DIFFERENCES BETWEEN LOANS GRANTED BY COMMERCIAL AND DEVELOPMENT BANKS: A CROSS-SECTIONAL ANALYSIS OF INTEREST RATE MARGINS*

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Resumen: Se comparan los efectos de un conjunto de factores sobre los márgenes de tasa de interés cobrados en los créditos de los bancos comerciales y de desarrollo a los negocios privados en México. Se utilizan más de 330 000 registros de créditos en diciembre de 2007. Al aplicar MCP y ANOVAS se encuentra evidencia empírica de diferencias entre los efectos de tales factores. Los resultados sugieren que los bancos gubernamentales no imitan a los privados, al menos en la determinación de los márgenes de tasa de interés, pero ello no necesariamente implica que estén resolviendo alguna falla de mercado bien identificada.

Abstract: This paper compares the effects of a set of factors that influence the interest rate margins charged on loans granted by commercial and development banks to private businesses in Mexico. Our database comprises more than 330 000 records of outstanding loans on December 2007. By means of WLS and ANOVAS, empirical evidence about differences between the effects of the studied determinants is found. The results suggest that development banks do not seem to mimic private banks, at least regarding the determination of interest rate margins, but that does not necessarily mean that they are solving a well-identified market failure.

1. Introduction

The aim of this paper is to identify and compare the effects of some of the factors that influence interest rate margins on loans granted by commercial and development banks to private businesses in Mexico. In this country, commercial banks are privately-owned and development banks are government-owned. Traditionally, the purpose of development banks has been to foster the development of specific economic sectors by providing first and second tier lending and credit guarantees.[1]

There is an extensive literature that focuses on three particularly important topics about development banking, namely, the effect of financial development on economic growth, the main obstacles restricting access to bank financing, and the role of the government in the credit market.[2] More interesting, the literature advocates government intervention as long as it tackles a well-identified credit market failure that restricts access to credit (Claessens, 2006; Beck, Demirgüc-Kunt, and Maksimovic, 2004; IDB, 2004; Stiglitz, 1994; Stiglitz and Weiss, 1981; and Fry, 1995).

While the debate regarding the details of government intervention in the credit market is not yet solved, in many countries, including Mexico, the government intervenes in credit markets by means of development banks. Mexico has a long experience with development banking. Throughout the 20th century, approximately 15 development banks and at least 30 development trust funds were created, although not all of them coexisted. By the end of 2008, only six development banks and several development trust funds remained. Among them, *Nacional Financiera* (Nafin), *Banco Nacional de Comercio Exterior* (Bancomext), *Financiera Rural*, and *Fideicomisos Instituidos en Relación con la Agricultura* (Fira) are responsible for providing bank financing mainly to small private corporations and individuals with business activities. The *Fideicomiso de Fomento Minero* (Fifomi) offers specialized financing to the mining sector.

However, the effectiveness of these financial institutions as promoters of access to bank financing in Mexico has long been questioned. Werner (1994), for example, suggested that they mainly grant credit to government entities. Armendáriz (1999) argued that some of these

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[1] The specialized literature defines development banks in many different ways. See IDB (2005); and Levy, Micco and Panizza (2004).

[2] See, among others, Claessens (2006), IDB (2004) and Fry (1995) for a complete survey.

institutions do not share information, as they should, to foster bank financing to the private sector. More recently, Benavides and Huidobro (2009) did not find evidence that such intermediaries facilitate access to private banks' credit. Note that if development banks simply replicate what commercial banks do in imperfect credit markets, by definition, they would neither promote wider access, nor increase credit market efficiency (Cotler, 2000). In such a case, the role of development banks as a governmental response to ameliorate market failures would be in doubt.

Empirical studies of the Mexican banking system, apart from being scarce, have not presented elements that would make it possible to evaluate the differences in lending policies between development banks and commercial banks. Huidobro (2012) attempted to close this gap by means of a thorough descriptive analysis of loans and debtors characteristics. Based on a broad database, he found that there were some significant differences between the loans offered by commercial and development banks, as well as between their respective debtor's features.

He also identified a notable difference: Mexican development banks consistently charge lower average interest rates on their loans than their private counterparts However, it is not obvious why they do this since their funding costs are higher than those of private banks (see figures 1a and 1b). Indeed, it is not clear whether development banks respond to incentives to raise their profitability, to accomplish adequate risk analyses or to serve vested interests (see Sapienza, 2004).

However, it is well known that commercial banks set their interest rates taking into consideration different characteristics of the loans they grant and of the debtors they support, in order to maximize their profits (Suwanaporn, 2003). Although the interest rates of government-owned banks are not necessarily immune to the aforementioned characteristics, it is unknown how sensitive they actually are to such features.

A possible way to test whether government banks apply the same criteria as private banks is to measure and compare how their interest rates, or even better, their interest rate margins, react to changes in the same set of loan and borrower characteristics. The relevance of this test stems from the idea that if development banks imitate private banks, they might be redundant from an efficient credit-allocation perspective.[3]

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[3] Levy, Micco and Panizza (2007: 222) state "...the finding of profitable public

In this paper we estimate a multiple regression model with interactions in a cross-section analysis with a two-fold purpose: first, we test whether a number of variables defined in advance are statistically significant determinants of interest rate margins. Second, by means of interactions, we test whether being a development bank or a commercial bank makes any difference in terms of the sensitivity of bank's interest rate margin to the mentioned variables.

Following Sapienza (2004) and Suwanaporn (2003), we set the interest rate margin as the dependent variable. Our explanatory variables are the characteristics of the loans (*e.g.* their term, whether they are collateralized, and the purpose of the loans, among others) and the characteristics of the debtors (their size, economic activity, location, etc.). Note that we take some loans and borrowers characteristics (those which are generally used to classify loans according to standard credit risk ratings) as *proxies* or indirect measures of risk because, in practice, they are relevant for determining interest rates and financial margins.

We were particularly inspired by the following two studies: on the one hand, Sapienza (2004), which studied 6 968 individual loans granted by 43 government-owned and 42 private banks for a sample period that began in 1991 and ended in 1995. It compared the interest rate charged in the same period to the same company, or to very similar companies, by state and privately-owned banks in Italy. It identified matching companies (firms operating in the same industry, in the same geographical area, similar size, among other characteristics) and estimated a model in which the interest rate charged by state and private banks is the dependent variable and the aforementioned characteristics, and some other variables (such as the size of the lending bank), are the independent variables. Its main conclusion is that state-owned banks charge lower interest rates than privately-owned banks.

On the other hand, Suwanaporn (2003) investigated how several factors, such as firm characteristics (size, age) impact the interest rate spread, i.e., the difference between the loan interest rate and the benchmark interest rate. It uses information from a dataset that comprises 560 revolving loans granted between 1992 and 1996 by nine of the 13 commercial Thai banks, and estimates a linear Ordinary

banks may be signaling the failure of the incentive scheme rather than its success. Pressures for profitability may induce public bank managers to deviate from their social mandate and mimic private banks in their credit allocation criteria, in what Augusto de la Torre calls Sisyphus syndrome. If so, public banks, although efficient, would become redundant".

Least Squares model in which the size of each commercial bank is an explanatory variable. It found that banks consider indirect risk factors (i.e. firm's size and age, availability of collateral, etc.), in the pricing of the loans. Therefore, it concludes that the use of *proxies* for risk consideration by banks is correct and appropriate.

In contrast with these two studies, our paper, which is based on a cross-section analysis, incorporates not only two different groups of commercial banks, but also their interactions with the other determinants of the interest rate margins. Moreover, our set of explanatory variables is also distinct, since our research purpose differs. Finally, unlike Suwanaporn (2003), our study brings government-owned banks' interest rate margins into the analysis.

Our paper contributes to the development banking literature by analyzing empirically part of the loan and debtor information Mexican development banks use to determine their interest rate margins, and by comparing this to private banks' practice. In doing so, we make use of a rich micro database on bank lending in Mexico. This study uses hard data from more than 330 000 records of loans granted by private and development banks to private businesses in Mexico. The information has national coverage and comprises loans to the agricultural, mining, manufacturing, industrial, trade, services and financial sectors.

The remainder of the paper is organized as follows. In the first section, the database and the characteristics of the variables included in the econometric model are described. The filters that were applied to refine the original database are explained in this section, and a brief description of the correlations between the variables and their Analysis of Variance (ANOVA) is presented. The second section specifies the empirical model and explains the results of its estimation. In the third section, an exercise testing the robustness of the estimated parameters is presented. Finally, the fourth section summarizes the main findings and their implications.

2. Database, variables, correlations and ANOVA

2.1. *Database*

Our database was obtained from the *Reporte regulatorio* R04C of the National Banking and Securities Commission (*Comisión Nacional Bancaria y de Valores*, CNBV), which captures information about

commercial loans, i.e., outstanding loans granted by private and de-velopment banks to individuals with business activities and to cor-porations in the private sector, as well as to government entities. To our knowledge, R04C is the only official source of information that enables to quantify the number of loans and to identify some of the characteristics of the debtors and the loans they were granted.

Although the records of this database originally come from 53 commercial banks and 8 development banks, by the end of 2007, 15 of these private banks were out of business or merged with others. Like-wise, two development banks had been liquidated (*Banco Nacional de Crédito Rural, Banrural,* and *Financiera Nacional Azucarera,* Fina). They appear in R04C, however, since they granted some of the loans collected in R04C. Therefore, our database comprises loan records from 38 private banks and six development banks.

By December 2007, a total of 1 695 646 individual loan entries were registered, of which 43.6% corresponded to commercial banks (739 266) and 56.4% (956 380), to development banks.[4] It should be noted that 98.3% of development bank records were granted by *Na-cional Financiera* (Nafin), while 80.7% of commercial bank records were granted by the four largest institutions in the commercial loan business. Nafin basically operates as a second-tier government finan-cial institution, that is, it lends most of its funds to privately-owned financial institutions, which in turn lend those funds to final bor-rowers. Fira and *Financiera Rural* are fully second-tier institutions. Bancomext' s small share (1.6% or 14 838 loan records) might reflect its capital inadequacy, which may explain why it reduced its first-tier commercial lending by 62.5% (in real terms) between 2003 and 2007 period. Fifomi is a first and second-tier government trust fund. Note that being a first or a second-tier financial institution may imply no-ticeable differences in the ways different types of banks operate and, as a consequence, might explain empirical differences in the interest rate margins.

It is also worth mentioning that R04C classifies loans according to the granting institution. Therefore, commercial bank loans are those loans granted by privately-owned banks irrespective of the source of funds (i.e., second-tier or own). This means that loans made by com-mercial banks with funds –or supported by guarantees– provided by development banks are classified as commercial bank loans. On the other hand, R04C represents a homogeneous database, in which each

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[4] The corresponding monetary balances of these loan records are consistent with those reported by CNBV (2007).

variable has the same meaning for each reporting institution. Besides, it comprises a large number of multidimensional and comparable loan records that are not available elsewhere.

We chose to analyze records from December 2007 for several reasons. First, since R04C information started to be recorded in June 2001, its quality has improved over the years. Thus, more recent information usually provides better quality and higher reliability. Second, for any given year, December data are more reliable than any other month, since it is the only month in which information is subjected to scrutiny by authorities, investors and external auditors, who review the banks' annual accounts. Third, following an average yearly increase of 47.4% from 2003 to 2007, December 2007 provided the largest possible number of observations before the outbreak of the 2008 international financial crisis. In December 2008, the number of records was around 8% less than in December 2007, since the Mexican credit market was affected by the crisis (Banxico, 2009a: 82-90).[5] Fourth, as a possible consequence of the financial crisis, during 2008 the Mexican banks reduced loans to micro borrowers (see figures 2, 3 and 4 and table 2). Finally, due to methodological changes to R04C, there are no comparable records from the third quarter of 2009 onwards.

It is noteworthy that R04C was not designed to accomplish economic research. It was designed for regulatory purposes. Because of this, we had to filter the information before estimating the econometric model. The first step in this process was removing those loan records that showed any of the reasons listed in table 1.

In order to study the most comparable loan records in the remaining database, the second step of data filtering was to include only those loan records granted under a *fixed interest rate formula*.[6] It is important to point out that *fixed interest rate formula* does not necessarily imply *constant interest rates* during the term of the loan. It refers to the fact that the determination of the rate follows a *fixed formula*, which allows the actual rate on the loan to adjust according to economic conditions. The usual form of a fixed interest rate formula is a base rate (say, the overnight inter-bank interest rate, TIIE) plus a certain number of percentage points (see Padmalatha and Paul, 2010 and Roussakis, 1997). R04C considers 67 possible formulas to determine the interest rates of the loans. After this filter was applied, 1 219 589 loan records remained in our database.

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[5]   The total number of entries decreased to 1 565 069 in December 2008.

[6]   Therefore, we discarded around 23.4% of the observations through this filter.

The third step was eliminating 676 172 records that corresponded to withdrawals made from a single credit line granted by Nafin to a governmental financial intermediary, the Trust Fund for the Savings of Electric Power (Fide).[7] Fide, which is not of our interest in this paper because is not a private corporation, was created by the Mexican government through the Ministry of Energy and the Federal Commission of Electricity in order to foster the efficient use of the electric power in the country. It offers financing for substituting old equipment and electric appliances in corporations and homes.

The fourth and last step of data filtering consisted in eliminating duplications of loan records, i.e., those entries for which the same debtor and loan characteristics were detected. To solve this problem, such entries were merged and their balances added up in order to consider them as a single loan. Even though this procedure might not fully prevent the duplication of loans, it seems a reasonable adjustment since many debtors have a credit line from which they make various withdrawals, which are registered in R04C as independent loan entries. In a similar fashion, all records that showed any difference in any characteristic, other than in their balance, were considered as different loans.

After these adjustments, the sample was reduced to 354 875 observations: 347 405 loan entries granted by commercial banks and 7 470 loan entries granted by development banks. Although this distribution between commercial and development banks may look biased, it is due to the fact that development banks basically operate as second-tier government financial institutions that lend to commercial banks, and because R04C classifies loans according to the granting institution. Table 2 presents the refined sample sorted by the size of debtors.

2.2. *Variables*

Table 3 explains the variables we used to estimate the empirical model. We constructed seven of these variables out of the refined primary data. The first constructed variable is the interest rate margin (*margin*), representing the difference in percentage points between the interest rate on each loan entry and the average cost of funds for each type of bank.

Although the (non-weighted) overnight inter-bank interest rate (TIIE), in principle, represents the opportunity cost of lending for

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[7]   After this adjustment, the sample included 543 417 entries.

the whole banking system, we used the weighted average cost of term funding for each type of bank instead, because it allows the detection of differences in funding costs between development and commercial banks.[8] Note that the relatively lower total funding costs of private banks are partially explained by the fact that they receive a huge amount of demand and term deposits from the public through a large network of branches. Development banks hardly have these kinds of facilities.

In fact, only two development banks (*Banco Nacional del Ejército, Fuerza Aérea y Armada*, Banjercito, and *Banco del Ahorro Nacional y Servicios Financieros*, Bansefi) receive demand deposits from the public. Deposits from the public are the cheapest sources of funds for private banks in Mexico. Among them, demand deposits are considerably cheaper and accounted for roughly 50% of private banks' total funding sources in 2007-2008. The rates paid on demand deposits normally lie below the rates of other sources of funds. Development banks also fund part of their operations by means of deposits from the public, but the share of demand deposits is less than 5% of total funding.

Moreover, even if demand deposits were omitted from the calculation, the average commercial banks' weighted costs of funds would remain lower than development banks' (figures 1a and 1b). Given that demand deposit interest rates are frequently sticky, meaning that they do not adjust immediately when economic conditions change (Saunders, 1994: 294-297), we only used the weighted average cost of term funds for each type of bank when computing *margin*. Finally, the level of interest rates of demand deposits' might be important in calculating the level of *margin* meticulously, but their role in determining the change in *margin* is marginal.

We classified the purpose of the loan (*purpose*) in three constructed variables. These variables categorize different purposes according to the nature or the aim of loans, which are usually related to their maturity. One category is *short term*, which groups loans with the purpose of financing working capital, inventories and the like (*Ps*). Likewise, when the purpose of the loan is to buy machinery or to develop business infrastructure, they are grouped as *medium* and *long-term* (*Pml*) loans. If the purpose of the loan is debt restructuring, it is labeled as *restructure* (*Pr*).

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[8] If the interest rate margin was calculated using exclusively the TIIE, the exercise would be very similar to comparing only the lending rates. It is worth mentioning that the TIIE renders similar qualitative results for the parameters estimated in this paper.

We included *location* in order to indicate whether the debtor is located in a rural or urban area. Rural areas are defined as those towns with a population below 15 000 inhabitants. We calculated the age of the debtor (*age*) as the difference between December 31st, 2007, and the date shown on his or her Federal Taxpayer Registry (*Registro Federal de Causantes*, RFC), which usually corresponds to the day when the taxpayer was born or the tax-paying entity set up in business. Finally, we computed the term of each loan (*term*) as the difference (measured in days) between the expiration date of the loan and the date at which the first withdrawal took place.

The rest of the variables are *bank*, *activity*, *debtor*, *size*, *collateral* and *balance*:

Bank. We split the sample into three categories: the four largest commercial banks (*bank4*) –in accordance with their assets size-; the rest of commercial banks (*bankrest*); and development banks (*bankdb*). The idea behind this classification was to test whether different types of banks have different lending behaviors and, if so, allowing for the possibility that the largest commercial banks might exert some market power (Suwanaporn 2003, and Spiller and Favaro 1984).

Activity. In order to capture the effect of the different industry characteristics, this variable classifies the borrower's main sector of economic activity. We related each sector to a specific dummy variable: *Agriculture* (*Aa*); *Mining* (*Ami*); *Manufacturing* (*Ama*); *Industry* (*Ai*); *Trade* (*At*); *Services* (*As*); *Financial Sector* (*Af*). Governmental activities were removed.

Debtor. This variable indicates whether the borrower is an individual or a company.

Size. The variable classifies the borrower's size according to the following dummy variables: *micro* (*SMi*); *small* (*Ss*); *medium* (*SMe*) and *large* (*Sl*).

Collateral. Indicates whether or not the loan is secured by collateral. Collateral can take three basic forms: real guarantees, coborrowers or loan guarantees provided by development banks or by development trust funds.

Balance. This variable indicates the real balance of the loan as of the end of the month. The balance includes capital and interests.

2.3. *ANOVA and correlation*

In order to test for possible differences in the interest rate margins charged on the loans in December 2007, table 4a presents the Analy-

sis of Variance (ANOVA) for all variables. ANOVA tests whether mean differences among groups *on a single dependent variable* are likely to have occurred by chance. Although the use of Multivariate Analysis of Variance (MANOVA) is often preferred over ANOVA, in this paper we use ANOVA, not only because the situations in which MANOVA is more powerful than ANOVA are "quite limited",[9] but because MANOVA "is a substantially more complicated analysis than ANOVA and is considerable less powerful than ANOVA in finding significant group differences for a particular dependent variable".[10] The Scheffé test was undertaken to verify differences and to obtain comparisons for all possible pairs of interest rate margin means.

The data indicate that average interest rate margins are higher for micro debtors (13.4%) than for small (5.3%), medium (6.5%), and large debtors (4.6%), as predicted by theory.[11]

The four largest commercial banks charge, on average, the highest interest rate margins on their loans (16.6%); this is significantly above the interest rate margins charged by the rest of commercial banks (8%), and by development banks (2.6%).

In regards to collateral, Suwanaporn (2003) recalls that the relation of collateral and loan pricing depends on the theoretical framework. The Signaling Theory (*e.g.* Bester, 1985) argues that firms that pledge collateral are viewed as less risky by the banks. Therefore, this theory predicts a negative relationship between interest rates and collateral. Meanwhile, the so-called Adverse Signaling Theories, which interpret collateral as an incentive device (*e.g.* Ewert, Schenk, and Szczesny, 2000), state that banks only require collateral and or covenants for relatively risky firms, and that this risk also leads the banks to decide on a high interest rate. "Due to the existence of these contradicting theories about the impact of collateral on interest rate, it is not certain or clear-cut to hypothesize the likely impact of collateral on interest rate spread" (Suwanaporn, 2003: 17 and 73).

In line with the Signaling Theory, we found that, on average, borrowers that pledged collateral to secure their loans were charged a significantly lower interest rate margin (7.7%) than those who did

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[9] For a more complete explanation, see Tabachnick and Fidell, 2006: 244. For instance, MANOVAs allow the researcher, under certain, probably rare conditions, to discover differences not shown in separate ANOVAs.

[10] For a more complete explanation, see Tabachnick and Fidell, 2006: 244. Note that MANOVA tests whether mean differences among groups *on a combination of dependent variables* are likely to have occurred by chance.

[11] Sapienza (2004) and Aportela (2001) found similar results.

not (16.4%). Thus, collateral plays a relevant role in the Mexican credit market.

Corporations might be regarded as less risky than individuals as they can reveal credible information easily. This might explain why our data show that individuals pay a higher interest rate margin (12.9%) compared to corporations (10.4%).

Because development banks' second-tier operations are generally linked to concessionary interest rates[12] –otherwise they might not be appealing to private financial intermediaries–, loan records to the financial sector exhibit the lowest interest rate margins (6.9%). The availability of government concessionary funds and collaterals might explain why agriculture faces the second lowest interest rate margins (7.9% on average). On the other hand, interest rate margins tend to be higher in the secondary and tertiary sectors. Trade and services are the economic activities that pay the highest average margins (15.4% and 16.4%, respectively).

Table 4a also shows that urban borrowers pay higher average interest rate margins than those located in rural areas (12.5% *versus* 8.4%), a finding that is opposite to what we initially expected; however, a possible explanation is that most of the loan entries to urban borrowers (205 016 out of 315 454) are directed to economic activities different from agriculture and the financial sector (99 277 and 11 161, respectively), which are the activities that obtain the lowest lending margins.

With respect to the variable *purpose*, it can be observed that loan records with purposes classed as *medium and long term*, or as *restructure*, show lower margins (7.8% and 11.2%, respectively) compared to those provided to firms to back up their short-term operations (14.9%). Regarding the variable *age*, debtors in the 10-to-15-year-old group obtain the lowest margins (7.9%), followed by the youngest debtors, with ages up to a year, who obtain 8.5%. Mexican banks barely finance debtors aged between one and two years.

As to the variable term, banks charge, on average, higher interest rate margins on the 1-to-2 year loans (17.9%); followed by loans granted up to a year (13%). Excluding the 10-to-15 year loan entries, and the 1-to-2 year loans, interest rate margins tend to diminish as the term of the loan increases.

The lower triangle of table 5 presents the correlations among all variables at the end of December 2007. Most of correlations were

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[12] By concessionary interest rates we mean lower interest rates than those usually available in the market.

statistically significant and the more intuitive interpretations seem to be those that involve *margin*.

The variable *margin* maintains a positive relation with micro-sized borrowers (0.456) and a negative one with the small (-0.212), medium (-0.285) and large (-0.246). On the other hand, *margin* shows a positive correlation with bank4 (0.698), and a negative one with development (-0.221) and with the rest of commercial banks (-0.634).[13] Correlations show a negative relation of *margin* with *collateral* and with *debtor*: (-0.693) and (-0.180), respectively. In contrast with theory (Beck, Demirgüc-Kunt, Laeven and Maksimovic, 2006; Voordeckers and Steijvers, 2006; Benavente, Galetovic and Sanhueza, 2005; IDB, 2004), debtors age correlates positively with interest rate margin (0.213). The contradiction arises because we expected a negative correlation (Suwanaporn, 2003: 16-17).

The correlations between *margin* and agriculture (-0.521), mining (-0.009), manufacturing (-0.059), industry (-0.016) and financial sector (-0.148) are all negative, while those of trade (0.297) and services (0.395) are positive. Although these correlations might seem contrary to economic intuition (Beck, Demirgüc-Kunt, Laeven and Maksimovic, 2006; IDB, 2004; Micco and Panizza, 2006; Aportela, 2001; Yaron and Charitonenko, 2000; McKinnon, 1973), they can be explained by two reasons. First, commercial banks granted most of the loans to the agricultural and mining sectors (99.9%),[14] channeling second-tier funds either from Fira and *Financiera Rural*, in the former case, or from Fifomi, in the latter.[15] Thus, most of the loans in these two sectors are financed with governmental funds offered at concessionary interest rates, even though the final interest rate margins are determined by private banks. Another explanation is that 99.5% of the agricultural debtors offered some type of collateral. In fact,

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[13] This is consistent with the findings of several studies in different countries such as Colombia (Stephanou and Rodriguez, 2008), Mexico (Cotler, 2008, Huido-bro, 2012), Italy (Sapienza, 2004), Argentina (Bleger and Rozenwurcel, 2000), and France (Armendariz, 1999). For Mexico, Aportela (2001) found the opposite results.

[14] That is, 133 920 out of 133 932 loan records to agriculture. Development banks only reported 12 loan entries to agriculture. This is natural given that at present there is no development first-tier bank financing to the primary sector. Notwithstanding, Fira and *Financiera Rural* channel second-tier funds to this sector. In regards to mining, government banks report only 3 loan records versus 460 reported by private banks.

[15] 98% of the private banks' loan records directed to agriculture were funded with Fira's and *Financiera Rural*'s second-tier funds.

the agricultural sector concentrated over 70% of the total collateral-backed loans (see table 6).

Thus it is possible that activities like services and trade were charged with higher financial margins because only 12% and 19% of the loan entries, respectively, were backed by collateral. It is also possible that the negative correlation between *margin* and the financial sector (-0.148) might reflect the concessionary nature of the second-tier funds channeled by development banks, through private financial intermediaries, to final beneficiaries.[16] However, it is difficult to offer conclusive interpretations from this simple analysis.

Interest rate margins are also positively related to *location* (.209). When the term or the balance of the loan increases (correlations of -0.558 and -0.051, respectively) the interest rate margin decreases. When the loan is associated with purposes such as working capital, *margin* increases (0.548) while activities such as investment projects, for instance, and restructuring of loans, are negatively related to *margin* (-0.548 and -0.008, respectively). Therefore, correlations involving the variable *purpose* are not in tune with prior theoretical anticipations, for instance, those provided by Cull *et al.* (2005), *Grupo DFC* (2002) and Boskey (1959). Our correlations actually point in the opposite direction from the results of these authors.

To sum up, the results seem to give some first insights, suggesting that interest rate margins diminish when the debtor pledges collateral, is a corporation, is located in a rural area, or belongs to the agricultural or financial sectors. On the other hand, the number of observations reported in the last column of table 4a either suggests that Mexican banks seem to favor urban over rural borrowers, up-to-five year termed loans, and short-term purposes, such as working capital, sales and inventories financing, or that the higher number of observations in these categories are demand-driven.

As far as differences between development banks and commercial banks are concerned, these findings do not seem to provide conclusive evidence to claim that development banks are relatively more involved with, or fundamentally oriented towards, promoting access to the kind of loans that some authors suggest contribute most to the growth and competitiveness of firms, such as medium or long term loans, and/or loans directed to purposes like infrastructure projects, new investments in machinery or equipment, and longer-term investments (see, for instance, Caprio and Demirgüc-Kunt, 1997).

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[16] Suwanaporn claims that in Thailand, "as expected, the interest rate spread is very low for borrowers from the banking and finance sectors"(2003: 81).

Supplying second-tier funds to private financial intermediaries seems to be a central role for development banks.[17] Private banks and other private financial intermediaries are expected to use these funds to grant loans to targeted economic sectors or borrowers, such as farmers, micro and small-size firms.

3. Model and results

The base model is a multiple linear regression model with 20 variables, 16 of which are qualitative and 4 are quantitative. The dependent variable is *margin*, which is quantitative. Among the explanatory variables, Ss, SMe, Sl, $bank4$, $bankdb$, *collateral*, *debtor*, Ami, Ama, Ai, At, As, Af, *location*, Pml, and Pr are qualitative variables, while *age*, *term*, and *balance* are quantitative variables (table 3).[18]

Intuitively, it is expected that banks charge higher interest rate margins on those loans and debtors perceived as riskier (Saunders, 1994). Part of the risk is determined by the general context in which lending takes place.[19] For specific transactions, the risk might be assessed partly by examining the credit history and the financial position of the borrower.[20] Finally, another part of the risk can be, frequently is, approximated by indirect indicators of the inherent risk of debtors and loans. This analysis focuses on these indirect determinants. The logic behind our approach is similar to Credit Scoring, which is a statistical technique used to assess the credit risk from a set of debtor and loan characteristics (De la Torre, Gozzi, and Schmukler, 2007), and constitutes a valuable tool that allows financial institutions to set interest rates in a consistent manner. Indeed, in this study we rely heavily on the aforementioned characteristics, so that *margin*

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[17] For instance, in December 2007, development banks allocated 5 510 out of their 7 740 total credit records (73.8%) to the financial sector. The corresponding figures for 2008 were 6 064 out of 7 505 (80.8%).

[18] Therefore, we will ignore any other variable potentially related to the interest rate margin determination.

[19] Among these general determinants are the competition in granting credit, the foreclosure costs for problematic loans, bank penetration, and regulatory costs (Banxico, 2007). Note that all these general or contextual determinants do not seem relevant for the purpose of this study because they are fixed under a cross-section analysis.

[20] This kind of risk assessment requires abundant information and is beyond the scope of this paper.

is expected to be directly or positively related to $bank4$, Ss, Ami, $term$ and Pml, and indirectly (inversely) related to $bankdb$, SMe, Sl, $collateral$, $debtor$, Ama, Ai, At, As, Af, $location$, age, Pr and $balance$.

The linear specification of our model was chosen for several reasons. The first one is simplicity and intuitiveness. Secondly, the literature does not offer a better alternative.[21] Thirdly, the MacKinnon-White-Davidson (MWD) test suggested that the linear specification is at least as good as the logarithmic-linear alternative (Gujarati, 2003). In fact, the logarithmic-linear specification rendered similar qualitative results, but it unnecessarily complicated the intuitive interpretation of the estimated parameters for the interactions presented below.

Equation (1) represents our base empirical model:

$$
\begin{aligned}
m \arg in = {} & \beta_0 + \beta_1 \ Ss + \beta_2 \ SMe + \beta_3 \ Sl + \\
& \beta_4 \ bank4 + \beta_5 \ bankdb + \beta_6 \ collateral + \\
& \beta_7 \ debtor + \beta_8 \ Ami + \beta_9 \ Ama + \beta_{10} \ Ai + \\
& \beta_{11} \ At + \beta_{12} \ As + \beta_{13} \ Af + \beta_{14} \ location + \\
& \beta_{15} \ Pml + \beta_{16} \ Pr + \beta_{17} \ term + \beta_{18} \ age + \\
& \beta_{19} \ balance + \mu
\end{aligned}
\tag{1}
$$

where β_i $(i = 0, 1, 2, 3...19)$ are the parameters to be estimated by means of Ordinary Least Squares (OLS). As shown in table 7, column II, all the estimated parameters for December 2007 are statistically significant at 99% level of confidence. The F statistic is highly significant (74 333). The adjusted R-square indicates that the model explains 79.9% of the variations of the dependent variable. In general, the signs of the parameters came out as expected, that is, according to theory.

Although we did not detect the presence of multicollinearity, we found evidence of heteroskedasticity. Therefore, we re-estimated the model by Weighted Least Squares (WLS). We applied WLS using alternatively $balance$, $term$ and age as weights. Again, most of the estimated parameters are statistically significant at 99% rate of confidence. Moreover, their signs do not change. For further analysis, we

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[21] The specified model shows similarities with those of Beck *et al.* (2006); Galindo and Micco (2004); Sapienza (2004); IDB (2004); Suwanaporn (2003); Van Hemmen (2002); and Aportela (2001).

chose *balance* as the weighting variable since it yields the best goodness of fit (0.854). The results are reported in column III of table 7. Given these estimates, we can say that, as the estimated parameters for *Ss*, *Sme* and *Sl* were -6.198, -6.661 and -7.908, respectively, it follows that interest rate margin decreases as the size of borrowers increases. Therefore, micro-borrowers are charged the highest margin. This might reflect the perception that micro-debtors are riskier than the rest. These results are consistent with previous findings from literature.

The estimated parameters for the variables *bank*4 and *bankdb* imply that debtors to the four largest private banks are charged with interest rate margins 0.538 percentage points higher than debtors of the rest of commercial banks, while debtors to development banks are charged with 6.630 percentage points lower than customers to the rest of commercial banks. Therefore, as some authors suggest, in Mexico development banks offer financing at concessionary interest rates.[22] In addition, this result looks consistent with the idea that the largest commercial banks exert some market power (Spiller and Favaro, 1984).

In line with Signaling Theory, when a loan is backed by collateral, the interest rate margin is on average 3.196 percentage points lower than otherwise, a result that is consistent with most of the literature (De la Torre, Gozzi and Schmukler, 2007; Voordeckers and Steijvers, 2006; Benavente, Galetovic and Sanhueza, 2005; Rodríguez-Meza, 2004; IDB, 2004; Gelos and Werner, 1999; Bester, 1985; Stiglitz and Weiss, 1981).

The estimated parameter for the variable *debtor* suggests that corporations pay on average an interest rate margin 3.301 percentage points lower than individuals. This finding is consistent with the idea of corporations being less risky than individuals, or perhaps the problems of asymmetric information are relatively less pervasive in the case of corporations (Levy, Micco and Panizza, 2007; Benavente, Galetovic and Sanhueza, 2005; Craig and Thomson, 2004; IDB, 2004; Hallberg, 2001; Stiglitz, 1994; Vives, 1990; Stiglitz and Weiss, 1981; Ponssard, 1979; Akerlof, 1970).

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[22] United Nations (2005), IDB (2004), Grupo DFC (2002), Stiglitz (1994), Kane (1975) are among the authors that would agree with this interpretation. However, other authors suggest the opposite, including World Bank (2008), Cotler (2008), Benavente, Galetovic, and Sanhueza (2005), Sapienza (2004), Fouad *et al.* (2004), Aportela (2001), Rojas and Rojas (1999), Fry (1995), Gale (1990), Bosworth, Carron, and Rhyne (1987), Raghavan and Timberg (1982), Kane (1977), McKinnon (1973).

In contrast with conventional literature (Beck, Demirgüc-Kunt, Laeven and Maksimovic, 2006; Benavente, Galetovic and Sanhueza, 2005; Hanson, 2004; IDB, 2004; Galindo and Micco, 2004; Hallberg, 2001; Aportela, 2001; Yaron and Charitonenko, 2000; McKinnon, 1973), our estimates indicate that debtors in agriculture pay the lowest interest rate margins, followed by borrowers in manufacturing, who pay 3.863 percentage points more than the former. Industrial debtors pay a margin 4.482 percentage points higher than agricultural debtors. The financial sector is charged 4.893 percentage points more than agriculture and the trade interest rate margin is 5.311 percentage points above that of agriculture. Borrowers whose economic activity is related to general services are charged with 5.449 percentage points above agriculture, and debtors in mining pay interest margins 5.684 percentage points higher than those charged to agriculture.

Our results indicate that loans for purposes like working capital, sales, etc., pay higher interest rate margins than those for real estate, fixed capital, imports or restructure. In fact, our calculations indicate that loans for medium and long-term purposes are charged on average 2.843 percentage points less than those for short-term purposes, while loans for credit-restructuring pay 1.520 percentage points less than loans for short-termed purposes. The reason behind these results may be that few commercial loans directed to short-term purposes (17.3%) are backed by collateral, whereas the percentages of collateralized loans for medium and long-term as well as for restructure purposes are considerably higher (97.4 and 52.1 percent, respectively).[23]

Even though *location* is a statistically significant variable, it has a negligible impact on *margin*: while its estimated parameter shows that urban debtors pay higher interest rate margins than rural debtors, the difference is only 0.025 percentage points.

Variations in *age*, *term* and *balance* do not exhibit any effect on *margin*. This result contradicts findings by Saurina and Trucharte (2004), who found a negative and significant coefficient associated with *balance*. Indeed, this is to be expected if banks were to be compensated for the fixed costs involved in originating and administering loans, especially in the case of small-sized loans. The estimated parameter for *age* does not provide evidence supporting Beck *et al.* (2006) and others, who found that younger debtors face higher interest rate margins. Besides, the null value estimated for the parameter

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[23] As predicted by Cull *et al.* (2005), and Benavente, Galetovic and Sanhueza (2005).

of *term* does not support the standard perceived higher-risk associated with longer-term loans.

3.1. *Interactions between the explanatory variables and the type of bank*

Given that the most important differences in interest rate margins rely on the variable *bank*, it is crucial to analyze the interactions between *bank* and all the other explanatory variables of the model. The estimation of these interactions constitutes a convenient method to contrast how different types of banks determine their interest rate margins. In addition, the interaction allows for some non-linearities between variables to emerge. The nonlinearities are captured through interactions between pairs of explanatory variables; specifically, between *bank*4 and *bankdb*, and each of the other explanatory variables.

Therefore, equation (2) was estimated by WLS with all the variables and bank interactions taken together[24]:

$$
\begin{aligned}
m\arg in = {} & \alpha_0 \ + \ \alpha_1 \ Ss \ + \ \alpha_2 \ SMe \ + \ \alpha_3 \ Sl \ + \\
& \alpha_4 \ bank4 \ + \ \alpha_5 \ bankdb \ + \ \alpha_6 \ collateral \ + \\
& \alpha_7 \ debtor \ + \ \alpha_8 \ Ami \ + \ \alpha_9 \ Ama \ + \ \alpha_{10} \ Ai \ + \\
& \alpha_{11} \ At \ + \ \alpha_{12} \ As \ + \ \alpha_{13} \ Af \ + \ \alpha_{14} \ location \ + \\
& \alpha_{15} \ Pml \ + \ \alpha_{16} \ Pr \ + \ \alpha_{17} \ term \ + \ \alpha_{18} \ age \ + \\
& \alpha_{19} \ balance + \alpha_{20} \ bank4 * Ss \ + \\
& \alpha_{21} \ bankdb * Ss \ + \ \alpha_{22} \ bank4 * SMe \ + \\
& \alpha_{23} \ bankdb * SMe \ + \ + \alpha_{24} \ bank4 * Sl \ + \\
& \alpha_{25} \ bankdb * Sl \ + \ \alpha_{26} \ bank4 * collateral \ + \\
& \alpha_{27} \ bankdb * collateral \ + \ \alpha_{28} \ bank4 * debtor \ + \\
& \alpha_{29} \ bankdb * debtor \ + \ \alpha_{30} \ bank4 * Ami \ + \\
& \alpha_{31} \ bankdb * Ami \ + \ \alpha_{32} \ bank4 * Ama \ + \\
& \alpha_{33} \ bankdb * Ama \ + + \alpha_{34} bank4 * Ai \ +
\end{aligned}
\tag{2}
$$

---

[24] We estimated equation (2) by WLS, given that heteroskedasticity persisted. See Johnston (1984: 228-233) and Hardy (1993).

α_{35} $bankdb$ * Ai + α_{36} $bank4$ * At +

α_{37} $bankdb$ * At + α_{38} $bank4$ * As +

α_{39} $bankdb$ * As + α_{40} $bank4$ * Af +

α_{41} $bankdb$ * Af + α_{42} $bank4$ * $location$ +

α_{43} $bankdb$ * $location$ + α_{44} $bank4$ * Pml +

α_{45} $bankdb$ * Pml + α_{46} $bank4$ * Pr +

α_{47} $bankdb$ * Pr + α_{48} $bank4$ * $term$ +

α_{49} $bankdb$ * $term$ + α_{50} $bank4$ * age +

α_{51} $bankdb$ * age + α_{52} $bank4$ * $balance$ +

α_{53} $bankdb$ * $balance$ + v

Table 7 column IV shows the estimated parameters. Most of them are statistically significant at 99% of confidence –including the correspondent interaction coefficients– and the goodness of fit was high (0.870).

In order to test the joint hypothesis that $bank4$ and $bankdb$ with their respective interactions are equal to zero, we conducted the corresponding F-test on the estimated R-square from the two (not shown) sets of restricted and unrestricted models (Wooldridge, 2009: 244; Pindyck and Rubinfeld, 1981: 117-120). In the case of $bank4$ and its interactions, the resulting F-statistic was 2 123, and in the case of $bankdb$ and its interactions, it was 606, so we soundly rejected the null hypothesis that the parameters of the two types of banks and their corresponding interactions were jointly not statistically different from zero. Therefore, the following analysis rests on our WLS estimates of equation (2).

For illustrative purposes, consider the estimated effects of $size$ and the interactions with $bank$ on $margin$, which are expressed in table 8. Based on table 8 and the estimated parameters for December 2007, table 9 shows that, when the lender is a development bank ($bankdb$), $margin$ charged to small, medium and large debtors are 1.225, 0.463 and 2.575 percentage points lower than for micro-borrowers. However, when the lender is one of the four largest commercial banks ($bank4$), the interest rate margins are 7.991, 8.914 and 11.035 percentage points lower, respectively, as compared to micro-debtors. The rest of commercial banks only reduce their margins to medium-sized customers (-1.049 percentage points), while they charge

additional 1.010 points to large-sized borrowers as compared to micro debtors. Their small and micro-borrowers pay roughly the same level of interest rate margins.

In order to find out the full effect of *size* over *margin* for each type of bank, we added the estimates of the intercept and of the corresponding bank estimated coefficient as shown in table 10.

As indicated by table 11, private banks consistently charge higher interest rate margins to all debtors irrespective the size as compared to development banks: the four largest and the rest of commercial banks respectively charge 19.6 and 9.5 percentage points to micro-debtors; 11.7 and 9.5 percentage points to small debtors; 10.7 and 8.4 points to medium-size debtors and, 8.6 and 10.5 points to large-size debtors.

Following the same analysis, in the rest of this section we present the results for each variable using only the full effect of the estimated coefficients on margin (see table 11). Debtors offering collateral to secure their loans pay lower interest rate margins, as opposed to those who do not, irrespective of the creditor: approximately 2.9 percentage points less in the case of the four largest commercial banks and 1.2 percentage points less in the case of development and the rest of commercial banks. The results also show that commercial banks charge smaller interest rate margins to loans directed to corporations than to loans granted to individuals. This may be because, in general, corporations are perceived less risky than individuals. In contrast, in the case of development banks, the estimated effect on margin suggests that individuals pay 1.551 percentage points less than corporations.

In spite of the fact that the average interest rate margins of the four largest commercial banks is the highest –followed by the rest of commercial banks–, from the estimates for the variable *activity* and its interactions with *bank*, we observed important differences between the interest rate margin-setting policies among the different bank types. For instance, the rest of commercial banks, followed by development banks, seem to discriminate the most between economic sectors since the range –and the variance– of the interest rate margins they charge to different economic sectors is larger than those of the four largest commercial banks.[25]

Interestingly, our estimates indicate that commercial and development banks appraise the risk of specific sectors differently: by

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[25] The estimated range of interest rate margins, that is, the highest minus the lowest margin is 6.422 (15.908-9.486) for the rest of commercial banks, 6.299 (7.289-0.990) for development banks, and 2.880 (21.402-18.522) for the four largest banks.

means of their lowest average interest rate margins, the four largest private banks seem to benefit manufacturing the most (18.522), while the rest of commercial banks benefit agriculture the most (9.486) and development banks benefit services the most (0.990). On the other hand, as development banks and the four largest private banks charge the mining sector their highest average interest rate margins (21.402 and 7.289, respectively), the rest of commercial banks charge their highest interest rate margins to the trade sector (15.908).

Although statistically significant, *location* shows a marginal effect on margin irrespective of the bank's type. In contrast with Levy, Micco, and Panizza (2007), IDB (2004), Yaron and Charitonenko (2000) and Armendariz (1999), our results suggest that commercial banks' urban debtors pay an interest rate margin slightly above their rural counterparts. As for the development banks, it was found that their urban debtors pay an interest rate margin of 0.691 and their rural clients pay roughly half a percentage point more.

According to our results, commercial banks charge their lowest interest rate margins for loans directed to real estate, machinery, investments, etc. –that is, to medium and long-term purposes–, and their highest margins for loans directed to finance working capital, sales or inventories financing, and other short-term purposes. On the other hand, development banks charge loan-restructuring operations with 1.936 percentage points of *margin*, as they benefit short-term purposes with an average interest rate margin of 1.182.

Cull *et al.* (2005) and Benavente, Galetovic, and Sanhueza (2005) claim that financial margins tend to diminish with the term of a loan. Notwithstanding, our estimates indicate that, irrespective of the bank's type, *term* does not have any relevant influence on *margin*. This might be due to the fact that most of the commercial credits in our database (98.9%) were granted in the up-to-five year term ranges.

By the same token, and in contrast with Beck *et al.* (2006), Voordeckers and Steijvers (2006) and IDB (2004), the estimated parameters imply that the age of the debtor is not an important factor in the determination of the lending interest rate margin for any bank type. The likely reason for this is that most of the debtors in our database (57.8%) were 20 or more years old.

Contrary to Beck *et al.* (2006); Saurina and Trucharte (2004); and Caprio and Demirgüc-Kunt (1997), we found no difference among banks in the way the interest rate margin reacts to the loan's balance.[26]

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[26]   All the above-mentioned levels of *margin* are presented in table 11.

To sum up, based on our estimates, the most important effects on *margin* are those that arise from the variables *bank*, *size*, *collateral*, *person*, *activity* and *purpose*. More importantly, we found important differences between the interest rate margin-setting policies among the different bank types.

4. Robustness

Do the relations presented in the previous section between *margin* and the independent variables hold over time? This question is relevant, mainly because the estimates in this paper are based on a cross-section analysis. In order to answer the question, the model was re-estimated using data from December 2008.[27]

Note that by the end of 2008, the international financial crisis had already broken out and, as a consequence, the Mexican economy had commenced to suffer negative effects (Banxico, 2009b). Similarly, bank credit to the private sector in Mexico started changing its composition. When comparing the December 2007 and December 2008 figures, some relevant differences should be mentioned:

First, even though the actual number of banks reporting to R04C was 46 in December 2008, two more private banks than in December 2007, the total number of loan records in R04C diminished. Therefore the database for December 2008 contained 332 728 records after the filtering process described in section 2, a 6.2% decline compared to December 2007 (see table 2). Second, the whole banking system distanced itself from lending to micro and small-debtors, and expanded lending to medium and large-sized borrowers.

Third, average interest rate margins decreased by 0.95 percentage points, perhaps because the costs of funding increased. The larger reductions in margin were observed in development bank loans, while the four largest commercial bank loans showed smaller reductions in margin.[28] Note that the average cost of funding increased more for

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[27] An alternative method to answer the question could be the two-period panel data analysis. However, a crucial condition for this method is that the independent variables have some variation across individual loan observations (Wooldridge, 2009: 455-458). This condition fails if the explanatory variables do not change over the time span of the analysis, as probably is the case with *size*, *bank*, *collateral*, *debtor*, *activity*, *location* and *purpose*.

[28] From December 2007 to December 2008, the average term cost of funding increased roughly one percentage point for commercial banks and 0.7 percentage points for development banks, reaching 7.2% and 8.3%, respectively.

commercial banks than for development banks. However, in response to these cost changes, banks acted differently: the four largest commercial banks increased their average lending rates by roughly half a percentage point; the rest of commercial banks increased it in about 0.28 percentage points and development banks marginally reduced their lending rates by 0.04 percentage points.

An identical procedure was followed to estimate the model for 2007 and for 2008. After estimating the model described by equation (1) by OLS, the presence of multicollinearity between the variables was rejected but the presence of heteroskedasticity was verified. Accordingly, the model was re-estimated by WLS using the variable *balance* as weight. The results are reported in column VI of table 7.

The most relevant results are the following: in December 2008, most of the estimated parameters were statistically significant at 99% of level of confidence, except for the coefficient related to the variable *location*, whose statistical significance decreased to 90%, and *age* and *balance*, which remained statistically not significant.

A *t*-statistic for each estimated parameter was constructed in order to test the null hypothesis that they were equal to the parameters estimated for December 2007. With the exemption of the estimated parameters for *age*, *term* and *balance*, all the estimated parameters changed from one year to the other. Therefore, it was necessary to verify whether the qualitative relationships between variables derived from the model with interactions (equation 2) for 2007 were still present by the end of 2008.

For that purpose, we conducted respective tests of the joint hypothesis that *bank4* and *bankdb*, and all their interactions, were equal to zero again. In the case of *bank4* and its interactions, the resulting F-statistic was 2 292 and in the case of *bankdb* and its interactions, it was 286, so we rejected the null hypothesis that the parameters of the type of bank and their corresponding interactions were jointly not statistically different from zero for each type of bank. Below the most important results for December 2008 are briefly commented.

The average interest rate margins charged by the four largest commercial banks continued to be higher than the average interest rate margins charged by the rest of commercial banks and the development banks (see table 11). Notwithstanding, our estimates suggest a qualitative change from one period to the other: although development banks continued charging the lowest *margin* to all size categories of borrowers, the rest of commercial banks, instead of the four largest banks, set the highest lending margins to small, medium and large borrowers (9.859, 9.756 and 10.919, respectively).

In general, under a less favorable economic environment, our results suggest that banks continued being sensitive to whether loans were backed by any collateral and, in that context, we confirmed the "signaling argument". However, in December 2008, development banks charged collateralized loans interest margins that were 4.141 percentage points higher than non-collateralized loans. This result not only represents a qualitative change because in December 2007 the effect of *collateral* on development banks' *margin* was calculated to be -0.04 percentage points, but it looks contrary to intuition. It is possible that it relates to new, higher-risk customers served by government banks by the end of 2008 who pledged collaterals as supplementary devices, in order to compensate the lender for the higher risk involved in their loans.[29]

Likewise, we found some interesting results in regards to the variable *activity*. First, all types of banks deepened their interest rate differentiation among economic activities as they widened the corresponding ranges of *margin*. Second, the rest of commercial banks continued to discriminate the most between economic sectors in terms of their interest rate margins (the range of their lending interest margins widened from 6.422 to 8.248 percentage points), and they continued favoring agriculture with their lowest interest rate margin (10.794), albeit slightly above the 2007 margin (9.486). Third, as a qualitative change, development banks turned out to be the ones that differentiated the least between economic activities in terms of their range –and variance– of *margin*. Fourth, the four largest private banks and development banks switched their most favored sector to the financial sector, which was charged their lowest interest rate margin (15.733 and 1.685, respectively). Finally, we found that the different types of banks charged their highest *margin* to different sectors: the four largest banks to services (21.258); the rest of commercial banks to mining (19.042); and development banks to industry (5.787). These last results imply qualitative changes as compared to our prior results.

From December 2007 to December 2008, the estimated effects of *purpose* on *margin* are mixed. On the one hand, we confirmed that: *a*) the four largest commercial banks charge their highest interest rate *margin* to loans targeting short-term purposes; *b*) the rest of commercial banks charge their lowest average *margin* to loans related to

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[29]   Collateralized loans from development banks diminished from 17 to 14 from December 2007 to December 2008; the interest rate margin charged on these loans was 4% and 5.8%, respectively, higher than those paid by the uncollateralized loans (2.6% and 1.8%, respectively).

medium and long-term purposes, and; *c*) development banks charge loan-restructuring purposes with their highest average *margin*, and favor loans directed to short-termed aims with the lowest one. On the other hand, the rest of commercial banks charged restructure-purposes, instead of short-term purposes, with their highest average *margin* (12.043), while the four largest banks favored restructuring-purposes, instead of medium and long-term purposes, with their lowest interest rate margin (14.469). It is precisely in this reaction of commercial banks' *margin* to restructuring purposes where we found the last qualitative change.

When comparing our estimates for December 2007 and December 2008, we confirmed: *a*) the positive interest rate margin gap between individuals and corporations for commercial banks; *b*) that development banks charged companies about 1.5 additional percentage points on the interest rate margin as compared to individuals; *c*) that *location* has little effect on *margin* irrespective of the bank's type, and *d*) that rural debtors of development banks pay a higher interest rate margin than their urban clients.

As in December 2007, in December 2008 the applicant's age, as well as the term and the balance of the loan were not important factors in the determination of the interest rate margin for either type of bank.

To sum up, although a few qualitative changes occurred from December 2007 to December 2008, most likely because the effects of the international financial crisis, our main results were confirmed, so we can confidently state that our prior results are robust. That is, we confirmed that the most important effects on *margin* are those that arise from the variables *bank*, *size*, *collateral*, *person*, *activity* and *purpose*.

Finally, we also confirmed that the largest and the rest of commercial banks, as well as development banks, reflect their different lending policies in the way their corresponding interest rate margins react to changes in the same set of loan borrower characteristics, and this one is the most important finding in this paper.

5. Final remarks

This paper provides empirical evidence for the existence of statistically significant differences between the effects of a set of determinants of the interest rate margins charged by commercial and development banks on their loans to the private sector in Mexico. Our results

suggest that, *ceteris paribus*, development banks do not necessarily mimic commercial banks when they set their financial margins, because their margins do not react in the same way to changes in the same set of loan and borrower characteristics.

It is worth noting that some differences between the interest rate margins of each type of bank are only a matter of magnitude, given that they point in the same direction, *e.g.*, *margin* tends to be inversely related to debtor's size and also tends to be lower for collateralized loans. Other differences reflect more profound matters related to lending practices, such as whether the lender is a commercial or a development bank.

According to our findings, the most relevant effects on the interest rate margins that the Mexican banks charge when lending to private businesses come from: *1*) the type of bank, *2*) the availability of collateral to support the loan, *3*) the borrower's size, 4) the borrower's type –an individual or a firm–, *4*) the loan's purpose (whether it is related to short-term or longer-term matters) and *5*) the debtor's economic activity.

It stands out that our results suggest that Mexican banks are particularly sensitive to whether loans are secured by any collateral and, in a sense, we found clear evidence that supports the so-called Signaling Theory.

Additional important findings of this paper can be summarized as follows: Development banks interest-rate margins are lower than those charged by private banks. This may be due in part to their relatively higher weighted cost of funds. In fact, their cost of funding is, on average, higher since they barely receive deposits from the public.

Another possible explanation for the differences between commercial and development banks interest rate margins may lie in the fact that they serve distinct clienteles. In terms of credit ultimately allocated to individuals and firms for business purposes, development banks mainly finance private financial intermediaries while private banks hold a more diversified credit portfolio within final borrowers.

Although we found no solid empirical justification for the statement that development banks follow the same criteria applied by commercial banks, we are left with mixed indications about development banks in Mexico. On the one hand, they do not seem to imitate private banks, so they might not be redundant from an economic perspective. On the other, we could not find clear evidence to enlighten us about what market failure they are attempting to solve. In this sense, it might be the case that the definition of a clear development mandate or mission statement to these institutions, such as having

a well-defined and measurable positive effect on credit additionality, should be a public policy goal.

Given that the effects of government interventions in the credit market cannot be measured on theoretical grounds but on empirical evidence only, more studies like ours are needed in order to adequately assess the developmental impact of government-owned financial institutions.

Finally, it is important to point out some limitations of our paper that could be addressed in future studies. Firstly, we only study one dimension of development banks operations, that is, we only revise the interest rate margin setting on their lending activity, both first and second tier, although they also regularly offer loan guarantees to private financial intermediaries. As a consequence, the observations belonging to development banks only represent around two percent of total observations in our sample. As far as we know, there is no similar database available yet that includes the final beneficiaries of their second-tier or loan guarantees operations, so we only know the characteristics of the directly-financed customers of development banks financing, i.e., private banks, non-bank financial institutions, and some other first-tier borrowers.

Part of the differences between the interest rate margins of commercial and development banks may be caused by some omitted variables in our model. That is, there may be unobserved characteristics that are related to the studied determinants and the financial margins (say, the opportunity cost of loan loss provisions, or the length of the relationship between banks and borrowers), which may explain part of the different estimated sensitivities. Moreover, interest rate margins could be affected by business strategies that include other financial services from which banks may profit, the so called cross selling (i.e., to entice customers, banks could lower the interest rate margin because they want another profitable business with the customer).

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Figure 1a
Weighted average total funding rate (%)
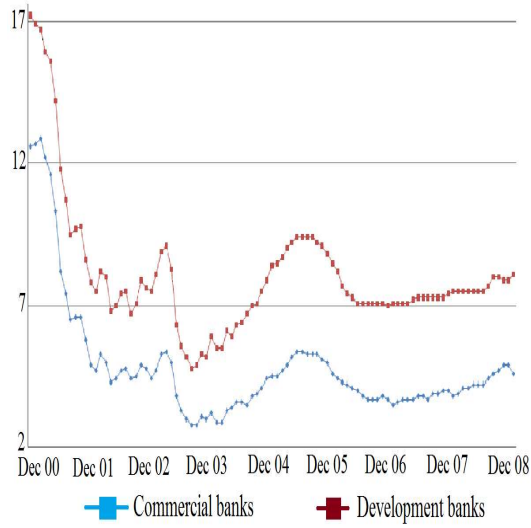
Figure 1b
Weighted average term funding rate (%)

Figure 2

Mexico's banking system's commercial loans
to private sector by size 2007-2008 */
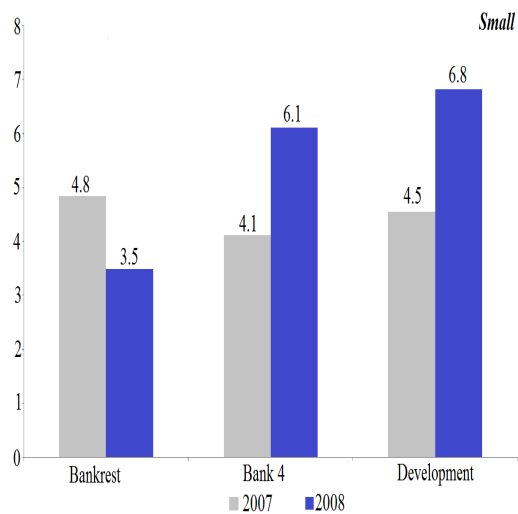
Figure 2
(*continued*)

Medium

Large
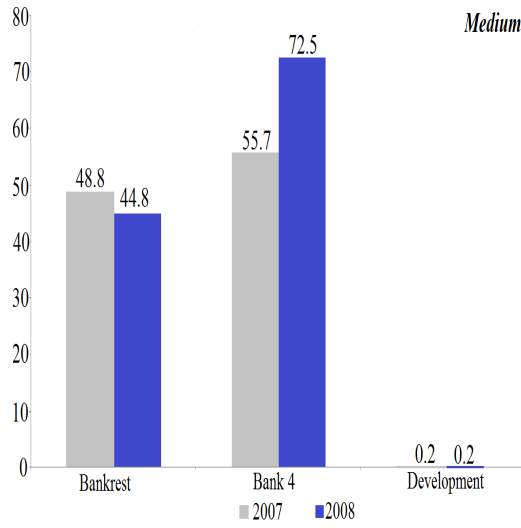
*/ Real stocks in thousands of millions of pesos as of December 2007 and December 2008 (pesos of December 2007). Note the changes in the scale of each section in the figure.

Figure 3
*Mexico's number of commercial loan
records by size 2007-2008 */*

Micro

	2007	2008

Small

	2007	2008

Figure 3
(*continued*)

Medium

	Bankrest	Bank4	Development
2007	24.4	8.6	0.1
2008	25.4	12.2	0.2

■ 2007   ■ 2008

Large

	Bankrest	Bank4	Development
2007	4.4	8.0	2.2
2008	15.3	7.4	2.5
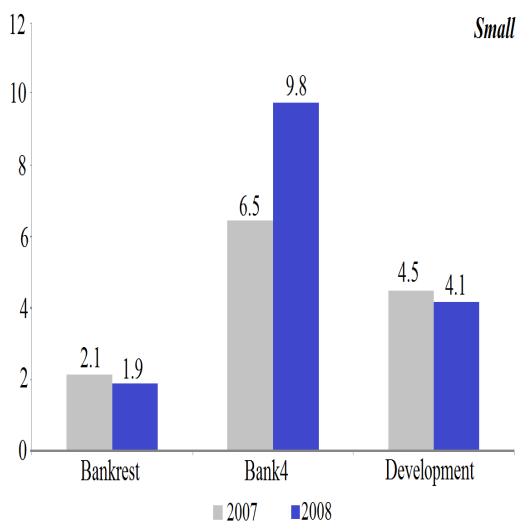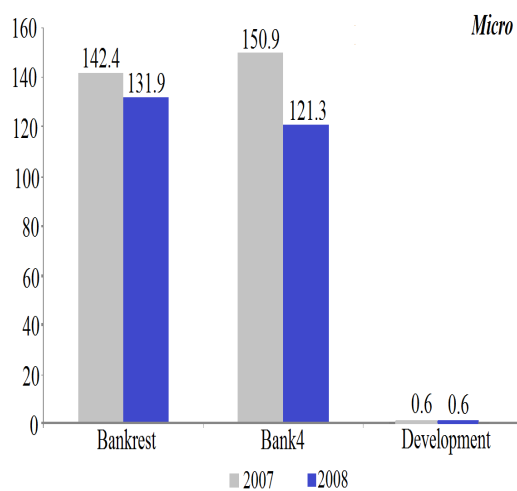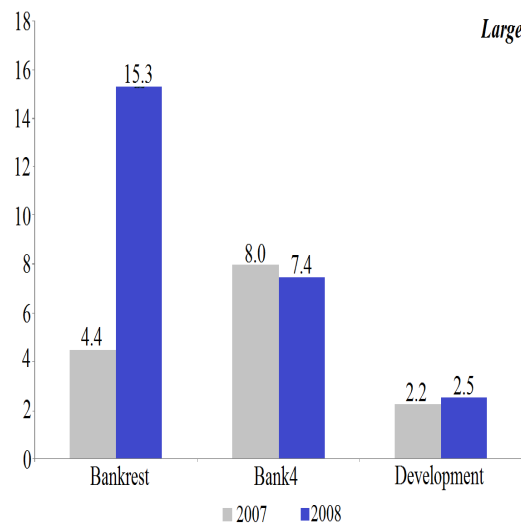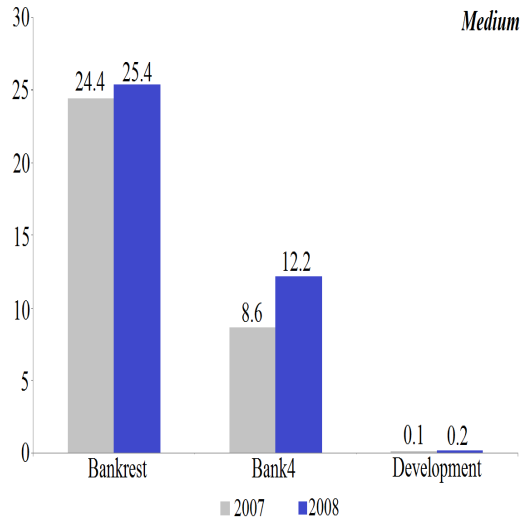
■ 2007   ■ 2008

*/ Thousands of records as of December 2007 and December 2008. Note the changes in the scale in each section of the figure.
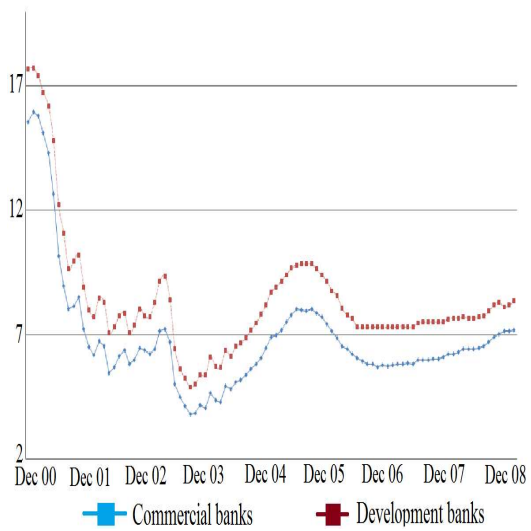
Figure 4

*Mexico's banking system average commercial
loans to private sector by size 2007-2008 */*
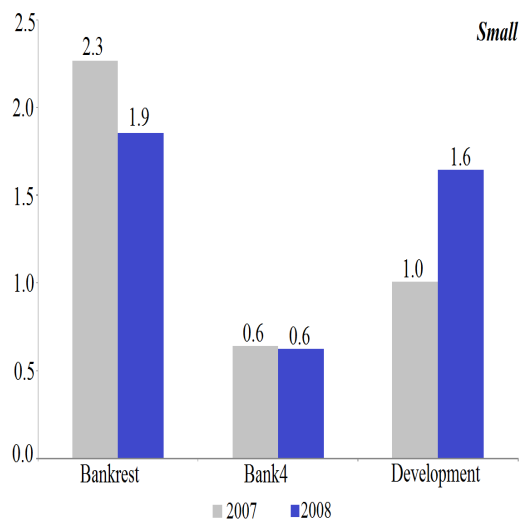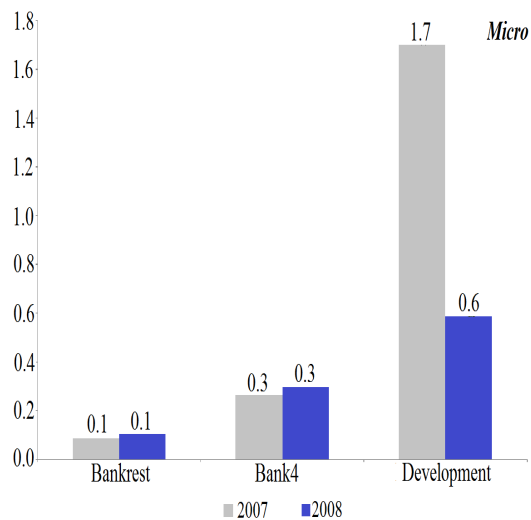
Figure 4
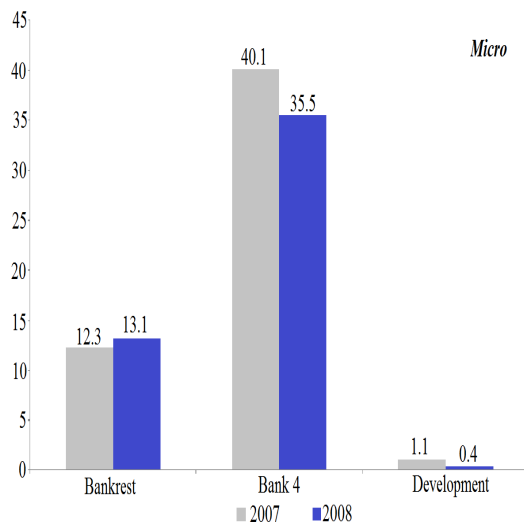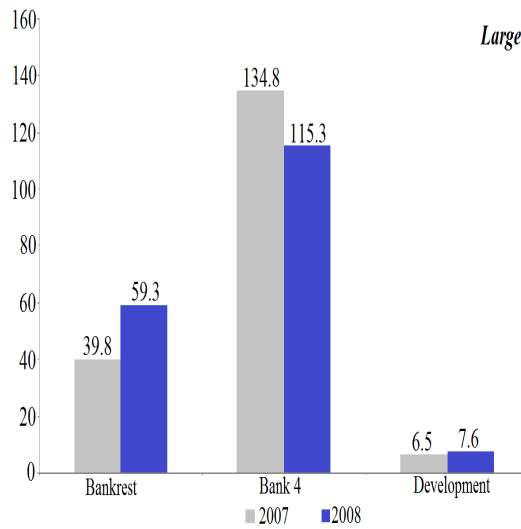(*continued*)

Medium

Large
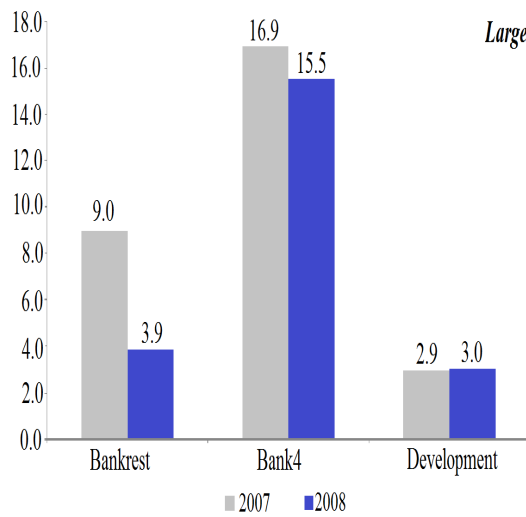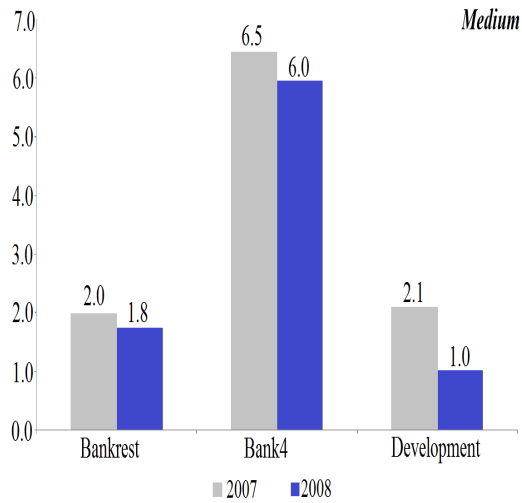
*/ Real stocks in millions of pesos as of December 2007 and December 2008 (pesos of December 2007). Note the changes in the scale in each section of the figure.

Table 1

Observations removed from the database

Variable	Reason
Size	Observations referred to loans granted to government entities or agencies (all of which are of no interest to this study).
Age	Observations showing a Federal Taxpayer Registry, *Registro Federal de Contribuyentes*, (RFC) format incompatible with the calculation of the borrower's age.
Debtor	Observations showing a Federal Taxpayer Registry, *Registro Federal de Contribuyentes*, (RFC) format incompatible with purpose of determining whether the borrower was a person or a corporation.
Location	Observations for which it was not possible to determine whether the borrower's location was urban or rural. Other observations were removed when corresponded to borrowers located abroad.
Activity	Observations for which it was impossible to determine the borrower's sector of activity. Besides, other observations were removed when corresponded to government activities, all of which are of no interest to this study.
Term	Observations showing errors in the expiration date so it was impossible to determine the actual term of the loan.
Purpose	Observations were it was impossible to determine the loan's purpose.

Table 2

Number of observations of the refined database sorted by size as of December

Size	2007				2008			
	Bankrest	*Bank4*	*Development*	*Total*	*Bankrest*	*Bank4*	*Development*	*Total*
Micro	142 420	150 905	635	293 960	131 940	121 316	634	253 890
Small	2 128	6 453	4 500	13 081	1 884	9 782	4 139	15 805
Medium	24 447	8 633	117	33 197	25 393	12 179	208	37 780
Large	4 440	7 979	2 218	14 637	15 288	7 441	2 524	25 253
Total	173 435	173 970	7 470	354 875	174 505	150 718	7 505	332 728

Note: Bank4 corresponds to the four largest commercial banks, in accordance with their assets size; Bankrest corresponds to the rest of commercial banks. Development stands for government-owned banks.

Table 3
Variables description

Variable	Unit of measure/Specification	Description
Loan's Balance (Balance)	Pesos. One variable.	Indicates the real outstanding balance of the loan as of the end of the month (December 2010 = 100). The balance includes capital and interests.
Interest margin (margin)	Percentage. One variable.	Indicates the spread between the gross annual interest rate of the loan minus the weighted average annual rate of term funding for each type of bank. In December 2007, the corresponding weighted average rate of term funding to commercial banks (*costo de captación a plazo de los pasivos en moneda nacional*) was 6.24%, while development banks' weighted average rate of term funding (*tasa de interés de los pasivos a plazo en moneda nacional*) reached 7.67%.
Borrower's age (Age)	Days. One variable.	The borrower's age was calculated subtracting from the last day of 2007 (December 31th 2007), the date read on the Federal Taxpayer Registry, that is, the *Registro Federal de Contribuyentes* (RFC). The RFC usually shows the date on which the taxpayer was born or set up in business.
Loan's Term (Term)	Days. One variable.	The term of the loan was calculated subtracting from its expiration date the date when it was outlaid.
Borrower's sector of activity (Activity)	Seven dummy variables.	Indicates the borrower's main sector of economic activity. Each sector of economic activity was related to a specific dummy variable:

Table 3
(continued)

Variable	Unit of measure/Specification	Description
		Aa = Agriculture; Ami = Mining; Ama = Manufacturing; Ai = Industry; At = Trade; As = Services; Af = Financial Sector. Government activities were removed. In each variable the number 1 was assigned when the loan was granted to the respective economic activity. Agriculture was taken as the reference category.
Type of Bank (Bank)	Three dummy variables.	Indicates the lending bank's type. Each type of bank was related to a specific dummy variable: if the bank is one of the four largest commercial banks = bank4, based on its assets size; if the bank is one of the rest of commercial banks = bankrest; development banks = bankdb. Bankrest was taken as the base category.
Type of Debtor (Debtor)	One dummy variable.	There exist two formats for RFC: the first one contains 12 characters and corresponds to persons. The second format contains 13 characters and refers to corporations. The base category (number 0) was assigned to persons and number 1 to corporations.
Borrower's Size (Size)	Four dummy variables.	Classifies the borrower's size according to the following dummy variables: SMi = micro; Ss = small; SMe = medium and Sl = large. Government entities or agencies were excluded. In each variable the number 1 was assigned when the loan was granted to the respective borrowers size. Micro size was taken as the reference category.

Table 3
(continued)

Variable	Unit of measure/Specification	Description
Loan's Purpose (Purpose)	Three dummy variables.	Different loan purposes were grouped in three dummy variables for short term, medium or long term, and restructure according to their aim or nature. Therefore, the following variables were included: Ps = short term, for working capital, sales financing, no specific purposes, etc.; Pml = medium or long term, for fixed asset, infrastructure, real estate, imports, etc., and Pr = restructure, for debt restructuring. In each variable the number 1 was assigned when the loan was granted to the respective purpose. Short term was taken as the base category.
Borrower's Location (Location)	One dummy variable.	Base category (number 0) was set to rural location and number 1 to urban location.
Existence of Collateral (Collateral)	One dummy variable.	Number 0 was set to loans for which there was no collateral and number 1 for those that exhibited collateral. Lack of collateral was taken as the base category. Collateral can take three basic forms: real guarantees, co-borrowers or loan guarantees provided by government-owned banks or by development trust funds.

Table 4A

ANOVA for margin, December 2007

Variable	Category	Median	Mean	Mean differences (base category minus each of the rest) */	Number of observations
margin */	All	8.26	12.09	0.0	354 875
Size	Micro	11.80	13.39	0.0	293 960
	Small	4.90	5.26	8.13	13 081
	Medium	6.70	6.50	6.89	33 197
	Large	3.73	4.63	8.76	14 637
Bank	Bankrest a/	7.98	8.01	0.0	173 435
	Bank4 b/	18.80	16.56	-8.55	173 970
	Development c/	1.77	2.59	5.42	7 470
Collateral	No	18.80	16.37	0.0 2/	180 341
	Yes	7.95	7.66	8.71 2/	174 534
Debtor	Individual	8.19	12.86	0.0 2/	241 891
	Corporation	8.55	10.43	2.43 2/	112 984
Activity	Agriculture	8.00	7.87	0.0	133 932
	Mining	7.70	10.44	-2.56	463
	Manufacturing	8.80	10.65	-2.77	22 341
	Industry	8.30	11.60	-3.73	15 211
	Trade	17.80	15.45	-7.58	83 377

Table 4A

(*continued*)

Variable	Category	Median	Mean	Mean differences (base category minus each of the rest) */	Number of observations
	Services	18.80	16.41	-8.53	88 285
	Financial sector	2.83	6.95	-0.92	11 266
Location	Rural	7.99	8.36	0.0 2/	39 421
	Urban	9.30	12.55	-4.19 2/	315 454
Purpose	Short term	17.80	14.90	0.0	212 820
	Medium and long term	7.99	7.84	7.07	140 803
	Restructure	11.80	11.22	3.69	1 252
Age (ranges in years)	Up to 1	8.00	8.49	0.0	52 441
	1-2	12.80	12.88	-4.38	4 898
	2-5	13.80	13.24	-4.74	26 635
	5-10	11.26	11.35	-2.85	31 600
	10-15	6.70	7.94	0.55	24 932
	15-20	7.33	9.06	-0.57	9 358
	More than 20	12.30	13.59	-5.10	205 011
Term (ranges in years)	Up to 1	16.80	13.02	0.0	64 217
	1-2	19.80	17.89	-4.86	116 127
	2-5	7.98	7.92	5.09	170 529
	5-10	5.92	6.22	6.79	3 378

Variable	Category	Median	Mean	Mean differences (base category minus each of the rest) */	Number of observations
	10-15	6.39	6.67	6.35	482
	15-20	6.16	5.73	7.29	63
	More than 20	3.80	3.24	9.78	79

Notes: 1/ Based on the Scheffé post hoc test. All mean differences were significant at 99% of confidence. 2/ Based on the *t*-test of mean differences at 99% of confidence. */ In December 2007, the average interest rate in the full sample was 18.32%. a/ In December 2007, the average interest rate in the full sample was 14.21%. b/ In December 2007, the average interest rate in the full sample was 22.76%. c/ In December 2007, the average interest rate in the full sample was 10.19%.

Table 4B
ANOVA for margin, December 2008

Variable	Category	Median	Mean	Mean differences (base category minus each of the rest) */	Number of observations
margin */	All	7.16	11.14	0.0	332,728
Size	Micro	7.74	12.76	0.0	253 890
	Small	5.70	5.40	7.36	15 805
	Medium	5.70	5.41	7.35	37 780
	Large	6.04	6.94	5.83	25 253

Table 4B
(*continued*)

Variable	Category	Median	Mean	Mean differences (base category minus each of the rest) */	Number of observations
Bank	Bankrest a/	6.98	7.29	0.0	174 505
	Bank4 b/	19.30	16.05	-8.76	150 718
	Development c/	1.13	1.85	5.44	7 505
Collateral	No	19.30	15.69	0.0 2/	165 444
	Yes	6.87	6.63	9.06 2/	167 284
Debtor	Individual	7.16	12.01	0.0 2 /	216 602
	Corporation	6.70	9.51	2.50 2 /	116 126
Activity	Agriculture	7.00	6.85	0.0	121 642
	Mining	8.80	11.53	-4.67	393
	Manufacturing	6.55	9.13	-2.28	22 429
	Industry	5.83	9.69	-2.83	15 321
	Trade	18.80	14.38	-7.53	73 563
	Services	18.80	15.78	-8.92	88 554
	Financial sector	1.86	5.42	1.43	10 826
Location	Rural	6.98	7.42	0.0 2/	37 389
	Urban	7.36	11.61	-4.19 2/	295 339
Purpose	Short term	17.80	13.86	0.0	203 584
	Medium and long term	6.98	6.82	7.04	128 002
	Restructure	9.80	9.65	4.21	1 142

Variable	Category	Median	Mean	Mean differences (base category minus each of the rest) */	Number of observations
Age (ranges	Up to 1	7.00	7.47	0.0	47 277
in years)	1-2	6.38	7.92	-0.45	2 702
	2-5	11.80	12.22	-4.75	22 802
	5-10	10.90	11.36	-3.89	32 050
	10-15	5.70	7.55	-0.08 3/	26 840
	15-20	6.04	8.57	-1.10	12 295
	More than 20	8.02	12.61	-5.14	188 762
Term (ranges	Up to 1	5.54	6.83	0.0	37 499
in years)	1-2	19.30	18.56	-11.72	116 302
	2-5	7.00	7.25	-0.41	173 152
	5-10	5.66	6.29	0.54	5 050
	10-15	5.39	5.93	0.90	588
	15-20	4.75	4.65	2.19	56
	More than 20	2.80	1.66	5.17	81

Notes: 1/ Based on the Scheffé post hoc test. All mean differences were significant at 99% of confidence. 2/ Based on the t test of mean differences at 99% of confidence. 3/ The difference was not statistically significant. */ In December 2008, the average interest rate in the full sample was 18.36%. a/ In December 2008, the average interest rate in the full sample was 14.49%. b/ In December 2008, the average interest rate in the full sample was 23.25%. c/ In December 2008, the average interest rate in the full sample was 10.15%.

A

2007 \ 2008	Margin	Micro	Small	Medium	Large	BankDB	Bank4	BankRest	Collateral	Debtor	Age	Agriculture	Mining
Margin	**1**	.436	-.191	-.306	-.180	-.211	.667	-.603	-.676	-.178	.206	-.485	0.002b
Micro	.456	**1**	-.401	-.642	-.514	-.242	.090	-.017	.019	-.649	.176	.398	-.026
Small	-.212	-.430	**1**	-.080	0.64	.360	.074	-.181	.046	.223	-.060	-.159	.010
Medium	-.285	-.706	-.063	**1**	-.103	-.041	-.094	.106	.034	.478	-.146	-.249	.029
Large	-.246	-.456	-.041	-.067	**1**	.149	-.091	.046	-.107	.290	-.060	-.212	.000b
BankDB	-.221	-.289	.440	-.039	.189	**1**	-.138	-.160	-.152	.191	-.053	-.115	-.004a
Bank4	.698	.102	.001b	-.148	.023	-.144	**1**	-.956	-.638	.186	.108	-.681	.009
BankRest	-.634	-.019	-.128	.159	-.077	-.143	-.959	**1**	.681	-.242	-.092	.713	-.008
Collateral	-.693	-.034	-.002b	.080	-.050	-.144	-.771	.812	**1**	-.249	-.089	.745	-.008
Debtor	-.180	-.625	.224	.460	.300	.198	.193	-.250	-.252	**1**	-.333	-.530	.032
Age	.213	.169	-.055	-.135	-.071	-.053	.123	-.108	-.101	-.324	**1**	-.030	-.011
Agriculture	-.521	.332	-.143	-.231	-.156	-.114	-.756	.789	.784	-.513	-.044	**1**	-.026
Mining	-.009	-.046	.002b	.033	.038	-.004a	.011	-.010	.004a	.039	-.011	-.028	**1**
Manufacturing	-.059	-.219	.061	.172	.105	-.015	.119	-.115	-.097	.267	-.046	-.202	-.009
Industry	-.016	-.132	-.004	.152	.032	-.024	.115	-.109	-.038	.215	-.058	-.165	-.008
Trade	.297	-.095	.035	.104	-.006	-.060	.354	-.337	-.336	.140	.058	-.431	-.020
Services	.395	.013	-.011	.003b	-.018	-.032	.385	-.376	-.426	.108	.066	-.448	-.021
Financial services	-.148	-.256	.258	-.040	.299	.589	-.016	-.153	-.126	.188	-.048	-.141	-.007

Table 5
(*continued*)

A

2007 \ 2008	Margin	Micro	Small	Medium	Large	BankDB	Bank4	BankRest	Collateral	Debtor	Age	Agriculture	Mining
Location	.209	-.108	.052	.071	.053	.046	.282	-.295	-.312	.184	.008	-.366	.009
Term (days)	-.558	.047	-.027	.011	-.080	-.029	-.738	.747	.733	-.276	-.077	.726	-.023
Short term (purpose)	.548	-.271	.077	.203	.144	.045	.775	-.788	-.781	.449	.058	-.922	.026
Medium and long term (purpose)	-.548	.275	-.077	-.208	-.144	-.046	-.775	.788	.782	-.454	-.058	.929	-.026
Restructure (purpose)	-.008	-.030	.004a	.038	-.002b	.009	-.008	.006	.003a	.034	.000b	-.043	.003b
Balance	-.051	-.067	.000b	.026	.088	.004a	.013	-.014	.005	.050	-.013	-.027	.003a

B

Manufac-turing	Industry	Trade	Services	Financial services	Location	Term (days)	Short term (purpose)	Medium and long term (purpose)	Restructure (purpose)	Balance
-.080	-.048	.258	.418	-.157	.197	-.519	.510	-.510	-.013	-.060
-.233	-.167	-.099	-.039	-.222	-.127	.076	-.348	.352	-.028	-.073
.068	-.001b	.072	-.037	.259	.056	-.048	.108	-.108	-.001b	-.001b
.194	.188	.129	-.031	-.048	.071	-.025	.223	-.229	.048	.033

Table 5
(*continued*)

B

Manufac- turing	Industry	Trade	Services	Financial services	Location	Term (days)	Short term (purpose)	Medium and long term (purpose)	Restructure (purpose)	Balance
.087	.043	-.054	.129	.206	.074	-.053	.204	-.203	-.011	.079
-.014	-.025	-.054	-.071	.664	.049	-.055	.059	-.059	.001b	.006
.114	.114	.334	.319	-.025	.244	-.672	.697	-.695	-.023	.017
-.110	-.106	-.317	-.297	-.172	-.258	.686	-.712	.711	.023	-.019
-.059	-.018	-.281	-.451	-.135	-.306	.621	-.742	.741	.013	.003b
.266	.227	.149	.102	.188	.186	-.277	.466	-.471	.034	.063
-.043	-.064	.045	.065	-.049	.001b	-.059	.046	-.046	-.002b	-.017
-.204	-.167	-.404	-.457	-.139	-.359	.657	-.909	.915	-.040	-.035
-.009	-.008	-.018	-.021	-.006	.006	-.014	.022	-.023	.004a	.005
1	-.059	-.143	-.162	-.049	.055	-.164	.173	-.177	.026	.029
-.055	**1**	-.117	-.132	-.040	.058	-.143	.153	-.153	-.001b	.032
-.144	-.117	**1**	-.321	-.098	.146	-.300	.374	-.378	.027	-.009
-.149	-.122	-.319	**1**	-.110	.172	-.248	.425	-.427	.007	.001b
-.047	-.038	-.100	-.104	**1**	.059	-.061	.103	-.103	-.007	.033
.065	.055	.158	.168	.059	**1**	-.243	.336	-.338	.016	.007
-.147	-.138	-.340	-.309	-.057	-.276	**1**	-.676	.670	.053	.021
.176	.155	.409	.412	.116	.346	-.749	**1**	-.993	-.074	.029

Table 5
(*continued*)

B

Manufac-turing	Industry	Trade	Services	Financial services	Location	Term (days)	Short term (purpose)	Medium and long term (purpose)	Restructure (purpose)	Balance
-.180	-.155	-.412	-.414	-.116	-.348	.743	-.993	**1**	-.046	-.031
.029	.000b	.022	.011	.000b	.017	.056	-.073	-.048	**1**	.019
.026	.019	-.007	.004a	.025	.007	.016	.023	-.024	.012	**1**

Notes: *Statistically significant at 99% of confidence, a Statistically significant at 95% of confidence, b Statistically not different from zero.

Table 6

Existence of collateral by economic activity

				Activity			
				December 2007			
	Agriculture	*Mining*	*Manufacturing*	*Industry*	*Trade*	*Services*	*Financial sector*
No	657	212	15 546	9 108	67 607	77 562	9 649
Yes	133 275	251	6 795	6 103	15 770	10 723	1 617
				December 2008			
	Agriculture	*Mining*	*Manufacturing*	*Industry*	*Trade*	*Services*	*Financial sector*
No	812	241	13 632	8 242	55 992	77 157	9 368
Yes	120 830	152	8 797	7 079	17 571	11 397	1 458

Table 7

*Estimated parameters */*

I	December 2007			December 2008		
	II	III	IV	V	VI	VII
Variable	*Equation 1*	*Equation 1*	*Equation 2*	*Equation 1*	*Equation 1*	*Equation 2*
Constant	13.577	13.385	9.486	13.928	14.459	10.794
Small	-6.417	-6.198	0.003 5/	-6.024	-7.226	-0.935
Medium	-6.307	-6.661	-1.049	-7.300	-7.066	-1.038
Large	-8.340	-7.908	1.010	-6.742	-6.511	0.125
Bank4	0.501	0.538	10.168	1.075	1.029	7.633
Bankdb	-5.747	-6.630	-8.304	-5.960	-6.361	-7.321
Collateral	-3.856	-3.196	-1.218	-4.096	-4.004	-2.354
Debtor	-3.109	-3.301	-6.616	-2.688	-2.653	-4.692
Mining	5.974	5.684	6.107	5.308	6.410	8.248
Manufacturing	3.927	3.863	5.798	3.161	2.287	1.679
Industry	4.491	4.482	5.781	3.658	2.932	2.314
Trade	5.255	5.311	6.422	4.669	4.253	4.141
Services	5.444	5.449	6.251	5.215	4.424	4.078
Financial services	4.438	4.893	4.336	2.839	3.322	1.609
Location	0.079	0.025	**0.015** 3/	**0.030** 3/	**0.024** 3/	**-0.001** 5/
Medium and long term	-1.617	-2.843	-0.919	-1.846	-3.238	-0.940
Restructure	-0.827	-1.520	-0.496	-0.247	-1.258	1.249
Term (days)	0.000	0.000	0.000	-0.001	0.000	0.000

Table 7
(*continued*)

	December 2007			December 2008		
I	*II*	*III*	*IV*	*V*	*VI*	*VII*
Age (days)	0.000	**0.000** 5/	**0.000** 5/	0.000	**0.000** 5/	**0.000** 5/
Balance (pesos)	0.000	**0.000** 5/	**0.000** 5/	0.000	**0.000** 5/	**0.000** 5/
*Bank4*Small*			-7.994			-9.487
*Bankdb*Small*			-1.228			**0.374** 4/
*Bank4*Medium*			-7.865			-9.837
*Bankdb*Medium*			**0.586** 4/			1.732
*Bank4*Large*			-12.045			-11.782
*Bankdb*Large*			-3.585			-2.084
*Bank4*Collateral*			-1.692			0.188
*Bankdb*Collateral*			**-3.106** 5/			6.495
*Bank4*Debtor*			3.421			2.200
*Bankdb*Debtor*			8.167			6.260
*Bank4*Mining*			-4.359			-6.452
*Bankdb*Mining*			**-3.994** 5/			**-9.654** 3/
*Bank4*Manufacturing*			-6.930			-1.236
*Bankdb*Manufacturing*			-3.369			**-0.581** 5/
*Bank4*Industry*			-6.273			-2.011
*Bankdb*Industry*			**-1.929** 3/			**-0.595** 5/
*Bank4*Trade*			-6.271			-2.610

Table 7

(*continued*)

I	II	III	IV	V	VI	VII
			December 2007			*December 2008*
*Bankdb*Trade*			-3.812			**-2.477** 3/
*Bank4*Services*			-5.955			-2.437
*Bankdb*Services*			-6.443			-5.140
*Bank4*Financial services*			-4.303			-0.680
*Bankdb*Financial services*			-3.731			-3.397
*Bank4*Location*			0.161			0.216
*Bankdb*Location*			**-0.506** 3/			**-0.810** 3/
*Bank4*Medium and long term*			-2.820			-1.811
*Bankdb*Medium and long term*			1.271			1.103
*Bank4*Restructure*			-1.756			-5.207
*Bankdb*Restructure*			**1.250** 3/			**-0.687** 5/
*Bank4*Term*			-0.001			**0.000** 3/
*Bankdb*Term*			0.000			0.000
*Bank4*Age*			**0.000** 5/			**0.000** 5/
*Bankdb*Age*			**0.000** 5/			**0.000** 5/
*Bank4*Balance*			**0.000** 5/			**0.000** 5/
*Bankdb*Balance*			**0.000** 4/			**0.000** 5/

Table 7

(*continued*)

I	December 2007			December 2008		
	II	III	IV	V	VI	VII
R2 (Adjusted)	0.799	0.854	0.870	0.806	0.853	0.871
F-test	74 333	109 553	44 945	72 814	101 823	42 435
Observations	354 874	354 874	354 874	332 727	332 727	332 727

Notes: */ Estimated parameters were statistically different from zero at 99% of confidence (t-statistic). 1/ Estimated by OLS, 2/ Estimated by WLS, 3/ Statistically different from zero at 90% of confidence (t-statistic), 4/ Statistically different from zero at 80% of confidence (t-statistic), 5/ Statistically not different from zero (t-statistic).

Table 8

*Estimated effects of size on margin */*

	Bankrest	Bank4	Development
(Small/Micro)	$\hat{\alpha}_1$	$\hat{\alpha}_1 + \hat{\alpha}_{20}$	$\hat{\alpha}_1 + \hat{\alpha}_{21}$
(Medium/Micro)	$\hat{\alpha}_2$	$\hat{\alpha}_2 + \hat{\alpha}_{22}$	$\hat{\alpha}_2 + \hat{\alpha}_{23}$
(Large/Micro)	$\hat{\alpha}_3$	$\hat{\alpha}_3 + \hat{\alpha}_{24}$	$\hat{\alpha}_3 + \hat{\alpha}_{25}$

*/ The estimated effects were calculated taking micro as the base or reference category.

Table 9

*Estimated effects on margin in percentage points */*

I	Bankrest		Bank4		Development	
	II	III	IV	V	VI	VII
Variable	2007	2008	2007	2008	2007	2008
Size						
Micro	—	—	—	—	—	—
Small	0.003	-0.935	-7.991	-10.422	-1.225	-0.561
Medium	-1.049	-1.038	-8.914	-10.875	-0.463	0.694
Large	1.010	0.125	-11.035	-11.657	**-2.575**	**-1.959**
Collateral	-1.218	-2.354	-2.910	-2.166	-1.218	4.141
Debtor	-6.616	-4.692	-3.195	-2.492	1.551	1.568
Activity						
Agriculture	—	—	—	—	—	—
Mining	6.107	8.248	1.748	1.796	6.107	-1.406
Manufacturing	5.798	1.679	-1.132	0.443	2.429	1.679
Industry	5.781	2.314	-0.492	0.303	3.852	2.314
Trade	6.422	4.141	0.151	1.531	2.610	1.664
Services	6.251	4.078	0.296	1.641	-0.192	-1.062
Financial services	4.336	1.609	0.033	0.929	0.605	**-1.788**
Location	0.015	-0.001	0.176	0.215	-0.491	-0.811
Purpose						
Short term	—	—	—	—	—	—

Table 9
(*continued*)

	Bankrest		Bank4		Development	
I	II	III	IV	V	VI	VII
Variable	*2007*	*2008*	*2007*	*2008*	*2007*	*2008*
Medium and long term	-0.919	-0.940	-3.739	-2.751	0.352	0.163
Restructure	-0.496	1.249	-2.252	-3.958	0.754	1.249
Term	0.000	0.000	-0.001	0.000	0.000	0.000
Age	0.000	0.000	0.000	0.000	0.000	0.000
Balance	0.000	0.000	0.000	0.000	0.000	0.000

*/Based on WLS Estimation of Equation 2 (columns IV and VII in table 7). See Johnston (1984: 232) and Wooldridge (2007: 197-199 and 238-244). See notes on table 7.

Table 10
*Estimation of margin sorted by the size of the borrower */*

Size	*Bankrest*	*Bank4*	*Development*
Micro	$\hat{\alpha}_0$	$\hat{\alpha}_0 + \hat{\alpha}_4$	$\hat{\alpha}_0 + \hat{\alpha}_5$
Small	$\hat{\alpha}_0 + \hat{\alpha}_1$	$\hat{\alpha}_0 + \hat{\alpha}_1 + \hat{\alpha}_4 + \hat{\alpha}_{20}$	$\hat{\alpha}_0 + \hat{\alpha}_1 + \hat{\alpha}_5 + \hat{\alpha}_{21}$
Medium	$\hat{\alpha}_0 + \hat{\alpha}_2$	$\hat{\alpha}_0 + \hat{\alpha}_2 + \hat{\alpha}_4 + \hat{\alpha}_{22}$	$\hat{\alpha}_0 + \hat{\alpha}_2 + \hat{\alpha}_5 + \hat{\alpha}_{23}$
Large	$\hat{\alpha}_0 + \hat{\alpha}_3$	$\hat{\alpha}_0 + \hat{\alpha}_3 + \hat{\alpha}_4 + \hat{\alpha}_{24}$	$\hat{\alpha}_0 + \hat{\alpha}_3 + \hat{\alpha}_5 + \hat{\alpha}_{25}$

*/ The estimated margin was calculated as suggested by Johnston (1984: 232-233).

Table 11

*Estimated levels of margin (%) */*

	Bankrest			Bank4			Development		
I	II	III	IV	V	VI	VII	VIII	IX	X
Variable	2007	2008	Difference	2007	2008	Difference	2007	2008	Difference
Size									
Micro	9.486	10.794	1.308	19.654	18.427	-1.227	1.182	3.473	2.291
Small	9.489	9.859	0.370	11.660	8.005	-3.655	**-0.046**	2.912	2.958
Medium	8.437	9.756	1.319	10.740	7.552	-3.188	0.719	4.167	3.448
Large	10.496	10.919	0.423	8.619	6.770	-1.849	**-1.393**	1.514	2.907
Collateral									
No	9.486	10.794	1.308	19.654	18.427	-1.227	1.182	3.473	2.291
Yes	8.268	8.440	0.172	16.744	16.261	-0.483	-0.036	7.614	7.650
Debtor									
Individual	9.486	10.794	1.308	19.654	18.427	-1.227	1.182	3.473	2.291
Corporation	2.870	6.102	3.232	16.459	15.935	-0.524	2.733	5.041	2.308
Activity									
Agriculture	9.486	10.794	1.308	19.654	18.427	-1.227	1.182	3.473	2.291
Mining	15.593	19.042	3.449	21.402	20.223	-1.179	7.289	2.067	-5.222
Manufacturing	15.284	12.473	-2.811	18.522	18.870	0.348	3.611	5.152	1.541
Industry	15.267	13.108	-2.159	19.162	18.730	-0.432	5.034	5.787	0.753
Trade	15.908	14.935	-0.973	19.805	18.578	-1.227	3.792	5.137	1.345

Table 11
(*continued*)

I	Bankrest			Bank4			Development		
	II	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*	*X*
Variable	*2007*	*2008*	*Difference*	*2007*	*2008*	*Difference*	*2007*	*2008*	*Difference*
Services	15.737	14.872	-0.865	19.950	21.258	1.308	0.990	2.411	1.421
Financial services	13.822	12.403	-1.419	19.687	15.733	-3.954	1.787	1.685	-0.102
Location									
Rural	9.486	10.794	1.308	19.654	18.427	-1.227	1.182	3.473	2.291
Urban	9.501	10.794	1.292	19.830	18.642	-1.188	0.691	2.662	1.971
Purpose									
Short term	9.486	10.794	1.308	19.654	18.427	-1.227	1.182	3.473	2.291
Medium and long term	8.567	9.854	1.287	15.915	15.676	-0.239	1.534	3.636	2.102
Restructure	8.990	12.043	3.053	17.402	14.469	-2.933	1.936	4.722	2.786
Term	9.486	10.794	1.308	19.654	18.427	-1.226	1.182	3.473	2.291
Age	9.486	10.794	1.308	19.654	18.427	-1.227	1.182	3.473	2.291
Balance	9.486	10.794	1.308	19.654	18.427	-1.227	1.182	3.473	2.291

*/ The estimated levels were calculated as suggested by Johnston (1984: 232-233).