FINANCIAL DEMAND AND ACCESS TO CREDIT IN LOW-INCOME AREAS OF RIO DE JANEIRO, BRAZIL

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Abstract: This paper attempts to evaluate the determinants of financial and micro-credit participation, furthermore it tries to identify the nature and degree of credit constraint in low-income urban areas of Rio de Janeiro, Brazil. This analysis is based on a cross sectional survey on 700 micro-enterprises clients and non clients of microfinance institutions (MFI) in five areas of Rio de Janeiro.
This study reports evidence that financial participation is partially linked to some asset and wealth characteristics. However, taking credit demand from micro-enterprises into consideration demonstrates the co-existence of several types of rationing — quantity, price and eligibility — in the credit market. On the supply side, this study shows that although MFI answer the needs of part of their clients thanks to their dynamic incentives policies, they still have a poor outreach and tend to keep only "safer" clients. Both banks and MFI are rationing the market and especially young micro-enterprises that have nevertheless important credit needs.

Keywords: micro-enterprises; credit rationing; access to credit; financial demand.

JEL code: O12.

Abstract: Este artigo tem por objetivo avaliar os fatores determinantes da demanda por produtos financeiros e por microcréditos. Procura identificar a natureza e o grau de constrangimento da oferta de crédito nas regiões de baixa renda da cidade do Rio de Janeiro, Brasil. Essa análise está baseada numa pesquisa transetorial com 700 microempreendedores, clientes e não clientes de instituições microfinanceiras (IMFs) cariocas, em cinco localidades do Rio de Janeiro.
O estudo traz evidências de que a demanda por produtos financeiros está ligada à propriedade de ativos e a alguns indicadores riqueza. Por outro lado, levando-se em consideração a demanda e necessidades dos microempreendimentos, o estudo demonstra a coexistência de vários tipos de fatores de racionamento no mercado de crédito — quantidade, preço e elegibilidade. Do lado da oferta, o estudo mostra que, apesar de as IMF atenderem às necessidades de parte dos clientes graças à dinâmica das políticas de incentivo utilizadas, ainda têm uma abrangência limitada e tendem a manter apenas os clientes mais seguros. Bancos e IMF estão criando, assim, um

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racionamento no mercado de crédito, especialmente para os microempreendimentos mais jovens que possuem necessidades creditícias importantes.

Palavras-chave: microempreendimentos; racionamento de crédito; acesso ao crédito; demanda financeira.

Introduction

Microfinance activities have started to develop from the acknowledgement that classical financial institutions could not sustain private initiatives of the poor and participate to poverty alleviation.

Microfinance challenged several beliefs, that the poor could not save, reimburse credit and repay with interest rates, which kept low-income populations from credit integration. After a dramatic growth over the last thirty years, microfinance institutions (MFI) are today implemented in Asia, Africa and Latin America. They adopted a large range of innovations according to local contexts and the diversity of objectives. Globally more than 60 millions people benefit from microfinance.

Because microfinance became very popular among development practitioners and donors, several questions have been raised about the sustainability of the model, the adaptation of financial services provided to the poor and the impact on clients.

Microcredit in Brazil seems to have a great potential whilst the outreach of current programs still being limited. Whereas the informal sector is large and employs almost half of the labor force in Brazil, it has been rather neglected by classical financial institutions, except for the diverse forms of consumption credit which is expensive and not adapted to micro-entrepreneurs needs. In this context, microfinance could be an important development tool in offering productive credit with adapted access systems.

This paper results from the implementation of a research on informal sector activities in five low-income areas (including four favelas) of Rio de Janeiro, Brazil. This research has been carried out in cooperation with two microfinance institutions (Riocred and Vivacred) and a Brazilian research institute[1]. A quantitative survey has been conducted on 700 micro-entrepreneurs clients and non clients of credit programs.

This paper is organized as follows. The first section briefly reviews the literature on credit rationing, credit constraint and measurement methodologies. Section 2 establishes the theoretic framework allowing for different types of rationing imposed on micro-entrepreneurs causing potentially credit constraint. Section 3 briefly describes the sample and data collected. Section 4 describes micro-entrepreneurs' financial

behavior, participation and demand. Finally, Section 5 evaluates the degree and determinants of rationing and constraint using a Multinomial Logit Model.

1. Review of theories and measurements of credit rationing, access to credit and credit constraint.

The first motive of microfinance is to improve access to credit of small informal activities excluded from formal institutions. Credit is seen as essential for investment, the adoption of new technologies, consumption smoothing and significantly affects the economy. However, various measurements deducted from different theoretic frameworks and methodologies find large evidence of credit constraint in developing countries — although this proportion varies greatly from one context to another — reinforcing the justification of intervention policies. Thus, identifying the nature of credit rationing and measuring the extent of credit constraint are important for the design of credit-oriented policies.

1.1 The source of the theory of credit rationing: Stiglitz and Weiss.

A series of models of credit market with imperfect information and the introduction of transaction costs, initiated by Stiglitz and Weiss, sought to investigate the cause of credit rationing especially in developing countries. The microfinance related literature has also largely shown the impact of group lending as an innovation able to overcome some of the agency problems causing credit rationing.

Stiglitz and Weiss (1981) demonstrate the existence of credit rationing at equilibrium in a competitive credit market due to two sources of well-known informational asymmetries.

1) Adverse selection: lenders are not able to identify the return of each individual's project. If banks increase interest rates beyond a certain level, only riskier borrowers will stay in the market while the most desirable borrowers are discouraged. In this context, banks cannot discriminate against risky borrowers and credit rationing occurs whenever the demand pushes the interest rate above a specific ceiling rate.
2) Moral hazard: lenders can not observe borrowers' behavior during the period of the contract and are not able to monitor credit use. In this case, an increase of the interest rate lowers the incentives of repayment. Micro-economic foundations of this behavior lie on the "debt-overhang" problem (Ghosh, Mokherjee and Ray). A large loan repayment is a disincentive for

> investing in profitable projects and may divert credit from productive use. For Stiglitz and Weiss, credit rationing will result in limiting "the number of loans the bank will make, rather than limiting the size of each loan, or making the interest rate charged an increasing function of the magnitude of the loan, as in most previous discussions of credit rationing".

1.2 Further development of credit rationing theory

1.2.1 Different types of quantity rationing

For Ghosh, Mookherjee and Ray, adverse selection which is one cause of credit rationing, is not applicable to every context in developing countries since informal lenders (but not formal lenders) have access to information on borrower characteristics, especially in rural areas. To them, moral hazard is the main agency problem. Moral hazard is explained through the contract framework between a lender and a borrower: the debt "overhang" problem: an indebted borrower will always work less hard on his project than one who is self-financed. A greater debt burden reduces the borrower's incentive to spend effort. Collateral increases effort and reliance for credit, enabling to get cheaper credit. Borrowers with assets have more chance to get a credit and reinforce the existence of a poverty trap.

Furthermore, credit rationing literature identifies the occurrence of two types of quantity rationing: "micro rationing" when borrowers receive less than demanded and "macro rationing" which "randomly denies access to any credit to a fraction of borrowers" (in the sense of Stiglitz and Weiss) and borrowers receive nothing at all.

For Diagne and Zeller, credit rationing occurs when there is a difference between what the lender is "willing" and the lender is "able" to lend to a particular borrower, this wedge results directly from the choice of the lender.

Kochar integrates demand from households in the theory of credit rationing and allows the combination of formal and informal structures because of empirical evidence suggesting that the reservation cost of credit in the informal sector is lower than in the formal one. Not taking into account the effective demand from households and not including informal sector tends to overestimate the extent of credit rationing.

1.2.2 Existence of non-quantity rationing

In terms of both theory and empirical measurement, it is complex to interpret households or firms which have a low demand for credit or have no credit history. In the Stiglitz and Weiss Model, those households are considered as fully rationed while

in other models (Rosensweig and Biswanger) they can be considered as not rationed (since their demand is equal to zero).

Evaluating the determinants of this particular case enables to identify other types of rationing and specifically non-quantity rationing.

Only a few analyses have sought to evaluate the existence of other than quantity rationing mechanisms.

Kochar and Boucher argue that differentiating the quantity rationed borrowers from other type of rationing has important implications in term of intervention in the credit market. Kochar suggests that non borrowing from the formal sector is not necessarily a form of credit rationing since it might be cheaper to borrow from informal sources. However, this analysis does not evaluate the determinants of non demand from both formal and informal credit sources.

Price rationing is a common form of rationing and is not considered as rationing by most of credit literature since prices are supposed to clear the market at equilibrium. However, households refuse to borrow when interest rates are higher than the marginal return of capital of their project.

Similarly, Carter and Boucher identify transaction cost rationing. Transaction costs seldom vary across different types of credits while loan sizes are often depending of project scope and borrowers' wealth. Poorer households that receive lower loan sizes face proportionally higher transaction costs, discouraging them to borrow. Thus transaction cost rationing is another form of price rationing.

For Boucher there is also another form of rationing — risk rationing — resulting form risk aversion behaviors. Households may refuse credit when they are risk-averse and are afraid to lose collateral.

It is also likely that in a context with several lenders there is a combination between different types of rationing (quantity, price and "risk" rationing).

1.3 Demand implications: Definition of access to credit and credit constraint.

Evaluating access to credit, rationing and constraint results from the comparison of household/firms' credit demand and lenders' supply schedule.

However, definitions of credit access and credit constraint are not clear-cut and are highly contextual. This explains why those terms are often used interchangeably while they have different meanings.

For Duflo and Banerjee, borrowers are rationed on the credit market by one or several lenders if they would like to borrow more from them at their market conditions. They are constrained if, at the market conditions, they would like to borrow more

than the total amount they received. Therefore, "It is clear that being constrained implies being credit rationed but not the other way around".

The interaction between formal and informal lenders is a very important feature in developing countries. Analyzing the interaction between one specific lender and households/firms credit demand only gives insight in the extent of rationing with this particular lender but not at the global credit market level.

For instance, Diagne and Zeller defined access only from a specific lender, "one has access to a certain type of credit when its credit limit for that type is strictly positive", then their definition of credit constraint — the inverse of credit access — is different, a household is constrained if one of its members is facing a binding credit limit. The difference with prior definitions is that credit constraint is derived from a specific lender and not from the credit market.

Authors distinguish rationing which occurs from the supply side and constraint which results from the confrontation of supply and household optimal demand. For Diagne and Zeller "credit rationing occurs because there is a wedge between what a lender is able and willing to lend, from the analysis of Stiglitz and Weiss, this wedge results from the exclusive choice of the lender…. On the other hand, whether or not a borrower ends up effectively credit constrained depends on his optimal loan demand".

A borrower may be rationed without being constrained from a specific lender point of view but for different reasons than those explained by Duflo and Banerjee.

Moreover, Diagne and Zeller differentiate between households being credit constrained and households whose credit constraint is binding depending on the nature of investments (in indivisible or divisible goods).

In fact, a household can be constrained even if the credit taken is equal to zero in case it did not receive the necessary amount to purchase an indivisible good and thus did not borrow at all. It shows again the problem of treatment of those who do not borrow at all.

Therefore, households or firms may be rationed by one or more lender and they are credit constrained if their optimal amount is greater that the one received. This can apply for one lender in the case of Diagne and Zeller or at the credit market level for Duflo and Banerjee depending on the definition.

In both cases, borrowers may be rationed without being constrained if their optimal amount is lower than their credit limit for a specific lender. Or because they are rationed from one lender but are able to get the optimal amount borrowing simultaneously from several lenders.

Some theoretic frameworks (Rozensweig & Biswanger, Iqbal) assume that access is measured by the proportion of household/firms in a given context which receive a loan and by looking at their credit transactions.

Other studies (Kochar, Swain & Boucher) however, sought to take into consideration in the analysis the different determinants of having no loan in the formal sector.

1.4 Empirical measurement of credit constraint (and credit rationing)

The definition of credit constraint is not unique across analyses; its measurement has also been subject to different methods within different theoretic frameworks.

Some "direct methods" measure constraint by analyzing demand from households or firms while other "indirect methods" seek to detect credit constraints from households' or firms' behaviors.

Some contexts allow using indirect methods but in general cases, direct methods are far simpler and more applicable to the analysis of small informal units in developing countries. It is important to note however, that measurements of credit constraint are highly contextual.

A first method refers only to credit history and transactions to evaluate credit constraint (Rozensweig, Biswanger and Iqbal) therefore households/firms who have not received any credit are considered as credit rationed. This method however overestimates rationing: no transaction may result from a low demand for credit (or no transaction in the formal sector

may result from a low demand from formal sector credit and a preference for the informal sector) and can be induced by some other types of rationing (price, risk…). Access and participation are not the same, one can have access although one is not participating. For Boucher "the researcher may not be able to infer the rationing mechanism at work by just observing the loan quantity transacted". Kochar suggests that demand for the formal sector is low and partially explained by the existence of a cheaper informal sector. This result however, does not explain the dynamics of the absence of demand (which is maybe determined by other factors coming from a type of rationing).

On the other hand "direct methods" seek to detect credit constraint by directly asking households a few reference questions (Feder and Lau). This method does however not allow to measure its extent.

Diagne and Zeller developed an alternative method, extended from the previous direct one, based on the concept of credit limit in order to detect and measure the extent credit constraint. They re-defined the concept of loan transaction contract. Essentially, the lender chooses the credit limit, the amount he or she wants to be repaid and the repayment modalities; the borrower chooses the amount to be borrowed within this range. The concept of credit constraint is then defined by the acceptation or not, of the

contract between the lender and the borrower. If the borrower's optimal amount is greater than the maximum amount the lender is willing (and not able) to lend, the credit constraint is binding. The credit limit largely depends upon each lender.

The problem with this method is that interest rates are not taken into account and households' information on credit limit from informal lender is likely to be imprecise. The direct method framework is also enriched by differentiating demand from formal and informal credit market (Kochar, Swain, Diagne and Zeller).

Finally, an alternative approach is to detect credit constraint from households' or firms' behaviors. Several methods based on different theoretical grounds have sought to indirectly evaluate constraint in different contexts.

The method of the life cycle event detects credit constraint without directly taking into account credits and borrowing patterns. This measure is based on the permanent income hypothesis. Whether or not the consumption will follow income during transitory income shocks allows to detect the existence (or not) of liquidity and borrowing constraint.

Another way to detect and measure the intensity of credit constraint is to evaluate the difference between the shadow price of capital (Carter and Sial estimate it on farmers) with formal interest rates.

In Thailand, Paulson and Townsend evaluate the determinants affecting the decision to start a business and the way the business is run. They demonstrate, controlling for entrepreneurial skills, that wealthier households are more likely to start up a business. They also find evidence that those which started a business have accumulated wealth more quickly before starting than those which have not started. These two behaviors are evidence of financial constraints.

Duflo and Banerjee take advantage of the discontinuity in the functioning of a credit market in India with the implementation of a specific subsidized credit program. They show that firms will respond differently if they are rationed by one lender or if they are constrained on the credit market.

If there are two markets, even with different interest rates, they can be rationed in one but may be able to borrow from the other one. However, if they want to borrow more at the market rate, it means they are implicitly rationed by the lender with lower interest rate and are rationed by the lender with market rate, they are rationed by the two lenders and are credit constrained.

If firms' production grows after the implementation of the subsidized credit program then they were credit constrained, if instead profit increases but production stays still, then firms were not credit constrained.

Extent of credit constraint is difficult to compare across countries since measurement methods are not similar, thus proportion of credit constrained households/

firms vary greatly in the different studies described above. Few studies using the same methodology in distinct regions within the same country also show significant differences.

If most of the literature reports that credit rationing in developing countries is very high, other studies (such as Kochar's) show that demand for credit is very low and rationing is significantly overestimated. Such evidence questions the role of credit-oriented policies in development and suggests that other interventions on other markets are required.

2. Theoretic framework of financial demand, credit rationing and credit constraint applied to 2 lenders and micro-entrepreneurs

Micro-entrepreneurs have a production function with diminishing marginal returns.

$P = F(k)$ (1)

where k represents the capital needed. Their demand for credit Dc is

$Dc^* = k$ (2)

where it is assumed that working capital is entirely financed by credit.

s.t (L_s, R_s), which are respectively, the supply of credit and the interest rate charged by lenders.

Let's assume for now that there are no eligibility criteria conditioning on receiving the loan but that household characteristics are to a certain extent, affecting the loan size such as

$$L_s = L_s(Z) = \sum_i x_i Z_i \qquad (3)$$

Zi is a set of household characteristics and xi are the coefficients associated. We also assume that Rs is uniform across borrowers from the same lender.

The borrowing optimization of the entrepreneur is given by

$$\max Dc = \alpha\, Ls\,(k) - \hat{a}\, Rs \qquad (4)$$

The entrepreneur will borrow if $Dc > 0$ and if $F'(k) > Rs$

There are different lenders available. Due to adverse selection and moral hazard in a context of imperfect information or to some constraints of specific credit programs, lenders are rationing in the credit market.

In order to meet her financing needs, an entrepreneur might have to borrow from different sources. The entrepreneur can be rationed by one or several lenders and is constrained if she is rationed simultaneously by all lenders. We follow here the definition of Duflo and Banerjee.

Let's assume there are only two lenders available.

With respective supply $_{L1}$ and $_{L2}$ and respective interest rates $_{R1}$ and $_{R2}$ such as $_{R1}$ $_{R2}$ <, the differential interest rate being explained by the fact that lender 1 is a subsidized lending program (with lower interest rate than the market rate, for example a micro-credit program) We also assume than transaction costs associated with the two lenders are equal.

Situation 1 : F'(k)<<R_1 *R*2

a) if *Dc** = 0 and *Dc* = 0 and if *Fk'()* =0

The optimization of the micro-entrepreneur is solved with no credit; the marginal productivity of capital is equal to zero. The borrower does not have any need for more working capital. In this case there is no constraint and no rationing.

b) if *Dc**>0 and *Dc*=0 and *Fk'()*> 0

The marginal productivity of capital is lower than any interest rate charged by lenders. Although the demand is positive, the borrower will not obtain credit from any of the two lenders. In this case, the borrower is price rationed by the two lenders.

Situation 2 : F'(k)>>R_2 *R*1

a) if *Dc** = 0 and *Dc* = 0

There is a need of credit (the marginal productivity of capital is positive) but for some reasons, the micro-entrepreneur does not have a positive demand. The coexistence of a credit need with no demand might be explained by some risk aversion or the fear to be turned down.

b) if *Dc*< * *L* 1

where *L*1 is the maximum amount the lender is willing to lend. The optimization of the micro-entrepreneur is solved by

Max $Dc = \alpha_1 L_1 - \beta_1 R_1$

The borrower will choose the lender with the lowest interest rate of the two available and is neither rationed nor constrained.

c) if $Dc^* > \overline{L_1}$ and $Dc^* < \overline{L_1} + \overline{L_2}$

Max $Dc = \alpha_1 \overline{L_1} - \beta_1 R_1 + \alpha_2 L_2 - \beta_2 R_2$

The borrower is rationed by lender 1, she will take a credit from the second lender who is more expensive, in order to obtain the total amount desired.

The borrower is rationed by lender 1 but is not constrained.

d) if $Dc^* > \overline{L_1} + \overline{L_2}$

Max $Dc = \alpha_1 \overline{L_1} - \beta_1 R_1 + \alpha_2 \overline{L_2} - \beta_2 R_2$

The borrower is rationed by both lenders and is constrained since at and $_{R1\ R2}$, she would borrow more.

Situation 3 :

We keep assuming for simplicity, there are two lenders available with the same conditions than before but now with $R_1 < F'(k)$ and $R_2 > F'(k)$

a) if $Dc^* < \overline{L_1}$

Max $Dc = \alpha_1 L_1 - \beta_1 R_1$

Like in the previous example: the borrower is neither rationed nor constrained

b) if $Dc^* > \overline{L_1}$ and $Dc^* < \overline{L_1} + \overline{L_2}$

Max $Dc = \alpha_1 \overline{L_1} - \beta_1 R_1$

In this context, the borrower is not willing to borrow from lender 2 and is rationed by lender 1. There is a combination of quantity rationing (from lender 1) and price rationing (from lender 2). The conclusion here is that this borrower is constrained although she could have borrowed from the second lender. Since the interest rate charged by the lender is greater than her marginal product the borrower will not borrow from the second lender although she would like to borrow more.

Situation 4 :

There are now some eligibility requirements to obtain a loan from each lender and borrowers' characteristics affect again partially the size the borrower can get.

$$L_s = L_s(Z) = \theta_0 \sum_i x_i Z_i$$

With è0 an eligibility criteria (for example collateral or being registered as a formal activity) which is binary 1: if eligible and 0 if not.

Let's assume there are two lenders *L*1 and *L*2 with *R*1 < *R*2 and $F'(k) > R_{1,2}$

$$\overline{L_{1,i}} = L_1(Z) = \theta_{1,0} \sum_i x_i Z_i$$

$$\overline{L_{2,i}} = L_2(Z) = \theta_{2,0} \sum_i x_i Z_i$$

*a) Dc**>0

if $\theta_{1,0} = 0$ and $\theta_{2,0} = 0$

+then$\overline{L_{1,i}} = 0$ and $\overline{L_{2,i}} = 0$

The borrower is fully constrained because of a fully rationing from both credit sources

b) if $\theta_{1,0} = 1$ and $Dc^* > \overline{L_1}$
if $\theta_{2,0} = 0$ then $\overline{L_{2,i}} = 0$
then $Dc^* > \overline{L_1} + \overline{L_2}$

The borrower is fully constrained and rationed by quantity and eligibility.

The basic theoretic framework shows three types of rationing potentially causing credit constraint:

- Quantity rationing by limiting the size of the loan to some borrowers while they are willing to pay the interest rates charged by the lender.
- Price rationing if the interest rate is higher than the marginal product of capital, although it might not reflect a credit constraint (there can also be some risk rationing[2] if interest rates discourage borrowers to apply for a credit or their willingness to borrow).
- Eligibility rationing if the borrower does not meet eligibility criteria of the lender such as collateral, being registered as a formal micro-enterprise... while her demand is positive and the borrower is willing to pay the interest rates charged by the lender.

The objective of the formulation with two lenders (we could have presented the theoretic framework with n lenders) is to show the different possibilities offered to borrowers to maximize their borrowing function. It also allows the existence of several types of rationing — quantity (micro and macro), price, risk and eligibility — which potentially generates credit constraint.

Lack of collateral is one major determinant of credit constraint in most of related studies. However, due to imperfect information some households/firms may be excluded from credit access because they are not eligible — for example in certain areas micro-enterprises which are not registered or are part of the informal sector do not have access to commercial banks — there can be also an "eligibility" credit rationing.

This can be the case in specific contexts such as in Brazil where entrepreneurs may have sufficient collateral to get a loan but are excluded because their enterprises are not formally registered (are part of the informal sector).

[2] See the work of S. Boucher about the identification of risk rationing

3. Data and description of demographic and economic characteristics

3.1 The data

Data has been collected among 704 micro-entrepreneurs in five low-income areas of Rio de Janeiro: Rocinha, Rio das Pedras, Mare, Complexo do Alemão and Campo Grande. 44% of micro-entrepreneurs were participating to one of the two microcredit programs, Riocred and Vivacred located in some of the areas investigated.

The sample was randomly selected with prior stratification on status (clients and non clients), localization (areas) and type of activity (trade, service, small industry). In addition, in-depth qualitative research has been carried out prior to the survey with twenty-four focus groups in order to better understand micro-entrepreneurs' financial behaviors and to adapt questionnaires accordingly. During these focus groups, participants were discussing general issues about their financial use and needs, classifying a series of credit attributes relatively of their importance and expressing their perception about the segmentation of the credit market in their areas.

3.2 Description of households and economic characteristics

The two figures below present respectively demographic and economic characteristics[3] of micro-entrepreneurs included in the survey and identify several homogenous typologies using Multiple Correspondence Analysis.

Figure 1 identifies three groups of households in the five areas studied.

The first group is made up of households with upper wealth level and higher education, living in a legalized neighborhood without problems; Campo Grande is a formal suburban area of Rio de Janeiro and is richer than the four other areas.

The second group includes households with intermediate wealth level, intermediate education, living in favelas where the main problems are violence and socio-economic conditions; Mare and Complexo do Alemão are characterized by a strong intensity of drug traffic and a high degree of violence between rival armed faction.

A third group comprises households with lower wealth levels, no education, living in favelas which main problems are the lack of infrastructure; Rocinha and Rio

[3] Demographic characteristics: degree of poverty (score of asset index divided in tercile, the construction of the is presented in appendix n°1), household size, level of education, name community where the household is living, main problems within the community.
- Economic characteristics: type of activity (trade, services, small industries), number of years of the business, level of profits and employees

das Pedras are less prone to violence but are less developed and poorer than the other areas studied.

This first analysis on qualitative data finds evidence of expected correlations between education level, wealth and areas.

Figure 2 identifies three main groups of economic activities.

A first group includes mainly new (less than 3 years) trade and services activities with low to medium profitability and no employee.

A second group, made up of average-aged trade activities, high profitability and with one employee or more.

The last group includes essentially "old" (more than 9 years of existence) small "industries" with high profitability and one or more employees. To resume, age of business increases both profitability and employment levels. In term of activity, services have the lowest profitability and small industry the highest.

Figure 1: mapping of household characteristics

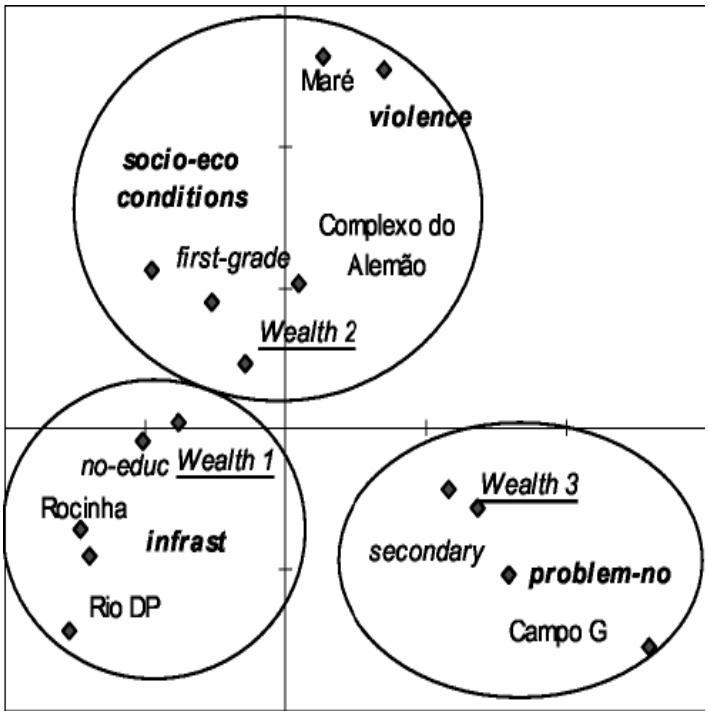
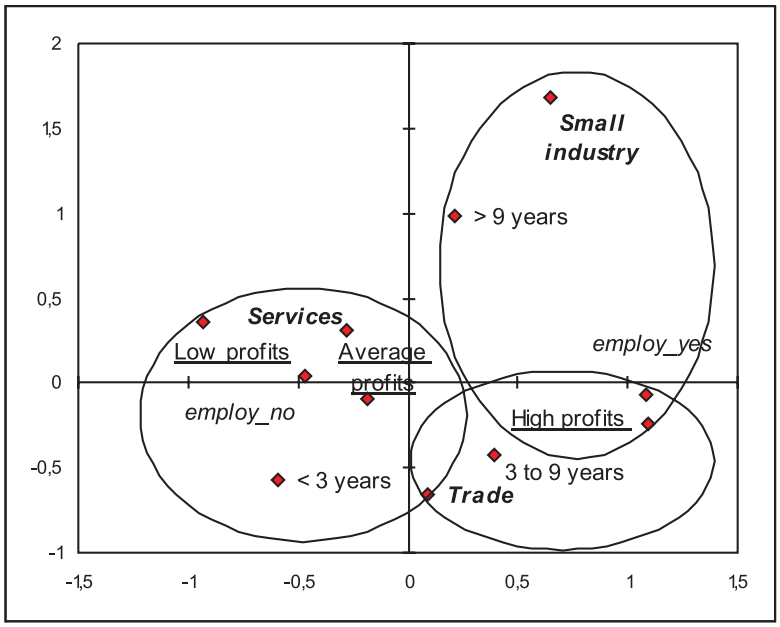


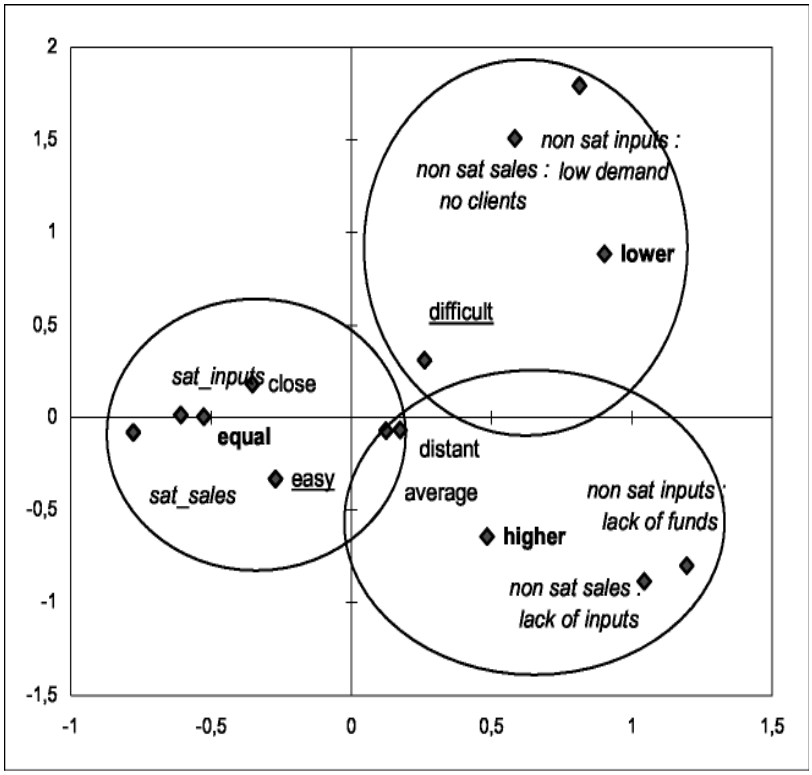
Figure 2: mapping of activity characteristics



3.3 Access to markets

The main objective of microfinance is to improve access of poor population on the credit market, but access to other markets is rarely integrated into microfinance analysis. Figure 3 below shows a similar segmentation, than the ones used before, on access to markets. It is defined as a combination of several characteristics: distance to suppliers and satisfaction with the supply needed for production are proxies of the degree of access to inputs. Sales levels and satisfaction with distribution of products measure the access to commercialization. Finally, the intensity of demand proxies the entrepreneurial ability of micro-enterprises. Aggregate measures of access to markets usually used in rural areas (such as distance to main roads) were not applicable here; in very dense contexts, aggregate measures do not allow any discrimination between individuals.

Figure 3: mapping of access to markets



The mapping identifies three groups.

A first group characterized by a high degree of market access: entrepreneurs are satisfied with both inputs and sales levels. Demand from clients is equal to their production capacity

and selling products is considered to be easy. 53% of this group is client of an MFI (compared to 42% of the sample).

The second group is characterized by a low degree of market access. Micro-entrepreneurs are not satisfied with the level of their sales and inputs purchased because of low demand from clients. Selling their products is hard and demand from clients is lower than their production capacity. They are in majority non-clients from microfinance institutions.

A third group is characterized by an intermediate degree of market access. Micro-entrepreneurs are not satisfied with both sales and input levels. Sales are low because of a low access to input that is itself correlated to a lack of funding availability. Demand from clients is higher than their production capacity. They are in majority non-clients from microfinance institutions.

The mapping shows that micro-entrepreneurs are differently constrained on markets. Some are constrained at the commercialization level — demand for their product is low. Others are directly constrained on the inputs market and indirectly on the credit market (lack of funds to purchase inputs).

Moreover, the variable « demand from clients » is likely to capture the "capacity" effect of micro-enterprises or the degree of entrepreneurial ability. The third group is particularly interesting because it underlies the importance of credit to enable micro-entrepreneurs to purchase inputs and face the demand from their clients.

4. Evaluation of financial participation and financial demand

4.1. Participation in different financial markets

4.1.1 Descriptive statistics of micro-entrepreneurs' financial behavior

In many contexts, MFI improve credit access of populations excluded from conventional financial institutions. In general microfinance is implemented in countries where bancarization rate is very low and where target clients are rarely able to fulfill commercial loan conditions.

In the Brazilian context, the frontier between access to microcredit and commercial banks is less clear-cut since the supply from classical institutions is diversified: conventional banks, consumer banks or Financeiras, credit cards…

Table 1 & 2 below, show that a significant proportion of micro-entrepreneurs use several types of financial services. There are also some small but significant differences between clients and non clients. Moreover, wealth is a significant determinant of financial services use.

Descriptive statistics show clear evidence that micro-entrepreneurs are, for a large part, not receiving credits from conventional bank systems, 15.6% and 13.7% of clients and non clients respectively obtained a loan from a commercial bank while a low proportion of the total sample use consumption credit from "Financeiras". The latter result has, however, to be tempered by the very significant proportion (48%) of clients and non clients who are using credit cards for consumption purposes although the level of credit purchased is in general very low.

Credit from relatives and in a smaller way, credit from informal lenders are more used by non clients than clients. This could be the result of a substitution between micro-credit and informal financial sources.

25.2% and 39.8% of clients and non clients respectively have a saving account. A World Bank's survey conducted over 2000 individuals in Brazilian urban areas report that 43% of the individuals have a bank account[4].

Wealth is a strong determinant of access to conventional banks for both clients and non clients. For example, 7.7% of clients of the lowest wealth quintile obtained a loan from conventional banks while this proportion is 27.4% for clients of the highest wealth quintile.

Table 1 : Clients' use of financial services and wealth index

	Wealth 1	**Wealth 2**	**Wealth 3**	**Wealth 4**	**Wealth 5**	**Total**
Conventional Bank	7.7	9.7	11.5	13.9	27.4	15.6
Consumer credit	5.1	0	5.8	6.2	6.0	4.7
Credit Card	35.9	37.1	48.1	52.3	58.3	48.0
Credit from relatives	_	_	_	_	_	_
Informal lender	_	_	_	_	_	_
Saving account	23.1	21.0	25.0	26.2	28.6	25.2

Table 2 : Non clients' use of financial services and wealth index

	Wealth 1	**Wealth 2**	**Wealth 3**	**Wealth 4**	**Wealth 5**	**Total**
Conventional Bank	9.8	9.0	14.6	18.4	19.3	13.7
Consumer credit	4.9	3.9	2.3	1.3	0	2.7

cont.

[4] Brazil access to financial services. Draft June 2003. *Brazil country management unit.* **World Bank**

	Wealth 1	Wealth 2	Wealth 3	Wealth 4	Wealth 5	Total
Credit Card	39.2	37.2	48.3	61.8	59.7	48.0
Credit from relatives	8.8	3.9	9.0	5.3	7.0	7.0
Informal lender	2.0	0	2.3	0	3.5	1.5
Saving account	30.4	39.7	31.5	48.7	57.9	39.8

In terms of amount, clients having access to conventional bank receive larger loans from banks (mean of R$ 2869.7) than from MFI (mean of R$ 1785.5). Clients with and without access to conventional bank receive similar amounts from MFI. Non clients receive also in average similar amounts from conventional banks than clients.

4.1.2 Determinants of financial participation

Following descriptive statistics about the use of financial services, this section will seek to evaluate the determinants of participation to conventional banks and micro-credit programs using two successive univariate probit estimations. Determinants of other type of financial participation, mainly from informal lenders and relatives will not be included in the analysis since their proportion is not significant and their estimation is beyond the scope of the current research.

The objective of this estimation is to evaluate the determinants of access to the formal sector. As Kochar argues, the probability of borrowing from the formal sector has to be jointly determined by the bank's decision on access as well as the household demand for loans. This will be investigated in the last section of this paper.

4.1.2.1 Univariate probit models

Determinants of bank and micro-credit participations are evaluated using two successive probit models:

$$P = \alpha + \beta X + \delta A + \varepsilon_i \qquad (1)$$

$P = 1$ if the individual use the financial service (bank or micro-credit) and $P = 0$ if not (2)

- X is a vector of demographic variables: age, gender, assets, subjective poverty

- $_A$ is a vector of activity variables: type of activity, age of business and market access variable (distance to supplier)

4.1.2.2 Determinants of participation to conventional bank

Whereas in most developing countries conventional banks do not lend to the informal sector, Brazilian banks are more flexible and provide some loans conditioned on some eligibility criteria.

Probit estimations (see estimation results table 4 in annex) show two main eligibility factors at individual level: ownership of a collateral[5] — land or car, for example — and the income level proxied here by expenditures. Banks ask in certain cases a moral guaranty or to own a saving account — this was however not found as a significant determinant of participation in the analysis. Credit lines for individuals are in general very small. However eligibility criteria for micro-enterprises are stricter and most conventional banks require them to be registered and to be formal. Age of business is also a positive determinant of formal participation and may reflect the screening from banks, excluding risky start up businesses.

Estimation shows that market access — distance to suppliers — is significantly correlated to bank credit. The connection outside the community where banks are available is a potential explanation. This is confirmed by looking at the supply side, out of the 12 most important Brazilian banks identified in the survey areas, ten of them are present in the only "formal" area, Campo Grande, two are located in the "most formal" favela —Rocinha — and none are present in the three favelas remaining — Complexo do Alemão, Maré and Rio das Pedras. An interesting outcome is that the presence of bank explains only partially the degree of participation and a significant proportion of micro-entrepreneurs borrow outside their community.

4.1.2.3 Determinants of participation to microcredit programs

Participation to microcredit programs is determined by micro-entrepreneurs characteristics but also by institutions[6], which screen clients according to a set of

[5] World Bank study (on access to financial services in Brazil) shows however that formal use of guarantees or collateral in successful applications was low; only 12 percent (24 persons out of 194 successful loan applicants). Personal guarantees were the most common (6 cases), followed by business inventory/bank accounts and institutional guarantees (3 cases each).

[6] Refusal rates of candidate is significant: 50% in average for the 2 institutions

criteria for eligibility. At the demographic level, probability to participate is positively linked to assets such as land (although MFI do not require physical collateral) and subjective wealth. Those two variables can be, at the same time, determinants and consequences of participation. MFI select only safer clients, those who own some collateral. The positive relationship may also result from the impact of microfinance on clients' standards of living. This double relationship will be developed in a subsequent version of this paper. Age and being a woman raise the probability of participation.

Age of business strongly affects the participation to microfinance programs, this a direct result from microfinance institutions' policy. For example, start-up businesses are not eligible for credit and young activities in general are less likely to have access to micro-credit. Although a significant proportion of micro-entrepreneurs use credit cards (20% of the sample) their use does not have a significant impact on microfinance participation.

Saving decreases the probability of participation, it either allows auto-financing or is a response to credit constraint (entrepreneurs who have no access to credit must save to finance their businesses).

Lastly, being member of an association (political or religious) and being educated positively affects participation, social network may enable potential borrowers to find a moral guaranty required to apply for credit.

Probit estimates show that microfinance programs target a specific type of clients: established activities, entrepreneurs with some assets and some social network.

Methodology of individual credit does not allow, as for solidarity group, to substitute group guaranty to individual one. The two MFI use a specific system of individual moral guaranty but in the end, delivery of credit results from a careful study of candidates' files.

Although moral hazard problems are partially solved by individual moral guaranty systems, MFI still select clients according to strong eligibility criteria. The remaining asymmetry of information pressures MFI to lead a cautionary policy attested by high rates of refusal and this may challenge a critical issue of microfinance social benefit[7] such as the outreach of programs.

4.2. Revelation of financial demand

The degree of participation in credit markets and the analysis of past credit transactions are not sufficient indicators of access to credit. Only few studies have

7 See Schreiner

sought to evaluate the desired credit structure (Diagne, Zeller and Sharma) from households/firms or borrowers and to compare their demand with the supply side.

Pitting demand and supply against each other is potentially the best solution to detect the occurrence and extent of access to credit and credit rationing.

As mentioned earlier in the literature review, credit access is evaluated using indirect and direct methods. One of these methods, developed by Diagne and Zeller, seeks to evaluate the credit limit from each lender and to compare it with the optimal size of the clients. Although this method provides very interesting results, it has two main limitations: the interest rate is not included in the calculation of the optimal size and the authors assume that borrowers know the credit limit imposed on them by informal lenders.

Financial demand is evaluated using a different method, a bidding game mechanism where the micro-entrepreneur chooses the pair Dc^* , the optimal loan size and R^* , the willingness to pay conditionally on the loan size demanded.

The order — estimating first the loan size and second the interest rate — follows the findings of the preliminary qualitative research where, during focus groups discussions, participants were asked to name and classify credit attributes relatively of their importance in their decision to ask for a loan. In all cases, the participants cited at least six attributes (loan size,interest rates, guaranty, repayment period, installment and staff attendance). Loan size was systematically ranked as the first attribute in the decision to take a credit, the interest rate being classified as a secondary factor. Similarly, for MFI clients, interest rates are always more appreciated than the loan size, confirming the prior ranking. Moreover, during the survey work, it was not possible to estimate micro-entrepreneurs' willingness to pay for a credit before evaluating their optimal size. Another solution would have been to propose participants different interest rates and ask them, for each of them, how much they would be willing to borrow. However, this would have given less information on credit sizes and might have pressured respondent to automatically lower their demand as interest rates proposed to them were rising (or vice-versa).

On the other hand, the main objective of financial demand was to estimate if their credit demand was higher than what they had received before, what rate they were willing to pay if they had access to the optimal credit size and to know if they were willing to borrow at market conditions. This method was also suggested by empirical evidence of previous studies (Bell, Kochar) that demand is relatively inelastic to interest rates.

The methodology used to evaluate financial demand is inspired from contingent valuation methodology used for revealing demand and willingness to pay for environmental goods in developing countries.

If contingent valuation seeks to reveal a willingness to pay (WTP) for a non-existing product, the revelation of demand applied to credit, is decomposed on a willingness to borrow (the size of optimal loan) and a willingness to pay for the credit (interest rate).

Respondents were proposed different gradual sizes, interest rates and repayment structures in function of supply characteristics.

4.2.1 Descriptive statistics of optimal credit structure

Figure 4 :
Optimal loan size (in Reais)

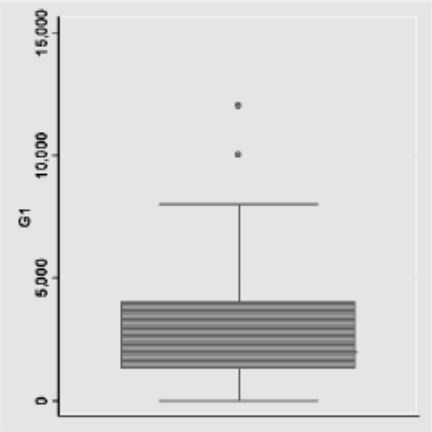
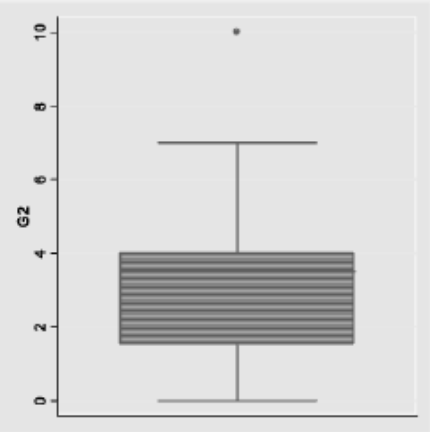


Figure 5 :
willingness to pay : interest (%/mth)



5. Degree and determinants of credit constraint and credit rationing

5.1 Classification of credit constraint intensity

After the presentation of the theoretical model, determinants of participation and the description of micro-entrepreneurs' optimal credit structures, the analysis will now focus on their implications in term of credit rationing and credit constraints.

The underlying assumption of this final section is that credit constraint is positively related to the willingness to borrow more than the credit received and the willingness to pay interest rate or market conditions for that credit.

Table 3 : different cases of credit demand

Cases of credit demand	Case 1 Dc*=Dc Dc=0	Case 2 Dc*=Dc Dc>0	Case 3 Dc*>Dc Dc>0 R*<r1	Case 4 Dc*>Dc Dc>0 r*>=r1	Case 5 Dc*>Dc Dc=0 r*<rm	Case 6 Dc*>Dc Dc=0 r*>=rm
	Not willing to borrow more. No credit	Not willing to borrow more. Credit	Willing to borrow more Credit. Willing to pay interest rate <going rate (r1)	Willing to borrow more. Credit. Willing to pay interest rate >=going rate	Willing to borrow more. No credit. Willing to pay interest rate < market rate	Willing to borrow more. No credit. Willing to pay interest rate >= market rate
Repartition (%)	4.6	15.1	28.4	16.9	22.0	13.1
	Risk aversion? Unconstrained	Unconstrained	Price rationed by banks and / or MFIs Partially constrained	Quantity rationed by banks and / or MFIsFully constrained	Price rationed by banks and MFIsRisk aversion? Partially constrained	Quantity rationed by banks and MFIsFully constrained

Comparing effective credit transaction and optimal credit demand leads to six different cases.

Case 1 :

Micro-entrepreneurs have no access to credit but they are not willing to borrow at any rate. This group has a low demand for credit. There is theoretically no credit constraint although there is a potential rationing linked to risk aversion for certain categories of borrowers.

Case 2 :

Micro-entrepreneurs have access to credit but are not willing to borrow more than what they have received. This group is unconstrained.

Case 3 :

Micro-entrepreneurs have access to credit and are willing to borrow more but at lower interest rates than the maximum rate they have paid. They are mainly price rationed by both suppliers since at lower rates they would borrow more.

This group is also constituted of bank clients who are willing to pay MFI rate and are quantity rationed by MFI. This group is theoretically only partially constrained.

Case 4 :

Micro-entrepreneurs of this group have access to credit and are willing to borrow more at market conditions or even at higher rates. There is quantity rationing from microcredit programs and/or banks. Banks will not increase interest rates since it might leave only riskier applicants in the market (Stiglitz and Weiss). On the other hand, MFI have a specific credit policy and a threshold (at R$ 5000). Thus, an increase in the demand is not translated into an increase of supply or of interest rates.

This group is also constituted of MFI clients who are quantity rationed by MFI and are willing to borrow more at MFI rates but are not willing to borrow at bank rates, they are then price rationed by banks (the interest rate charged by banks might be higher than the marginal return of capital).

Moreover, there is also a significant proportion of micro-entrepreneurs rationed on the bank credit market because of not being eligible (formal, collateral, having a bank account…). This group is fully constrained.

Case 5 :

Micro-entrepreneurs have no access to credit and are willing to borrow but not at market or micro-credit conditions. They are price rationed and probably risk rationed. This group is partially constrained.

Case 6:

Micro-entrepreneurs have no access to credit and are willing to borrow at market conditions and even higher rates. They are fully quantity rationed since they receive no credit. There is also probably some eligibility rationing. This group is fully constrained.

5.2 Determinants of credit rationing and credit constraint

5.2.1 Estimation strategy: Multinomial Logit

The influence of household and supply characteristics on the different cases of rationing and constraint is estimated using a Multinomial Logit Model. The dependent variable D can take one of the categories (1,. .j) defined by the different cases above.

The Multinomial Logit Model is formulated as follow:

$$P(y = m|x) = \frac{\exp(x\beta_{m|b})}{\sum_1^j \exp(x\beta_{j|b})}$$

where b is the base category (comparison group), m the outcome of interest and x the characteristics predicted to affect the probability of the outcome.

It is important to note that Multinomial Logit model supposes, in general, random utility (the choice is based on the utility derived from the outcome). The common example in credit literature is the probability affecting the choice of borrowers among several formal and informal lenders. However, in the case of credit rationing the outcome is not function of the utility but is a "state" imposed to the individual[8].

In this case, it is particularly interesting to evaluate the marginal effect of individual characteristics on the probability of occurrence of outcomes. Using the quotient rule of differentiation, marginal outcomes can be formulated as follows :

$$\frac{\partial P(y=m|x)}{\partial x} = P(y=m|x)\left[\beta_{m|J} - \sum_{1}^{j}\beta_{j|J}P(y=j|x))\right]$$

With the combination of all *âj J ,* the value of marginal change depends of the levels of all variables in the model (Long and Freese).

5.2.2 Results

Most of results presented in this section refer to estimations figuring in table 6 and illustrate the marginal change of variable of interest holding all others at their mean values.

The different cases of rationing described in the theoretic and empirical sections are supposed to vary with households and supply characteristics. Some variables of supply — number of banks per area for example — are not included in the regressions because they predict perfectly the outcomes in certain cases. For example, in certain areas where there is no bank, even in close surroundings, a variable "number of banks in the area" will perfectly predict outcomes 1,5 and 6 (with no access to credit at all).

In analyzing the determinants of occurrence of outcomes, micro-entrepreneurs who have access to any kind of credit and those who have not will be distinguished, identifying within these two groups the different cases of rationing and constraints as described before.

Starting with micro-entrepreneurs who have no access, a first group (case 1) — 4.6% of the sample — has no demand for credit and can be considered as unconstrained on the credit market. Being an owner increases the probability of being unconstrained with no access. This group is characterized by a lower financial use

[8] We follow Boucher who evaluate determinants of similar types of outcomes, " the Multinomial logit framework is simply used to impose a probability structure on the outcomes".

(owning a credit card is negatively correlated) and a low demand for credit as conventional banks, microcredit programs and relatives are not seen as potential lenders. Conventional banks and microcredit programs — probably not located in micro-entrepreneurs areas — are likely to capture some of the supply effect. They are also the poorest group of the sample, their low demand for credit may be the result of risk-aversion.

Secondly, for micro-entrepreneurs who receive no credit but have a positive demand, estimation results table 6 and 7 confirm the first analysis on participation. The probability of

not receiving a credit — for micro-entrepreneurs who have a positive demand — is determined mainly by lack of ownership of collateral such as land or the non use of financial instruments (credit card).

In term of constraint, owning land decreases more the probability of being fully constrained (case 6) than being partially constrained (case 5). Land collateral is only required (in certain cases) for bank credit, thus owning land decreases the probability of jointly having a demand for a credit at market conditions and being rejected. This is maybe an aspect of eligibility rationing.

There are however some interesting differences between the two groups who have no access but have a positive demand.

Specifically, micro-entrepreneurs of group 5 have no access to credit and are partially constrained since they have a positive credit demand but at lower interest rates than both market and MFI rates. Their credit demand is first directed towards relatives and secondly to conventional banks (both sources are significant determinants of being part of this group). Three types of rationing are evaluated with their respective determinants;

- Although their demand for credit is positive, micro-entrepreneurs of this group are not theoretically quantity rationed since their demand at market interest rates is equal to zero. Land, proxied here as collateral, does not significantly decrease the probability of being part of this group confirming that the lack of collateral is not a significant determinant of quantity rationing.
- Price rationing occurs mainly because they are not willing to pay market interest rates since they are too high (this is the case of $r^* > F'(k)$). Although both banks and relatives are perceived as potential lenders, borrowing potentially from relatives rises more the probability of being part of this group, confirming partially the price rationing since relatives lend generally at no interest rates.

- There is also some evidence of risk averse behavior (or risk rationing) confirmed by the higher propensity of micro-entrepreneurs of this group to save, although it might be the result of rationing itself. Subjective poverty (self-estimation of poverty) is also strongly negatively correlated, suggesting that "feeling" poor increases the probability of being part of having no access and a demand at lower rates than market rates. Feeling poor might be a proxy of risk aversion.

In the end, this group is one of the poorest — but not the poorest — since micro-entrepreneurs have a positive demand but are either price rationed or risk averse. The combination of the two rationing implies then a partial constraint on the credit market.

Micro-entrepreneurs of group 6 are fully constrained; they have no access to credit and are willing to borrow at market conditions. Their high demand for credit from conventional banks is attested by the strong significance of perceiving banks as potential lenders. On the other hand, relatives are not perceived as a potential credit source and micro-credit programs are not known or are not present in areas of this group, explaining the low demand for micro-credit.

Two complementary rationing are identified with again, their respective determinants:

- There is mainly quantity rationing or macro-rationing since there is no access to credit at all. Having no land, being a relatively young activity and having no education strongly increases the probability of being part of this group. Thus, lack of collateral is the main determinant of this type of rationing. There is a large body of evidence in the literature, even if it is mainly in rural areas, that land and quality of land (for agricultural activities) are strong determinants of access (Kochar, Swain, Carter, Boucher).
- "Macro" quantity rationing might also result from eligibility rationing of this type of micro-entrepreneurs, which are the poorest of the sample. For example, being a young business increases the probability of having no access and being fully constrained. Both Microfinance programs and banks require micro-enterprises to be already established to be eligible for a loan, they generally do not finance start-up business. Almost 30% of micro-enterprises of this group are one year old or younger confirming the latter finding. Being uneducated also rise the probability of being fully rationed (although not significant at 10%).

This group is the poorest in terms of assets with group 1. However, micro-entrepreneurs are not risk averse (subjective poverty has no correlation) or price

rationed since they are willing to pay market rates. Their demand is primarily directed to conventional banks and relatives are not seen as potential lenders.

The negative and significant impact of distance to suppliers demonstrates potentially the connection between constraint in the credit market and other markets.

On the supply side, perceiving MFI as potential lenders strongly decreases the probability of being fully constrained with no access at all, but the coefficient associated to this variable (potmf) is lower than for group 5. It confirms that a small but significant proportion of this group is eligibility rationed by MFI.

Turning now to the analysis of micro-entrepreneurs with access, three groups are identified with respective rationings causing potentially credit constraint.

The first group (group 2) includes micro-entrepreneurs who have access to credit and are not willing to borrow more (Dc*=Dc). They are unconstrained on the credit market. According to estimation results, number of years in the business significantly increases the probability of being unconstrained with access to credit (as described earlier, this variable has exactly the opposite effect on the probability of being fully constrained with no access). For example only 6% of this group are one year or younger. As mentioned earlier, the age of business can be a significant eligibility criterion for both MFI and banks. Owning a land title is not a significant determinant of full access. This can mainly be explained by the strong proportion of this group being clients of MFI, which do not require fixed assets collateral but moral collateral. The latter finding is somehow confirmed here by the positive impact of being part of an association on having full access; the social network may ease the access to moral guaranty.

Moreover, the joint action of social collateral and dynamic incentives policy (loan size increase upon satisfactory repayments) enables some of the micro-entrepreneurs to meet their credit need although their access to other credit sources is limited. For instance for this group, social network and age of business are strong determinants of full access while land ownership is not significant. Furthermore, banks are not perceived as a potential source.

Micro-entrepreneurs of this group are receiving in average larger loan sizes and number of credits than the rest of the sample even though they are not the wealthiest.

Group 3 includes MFI and conventional banks clients who are willing to borrow more but not at the going interest rates (microfinance or market rates). Their optimal demand is thus higher than what they actually receive on the credit market (D*>Dc).

Owning land and being the head of the household positively affects (but not significantly at 10%) the probability of partial access. Micro-entrepreneurs of this group have a diversified access to credit sources and a positive demand to both micro-credit program and banks. Different scenario of rationing are identified for this of group:

- MFI clients are not theoretically quantity rationed since they are not willing to pay the going interest rates for access to larger loan sizes.
- Some of the bank clients are rationed by microcredit programs since they are willing to pay MFI rates (but not bank rates which are substantially higher they are currently paying) to obtain extra credit. Although this rationing does only concern a small proportion of micro-entrepreneurs, theoretical evidence suggests that the marginal product of an extra unit of capital is lower than bank interest rates but not than microcredit interest rates. In this case, finding evidence of potential quantity rationing from MFI is uneasy since it might result from the non intervention of MFI in the areas investigated.
- There is also a probable price rationing if the marginal product of an extra unit of capital borrowed is lower than interest rates charged by microcredit programs. In other words, at lower interest rates micro-entrepreneurs of this group would borrow more.

This group is heterogeneous and shows different types of micro-enterprises: some are price rationed or have a low demand (MFI or bank clients), others are price rationed by banks and simultaneously quantity rationed by microcredit programs mainly because they are not intervening in their area. Finally, there is a significant proportion of micro-enterprises who use diversified sources (see table 4) as a strategy to meet their credit needs.

At different levels this group is partially constrained on the credit market.

To finish, group 4 includes micro-credit and bank clients who are willing to borrow more than what they actually receive at market conditions or at higher rates. They are fully constrained with access.

Here, different rationings are again identified:

- There is a quantity (micro) rationing from MFI resulting from dynamic incentives policy (number of years in the business decreases the likelihood of being part of this group) and from conventional banks.
- Some MFI clients are also "eligibility" rationed from conventional banks implying macro-rationing since they are willing to borrow more at bank rates but they have no access. One empirical evidence is the negative correlation of expenditures which can be a way for banks to screen applicants. There is however no such evidence regarding land ownership (the coefficient is not significant and does not have the expected sign).
- This group is characterized however by a low demand for bank credit. Perceiving banks as a potential source of credit decreases the probability of being fully rationed. Some MFI clients may be risk averse and reluctant to

apply for a bank loan (and not willing to give collateral) or are discouraged to apply if they believe their demand will be rejected.

- Finally, there is a possible price rationing for MFI clients who are willing to pay microfinance interest rates but not bank rates.

It is possible that risk averse or discouraged behavior characterized by a low demand for conventional credit outweighs eligibility rationing (which can only be detected if there is a positive demand).

To resume, micro-entrepreneurs of this group face different types of rationing leading to a full constraint on the credit market.

Conclusion and policy implications

This paper attempted to evaluate the determinants of financial participation and financial demand of micro-entrepreneurs in low-income urban areas of Rio de Janeiro and to identify the nature and degree of credit rationing causing potentially credit constraint. Evaluation of demand showed that appropriate methods could be implemented in the survey to reveal financial demand of low-income populations.

There is strong empirical evidence of a high degree of rationing from bank and MFI especially for young activities which can be a severe threat to economic development for those areas.

Although eligibility criteria for getting a loan are not very clear, ownership of some assets — a proxy of wealth — is a strong determinant of access.

For micro-enterprises, micro-credit has some strong potential because it guaranties the best access through the dynamic incentives scheme. It implies larger loan sizes than bank credit even for poorer micro-entrepreneurs. But at the same time, evaluation of microfinance participation shows that MFI have a cautionary policy and are tempted to work only with safer clients (thus explaining partially their poor outreach).

Following the literature, this paper shows the importance of including demand in credit constraint and credit rationing analysis. As a matter of fact, not receiving a credit does not imply automatically credit rationing but may also reflect a low demand. A step further has been taken in identifying the determinants of low demand such as risk aversion or price rationing. Low credit demand is also potentially linked to market failures other than the credit market; this is potentially the case in favelas in Brazil where lack of infrastructures and access to other markets is very important.

Appendix 1 : Asset ownership index

The asset index method has been developed by Filmer and Pritchett (World Bank). The specific index method is constituted of the following components:

$$Ai = f_1 \times (aj_1 - a_1)/(s_1) + fn \times (aj_n - a_n)/(s_n)$$

Where *f*1is the factorial score of the first asset, *aj*1 is the value j of the first asset for the household and $_{a1}$ is the mean and standard deviation of the first asset across the all sample and its standard deviation.

Appendix 2 : Tables of statistics

Table 1. Description of variables included in the analysis

Variable	Description	Mean (Std deviation)
Age	Age of the micro-entrepreneur	41.4 (11.7)
HH head	Dummy : 1 if household head	0.8 (0.4)
HH size	Number of members of the household	3.6 (1.9)
Male	Dummy : 1 if male	0.5 (0.5)
Education	Dummy : 1 if secondary education or more	0.66 (0.47)
Own car	Dummy : 1 if own a car	0.43 (0.5)
Own house	Dummy : 1 if own house	0.86 (0.35)
Own land	Dummy : 1 if own land	0.25 (0.44)

cont.

Variable	Description	Mean (Std deviation)
Emergency	Dummy : 1 if an emergency has occurred in the last 12	0.07 (0.26)
Expenditure (log)	Monthly expenditure of the household	6.24 (0.66)
Subjective	Rank on subjective poverty (ladder ranging from 1 to 9)	4.5 (0.75)
Distance supplier	Distance to main supplier in minutes	131.5 (360.54)
Years in business	Number of years of existence of the activity	7.8 (7.2)
Commerce	Dummy : 1 if commerce activity	.48 (0.5)
Services	Dummy : 1 if service activity	0.24 (0.4)
Industry	Dummy : 1 if small industry activity	0.11 (0.31)
Salaried	Dummy : 1 if salaried worker	0.12 (0.32)
Presence Bank	Dummy : 1 if bank perceived as a potential lender	0.58 (0.49)
Presence MFI	Dummy : 1 if MFI perceived as a potential lender	0.47 (0.5)
Presence Relatives	Dummy : 1 if Relative perceived as a potential lender	0.28 (0.45)

Table 4. Results of Probit estimations

	Credit from a conventional Bank	*Credit from a Microcredit Program*
Age	- 0.0099(0.137)	0.013(0.012)
HH head	0.29(0.082)	0.29(0.027)
HH size	0.05(0.17)	0.014(0.612)
Male	-0.007(0.96)	-0.27(0.02)
Education	0.19(0.21)	0.24(0.04)
Own car	0.3***(0.02)	0.059(0.59)
Own house	-0.072(-0.707)	0.16(0.32)
Own land	0.395***(0.005)	0.23(0.06)
Emergency	-0.14(-0.59)	-0.76(0.001)
Expenditure	0.215***(0.04)	-0.15(0.08)
Subjective	0.053(0.164)	0.12(0.000)
Years in business	0.02**(0.05)	0.012(0.125)
Commerce	0.075 (0.717)	-0.27(0.062)
Services	0.34(0.115)	-0.17(0.287)
Industry	0.099 (0.704)	0.75(0.000)
Salaried	-0.026 (0.897)	0.39(0.02)
Distance supplier	0.0003 (0.050)	-0.00017(0.27)

cont.

	Credit from a conventional Bank		*Credit from a Microcredit Program*
Saving	-0.27	(0.058)	-0.33(0.003)
Credit card	0.499	(0.000)	-0.021(0.85)
Association	0.176	(0.189)	0.20(0.06)
Cons	-3.59	(0.000)***	-0.73(0.22)
Nb of Observations	704		704
Log Likelihood	-251.6		- 411.2
Pseudo R2	0.136		0.1473

Table 5. Results of Multinomial Logit

	Case 1	*Case 2*	*Case 4*	*Case 5*	*Case 6*
Age	0.003 (0.884)	0.004 (0.74)	0.008 (0.51)	0.007 (0.55)	0.004 (0.74)
HH head	-0.95 (0.053)	0.24 (0.5)	-0.32 (0.29)	-0.52 (0.09)	-0.423 (0.220)
HH size	0.004 (0.970)	0.031 (0.6)	0.017 (0.78)	-0.052 (0.5)	-0.06 (0.42)
Male	-0.62 (0.167)	-0.21 (0.44)	-0.24 (0.35)	-0.32 (0.23)	-0.06 (0.84)
Education	-0.71 (0.123)	0.004 (0.99)	-0.15 (0.58)	-0.064 (0.82)	-0.61 (0.04)

cont.

	Case 1	*Case 2*	*Case 4*	*Case 5*	*Case 6*
Own land	0.43 (0.350)	0.15 (0.59)	-0.019 (0.95)	-0.16 (0.58)	-0.82 (0.029)
Expenditure	0.34 (0.321)	0.19 (0.35)	-0.26 (0.18)	0.20 (0.29)	0.03 (0.91)
Subjective	-0.25 (0.053)	-0.199 (0.011)	0.15 (0.032)	-0.26 (0.001)	-0.07 (0.36)
Years in business	0.03 (0.351)	0.04 (0.016)	-0.02 (0.32)	0.0005 (0.98)	-0.04 (0.073)
Distance supplier	0.0006 (0.261)	0.0002 (0.66)	0.00007 (0.82)	0.0005 (0.19)	-0.0009 (0.18)
Saving	0.42 (0.355)	0.37 (0.17)	0.08 (0.76)	0.68 (0.009)	0.72 (0.01)
Credit card	-1.27 (0.007)	0.21 (0.41)	0.13 (0.601)	-0.77 (0.003)	0.51 (0.073)
P-bank1	-0.37 (0.4)	-0.15 (0.59)	-0.32 (0.235)	0.196 (0.43)	0.37 (0.183)
P-bank2	-1.37 (0.084)	-0.61 (0.06)	-0.37 (0.21)	-0.73 (0.04)	0.73 (0.08)
P-MFI	-2.3 (0.000)	0.37 (0.18)	0.19 (0.472)	-2.05 (0.000)	-1.57 (0.000)
P-Relatives	-0.37 (0.45)	-0.38 (0.21)	-0.16 (0.6)	0.47 (0.072)	-0.29 (0.35)
Cons	-0.29 (0.9)	-1.9 (0.16)	0.62 (0.64)	0.84 (0.51)	1.45 (0.32)

cont.

	Case 1	*Case 2*	*Case 4*	*Case 5*	*Case 6*
Nb of Observations	704				
Log Likelihood	-1026.5				
Pseudo R2	0.134				

Base category (comparison group) is case 3

Table 6. Marginal change of each case at sample mean

	Case 1	*Case 2*	*Case 3*	*Case 4*	*Case 5*	*Case 6*
Age	-0.0003 (0.95)	0.00002 (0.99)	-0.0013 (0.51)	0.0007 (0.66)	0.0006 (0.70)	0.00006 (0.96)
HH head	-0.27 (0.18)	0.06 (0.07)	0.07 (0.16)	-0.02 (0.66)	-0.06 (0.16)	-0.026 (0.46)
HH size	0.0004 (0.89)	0.006 (0.36)	0.003 (0.76)	0.005 (0.55)	-0.008 (0.41)	-0.0066 (0.38)
Male	-0.014 (0.28)	-0.007 (0.82)	0.05 (0.21)	-0.014 (0.68)	-0.03 (0.39)	0.012 (0.66)
Education	-0.019 (0.223)	0.02 (0.49)	0.046 (0.29)	-0.001 (0.97)	0.014 (0.69)	-0.06 (0.05)
Own land	0.018 (0.296)	0.04 (0.30)	0.026 (0.57)	0.01 (0.78)	-0.015 (0.68)	-0.08 (0.005)
Expenditure	0.009 (0.341)	0.02 (0.32)	-0.012 (0.71)	-0.05 (0.04)	0.032 (0.21)	-0.001 (0.96)
Subjective	-0.05 (0.15)	-0.02 (0.03)	0.023 (0.06)	0.04 (0.000)	-0.035 (0.001)	-0.0005 (0.95)

cont.

	Case 1	*Case 2*	*Case 3*	*Case 4*	*Case 5*	*Case 6*
Years in business	0.008 (0.29)	0.006 (0.001)	0.0005 (0.86)	-0.003 (0.22)	0.0004 (0.87)	-0.005 (0.03)
Distance supplier	0.0002 (0.25)	0.00002 (0.65)	-0.00001 (0.85)	0.000007 (0.87)	0.00008 (0.08)	-0.0001 (0.09)
Saving	0.03 (0.81)	0.009 (0.78)	-0.099 (0.02)	-0.04 (0.24)	0.07 (0.05)	0.05 (0.079)
Credit card	-0.03 (0.02)	0.06 (0.05)	0.06 (0.13)	0.06 (0.09)	-0.11 (0.001)	-0.04 (0.15)
P-bank1	-0.011 (0.34)	-0.02 (0.48)	0.0007 (0.99)	-0.05 (0.10)	0.04 (0.25)	0.05 (0.09)
P-bank2	-0.23 (0.09)	-0.03 (0.36)	0.15 (0.008)	0.003 (0.94)	-0.06 (0.17)	-0.04 (0.28)
P-MFI	-0.05 (0.003)	0.13 (0.000)	0.17 (0.000)	0.12 (0.000)	-0.26 (0.000)	-0.11 (0.000)
P-Relatives	-0.37 (0.45	-0.05 (0.11)	0.009 (0.85)	-0.023 (0.53)	0.10 (0.010)	-0.03 (0.25)
pr (m)	0.03	0.15	0.33	0.17	0.19	0.12

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