Revista de Administração Contemporânea
Journal of Contemporary Administration

ASSOCIAÇÃO NACIONAL DE PÓS-GRADUAÇÃO E PESQUISA EM ADMINISTRAÇÃO

e-ISSN: 1982-7849

Research Article

Concentration and Competition in the Domestic Credit Market

Concentração e Competição no Mercado de Crédito Doméstico

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ABSTRACT

Context: the financial market has experienced sharp restructuring and mergers in recent decades. As banks expand the scope of their activities, they raise concerns about the impact on the sector's competitiveness. If the characteristics of the financial industry, which contribute to make the sector more concentrated, can make it less competitive, it implies assessing the relationship between concentration and competition. **Objective:** the general objective of this study is to promote diagnosis of the organization of the national credit market by calculating and analyzing concentration and competition indicators, between 2000 and 2019. **Methods:** to measure concentration, the Herfindahl-Hirschman and the Five Major Concentration Ratio indexes are used. The degree of competition is estimated via Lerner's econometric model applied to data displayed on a panel with accounting and financial information from financial institutions. **Results:** the results suggest that although the concentration has increased in the time frame considered, competitiveness has not deteriorated, reinforcing the argument of seminal references that concentration does not necessarily harm competition. **Conclusion:** in the absence of academic consensus, this work elucidates the relationship between concentration and competitiveness. Still, it gains relevance by pointing out the role of regulation and credit unions in increasing recent competition. The work thus becomes capable of supporting policies that promote contestability, such as initiatives that relax restrictions on the entry of non-banking institutions and financial technology companies.

Keywords: concentration; competition; credit; banks; credit unions.

JEL Code: E5, D4, P1.

RESUMO

Contexto: o mercado financeiro tem vivenciado acentuadas reestruturações e concentrações nas últimas décadas. À medida que os bancos expandem o escopo de suas atividades, levantam preocupações quanto ao impacto sobre a competitividade do setor. Se as características da indústria financeira, que colaboram para tornar o setor mais concentrado, podem torná-la menos competitiva, implica avaliar a relação entre concentração e concorrência. **Objetivo:** o objetivo geral deste estudo consiste em promover diagnóstico da organização do mercado de crédito nacional mediante cálculo e análise de indicadores de concentração e de competição, entre 2000 e 2019. **Métodos:** para mensurar a concentração, são utilizados os índices de Herfindahl-Hirschman e a Razão de Concentração dos Cinco Maiores. O grau de competição é estimado via modelo econométrico de Lerner aplicado a dados dispostos em um painel com informações contábeis-financeiras de instituições financeiras. **Resultados:** os resultados sugerem que embora a concentração tenha se elevado no recorte temporal considerado, a competitividade não se deteriorou, reforçando o argumento de referências seminais de que concentração não necessariamente prejudica competição. **Conclusão:** diante de ausência de consenso acadêmico, este trabalho elucida a relação entre concentração e competitividade. Ainda, ganha relevância ao apontar o papel da regulação e das cooperativas de crédito no aumento da concorrência recente. O trabalho torna-se, assim, passível de apoiar políticas capazes de promover a contestabilidade, como iniciativas que flexibilizem restrições à entrada de instituições não bancárias e de empresas de tecnologia financeira.

Palavras-chave: concentração; competição; crédito; bancos; cooperativas de crédito

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Cite as: Azevedo, M. de A., & Gartner, I. R. (2020). Concentration and competition in the domestic credit market. *Revista de Administração Contemporânea*, 24(5), 380-399. https://doi.org/10.1590/1982-7849rac2020190347

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Received: October 21, 2019
Last version received: March 02, 2020
Accepted: March 24, 2020

# of invited reviewers until the decision

	1	2	3	4	5	6	7	8	9
1st round	X	X	X	X	X	X	✓	✓	X
2nd round	✓	✓							

INTRODUCTION

The global financial market has experienced sharp restructuring and mergers in recent decades (Hankir, Rauch, & Umber, 2011). Bank mergers can be explained, according to the authors above, by the search for market power, by waves of corporate reorganizations, by operational and financial synergies (to prevent competitors from buying preferred targets), and by financial problems. Especially after the global economic crisis of 2008, monetary authorities encouraged the concentration of financial institutions (FIs), which contributed to the greater efficiency of regulation and supervision of the industry (Montes, 2014). Mergers and acquisitions are presented as private alternatives for fragile institutions to remain in operation without generating public expenditure, due to the potential appropriation of tax benefits by the acquirer (Bulow & Shoven, 1978).

As the FIs expanded their activities across national borders and by provision of new services, they raised concerns about competitiveness, that is, the lower supply of credit at higher prices when compared to the perfect competitive environment. If the characteristics of the financial sector, which help to make the industry more concentrated, can reduce competition, it implies estimating and analyzing the relationship between concentration and competition. In this regard, it is important to note that the literature predominantly shows that concentration is not an appropriate measure for competition (Bikker, Shaffer, & Spierdijk, 2009).

The perception of economic agents about the effects of concentration on the cost of financial intermediation and on stability has prompted scientific studies. The structure-conduct-performance theory (VanHoose, 1985) suggests that concentration, characterized by the presence of a few large IFs, raises profitability by charging higher interest on loans and paying lower interest to depositors, reducing social welfare. Empirical results presented by Gilbert (1984) suggest that the increase in concentration caused an increase in average interest on loans and a decrease in interest on deposits in the North American banking market.

In the structure-efficient perspective (VanHoose, 1985), in contrast, the benefits from economies of scale and scope reduce interest rates on loans and raise those on deposits because profitability comes from efficiency gains. More recent studies have supported the existence of an inverse relationship between concentration and credit interest (Fungácová, Shamshur, & Weill, 2017). Still, they have indicated the importance of differentiating competition and concentration. Claessens and Laeven (2004) concluded that developed financial markets, with a lower barrier to entry into new organizations and services resulting from financial innovations, can be competitive even if concentrated.

There is also no consensus between concentration and stability, nor between competition and stability. Vries (2005) concluded that focusing risk on individual institutions increases the frequency of isolated failures. Matutes and Vives (1996; 2000) argue that a free market contributes to stability. Maghyereh and Awartani (2014), in turn, pointed out that competition and diversification do not contribute to the health of banks.

According to VanHoose (2010), theories concerning intermediary market structures, that is, between perfect competition and pure monopoly, are the most adequate to explain the behavior of the banking industry. There is also monopolistic competition (Chamberlin, 1962) in which the monopoly stems from the degree of differentiation of the products offered.

In view of the above, the estimate and the assessment of the competitiveness of the national credit market conducted in this article fill a scientific gap, due to the time frame, the Business Model Category (BMC) of the FI considered, and the methodology applied. The theoretical-empirical literature that evaluates competition in the sector is scarce, especially with regard to emerging countries like Brazil, due to the lack of data and the complexity of the calculation (Bikker & Haff, 2002; Turk-Ariss, 2010).

In addition, this research gains relevance by elucidating the relationship between concentration and competition. The nexus between concentration and competitiveness is not a pacified matter, both from a theoretical and an empirical perspective. Ahead of such a discussion, it still brings up the importance of regulation, as suggested by the literature (Akin, Aysan, Borici, & Yildiran, 2013; Claessens & Laeven, 2004), and the role of non-banking institutions on increasing competition in the domestic credit market.

It is important to note that the financial sector is undergoing a transformation with the recent entry of financial technology companies, which includes digital banks, fintechs and large companies. Technological innovations increase the potential to enhanced competition in the credit market. Amid these changes and the academic debates revealed, this article aims to assess the level of concentration and competition, their causes and potential consequences, becoming a relevant research topic.

In this context, this study aims to evaluate the organization of the national credit market, by calculating and analyzing indicators that reflect concentration and competition between the first quarter of 2000 and the first quarter of 2019. The Herfindahl-Hirschman Index (HHI) and the Five Major Concentration Ratio (CR5), proposed by the literature and by regulatory authorities, according to VanHoose (2010) and Central Bank of Brazil (Banco Central do Brasil [BACEN], 2018), are used to measure the concentration. The degree of competition is estimated via the Lerner Indicator. With the results of the HHI, the CR5 and the Lerner Index, it is possible to assess the relationship between concentration and competition.

As specific objectives, this research compares the competition between the different BMCs (b1, b2, b3S, and n1) that make up the national banking and non-banking sector, in order to identify which group of FI contributes to the competition. Furthermore, competitiveness is evaluated by segmentation (S1, S2, S3, S4, and S5), thus classified by Resolution No. 4,553/2017 of the National Monetary Council (Conselho Monetário Nacional [CMN], 2017) according to size, international activity, and the organization's risk profile. Segmentation, implemented by the proportional prudential regulation of capital requirements, is expected to have contributed to the improvement of competition.

It is worth emphasizing that the literature on banking competitiveness innovated with the development of the Lerner method (Delis & Tsionas, 2009; Lerner, 1934), used in this article. Considered preferable to proxies such as H-Statistics (Turk-Ariss, 2010), the Lerner Indicator estimates a company's market power by the difference between the price charged by the organization and its marginal cost, also known as margin or mark-up. The method is in line with the concept of market power, given the financial institution's ability to charge interest on credit above the marginal cost (VanHoose, 2010).

The first hypothesis of the present study is that the increase in concentration in the national financial industry operating in credit does not imply a reduction in competitiveness, in the time frame considered. In this respect, potential explanations for the trajectory of the Lerner Indicator are evaluated, based on the scientific literature. Thus, as a second hypothesis, it is expected that regulatory aspects have contributed to the recent improvement in competition. The third hypothesis consists of looking for evidence that the competitiveness among the different FI groups that make up the national credit market is heterogeneous, and, thus, the margins applied by banks are higher than those practiced by credit unions.

The next section presents the theoretical framework about the industrial banking organization. In the subsequent section, there is a description of the theoretical method used to estimate the concentration and competition indicators. Then, section 4 presents the application of the method, from the selection of the sample and the definition of the proxies to the techniques used to estimate the regression of the total cost and to analyze the results. Section 5 is dedicated to the analysis of the econometric model and the presentation of the results of the indexes, also containing discussions on possible causes. Finally, conclusions, limitations, practical implications, and suggestions for future studies are made.

LITERATURE REVIEW

The economic policy analysis of the industrial banking organization has been guided by structure-conduct-performance (SCP) and efficient-structure theory (ES), according to VanHoose (2010). In SCP, the higher concentration increases profitability by charging higher interest on credit agreements and paying lower interest to depositors, reducing the population's well-being. In ES, the increase in profits can be explained by efficiency, arising out of scale and scope gains. In this context, there is no clear positive relationship between concentration shown and performance. Aspects related to the contestability of the market have to be significant to explain the competition (Claessens & Laeven, 2004).

It is also worth mentioning the New Empirical Organization (NEIO), which measures competition by estimating indicators, without ex-ante assumptions about the structure or market conduct. In this approach, the Panzar-Rosse (1987) and Lerner (1934) methods stand out, which can be formally derived from equilibrium conditions assuming profit maximization (Bikker, Shaffer e Spierdijk, 2009).

Empirical evidence supports SCP, ES, and NEIO. Under the SCP, empirical results presented by Gilbert (1984) suggest that a 10% increase in concentration raised interest rates on loans between 0.1 and 11 basis points and reduced those on bank deposits in the USA between 0.1 and 18. According to Shaffer and Srinivasan (2002), the concentration contributed to the high rates of loans practiced in the American banking market. SCP's perspective is based on the dominant bank model, that is, on the assumption that large banks

have advantages over smaller rivals in terms of costs and, therefore, exhibit anti-competitive behavior with respect to prices.

Under the ES, benefits from economies of scale and scope reduce interest rates on loans and raise those on deposits. In this approach, the interest charged by larger banks, which bear lower unit costs, restricts the rates practiced by smaller rivals, resulting in lower average loan rates and higher deposit rates. Higher profits from large FIs are due to efficiency, not predatory conduct designed to hinder the entry of new institutions.

Recent studies have supported the existence of an inverse relationship between concentration and interest rates of loans (Fungácová, Shamshur, & Weill, 2017; Silva, 2014; Tonooka & Koyama, 2003) due to factors such as regulation, informational rigidity, and limited financial education. When applying the Panzar-Rosse method, Claessens and Laeven (2004) found no evidence that competition is related to concentration in more than 4,000 banks in 50 countries, concluding that developed financial markets more contestable to new organizations and services tend to be competitive even if concentrated.

As regards risk, Berger, Leora, and Turk-Ariss (2008), when examining more than 8,000 banks in 23 countries between 1999 and 2005, found a lower degree of overall risk exposure in banks with greater market power. Vries (2005), who proposed a theoretical model of systemic risk arising from deposit market interconnections, concluded that concentrating risk on individual institutions raises the frequency of isolated failures. Thus, it suggests the segregation of risk in multiple institutions.

Matutes and Vives (1996; 2000) have developed models that associate bank collapse and imperfect competition in the deposit market; therefore, greater competitiveness would be healthy. Allen and Gale (2004) argued that perfect competition in the interbank market reduces stability. Maghyereh and Awartani (2014) pointed out that competition and diversification do not contribute to the robustness of banks.

The banking activity makes financial intermediation between savers and investors possible; however, it brings risks whose origin is in the capture of deposits redeemable at any time to offer credit. Competition-related aspects such as efficiency, although socially desirable, can create risks for banks individually and at a systemic level. If it is regulation that creates barriers to entry, making the sector more concentrated and possibly less competitive, thereby reducing the risk of insolvency, is a question that involves first deciphering levels of concentration and competition (VanHoose, 2010).

Intermediate market structures are the most appropriate to explain the banking industry (VanHoose, 1985). The Cournot approach, which assumes the existence of some competitors offering homogeneous products (Dasgupta & Stiglitz, 1981), can be used to examine this market. This is an oligopoly model in which the supply of credit and deposit depends on the estimated amount produced by competitors (Pindyck & Rubinfeld, 2010). In the oligopoly, there are barriers to entry for new entrants. Another approach is the monopolistic competition model (Chamberlin, 1962) where there are competitors and no restrictions on new entrants. The power of monopoly stems from the degree of differentiation of the products offered.

In these intermediate market environments, interest rates on loans tend to be higher and those on deposits lower, when compared to those in perfect competition. In 2015, Tabak, Gomes, and Medeiros (2015) had pointed out that concentration on credit portfolios increases monitoring efficiency since it facilitates loan recovery, making the bank less susceptible to risk.

The Herfindahl-Hirschman Index (HHI) and the Concentration Ratio of Five (CR5) are proposed by academia and monetary authorities to measure concentration in the financial system (BACEN, 2017; 2018; VanHoose, 2010). In terms of competition, it is recommended to estimate the indicators of Lerner and Boone (BACEN, 2017; 2018; Boone, 2008; Lerner, 1934).

The Lerner Index (Berger, Klapper, & Turk-Ariss, 2009; Lerner, 1934) measures the ability of a profit-maximizing bank to exercise market power by imposing high interest rates on loans in relation to their cost without significant loss of customers. Such capacity depends on the elasticity of demand for credit in relation to interest. In competitive environments, a high interest elasticity of demand for credit is expected, as well as difficulties in raising rates. Banks with market power, on the other hand, tend to set their rates by applying an optimal mark-up on their marginal cost of lending.

Thus, the greater the market power of the financial institution, the higher is the profit margin earned and the higher is the value of the Lerner Indicator. For example, suppose that the interest rate levied from the borrower is 20% per year (p.a.) and the cost of granting an additional unit of credit, known as marginal cost, is 10% p.a. Under these conditions, the mark-up on the marginal cost will be 10 percentage points (p.p.)

and Lerner Index will be 0.50 or 50% of the credit price, resulting from the quotient between 10 and 20.

Therefore, Lerner Indicator captures how much the fees charged exceed the marginal cost, in relative terms, as a percentage of the price. Ideally, the Indicator should consider the rates charged on loans and deposits separately, which is often not feasible due to data barriers (Turk-Ariss, 2010). In view of this, the Indicator has been constructed in the literature to cover the entire activity of the FI (Angelini & Ceterolli, 2003), the so-called conventional Lerner.

The Boone index (Boone, 2008) proposes to measure the sensitivity of the FI's market share to changes in its marginal cost. In a competitive environment, increases in marginal cost tend to lead to increases in the rates charged on loans compared with other institutions, with a consequent reduction in their market share. The more negative the Boone index, the higher the level of competition in the sector. The Lerner and Boone indicators are considered complementary metrics to measure the level of competition (BACEN, 2017).

THE THEORETICAL MODEL

This section describes the theoretical method used to measure the indicators that reflect concentration and competitiveness in the domestic banking and non-banking segments for loans granted in Brazil. Regarding concentration, this research calculates the Herfindahl-Hirschman Index (HHI) and the Five Major Concentration Ratio (CR5). Both measure market shares, without implications, a priori, about the competitive behavior of institutions.

The HHI is obtained by summing the square of the participation in decimal form of each FIs in the credit market, as shown in Equation (1). Its results assume values between 0 (no concentration) and 1 (totally concentrated), whereas estimates between 0.1000 and 0.1800 represent moderate and, above 0.1800, high concentration (BACEN, 2017, 2018; VanHoose, 1985).

$$\text{HHI} = \sum_{i=1}^{n} \left(\frac{\textit{Credit Operations Stock of the Bank } i}{\textit{System Credit Operations Stock}} \right)^2 \quad (1)$$

The CR5, calculated according to Equation (2), consists of the participation of the five largest institutions in the total of loans offered by the banking and non-banking sector. The results of the CR5, as well as of the HHI, also range from zero (no concentration) to one (maximum concentration).

$$RC5 = \sum_{i=1}^{5} \left(\frac{\textit{Credit Operations Stock of the Bank } i}{\textit{System Credit Operations stock}} \right) \quad (2)$$

With regard to competition, Lerner Indicator estimates market power by the difference between the price charged on credit product and the marginal cost of FI, as a percentage of the price, as shown in Equation (3) (BACEN, 2017; 2018; Turk-Ariss, 2010; VanHoose, 1985). Its results are in continuous dimensions ranging from null competition (L_{it}= 0) to full competition (L_{it}= 1). However, if the bank has other objectives, its Lerner may be negative, even if it shows profit.

$$L_{it} = \left(\frac{P_{it} - Cmarg_{it}}{P_{it}} \right) \quad (3)$$

Where

L_{it}: Lerner indicator of each FI_i at each time t (quarter);

$Cmarg_{it}$: marginal cost of the FI_i in t (calculated from the partial derivative of the total cost function given by Equation 5); and

P_{it}: price loans of FI_i in t, estimated by the ratio of its credit income and its total credit.

Measuring competitiveness requires the estimation of marginal cost, which corresponds to the increase in the total cost of offering an additional unit of loan. Silva (2014) points out that only internal agents of the organization know the marginal costs. In view of this, the scientific literature recommends estimating the transcendental logarithmic function (translog) of the total cost, given by Equation (4) (Silva, 2014; Tabak, Gomes, & Medeiros, 2015; Turk-Ariss, 2010). The translog consists of a general functional form introduced by Christensen, Jorgenson, and Lau (1973) considered flexible, with linear and quadratic terms, and can be used to test hypotheses of the firm's theory. Usually interpreted as an approximation by a second-order Taylor expansion series, it allows working with discretionary values for the elasticity of substitution between pairs of inputs.

Revista de Administração Contemporânea - RAC, v. 24, n. 5, art. 1, pp. 380-399, 2020 | doi.org/10.1590/1982-7849rac2020190347| e-ISSN 1982-7849 | rac.anpad.org.br

$$ln\left(\frac{TC_{it}}{w_{2it}}\right) = \lambda_0 + \Sigma_j \lambda_j \, ln(y_{jit}) + \Sigma_j \Sigma_k \lambda_{jk} \, ln(y_{jit}) \, ln(y_{kit}) + \beta_1 \, ln\left(\frac{w_{1it}}{w_{2it}}\right) + \frac{1}{2} \beta_{11} \, ln\left(\frac{w_{1it}}{w_{2it}}\right)^2 + \Sigma_j \theta_j \, ln(y_{jit}) \, ln\left(\frac{w_{1it}}{w_{2it}}\right) + \Sigma_t \tau_t D_t + \Sigma_t \Gamma_t D_t y_{1it} + \varepsilon_{it} \quad (4)$$

Where:

TC_{it}: *total cost of* FI_i *in t;*
w_1 *: operating costs;*
w_2 *: financial intermediation costs;*
y_{jit} *: FI's outputs,respectively credit operations (j=1), liquid assets (j=2) and other assets (j=3);*
D_{it} *: FI's dummies of* IF_i*; and*
$\varepsilon_{it} = v_{it} + u_i$*: error term, with* v_{it} *having normal and independent distribution; and*
$u_{it} \sim N(0,\sigma)$ *and* $var(u_i) = \sigma^2$.

In the field of the theory of the firm, the cost function is considered a production function, which relates products to the respective production factors used in the production process. By estimating the coefficients of the production function in Equation (4), obtained via the multiple regression econometric model, it is possible to measure the marginal cost of credit operations for each IF in each period, according to Equation (5).

$$Cmag_{1it} = \left(\frac{\frac{TC_{it}}{w_{2it}}}{y_{1it}}\right)[\lambda_1 + 2\,\lambda_{11} \ln(y_{1it}) + \lambda_{12} \ln(y_{2it}) + \lambda_{13} \ln(y_{3it}) + \theta_1 \, ln\left(\frac{w_{1it}}{w_{2it}}\right)] + \Sigma_t \tau_t D_t \quad (5)$$

METHOD APPLICATION

Sample and data source

The HHI, CR5, and Lerner Index are measured in this survey at quarterly frequency, from the first quarter of 2000 (Q1 2000) to the first quarter of 2019 (Q1 2019), thus incorporating the latest global financial crisis. The time window of approximately 20 years (77 quarters) can be considered sufficient to accommodate bullish and bearish cycles in the asset market and in the economy. In addition, this is the longest period available for the accounting information published in BACEN's database, IF.data (https://www3.bcb.gov.br/ifdata/, recovered July 30, 2019), up to the time of submission of this article.

The concentration and competition indices include the isolated financial institutions between the Q1 2000 and Q1 2019 belonging to the banking segment, Business Model Category (BMC) b1 and b2, and non-banking, BMCs n1 and b3S, henceforth the system, as shown in Table 1. BMC b1, b2, b3S, and n1 institutions correspond to around 93% of the credit market at the end of 2018, according to data available from IF.data.

Table 1. Business model category.

Nomenclature	Meaning
b1	Commercial bank, universal bank with commercial portfolio, and savings bank
b2	Universal bank without commercial portfolio or investment bank and foreign ex-change bank
b3S	Credit union
n1	Non-banking credit company

Note. Elaborated by the authors. Source: Banco Central do Brasil. (2018). *Relatório de economia bancária 2018*. Retrieved from https://www.bcb.gov.br/content/publicacoes/relatorioeconomiabancaria/reb_2018.pdf; and IF.data (available at https://www3.bcb.gov.br/ifdata/, recovered June 12, 2019).

The banking segment BMC b1 is represented, according to the monetary authority (BACEN, 2018), by commercial banks, universal banks with commercial portfolio, and savings banks. Universal banks without commercial portfolio and investment banks make up the b2 banking segment. Credit unions and non-bank credit companies are represented by b3S and n1, respectively.

Thus, it was possible to form an unbalanced panel with information from 1,720 individual

institutions. According to the regulatory authority, these organizations comprise financial institutions and other institutions authorized to operate by the Central Bank separated by legal personality (CNPJ), at an unconsolidated level. In this configuration, the corporate interests in Brazil and/or abroad and the agencies abroad are registered as investments through the equity method.

It is worth illustrating that non-banking credit companies (n1) are represented by organizations such as leasing companies, mortgage companies, and microenterprise credit companies. Credit cooperatives (b3S) directly perform customer service. Although the cooperatives do not aim at profit, they seek to maximize the benefit enjoyed by their members and keep their projects at sustainable levels, which allows them to evaluate their competitiveness through the Lerner Indicator.

The Banking Reports of the Central Bank (BACEN, 2017; 2018) consider, in the estimation of the Lerner Index, both credit cooperatives and non-bank credit institutions, but does not include development banks. The development banks, classified as BMC b4, are also not considered in this survey as they do not aim at profit, nor do they maximize benefits from their representatives. These institutions accounted for 8.4% of credit operations net of provisions in Q3 2018.

Variables and proxies

In order to estimate the concentration and competition indexes, use was made of quarterly accounting information of the Individual Financial Institutions participating in the system published by Central Bank of Brazil in the IF.data database. The selection of proxies was based on the Banking Report (BACEN, 2017; 2018), in Ornelas, Silva, and VanDoornik (2020), in Turk-Ariss (2010), and in VanHoose (2010), as detailed in Table 2.

Table 2. Variables, references, proxies, and formulas used to calculate the HHI, CR5, and Lerner Index.

Variables	Proxies references	Formulas and proxies adopted in accordance with the name of the IF.data account items
HHI: Herfindahl-Hirschman Index	BACEN (2017) BACEN (2018) VanHoose (2010)	$HHI = \sum_{i=1}^{n} \left(\frac{Credit\ Operations\ Stock\ of\ the\ Bank\ i}{System\ Credit\ Operations\ Stock} \right)^2$; $HHI = \sum_{i=1}^{n} \left(\frac{Loans\ (d) + Leases\ (e)}{System\ Credit\ Operations\ Stock} \right)^2$
CR5: Five Major Concentration Ratio	BACEN (2017) BACEN (2018) VanHoose (2010)	$CR5 = \sum_{i=1}^{5} \left(\frac{Credit\ Operations\ Stock\ of\ the\ Bank\ i}{System\ Credit\ Operations\ Stock} \right)$; $CR5 = \sum_{i=1}^{5} \left(\frac{Loans\ (d) + Leases\ (e)}{System\ Credit\ Operations\ Stock} \right)$
P_{it}: Price loans of the FI i in t	BCB (2017) BCB (2018) Ornelas et al. (2020)	$P_{it} = \frac{[Credit\ Income\ (a1) + Lease\ Income\ (a2)]}{[Loans\ (d) + Leases\ (e)]}$
TC_{it}: Total cost of the FI i in t	BCB (2017) BCB (2018) Ornelas et al. (2020) Turk-Ariss (2010)	$TC_{it} = \frac{[Borrowing\ and\ Onlending\ Expenses\ (b2)\ and\ Lease\ Expenses\ (b3) + Net\ Loan\ Loss\ Provision\ (b5) + Operating\ Cost\ (w_1) + Tax\ Expenses\ (d5) + Income\ Tax\ Expenses\ (h)]}{\text{Total Assets}}$ The funding (b1), borrowing and onlending (b2), and lease expenses (b3) are part of the Interest Expenses.
w_{1it}: Operating cost	BCB (2017) BCB (2018) Ornelas et al. (2020) Turk-Ariss (2010)	$w_1 = \frac{[Personnel\ Expenses\ (d3) + Administrative\ Expenses(d4) + Other\ Operating\ Expense\ (d8)]}{\text{Total assets}}$
w_{2it}: Financial intermediation cost	BCB (2017) BCB (2018) Ornelas et al. (2020) Turk-Ariss (2010)	$w_2 = \left[\frac{Funding\ Expenses\ (b1)}{Gross\ Interest\ Income\ (a)} \right]$
y_{1it}: Loan financial outputs	BCB (2017) BCB (2018) Ornelas et al. (2020)	$y_{1it} = Loans\ (d) + Leases\ (e)$
y_{2it}: Liquid assets outputs	BCB (2018) BCB (2017) Ornelas et al. (2020)	$y_{2it} = Cash\ and\ Equivalents\ (a) + Interbank\ Investments\ (b) + Securities\ and\ Financial\ Derivatives(c)$
y_{3it}: Other assets	BCB (2018) BCB (2017) Ornelas et al. (2020)	$y_{3it} = Other\ Receivable\ (f) + Other\ Assets\ (g) + Adjusted\ Fixed\ Assets\ (h)$

Note. Source: Elaborated by the authors.

Estimation and analysis techniques

From the sample containing accounting information of 1,720 FIs over 77 quarters, an unbalanced panel was formed with 80,849 data considered in the estimate of the total cost dependent variable whose general expression is represented by Equation (6). A panel is formed when time series with cross-sectional data are combined. Statistical Analysis Software Studio OnDemand for Academics (SAS) was used to build the database and to obtain the competition concentration indicators.

$$y_{it} = \alpha_{it} + \Sigma \beta X_{it} + \varepsilon_{it} \quad (6)$$

Where:

y_{it}: *total cost of* FI_i *in t;*

X_{jit}: *Outputs and inputs prices of* FI_i in t;

i: *cross section*;

t: *time series.*

In the translog function of total cost, production factors are quantified through the natural logarithm of the values measured in relative terms, because they represent input prices, according to BACEN (2018), Ornelas et al. (2020), Maghyereh and Awartani (2014), and Turk-Ariss (2010). The nepierian logarithm is also applied to the absolute values of financial products. The logarithmic scales allow for the reduction of high magnitude quantities to a smaller scale.

The parameters of the translog function of the total cost are estimated by means of multiple linear regression applied to the data arranged in the unbalanced panel, formed by proxies of the variables that integrate the model represented by Equation (4). In the sequence, these parameters are used in the function of the marginal cost of product credit for each FI in each period, according to Equation (5). With the results of the marginal cost and the price of loan operations, whose calculation is indicated in Table 1, the Lerner Indicator is obtained.

The concentration indices, HHI and CR5, are calculated according to Equations (1) and (2) and proxies presented in Table 1. With the concentration and competitiveness indicators, measured by the average and its quartiles, it is possible to promote analyses about the behavior of each one of them separately and jointly. The period following the last global financial crisis and the implementation of the prudential regulation of capital requirements was highlighted. In addition, given the heterogeneity of Lerner's distribution, we compare the levels of competition observed in each BMC.

EMPIRICAL AND DESCRIPTIVE ANALYSIS AND RESULTS

Estimation of total cost

To identify the level of competition in the system, it is first necessary to estimate the total cost *(TC) by multiple regression econometric model, where*: *TC = f (operating cost, financial intermediation cost, outputs).*

When regressing a time series variable over other variables that also follow time series, it is necessary that the series involved are stationary, otherwise a high coefficient of determination (R^2) may reflect a spurious relationship. A stationary stochastic process occurs if the mean and the variance are constant over time and the value of the covariances between two periods depends only on the lag between them.

Maddala and Wu (1999) and Choi (2001) proposed the test developed by Fisher (1932) which is based on the combination of p-value and augmented Dickey-Fuller (ADF) values for each cross-section unit. This is a non-parametric test whose null hypothesis (H_0) is that all panels contain unitary root. The results presented by the SAS indicate rejection of H_0 at the level of statistical significance of 1%, which was expected for variables measured in relative terms.

It is worth noting that the four types of Fisher-Type test rejected the null hypothesis that all panels contain unit roots at the significance level of 1%: Chi-Square Fisher test, asymptotic Fisher test, inverse normal test, and logit test. Choi (2001) recommends the inverse normal test, corresponding to the Z statistic (normal distribution), in the analyses. It is also observed that the logit test L* (t distribution) corroborates the Z test, which usually occurs. Therefore, the alternative hypothesis of panel stationarity prevails.

As for the method of parameter estimation, panel-built models use specific tools according to the structure of the error term. The error term (ε_{it}), which captures what is no longer explained about the dependent variable, is broken down into the term that varies in the time of the observation units (v_{it}) and the disturbance of

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the specific units (u_i). The error reflecting unobserved individual characteristics may affect the dependent variable.

The Hausman specification test (1978) was used to evaluate the adjustment of fixed and random effects models. The null hypothesis of no correlation between the effects (individual or temporal) and the regressors was rejected at a significance level of 1%, favoring the specification of fixed effects. Under H_0, the fixed effects estimator is consistent (asymptotically convergent to the real values of the population parameters), but inefficient (no minimum variance), while the random effects estimator is consistent and efficient. Under the alternative hypothesis, only the fixed effects estimator remains consistent because there is correlation between the effects and the explanatory variables.

It is also verified that the F test of individual effects suggests heteroscedasticity in the observations, which strengthens the choice for a fixed effects panel model. At a 1% significance level, the null hypothesis of homoscedasticity was rejected, concluding therefore that all intercepts are not the same, satisfying the assumption of the model of different intercepts. Fixed effect estimators are the most appropriate option to model panel data when the intercept is correlated with the explanatory variables in any time period.

Once the econometric assumptions are met, the statistical significance of the coefficients and the global fit metrics of the total cost (*TC*) estimation model are verified. Then, the marginal cost (*Cmag*) is calculated by deriving the total cost function from the credit operations. The Lerner Index, therefore, can be calculated by the difference between the aggregate price and the marginal cost, as a proportion of the price. The test results and the parameters of the multiple normal linear regression of the total cost dependent variable (*TC*), with a 95% confidence interval, considering fixed effects, are shown in Table 3.

Tabela 3. Função translog do custo total: coeficientes e resultados dos testes da regressão.

Variables	Coefficient	Standard Error	Confidence Interval (95%)		t-Value	p-Value
Intercept	-2.7708	0.0608	-2.8924	-2.6492	-45.54	<0.0001
lny1it	0.3531	0.0088	0.3355	0.3707	40.21	<0.0001
lny2it	0.3369	0.0050	0.3270	0.3469	67.99	<0.0001
lny3it	0.3115	0.0064	0.2987	0.3244	48.59	<0.0001
lny1itlny2it	-0.0459	0.0008	-0.0475	-0.0442	-55.52	<0.0001
lny1itlny3it	-0.0670	0.0012	-0.0693	-0.0647	-58.50	<0.0001
lny2itlny3it	-0.0392	0.0008	-0.0407	-0.0376	-50.69	<0.0001
lny1itlny1it	0.0569	0.0007	0.0554	0.0583	79.62	<0.0001
lny2itlny2it	0.0406	0.0004	0.0398	0.0414	101.97	<0.0001
lny3itlny3it	0.0532	0.0007	0.0519	0.0545	81.41	<0.0001
lnw1itw2it	0.8505	0.0087	0.8332	0.8678	98.30	<0.0001
lnw1itw2it2	-0.0136	0.0006	-0.0147	-0.0125	-23.80	<0.0001
lny1itlnw1itw2it	-0.0049	0.0012	-0.0074	-0.0025	-4.07	<0.0001
lny2itlnw1itw2it	-0.0187	0.0008	-0.0203	-0.0170	-22.50	<0.0001
lny3itlnw1itw2it	0.0071	0.0011	0.0048	0.0093	6.26	<0.0001
R2	0.9709					
Hausman	m = 795.66 p-value < 0.0001					
Test – F	F = 22.06 p-value < 0.0001					
Fisher Test	$\chi 2 = 12384.0$ p-value < 0.0001					

Note. Source: Elaborated by the authors, based on the statistical analysis provided by the SAS.

Regarding the global adjustment of the model, the R^2 (*R-Square*), which represents the percentage of the endogenous variable explained by the exogenous ones, was high. The root mean square error of approximation (RMSE) or root of the mean square error, which corresponds to the amount of population approximation error in a covariance matrix, was calculated at 0.3982. The lower its value, the greater the accuracy of the model.

Locally, the model proved to be well adjusted because the Student's t-test pointed to the statistical significance of the coefficients of exogenous variables, indicating, therefore, that the parameters are statistically different from zero at the significance level of 1%. In other words, the probability of making the type I error, that is, of rejecting the null hypothesis, H_0: λ=0, being this true, is at an acceptable level (p-value < 1%). In addition, the parameters of the independent variables are associated with a low standard error.

It is worth noting that by meeting the econometric assumptions, it is possible to interpret the signs and magnitudes of the translog function cost coefficients (Albuquerque, 1987). Average growth rates of production factor prices, price elasticities, and substitution elasticities are relevant concepts that can be analyzed through total cost regression parameters. Such microeconomic interpretations have the potential to be the subject of a specific study aiming at deepening the evaluation of banking efficiency in the credit market.

Descriptive statistical analysis

For a better understanding of the results and analysis of the competition indicators, which will be analyzed in the following section, it is important to present the descriptive statistics for each BMC considered in this article. Table 4 presents the descriptive analysis of Lerner Indicator whose results suggest the existence of a negative (or left) asymmetric distribution, that is, there is a higher concentration of values above the average. It is also worth adding that single credit cooperatives (b3S) presented the lowest average and median mark-up among the BMCs considered, while the non-banking credit institutions (n1) registered the highest average and median mark-up in the period.

Table 4. Descriptive Lerner indicator statistics by BMC.

	b1	b2	b3S	n1
Minimum	-0.99	-0.92	-0.99	-0.93
First Quartile	0.74	0.75	0.65	0.81
Average	0.77	0.77	0.72	0.85
Median (Second Quartile)	0.85	0.84	0.76	0.88
Third Quartile	0.90	0.90	0.85	0.95
Maximum	1.00	0.99	0.99	0.99
Standard Deviation	0.25	0.24	0.21	0.17
Coefficient of Variation	33.83	31.22	29.82	20.70
Asymmetry	-3.12	-3.52	-2.77	-4.19
Kurtosis	12.27	15.77	12.19	27.50

Note. Source: Elaborated by the authors, based on the statistical analysis provided by the SAS.

Results of HHI, CR5, and Lerner Indicator

Concentration versus competition ratios

The scientific literature does not present a consensus on the nexus between competition and concentration within the financial industry. The results of the HHI suggest that the concentration of the banking and non-banking system operating in credit (b1+b2+b3S+n1) increased from low (0.07) to moderate (0.13) over the sample period considered. With regard to CR5, Caixa, BB, Itaú-Unibanco, Bradesco, and Santander controlled 72.2% of loans in the Q1 2019, compared to 45.4% in the Q1 2000.

Despite the increase in concentration, the average of the system's Lerner Indicator, weighted by the volume of credit offered by each FI in relation to the BMC it belongs to, closed the Q1 2019 at a level similar to that of the Q1 2000, of 0.8. Therefore, competition did not deteriorate in the period. By analyzing the competitiveness by the median of Lerner, which discards the highest and lowest indices, there is an improvement in competition. The correlation between the median of Lerner Index and the HHI was equal to 4.8% and, between Lerner and RC5, equal to -0.72%. Figures 1 and 2 allow us to visualize the behavior of the concentration indicators in comparison to the competition.

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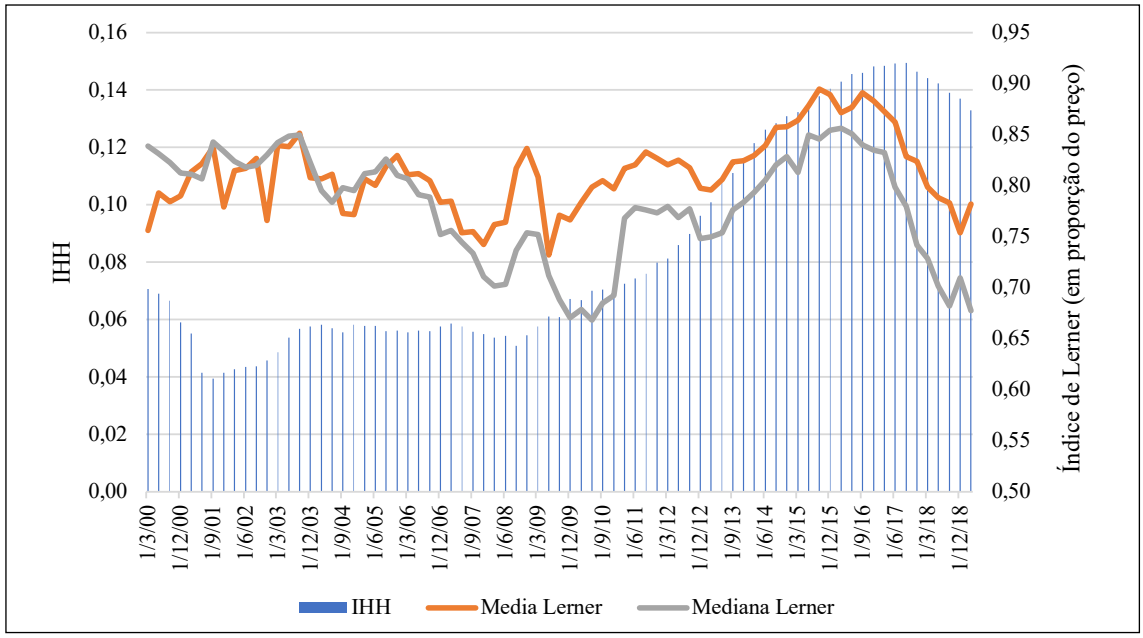

Figure 1. **HHI versus Lerner Index.**
Source: Elaborated by the authors.

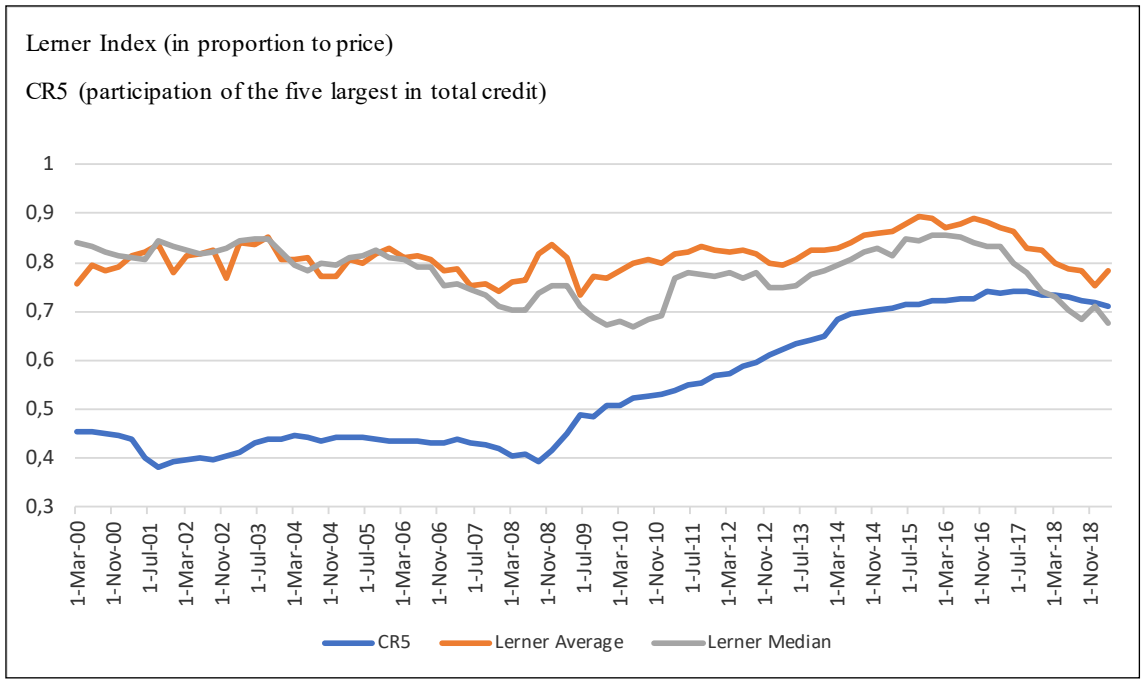

Figure 2. **CR5 versus Lerner Index.**
Source: Elaborated by the authors.

The concentration is explained, in part, by the need for economies of scale, high investments, and complex risk management in the sector. In addition, with the 2008 crisis the market has become more concentrated, with relevant merger and acquisition events. The increase was also perceived in most countries with the outbreak of international financial instability, according to a study by the Bank for International Settlements (BIS) (2018).

After the international financial turbulence, more specifically from the Q3 2009 onwards, credit mark-ups rose, which means that the competition deteriorated until 2016, even with the fall in the

Selic rate in the middle of 2009. However, the monetary tightening that began in mid-2013, with the Selic rate at 7.5% per year (p.a.), until the end of 2016, with the Selic rate at 14.5% p.a., may have contributed to the increase in margins on loans provided by the sector. In addition to the increase in the opportunity cost, it is worth remembering that the FIs faced an increase in default due to the domestic economic crisis in that period.

The concentration indicators, however, proved to be relatively more persistent than the competition indicators, which have already returned to the pre-crisis level (Q3 2008). The fall in interest rates from the end of 2016 to the beginning of 2019, by more than eight percentage points (p.p.), may have influenced the reduction of credit mark-ups from 2017 onwards. In addition, competition may have increased due to regulatory aspects, such as the proportionality of prudential regulation of capital requirements, as suggested in the most recent literature (Claessens & Laeven, 2004).

The Resolution No. 4,553/2017 (CMN, 2017), published on January 30, 2017, separated the FIs into five segmentations. In the S1 segmentation are banks whose size, measured by total exposure, is equal to or greater than 10% of GDP (Gross Domestic Product) or that are internationally active. According to the Basel Committee, banks are defined as internationally active banks that have Tier 1 capital of more than €3 billion and include all 30 banks that have been designated by the Financial Stability Board as global systemically important banks. S2 groups banks whose size is less than 10% of GDP and other FIs whose size is greater than 1% of GDP. S3 contains banks and non-banking institutions with sizes between 0.1% and 1% of the GDP. Banks and non-banking FIs smaller than 0.1% of GDP fall into S4. Of the latter, credit unions and non-banking institutions that have a simplified risk profile will fall under S5.

Thus, the requirements of the Basel Accords became valid for banks with relevant international activity, gathered in the S1 segment. For the institutions classified in the other segmentations, the standards started to be applied proportionally, contributing to increase competition in the Brazilian market. By following a prudential rule of complexity appropriate to their activities, FIs can compete more equally with the others.

The analysis in Figure 3 supports the perspective that credit margins have been reduced since the Regulation, especially in those segments whose requirements have been relaxed. Credit cooperatives and non-banking institutions whose simplified risk profile fitted into S5 registered the largest falls in the Lerner Index.

The heterogeneity in the distribution of the Lerner Index reveals the importance of presenting the Competitiveness Indicator in terms of quartiles, and prompts an evaluation of each BCM separately, as shown in the next sections.

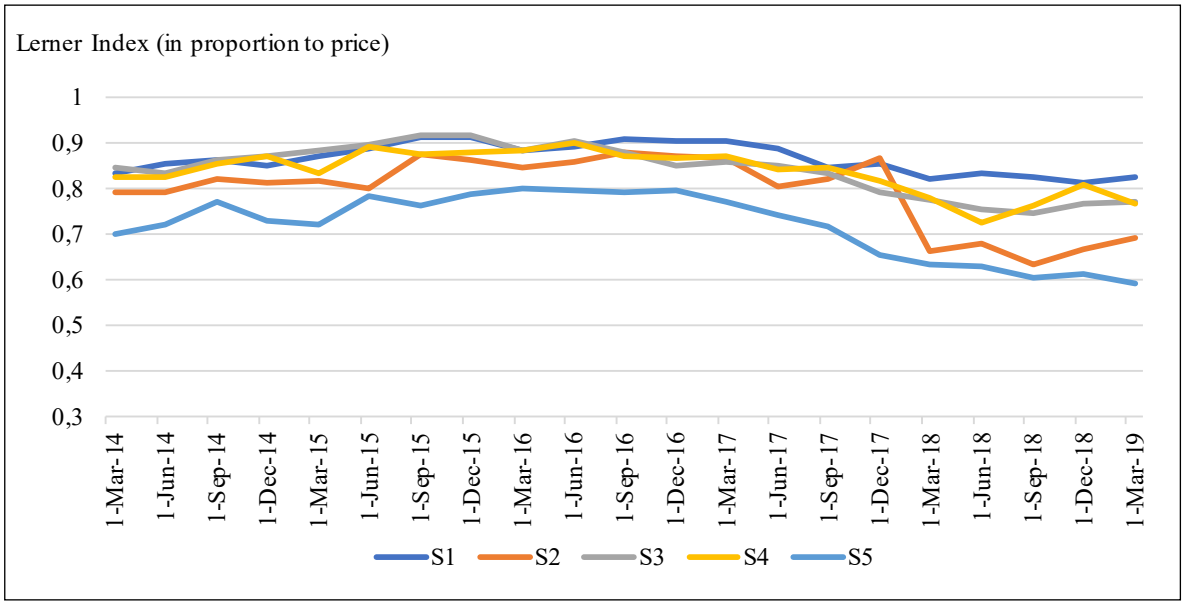

Figure 3. Median Lerner Indexes by segmentation.
Source: Elaborated by the authors.

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Competition index

Profit maximizing institutions with relative market power seek to apply a mark-up on their marginal costs in offering credit. In competitive environments, the greater elasticity of demand for credit in relation to interest tends to limit the value of loan rates. Therefore, the higher the mark-up, the less competition in the market. Lerner Indicator of the banking segments b1 and b2 and of the non-banking segments b3S and n1 presented a trajectory represented in Figure 4. The average was weighted by the volume of credit offered by each FI relative to the BMC to which it belongs. The median or 2nd quartile, that consists of the value up to which 50% of the ordered sample is found, is represented by the legend p_50. The 1st quartile, designated as p_25, is the value which holds 25% of the observations of the sample below and 75% above, while the 3rd quartile (p_75) leaves 75% of the observations below and 25% above.

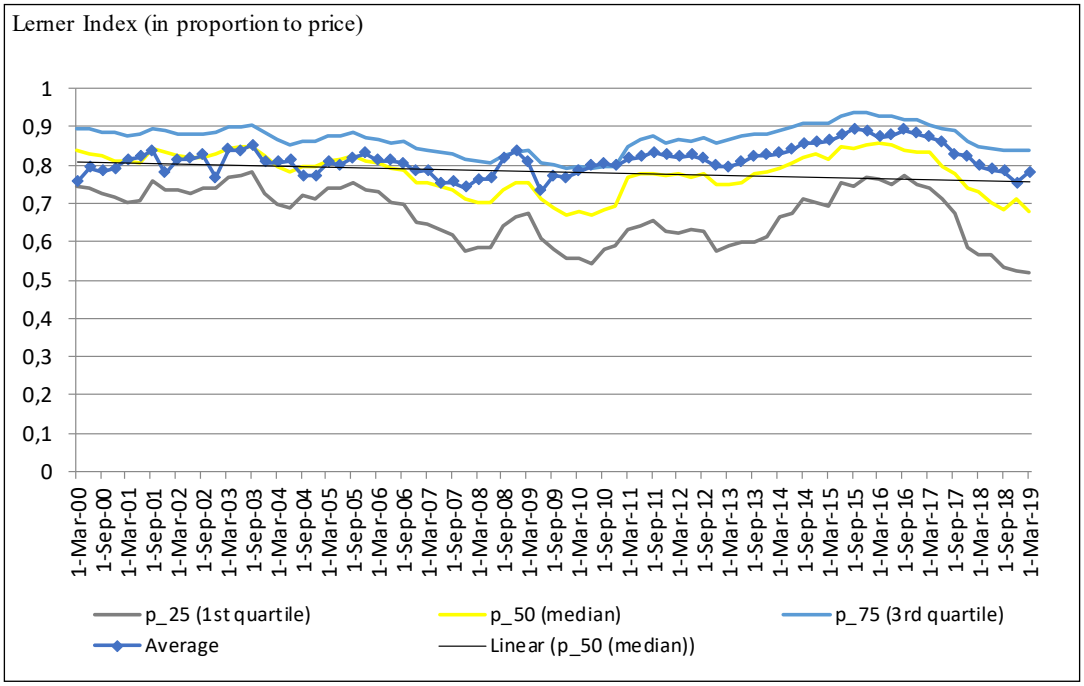

Figure 4. Lerner Indexes and their quartiles.
Source: Elaborated by the authors.

The weighted average of the Lerner Indicator follows a dynamic similar to that presented by the median; however, the level of the average indicator is higher for most of the period. This result indicates that large FIs, such as type b1 banks, have Lerner in the upper tail of the distribution.

Banking competition index

Given the relevance of BMC b1 banking institutions in granting the total loan, their average Lerner Indices follow the trajectory and the level of the average of the system, as shown in Figure 5. The average of the mark-up for both b1 and b2, although it varied along the series, closed the Q1 2019 practically at the same levels recorded at the beginning of the sample period, as can be seen in Figures 5 and 6.

Starting in the Q3 2009, that is, one year after the eruption of the global financial crisis, the indices rise, contributing to the worsening of the competition system identified in section 5.3.1. It is also worth noting the increase in the dispersion of the competition indicator to b1 and b2.

Since the Q4 2016, however, the banks have seen their mark-ups fall. It is important noting that the indicator already reflects the credit operations carried out by digital banks: ING Bank, Original Bank, BS2 Bank, Inter Bank, Modal Bank, and Neon Bank. Together, digital banks accounted for 0.8% of total net provisioning loans granted by the system.

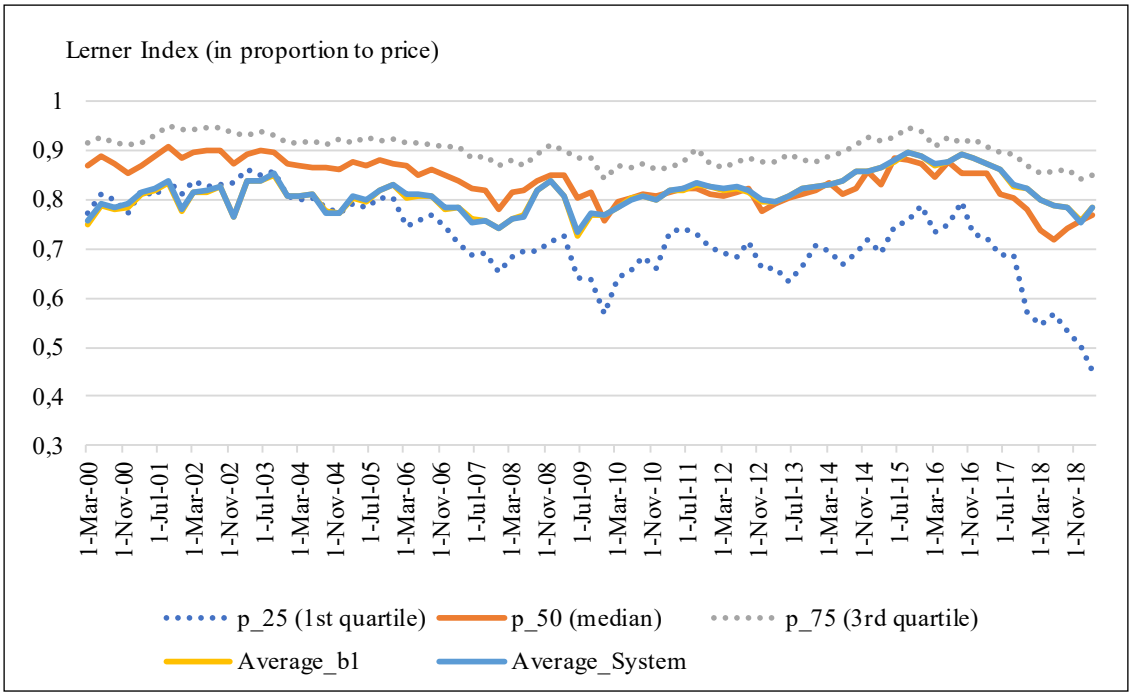

Figure 5. Lerner Index of b1 banking institutions.
Source: Elaborated by the authors.

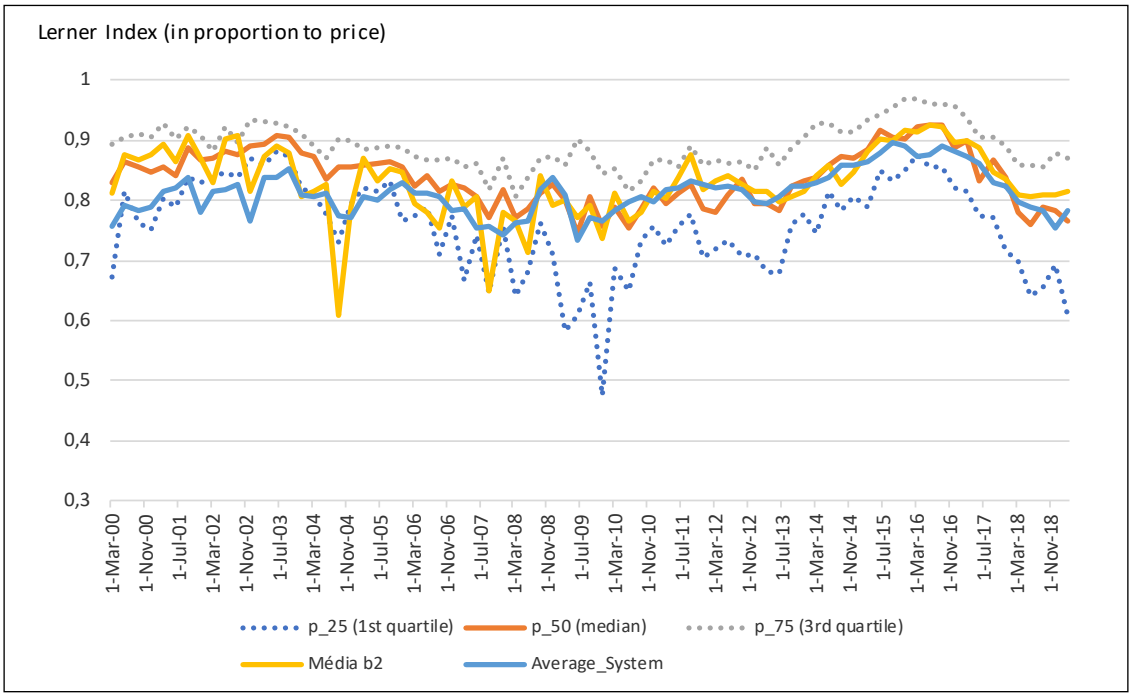

Figure 6. Lerner Index of b2 banking institutions.
Source: Elaborated by the authors.

Competition index of non-banking institutions

With respect to the non-banking segment, the average of the mark-up of the credit cooperatives (b3S) presented a decrease in the period analyzed by the present research, from 0.80 to 0.67, as shown in Figure 7. After two years of the beginning of the world financial crisis, these institutions raised their margins on the offered credit but for a short period. Since 2017, as it happened in the banking segment,

they registered an increase in competitiveness. The recent fall in the Lerner Indicator of non-banking FIs may have been influenced by the easing of monetary policy and the implementation of prudential regulation of proportional capital requirements.

Although cooperatives do not aim at profit, they seek to maximize the benefit enjoyed by their members and maintain their sustainable projects, which allows them to assess their competitiveness through the Lerner Indicator. It is interesting to note that, since the beginning of the considered time cut, cooperatives have stood out for presenting average levels of competitiveness higher than b1, b2, and n1, as shown in Figure 8.

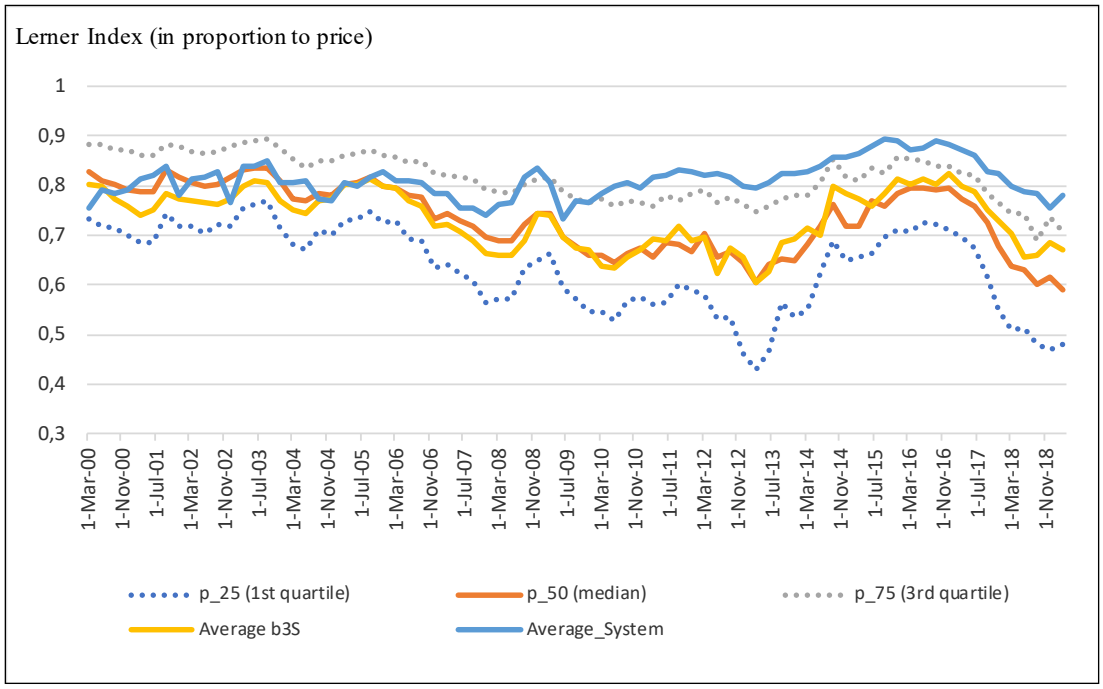

Figure 7. Lerner Index of credit union cooperatives (b3S).
Source: Elaborated by the authors.

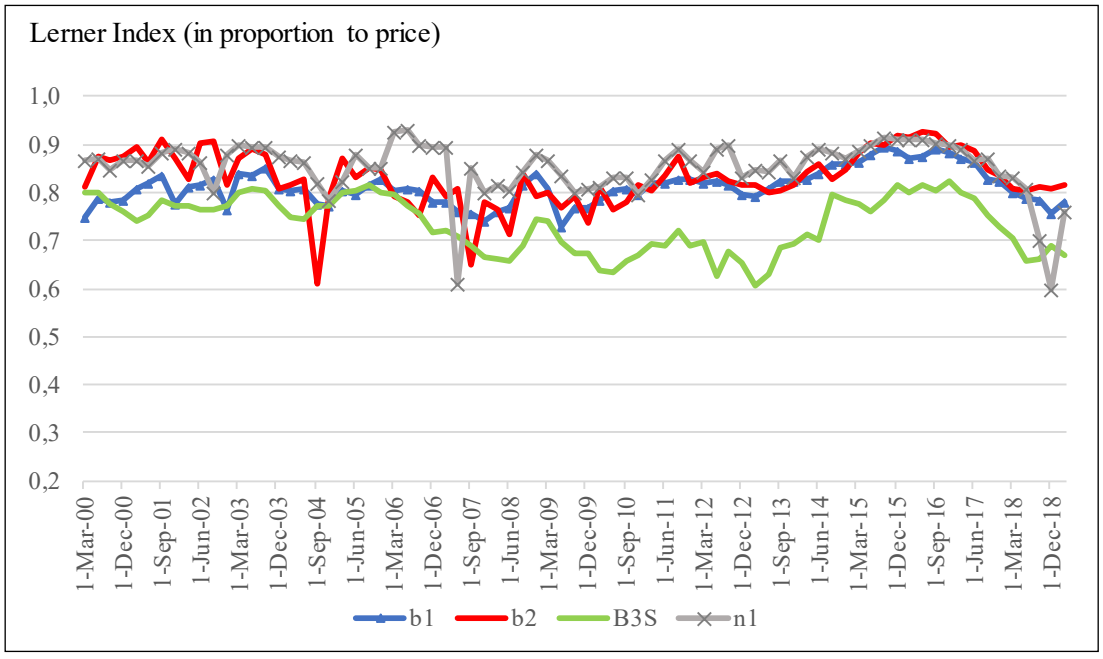

Figure 8. Lerner Index of b1, b2, b3S, and n1.
Source: Elaborated by the authors.

The cooperatives, although representing only 3.0% of the loans granted by the system (Q3 2018), have grown in participation (BACEN, 2017), increasing the potential to increase competition in the credit market. The monetary authority also highlights that the interest rates practiced by these institutions are lower than those practiced by the b1 banking segment. A possible explanation lies in the increase in professionalism and the consequent gain in scale, as well as in the disengagement of the search for profit, tax benefits, and positive feedback between cooperative members and the cooperative.

Non-bank credit institutions (n1) maintained their weighted average mark-ups at high levels throughout the series. Moreover, their Lerner Indices were higher than those presented by the other BMCs, suggesting the lower competition of this group, as shown in Figure 8. These institutions are responsible for 3.9% of the credit operations (Q3 2018).

CONCLUSION

The concentration indicators related to the domestic financial industry operating in credit showed a consistent increase between the Q1 2000 and Q1 2019, especially from 2008. The HHI went from low concentration at the beginning of the period to moderate. The five largest institutions, which controlled 45.4% of the credit market, started to control 72.2% at the end of the series. The increased concentration of the system can be explained by strategic issues, such as the search for gains of scale and scope, as well as the need for high investments and complex risk management in the sector. After the 2008 crisis, relevant mergers and acquisitions contributed to the concentration, movement observed in most countries (Bank for International Settlements, 2018).

Despite the increase in concentration, the median of Lerner Indicator declined from 0.83 in the Q1 2000 to 0.68 in the Q1 2019, which means that competition increased. The average of the Indicator, weighted by the loans granted by each FI in the respective BMC, closed the series at practically the same level, suggesting that large institutions did not present a reduction in their credit mark-ups.

The comparison between concentration and competitiveness indicators supports the first research hypothesis, further reinforcing the structure-profit theory, which argues that there is not necessarily a trade-off between concentration and competition (VanHoose, 2010). From this perspective, gains in efficiencies provided by mergers and acquisitions allow FIs to reduce interest without loss of profitability. The existence of an inverse relationship between concentration and credit interest has prevailed in the current literature, according to Fungacová, Shamshur, and Weill (2017). Claessens and Laeven (2004) have shown that financial markets with lower barriers to new organizations and financial innovations can be competitive and concentrated.

Competition in the financial industry operating in credit deteriorate after the outbreak of the international financial turmoil of 2008. In addition to the increase in the opportunity cost, with the monetary tightening that began in mid-2013, it is worth remembering that FIs faced increased default due to the domestic economic crisis in that period. However, concentration indicators proved to be relatively more persistent than those of competitors, who have already returned to pre-crisis levels.

Lerner average and median registered a significant reduction from 2017 onwards. The results suggest that competition may have increased due to regulatory issues, mainly the proportionality of prudential regulation of capital requirements, as pointed out in the most recent literature (Claessens & Laeven, 2004) and the second research hypothesis. With the implementation of Resolution No. 4,553/2017 (CMN, 2017), smaller IFs started to follow simpler rules than those applied to large banks, contributing to increase competition in the Brazilian market.

In addition, it is also worth mentioning the relevance of the credit cooperatives expanding the supply of supplementary credit, as well as technological innovations, which also affect the functioning of the system. In this context, this article found evidence that competition in the non-bank b3S segment is greater than that observed in b1 and b2 banks, as established in the third hypothesis.

Technology intensive financial companies, which include digital banks, fintechs, and large companies, have evolved in recent years, increasing the potential to stimulate competition in the credit market. It is important to remember that the concentration and competition indicators estimated in this article take into account the recent entry of digital banks whose accounting information is registered at IF.data. However, there are no public data available for the calculation of the indices related to fintechs, thus constituting a limitation of the research.

When comparing the competitive performance by BMC, it is noted that the Lerner Index of b1 banking institutions follows the

trajectory and the level of the system average. The average mark-up for both b1 and b2 closed the Q1 2019 at the same levels recorded at the beginning of the series. Starting with the Q3 2009, i.e., one year after the onset of the world economic crises, the Indices rose, corroborating the perspective that large institutions, such as banks, contributed to the worsening of the system's competitiveness. Since the Q4 2016, the banking segment has shown improvement in the level of competition.

It is concluded, in the article conducted and despite the limitations pointed out, that the estimates and analysis of competition within the Brazilian credit market in itself already fill a research gap. In the absence of academic consensus, this paper also elucidates the relationship between concentration and competitiveness, in addition to highlighting the relevance of regulation and credit cooperatives on the margins practiced in credit operations.

Theoretical and empirical literature on competition in the financial industry is rare, especially in relation to developing nations (Bikker & Haff, 2002; Turk-Ariss, 2010). Thus, this paper contributes to the academic and practical epistemology by becoming useful to support microeconomic policies capable of promoting contestability. Initiatives that ease entry restrictions for non-banking institutions and companies that operate with technology may contribute to the fall in margins charged on credit operations. In this context, it is expected that Resolution No. 4,656/2018 (CMN, 2018), which regulated the performance of credit fintechs, will stimulate competition in the sector.

Estimates of concentration and competition should move towards incorporating other countries and other financial products and services. Publications of empirical studies at the international level generally focus on aggregate banking activity rather than on separate credit operations (Turk-Ariss, 2010). Thus, future studies that estimate competitiveness in the global loan market tend to gain relevance. From this perspective, it is feasible to compare the level of national competition with that presented by Latin America and the Caribbean, and by competing countries.

Research also deserves to cover other products and services, such as means of payments (cards), transfers and deposits, and thus obtain a full assessment of competitiveness. The expanded scope is justified by the growth of the payments market and the recent impact of competition, especially in the acquiring sector. The development and relevance of the payments industry is not accompanied by scientific work. No specific studies have been identified yet on the acquiring activity. Akin, Aysan, Borici and Yildiran (2013) and Shaffer and Thomas (2007) evaluate the sector from the perspective of issuing banks and concluded that regulation has increased competition in the sector.

Identifying the impact of competition on systemic risk is also a fruitful line of research. Given the adverse systemic effects, the financial system regulator wonders what factors lead to the imminence of a bank failure. As far as the relationship between competition and stability is concerned, there is no convergence. The traditional side argues that more competitive banking systems generate instability, as market power would reduce information asymmetry and banks' exposure to risk. Theoretical and empirical evidence also indicates that competition increases banks' robustness, since efficiency creates incentives to select and monitor creditors, reducing default on loans granted.

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Data Availability

All data and materials were made publicly available through the Mendeley platform and can be accessed at:

de Abreu Azevedo, Monique (2020), "Data for "Concentration and Competition in the Domestic Credit Market"", Mendeley Data, v1 http://dx.doi.org/10.17632/c5kzfxbbb4.1

Funding

The 1st author is grateful for the technical and financial support granted by the Central Bank of Brazil (Banco Central do Brasil). The conclusions of the research are the responsibility of the authors, and therefore do not reflect the opinion of this Authority.

Conflict of Interest

The authors have stated that there is no conflict of interest.

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