

Does location matter to explain loan interest rates? Evidence from Brazilian local banking markets

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RESUMO

O setor bancário brasileiro é altamente concentrado. Embora concentração não signifique necessariamente que o mercado se comporta de forma não competitiva, o grau de competição é frequentemente questionado no país. Utilizando uma base de dados extensiva e única do mercado de crédito brasileiro, este trabalho procura avaliar muitos dos fatores que contribuem para a variação nas taxas de juros cobradas pelos bancos nos diferentes mercados locais em duas categorias de empréstimos. A concentração não é significativa ou mesmo associada a taxas de juro mais baixas, em parte devido ao papel dos bancos públicos. O prêmio de default é significativo, e há alguma evidência de imperfeição de mercado. Neste trabalho, analisamos também o comportamento de precificação dos bancos em diferentes regiões do país, e encontramos que a localização é importante para explicar as taxas de juro dos empréstimos.

Palavras-chave: bancos, operações de crédito, taxa de juro, concentração de mercado.

ABSTRACT

Brazilian banking sector is highly concentrated. Although concentration does not necessarily imply that the market behaves non-competitively, the degree of competition is frequently questioned in the country. Using an extensive and unique database of the Brazilian credit market, this paper seeks to evaluate many of the factors that account for the differences in the interest rates charged by banks in different local markets in two categories of loans. Concentration is not significant or even associated with lower interest rates, partly due to the role of public banks. Default premium is positive and significant, and we find some evidence of market imperfection. In this paper we also analyze bank pricing behavior across different regions in the country, and find that location do matter to explain loan interest rates.

Keywords: banks, credit operations, interest rate, market concentration.

Area 7: Microeconomics, Quantitative Methods and Finance

JEL Codes: E43; D43; G21

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1 Introduction

In the last 20 years, Latin American banking sectors have experienced a process of consolidation that was accompanied by significant increases in concentration. Although there is an extensive literature analyzing the impact of bank concentration on prices, efficiency, credit availability and financial stability, the results are not conclusive. See Berger, Demsetz, and Strahan (1999) and Berger et al. (2004) for a review of the existing literature.

The banking industry in Brazil is highly concentrated. Although concentration does not necessarily imply that the market behaves non-competitively, the degree of competition is frequently questioned in the country since banking spread is still elevated and the participation of credit in the gross domestic product, low compared to other countries despite the stabilization of the economy. Nakane (2002) investigated the Brazilian banking market and found that although it does not operate under perfect competition, the cartel hypothesis was rejected too. The study, however, was carried out in an aggregated level, hence the definition of relevant market might be considered too broad in scope.

Firms compete across a number of dimensions, as most have broad product and geographic span. Nonetheless, due to lack of data, research with both dimensions is very limited. In contrast to previous studies, which focus on a nationwide level of aggregation, we take advantage of an unusually rich database to analyze the factors that might explain the average level of interest rates in different local markets for two types of financing: discount of accounts receivable and working capital loan. We perform tests similar to those applied in the international literature to examine whether local markets rates variation exists and estimate which factors account for those differences.

The Brazilian financial market is characterized by the predominance of large nationwide banks, meaning that the same rivals meet at multiple locations. One can argue that pricing setting is centralized in the head offices. Although large banks can set a uniform rate for deposits and loans over a state or region, it is more likely that price discrimination in bank branches occurs when customers possess lower bargaining power and lesser options to shop around. We therefore expect that prices differ not only by banks but also by local markets.

The role of different financial institutions in affecting the overall competition in the banking sector has received little attention. Despite the wave of privatization that occurred in the 90's, the presence of public banks is still very strong since a great part of the monopolies in local markets are held by government-owned institutions. As public institutions are still very active in the Brazilian banking sector, in this study we incorporate the possibility that government-controlled banks compete in a different way and influence the behavior of the other banks in the market.

We include other risk-adjusted marginal cost of loans as well. As observed by Oliver, Fumás and Saurina (2006), interest rate and default risk are factors that should be considered in the composition of the marginal cost on bank loans. Both have been ignored in previous researches, whereas our database allows us to incorporate those variables.

The results show that, despite the high concentration in Brazilian local markets, it shows to be non-harmful to consumers. Contrary to the general expectations, concentration is non-significant or even associated with lower interest rates, partly due to the role of public banks. As expected, default risk represents an important factor in the differences in the rates banks charge in local markets. Nonetheless, we also identify the existence of some market imperfection in the discount of accounts receivable market. Although scale is expressed in lower rates, it is less pronounced among the largest banks, and higher credit expertise is associated with higher rates, indicating that not all the gains are passed to the consumers. Market imperfection is observed in the working capital loan market too, and may be a consequence of market power exercise. Finally, we examine the dynamics of bank pricing decisions through different regions of the country. We find that location do matter to explain loan interest rates, however, there isn't a clear, uniform pattern, with geographical pricing strategy varying between banks.

The remainder of the paper is organized as follows. Section 2 reviews prior research of bank concentration and consolidation. The data used in our study are described in Section 3. Section 4 introduces the methodology to be applied in this paper. Section 5 presents the main results and then focuses on how banks behavior varies across different regions of the country. Section 6 concludes.

2 RELATED LITERATURE

As of the early 1990s, a number of studies based on the structure-conduct-performance (SCP) paradigm to explain the relationship between price and market concentration. According to the SCP hypothesis, less favorable prices to consumers in more concentrated markets is a consequence of collusion or other forms of non-competitive behavior of firms. Bank prices were considered as endogenous indicators of bank conduct and performance, and market structure, measured by the Herfindahl-Hirschman Index (HHI) or n-firm concentration ratio (CR_n), the key exogenous variable.³ Most of the empirical research focused on U.S. local markets – usually defined as Metropolitan Statistical Areas (MSAs) or non-MSA counties – and found that banks in more concentrated markets pay lower interest rates on retail deposits (BERGER; HANNAN, 1989) and charge higher rates on small business loans (HANNAN, 1991).

Research in other markets has been limited due to lack of data on the quantities and interest rates of products offered by banks. In this article we take advantage of an extensive and unique database of the Brazilian credit market and perform tests similar to those applied by Berger and Hannan (1989) and Hannan (1991) to analyze the interest rate charged by banks in different local markets. We improve previous studies in three ways. First, we match the exogenous variables with the corresponding market in analysis. As loan data were not available by MSA, Hannan (1991) used population as a proxy for market size and the business failure rate of the state in which each bank is located, for the riskiness of the local market. Moreover, deposits were used to assign the local market of each bank. Branching is not restricted in Brazil and the same bank can be found in multiple regions, therefore such criterion would not be appropriate. Information on the location of the borrowers is available in our database, enabling a more adequate definition of the local market. To control for efficiency, Berger and Hannan (1989) included market share variable in deposit price regressions. Yet, market share may also be an indicator of market power, so an alternative measure of operational efficiency is applied in this study.

Tonooka and Koyama (2003) performed tests similar to Berger and Hannan (1989) to analyze the price-concentration relationship in the Brazilian banking industry, and found no significance of concentration on loans interest rates. They argue that concentration in each category of loan may not be sufficiently high to characterize the existence of market power. However, it is important to highlight that their definition of relevant market was based only on the product concept, ignoring any possibility of regional market power. The geographical extent of the country and the concentration of the economic activity in the southeast region represent a limitation for branching in more remote regions. Consequently, when both product and geographic dimensions are taken into account, concentration in local markets is on average very high and may have a negative effect on consumers, specially for households and small businesses enterprises.

Based on a different approach, Nakane (2002) developed an empirical model to test the significance of market power in the Brazilian banking market. Nonetheless, the definition of relevant market used in the study (free credit market) may be considered too broad in scope and the results should be interpreted as estimates of the average degree of market power over various markets. In this paper, we consider both the product and geographic dimension in the definition of relevant market and to our knowledge, it is the first to properly consider the local market issue in the Brazilian

³HHI is the sum of the squared market share of all active banks. CR_n is the sum of market share of the n-largest banks in the market.

banking market.

And finally, the public bank issue. The hypothesis that certain categories of banks affect the competitive environment in different ways has received little attention in the literature. Peria and Mody (2004) argue that foreign banks have access to other markets and to more modern technology, which could represent a competitive advantage in comparison to domestic banks, whereas Berger et al. (2005) suggest that small banks would be more competitive than large banks in activities that require soft information processing (BERGER et al., 2005).

Government-controlled institutions are still very representative in the Brazilian banking market despite the wave of privatization that occurred in the last decade. Social function has been frequently used to justify the persistence of public banks. Nevertheless, they can also be used to induce a more competitive environment in the industry.⁴ In this article, we therefore incorporate the possibility that public banks compete in a different way and influence the behavior of the other banks in the market.

In the literature on banking concentration and competition, another strand has examined the dynamic effects of bank mergers and acquisitions on prices. The general conclusion is that in-market consolidation generates adverse price changes for customers (PRAGER; HANNAN, 1998). Nevertheless, those effects seem to depend on the local market share of the targeted bank (SAPIENZA, 2002) and on the type of product (KAHN; PENNACHI; SOPRANZETTI, 2005). Moreover, it is important to separate the short-run from the long-run impact of in-market consolidation, since the efficiency gains may take time to materialize (FOCARELLI; PANETTA, 2003).

Other studies have employed non-structural models of competition, such as those developed by Bresnahan (1982) and Lau (1982) and Panzar-Rosse (1987). Nonetheless, they are usually nationwide or cross-country tests and have not been applied to examine the degree of competitiveness in local markets.⁵

3 DATA

3.1 Sources

The main source for this paper is the “Sistema de Informações de Crédito” (SCR), an information system of the Brazilian Central Bank that collects data on the characteristics of loans granted by financial institutions under its supervision. Since 2003 all financing (loans, leasing operations, advances, mortgages, collateral and losses on such operations) are reported in a monthly basis by the entity exercising the ultimate control over the financial operation. The information is very detailed for individual loans with a face value of R\$ 5,000 (equivalent to US\$ 2,093 as of mid January, 2009) or more, including the interest rate, maturity, frequency of payments, type of loan, whether the loan is fixed or floating-rate, etc. It also provides some information on the characteristics of the borrowers, such as date of birth, home’s ZIP code, gender and occupation if households, and date of foundation, headquarters’ zip code and economic activity if firms. These data are used for monitoring purposes and are highly confidential. The data from SCR were matched with COSIF, another information system of Banco Central do Brasil that contains accounting reports of the Brazilian financial institutions. Quarterly balance sheets and income statements were used to construct a bank-level aggregate data.

⁴Research on public bank is very extensive. La Porta et al. (2002) and Yeyati et al (2004) studied the impact of government-owned institutions in the financial and economic development, while Mian (2003) and Micco et al. (2007) investigated the lower performance of public banks. Micco and Paniza (2006) indicate that public banks have a important role in the credit stabilization, specially in periods of economic downturn, whereas Dinç (2005) and Sapienza (2004) criticize the political use of the public banks.

⁵See Bikker and Haaf (2002) for a cross-country study and Claessens and Laeven (2004) and Yeyati and Micco (2003) for papers that adopted non-structural models of competition in different countries.

3.2 Sample selection

Ideally, the evaluation of competitive conditions and the degree of concentration in the banking industry has to depart from the definition of the market under consideration. The definition of relevant market has both a product and a geographical dimension. The product definition of a market is based on the substitutability of the products from the point of view of specific consumer wants. Banks usually sell their outputs in two distinct markets, namely retail and corporate banking markets. Customers cannot substitute retail loans for corporate loans or vice versa, since demand in both markets are independent. In addition, both differ regard as informational asymmetries and the extent of customer mobility. As a result, a separation between retail and corporate loans has to be made. Households were not considered in this study because information on interest rate in our database is available only for loans of at least R\$ 5,000, which would limit our analysis basically to mortgage financing, a type of loan that receives a lot of subsidized funds and therefore would distort the analysis. We focus our attention to discount of accounts receivable, a type of financing in which the bank advances a percentage of the invoiced amount and that is used mainly by small business enterprises.⁶ This seems appropriate for our study since the available evidence suggest that small businesses regard the relevant market for banking as local and are unlikely to have access to financing services in other areas of the country.

The study was further expanded to include another product, working capital loan. Brazilian industrial structure is characterized by many small, privately held companies, all of which rely heavily on bank loans since access to other sources of capital is limited. And working capital loans are individually the most representative type of financing for those borrowers.

The data on SCR cover all types of financial institutions, banks and non-banks. The inclusion of non-bank institutions permits to take into account the influence of other forms of financial intermediation in the competitive environment, however, their representativeness in the credit volume is still very low, and with activities concentrated in a few municipalities. Moreover, non-bank institutions such as "financeiras" are well-known for charging higher interest rates compared to banks, so we restricted our attention to banking firms. Credit cooperatives were also excluded, they usually concentrate lending in a very narrow niche and only recently have they started to send information to SCR.

Information is available either for new and preexisting loans. Nonetheless, since changes in the market conditions would be reflected mostly in new loans, rather than in the entire portfolio of existing loans, only loans granted in each respective month were used in the calculation of the average interest rate charged by each financial institution in each local market.

Finally, while information on the individual loans is available in a monthly basis, accounting reports are published only quarterly, therefore the period considered were the quarters between the years 2005 and 2007. Information anteceding September, 2005 was discarded due to quality problems of representative institutions.

After excluding possible outliers and data with bad information, the final sample contains over 700,000 observations of loans originated from 101 financial institutions or conglomerates in 4,789 municipalities from September, 2005 to September, 2007.

3.3 Descriptive statistics

For the purposes of our study, the data on individual loans were aggregated by financial conglomerate and municipality level. The dependent variable therefore consists in the quarterly weighted

⁶Although similar, discount of accounts receivable differs to discount factoring in important aspects. The second is a commercial transaction in which the factor buys the accounts receivable of the seller at a discount on a non-recourse basis, while the first is a type of financing in which the lender does not buy the accounts receivable, it is used only as a collateral.

average of the effective annual interest rates charged by each financial conglomerate in each municipality in new discount of accounts receivable and working capital loan products. The weights are the volume of each contract to total loans. We also constructed financial conglomerate and municipality specific measures using data from SCR and COSIF. Summary statistics are shown in Table 1 for discount of accounts receivable and in Table 2 for working capital loan.

In panel A we report the average interest rate charged by each financial conglomerate in each municipality over time. The average rate is higher for working capital loan compared to discount of accounts receivable. We observe that the average rate declined from 35.7 percent in September, 2005 to 27.0 percent in September, 2007 for discount of accounts receivable and from 51.0 to 40.3 percent for working capital loan. Although the minimum rate also dropped over the same period, the maximum rate showed a not well-defined trend. The average rates exhibit substantial variation between financial institutions. In September, 2007, for example, it ranges from a minimum of 10.6 to a maximum of 48.4 between financial conglomerates for discount of accounts receivable, and from 10.3 to 63.7 for working capital loan. According to our expectations, a significant dispersion was observed also across municipalities. For the same time period, it varies from a low of 10.1 to a high of 83.1 for the discount of accounts receivable, and from 12.0 to 138.4 for working capital loan. Charts 1 to 4 depicts the dispersion of the average interest rate between banks and municipalities over the period.

Chart 1 - Discount of accounts receivable rates across banks

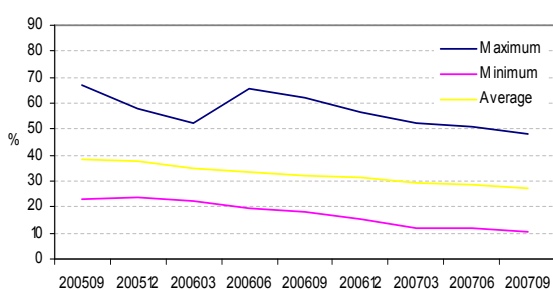


Chart 2 - Discount of accounts receivable rates across municipalities

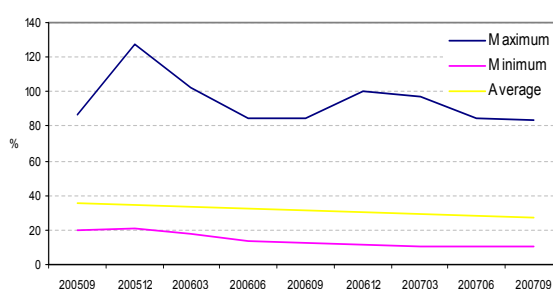


Chart 3 - Working capital loan rates across banks

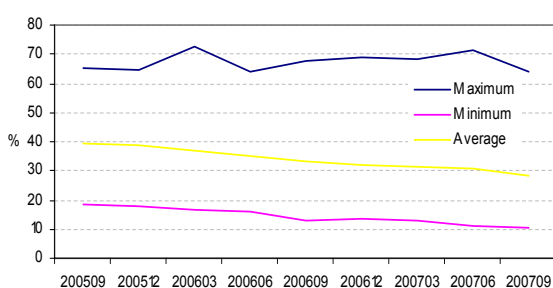
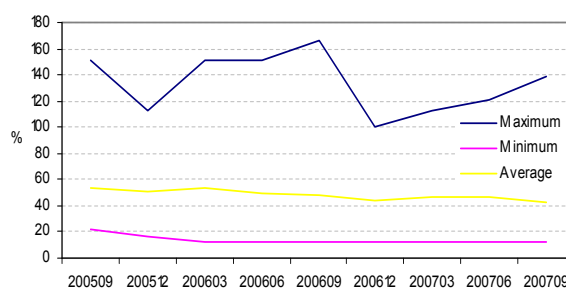


Chart 4 - Working capital loan rates across municipalities



Summary statistics for local markets are reported in Panel B. The working capital loan market is considerably greater than the discount of accounts receivable market, with average size of R\$ 7 million and R\$ 4 million, respectively. The largest market represents, as expected, the municipality of São Paulo. The Brazilian financial sector is characterized by highly concentrated local markets. The average HHI is over 4,500 for both products. According to the U.S. Department of Justice, a market with HHI above 1,800 is considered as highly concentrated. Of the 4,750 local markets examined in September, 2007, only 378 scored HHI under 1,800. The figures for CR₃ give similar conclusion. The representativeness of public banks in local markets is very strong, with the average participation in the credit volume higher than 40 percent.

Panel C shows summary statistics on the reporting financial institutions. The sample comprises a heterogeneity of institutions, from small independent banks to large nationwide financial conglomerates, with assets varying from R\$ 26 million to R\$ 342 billion. The average ratio of loss provisions is equal to 4.9 percent, while efficiency is 32.0 percent and credit expertise, 38.5 percent for institutions active in the discount of accounts receivable market. For institutions in the working capital loan market, the numbers are 7.7, 32.4 and 39.4 percent, respectively.

Panel D shows statistics for indicators that varies across financial conglomerates and municipalities. The average maturity of discount of accounts receivable contracts is 69 days, while of working capital loan is substantially longer, 353 days. The amount of credits past due 90 days or more is on average very low, but reaches almost 100 percent in some local markets for both products.

4 METHODOLOGY

In this section we describe the econometric methodology and our basic tests. We consider a model of bank pricing that takes into account many of the factors that may influence interest rate on loans. These factors are divided into three general categories: local market conditions, bank-specific characteristics and other variables that are observable at the municipality and the bank level.⁷

4.1 Local market variables

The variation in the loan rates may reflect differing local conditions. A more concentrated market is usually considered a less competitive one. With less options to shop around, conduct problems may arise, and banks should be able to charge a higher interest rate. Concentration is measured by HHI, with markets defined separately by product and by municipality.

As an additional measure of local market conditions, we include the growth rate of loans in each local market. Bank competition varies significantly over the business cycles. Expansions create intense price competition among lenders, while recessions are accompanied by more restrictive policy towards lending. With less banks willing to lend to an applicant, the probability of higher markups increase. Moreover, in moments of economy downturns, the default risk arises and banks have to compensate for the increase in risk. We therefore include a variable to separate growing and declining areas.

The size of each local market is also included do distinguish between large metropolitan and small rural areas. All local variables were constructed utilizing data for the market in consideration, which represents an advantage over prior studies. Due to lack of data, some studies used population for each local area as a proxy for market size and the HHI based on total banks assets or on deposits in loan regressions.

4.2 Bank variables

This study includes a full range of banks, from large nationwide to small, single-office banks. The larger bank has greater financial resources, a wider network, often more experience and expertise, and a more diversified portfolio. To account for numerous possible differences that may vary with the size of the bank, bank's asset is included as an additional explanatory variable.

Banks operate in different market segments, such as trading or credit loans. A greater participation in the credit activity may represent a higher expertise in evaluating the riskiness of potential borrowers, which can be reflected in lower interest rates. We then include an indicator of the credit expertise of each bank, measured as the proportion of lending to total assets.

⁷Unless indicated otherwise, from now on we use the term banks to describe either a financial institution or a conglomerate.

Table 1: Summary statistics - Discount of accounts receivable

| | N | Mean | Std. dev. | Minimum | Maximum |
|--|--------|--------|-----------|---------|-----------|
| Panel A: Average interest rate on discount of accounts receivable (%) | | | | | |
| Year / month | | | | | |
| 200509 | 5,587 | 35.74 | 9.69 | 18.72 | 140.50 |
| 200512 | 5,715 | 34.96 | 9.45 | 15.41 | 156.23 |
| 200603 | 5,729 | 34.10 | 9.53 | 16.49 | 129.60 |
| 200606 | 5,538 | 32.29 | 9.87 | 13.25 | 142.74 |
| 200609 | 5,658 | 31.08 | 9.37 | 12.28 | 127.32 |
| 200612 | 5,444 | 30.24 | 9.46 | 11.08 | 134.78 |
| 200703 | 5,511 | 29.16 | 9.63 | 10.10 | 133.65 |
| 200706 | 5,460 | 27.92 | 9.79 | 9.75 | 128.84 |
| 200709 | 5,421 | 27.00 | 9.86 | 9.41 | 128.08 |
| Panel B: The local markets | | | | | |
| Variables | | | | | |
| Size (R\$ thousand) | 14,834 | 4,324 | 32,022 | 5 | 1,391,207 |
| HHI | 14,834 | 5,523 | 2,505 | 1,098 | 10,000 |
| CR ₃ (%) | 14,834 | 93.31 | 10.18 | 43.65 | 100.00 |
| Public banks (%) | 14,834 | 49.92 | 31.53 | 0.00 | 100.00 |
| Panel C: The financial conglomerates | | | | | |
| Variables | | | | | |
| Assets (R\$ million) | 465 | 30,169 | 64,170 | 26 | 342,398 |
| Loss provisions (%) | 469 | 4.91 | 10.16 | 0.00 | 93,61 |
| Efficiency (%) | 464 | 32.03 | 17.06 | 1.15 | 126,83 |
| Credit expertise (%) | 465 | 38.45 | 18.95 | 0.51 | 98.11 |
| Panel D: Other variables | | | | | |
| Variables | | | | | |
| Maturity (days) | 50,062 | 69 | 70 | 1 | 472 |
| Overdue credit (%) | 50,062 | 1.45 | 7.29 | 0.00 | 99.56 |
| Market share (%) | 50,062 | 18.53 | 25.14 | 0.0005 | 100.00 |

Notes: Only freely allocated fixed rate loans. HHI is the sum of squared market shared of all active banks. CR₃ is the 3-firm concentration ratio. Public bank is the ratio of credit volume held by public banks to total credit. Loss provisions are the sum of provisions calculated according to Act 2.682 divided by total credit. Efficiency is measured by the ratio of personal and other administrative costs over gross income on financial intermediation plus revenues from fees. Credit expertise is the ratio of loans to total assets. Maturity is the amount of days between the date when the contract becomes due and the date when it is originated. Overdue credit is the ratio of credit volume past due 90 days or more to total credit.

Table 2: Summary statistics - Working capital loan

| | N | Mean | Std. dev. | Minimum | Maximum |
|--|--------|--------|-----------|---------|-----------|
| Panel A: Average interest rate on working capital loans (%) | | | | | |
| Year / month | | | | | |
| 200509 | 8,546 | 51.00 | 15.41 | 14.03 | 151.82 |
| 200512 | 8,779 | 47.63 | 15.01 | 12.68 | 151.82 |
| 200603 | 8,421 | 50.30 | 16.58 | 12.00 | 166.17 |
| 200606 | 8,201 | 47.47 | 15.56 | 12.00 | 166.17 |
| 200609 | 7,908 | 46.17 | 16.14 | 10.75 | 166.17 |
| 200612 | 8,734 | 41.88 | 15.12 | 11.35 | 126.15 |
| 200703 | 8,710 | 44.40 | 15.68 | 9.42 | 166.17 |
| 200706 | 7,500 | 43.76 | 15.32 | 10.43 | 166.17 |
| 200709 | 9,286 | 40.33 | 15.10 | 8.04 | 152.32 |
| Panel B: The local markets | | | | | |
| Variables | | | | | |
| Size (R\$ thousand) | 25,883 | 7,062 | 85,907 | 5 | 5,009,913 |
| HHI | 25,883 | 4,506 | 2,402 | 777 | 10,000 |
| CR ₃ (%) | 25,883 | 88.15 | 14.31 | 34.05 | 100.00 |
| Public bank (%) | 25,883 | 42.89 | 31.56 | 0.00 | 100.00 |
| Panel C: The financial conglomerates | | | | | |
| Variables | | | | | |
| Assets (R\$ million) | 590 | 21,450 | 50,899 | 26 | 342,398 |
| Loss provisions (%) | 653 | 7.70 | 10.76 | 0.00 | 100.00 |
| Efficiency (%) | 589 | 32.43 | 22.28 | -39.41 | 200.74 |
| Credit expertise (%) | 587 | 39.35 | 21.01 | 0.00 | 98.11 |
| Panel D: Other variables | | | | | |
| Variables | | | | | |
| Maturity (days) | 76,084 | 353 | 209 | 1 | 1,976 |
| Overdue credit (%) | 76,084 | 2.37 | 6.58 | 0.00 | 97.05 |
| Market share (%) | 76,084 | 22.14 | 24.76 | 0.0001 | 100.00 |

Notes: Only freely allocated fixed rate loans. HHI is the sum of squared market shared of all active banks. CR₃ is the 3-firm concentration ratio. Public bank is the ratio of credit volume held by public banks to total credit. Loss provisions are the sum of provisions calculated according to Act 2.682 divided by total credit. Efficiency is measured by the ratio of personal and other administrative costs over gross income on financial intermediation plus revenues from fees. Credit expertise is the ratio of loans to total assets. Maturity is the amount of days between the date when the contract becomes due and the date when it is originated. Overdue credit is the ratio of credit volume past due 90 days or more to total credit.

More efficient banks are more likely to charge lower rates, therefore a measure of efficiency is added. A commonly used index in the banking industry for operational efficiency is the ratio of personal and other administrative costs to gross income of financial intermediation plus revenue from fees. Implicit in our analysis is the assumption that reductions in the lender's cost are passed on to the borrower in a lower rate.

Variation in the loan rates may be attributed to another important bank-specific characteristic, such as bank's preference towards risk. A higher interest rate may be a consequence of a high-risk/high-return strategy, and the willingness to take on risk in its loan portfolio is measured by the ratio of loss provisions to loans outstanding. Loss provisions were calculated according to Act 2.682 of Banco Central do Brasil, and preferred to loss provisions from balance sheets because the second may include additional provisions for tax purposes.⁸

4.3 Other variables

Loans are distinct from other bank products because of some important feature. Interest rate fluctuations generate a reinvesting or refinancing risk to the bank for fixed-rate products. Long-term loans therefore demand a risk premium since they may be more risky than short-term loans, so we include the average maturity of loans of each bank in each municipality as an explanatory variable.

The other potential explanation for the variation of the loan interest rates in different local markets is the default risk. If there is some probability of borrowers defaulting on loans, then additional premium is likely to be added to the rate on loans. The greater the probability of loan change-offs, and, therefore, potential loss of capital and interest, the higher the default premium is likely to be demanded. The riskiness of the loan portfolio is approximated by the proportion of loans past due 90 days or more to total loans. Both variables are calculated by bank and by municipality and separately for each product.

4.4 Empirical model

By incorporating all of the above influences into an empirical pricing model of loans, we hope to explain the variation in the interest rates charged by banks in different local markets. The basis regression is of the form:

$$r_{i,j,t} = \alpha + \beta_1 \text{ interest rate risk}_{i,j,t} + \beta_2 \text{ default risk}_{i,j,t} + \beta_3 \text{ market size}_{j,t} + \beta_4 \Delta\% \text{ market size}_{j,t} + \beta_5 \text{ market concentration}_{j,t} + \beta_6 \text{ assets}_{i,t} + \beta_7 \text{ risk preference}_{i,t} + \beta_8 \text{ efficiency}_{i,t} + \beta_9 \text{ credit expertise}_{i,t} + \Phi d_t + e_{i,j,t} \quad (1)$$

where $r_{i,j,t}$ denotes the weighted average rate charged by bank i in local market j at time period t on new loans, *interest rate risk* $_{i,j,t}$ and *default risk* $_{i,j,t}$ are variables for bank i in local market j in period t , *market size* $_{j,t}$, $\Delta\%$ *market size* $_{j,t}$ and *market concentration* $_{j,t}$ are variables specific to market j in period t , and *assets* $_{i,t}$, *risk preference* $_{i,t}$, *efficiency* $_{i,t}$ and *credit expertise* $_{i,t}$ are bank variables in period t . Time dummies, d_t , are included to account for the influence of the interest rate fluctuations and other macroeconomic effects that are constant across banks and markets. Finally, $e_{i,j,t}$ represents the error term.

The data cover the period from September, 2005 to September, 2007 and contain 50,172 observations in total for discount of accounts receivable and 76,512 observations for working capital loan regressions.

⁸Each contract is classified in one of the nine categories according to the riskiness or the amount of days it is past due, whichever is worst, and provisioned by the factor of each category. See Annex for details of Act 2.682.

5 RESULTS

Discount of accounts receivable and working capital loan were analyzed separately since local market characteristics differ across products. Tables 3 and 4 display the results obtained by estimating equation (1) using discount of accounts receivable and working capital loan interest rates, respectively, as the dependent variable. Different specifications were also employed to test the robustness of the estimates using another measure of concentration and other alternative hypothesis.

Looking first at column (1), we observe that as expected, interest rates are lower in the municipalities with high volume of loans and decreases in the growing local markets for both products, with the estimated effect higher for working capital loan. The differences in magnitude can possibly be explained by the characteristics of each market. The working capital loan market is much more developed than the discount of accounts receivable one, and with more institutions offering the same product, competition may be more intense, causing a more intense drop in the interest rates particularly in the larger markets or in the growing ones. The negative coefficient for the concentration variable is contrary to the findings in the existing literature. In moving from the least concentrated market in the sample ($HHI = 1,098$) to the most concentrated market in the sample ($HHI = 10,000$), there is a reduction of 21 basis points in the discount of accounts receivable rate ($-0.0238 / 1000 \times (1,098 - 10,000) \times 100 = 21$). When CR_3 is used in place of HHI (column 2), the predicted reduction is of 193 basis points. Concentration shows to be non-harmful to consumers of working capital loans as well. In this case, the estimated effect is greater for HHI (221 basis points) than for CR_3 (52 basis points). Default risk exerts a significant effect on interest rates for both discount of accounts receivable and working capital loan, an increase of 5 percentage points in the default risk implies a raise of 34 basis points in the first and of 64 basis points in the second. The coefficient of interest rate risk is also statistically significant, an increase of 30 days in the average maturity in discount of accounts receivable raises the average interest rate by 45 basis points. However, the estimated coefficient is of opposite sign for working capital loan. The negative coefficient on interest rate risk is somewhat intriguing at first but is consistent with the findings of Tonooka and Koyama (2003) and might be associated with the use of derivative instruments to reduce interest rate risk in loans with longer maturity. The average maturity on working capital loans is significantly higher compared to discount of accounts receivable, and it is unlikely that banks would not hedge their exposure against interest rate fluctuations in long-term contracts. Unfortunately, such information is not available in our data to validate our hypothesis.

Bank assets are negatively correlated with discount of accounts receivable rates, indicating that gains from economies of scale of larger banks are partially transferred to consumers in the form of more favorable interest rates. Nonetheless, interest rates are higher for more efficient banks and for banks with more credit expertise, suggesting the existence of some monopoly power. We observe some inefficiency for working capital loan market too, although from different sources. In this case, the interest rate increases with the size of the assets and with credit expertise, but decreases with efficiency.

The average loan rates declined over the years, what is consistent with the pattern of Selic, the benchmark rate set by the Brazilian Central Bank. The cost of funds can be proxied by the Selic rate, and to examine how closely the loan rates respond to its change, the regression was re-run substituting the time dummies with the Selic target rate published after the monthly meetings of the Monetary Policy Committee (COPOM). As shown in column (3) of table 4, this estimation has almost the same explanatory power ($R^2 = 0.102$) as the one with the time dummies ($R^2 = 0.104$), and the coefficient of 1.1 indicates that discount of receivables rates are strongly related to the Selic rate. Similar conclusion is found for working capital loan.

The regression in column (4) tests the bank's market share as an explanatory variable. Market share is negatively and statistically significant, and the magnitude, sign and significance of the other variables remain unaltered by substituting concentration by market share measures. Nevertheless,

Table 3: Regression results - Discount of accounts receivable

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Interest rate risk $_{i,j,t}$ | 0.0150 ^a (0.0006) | 0.0151 ^a (0.0006) | 0.0151 ^a (0.0006) | 0.0160 ^a (0.0007) | 0.0154 ^a (0.0006) | -0.0243 ^a (0.0016) |
| Default risk $_{i,j,t}$ | 0.0671 ^a (0.0064) | 0.0663 ^a (0.0064) | 0.0674 ^a (0.0064) | 0.0675 ^a (0.0063) | 0.0671 ^a (0.0064) | 0.0285 ^a (0.0060) |
| Market size $_{j,t}$ (log) | -0.2364 ^a (0.0273) | -0.3755 ^a (0.0321) | -0.2435 ^a (0.0274) | -0.2802 ^a (0.0272) | -0.1898 ^a (0.0277) | -0.2034 ^a (0.0251) |
| $\Delta\%$ market size $_{j,t}$ | -0.0005 ^a (0.0001) | -0.0004 ^a (0.0001) | -0.0005 ^a (0.0001) | -0.0004 ^a (0.0001) | -0.0005 ^a (0.0001) | -0.0004 ^a (0.0001) |
| HHI $_{j,t}$ (thousand) | -0.0238 (0.0269) | | -0.0293 (0.0269) | | 0.0556 ^b (0.0281) | -0.0485 ^c (0.0251) |
| Assets $_{i,t}$ (log) | -0.3881 ^a (0.0327) | -0.3606 ^a (0.0327) | -0.3934 ^a (0.0327) | -0.3862 ^a (0.0327) | -0.3761 ^a (0.0328) | -1.6999 ^a (0.0841) |
| Risk preference $_{i,t}$ | 0.1507 ^a (0.0149) | 0.1514 ^a (0.0149) | 0.1563 ^a (0.0150) | 0.1488 ^a (0.0149) | 0.1583 ^a (0.0149) | -0.0156 (0.0185) |
| Efficiency $_{i,t}$ | -0.0184 ^a (0.0068) | -0.0165 ^b (0.0068) | -0.0195 ^a (0.0067) | -0.0193 ^a (0.0068) | -0.0146 ^b (0.0068) | -0.0065 (0.0087) |
| Credit expertise $_{i,t}$ | 0.0260 ^a (0.0045) | 0.0273 ^a (0.0045) | 0.0273 ^a (0.0045) | 0.0275 ^a (0.0045) | 0.0228 ^a (0.0045) | -0.1566 ^a (0.0060) |
| CR $_{3j,t}$ | | -0.0342 ^a (0.0049) | | | | |
| Selic $_t$ | | | 1.1006 ^a (0.0165) | | | |
| Market share $_{i,j,t}$ | | | | -0.0086 ^a (0.0024) | | |
| Public bank $_{j,t}$ | | | | | -0.0168 ^a (0.0020) | |
| dBank1 | | | | | | 18.3868 ^a (0.6463) |
| dBank2 | | | | | | 2.3146 ^a (0.2644) |
| dBank3 | | | | | | 4.9435 ^a (0.3161) |
| dBank4 | | | | | | -1.3348 ^a (0.2225) |
| dBank5 | | | | | | 9.1954 ^a (0.2748) |
| dBank6 | | | | | | 12.8834 ^a (0.4573) |
| dBank7 | | | | | | -5.8623 ^a (0.2944) |
| dBank8 | | | | | | 0.6928 ^a (0.2235) |
| dBank9 | | | | | | 5.3753 ^a (0.7695) |
| dBank10 | | | | | | 4.6528 ^a (0.2974) |
| Constant | 44.4167 ^a (0.9150) | 48.6777 ^a (1.1136) | 23.9093 ^a (0.9530) | 44.9977 ^a (0.8948) | 43.9919 ^a (0.9165) | 72.8301 ^a (1.6566) |
| Time dummies | * | * | | * | * | * |
| # of observations | 49,091 | 49,091 | 49,092 | 49,091 | 49,091 | 49,091 |
| Adj. R ² | 0.1035 | 0.1045 | 0.1017 | 0.1038 | 0.1049 | 0.2428 |
| Wald statistic** | | | | | | 787.01 ^a |

Robust standard errors in parentheses. The letters a, b and c denote significance at the 1, 5 and 10% level, respectively.

* Time dummies were included in the regressions but omitted due to lack of space. The coefficients follow a decreasing pattern over the years.

** Joint test of equality within all banks.

Table 4: Regression results - Working capital loan

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Interest rate risk $_{i,j,t}$ | -0.0127 ^a (0.0003) | -0.0127 ^a (0.0003) | -0.0125 ^a (0.0003) | -0.0111 ^a (0.0003) | -0.0123 ^a (0.0003) | -0.0080 ^a (0.0003) |
| Default risk $_{i,j,t}$ | 0.1284 ^a (0.0080) | 0.1295 ^a (0.0080) | 0.1326 ^a (0.0080) | 0.1251 ^a (0.0079) | 0.1277 ^a (0.0079) | 0.1477 ^a (0.0076) |
| Market size $_{j,t}$ | -1.9267 ^a (0.0314) | -1.8401 ^a (0.0382) | -1.9231 ^a (0.0315) | -2.6686 ^a (0.0286) | -2.0950 ^a (0.0324) | -1.8404 ^a (0.0295) |
| $\Delta\%$ market size $_{j,t}$ | -0.0012 ^b (0.0005) | -0.0013 ^b (0.0006) | -0.0015 ^b (0.0006) | -0.0011 ^b (0.0005) | -0.0013 ^b (0.0006) | -0.0010 ^b (0.0005) |
| HHI $_{j,t}$ (thousand) | -0.2396 ^a (0.0386) | | -0.1815 ^a (0.0387) | | -0.1938 ^a (0.0385) | -0.0762 ^b (0.0361) |
| Assets $_{i,t}$ (log) | 2.1480 ^a (0.0438) | 2.1572 ^a (0.0438) | 2.0772 ^a (0.0437) | 2.3165 ^a (0.0439) | 2.0944 ^a (0.0438) | 0.3840 ^a (0.1199) |
| Risk preference $_{i,t}$ | 0.1566 ^a (0.0172) | 0.1516 ^a (0.0172) | 0.1807 ^a (0.0172) | 0.2040 ^a (0.0172) | 0.1930 ^a (0.0174) | 0.2464 ^a (0.0217) |
| Efficiency $_{i,t}$ | 0.1335 ^a (0.0101) | 0.1336 ^a (0.0101) | 0.1015 ^a (0.0097) | 0.1358 ^a (0.0100) | 0.1439 ^a (0.0103) | -0.0421 ^a (0.0104) |
| Credit expertise $_{i,t}$ | 0.3069 ^a (0.0049) | 0.3071 ^a (0.0049) | 0.3002 ^a (0.0049) | 0.3019 ^a (0.0049) | 0.3001 ^a (0.0049) | 0.2245 ^a (0.0067) |
| CR $_{3j,t}$ | | -0.0079 (0.0050) | | | | |
| Selic $_t$ | | | 1.0141 ^a (0.0198) | | | |
| Market share $_{i,j,t}$ | | | | -0.1495 ^a (0.0029) | | |
| Public banks $_{j,t}$ | | | | | -0.0424 ^a (0.0024) | |
| dBank1 | | | | | | -1.7131 ^a (0.6127) |
| dBank2 | | | | | | 7.3915 ^a (0.4453) |
| dBank3 | | | | | | 7.5859 ^a (0.4548) |
| dBank4 | | | | | | 2.0092 ^a (0.3476) |
| dBank5 | | | | | | -1.5083 ^a (0.4110) |
| dBank6 | | | | | | 9.5369 ^a (0.4345) |
| dBank7 | | | | | | 4.3541 ^a (0.4543) |
| dBank8 | | | | | | 19.6614 ^a (0.3053) |
| dBank9 | | | | | | -7.3743 ^a (0.6671) |
| dBank10 | | | | | | -6.6758 ^a (0.3902) |
| Constant | 29.9080 ^a (1.2537) | 28.3710 ^a (1.4121) | 12.2956 ^a (1.3371) | 39.4693 ^a (1.1821) | 34.5733 ^a (1.2702) | 60.7807 ^a (2.2585) |
| Time dummies | * | * | | * | * | * |
| # of observations | 74, 839 | 74, 839 | 74, 839 | 74, 839 | 74, 839 | 74, 839 |
| Adj. R^2 | 0.1974 | 0.1969 | 0.1878 | 0.2300 | 0.2010 | 0.3273 |
| Wald statistic ** | | | | | | 1, 705.28 ^a |

Robust standard errors in parentheses. The letters a, b and c denote significance at the 1, 5 and 10% level, respectively.

* Time dummies were included in the regressions but omitted due to lack of space. The coefficients follow a decreasing pattern over the years.

** Joint test of equality within all banks.

since market share may be highly endogenous to prices, it is discarded in future regressions.⁹

We then test whether the negative coefficient for the concentration variable is influenced by the role of public banks. The Brazilian financial market is characterized by the strong presence of public banks. Despite the privatization of state-owned banks in the last decade, Banco do Brasil and Caixa Econômica Federal, two federal institutions, are still under government control, and rank among the five largest banks in the country. Of the 3,325 municipalities served by financial institutions, 1,396 are monopolies – over 60% of the cases, monopoly is exerted by a public bank. Consequently, HHI may absorb some of the effect of public banks, so in regression (5) we include a public bank variable and find that the higher the participation of government-owned institutions in the credit volume of the municipality, the lower the interest rate banks charge in the local market. As a matter of fact, when public bank participation is included in the model, the HHI coefficient turns out to be positive for discount of accounts receivable.

Loan rates may vary across banks and markets for numerous reasons, both observable and unobservable. To account for other bank-specific variables not explicit in the model, we re-run equation (1) including a set of dummy variables (one for each of the ten largest, all other banks are represented in the constant). The increase in the explanatory power is significant ($R^2 = 0.243$ for discount of accounts receivable and $R^2 = 0.327$ for working capital loan). A Wald test of equality within all bank coefficients was performed and the null hypothesis was rejected at the 1% level.

When bank dummies are included in the discount of accounts receivable regression, the coefficient for the bank assets variable increases significantly, indicating that large banks do transfer part of the gains from economies of scale to consumers in the form of lower interest rates, but the reduction is less pronounced among the ten largest banks. Additionally, the sign of the credit expertise variable turns to be negative, suggesting that the inefficiency in the market is associated within the ten largest banks in the market and therefore may represent the existence of some monopoly power.

In working capital loan regression, we also observe that higher interest rates are mostly associated with the ten largest banks in the market since the inclusion of the bank dummies decreases significantly the bank assets coefficient value. The credit expertise coefficient remains positive and significant, suggesting some monopoly power in the working capital loan market too. The sign of the efficiency variable turns out to be negative, indicating that higher inefficiency is correlated with higher interest rates among the ten largest banks, but not necessarily within the rest of the banks in the market.

5.1 Do banks charge uniform interest rates?

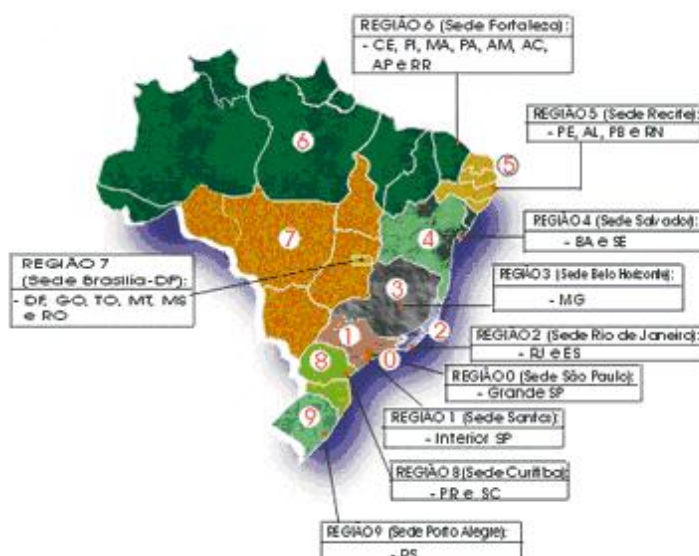
More than 70% of the loans market is held by large nationwide banks that have branches all over the country. Although price setting can be centralized in the head offices, the same rivals meet at multiple locations, and interest rates may vary according to local market conditions. To test if banks charge uniform interest rates, interaction between bank and region dummies is added in estimating equation (1). The region dummies take in consideration the differences between different geographic areas and are defined according to the zip code's structure. The Brazilian Post Office (Correios) divides the country in 10 regions according to socioeconomic and demographic density factors of a region or a group of them. This seems a better criterion than the use of states or municipalities as a region since it distinguishes the metropolitan area of São Paulo from other regions.¹⁰ Second, it limits the (dummy) variables to a number that can be feasibly estimated.

Table 5 illustrates that for the discount of accounts receivable market, except for banks 4 and 7, the other ten largest banks charge on average higher interest rates compared to all the other banks. Interest rates are on average higher in the states of Sao Paulo (regions 1 and 3), Rio de Janeiro

⁹Firms offering more favorable prices may attract more customers and gain share.

¹⁰The metropolitan area of São Paulo is composed by 39 municipalities of the state of São Paulo and responds for more than 10% of the GDP of the country.

Figure 3: Regions according to Correios division



and Espirito Santo (region 2) in respect to the state of Minas Gerais. As seen in table 6, there is a significant variation across the interest rates charged by the ten largest banks, with the highest rates observed in bank 1 and the lowest ones in bank 7. The variation across regions exists but is much smaller, of 250 basis points. Table 7 reports the “liquid” rate of each bank in each region. To verify whether or not interest rates vary through different regions, we perform an equality test across regions for each of the banks, and the null hypothesis is rejected at the 1% level for all banks. The lowest interest rates are observed with more frequency in the south region of the country. Dispersion is higher in banks 6 and 9 (17.6 and 19.8 percent, respectively), while bank 7 shows to be most competitive one in all regions of the country.

Concentration showed to be non-harmful in earlier regressions, and we perform an additional test to verify the existence of market power. If banks collude, a variation in the interest rates banks charge in the same region would not be observed. We then run an equality test between all banks for each of the nine regions, but the null hypothesis is reject at the 1% level. If collusion exists, it would be mostly observed among only a few institutions, probably the largest ones, so we perform the same test for the three and five largest banks in the market. The null hypothesis, however, is again rejected at the 1% level.

For working capital loan market, six of the ten largest banks charge on average higher rates compared to all the other banks. Interest rates shows to be higher in many regions of the country compared to Minas Gerais. There is a significant variation across the rates charged by the ten largest banks, with bank 8 charging the higher interest rates and bank 10, the lower ones. The variation across regions exists and is much higher than the one observed in the discount of accounts receivable market. And as can be seen through table 10, each bank follows a different pattern across the regions. In bank 1, for example, interest rates fall with the distance from the region of Grande Sao Paulo, while the lowest rates are observed in the metropolitan area of Sao Paulo for banks 2 and 3 and in the south region for banks 4, 5, 9 and 10. Higher interest rates are observed in bank 8 and the lower ones in banks 9 and 10 independently of the region. Moreover, the Wald statistic rejected the null hypothesis of equality across regions for each of the banks, as the equality across banks for each of the regions.

Table 5: Bank and region dummies and interactions coefficients significance - Discount of accounts receivable

| Individual region / bank dummy | Banks | | | | | | | | | |
|---------------------------------------|-------|---|---|---|---|---|---|---|---|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | + | + | + | - | + | + | - | + | + | + |
| 1 (Interior SP) | + | - | | - | + | + | + | - | | |
| 2 (RJ and ES) | + | + | | | + | | | | | + |
| 3 (Grande SP) | + | + | - | + | + | + | + | | | |
| 4 (BA and SE) | + | + | | + | + | + | | | | |
| 5 (PE, AL, PB and RN) | - | + | | + | + | + | | | + | |
| 6 (CE, PI, MA, PA, AM, AC, AP, RR) | - | + | + | + | + | + | | + | - | + |
| 7 (DF, GO, TO, MT, MS and RO) | + | + | | | + | | | + | | - |
| 8 (PR and SC) | + | + | - | | + | | | | | |
| 9 (RS) | - | + | | | + | | | | | |

Notes: A "+" sign is attributed when the coefficient is positive and statistically significant, a "-" sign when negative and statistically significant. If the coefficient is not statistically significant, the cell is left empty. Banks 1 to 10 represent the largest banks in the market. The region of MG and all other banks are represented in the constant. Bank names are omitted due to the confidentiality of the information.

Table 6: Bank and region dummies and interactions coefficients value - Discount of accounts receivable

| Individual region / bank dummy | Banks | | | | | | | | | | |
|---------------------------------------|-------|-----|------|------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| | 16.2 | 3.0 | 4.8 | -1.0 | 7.1 | 10.2 | -6.8 | 1.2 | 4.5 | 4.8 | |
| 1 (Interior SP) | 0.9 | 0.4 | -0.9 | 0.0 | -1.1 | 2.5 | 3.7 | 3.5 | -1.9 | 2.3 | 1.2 |
| 2 (RJ and ES) | 1.1 | 1.6 | 0.6 | 0.8 | 0.8 | 4.8 | 0.7 | 1.1 | -1.0 | 1.8 | 2.1 |
| 3 (Grande SP) | 1.2 | 2.9 | -0.9 | 2.3 | -0.3 | 3.0 | 7.8 | 2.0 | 0.6 | -0.1 | 0.9 |
| 4 (BA and SE) | 0.4 | 2.5 | 0.7 | 0.5 | 1.3 | 3.6 | 15.7 | -1.2 | 1.4 | 1.7 | -0.6 |
| 5 (PE, AL, PB and RN) | -1.3 | 4.4 | 0.9 | 3.9 | 0.9 | 2.8 | 7.6 | -0.3 | 0.8 | 10.6 | -0.1 |
| 6 (CE, PI, MA, PA, AM, AC, AP, RR) | -1.3 | 6.2 | 2.1 | 5.1 | 3.8 | 3.6 | 9.7 | 0.7 | 3.7 | -9.2 | 3.1 |
| 7 (DF, GO, TO, MT, MS and RO) | 0.4 | 2.0 | -0.5 | 0.8 | 0.6 | 2.6 | 2.7 | -1.6 | 1.3 | -2.8 | -2.7 |
| 8 (PR and SC) | 0.2 | 1.7 | 0.0 | -1.0 | 0.7 | 1.8 | 1.1 | -1.1 | -0.2 | 0.6 | -0.1 |
| 9 (RS) | -1.3 | 2.6 | -0.5 | 0.7 | 0.2 | 5.2 | -0.3 | 0.4 | 0.9 | 3.6 | 0.1 |

Table 7: "Liquid" rate - Discount of accounts receivable

| | Banks | | | | | | | | | | Wald statistic** | | |
|---------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------|---------|---------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | All | First 3 | First 5 |
| 1 (Interior SP) | 90.69 | 76.13 | 78.89 | 72.02 | 83.63 | 88.00 | 70.76 | 73.43 | 80.88 | 80.11 | 283.92 | 263.09 | 419.89 |
| 2 (RJ and ES) | 92.05 | 77.84 | 79.89 | 74.03 | 86.08 | 85.11 | 68.54 | 74.45 | 80.51 | 81.17 | 124.39 | 126.60 | 206.61 |
| 3 (Grande SP) | 93.49 | 76.48 | 81.46 | 73.12 | 84.45 | 92.38 | 69.63 | 76.15 | 78.73 | 80.12 | 146.64 | 263.18 | 235.59 |
| 4 (BA and SE) | 92.27 | 77.16 | 78.90 | 73.90 | 84.18 | 99.38 | 65.55 | 76.13 | 79.75 | 77.75 | 49.41 | 86.49 | 87.40 |
| 5 (PE, AL, PB and RN) | 92.47 | 75.72 | 80.60 | 71.78 | 81.74 | 89.67 | 64.70 | 73.83 | 86.86 | 76.55 | 59.47 | 107.12 | 112.46 |
| 6 (CE, PI, MA, PA, AM, AC, AP, RR) | 94.24 | 76.95 | 81.76 | 74.68 | 82.49 | 91.72 | 65.75 | 76.74 | 67.11 | 79.78 | 62.03 | 80.52 | 56.00 |
| 7 (DF, GO, TO, MT, MS and RO) | 91.86 | 76.06 | 79.20 | 73.22 | 83.26 | 86.45 | 65.15 | 76.05 | 75.30 | 75.69 | 94.35 | 170.50 | 135.49 |
| 8 (PR and SC) | 91.27 | 76.25 | 77.15 | 73.02 | 82.19 | 84.63 | 65.44 | 74.35 | 78.36 | 78.07 | 253.97 | 254.32 | 290.94 |
| 9 (RS) | 90.74 | 74.37 | 77.44 | 71.13 | 84.19 | 81.82 | 65.52 | 74.01 | 79.97 | 76.87 | 218.62 | 214.22 | 279.05 |
| Minimum | 90.69 | 74.37 | 77.15 | 71.13 | 81.74 | 81.82 | 64.70 | 73.43 | 67.11 | 75.69 | | | |
| Maximum | 94.24 | 77.84 | 81.76 | 74.68 | 86.08 | 99.38 | 70.76 | 76.74 | 86.86 | 81.17 | | | |
| Mean | 92.12 | 76.33 | 79.47 | 72.99 | 83.58 | 88.79 | 66.78 | 75.02 | 78.61 | 78.46 | | | |
| Dispersion | 3.55 | 3.47 | 4.61 | 3.55 | 4.34 | 17.57 | 6.05 | 3.31 | 19.75 | 5.48 | | | |
| Wald statistic* | 2.88 | 11.40 | 48.08 | 17.67 | 11.78 | 12.00 | 25.47 | 17.09 | 20.26 | 10.74 | | | |

Notes: "liquid" rate = $c + \alpha_1 d_b + \alpha_2 d_r + \alpha_3 d_b^* d_r$. * Joint test of equality across regions. ** Joint test of equality across banks. All F-statistics are significant at the 1% level.

Table 8: Bank and region dummies and interactions coefficients significance - Working capital loan

| Individual region / bank dummy | Banks | | | | | | | | | |
|---------------------------------------|-------|---|---|---|---|---|---|---|---|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | | + | + | + | | | + | + | | - |
| 1 (Interior SP) | + | - | - | - | - | - | - | - | - | - |
| 2 (RJ and ES) | + | - | - | - | - | - | - | - | - | - |
| 3 (Grande SP) | + | - | - | - | - | - | - | - | - | - |
| 4 (BA and SE) | + | - | - | - | - | - | - | - | - | - |
| 5 (PE, AL, PB and RN) | - | | + | + | + | | + | + | + | |
| 6 (CE, PI, MA, PA, AM, AC, AP, RR) | + | - | - | + | - | - | - | - | + | - |
| 7 (DF, GO, TO, MT, MS and RO) | + | - | - | - | - | - | - | - | - | - |
| 8 (PR and SC) | | - | - | - | - | - | - | - | - | - |
| 9 (RS) | - | + | + | + | + | + | + | + | + | + |

Notes: A "+" sign is attributed when the coefficient is positive and statistically significant, a "-" sign when negative and statistically significant. If the coefficient is not statistically significant, the cell is left empty. Banks 1 to 10 represent the largest banks in the market. The region of MG and all other banks are represented in the constant. Bank names are omitted due to the confidentiality of the information.

Table 9: Bank and region dummies and interactions coefficients values - Working capital loan

| | | Banks | | | | | | | | | |
|---------------------------------------|------|-------|-------|------|------|------|------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | | -0.1 | 12.1 | 9.7 | 3.3 | -0.7 | 11.2 | 4.2 | 22.1 | -2.3 | -5.5 |
| 1 (Interior SP) | 7.2 | -3.8 | -11.1 | -7.6 | -4.5 | -5.0 | -6.1 | -1.3 | -8.4 | -9.9 | -4.1 |
| 2 (RJ and ES) | 4.4 | -1.0 | -3.6 | -4.8 | -1.8 | 0.7 | -3.1 | 1.8 | -3.0 | -4.4 | -1.4 |
| 3 (Grande SP) | 4.5 | 2.9 | -11.9 | -8.8 | 1.0 | -2.2 | -4.0 | -1.8 | -3.5 | -3.9 | 1.1 |
| 4 (BA and SE) | 2.9 | -4.8 | -1.3 | -0.3 | -2.0 | 1.7 | -2.1 | -7.1 | 0.7 | -3.8 | -1.5 |
| 5 (PE, AL, PB and RN) | -1.9 | -0.1 | -0.5 | 2.7 | 3.2 | 4.8 | 0.4 | 5.2 | 1.9 | 5.5 | 1.5 |
| 6 (CE, PI, MA, PA, AM, AC, AP, RR) | 5.5 | -8.1 | -5.0 | 2.8 | -4.9 | -1.9 | -2.9 | -4.0 | -3.0 | 7.0 | -6.0 |
| 7 (DF, GO, TO, MT, MS and RO) | 5.4 | -6.7 | -1.4 | -5.8 | -4.0 | -4.7 | -5.0 | -8.2 | -5.4 | -1.9 | -5.0 |
| 8 (PR and SC) | -0.2 | 0.0 | -1.5 | -2.7 | 0.3 | -1.2 | -0.7 | 0.0 | -0.4 | -2.2 | -0.7 |
| 9 (RS) | -4.9 | 6.2 | 0.8 | 3.2 | 4.8 | 3.8 | 6.9 | 6.2 | 5.6 | 1.3 | 4.7 |

Table 10: "Liquid" rate - Working capital loan

| | Banks | | | | | | | | | | Wald statistic** | | |
|---------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|------------------|---------|---------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | All | First 3 | First 5 |
| 1 (Interior SP) | 50.26 | 55.15 | 56.18 | 52.90 | 48.41 | 59.28 | 57.04 | 67.92 | 42.02 | 44.51 | 339.29 | 10.28 | 102.43 |
| 2 (RJ and ES) | 50.27 | 59.76 | 56.21 | 52.79 | 51.30 | 59.48 | 57.27 | 70.41 | 44.60 | 44.37 | 174.57 | 18.67 | 37.65 |
| 3 (Grande SP) | 54.27 | 51.59 | 52.29 | 55.73 | 48.53 | 58.66 | 53.85 | 70.10 | 45.32 | 47.02 | 112.86 | 0.74 | 26.44 |
| 4 (BA and SE) | 44.94 | 60.57 | 59.14 | 51.12 | 50.83 | 58.92 | 46.92 | 72.66 | 43.79 | 42.77 | 209.07 | 212.68 | 119.53 |
| 5 (PE, AL, PB and RN) | 44.85 | 56.57 | 57.39 | 51.47 | 49.09 | 56.68 | 54.41 | 69.04 | 48.30 | 41.03 | 103.25 | 68.99 | 42.67 |
| 6 (CE, PI, MA, PA, AM, AC, AP, RR) | 44.22 | 59.49 | 64.91 | 50.78 | 49.86 | 60.74 | 52.57 | 71.54 | 57.19 | 40.96 | 281.67 | 422.17 | 266.87 |
| 7 (DF, GO, TO, MT, MS and RO) | 45.60 | 62.99 | 56.20 | 51.60 | 46.94 | 58.58 | 48.35 | 69.08 | 48.17 | 41.86 | 304.91 | 153.86 | 153.37 |
| 8 (PR and SC) | 46.68 | 57.27 | 53.63 | 50.28 | 44.75 | 57.27 | 50.91 | 68.39 | 42.25 | 40.45 | 428.74 | 54.01 | 127.41 |
| 9 (RS) | 48.18 | 54.92 | 54.92 | 50.13 | 45.15 | 60.20 | 52.36 | 69.74 | 41.05 | 41.20 | 176.93 | 10.52 | 49.70 |
| Minimum | 44.22 | 51.59 | 52.29 | 50.13 | 44.75 | 56.68 | 46.92 | 67.92 | 41.05 | 40.45 | | | |
| Maximum | 54.27 | 62.99 | 64.91 | 55.73 | 51.30 | 60.74 | 57.27 | 72.66 | 57.19 | 47.02 | | | |
| Mean | 47.70 | 57.59 | 56.77 | 51.87 | 48.32 | 58.87 | 52.63 | 69.87 | 45.85 | 42.69 | | | |
| Dispersion | 10.04 | 11.40 | 12.62 | 5.60 | 6.56 | 4.06 | 10.35 | 4.74 | 16.14 | 6.58 | | | |
| Wald statistic* | 5.40 | 28.68 | 69.91 | 37.33 | 19.20 | 1.82 | 16.81 | 12.95 | 183.63 | 12.63 | | | |

Notes: "liquid" rate = $c + \alpha_1 d_1 + \alpha_2 d_r + \alpha_3 d_b + \alpha_4 d_{r*}$. * Joint test of equality across all regions. All F-statistics are significant at the 1% level, except in bank 6, which F-statistic is significant at the 10% level. ** Joint test of equality across banks. All F-statistics are significant at the 1% level, except for the 3 largest banks in region 3, which F-statistic is not significant.

5.2 Other issues

5.2.1 Quality of borrowers

Differences in loan interest rates may exist due to quality of the borrowers. Larger firms are in general more transparent, less risky and due to the volume of their financing needs, usually have relationship with more than one bank. On the other side, firms with restricted access to credit borrow from only one source. Information on the riskiness of the borrowers is limited in the SCR, however, it permits to take into account the number of institutions firms borrow from. Exclusive borrowers, defined as those who receive credit from only one bank, is then used as a proxy for the quality of the borrowers, and its inclusion as an additional control variable shows that the larger their representativeness in the credit portfolio, the higher the average interest rate banks demand in each local market (table 11). The sign and significance of the other variables remain unaffected by the inclusion of the exclusive borrowers variable.

Table 11: Regression results

| | Discount of accounts receivable | Working capital loan |
|------------------------------|------------------------------------|----------------------------------|
| Interest rate risk i,j,t | 0.0137 ^a (0.0006) | -0.0131 ^a (0.0003) |
| Default risk i,j,t | 0.0635 ^a (0.0063) | 0.1118 ^a (0.0079) |
| Market size j,t (log) | -0.1880 ^a (0.0274) | -1.7269 ^a (0.0315) |
| $\Delta\%$ market size j,t | -0.0005 ^a (0.0001) | -0.0011 ^b (0.0005) |
| HHI j,t (thousand) | -0.0596 ^b (0.0269) | -0.2976 ^a (0.0381) |
| Assets i,t (log) | -0.4243 ^a (0.0327) | 2.0440 ^a (0.0434) |
| Risk preference i,t | 0.1507 ^a (0.0149) | 0.1149 ^a (0.0169) |
| Efficiency i,t | -0.0215 ^a (0.0068) | 0.1189 ^a (0.0099) |
| Credit expertise i,t | 0.0219 ^a (0.0045) | 0.2956 ^a (0.0048) |
| Exclusive borrowers i,j,t | 0.0248 ^a (0.0014) | 0.0599 ^a (0.0014) |
| Constant | 44.4143 ^a (0.9098) | 27.9562 ^a (1.2338) |
| Time dummies | * | * |
| # of observations | 49,091 | 74,839 |
| Adj. R ² | 0.1099 | 0.2199 |

Robust standard errors in parentheses. The letters a, b and c denote significance at the 1, 5 and 10% level, respectively.
 * Time dummies were included in the regressions but omitted due to lack of space. The coefficients follow a decreasing pattern over the years.

5.2.2 Definition of relevant market

In the definition of relevant market, the municipality where the firm is located was defined as the geographic dimension. It can be argued that firms not necessarily borrow from a branch in the same municipality where the firm is located. Most of the banks inform in the SCR the location of the branch responsible for the loan, and we find out that in more than 70 percent of the observations, the municipality of the branch who granted the credit is the same of where the firm is located. It seems therefore appropriate to consider the discount of accounts receivable and working capital loan market as local and the municipality as the geographic dimension for both markets.

6 CONCLUSION

This paper employs extensive and unique information on discount of accounts receivable and working capital loan to test the influence of a set of factors in the interest rates banks charge in each local market. The Brazilian financial market is concentrated, and concentration in local markets is even higher. However, contrary to general expectations, concentration is not significant or even negatively associated to prices. Ceteris paribus, in moving from the least to the most concentrated market, the average loan interest rate decreases from 21 to 221 basis points, depending on the product and on the concentration measure. The negative relationship between concentration and prices can be attributed in part due to a particularity of the Brazilian banking market: the strong presence

of public banks. Our results are also consistent with the hypothesis that bank interest margins reflect default risk premium for both products. Although concentration shows to be non-harmful to consumers, we find the existence of some market imperfection. Bank assets are negatively associated with loan prices, indicating economies of scale in the discount of accounts receivable market. However, lower interest rates are less pronounced among the ten largest banks. Moreover, interest rates are higher for banks with higher credit expertise, meaning that not all the gains are passed to consumers in the form of more favorable interest rates. Market inefficiency is observed in working capital loans market as well, and may be an indicative of market power exercise.

The decrease in the average loan interest rates over the years parallels the movement of the aggregate level of interest rates. As a matter of fact, the drop in the loan interest rates is highly correlated with the reduction in the Selic rate over the period. Since interest rates in Brazil is considered one of the highest in the world, the rule of monetary policy in determining the aggregate level of interest rates is fundamental to reduce the borrower's financing costs.

We also observe distinct patterns between banks and products across different regions of the country. However, the reason why those differences exist remains an interesting puzzle. Significant coefficients for bank and municipality dummies, as for their interactions, mean that loan interest rates differ in a way that cannot be fully explained by the model, suggesting some directions for future research. Additionally, a better understanding of the factors that account for those differences is crucial to successfully implement a policy to lower the loans average interest rates in the country.

REFERENCES

- BELAISCH, Agnès. *Do Brazilian banks compete?* IMF working paper 03/113, 2003.
- BERGER, Allen N.; DEMIRGÜÇ-KUNT, Asli; LEVINE, Ross; HAUBRICH, Joseph G. *Bank concentration and competition: an evolution in the making.* Journal of Money, Credit and Banking 36, 433-451, 2004.
- BERGER, Allen N.; DEMSETZ, Rebecca S.; STRAHAN, Philip E. *The consolidation of the financial services industry: causes, consequences, and implications for the future.* Journal of Banking and Finance 23, 135-194, 1999.
- BERGER, Allen N.; HANNAN, Timothy H. *The price-concentration relationship in banking.* The Review of Economics and Statistics 71, 291-299, 1989.
- BERGER, Allen N.; MILLER, Nathan H.; PETERSEN, Mitchell A.; RAJAN, Raghuram G.; STEIN, Jeremy C. *Does function follow organizational form? Evidence from the lending practices of large and small banks.* Journal of Financial Economics 76, 237-269, 2005.
- BERGER, Allen N.; ROSEN, Richard J.; UDELL, Gregory F. *Does market size structure affect competition? The case of small business lending.* Journal of Banking and Finance 31, 11-33, 2007.
- BIKKER, Jacob A.; HAAF, Katharina. *Competition, concentration and their relationship: an empirical analysis of the banking industry.* Journal of Banking and Finance 26, 2191-2214, 2002.
- BRESNAHAN, T. F. *The oligopoly solution concept is identified.* Economic Letters 10, 87-92, 1982.
- CLAESSENS, Stijn; LAEVEN, Luc. *What drives bank competition? Some international evidence.* Journal of Money, Credit and Banking 36, 563-583, 2004.
- CORVOISIER, Sandrine; GROPP, Reint. *Bank concentration and retail interest rates.* Working paper 72, European Central Bank, 2001.
- DINÇ, Serdar I. *Politicians and banks: political influences on government-owned banks in emerging markets.* Journal of Financial Economics 77, 453-459, 2005.
- FOCARELLI, Dario; PANETTA, Fabio. *Are mergers beneficial to consumers? Evidence from the market for bank deposits.* The American Economic Review 93, 1152-1172, 2003.
- HANNAN, Timothy H. *Bank commercial loan markets and the role of market structure: evidence from surveys of commercial lending.* Journal of Banking and Finance 15, 133-149, 1991.

- KAHN, Charles; PENNACCHI, George; SOPRANZETTI, Ben. *Bank consolidation and the dynamics of consumer loan interest rates*. Journal of Business 78, 99-133, 2005.
- LA PORTA, Rafael; LÓPEZ-DE-SILANES, Florencio; SHLEIFER, Andrei. *Government ownership of banks*. Journal of Finance 57, 265-301, 2002.
- LAU, Lawrence J. *On identifying the degree of competitiveness from industry price and output data*. Economics Letters 10, 93-99, 1982.
- MIAN, Atif. *Foreign, private domestic, and government banks: new evidence from emerging markets*. Mimeo, University of Chicago, 2003.
- MICCO, Alejandro; PANIZZA, Ugo. *Bank ownership and lending behavior*. Economic Letters 93, 248-254, 2006.
- MICCO, Alejandro; PANIZZA, Ugo; Yañez, Monica. *Bank ownership and performance. Does politics matter?* Journal of Banking and Finance 31, 219-241, 2007.
- NAKANE, Márcio I. *A test of competition in Brazilian banking*. Estudos Econômicos 32, 203-224, 2002.
- NAKANE, Márcio I.; KOYAMA, Sérgio M. *Search costs and the dispersion of loan interest rates in Brazil*. Paper presented in the XXXI Brazilian Economics Meeting. Porto Seguro, 2003.
- OLIVER, Alfredo M.; FUMÁS, Vicente S.; SAURINA, Jesús. *Risk premium and market power in credit markets*. Economics Letters 93, 450 - 456, 2006.
- PANZAR, John C.; ROSSE, James N. *Testing for "monopoly" equilibrium*. The Journal of Industrial Economics 35, 443-456, 1987.
- PERIA, Maria S.M.; MODY, Ashoka. *How foreign participation and market concentration impact bank spreads: evidence from Latin America*. Journal of Money, Credit and Banking 36, 511-537, 2004.
- PRAGER, Robin A.; HANNAN, Timothy H. *Do substantial horizontal mergers generate significant price effects? Evidence from the banking industry*. The Journal of Industrial Economics 46, 433-452, 1998.
- SAPIENZA, Paola. *The effects of banking mergers on loan contracts*. The Journal of Finance 57, 329-367, 2002.
- SAPIENZA, Paola. *The effects of government ownership on bank lending*. Journal of Financial Economics 72, 357-384, 2004.
- TONOOKA, Eduardo K.; KOYAMA, Sérgio M. *Taxa de juros e concentração bancária no Brasil*. Working paper 62, Banco Central do Brasil, 2003.
- YEYATI, Eduardo L.; MICCO, Alejandro. *Banking competition in Latin America*. Prepared for the First Meeting of the Latin American Competition Forum. Paris, 2003.
- YEYATI, Eduardo L.; MICCO, Alejandro; PANIZZA, Ugo. *Should the government be in the banking business? The role of state-owned and development banks*. Working paper 517, Inter-American Development Bank, 2004.