

## **Determinants of access to credit for SMEs: evidence at the level of the firm in Latin America**

*Determinantes del acceso al crédito de las  
pymes: evidencia a nivel de la firma  
en Latinoamérica\**

*Determinantes do acesso ao crédito  
para as PME: Evidência da empresa  
na América Latina*

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## Resumen

La financiación permite a las empresas hacer frente a sus actividades económicas al obtener recursos externos a diferentes plazos. Sin embargo, existen fallas en los mercados crediticios que limitan este proceso, en especial en las pymes. Teniendo en cuenta lo anterior, el objetivo del artículo es investigar los determinantes del acceso al crédito de este tipo de empresas en América Latina. El análisis se basa en un modelo de elección discreta compuesto a partir de las características internas y externas de las firmas. Se evidencia que el tamaño y la capacidad tecnológica son las variables que más influyen para el acceso a los mercados de financiamiento, debido a su habilidad para generar ventajas competitivas.

**Palabras clave:** financiamiento, mercados financieros, empresas, modelos probabilísticos. América Latina.

**Clasificación JEL:** D01, D02, D1, G21.

## Abstract

The financing allows companies to address their economic resources to obtain external activities at different terms. However, there are flaws in the credit markets that limit this process, especially in SMEs. Taking into account the above, the objective of the paper is to investigate the determinants of access to credit for these businesses in Latin America. The analysis is based on a discrete choice model compound from the internal and external characteristics of the firms. It is evident that the size and technological capability are the most influential variables for access to funding markets, due to its ability to generate competitive advantages.

**Keywords:** finance; financial markets, companies, probabilistic models, Latin America.

## **Resumo**

O financiamento permite que as empresas para resolver os seus recursos económicos para a obtenção atividades externas em termos diferentes. Entanto, existem falhas nos mercados de crédito que limitam a este processo, especialmente em PME. Considerando o exposto, o objetivo do trabalho é investigar os determinantes do acesso ao crédito para esses negócios na América Latina. A análise baseia-se em um composto modelo discreto de características internas e externas das empresas. É evidente que o tamanho ea capacidade tecnológica são as variáveis que influenciam o acesso aos mercados de financiamento, devido à sua capacidade de gerar vantagens competitivas.

**Palavras-chave:** finanças, mercados financeiros, modelos de negócios probabilística. América Latina.

## INTRODUCTION

The access of firms to the credit markets has been identified as an ingredient that contributes to the growth of the production, employment and consequently on the quality of life of the countries (Odedokun, 1996; Levine, 1997; Carvajal & Zuleta, 1997; Greenwood, Sánchez & Wang, 2013). However, Latin America's financial systems show a significant delay compared to the more advanced countries, since there is no diversification in credit instruments, low domestic savings, poor information between applicants and suppliers of credit, among other reasons (De la Torre, Ize & Schmukler, 2012). This context is reflected in the high cost of financing, especially those faced by SMEs, as these have lower levels of productivity and ability to generate resources to repay the credit.

However, the inability to access credit markets has not only macroeconomic origin but also lies within companies, as many of these have characteristics that do not allow them to opt for external financing.

In this sense, this paper investigates the determinants that allow firms the access to credit markets in Latin America. The scientific literature is reviewed and helps to create the hypotheses about factors that influence this phenomenon and is empirically tested by estimating probabilistic models that facilitate control the characteristics of firms, in order to obtain the net effect of each on the probability of obtaining a loan. It uses cross section microdata about 110 000 companies in the industrial and service sectors of the enterprises survey elaborated for the World Bank. The results show that internal factors

are companies which exert a greater influence on the access to financing for businesses

For the above, this paper is divided into six additional parts. In the second, a literature review of the corporate financing concepts, describing then in the third section, various empirical studies separating its main findings and showing the hypothesis of the paper. In the fourth part, the methodology is presented along with a description of the data set. In the fifth section, the results of the estimates are presented and finally the conclusions.

## **THEORETICAL FRAMEWORK**

The funding is part of the everyday act of enterprises, which require resources to deal with charges of various kinds; for example in the short term, addressing payments to employees, suppliers or unexpected spends occurred within production processes (machinery failure, rentals, leasing). While in the long run the additional amounts of capital allow the creation, expansion and firm's merger (Berggrun, 2006).

Funding can be achieved internally or externally to the firm. The internal, also known as self-financing, parts of an autonomous strategy where the resources come from equity partners, the cash flow or the re-investment of surplus profits from the commercial operation. This ability is common in companies with a moderate level of growth, because

if the expansion of the business units is accelerated, it is possible that additional capital requirements exceed available funds, undercapitalized company and risking its capital structure (Carvajal & Zuleta, 1997).

In this view, enterprises have to raise funds through third parties, through commercial loans, bank acceptances, bonds, ordinary participation certificates (OPC) or issuance of bonds and stocks (Brealey, Myers, Soria & Left, 2006):

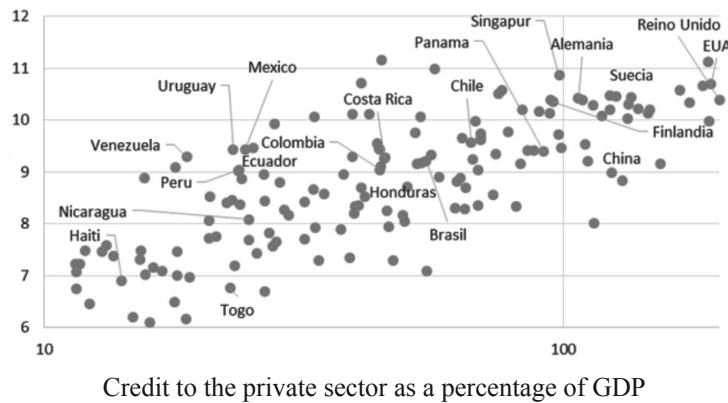
- 1) Commercial loans are notes whose collateral are the assets of the issuing company, with a period and an interest rate that is paid after expiry of the agreed period stipulated.
- 2) Bank acceptances are sources of short-term financing, consisting of bills of exchange issued by the company and approved by lending institutions.
- 3) The issuer of the paper is sold in the market and promises to return a principal plus interest, also called coupon. Instruments are widely deployed debt for large companies, both in the short and long term financial markets.
- 4) Ordinary participation certificates (OPC) are debt securities that represent the right to a portion of future returns equivalent to redeem the nominal value of the security company. For example, accounts receivable, contracts for rent or supply of raw materials, etc.

5) The bonds are debt securities that represent a collective credit, issued by natural persons, medium and long term in order to acquire fixed assets or fund investment projects.

6) The issuance of shares extend the equity of companies is represented by the shares of members and grant the rights to their owners.

These sources allow companies to expand more rapidly than with internal resources allowing the creation of new business lines, infrastructure and innovation more rapidly. In this line of thought, there is a strong relationship between increasing access to external financing and higher levels of economic growth and development like in Figure 1 (Odedokun, 1996; Carvajal & Zuleta, 1997; Jiménez & Manuelito, 2011; Greenwood, Sánchez & Wang, 2013).

Log (GDP per capita in PPA 2005 constant dollars)



**Figure 1.** Financial deepening and economic development 2012.  
**Source:** author's calculations based on data from the World Bank and the International Monetary Fund.

Failures in the credit markets particularly affect SMEs, given their lower levels of productivity and consequent weak cash flow generation necessary for self-financing. Moreover, these have a more concentrated, family, unskilled and autarkic administrative organization which leads to lack of reliable financial and accounting information increasing

difficulties when a credit (Bleger & Rozenwurcel, 2000) is requested. At the macroeconomic level, this lack of financing becomes a systematic problem because of SMEs importance in the economic structure, for example, Table 1 shows as in Latin America about 67 % of employment and 40 % of production is generated from these types of enterprises.

**Table 1.** Importance of SMEs in production and employment.  
 (Number of employees on total employment and participation in the generation of value added)

Country	% contribution to employment	% contribution to GDP
Argentina	70,2	53,7
Brazil	59,8	34,3
Chile	63,0	20,4
Latin America	67,2	38,7
Ecuador	55,0	20,0
Mexico	75,0	62,0
Paraguay	77,0	-
Peru	67,9	55,5
Uruguay	68,5	-
Venezuela	38,1	-
Argentina	66,3	50,2
Europe	67,1	57,6

Source: Arazi & Baralla (2012).

Jiménez and Manuelito (2011) mention that in Latin America financial systems show a lower level of development compared to other regions. The data displayed in Table 2 demonstrate that the degree of financial deepening in most Latin American countries is low compared with other regions. Credit to the private sector as a percentage of GDP in Latin America is equivalent to 48 % of the regional gross domestic product (GDP), while in Asia, Europe and North America this indicator exceeds 100 % of GDP. In Latin America the highest levels of financial deepening are seen in Chile and Panama with 73 % and 89 % of GDP respectively.

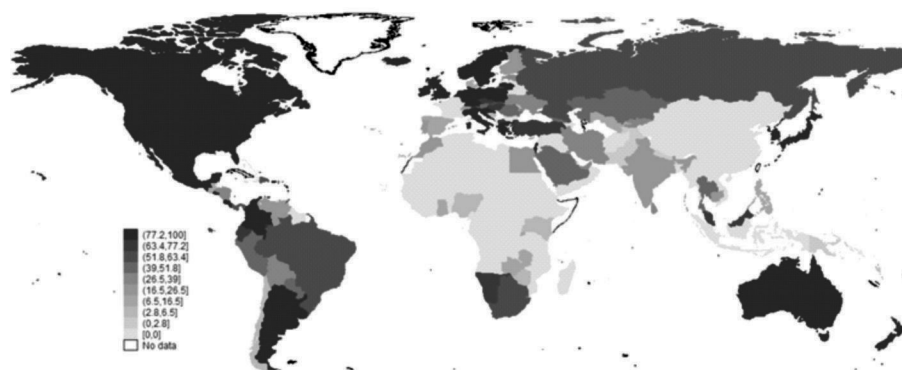
According to McKinnon (1993) and Stiglitz (1993), information problems between buyers and sellers of credit are the main cause of this problem. Information asymmetries between

demanders and suppliers of credit can be generated because the banks cannot fully understand the characteristics of customers, which hamper their ability to assess the repayment of the loan, based on risk and expected return productive projects. The moral hazard is a problem too, occurs once the loan has been granted some actions of the applicant credit may jeopardize their repayment (Bleger & Rozenwurcel, 2000). These situations create uncertainty for which the lender must implement strategies within the contracts as default clauses and joint responsibility. (Diamond, 1991; Bleger & Rozenwurcel, 2000). However, data on the coverage of the credit rating agencies in the adult population (Figure 2) suggests that Latin America is among the regions with the highest coverage in the world as an indicator of doing business develop by the World Bank.

**Table 2.** Credit to the private sector as a percentage of GDP 1980-2012

Country	1980	1990	2000	2012
Asia	96.13	154.86	171.65	141.06
Europe	75.54	77.71	97.84	128.65
North America	92.29	112.38	157.64	183.79
Africa	29.06	41.49	60.52	61.26
Latin America	32.32	29.67	25.74	48.05
Argentina	25.4	15.6	23.89	18.54
Bolivia	17.09	24.03	58.72	44.22
Brazil	42.48	42.08	31.66	68.37
Chile	46.85	45.31	69.8	73.25
Colombia	30.46	30.78	20.95	52.23
Mexico	19.37	17.45	15.38	27.74
Panama	58.11	46.7	101.89	89.61
Peru	12.89	11.8	25.96	26.66
Uruguay	37.24	32.44	45.09	24.09
Venezuela	49.86	26.21	12.47	25.26

Source: Author's elaboration based on data from the World Bank and IMF.



\*Private credit bureau coverage reports the number of individuals or firms listed by a private credit bureau with current information on repayment history, unpaid debts, or credit outstanding. The number is expressed as a percentage of the adult population.

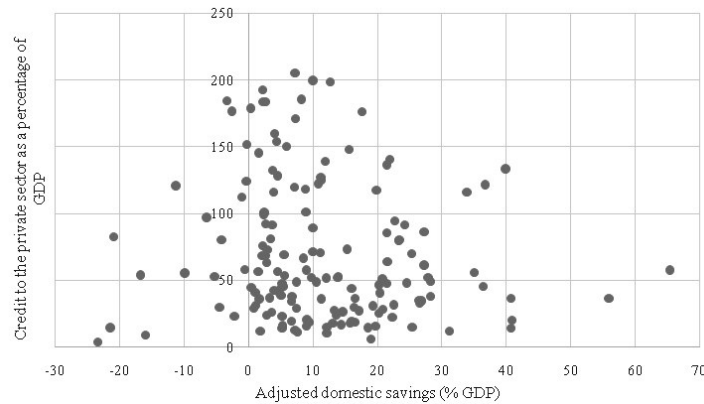
**Figure 2.** Private credit bureau coverage (% of adults)\*

Source: World Development Indicators.



Additionally, it has been argued that the lack of financing is intensified when there is low domestic savings (Bleger & Rozenwurcel, 2000). Since the real savings of the population

allowing offer more credit. Figure 3 does not disclose a clear relationship between domestic credit provided to the private sector against the adjusted domestic savings.



**Figure 3.** Relationship between adjusted net domestic saving and domestic credit to the private sector as a percentage of GDP.

**Source:** Author's elaboration based on data from the World Bank and IMF.

In this vein, access to credit for firms has been specially studied from a macroeconomic point of view or from the companies listed on the public markets (Tong & Wei, 2008; Allen & Carletti, 2008; Duchin, Ozbas & Sensoy, 2010; Quicazan, Moreno & Estrada, 2012). However, a more limited set of studies have discussed this issue from the perspective of firms, because of the lack of micro data on a wide range of companies that allow delve into the phenomenon. These studies are empirically analyzed using mathematical models using internal or external variables to firms that help or hinder their access to credit markets and the net effect that each factor is

estimated. The main factors identified in this process were:

**a) The firm's size:** firms with high production volumes and capitalization rates show an ability to attract capital flows because they can produce easily the resources needed to repayment of loans. Also they can provide greater amount of guaranties based on their higher level of capital stock and infrastructure and may provide greater transparency in its financial statements. Levels of assets, sales or number of employees have been related variables as proxies and have demonstrated a strong positive relationship with the ability to access credit. See Foxley (1999); Bigsten, Collier, Dercon,

Fafchamps, Gauthier, Gunning and Zeufack (2003); Llisterri, Fermin and Ariano (2003); Rojas (2006); González, López and Saurina (2007); Granda (2012).

**b) The age of the firm:** the degree of consolidation and experience with the firm in the market is a sign for credit's suppliers of the presence of stable enterprises, which generate steady cash flows based on experience with the customers and the market structure. The studies found a positive relationship between firm age and the probability of obtaining credit (see Rodríguez, Bolzico, Druck, Henke, Rutman, Sosa and Streb, 2001; Akoten, Sawada and Otsuka, 2006; Llisterri & Ariano, 2003; González, Lopez & Saurina, 2007).

**c) Characteristics of organizations:** issues related to the constitution of the firm such as ownership concentration, type of management and internationalization of the company, are significant when there are trying to get a credit loan (Granda, 2012). The degree of ownership concentration ensures financial institutions to lower monitoring costs of projects undertaken and the reliability of the financial statements. A company directed by qualified personnel will have a more focused and reliable balances strategic direction. The observed studies use different proxy variables; for example, the work of González, López and Saurina (2007) and Mukiri (2011) found a positive relationship between access to credit and a bigger ownership concentration of the firm. Similarly, there are researchers

that positively correlate management conditions with financial access like so Berkowitz and White (2004); Nikaido, Pais and Sarma (2012); Asiedu, Kanyama, Ndikumana and Nti-Addae (2013). Furthermore, the internationalization of the company can improve the requirement of higher amounts of resources since many international trade transactions are complete on credit (Restrepo, Cuervo & Uribe, 2012).

**d) Technological capabilities:** the technological capabilities within the firm increase the competitiveness (Chetty & Hamilton, 1993). Organizational processes, production and marketing area directly influencing, allow deliver the goods or services of higher quality and optimize its presence in markets (Alonso & Donoso, 2000). These advantages give signals to financial institutions that the firm can generate cash flows required to pay the credit. The use of information and communications technology (ICT) and spend in certified software are variables proxies to represent this capabilities.

**e) Sectorial differences and location:** markets differences related to the characteristics of goods can affect the performance of firms and cause differences in the level of access to financing companies (Callejón & Costa-Campi, 1996). Also, the geographical location variables can influence the costs faced by the company such as logistics and transport of goods by improving the dynamics of working capital. Also

found in large cities can bring benefits through economies of agglomeration, due to the presence of major financial service providers decreasing costs and increasing the likelihood that the company can access your products more easily (González, López & Saurina, 2007).

Summarizing the literature has observed that domestic factors firms are significantly more relevant are the external factors of firms (Hall & Monge, 2003; González, López & Saurina, 2007). It means that combination of factors specific enterprises, such as organizational strategy, distribution, logistics, technology investment among others; leads to the generation of own firms competitive advantage, enabling them to become competitive in the market and thereby ensure the creation of sustainable cash flows. This aspect would observe what credit suppliers in their assessments for allocating loans advantage of economic projects with higher returns.

There are few studies investigating the determinants of access to credit at a microeconomic focus on Latin America. These include investigations of countries, such as Rodríguez, Bolzico, Druck, Henke, Rutman, Sosa and Streb (2001) study the determinants of credit to firms in Argentina by probit models and found that the cost of credit in the solid margin is lower for firms that offer guarantees; they have a good credit history. In Ecuador, Granda (2012)

analyzed the possibilities of access to financing for 57,000 businesses and using a probabilistic model could test their hypothesis that a greater amount of fixed income assets and facilitate the granting of loans.

In view of the studies reviewed, this research will contrast the following hypothesis:

H1: The firm size has a positive relationship with the possibility that the company can access funding markets.

H2: The experience brings trust to the financial institutions and this is identified as a variable positively correlated with access to credit.

H3: An efficient strategic direction has a positive effect on access to credit. It is measured by the years of experience of the manager, gender, qualification thereof.

H4: Investment in technology (adoption of quality certifications, licenses and worker training, tenure ICT) is directly related to obtaining external financing.

H5: Differences in the level of access to credit by geographical location and economic sector in which the firm develops.

To test these hypotheses must shift from traditional statistical analysis and descriptive statistics derivatives, because these cannot demonstrate the

reasons why they could access funding, many of which are interrelated. So it's proceeded to conduct the econometric model whose methodology is described below.

## **METHODOLOGY**

### **Data source**

For this research, the data is provide by the enterprises survey conducted by the World Bank (WB), which focuses on formal and informal enterprises in the manufacturing and service sectors, this corresponds to companies classified in ISIC codes 15-37, 45 is used, 50-52, 55, 60-64, and 72 (ISIC Rev. 3.1). The surveys cover a broad range of business environment topics including access to finance, corruption, infrastructure, crime, competition, and performance measures.

The Enterprise Survey is answered by business owners and top managers. Sometimes the survey respondent calls company accountants and human resource managers into the interview to answer questions in the sales and labor sections of the survey. Typically 1200-1800 interviews are conducted in larger economies, 360 interviews are conducted in medium-sized economies, and for smaller economies, 150 interviews take place. The Sampling Note provides the rationale for these sample sizes.

The manufacturing and services sectors are the primary business

sectors of interest. This corresponds to firms classified with ISIC codes 15-37, 45, 50-52, 55, 60-64, and 72 (ISIC Rev.3.1). Formal (registered) companies with 5 or more employees are targeted for interview. Services firms include construction, retail, wholesale, hotels, restaurants, transport, storage, communications, and IT. Firms with 100 % government/state ownership are not eligible to participate in an Enterprise Survey. Occasionally, for a few surveyed countries, other sectors are included in the companies surveyed such as education or health-related businesses. In each country, businesses in the cities/ regions of major economic activity are interviewed.

In some countries, other surveys, which depart from the usual Enterprise Survey methodology, are conducted. Examples include 1) Informal Surveys- surveys of informal (unregistered) enterprises, 2) Micro Surveys- surveys fielded to registered firms with less than five employees, and 3) Financial Crisis Assessment Surveys- short surveys administered by telephone to assess the effects of the global financial crisis of 2008-09.

The Enterprise Surveys Unit uses two instruments: the Manufacturing Questionnaire and the Services Questionnaire. Although many questions overlap, some are only applicable to one type of business. For example, retail firms are not asked about production and nonproduction workers.

The standard Enterprise Survey topics include firm characteristics, gender participation, access to finance, annual sales, costs of inputs/labor, workforce composition, bribery, licensing, infrastructure, trade, crime, competition, capacity utilization, land and permits, taxation, informality, business-government relations, innovation and technology, and performance measures.

Over 90 % of the questions objectively ascertain characteristics of a country's business environment. The remaining questions assess the survey respondents' opinions on what are the obstacles to firm growth and performance. The mode of data collection is face-to-face interviews.

### **Sampling and weights**

The sampling methodology for Enterprise Surveys is stratified random sampling. In a simple random sample, all members of the population have the same probability of being selected and no weighting of the observations is necessary. In a stratified random sample, all population units are grouped within homogeneous groups and simple random samples are selected within each group. This method allows computing estimates for each of the strata with a specified level of precision while population estimates can also be estimated by properly weighting individual observations. The sampling weights take care of the varying probabilities of selection across different strata. Under

certain conditions, estimates' precision under stratified random sampling will be higher than under simple random sampling (lower standard errors may result from the estimation procedure).

The strata for Enterprise Surveys are firm size, business sector, and geographic region within a country. Firm size levels are 5-19 (small), 20-99 (medium), and 100+ employees (large-sized firms). Since in most economies, the majority of firms are small and medium-sized, Enterprise Surveys oversample large firms since larger firms tend to be engines of job creation. Sector breakdown is usually manufacturing, retail, and other services. For larger economies, specific manufacturing sub-sectors are selected as additional strata on the basis of employment, value-added, and total number of establishment's figures. Geographic regions within a country are selected based on which cities/regions collectively contain the majority of economic activity.

Ideally the survey sample frame is derived from the universe of eligible firms obtained from the country's statistical office. Sometimes the master list of firms is obtained from other government agencies such as tax or business licensing authorities. In some cases, the list of firms is obtained from business associations or marketing databases. In a few cases, the sample frame is created via block enumeration, where the World Bank «manually» constructs a list of eligible firms after 1)

partitioning a country's cities of major economic activity into clusters and blocks, 2) randomly selecting a subset of blocks which will then be enumerated. In surveys conducted since 2005-06, survey documentation which explains the source of the sample frame and any special circumstances encountered during survey fieldwork are included with the collected datasets.

Obtaining panel data, i.e. interviews with the same firms across multiple years, is a priority in current Enterprise Surveys. When conducting a new Enterprise Survey in a country where data was previously collected, maximal effort is

expended to re-interview as many firms (from the prior survey) as possible. For these panel firms, sampling weights can be adjusted to take into account the resulting altered probabilities of inclusion in the sample frame.

Were used for this research the surveys realized in 2006 and 2010 in Latin America, this information comes from 422,000 firms in fourteen countries: Argentina, Bolivia, Chile, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela. The table 3 shows the distribution and the number of firms by country categorized by size.

**Table 3.** Distribution of the enterprise survey by World Bank country 2010

Country	Small		Medium		Total	% Participation
	Number	%	Number	%		
Argentina	14,444	59.40%	9,872	40.60%	24,316	12.61%
Bolivia	2,174	54.10%	1,845	45.90%	4,019	2.08%
Chile	4,722	42.50%	6,389	57.50%	11,111	5.76%
Colombia	21,607	81.70%	4,840	18.30%	26,447	13.72%
Ecuador	5,214	68.60%	2,386	31.40%	7,600	3.94%
El Salvador	2,967	67.10%	1,455	32.90%	4,422	2.29%
Guatemala	5,433	62.00%	3,330	38.00%	8,763	4.54%
Honduras	3,744	78.30%	1,037	21.70%	4,781	2.48%
Mexico	46,557	72.20%	17,926	27.80%	64,483	33.44%
Nicaragua	1,266	69.70%	550	30.30%	1,816	0.94%
Panama	3,701	66.60%	1,856	33.40%	5,557	2.88%
Paraguay	1,079	52.50%	977	47.50%	2,056	1.07%
Peru	8,526	68.60%	3,902	31.40%	12,428	6.45%
Uruguay	2,481	74.20%	862	25.80%	3,343	1.73%
Venezuela	9,275	79.40%	2,406	20.60%	11,681	6.06%
Total	133,188	69.07%	59,635	30.93%	192,823	100.00%

Source: Enterprise Survey World Bank.

In a first approach, is performed a descriptive statistical analysis of the dynamics of financing SMEs in Latin America, for the following variables:

- Percentage of working capital of the company financed with external credit. Working capital is defined as the difference between current assets and current liabilities.
- Percentage of firms with checking or savings accounts.
- Percentage of firms with bank loans or lines of credit.
- Reasons for not having sued credits.
- Percentage of loans requiring collateral and number of required collateral for a loan.
- Percentage of firms that audit their balance sheets.

Similarly, in order to analyze further different characteristics of the firm will be used to separate the performance of enterprises such as size and country.

### Model

The phenomenon of access to credit can be modeled as a dichotomous variable which is estimated by probabilistic or discrete choice models. According to the

$$(2) \quad P_i = \text{Prob}(Y_i = 1) = \text{Prob}(\beta_i X_i + \varepsilon > 0) = F(X_i \beta_i)$$

In these models the endogenous variable represents the probability of occurrence

$$(3) \quad Y = f(S, X) \quad Y = \alpha + \beta_i X_i + \varepsilon$$

function used to estimate the probability its use a truncated linear probability model, logit and probit model. In general, it is considered that behind the dependent variable in these models, is an unobservable variable,  $I$ , that depends on a set of explanatory variables taking certain values if you exceed a certain limits, as expressed below .

$$Y_i = 1 \text{ si } I_i^* > 0 \text{ when } \beta_i X_i + \varepsilon > 0$$

o

$$Y_i = 0 \text{ si } I_i^* < 0 \text{ when } \beta_i X_i + \varepsilon < 0$$

The assumption on the distribution of  $\varepsilon$ , provides the type of model estimates: if a function of uniform distribution is assumed, the truncated linear probability model is used; if distributed as a normal with zero mean and unit variance, the generated model will be a probit; while assuming that is distributed as a logistic curve, it would be a logit model. The hypothesis that the limit to be reached by the latent variable is zero can be modified by any other value, for example, that the critical value is defined by the constant term (Perez, 2004). Under the first approach the probabilistic model would be defined (Medina, 2003)

of the analyzed phenomenon (Pérez, 2004). For this work, the role of probabilistic estimation will be:

Where  $Y$  is the dependent variable, where 1 is if the company agreed to a credit and zero otherwise. Meanwhile coefficient,  $\beta$ , captures the marginal contribution of each factor to the probability of access to credit. The latter are grouped on a table that summarizes factors characteristic signature  $X$ , which were selected based on the hypotheses:

H1: Company size: was checked by the number of employees, sales volume of the company.

H2: Age: Years of operation of the company.

H3: Technological Capacity: tenure email, website, quality certifications, training of workers in quality courses.

H4: Characteristic of organizations: Experience generate, share concentration of the company, holding bank account.

H5: Sectorial indicators: Activity, country and city of location of the firm sector.

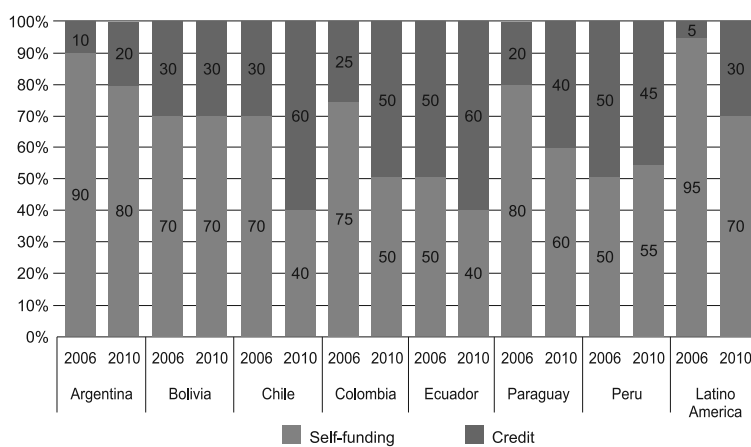
The effectiveness of discrete choice models is assessed by four equally important criteria. The first measures the percentage of the variance of the dependent variable obtained by the independent, indicator labeled Mcfadden's  $R^2$ , higher values indicates more effective the model to determine the behavior of the dependent variable valve timing. Secondly, it is checked whether the combination of independent

variables is significant together to try to explain the dependent variable, measured by the statistical chi square global setting that seek to reject the hypothesis of no joint significance of the model through higher values of this indicator. Third, the individual significance of the variables in the model is tested by observing the value of 5 % less likely to reject the null hypothesis. A fourth consideration is the model's ability to correctly classify the observations in the corresponding groups. Is tabulated the numbers of cases not being successful credit applicants were classified as such by the model and viceversa, these are known as errors of hypotheses I and II respectively (Reynoso, 2011). There are also different situations on the nature of the data must also be corrected for optimal calibration of the model such as the presence of heteroscedasticity, multicollinearity and serial autocorrelation.

## RESULTS

The results of the survey of the World Bank show that external financing plays an important role in resource needs of companies in the region, in Figure 4 can be seen as the percentage of working capital that is financed by external sources has increased from 5 % recorded in 2006 to 30 % in 2010. By country, companies in Chile were the most increased their external funding sources from 30 % to 60 %; followed by Colombia (25 % to 50 %) and Paraguay (20 %-40 %), while Latin America has maintained its trend from 2010 to around 30 %.





**Figure 4.** Distribution of funding sources for working capital in enterprises 2006-2010.  
**Source:** Enterprise Survey World Bank.

In the Table 4 is observed the credit penetration by size. In 2010, 56 % of companies surveyed had access to credit in the financial sector, with a high

tendency for companies with more than 100 employees with 83 % versus small with only 26 %.

**Table 4.** Percentage of firms that agreed to a loan by size. 2010

Country	Small	Medium	Total
Argentina	59.40%	40.60%	24316
Bolivia	54.10%	45.90%	4019
Chile	42.50%	57.50%	11111
Colombia	81.70%	18.30%	26447
Ecuador	68.60%	31.40%	7600
El Salvador	67.10%	32.90%	4422
Guatemala	62.00%	38.00%	8763
Honduras	78.30%	21.70%	4781
Mexico	72.20%	27.80%	64483
Nicaragua	69.70%	30.30%	1816
Panama	66.60%	33.40%	5557
Paraguay	52.50%	47.50%	2056
Peru	68.60%	31.40%	12428
Uruguay	74.20%	25.80%	3343
Venezuela	79.40%	20.60%	11681

**Source:** Enterprise Survey World Bank.

It is important to note that commercial banks are the main source of funding (89.2 %) while 5.4 % of credits were taken from government financial institutions and 5.43 % from informal sources tending an increase of 1 %. In Guatemala, Nicaragua and Paraguay informal credit sources play an important role in financing companies with a percentage above 21 %, reflecting the problems of SMEs to access formal sources of capital.

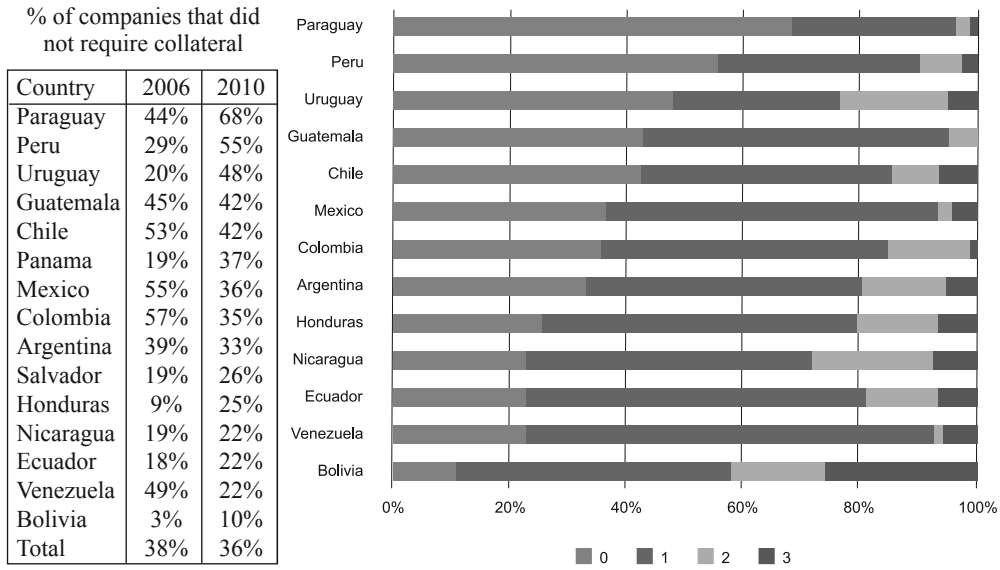
**Table 5.** Distribution of the institutions that offering loans, 2006-2010

Country	2006			2010		
	Banks	Government	Informal	Banks	Government	Informal
Argentina	77.65%	21.10%	1.25%	73.48%	21.03%	5.49%
Bolivia	87.71%	0.16%	12.13%	89.25%	6.41%	4.34%
Chile	90.35%	9.22%	0.43%	96.33%	3.62%	0.06%
Colombia	86.56%	11.46%	1.98%	92.26%	2.64%	5.10%
Ecuador	99.08%	0.26%	0.66%	92.70%	0.29%	7.01%
El Salvador	87.14%	2.79%	10.07%	86.63%	7.78%	5.59%
Guatemala	80.34%	4.78%	14.88%	76.12%	2.09%	21.79%
Honduras	86.98%	0.61%	12.41%	99.04%	0.28%	0.68%
Mexico	98.27%	1.05%	0.68%	96.23%	1.04%	2.73%
Nicaragua	86.48%	0.00%	13.52%	78.24%	0.13%	21.63%
Panama	96.51%	1.91%	1.58%	76.64%	2.76%	20.60%
Paraguay	61.55%	3.24%	35.22%	76.17%	0.17%	23.66%
Peru	98.91%	0.05%	1.04%	92.58%	0.15%	7.27%
Uruguay	62.89%	31.62%	5.48%	79.99%	16.91%	3.10%
Venezuela	86.85%	10.11%	3.04%	86.64%	13.36%	0.00%
Total	86.49%	9.32%	4.19%	89.17%	5.40%	5.43%

**Source:** Enterprise Survey World Bank.

This greater access has been accompanied with higher requirements to get a credit. For example the percentage of companies that do not need collateral increased from 38 % to 36 % between 2006 and 2010. This trend was critical in countries like

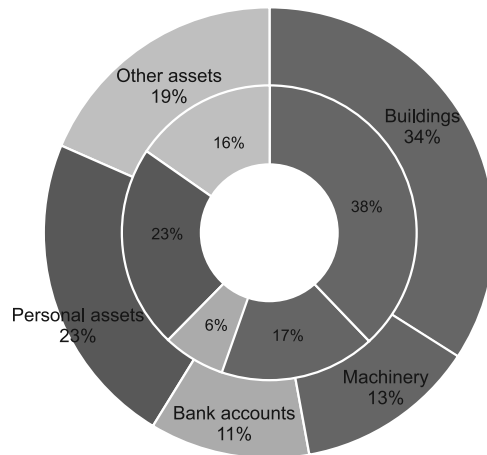
Mexico where 36 % of the companies did not need to back up their loans in 2010, however in 2006 this level was 55 %. Colombia and Venezuela had the largest decreases with 22 % and 27 % respectively.



**Figure 5.** Collateral used as guarantee credits 2006-2010  
**Source:** Enterprise Survey World Bank.

In Paraguay, 68 % of firms had not submitted any support for their loans, but this result may be due to the high level of informal credit market. Among the countries requiring more collateral

is Bolivia, where 47 % of the loans required collateral, two collateral 16 % and 26 % of loans drawn to companies needed 3 or more garments company payment.



**Figure 6.** Types of collateral used as guaranties 2006-2010.  
**Source:** Enterprise Survey World Bank.

This participation shows the importance of holding financial records and consolidated corporate structure; in this sense half of the survey companies in 2010 have an audited balance sheet against 46 % in 2006. For medium companies growth, since 2006, was 10 % versus 2 % of small businesses. El Salvador is the country with the best results with 96 % of companies surveyed, followed by Bolivia (78 %) and Argentina (68 %).

**Table 6.** Percentage of firms that audit their financial statements 2006-2010

País	2006			2010		
	Small	Medium	Total	Small	Medium	Total
Argentina	49%	71%	59%	59%	80%	68%
Bolivia	54%	91%	70%	62%	98%	78%
Chile	28%	44%	34%	30%	56%	45%
Colombia	55%	30%	47%	47%	57%	49%
Ecuador	23%	49%	32%	39%	55%	44%
El Salvador	87%	95%	89%	95%	99%	96%
Guatemala	49%	63%	53%	56%	85%	67%
Honduras	41%	72%	50%	50%	76%	56%
Mexico	23%	37%	26%	30%	64%	39%
Nicaragua	25%	52%	33%	34%	73%	46%
Panama	80%	93%	84%	57%	53%	56%
Paraguay	10%	21%	15%	29%	60%	44%
Peru	15%	35%	26%	23%	32%	26%
Uruguay	17%	24%	19%	45%	36%	43%
Venezuela	72%	93%	76%	61%	75%	64%
Total	41%	56%	46%	43%	66%	50%

**Source:** Enterprise Survey World Bank.

Another limiting companies for funding is the lack of a savings account. The following table shows that 80 % of companies in the region have this financial instrument, with Mexico and Nicaragua with less development with 61 % and 74 % respectively, although Mexico has the highest rate of increase in the period of study. The other countries have percentages above 90 %. In this regard there are not significant differences between small and medium enterprises.

These statistical analyzes can hide the reasons why the companies could access funding because of their internal characteristics. Therefore, this investigation proceeded to conduct the econometric model. In this sense, after evaluating the database and validate responses, 110,000 firms were selected for analysis. Therefore, were performed the probability distribution test chi square to find the function type with which the dependent variable was distributed

**Table 7.** Percentage of enterprises with savings account 2006-2010

Country	2006		2010			
	Small	Medium	Small	Medium	Small	Medium
Argentina	98%	98%	98%	94%	99%	96%
Bolivia	92%	89%	91%	93%	98%	95%
Chile	90%	99%	94%	95%	100%	98%
Colombia	91%	100%	94%	94%	100%	95%
Ecuador	99%	95%	97%	100%	100%	100%
El Salvador	89%	98%	91%	93%	95%	94%
Guatemala	87%	85%	87%	54%	70%	60%
Honduras	87%	86%	86%	79%	78%	79%
Mexico	47%	66%	51%	59%	67%	61%
Nicaragua	65%	86%	72%	64%	97%	74%
Panama	98%	100%	98%	75%	57%	69%
Paraguay	78%	92%	84%	82%	96%	89%
Peru	90%	99%	95%	82%	92%	86%
Uruguay	84%	96%	87%	87%	98%	90%
Venezuela	98%	100%	98%	96%	100%	96%
Total	75%	89%	79%	78%	86%	80%

Source: Enterprise Survey World Bank.

and found to be using a logistic curve. Table 9 shows the results of the logit model estimates the coefficients and marginal effects of each of the variables over the probability of Latin American companies to obtain a Credit in 2006 and 2010.

In terms of general fit, the model is acceptable considering that the value of chi2 statistic is significant (29045.25). All input variables showed statistical significance levels of 5 % and according to McFadden's  $R^2$ , the model explains 24.7 % of the variance of the dependent variable, while the percentage of cases

correctly classified by the model reached 86.1%.

For interpretation, the marginal effect for continuous variables equals to the rate at which the probability of access to credit increases given 1 % change in the independent variable of analysis. For categorical variables, the marginal effect measures the probability of a relative manner as compared to a base feature, for example, the probability that a midsize company get external funding is 20 % higher than for small business. After robustness check, we pass to check each of the hypotheses proposed by contrasting the effect of each variable.

**Table 8.** Results of the estimates. Dependent variable: access to credit. Model Logit

Variable	Characteristics Evaluated	Coef.	P (value)	Marginal effect	Error Std	P (value)	Characteristics Base
City size	1 million >	0.203	0.0000	0.081	0.005	0.0000	Capital city
	50 thousand to 200 thousand	-0.116	0.0000	-0.046	0.010	0.0000	
	< 50 thousand	-0.365	0.000	-0.140	0.011	0.000	
Subsidiary	Yes	0.361	0.000	0.140	0.005	0.000	No
	Limited society	0.086	0.000	0.034	0.007	0.000	Public markets
International rating	Sole Shareholder	-1.522	0.000	-0.408	0.022	0.000	
	No	-0.079	0.000	-0.031	0.009	0.000	Yes
Email tenure	No	-0.215	0.000	-0.084	0.009	0.000	Yes
	No	-0.243	0.000	-0.096	0.004	0.000	Yes
Web page tenure	No	-0.243	0.000	-0.096	0.004	0.000	Yes
	Yes	0.054	0.013	0.021	0.009	0.013	No
Think that the judicial system is fair	Yes	0.120	0.000	0.048	0.004	0.000	disagree
	No	-0.472	0.000	-0.180	0.006	0.000	Yes
Savings Account tenure	No	-0.472	0.000	-0.180	0.006	0.000	Yes
	Yes	0.242	0.000	0.096	0.006	0.000	No
Export	Yes	0.242	0.000	0.096	0.006	0.000	No
	No	-0.472	0.000	-0.180	0.006	0.000	Yes
Firm size	Midsize	0.519	0.000	0.205	0.009	0.000	Small
	Small	-0.519	0.000	-0.205	0.009	0.000	Midsize
Country	Bolivia	0.550	0.029	0.214	0.098	0.029	Argentina
	Chile	7.904	0.000	0.733	0.006	0.000	
	Colombia	-1.045	0.000	-0.366	0.011	0.000	
	Ecuador	-1.195	0.000	-0.376	0.040	0.000	
	El Salvador	0.191	0.000	0.076	0.012	0.000	
	Guatemala	-1.769	0.000	-0.441	0.041	0.000	
	México	0.407	0.001	0.161	0.011	0.001	
	Nicaragua	4.659	0.001	0.549	0.098	0.001	
	Panamá	0.513	0.000	0.200	0.051	0.000	
	Paraguay	-2.735	0.000	-0.472	0.011	0.000	
	Peru	0.997	0.000	0.363	0.007	0.000	
Venezuela	1.765	0.000	0.513	0.019	0.000		

Variable	Characteristics Evaluated	Coef.	P (value)	Marginal effect	Error Std	P (value)	Characteristics Base
Sector	Foods	-0.241	0.000	-0.094	0.010	0.000	Textile
	Metals and machinery	-0.220	0.000	-0.086	0.010	0.000	
	Electronics	-0.687	0.000	-0.245	0.020	0.000	
	Chemicals	-0.301	0.000	-0.116	0.012	0.000	
	Furniture	0.106	0.000	0.042	0.010	0.000	
	Trade	0.112	0.000	0.044	0.009	0.000	
	Hotels and restaurants	-0.628	0.000	-0.230	0.010	0.000	
	Other services	-0.437	0.000	-0.168	0.008	0.000	
	Construction	0.131	0.000	0.052	0.010	0.000	
	Age		0.007	0.000	0.000	0.000	
Management experience		0.004	0.000	0.000	0.000	Continuous	
Product diversification		0.002	0.040	0.040	0.000	Continuous	
Sales per worker		0.195	0.000	0.000	0.002	0.000	Continuous

Number of cases	110,124
McFadden adjusted R2	0.25
Correct classification cases	0.861
Wald chi2(36)	29045.25

Source: author's calculations based on company surveys World Bank (2010).

About the first hypothesis, the estimation confirms that the firm size, measured by number of employees and amount of sales, allows greater accessibility to credit. As the company increases in 1 % his sales per worker, its chance of getting a loan rises at 7.7 %. The effect of the age supports the second hypothesis, as 1 % increases in the experience of the company in the market grows the chance of getting a loan in 0.03 %.

For the third hypothesis, investment in technology has a great influence on the ability of the firm to access credit in Latin America, due to the development of differentiating competitive advantages. If the firm has email has an additional 8.4 % probability of accessing credit versus ones that does not. If the company is engaged in foreign trade, the probability that can access credit increased by 9.6 %. Among the characteristics of organizations, each additional year of management experience, the enterprise obtained 0.02 %, while the degree of product diversification of the firm's external financing company favors by 0.01 %.

The hypothesis five states that it is possible to find significant differential between the location of the firm and the sectors where they are. In this sense, it is observed that firms located in large cities, greater than 1 million inhabitants, have a 8.1 % chance regarding smaller cities such as population 200,000 inhabitants (4.6 %) and less than 50,000 with (-14

%). By sector, trade and manufacture of textiles have a better chance of obtaining external financing compare to food and machinery, but with fewer chances against the manufacture of furniture that has averaged 4 % over the previous.

## CONCLUSIONS AND RECOMMENDATIONS

Within the firms in Latin America, funding through external resources is a significant part of working capital (30 %). With these funds companies can encourage the establishment of new production projects, plant expansions and mergers between business lines. In this sense, the article studies the financing of SMEs from a microeconomic point of view on dataset of 110 thousand firms and showed that the most important determinants that influence the probability of access to credit are internal, such as size, formality and technological capacity factors.

These determinants increase firms' competitiveness in the market and thereby ensure the creation of sustainable cash flows, aspects that motive banks to grant loans. Significant sectorial and geographical differences caused by variations in the amount of credit suppliers and expected returns on investment plans undertaken by economic sector are evident.

Compared with other regions, in Latin America is lower the amount of firms



that can get financed in the credit market, there is why there must be a continuity in public policies that focus on supporting the company to increase coverage without incurring risk exposure from financial institutions or involves a loss of public resources.

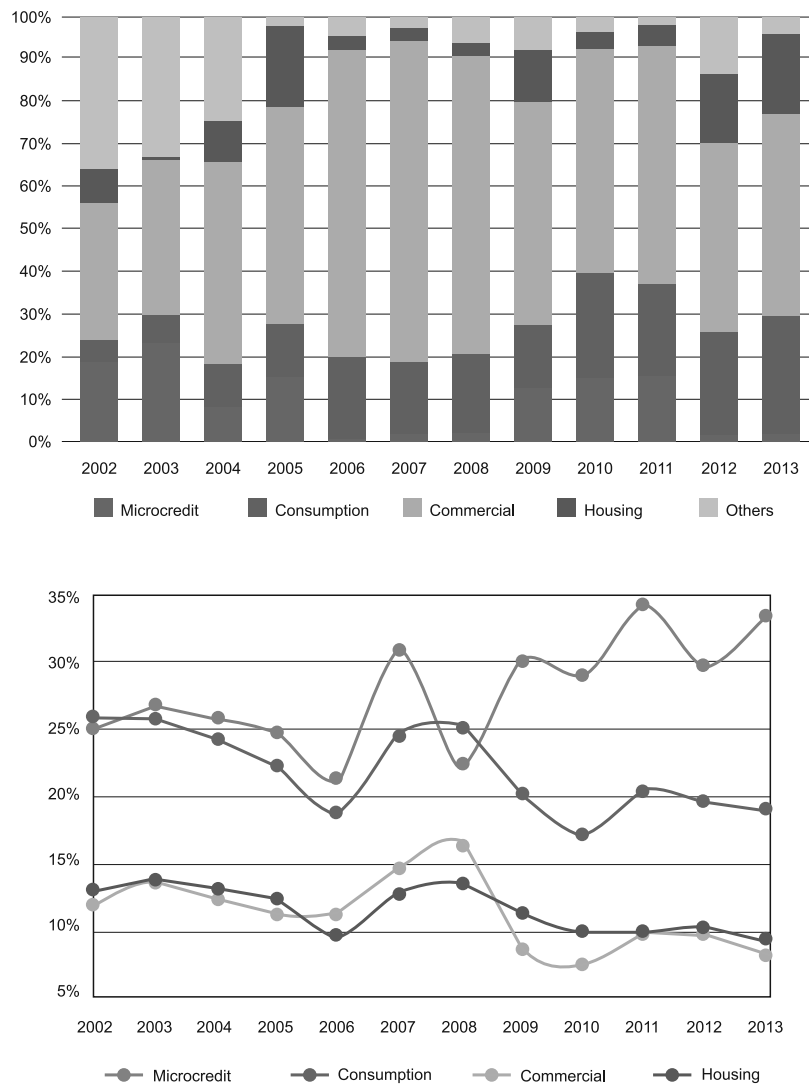
It is common, suggesting that industrial policy will focus on reducing interest rates to SMEs through mechanisms of special loans financed by taxes. These are known in Latin America as National Systems Support and Promotion of SMEs and have been one of the most implemented programs by governments to confront this problem (Held, 1999).

These policies in the first instance provide information services between the financial system and the companies listed, reducing transaction costs. Secondly these programs are active in the credit market by subsidizing interest rates. However, from the point of view of Held (1999) this mechanism delays the development of markets for financing to a segment of enterprises as these subsidies cannot pass a permanent effect on interest rates in the market. Together, these programs caused distortion to financial institutions for evaluate the

intention of SMEs in their demand for credit. With this mechanism is possible to provide credit to companies with *unprofitable* productive investment projects and in the future they give back to the society.

For example, in Colombia, SMEs can obtain financing through microcredit offered by the different entities in the Colombian financial system (commercial banks, commercial finance companies, cooperatives) where twenty-one banks operating in the country, five specialize in SMEs. Finance companies capture time and resources are directed at specific segments such as trade, transportation and consumer durables through microcredit. Another way is that the company applies for credit in a private financial institution that uses resources in the Banco de Desarrollo Empresarial y Comercio Exterior de Colombia (BANCOLDEX), which is a public institution of origin, which evaluates the application and run the credit risk. Nevertheless the programs have found difficulties because the microcredit's interest rate is higher than the other, as it is shown in Figure 7 (ECLAC, 1999; Zuleta, 2011).

Determinants of access to credit for SMEs: evidence at the level of the firm ...  
 Héctor Alberto Botello Peñalosa



**Figure 7.** Distribution of loans and interest rates by type of credit in Colombia, years 2002-2013.  
**Source:** Authors' calculations based on data from Banco de la República.

In the overall distribution of financial credit, microcredit only represented the 3 % in 2013, with a marginal rise since 2004 when it represented 0.1 %. About this, Barona, Zuluaga Gomez and Torres (2006) think the little efforts from commercial banking towards the creation of new businesses. The authors believe that the financial sector could always make a greater role in the capital market with the help of government paper.

In Colombia, the interest rates charged by the financial system to SMEs for their loans are significantly higher (34 %), and as in most Latin American countries, are about twice that for the other types of loans (Figure 2). According to Meléndez and Perry (2009) the risk perception by establishments not affect the access to credit by SMEs, instead the risk is transferred to firms through high interest rates. One of the most serious problems of these economies is the high degree of informality, it is estimated that about

50 % of companies in Colombia are informal (Cárdenas & Mejía, 2007).

The results show the need for better information systems to be built between the business sector and financial institutions, in order to reduce the transaction costs involved in credit allocation, which could complement solution is the creation of generating an information network with a specialized supplier who could also guide them through the various financial options available in the market. Secondly, it is necessary to continue or create programs in which entrepreneurs can professionalize the realization of its financial statements since many of them may lack the resources or knowledge to perform them. It is equally important, greater capitalization by SMEs in its prompt growth stages, so that programs to encourage venture capital funds and other forms of crowdfunding are solutions to alleviate this situation.

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