Review of Development Finance 2 (2012) 84–92

DEVELOPMENT FINANCE

www.elsevier.com/locate/rdf

A methodology for the assessment of potential demand and optimal supply of entrepreneurial microcredit☆

Ayi Gavriel Ayayi [a,*], Nurmukhammad Yusupov [b]

[a] *Financial Economics, Université du Québec à Trois Rivières, 3351 Boulevard des Forges C.P 500, Trois Rivières, Québec G9A 5H7, Canada*
[b] *Economics, Westminster, International University in Tashkent, Uzbekistan*

Available online 18 June 2012

Abstract

We propose a methodology for the assessment of potential demand and optimal supply for microcredit. We show that the total demand is a combination of the demand that stems from the active poor plus the demand generated by a motivator agent among the entrepreneurial non-motivated poor. We use French data to provide an illustration of the assessment of potential demand for microcredit. We also show that the proportion of the potential demand satisfied by a microfinance institution depends on its objective i.e. either it is socially oriented or a profit maximizer.

JEL classification: G21; R22; R39

Keywords: Entrepreneurial microcredit; Potential demand; Optimal supply; France

1. Introduction

As poverty alleviation tool (e.g. Hossain, 1988; Pitt, 1999; Morduch, 1999; Khandker, 2005; Ayayi, 2012); microcredit is applicable only to a certain type of poor people: those with at least a minimum level of entrepreneurial skills that could use the borrowed money to develop sustainable micro-businesses. In effect, because micro-loans must be repaid, they should be offered to those who can engage in income-generating activities. However, in light of the growing popularity of microfinance as a poverty alleviation tool and commercial interest in microfinance by private investors, current assessments of the potential demand of the market by some institutions seem to be overly optimistic.

Many international organizations, as well as private consulting firms such as McKinzey & Company and Standard & Poor's, project huge growth potential for the microfinance industry (Tilman, 2006; Chavee et al., 2007). For example, Standard & Poor's Microfinance Rating Methodology Working Group (2007) contends that, while the total number of microcredit borrowers today is about 100 million; of 3 billion poor around the globe, about half are potentially eligible for microcredit. Simply put, demand greatly surpasses supply. Because microcredit is primarily aimed at to launch microenterprise, and assuming that Standard and Poor's claim hold, one can infer that on average, every other poor person is endowed with or can relatively easily acquired at least some entrepreneurial skills that make him a potential entrepreneurial microcredit borrower who could run a micro-enterprise. In another striking example, the European Microfinance Network (2008) estimated that the total demand for microcredit is about 180,000–230,000 clients per year in France, which corresponds to a total stock of 1,080,000–1,380,000 between 2000 and 2005.

In our view, these statements seem to be too optimistic and seem to ignore the key determinant of the survival of microcredit: the entrepreneurial skills of the micro-borrowers which are instrumental to the success or failure of the micro-businesses. For example, in its April 2008 brief CGAP discussed issues related to overestimation of the demand for micro-loans. Anand and Rosenberg (2008) point out that current estimates based

☆ We are grateful to the seminar participants at Tilburg Center of Finance, the Eastern Finance Association, University of Stenllenbosch Business School, Cape Town, South Africa, the African Economic Research Consortium and at the Université du Québec à Trois Rivières for their insightful comments. We are responsible for any errors or omissions.

* Corresponding author. Tel.: +1 819 376 5011x3137.
E-mail addresses: ayi.ayayi@uqtr.ca (A.G. Ayayi), nyusupov@wiut.uz (N. Yusupov).

Peer review under responsibility of Africagrowth Institute.

ELSEVIER Production and hosting by Elsevier

1879-9337 © 2012 Production and hosting by Elsevier B.V. on behalf of Africagrowth Institute. Open access under CC BY-NC-ND license.
http://dx.doi.org/10.1016/j.rdf.2012.05.003

on the assumption that half of the target population would be borrowing at any given time are too high. Reinke (2004) points out that the current method used to estimate microfinance demand has significant shortcomings because many people who want to start micro-enterprises do not want to be in debt. They would rather wait until they have accumulated enough of their own assets before they start a business.

Given this controversy, this paper proposes a methodology for the assessment of two factors: potential demand for entrepreneurial microcredit and optimal supply of entrepreneurial microcredit services, both measured by the number of entrepreneurial borrowers. To the best of our knowledge, the development financial economic literature that deals with microcredit demand is very limited. Previous papers that deal directly or indirectly with microcredit demand very rare. The closest relevant few papers related to microcredit demand are those that deal with the interest rate elasticity for microcredit (Dehejia et al., 2012; Karlan and Zinman, 2008; Salazar et al., 2011). Our paper intends to contribute to this segment of microfinance literature because such an estimate may have a substantial impact on the development of more efficient policy and on the success or failure of microcredit in the coming years.

First, people become entrepreneurs because on their talents, which are an endowment, and, to some extent, because of their socio-political and economic environment. In this respect, following the argument of Bianchi (2007) that job satisfaction in the developed world is higher than in the developing world; it is reasonable to assume that within the developed world the number of people that start micro-enterprises for poverty relief should be lower than that seen in the underdeveloped world, because of the favorable socio-economic situation and the stronger social safety net of the poor in the developed world. Another reason may be that individuals that had started their micro or small businesses after failing to find a job would likely prefer to take advantage of new employment opportunities instead of continuing to run businesses, especially if running a business is not something they enjoy doing. Therefore, the assessment of the potential demand for entrepreneurial microcredit in a given poor neighborhood must be carefully crafted to avoid overestimations that may lead to overly optimistic expectations of the future of entrepreneurial microcredit.

The second important point is as follows: if economic growth is to be projected based on entrepreneurial microcredit, the assessment of the potential number of entrepreneurial microcredit borrowers must incorporate the financial sustainability of microcredit programs in the long run. This implies that microcredit programs must be able to differentiate the entrepreneurial people that are likely to be able to run viable micro-businesses that generate sufficient income to cover at least routine consumption levels of the entrepreneurs' households from those that cannot. Therefore, we hypothesize that the demand for entrepreneurial microcredit can be assessed without a significant bias if it is based on the actual distribution of entrepreneurs in the target community.

We show that the total demand for entrepreneurial microcredit is a positive linear function of the motivator agent's performance. To replicate a concrete situation, we use French data to provide an illustration of the assessment of potential demand for microcredit. More specifically, we estimate that the potential annual stock of entrepreneurial microcredit clients should be in the range of 131,000–251,000 if the actual number of the poor adults does not change significantly over time. Additionally, we show that the total demand satisfied by a specific microfinance institution (MFI) either outreach or for-profit MFI is derived from its utility function.

The rest of the paper is structured as follows: Section 2 describes the model. Section 3 provides a computational example of potential demand. Section 4 discusses the MFI's problem of optimal supply depending on its objective i.e. either the client outreach goal or the profit maximizing goal. Section 5 concludes the paper.

2. The model

2.1. Description of the population

Let us call the population the potential stock of people that could be eligible for microcredit. Following the definition of the European Union, it consists of mature individuals that cannot back up a loan up to €25,000.[1] The whole population consists of people that are below or slightly above the poverty line.[2] Following this, we assume that the vast majority of these people live in poor neighborhoods, as we observed in France, Germany and Spain.

The population could be categorized by the following mutually non-exclusive characteristics: age, origin, gender and level of qualification. However, for the purposes of this paper, we divide the population into the following two groups motivated and non-motivated people. Motivated individuals have taken actions to increase their wealth, and their actions can be observed. Some of them start their own businesses, while the rest are either employed or are looking for jobs. The non-motivated are those that do not take any action to improve their living conditions.

2.2. Model setup

To fulfill of the task at hand, we provide in forthcoming sections a model that allows us come up with a reasonable entrepreneurial microcredit's demand express in term of the number of potential micro-borrowers whose aims are to launch micro-businesses. To achieve this goal, let P be the general population as described in Section 2.1. Additionally, let us call M the number of people motivated to take actions and N the non-motivated people, such that:

$$P = M + N \tag{1}$$

For the purposes of the model, we then divide each group into two subgroups (see Fig. 1).

[1] Elsewhere in the world, microcredit is much less prevalent than the EU definition.

[2] For example, in France the poverty line is defined as 60%of the median income. In 2005, it was €817 per month.

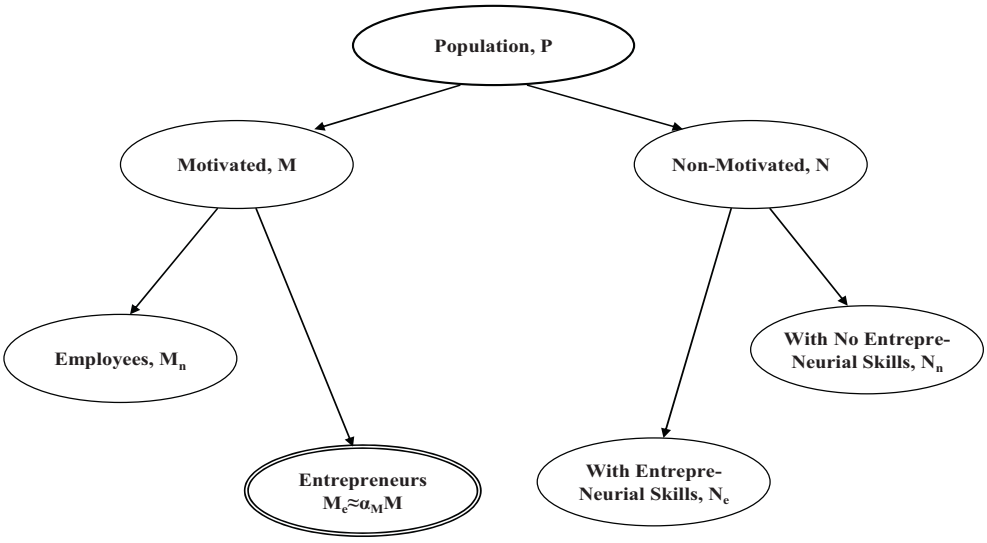

Fig. 1. The model.

We divide the motivated people into people who have entrepreneurial skills, M_e, and those who do not, M_n, such that:

$$M = M_n + M_e \tag{2}$$

Similarly, we divide the non-motivated people into people endowed with entrepreneurial skills, N_e, and those with no entrepreneurial skills, N_n,

$$N = N_n + N_e \tag{3}$$

This problem, if not addressed, will have a negative effect on the potential demand because people with enough skills to become entrepreneurs in this group may not be motivated to do so if they face low opportunity costs. In our model we resolve this issue through a motivating agent hired by the microcredit institution. The agent deals with individuals that have the entrepreneurial skills but no intentions to apply for microcredit. However, given, that the non-motivated people endowed with entrepreneurial skills have a predisposition to run businesses; we assume that they can be induced to start a micro-enterprise if they are given additional motivation by the motivator. The motivator job is to persuade those with entrepreneurial skills in the non-motivated group to seek microcredit to start micro-enterprises by motivating them and conveying to them that microcredit is a superior solution to meet their financial needs and to improve their well being. Simply put, the motivator has to provide the necessary and sufficient incentives to those with entrepreneurial skills in the non-motivated group to launch micro-enterprises. In the next section, we provide the details of the implementation of the motivator agent's actions.

2.3. The motivation process

To induce the entrepreneurial non-motivated group members to start micro-enterprises, the motivator needs a practical way to convince them that launching micro-enterprises will allow them to increase their well-being. Simply put, entrepreneurial microcredit activities must satisfy individual rationality constraints. This task is assigned to the motivator. Before providing the sequence of actions and events in the game, we summarize in Fig. 2 the motivator-non-motivated clients' interaction.

In the motivator-non-motivated game, the motivator is someone with multiple characteristics that enable him to induce the entrepreneurial non-motivated potential microcredit clients to launch micro-businesses. Therefore, on top of strong motivational skills, he needs very strong persuasive powers, and a good understanding of: the socio-economic and cultural environment and of the psychological conditions of the target community. Having established the motivator's characteristics, we now turn to the sequence of actions and steps in the game.

2.3.1. Steps and ordering of moves in the game

In the game, there are five steps with the following sequence of moves. In step one, the MFI hires a motivator to motivate the non-motivated potential clients to seek entrepreneurial microcredit. Because entrepreneurial skills are hidden information, the motivator has to induce them to come forward. To achieve this goal, in step two the motivator sends out a structured message to the non-motivated people through the following mutually non-exclusive channels: word of mouth, social workers, community groups, personal visits to individual households, town hall meetings, door-to-door canvassing, phone calls, radio and TV advertisements, etc. In step three, upon receiving the message and after giving serious thought to it, the non-motivated group members with entrepreneurial spirit, who would like to satisfy their individual-rationality constraints through microcredit, contact the motivator for further information. This subgroup (denoted by N_e) of the non-motivated people is formed on the basis of self-screening, and its size depends on the quality of the message conveyed by the motivator.

In step four, the motivator, through one-on-one and small group meetings, informs the N_e group members of the contribution of entrepreneurial microcredit to the enhancement of their wealth and social condition. The objective of these meetings is to clearly demonstrate to the N_e group's members that microcredit

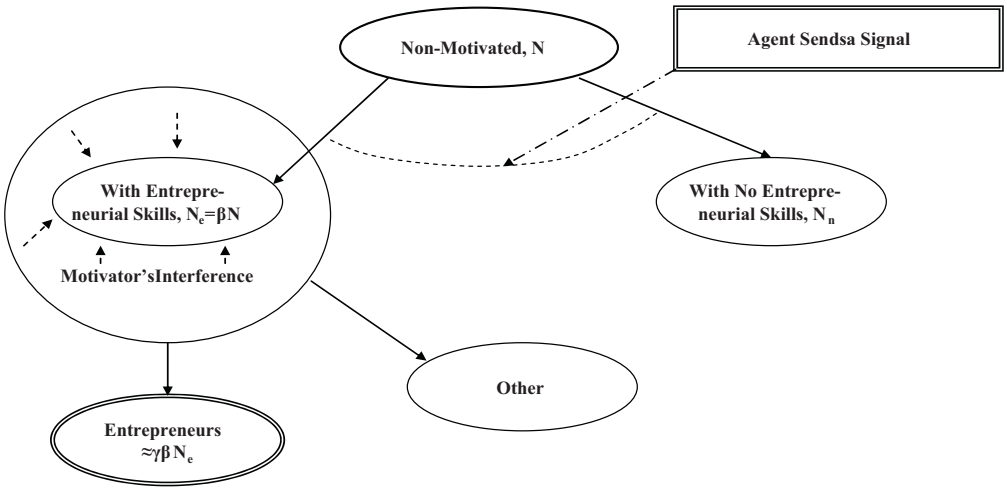

Fig. 2. The motivation game.

is an optimal way for them to increase their wealth and consequently to improve their social and material standing. All these goals could be simply shown through a satisfactory individual rationality constraint. At the end of this step, while some may decide to pursue the entrepreneurial microcredit avenue, other individuals may simply decide to pursue other avenues. In step five, those who seek entrepreneurial microcredit to reduce their poverty are put into contact with the credit agent to procure microcredit after fulfilling the microcredit requirements.

2.4. Total demand

Total demand has two components: demand that stems from the motivated individuals and demand that stems from the non-motivated group. The latter is a function of the motivator's effort; it is thus endogenous demand. Let us denote demand from motivated individuals as D_{EX} and demand from non-motivated individuals as D_{EN}.

Now, before estimating each demand, we need to determine the distribution of the entrepreneurial skills in each group. One way to approach this problem is as follows: first, we estimate the proportion of entrepreneurial people in the active population in a given economy and second, we adjust this proportion based on the socio-economic environment of the group. The underlying premise for this approach is that entrepreneurial skills are not merely endowed, but are also partly determined by the socio-economic environment: ceteris paribus, it would be relatively easier for a rich/motivated person to launch a business than for a poor/non-motivated person.

To estimate the proportion of entrepreneurial people in the economically active population, we conjecture that each enterprise is launched by one person. This is particularly true for micro-enterprises and small businesses and to some extent for medium and large enterprises,[3] when we refer to the founder. It follows that the proportion of entrepreneurial people in the general economy is the number of enterprises divided by the size of the active population in the economy. In practice, the available statistics on the size of the economically active population are labor force and working age population. Usually, the size of the labor force is smaller than the size of the working age population. Let α denote the proportion of entrepreneurial people in the economically active population such that:

$$\alpha = \frac{\text{Entreprenerial People}}{\text{Economically Active People}} < 10\% \tag{4}$$

These boundary conditions for α i.e. $0<\alpha<10\%$ are supported by Karnani (2007), who contends that in developed countries about 10% of people choose to be entrepreneurs, and Parker (2004), who claims the same for most OECD economies. Additionally, our own calculation of α for France (see Section 3.1) is within this boundary limit.

2.4.1. Exogenous demand

Now that we have computed α, we can adjust its value to reflect the socio-economic environment and the other factors that may affect motivated people. These factors may be positive or negative events that they or their families have experienced. Other relevant factors are events in their neighborhoods, personal desire, pride and determination to get out of the vicious circle of poverty. For all these known and unknown potential reasons, we assume that the share of entrepreneurial individuals in the group of motivated people, which we denote by α_M, belongs to the interval $[\alpha, 10\%]$ such that:

$$D_{EX} = M_e = \alpha_m M \tag{5}$$

2.4.2. Endogenous demand

To determine the endogenous demand, let us first denote the proportion of people in the non-motivated group who approach the motivator as β, as described in Step 3 (see Section 2.3.1) following the structured message conveyed by the motivator. Note that β is the share of N who perceive themselves as endowed with entrepreneurial skills that decide to contact the motivating

[3] Also note that although one enterprise, if large, includes numerous managerial people with entrepreneurial skills, most of those managers are employed and do not face risk of losing their investments in the enterprise.

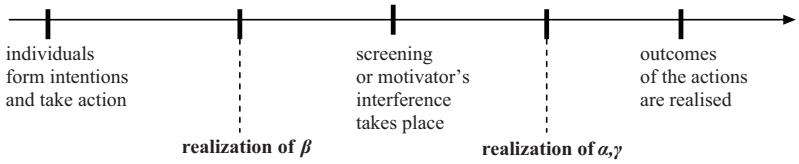

Fig. 3. Realization of α, β and γ in the timing of events.

agent. From this proportion, we then assume that following their small group and one-on-one meetings with the motivator, in which they are explained the role of microcredit in the enhancement of their wealth and social conditions, those who are willing to meet the challenge will decide to embrace entrepreneurial microcredit. Let us call this proportion γ. Notice that, theoretically, γ can take values in the interval [0, 1] since γ depends on the quality of work performed by the agent, i.e. how good the motivator performs his job. Thus, it follows that the share of the entrepreneurial non-motivated people who seek microcredit with the help of the motivating agent, $\beta\gamma$, is a mirror of the performance of the motivator's job.

In this respect, it becomes critical to set a non-ambiguous target that the motivator must fulfill in order to be able to continue to be a determining player in the creation of the potential demand for entrepreneurial microcredit among the non-motivated group. In this respect, we assume that a reasonable target will be to have $\alpha \leq \beta\gamma \leq \beta$.

As for the upper boundary, β, following Chavee et al. (2007) we hypothesize that every other poor individual is endowed with entrepreneurial skills. Therefore, we consider the following limits for β[4] $\in [\alpha, 1/2]$.

Note that α and γ are obtained by observing people's actions and therefore are *ex post*, while β is observed based on the self-perception of entrepreneurial skills among the people that constitute the non-motivated group. Therefore, β is obtained prior to the meeting with the motivator, whose job also serves as a screening process, as illustrated by the time line in Fig. 3.

Having computed $\beta\gamma$, we provide the expression of the endogenous demand as follows:

$$D_{EN} = \beta\gamma N \tag{6}$$

Having obtained the exogenous and endogenous demand, the total expected demand (D) is:

$$D = D_{EX} + D_{EN} = \alpha_M M + \beta\gamma N \tag{7}$$

Fig. 4 provides a general graphical representation of the total potential demand for microcredit for different values of γ in one specific year. For example: for $\gamma = 0.6$ in 2003, the total quantity of the potential demand for entrepreneurial microcredit is 195,700.

More generally, in Table 3 (see next section), for each specific value of γ, we provide a numerical illustration of total quantity of the potential demand for entrepreneurial microcredit from 2000 to 2005.

[4] Note that the upper boundary of β signifies an unlikely extreme case scenario.

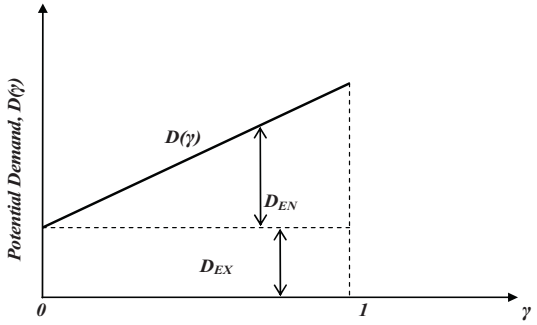

Fig. 4. Total demand as a function of endogenous α_N.

3. Illustration of the assessment of potential demand

3.1. Data collection and analysis

To illustrate the potential demand for entrepreneurial microcredit, we collect data from the French statistics bureau INSEE and the US Department of Labor (USDL) (Bureau of Labor Statistics, 2007). From INSEE, we collect two sets of data. First, the stock of enterprises from 2000 to 2005 and second, data on the distribution of poor adults in order to be able to compute the total number of poor adults to be used in the estimation of entrepreneurial microcredit from 2000 to 2005. From the USDL[5] we gathered the data on the working-age population over the period from 2000 to 2005. The Data from INSEE and USDL are in Table 1 below.

From the data in Table 1, we compute the number of people with entrepreneurial skills as defined in Eq. (4). In addition, we compute the total number of the motivated[6] poor by adding the employed poor to those who are seeking employment. The number of non-motivated poor was obtained by subtracting the number of poor students ages 18+ (eighteen plus) from the inactive poor ages eighteen plus. We exclude students because they are not a class of microcredit clients until they complete their studies.

Having computed the numbers of motivated and non-motivated people, we then compute the total poor adult

[5] The data on people of working age in France are extrapolated from those of the US Department of Labor because we could not procure this data directly from the INSEE database. The data we collect from US Department of Labor have been provided by INSEE to USDL.

[6] By motivated poor we mean individuals that are actively doing something to alleviate their poverty. This population includes people endowed with entrepreneurial skills, who are of particular interest to this study. Please note also that our objective is to discern within the motivated poor individuals that have entrepreneurial skills.

Table 1
The data in thousands.

	2000	2001	2002	2003	2004	2005
No. of enterprises	2374	2418	2469	2498	2569	2618
Working-age population	46,129	46,522	46,909	47,281	47,621	47,959
Employed poor	1750	1716	1651	1554	1594	1694
Unemployed poor	743	706	789	871	851	922
Inactive poor ages 18+	2650	2568	2491	2445	2421	2979
Poor students ages 18+	344	299	294	315	322	333
Total poor population	7328	7167	6976	7016	6867	7136

Table 2
Computations.

	2000	2001	2002	2003	2004	2005
α = No. of enterprises/working-age population	5.15%	5.20%	5.26%	5.28%	5.39%	5.46%
Motivated people = employed poor + unemployed poor	2493	2421	2440	2425	2445	2626
Non-motivated people = inactive poor − poor students	2306	2269	2197	2130	2100	2646
Total adult poor = motivated people + non-motivated people	4799	4690	4637	4555	4545	5271

population that is pertinent for the assessment. The results of all these computations are shown in Table 2 below. From the data in Table 2, we derive Fig. 5 to analyze the changes in the motivated and non-motivated people over six years. This provides an initial insight into the progression of the potential demand for entrepreneurial microcredit over time.

Over the given period, the number of inactive poor population has decreased at a relatively stable rate – from 2,306,000 to 2,100,000, from 2000 to 2004 – before increasing to 2,646,000 in 2005. The decrease from 2000 to 2004 is probably due to individuals' either having found jobs or becoming officially unemployed through the public services. Ceteris paribus, we expect the decrease in the number of inactive poor to be translated into an increase in the active poor. Nonetheless, the graphical representation (see Fig. 5) of the active poor does not reveal a constant increase over the period, but rather points to relative stability. This suggests that from 2000 to 2005, the active poor are rising above the poverty line as a result of government poverty reduction policies and/or generally improving economic conditions. This observation is consistent with the decreasing levels of the total poor population from 2000 to 2004 as shown in Fig. 5, which, ceteris paribus, implies a reduction in the potential demand for entrepreneurial microcredit services over time.

To provide a concrete estimate of the total potential demand for entrepreneurial microcredit as expressed in Eq. (7) for different values of γ i.e. the performance of the motivated agent, we assume that the percentage of inactive poor who perceive themselves as having entrepreneurial skills is not different from the proportion of entrepreneurial people in the general economy, i.e. $\beta = \alpha$.

In Table 3 (see below), $\gamma = 0$ corresponds to the exogenous demand. This scenario is equivalent to the situation where the motivator does not induce any potential microcredit demand from the non-motivated poor who have entrepreneurial skills. Over the six years, the exogenous potential demand for microcredit remains relatively stable, at around 128,000, aside from 2005, where it is about 143,000. In contrast, $\gamma = 1$ corresponds to the upper bound value of the total potential demand for entrepreneurial microcredit, assuming that the motivator has performed a perfect job. In this unlikely scenario, the average total potential demand from 2000 to 2005 would be 251,400, with the

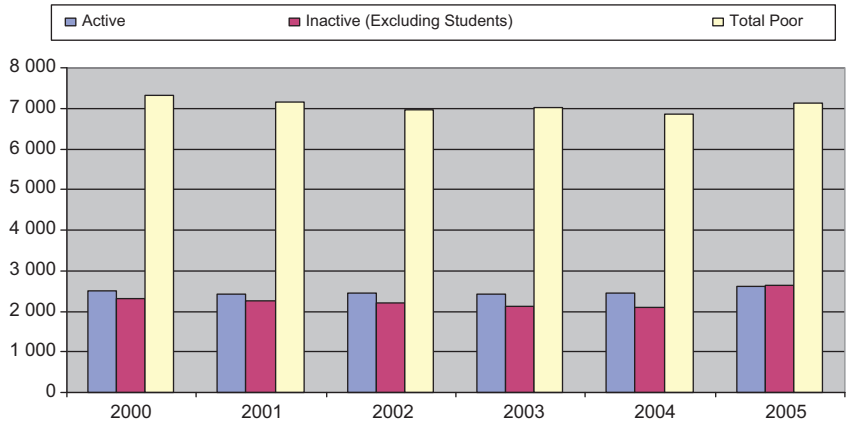

Fig. 5. Dynamics of active and inactive poor population.

Table 3
Total demand for various levels of γ for $\beta = \alpha$ in thousands.

γ	2000	2001	2002	2003	2004	2005	Average
0	128.3	125.8	128.4	128.1	131.9	143.3	131.0
0.1	140.1	137.6	140.0	139.4	143.2	157.8	143.0
0.2	152.0	149.4	151.5	150.6	154.5	172.2	155.1
0.3	163.9	161.2	163.1	161.9	165.9	186.7	167.1
0.4	175.8	173.0	174.7	173.2	177.2	201.1	179.2
0.5	187.6	184.8	186.2	184.4	188.5	215.6	191.2
0.6	199.5	196.6	197.8	195.7	199.8	230.1	203.2
0.7	211.4	208.4	209.3	206.9	211.2	244.5	215.3
0.8	223.2	220.2	220.9	218.2	222.5	259.0	227.3
0.9	235.1	232.0	232.5	229.4	233.8	273.4	239.4
1	247.0	243.8	244.0	240.7	245.1	287.9	251.4

minimum of 240,700 in 2003 and the maximum of 287,900 in 2005.

Beyond these two extreme cases, it follows that the key element to substantially increase the total potential demand for entrepreneurial microcredit is the performance of the motivator agent, as we pointed out in the motivation game in Section 2.3. It is worth noting that for each value of γ, the total number of the potential demand is relatively constant across the years. For example, for $\gamma = 0.4$ the total average potential demand for each year from 2000 to 2005 is about 179,200, while for $\gamma = 0.7$ for each of the six years the total potential demand is about 215,300. Furthermore, for each specific year, for any value of $\gamma = 0.1$ to $\gamma = 0.9$ the total demand is between 137,600 and 273,400.

An important observation from Table 3 is that the total potential demand has remained relatively stable across the years and across different values of the motivator agent's performance. If the past is a good predictor of the future, following trends in the motivated, non-motivated and total poor population, as illustrated in Fig. 6, we should reasonably expect the potential stock of the entrepreneurial microcredit clients to be within the 131,000–251,000 range.

Because the total potential demand is a linear positive function of γ (see Eq. (7) or Table 3), an important question that remains to be answered is: what is the total potential demand that the MFI wants to satisfy? The answer to this question, which depends on the type of the MFI, is the subject of the next section.

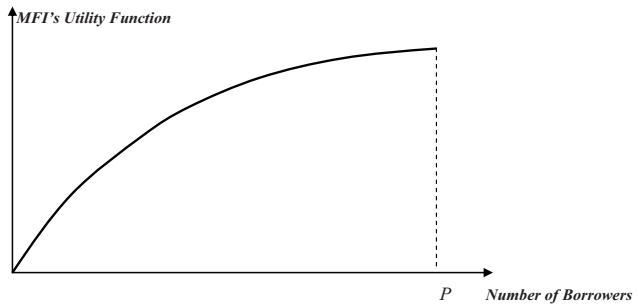

Fig. 6. Monotonically increasing utility function.

4. Optimizing the supply

In our model, the extent to which potential demand for entrepreneurial microcredit is satisfied depends on the preferences of the MFI that offers the microcredit contracts. Thus, in this section we look at the supply optimization problem of the MFI to determine what part of the potential demand the MFI is going to satisfy depending on its objective. The MFI in our model is an expected utility maximizer that can be of two types: socially oriented and commercially driven. Given that a social MFI wants to supply its services to as many micro-entrepreneurs as possible, its objective is to maximize outreach, which is measured by the number of individuals gaining access to microcredit. In contrast, the commercial MFI's objective is to maximize its expected profit.

Now, following a standard assumption in economics that profit is a concave function of the inputs, we conjecture that the expected utility of the MFI is concave but the concavity of the MFI's expected profit will depend on the MFI's objective. Following this objective, we distinguish between monotonically increasing and non-monotonic concave forms that are applicable to the two types of MFIs: those which target outreach and those which prioritize financial performance. Both cases can be generalized through a quadratic utility function of S, where S is the number of contracts offered by the MFI, defined over the interval $[0, P]$, where P is the size of the population as defined in Section 2.1.

For an outreach maximizing MFI, the solution of the utility maximization problem implies using all of its budget to extend as many loans as possible, while for a profit maximizing MFI the solution of the utility maximization problem with respect to the number of clients, assuming no adverse selection, will be S^*, such that:

$$S^* = arg\max_{S} U(S) \tag{8}$$

where $U(S)$ is the utility function. If the value S^* is smaller than M_e then the MFI will not hire the agent because the demand from the motivated people already exceeds the optimal demand. Otherwise the MFI will seek additional clients by employing the motivation expert in the field. A detailed discussion of these two cases follows.

4.1. Outreach maximizing MFIs

If the MFI prioritizes the social mission, i.e. aims at maximizing outreach, it is likely to have its objective function monotonically increasing in U simply because more clients is better. This function has a positive slope everywhere on the two-dimensional (utility function, number of clients) space.

The easiest utility function to deal with is a straight line with a positive slope, in which case marginal utility stays constant. However, it is more realistic to assume that the marginal utility decreases as the number of borrowers increases, as illustrated in Fig. 6. For instance, getting the first client to sign a contract is more desirable than getting the thousandth client to do so because the target community is expected to get less poor as

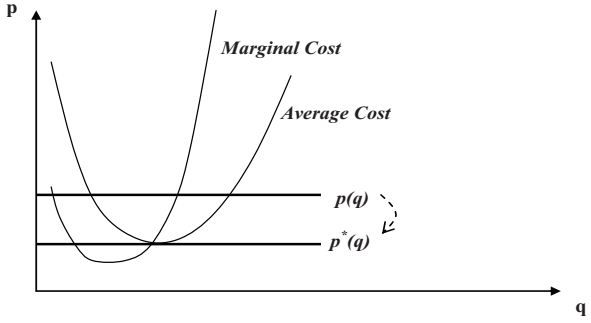

Fig. 7. Increase in competition drives down the profit margins.

more borrowers contract a loan. One example of such a utility function could be the following quadratic function:

$$U(S) = \nu S - S^2 \tag{9}$$

Marginal utility is computed as:

$$\frac{\partial U(S)}{\partial S} = \nu - 2S \tag{10}$$

Theoretically, S changes from 0 to P but is bounded above by $1/2P$ because we suppose that opening a business is more difficult than finding a job, thus the number of entrepreneurs cannot be the majority of population. Therefore the marginal utility (Eq. (10)) decreases as S increases but remains always positive for $0 < \nu < 2P$

4.2. Profit maximizing MFIs

Because micro-entrepreneurs engage in low-tech and relatively homogenous activities, a higher number of micro-entrepreneurs entering the market increases competition and reduces profit margins. Fig. 8 illustrates a typical case of a micro-entrepreneur who sells q units of his product at the price p. As the number of entrepreneurs increases, the demand curve, $p(q)$ shifts down on the (price, quantity) plane to $p^*(q)$ as a direct consequence of the increase in competition until it reaches the point of tangency to the average cost curve.

Consequently, each MFI's client profit decreases, which effectively increases the expectation of the number of bad loans. This, in turn, drives down the expected profit from offering microcredit services for the for-profit MFI. Therefore, there exists an optimal value S^*, as defined in Eq. (8), that maximizes the MFI's expected profit. If $S^* \leq D_{EX}$ then the MFI supplies

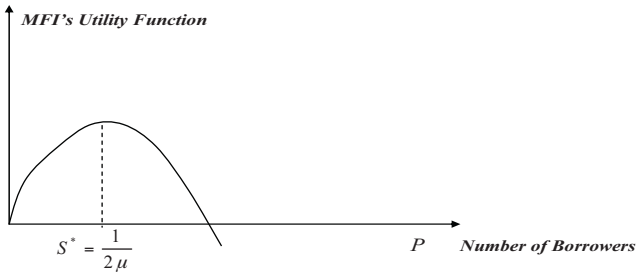

Fig. 8. Strictly concave utility function.

Table 4
The regularity conditions for γ and μ.

	ν	μ
Outreach maximizer	$\nu < P$	$\mu = 1$
Expected profit maximizer	$\nu = 1$	$\mu < \frac{1}{2P}$

S^*, otherwise it supplies D_{EX} and hires the motivating agent to generate more demand[7] (Fig. 7)

Thus, the optimal supply can be written as $\min\{S^*, D_{EX}\}$ plus additional demand created by the motivating agent (which is zero if unnecessary). However, if $S^* > D_{EX}$, then the MFI can increase its utility by increasing the number of its clients to the optimal level S^* and will ask the motivator to bring in $(S^* - D_{EX})$ additional clients. Thus, if the MFI seeks to maximize expected profit, its utility function is likely to be concave in the number of borrowers, such as:

$$U(S) = \mu S - (\mu S)^2 \tag{11}$$

For this utility function the maximum is reached at $S^* = 1/(2\mu)$. In order to have S^* positive but less than P, i.e. to guarantee an internal solution, μ must belong to the interval $[0, 1/(2P)]$.

From Sections 4.1 and 4.2, it follows that the utility function of any kind of MFI (outreach and profit maximizer) can be represented in the following form:

$$U(S) = \mu\nu S - (\mu S)^2 \tag{12}$$

where the parameters γ and μ should satisfy the regularity conditions given in Table 4.

The number of additional clients the MFI will ask the motivator agent to bring in can be written as $\max\{0, S^* - D_{EX}\}$. Hence, the optimal supply formula becomes

$$S = \min\{S^*, D_{EX}\} + \max\{0, S^* - D_{EX}\} \tag{13}$$

5. Conclusion

In this paper we propose a methodology for the assessment of the potential demand for microcredit as well as a method for the assessment of the optimal supply. With French data on poor adults we find that the stock of poor individuals who are likely to have potential demand for microcredit must be within the range of 131,000–251,000. To derive this result, we assume that the total potential demand for entrepreneurial microcredit is divided into exogenous demand and the demand generated by the motivator among the non-motivated poor. The results of our methodology refute the optimistic projections of ADIE, the main French microcredit institution, which is in line with S&P's overly optimistic projection we quoted in the introduction to the paper. We also show that the total potential demand for entrepreneurial microcredit is a positive linear function of the motivator's performance. Furthermore, we show that optimal

[7] We assume a zero cost of hiring the agent.

supply of microcredit contracts depends on whether the MFI pursues outreach or profit maximization.

References

Ayayi, G.Ayi, 2012. Credit risk assessment in the microfinance industry: an application to a selected group of Vietnames microfinance institutions and an extension to East Asia and Pacific MFI. The Economics of Transition 20 (1), 37–72.

Anand, M., Rosenberg, R., 2008. Are we overestimating demand for microloans. Brief Washington, DC, CGAP, April, p. 4.

Bianchi, M., 2007. Financial Development, Entrepreneurship and Job Satisfaction. Paris School of Economics, Mimeo.

Bureau of Labor Statistics of the US Dept. of Labor, 2007. Comparative Civilian Labor Force Statistics, Ten Countries, 1960–2006. Biannual Compendium. Retrieved October 12, 2007. URL: http://www.bls.gov/fls/lfcompendium.pdf.

Chavee, et al., 2007. Report of the Microfinance Rating Methodology Working Group. Standard & Poor's. Retrieved June 19, 2007. URL: http://www2.standardandpoors.com/portal/site/sp/en/us/page.article/3,1,1,0,1148445218456.html.

EMN, 2008. Étude Sur l'Offre Et La Demande Du Microcrédit En Europe. EMN Newsletter Feb.–May 2008, URL: http://www.european-microfinance.org/news_newsletter_spring_2008.php#paragraphe3.

Dehejia, R., Montgomery, H., Morduch, J., 2012. Do interest rates matter? Credit demand in the Dhaka slums. Journal of Development Economics 97 (2), 437–449.

Hossain, M., 1988. Credit for Alleviation of Rural Poverty: The Grameen Bank in Bangladesh. IFPRI Research Report 65. International Food Policy Research Institute, Washington, DC.

Karlan, D.S., Zinman, J., 2008. Credit elasticities in less developed economies: implications for micronance. American Economic Review 98 (3), 1040–1068.

Karnani, A.L., 2007. Microfinance: Boon or Bane? Financial Times, 27 June 2007. URL: http://us.ft.com/ftgateway/superpage.ft?news_id=fto072720071032276655.

Khandker, S., 2005. Microfinance and poverty: evidence using panel data from Bangladesh. World Bank Economic Review 19, 263–286.

Morduch, J., 1999. The microfinance promise. Journal of Economic Literature 37 (4), 1569–1614.

Parker, S., 2004. Economics of Self-employment and Entrepreneurship. Cambridge University Press.

Pitt, M.M., 1999. Reply to Jonathan Morduch's 'Does Microfinance Really Help the Poor? New Evidence from Flagship Programs in Bangladesh'. Unpublished manuscript.

Reinke, J., 2004. Demand Studies and How Not To Do Them: A Story About Pancakes (With Lessons From Microfinance). URL: http://www.ruralfinance.org/cds_upload/1099737987726_Pancake_tale.pdf, p. 2.

Salazar G., Bogan, V., Turvey, C., 2011. "The Elasticity of Demand for Microcredit". Available at SSRN: http://ssrn.com/abstract=1646048 (accessed April 2012).

Standard & Poor's, 2007. Microfinance: Taking Root in the Global Capital Markets. Special Report by the Microfinance Rating Working Group of Standard & Poor's.

Tilman, E., 2006. 'Optimizing Capital Supply in Support of Microfinance Industry Growth'. A Working Paper for the Microfinance Investor Roundtable. AED Conference Center, Washington, DC, Oct. 24–25, 2006. URL: http://www.seepnetwork.org/files/5056_file_Roundtable_Agenda.pdf.