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Strategic behavior between a bank and a microfinance institution: the role of psychological distance and education level

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Abstract

In Hotelling's fundamental model (1929), the geographical distance and high transportation costs grant firms present in a market a certain power over local buyers in their neighborhoods. Starting from his model, this study shows that in the competition between a bank and a microfinance institution (MFI), geographical distance and transportation costs alone are no longer sufficient for attributing market power to the firms present. In fact, the introduction of psychological distance and education level in the model alter the Hotelling's results. Psychological proximity (trust) and the educational level of the client play determinant roles in dividing the credit market between a bank and an MFI.

Keywords: spatial competition, bank, microfinance, market power

Jel-code: G21, O17, C72, D43

1. Introduction

Since its appearance over thirty years ago, microfinance has continued to play a major role in financial intermediation in developing countries (Fall et al., 2021, Fall et al., 2018). Considered at the beginning as secondary, today it is an inevitable part of the dynamics of financial inclusion. Microfinance institutions have largely proved their capacity to play a determinant role in mobilizing local resources and financing the economy, along with the traditional banking sector. In certain regions, such as Latin America, MFIs have largely surpassed classical banks in terms of profitability and size of assets. Some MFIs, such as Compartamos in Mexico, have even had their initial public offering on the stock market. Thus, while at the very beginning microfinance was oriented towards a purely complementary offer and strongly differentiated by its social profile, today, it is increasingly involved in commercial activities and approaching traditional banking intermediation.¹ Currently, overlapping between banks and MFI is very common, particularly in Latin America. In West Africa, competition between the two sectors is still weak, but remains perceptible. In Senegal, for example, this competition is evident in the poorer urban suburbs, where today both banks and MFIs exist. Nevertheless about fifteen years, no bank existed in these suburbs. Today, the competition between them is keen and merits closer attention (see Fall, 2009; Westley, 2006).

The theoretical literature is virtually non-existent on the subject of competition between the two types of institutions. Yet with regard to the banking industry, the work on spatial competition is abundant. These studies are based on Salop's circular model, and generally focus on a Bertrand-style competition in which there are two types of products (savings and credits), whether differentiated or not. For example, Kim and Kim (2003) applied Salop's circular model in analyzing the credit market in order to highlight the role of information asymmetries on a market's equilibrium interest rate. Matutes and Padilla (1994) provided another variant of Salop's spatial competition model, in which banks propose other types of services to their customers, such as withdrawals and portfolio management. Grimaud and Rochet (1994) also used Salop's model to provide a simple and robust specification of the monetary and financial part of a macroeconomic model. Chiappori et al. (1995), using a circular economy, proposed a model of spatial competition in which banks offer both credits and savings and studied the incidence of regulation on interest rates for savings and loans. Other studies on banking competition have been based on Hotelling's fundamental model. Wong and Chan (1993) applied this model when analyzing banking competition by combining theories of intermediation and of optimal contracts. These studies are often focused on the competition between two vendors who are considered identical, and generally, the literature is based on studying competition between non-differentiated institutions. Yet, is the

¹ Banks and MFIs can be considered as two types of financial intermediaries with different natures, but who often have the same objective: collecting the savings of agents who have a surplus in order to finance projects that are considered profitable. (Fall, 2009).

nature of the competition different when financial intermediaries are different? For example, in the case of an interaction between a bank and an MFI, does competition have the same importance?

The purpose of this article is to analyze spatial competition between a bank and an MFI. We start from Hotelling's basic model and consider a duopoly in which competition between these two institutions takes place in two phases: first, institutions choose their locations in a non-cooperative way and, second, they compete on price. We introduce two additional factors of product differentiation to better account for the reality of the interaction between both sectors: 'psychological distance' and the client's level of education. "Psychological distance" in this model refers to the level of distrust between the lender and the client. It is inversely proportional to the trust that may exist between a bank or an MFI and its client. This term covers all the factors that create distrust between a bank and its client.² Contrary to physical distance, psychological distance is not measurable. It is specific to the relationship between lender and borrower, and highlights the idea of proximity between an institution and its clientele. In fact, socio-cultural factors, rather than physical ones, explain the level of trust between a client and his/her bank.

Educational level refers to the number of years the customer attended school. We know that usually, customers who have a high education level are the banks' customers, whereas those who have a low level of study are generally excluded from the bank.³ Our intention here is not to study the game between both vendors to position themselves on the market, but rather to start from Hotelling's principle of maximal differentiation in order to analyze the sharing of the market between two potential vendors. The choice of location at the extreme ends of the spectrum allows us to better highlight the impact of the psychological distance on the spatial sharing of the market between a bank and an MFI. This study considers only the case of maximal differentiation to highlight the role that trust and education level may play in the competition between banks and MFIs. In the following sections, we present the model (section 2), study market equilibrium (section 3), and finish by drawing conclusions (section 4).

2. Literature review

The relationship between banking and microfinance is a critical element of financial inclusion in developing countries (Fall, 2017). Indeed, financial intermediation in such a context is essentially

² These factors can come from the bank as well from the customer, for example, the bank's intermediation strategy, and its culture or conditions of financing. These factors can also include customers' educational level, their level of income, the expected profitability of their projects, the business sector in which they work their culture, etc.

³ It is essential to emphasize the influence of the consumer's education level on his work activities (Somani, 2021), which, in turn, might affect the lender's risk perception (Isaga, 2018; Chowdhury et al., 2018, among other). For instance, customers with a low level of education are more likely to work in labor-intensive sectors, such as agriculture or fishing. Differently, those with a high level of education seem to work in capital-intensive sectors. The market share between the bank and the MFI will therefore depend on the client's business sector. A client who works in the agricultural sector might find it more difficult to obtain credit from the bank due to its risk perception of consumer activities. On the other hand, such a consumer should have a better chance of getting a loan from the MFI, which has more flexible procedures and greater risk-taking in terms of financing.

based on these two sectors. Consequently, studying their interaction is of paramount interest. Vanroose and D'Espallier (2013) consider that the relationship between MFIs and the banking sector is vital, as the development of the traditional financial sector influences MFIs. The interaction between the two sectors is supposed to improve the efficiency of the intermediation system as a whole, particularly access to credit for entrepreneurs. There is a significant number of studies on this relationship, but it is essentially empirical work (Baydas et al., 1997; Bell et al., 2002; Isem and Porteous, 2005; Westley, 2006; Delfiner and Peron, 2007; Fall, 2009; Baraton and Léon, 2021, among others). Theoretical analyzes are still rare.

Complementarity and competition are the most studied aspects of the relationship between banking and microfinance. Fall (2009) provides an overview of the different patterns of interpenetration between banks and MFIs worldwide. According to him, in regions where microfinance has reached maturity and has proven its viability (such as Latin America), the relationship between the two sectors is marked more by competition. On the other hand, in regions where microfinance is still in search of development, maturity, and viability (as in sub-Saharan Africa), the relationship between the two sectors is more marked by cooperation. More generally, the competition level between the two sectors is increasing with the development of the microfinance sector and the withdrawal of subsidies. In Cameroon, some MFIs believe that competition is likely the most substantial relationship between banking and microfinance (Messomo, 2017). In the same vein, Donou-Adonsou and Sylwester (2016) estimate that some banks facing competition from MFIs extend their financing to the poor. Overall, MFIs catch more clients in countries with low access to the traditional financial system. In well-developed financial system countries, MFIs instead reach poorer clients (Vanroose and D'Espallie, 2013). Also, greater bank penetration can push MFIs toward poorer markets (Cull et al., 2014).

Fall (2017) analyzes the refinancing relationship between banks and microfinance institutions in Senegal. He finds that cooperation between the two sectors, particularly in refinancing, is essential for financial intermediation in Senegal and West Africa. Fall (2011) attempts a theoretical justification of the complementarity between the two sectors through the theory of information asymmetries and the theory of industrial organization. The author highlights the specificity of microfinance intermediation compared to banks. Besides, he discusses the factors that underpin confidence in both types of intermediation. According to the author, the trust foundations that remain the central intermediation elements differ from one institution to another. In banking, trust is based more on material elements. Obtaining bank credit is conditional on the provision of formal material guarantees and reliable accounting documents. In microfinance, trust is, in contrast, based more on intangible elements such as group solidarity, social pressure, client morality.

In our study's banking/microfinance competition, analysis of Fall (2011) allows us to understand the role of confidence in the market partition. Individuals who can provide sufficient material collateral, bankable projects, and reliable financial statements will have a better chance of obtaining credit from the bank. On the other hand, individuals who do not have sufficient material guarantees

and bankable projects will be more likely to obtain credit from microfinance by providing social guarantees.

3. The model

We consider a linear city whose length is normalized at 1. In this city, customers are uniformly distributed, each of whom wants to acquire one unit of credit for financing an investment project. We assume that two types of intermediaries ensure the financing of projects in this market: a bank b and a microfinance institution i . The bank is located at the left end of the segment. Its location is given by ($x_b = 0$). The MFI is at the right end and its location is given by ($x_i = 1$). A borrower e located in a place x_e ($0 \leq x_e \leq 1$) who wants to obtain credit must necessarily go to one of the two institutions. The borrower has a transport cost t proportionate to the distance that separates him/her from the institution. The bank and MFI respectively set the interest rates r_b and r_i for the client. Contrary to Hotelling, we consider the existence of three factors of credit differentiation:

- (i) The physical distance that separates the client and the bank (MFI). The unit transport cost is denoted by t .
- (ii) The psychological distance, measuring the level of distrust between a client and his/her bank (or MFI). This cost is denoted by σ_b (σ_i), and refers to the price that an individual must pay to dissipate the bank's (or the MFI's) distrust.
- (iii) The level of education measured by the number of years of schooling. We assume that the higher the educational level of a given customer, the more he/she prefers the bank to the MFI. Therefore, for each additional year of study, we consider that his/her cost of financing with the bank decreases by an amount γ .

We use the linear form of the transfer cost. This linear form was questioned by d'Aspremont et al. (1979). In our model, we have rehabilitated this form to give more robustness to psychological distance and education level. By using quadratic forms, there is a risk of seeing transportation costs supplant factors linked to trust and the number of years of education. However, linear transport costs enable us to eliminate the risk linked to correlation between the two types of distances. Mayoukou and Ruffini (1998) highlighted the influence of geographical proximity in the relationship of trust between a customer and his/her banker. This influence is even stronger when it comes to quadratic transportation costs. Thus, to free ourselves from this risk of correlation and to make the model more legible, we found it more sensible to work with a linear form.

For a client located at x_e and having a number of years of education a_e , his/her financing cost from the bank and the MFI respectively is given by:

$$c_b = r_b + x_e t + \sigma_b - a_e \gamma \quad [1]$$

$$c_i = r_i + (1 - x_e)t + \sigma_i \quad [2]$$

The location x_m of the marginal borrower is given by the formula:⁴

$$x_m = \frac{t+(r_i-r_b)+(\sigma_i-\sigma_b)+a_e\gamma}{2t} \quad [3]$$

Each institution's market power is given by the right segment, in other words, the distance that separates the institution from the marginal client. Thus, the market power of the bank and that of the MFI is respectively determined by:

$$D_b = \int_0^{x_m} dx = \frac{t+(r_i-r_b)+(\sigma_i-\sigma_b)+a_e\gamma}{2t} \quad [4]$$

$$D_i = \int_{x_m}^1 dx = \frac{t+(r_b-r_i)+(\sigma_b-\sigma_i)-a_e\gamma}{2t} \quad [5]$$

We consider a non-cooperative game between a bank and MFI. They are in competition through price and each player determines his/her rate of interest by taking into account the other player's strategy. The function of profit of each player is given by:

$$\pi_b = r_b D_b = r_b \frac{t + (r_i - r_b) + (\sigma_i - \sigma_b) + a_e\gamma}{2t} \quad [6]$$

$$\pi_i = r_i D_i = r_i \frac{t + (r_b - r_i) + (\sigma_b - \sigma_i) - a_e\gamma}{2t} \quad [7]$$

The best response of each institution, by taking into account the other's rate of interest, becomes:

$$r_b(r_i) = \frac{r_i + t + (\sigma_i - \sigma_b) + a_e\gamma}{2} \quad [8]$$

$$r_i(r_b) = \frac{r_b + t + (\sigma_b - \sigma_i) - a_e\gamma}{2} \quad [9]$$

Thus, the equilibrium interest rate of each institution is determined by:

$$r_b = \frac{t + (\sigma_i - \sigma_b) + a_e\gamma}{2} \quad [10]$$

$$r_i = \frac{t + (\sigma_b - \sigma_i) - a_e\gamma}{2} \quad [11]$$

The location of the marginal client is given by:

⁴ This is the location at which the customer is indifferent to borrowing from a bank or from an MFI.

$$x_m = \frac{3t + (\sigma_i - \sigma_b) + a_e \gamma}{6t} \quad [12]$$

3. Market equilibrium

Note that the location of the marginal customer given in Equation (12) satisfies the condition: $0 \leq x_m \leq 1$. The market power of an institution is thus a function of educational level, psychological distance, and physical distance. Equation (12) allows to us to identify the various types of customers.

Let $\Delta\sigma = \sigma_b - \sigma_i$. This variable can be considered as the relative trust in the MFI compared to the bank, or in other words, the psychological distance relative to the bank.⁵

Proposition 1. When $\bar{\Delta}\sigma = a_e \gamma$, the market share is determined only by transport costs.

Proposition 1 indicates that as long as the relative psychological distance is compensated by educational level, the customer's choice of financing depends only on transport costs. Thus, we have Hotelling's initial case. Accordingly, proximity becomes a critical element of the competition between the two sectors. This situation corresponds to the Bank/MFI competition in Madagascar described by Baraton and Léon (2021). These authors find that geographical location is essential in the interaction between the two types of institutions. Their econometric results show that competitive pressure from banks (induced by physical proximity) affects the credit policy of MFIs.

This proposition appears to concern the intermediate client.⁶ For this category of client, there are two contradictory characteristics. On the one side, there is certain distrust between this client and the bank, which makes access to bank financing difficult. On the other side, his/her educational level gives him/her a certain advantage in accessing financing through the bank. These two characteristics nullify each other, and thus his/her final choice is only determined by transport costs.

Proposition 2. There are two thresholds \bar{a}_e and \underline{a}_e , according to which if $a_e \geq \bar{a}_e$, the bank holds monopolistic power, whereas if $a_e \leq \underline{a}_e$, it is the MFI that has the monopoly.

⁵ This relative trust in the MFI is inversely equal to the relative mistrust in the bank.

⁶ This is a client who is psychologically equidistant between a bank and an MFI and with an average educational level.

Proof. The bank has a monopolistic situation if $x_m \geq 1$. If $\bar{a}_e = \frac{3t+\Delta\sigma}{6t\gamma}$, then $x_m \geq 1$ when $a_e \geq \bar{a}_e$. Conversely, the MFI holds monopolistic power if $x_m \leq 0$. If $\underline{a}_e = \Delta\sigma - 3t$, then $x_m \leq 0$ if $a_e \leq \underline{a}_e$.

Proposition 2 implies that when the educational level of the customer is relatively higher than the psychological and physical distances, the customer is going to choose the bank to finance his project, whatever its location. The bank thus has a monopolistic market power. Inversely, when the educational level is sufficiently weak in relation to psychological and physical distances, the MFI has the power of monopoly. In this case, the customer prefers to deal with the MFI. Between these two critical thresholds, both institutions find themselves in a duopoly competition.

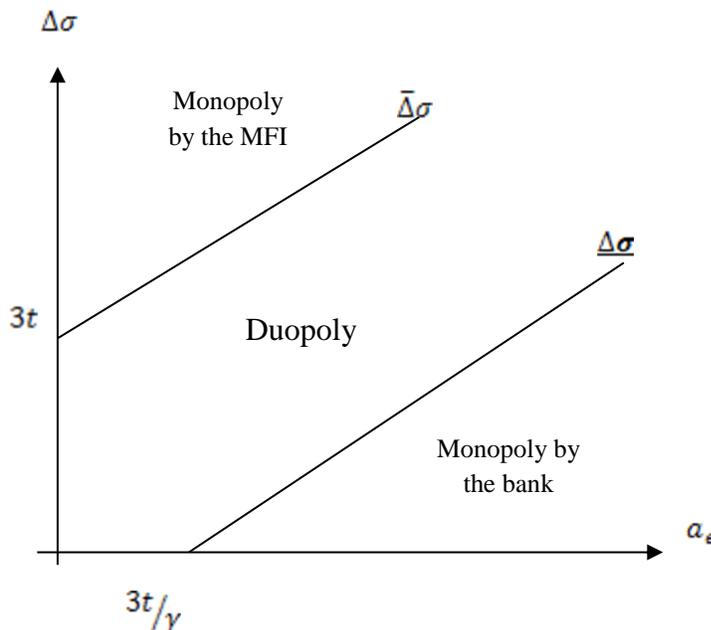
Proposition 3. There are two thresholds, $\bar{\Delta}\sigma$ and $\underline{\Delta}\sigma$, according to which if $\Delta\sigma \geq \bar{\Delta}\sigma$, the MFI has the monopoly, whereas if $\Delta\sigma \leq \underline{\Delta}\sigma$, it is the bank which has this power.

Proof. We posit that $\bar{\Delta}\sigma = a_e\gamma + 3t$ and $\underline{\Delta}\sigma = a_e\gamma - 3t$.

This proposition shows that trust can play an important role in determining the customer's choice of financing. Particularly, if the trust in the MFI compared to the bank is high enough, the MFI becomes the sole financial institution on the market. On the contrary, if this trust is relatively weak, the bank is alone in the market. When the trust is neither high nor low ($\bar{\Delta}\sigma \geq \Delta\sigma \geq \underline{\Delta}\sigma$), the bank and MFI are active in the market and constitute a duopoly competition.

The relationship between relative trust and the educational level is given in Figure 1:

Figure 1- Relative trust and education level



The monopolistic position of the bank seems to concern white-collar customers, those who have a rather high level of income, such as legislators, senior officials and managers, professionals, and technicians and associated professions. This clientele is characterized by a higher level of education and a substantial income that facilitates access to bank financing. This type of customer chooses a bank to finance his/her project, irrespective of its geographical distance.

However, the monopolistic position of the MFI refers to poorer customers who have a lower educational level or are less skilled. This is the case for micro-entrepreneurs in the informal sector, craftspeople, and small traders who are generally poorly educated and have a low or even very low income. This low income and the low level of education push them to seek out the MFI, whatever their location. Note that in both previous cases, transportation costs are marginal and do not come into play in the customer's choice of financing.

Between these two scenarios, the bank and the MFI are in a duopolistic competition. Hence, transport costs become the third factor, after psychological distance and educational level, that determines the customers' choice of financing. In this case, customers straddle the two sectors. In developing countries, banks and MFIs share a common customer niche in the middle of the pyramid (see Fall, 2009).

4. Extensions and discussions

It should be noteworthy that the above model can be extended to apply in different phenomena.

4.1. Role of Information and Communication technologies

First, notice that the development of ICT in recent years has been widely impacted the financial sector worldwide, including that in developing countries. The increasingly usage of smartphones among clients and incorporating applications for various transactions (e.g., credits, payments) among financial institutions might widely reduce the transportation costs. However, to this end, clients should reach some educational level and/or be sufficiently rich.

Our model might be extended to take these outcomes into account. We can assume that the geographical location is no longer matter ($t = 0$) once the consumer's education level reaches a critical threshold, $a_e \geq \hat{a}_e$.

- (i) If $\hat{a}_e > \bar{a}_e$, then Proposition 2 still holds. Consequently, if the consumer's education level is high enough, the development of ICT has no impact on her/his decision. She/he always refers to the bank to finance her/his project, regardless of her/his geographical location.
- (ii) Interestingly, if $\hat{a}_e < \bar{a}_e$ then given development of ICT, the education's impact on the market equilibrium becomes more implicated and we would introduce new parameters in

the model as the number of banks and MFIs, whether a given financial institution has an application for credit, the customer's revenue level. However, the main conclusions of our current model would remain the same. For instance, low-educated consumers would privilege MFIs, while high-educated counterparts should refer to banks to finance their project.

4.2. The possible endogeneity of trust

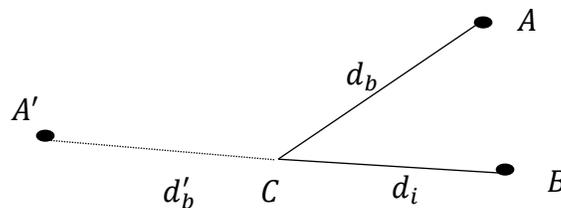
In our model, trust (σ_b, σ_i) is treated as exogenous. Such a parameter could be, in reality, endogenous and highly determined by other parameters as the education level (high education level should reduce psychological cost). Besides, trust could affect the interest rate proposed by the lender. Indeed, if the borrower has been already client of the financial institution and/or there are some transactions between them in the past, these outcomes should have an influence on the proposed interest rate.

To be able to treat trust as endogenous, we need to develop a model with different periods and the market equilibrium would be determined in different stages. At a given period t , a given consumer should first determine her/his trust level toward a bank or an MFI, relying on her/his education level, the relationship with the financial institution in the past and other parameters of the model as transport costs. At the second stage, the financial institution proposes its interest rate by taking the consumer's information into account. Market equilibria is determined at the third stage. It should be noteworthy that those demonstrations are not straightforward.

4.3. Competition between multi-banks and multi-MFIs in a two-dimension model

In our current framework, there is only a bank and an MFI locating in a linear city. With some conditions, it can be extended to a two-dimension model where there are multi-banks and multi-MFIs. Indeed, let us consider a typical customer c who needs to acquire one unit of credit to finance an investment project (point C). She/he first searches randomly a bank (point A) or an MFI around her/him (point B). Assume that the associated geographical distance is d_b and d_i , respectively (see Figure 2 below).

Figure 2 – Multi-banks and multi-MFIs competition



Without loss of generality, we can assume that the geographical distance to the bank and the MFI in question is $\frac{d_b}{d_b+d_i}$ and $\frac{d_i}{d_b+d_i}$, respectively. Thus, this set-up allows us to come back to a linear city (cf., $\frac{d_b}{d_b+d_i} + \frac{d_i}{d_b+d_i} = 1$), as there is a bank at point A' with a distance d'_b to the customer and $d'_b + d_i = 1$ (Figure 2). Hence, we can rely on the theoretical framework developed in Sections 2-3 to determine the equilibrium.

Notice that if banks are homogenous, then each of them will get a local monopole situation for customers locating around it. Similarly, if MFIs are homogenous, then a typical MFI will hold a local monopole. In this case, our theoretical framework remains relevant to explain a local competition between a bank and an MFI.

Nonetheless, if banks are heterogenous and so are MFIs, the main conclusions of our theoretical framework no longer hold and we need to develop another framework to deal with such situation.

4.4. Role of informal borrowing/lending

In our current theoretical framework, credit is only supplied by a bank and an MFI, which provide the bulk of financial intermediation in developing countries. Nonetheless, from a financial accessibility perspective, it should be noteworthy that banks and MFIs cannot meet the whole market demand and that informal actors (informal lenders, deposit collectors, friends and relatives, etc.) can help. Consequently, in future research, it would be relevant to consider the role of the informal sector.

Depending on their education level, geographical, and psychological distance, some clients may be excluded from banking and MFI and thus refer to the informal sector. To consider the informal factor, together with the bank and MIF, the one-dimension theoretical framework developed in this research is no longer suitable. We should rely on a two-dimension model where the competition occurs between multi-banks, multi-MFIs, and multi-informal institutions.

5. Conclusion

This study has highlighted the interactive context that may prevail between a bank and an MFI in the particular context of urban suburbs in developing economies. Drawing on Hotelling's principle of maximum differentiation, we have shown the importance of factors of psychological distance and educational level in the sharing of the market between these two types of institutions. Our model shows that the competition does not play out only on the basis of transport costs, as for Hotelling. On the contrary, transport costs may be relegated to a secondary concern, depending on the strength of factors linked to trust and the clients' educational level. Here, the bank's market power is greater in the niche of customers having a higher educational level. When this level is

relatively high compared to psychological and physical distance, the clientele prefers the bank rather than the MFI. In poorer urban suburbs, this was true for the higher income class who generally has a higher level of education. Indeed, those who have a higher educational level generally have a higher degree level and consequently, better chances to find a good job. These clients naturally have more income, which they can then invest to increase their wealth and keep it safe in the banking sector. For this niche of clientele, the bank serves the entire market. On the other hand, when the educational level of the clientele is particularly low compared to mistrust and physical distance in regard to the MFI, these clients will prefer to deal with the MFI rather than the bank. In this scenario, the MFI serves the entire market. The same results arise in situations in which psychological distance becomes dominant with regard to physical distance and level of education. When distrust towards the MFI is very high compared to transport costs and the level of education, the bank serves the whole market. In opposite case, when mistrust towards the bank is high compared to the other factors, the MFI has the power of monopoly. There is however, an intermediate situation, where the clientele is at a psychological equidistance from both institutions and has an average educational level. In this scenario, the market share is determined by the amount of transport costs and physical distance, as in Hotelling's model. This scenario concerns a particular niche of customers who can equally seek out a bank or an MFI, as they know how to properly communicate with both institutions.

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