(\theta) I - I,$$

which yields

$$I(\theta) = \begin{cases} \bar{I} & \text{if } p\pi(\theta) R(\theta) - 1 > 0 \\ 0 & \text{otherwise} \end{cases}, \tag{1}$$

and when the individual can borrow

$$r(\theta) = \frac{1}{p\pi(\theta) R(\theta)}. \tag{2}$$

The step function behavior of the loan function $I(\theta)$ is essentially driven by the constant-return-to-scale technology. By allowing decreasing returns, results are qualitatively unaltered: loan amounts increase with θ, while interest rates decrease.

We now look at the determinants of the key parameter θ. We suppose that θ is a function of two salient parameters: the distance d that separates the loan applicant to the microfinance office, and a vector of characteristics e that includes the gender of the borrower, its education level, its sector of activity, etc. Thus, we model $\theta(d, e)$ with the structural assumptions that $\frac{\partial}{\partial d}\pi(\theta) R(\theta) < 0$ and $\frac{\partial}{\partial e}\pi(\theta) R(\theta) > 0$. The implicit

function theorem implies that the marginal borrower defined by $p\pi(\theta^*)R(\theta^*) = 1$ is such that $\frac{de^*}{dd} > 0$: due to the selection process stemming from (1), characteristics such as education, ability to reimburse a loan are increasing as distance increases, even though the relationship for the average borrower is going in the opposite direction. To see this, let's suppose that e measures say education and let's write the average education of all borrowers as

$$E[e|e \geq e^*(d), d] = \int_{e^*(d)}^{\infty} e \times f(e|d)\, de,$$

where $f(e|d)$ is the distribution of education levels at given distance d. For any $d' > d$, we have

$$E[e|e \geq e^*(d), d] - E[e|e \geq e^*(d'), d'] = \underbrace{\int_{e^*(d)}^{\infty} e\left[f(e|d) - f(e|d')\right] de}_{\text{intensive margin}} \underbrace{- \int_{e^*(d')}^{e^*(d)} e f(e|d')\, de}_{\text{extensive margin}} \quad (3)$$

The first term in (3) is the intensive margin effect, which compares the distributions of education levels as distance d increases. The second term is the extensive margin effect, whereby the marginal borrower $e^*(d)$ is such that $e^*(d) > e^*(d')$, provided that $\theta'_d < 0$ and $\theta'_e > 0$.

Proposition 1: Suppose the distribution of characteristics e to be such that:

(i) $[f(e|d) - f(e|d')] < 0$ for every e and distances $d < d'$:

Then intensive and extensive margin effects reinforce each other and for any $d' > d$,

$$E[e|e \geq e^*(d), d] - E[e|e \geq e^*(d'), d'] < 0$$

(ii) $[f(e|d) - f(e|d')] > 0$ for every e and distances $d < d'$:

Then intensive and extensive margin effects offset each other and the net effect is ambiguous.■

We summarize the other results below:

Proposition 2: Under the assumption that borrowers have access to decreasing-returns-to-scale technology, the following holds in equilibrium:

(i) Loan amounts are non-increasing as distances increase: $\partial I(\theta)/\partial d \leq 0$.

(ii) The probability of default on a loan increases with distance: $\partial \delta(\theta)/\partial d > 0$.

(iii) Interest rates charged to borrowers increase with distance: $\partial r(\theta)/\partial d > 0$.

(iv) There is no scope for additional ex-ante or ex-post monitoring of the borrower by the lender as contracts are complete.■

2.2 Adverse selection in credit markets

We keep the same framework, i.e. borrowers are characterized by $\theta(e, d)$ that is observable by the lender. However, there are two types of borrowers: p or q such that $p > q$ and the probability of success of their investments is now respectively $p\pi(\theta)$ and $q\pi(\theta)$. Types of borrowers are not directly observed by the lender. However, the distribution of types is common knowledge, and we denote $\rho(\theta)$ the probability a potential borrower is of type p. The literature on joint liability (see e.g. Ghatak, 1999) has argued that joint liability could be an institutional response to adverse selection in credit markets. Thus, if adverse selection is more severe as distance increases, group

lending is more likely to be observed further away from microfinance offices. However, there is no clear prediction on group size or group composition. Furthermore, we assume that borrowers do not have sufficient funds to pledge as collateral, so that no separation can take place between p and q borrowers. Alternatively, lenders can decide to invest in a monitoring technology in order to observe types with probability 1, but such technology has cost $\gamma(\theta) I(\theta)$. Monitoring will therefore take place if and only if

$$p\pi(\theta) r(\theta) R(\theta) I(\theta) - \gamma(\theta) I(\theta) \geq \pi(\theta) [\rho(\theta) p + (1 - \rho(\theta)) q] r(\theta) R(\theta) I(\theta),$$

while lenders' participation is given by

$$p\pi(\theta) r(\theta) R(\theta) I(\theta) - \gamma(\theta) I(\theta) \geq I(\theta)$$

with monitoring and

$$\pi(\theta) [\rho(\theta) p + (1 - \rho(\theta)) q] r(\theta) R(\theta) \geq 1$$

without. Then, supply of credit is equal to

$$I(\theta) = \begin{cases} \bar{I} & \text{if } \sup \{\pi(\theta) [\rho(\theta) p + (1 - \rho(\theta)) q] R(\theta), [p\pi(\theta) R(\theta) - \gamma(\theta)]\} \geq 1 \\ 0 & \text{otherwise} \end{cases}.$$

Borrowers have expected probability of default

$$\delta(\theta) = 1 - s\pi(\theta)$$

with $s = p, q$, and are charged interest rates

$$r(\theta) = \frac{1 + \gamma(\theta)}{p\pi(\theta) R(\theta)}$$

with monitoring and

$$r(\theta) = \frac{1}{[\rho(\theta)\, p + (1 - \rho(\theta))\, q]\, \pi(\theta)\, R(\theta)}$$

otherwise. The implications are thus qualitatively similar to the complete information framework as $\frac{\partial \gamma(.)}{\partial d} > 0$. Adverse selection in effect imposes an extra monitoring cost to the lender that is then passed onto the borrower via higher interest rates and more stringent lending conditions. Loan applicants (who include recipients and those who were denied credit) will be visited by a lender prior to the loan decision with a likelihood that depends on the relative cost $\gamma(\theta)$ with respect to the "need" for screening $\rho(\theta)$. Without further structural assumptions on these functions, the patterns of pre-loan visits are uncertain. However, conditional on receiving a loan, all individuals are equally likely to be monitored by the lender. We summarize the results below:

Proposition 3: If credit markets are characterized by adverse selection:

(i) Properties (i) and (ii) of Proposition 1, and properties (i)-(iii) of Proposition 2 still hold.

(ii) Group lending is more likely to be observed at larger distances from microfinance offices.

(iii) Lenders undertake monitoring visits prior to the loan decision. The probability of visits is identical conditional on being a borrower; in particular, it does not depend on d.■

2.3 Moral hazard in credit markets

Let's modify the complete-information model and add a $T = 1$ effort stage, in which the borrower has the option to exert effort. If the borrower exerts effort, then the probability of success is $p\pi(\theta)$ but the borrower does not enjoy any private benefit. Otherwise, the borrower gets private benefit $B(\theta) I(\theta)$ but the probability of success drops down to $q\pi(\theta)$, with $q < p$. Effort is not contractible, but the lender can spend an amount $\gamma(\theta) I(\theta)$ in monitoring costs to bring the borrower's private benefit down to 0. Borrowers' incentive-compatibility constraints are given by

$$r(\theta) \leq 1 - \frac{\beta(\theta)}{(p-q)\pi(\theta) R(\theta)} \tag{4}$$

where $\beta(\theta) \in \{0, B(\theta)\}$. The lender will exercise monitoring of the borrower if and only if

$$\gamma(\theta) \leq \frac{p}{p-q} B(\theta) \tag{5}$$

Assuming that monitoring costs increase with distance, monitoring is less likely to occur at further distances if $[B(\theta) - b(\theta)]$ is non-increasing as distance increases. Then, the lender will make a loan decision as follows:

$$I(\theta) = \begin{cases} \bar{I} & \text{if } \inf\left\{p\pi(\theta) R(\theta) - \frac{pB(\theta)}{(p-q)}; p\pi(\theta) R(\theta) - \gamma(\theta)\right\} > 1 \\ 0 & \text{otherwise} \end{cases}$$

Furthermore, the literature on group lending also argues that group lending could be a response to moral hazard when group monitoring is more efficient than individual monitoring. However, how group size will change as distance increases is uncertain

as the tension between free-riding and insurance is unlikely to be systematically correlated with distance from MFIs' offices.

Proposition 4: If credit markets are characterized by moral hazard:

(i) Properties (i) and (ii) of Proposition 1, and properties (i), (ii) and (iv) of Proposition 2 still hold

(ii) Group lending is more likely to be observed at larger distances from microfinance offices

(iii) If the informational rent (measured by private benefit $B(\theta)$) is non-decreasing with distance, then interest rates $r(\theta)$ should *decrease*: $\partial r(\theta)/\partial d < 0$

(iv) If the informational rent (measured by private benefit $B(\theta)$) is non-increasing with distance, then the probability of monitoring decreases with distance.■

3 Empirical results

In this section, we will test the predictions of the three stylized models analyzed previously. We summarize the main implications of the models:

1. The intensity of screening increases with distance: at the margin, borrower characteristics should improve as distance increases, while the predictions for the average borrower are ambiguous.

2. A pre-loan visit by MFI officials is evidence of adverse selection: the probability of pre-loan visit across borrowers is independent of distance.

3. Post-loan monitoring visits by MFI officials are evidence of moral hazard: *ceteris paribus*, monitoring is less likely to occur as distance increases.

4. In moral hazard context:

   If the informational rent is nondecreasing with distance: rates of default increase with distance, while predictions on monitoring and interest rates are ambiguous

   If the informational rent is nonincreasing with distance: monitoring decreases with distance and interest rates increase with distance, while predictions on default are ambiguous.

3.1 Data

Data have been collected in July 2005. The specificity of the data is that they both include information on the MFI's side, and socioeconomic information on clients: this approach allows to record information on clients' assets, education, and household composition, which are not collected by the MFI. The questionnaire was also especially designed to look at the issue of distance.

The population of reference consists of MFI's clients in 5 out of the 7 regions of Niger. Among the 59 MFIs with an authorization of the Ministry of Finance to offer microfinance services (BCEAO, 2002), 10 were chosen based on availability and regional location. Moreover, as the focus of the present study was the investigation of the impact of distance on MFI performance, sampling of borrowers has been stratified by distance. Each sampled MFI branch was asked to sample clients by stratum. Of

all the applications received by these 10 MFIs in the last 5 years, 161 loan applications were selected as survey sample. Those applications were requested according to different distance ranges to individuals and groups. Subsequently, a group and household questionnaire would be administered according to the information provided by the MFI to locate its clients. Statistical weights were applied at the 3 levels of stratification: different regions of the country, different sizes of MFI and different distribution of each MFI's clients. The first weight accounts for the number of MFIs operating in a region. The second addresses differences in size between the MFIs, and finally the third weight corrects the selection of households in different distance ranges.[1]

Table 2 summarizes the main socioeconomic variables for these individuals for different types of clients: as we can see, borrowers are around 50 years old and those in rural areas have lower household income per capita. On average, families are more numerous in urban contexts.

Our analysis will restrict to group lending, as individual lending is found to be mostly restricted to urban areas, in the vincinity of microfinance offices. The methodology we will follow consists of comparing groups characteristics, contractual forms, monitoring activities and outcomes as distance between clients and the MFI increases.

[1] The computation of the weight to be applied for group i is thus given by expression:

$$TotalWeight_i = RegionMFIweight_i * MFIsizeweight_i * Distance_i$$

3.2 Regression results

The canonical regression analysis consists of the following

$$Y_i = \alpha + \beta \times dist_i + X_i\gamma + \varepsilon_i$$

where Y_i is the outcome of interest, $dist_i$ is the distance that separates borrowers from the MFI's office, and X_i is a vector of group characteristics. Observations are weighted to account for our sampling strategy, and our regressions account for heteroskedasticity. We once again emphasize that this specification describes correlations we expect to observe on the equilibrium path, and by no means identifies the causal impact of distance on credit market outcomes.

3.2.1 Group characteristics

First and foremost, groups are more likely to be found at larger distances (Table 2), which is in line with the findings of Armendariz and Morduch (2000). While no individual lending is observed when the distance exceeds 25 kilometers, group lending takes place as far as 230 kilometers from the MFI's offices. Since a complete information framework is unlikely to explain the emergence of joint liability (given the magnitude of the distances involved), we interpret the dominance of group lending as evidence of adverse selection or moral hazard that are more expensive to address as distance increases. However, there is no clear-cut prediction on the relationship between group size and distance, and no empirical pattern emerges either (results not shown).

Table 3 looks at average group characteristics. In terms of our model, we are interested in looking at the behavior of $E\left[e|e \geq e^*\left(d\right), d\right]$, as d increases, where e is a vector of group characteristics that are believed to be relevant for creditworthiness. Proposition 1 predicts that if $E\left[e|d\right]$ is non-decreasing with e, then if selection actually takes place, we should observe $\frac{\partial}{\partial d}E\left[e|e \geq e^*\left(d\right), d\right] > 0$.

Looking at gender, women in Niger are associated with higher creditworthiness, anecdotally because the stigma of default is more severe on them. According to Paxton (1995), women are more vulnerable to peer pressure. Assuming that women face a larger stigma in case of default on a loan, Proposition 1 predicts a higher likelihood that borrowers are female groups as distance increases. This prediction is supported by the positive correlation between group gender and distance displayed in Table 3, column (1). The coefficient can be interpreted as follows: a group of borrowers at a 100 kilometer distance from the MFI center is 40 percent more likely to be a female group than the average group of borrowers at a 10 kilometer distance.

On the other hand, if e measures education, we expect $\frac{\partial}{\partial d}E\left[e|d\right] < 0$: average education levels in the population decrease as we move further away from urban centers, where MFI offices usually are. Thus, intensive margin and extensive margin effects give ambiguous results in terms of education levels of the *average* borrower. This fact is consistent with the absence of significant relationship between education and distance (Table 3, columns (2) to (7)).

Finally, if we look at the sector of activity of the average borrower, cash generating

activities are safer investments from a lender's standpoint. Thus, similarly to groups' gender, Proposition 1,3 and 4 all predict a bias of lending activities towards short term projects as distance increases. Columns (8) to (10) in Table 3 show a positive correlation between distance and the fact that the loan was primarily used to finance short-term trading activities.

3.2.2 Loan characteristics

We now turn to the determinants of the financial contract. in Table 4, columns (1) to (4) display the determinants of loan amounts, whether it is the reported amount that was applied for (columns (1) and (2)), or the amount granted (columns (3) and (4)). First, we remark that higher education of the head of the group is associated with larger loans. Second, as distance increases, the amount of loan granted decreases. This result is consistent with the three proposed models of credit markets provided that projects have decreasing net present value as distance increases. At the same time, this may be a reflection of borrowers' wealth: "Loan sizes are typically used to proxy for borrower incomes" (Armendariz and Morduch, 2000).

Columns (5) to (7) suggest that while pre-loan visits are common, their frequency is independent of the distance that separates the borrower from the lender. These results are consistent with the adverse selection case and Proposition 3, whereby all loan recipients should have equal probability of a visit, irrespective of their distance.

Finally, if we look at interest rates charged, we find a strongly positive and statisti-

cally significant relationship with distance. This result is consistent with Proposition 2 and 3, whereby interest rates internalize the net present value of the project. In the moral hazard case, Proposition 4 suggests that the only possibility for interest rates to increase with distance while net present values are decreasing, is that the information asymmetry $B(\theta)$ must decrease with distance. This is a plausible explanation if one assumes that $B(\theta)$ captures the outside option of the borrower in case of failure. When borrowers are further away, it is likely that reputation is more important as there is no alternative credit institution to turn to in case of default. Thus, if $B(\theta)$ decreases with distance d sufficiently rapidly, then (4) can yield a negative gradient between interest rates and geographic distance.

3.2.3 Loan performance

Table 5 confirms the presumption that $B(\theta)$ does not increase as d becomes large: columns (1) and (2) show that borrower monitoring is less likely as distances increase. This suggests that the benefits from monitoring $(B(d) - b(d))$ do not increase as fast as monitoring costs $\gamma(d)$. Yet, columns (3) to (10) in Table 5 suggest that in the absence of monitoring, repayment is still improved as distances increase. Thus, in an economy in which monitoring is taking place, for lower monitoring frequencies to be associated with higher repayment rates, it must be the case that information asymmetry is less severe as monitoring costs increase.

We speculate that a rationale underlying decreasing moral hazard has to do with

the increasing importance of reputation among borrowers: a default might be sanctioned by loan denial in the future as there are few financial institutions far away from urban centers. Thus, since clients have less possibilities of getting access to finance, travel costs usually put MFIs in a situation of de facto monopoly power, that in turn acts as a monitoring device.

4 Conclusion

We started the paper with the presumption that distance would impose a cost on microfinance development. However, how the cost would be transmitted to borrowers was an open question. The analysis conducted here suggests that the cost is born in part by borrowers who face higher interest rates, and more constraints and delays to obtain a loan, but is certainly also faced by marginal borrowers who may be excluded from the semi-formal credit market due to more stringent screening conditions. Moreover, we argue that adverse selection and moral hazard also plague the credit market, increasing transaction costs. Finally, we speculate that distance is also associated with a rarefaction of microfinance institutions, putting providers of finance in a monopoly situation that acts as a monitoring tool for borrowers: reputation of creditworthiness is more important to preserve as distance increases.

We do not make any normative statement on whether the microfinance sector is developed enough or not. The results shown in this paper bring back the tension that exists between outreach and financial sustainability. If microfinance institutions

need to be sustainable, they need to manage their portfolio carefully. Distance will de facto impose a risk on their portfolio, so that they will need to screen the demand for finance accordingly. There is therefore an intrinsic contradiction between outreach and sustainability that is exacerbated by low population density, making distance an important parameter in this tradeoff.

Our findings also suggest that limiting outreach has important consequences, as distant clients are more likely to be traders, while long-term investment activities (e.g. breeders) are more likely to be left out of the credit market. Beyond the efficiency concern, we also raise the equity concern whereby the poorest of the poor might be more likely to be excluded as they live further away from economic centers, and are engaged in activities that would not be considered creditworthy for MFIs. Screening policies implemented by MFIs to maintain the quality of their portfolios will potentially hurt the poor (see also Paxton and Fruman, 1997). The tradeoff between sustainability and outreach therefore deserves more attention in academic research and policy discussions.

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