Economics
The Open-Access, Open-Assessment E-Journal

Discussion Paper
No. 2015-66 | December 02, 2015 | http://www.economics-ejournal.org/economics/discussionpapers/2015-66

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.

JEL G21 O17 C72 D43
Keywords spatial competition, bank, microfinance, market power

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Citation François Fall and Thanh Tam Nguyen-Huu (2015). Strategic Behavior between a Bank and a Microfinance Institution: The Role of Psychological Distance and Education Level. Economics Discussion Papers, No 2015-66, Kiel Institute for the World Economy. http://www.economics-ejournal.org/economics/discussionpapers/2015-66

Received October 9, 2015 **Accepted as Economics Discussion Paper** November 24, 2015 **Published** December 2, 2015
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1 Introduction

Since its appearance over thirty years ago, microfinance has continued to play a major role in financial intermediation in developing countries. 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 (Fall , 2009; Westley , 2007).

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 (Salop , 1979), 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 Salops's model to provide a simple and robust specification of the monetary and financial part of a macroeconomic model. Chiappori, Perez-Castillo and Verdier (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 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

[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).

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. 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 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. 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 et 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 its 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 $\sigma_b(\sigma_i)$, 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, Gabszwicz and Thisse (1979).In our model, we have rehabilitated this form to give more ro-

[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.

bustness to psychological distance and education level. By using quadratic forms, there is a risk of seeing transport costs supplant factors linked to trust and the number of years of education. However, linear transportation 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:

$$c_b = r_b + x_e t + \sigma_b - a_e \gamma \tag{1}$$

$$c_i = r_i + (1 - x_e)t + \sigma_i \tag{2}$$

The location x_m of the marginal borrower is given by the formula:[3]

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

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:

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

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

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:

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

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

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

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

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

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

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

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

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

The location of the marginal client is given by:

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

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.[4]

Proposition 1. *When $\bar{\Delta}\sigma = a_e\gamma$, the market share i s 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.

This proposition appears to concern the intermediate client. 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 $\bar{a}_e$ et $\underline{a}_e$, 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.*

Proof. The bank has a monopolistic situation if $x_m \geq 1$. Let $\bar{a}_e = \frac{3t+\Delta\sigma}{6t\gamma}$, then $x_m \geq 1$ when $a_e \geq \bar{a}_e$.

Conversely, the MFI holds monopolistic power if $x_m \leq 0$. Let $\underline{a}_e = \Delta\sigma - 3t$, then $x_m \leq 0$ if $a_e \leq \underline{a}_e$ □

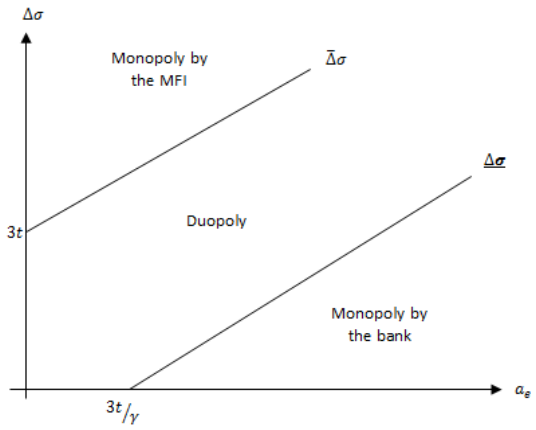
Proposition 2 implies that when the educational level of the customer is relatively higher than the psychological and physical distances, the customer is going to choose the bank to finance his project, whatever its location. The bank thus has a monopolistic market power. Inversely, when the educational 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, $\bar{\Delta}\sigma$ et $\underline{\Delta}\sigma$, 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. Let $\bar{\Delta}\sigma = a_e\gamma + 3t$ and $\underline{\Delta}\sigma = a_e\gamma - 3t$. □

[4] This relative trust in the MFI is inversely equal to the relative mistrust in the bank.

Figure 1: Relative trust and education level



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 below.

The monopolistic position of the bank seems to concern white-collar customers, those who have a rather high level of income, such as legislator, senior officials and managers, professionals or technicians and associate professionals. 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.

On the other hand, 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.

4 Conclusion et discussions

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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