The impact of mergers and acquisitions on Brazil's banking spread (1996-2021)

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ABSTRACT

Recognizing the importance of the credit market for a nation's economic development, this study aims to determine the impact of mergers and acquisitions in the Brazilian banking sector on Brazil's banking spread and the consequent effects on the country's credit market from 1996 to 2021. The methodology employed includes bibliographical research, descriptive analysis, and econometric research, specifically utilizing a recent Differences-in-Differences approach for multiple treatment periods. This approach is used to assess the effect of mergers and acquisitions on the cost and availability of credit in the Brazilian banking market, as well as on the size, operational efficiency, and profitability of financial institutions. The findings indicate that, despite significant market concentration during the period, there was a reduction in the interest margins charged by banks involved in the mergers and acquisitions, suggesting a negative impact on the banking spread. This supports the hypothesis of efficiency gains under the Structure-Conduct-Performance paradigm. Consequently, banking firms that participated in mergers and acquisitions in the Brazilian market during the study period did not necessarily gain greater market power and profitability, although the reduction in charged margins might be offset by efficiency improvements.

Keywords: banking spread; credit market; efficiency; market concentration.

JEL Classification: E51; G00; G34.

INTRODUCTION

The importance of the financial system – and consequently, the credit market – for the performance of an economy has been reported for a long time, directly or indirectly. The pioneering work of Goldsmith (1969) established a positive correlation between the development of this market and economic growth. Given this significance, it is also necessary to study the variables that affect it, such as the banking spread, which directly influences the cost of credit in countries and, consequently, investment decisions.

In this context, the present study aims to verify the impact of the mergers and acquisitions process in the Brazilian banking sector on Brazil's banking spread and the consequences for the country's credit market between 1996 and 2021. To this end, the study analyses mergers and acquisitions (M&As) among the main banking firms in Brazil following the implementation of government incentives for the consolidation of the financial system, correlating these events with the behaviour of the Brazilian banking spread and presenting the interrelations with the credit market. Moreover, it seeks to show the impacts of M&As on the operational efficiency of banks and contrast these results with the concentration of the credit market and the market power of firms, and consequently, competition in the Brazilian credit market, showing whether this was reflected in the interest rates charged on loans.

To achieve the proposed objectives, an econometric Differences-in-Differences estimator for multiple treatment periods is used. As far as is known, the use of this estimator is unprecedented in the study of banking spreads. Therefore, by structuring a relationship between the M&A process and the behaviour of the Brazilian banking spread and analysing the impacts on competition, profitability, and the credit market itself, this study hopes to contribute to the economic literature on the subject.

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In addition to this introduction, the remainder of the study is divided as follows: Section 2 provides a literature review on banking spreads and the M&A process and efficiency; Section 3 presents an overview of banking spreads and the M&A process in the credit market in Brazil; Section 4 explains the applied methodology and data used; Section 5 presents the results of the econometric estimations; Section 6 discusses the results and relates the findings to the existing literature; and Section 7 concludes the study.

2 RELATIONSHIP BETWEEN BANKING SPREAD, MERGERS AND ACQUISITIONS, AND EFFICIENCY IN THE BANKING MARKET

The banking spread can be characterized as the difference between two interest rates recorded in a credit operation: the interest rate that the bank charges its borrowers minus the interest rate that the bank pays its lenders. The seminal work on the subject is by Ho and Saunders (1981), in which the authors develop a theoretical model based on risk-hedging – more related to macroeconomic variables – and utility models – more related to microeconomic variables – along with empirical results for the U.S. case.

Over time, important features were added to the Ho-Saunders model, such as the significance of direct and indirect taxation on interest margins and the gains in scale and efficiency brought about by mergers and acquisitions (Hanson and Rocha 1986); the minimization of risks through banks' portfolio effects (Allen 1988); credit risk (default) and its interaction with market risk (Angbazo 1997). Beyond the specific studies on the Brazilian case, the empirical literature on banking spread determination can be divided into three main groups. Studies focused on developed countries, predominantly European countries and the United States; studies focused on developing countries, with an emphasis on Latin America, Africa, and Asia; and studies involving both developed and developing countries.

For developed countries, the study by Ho and Saunders (1981) uses cross-sectional data from U.S. commercial banks from 1976 to 1979 to estimate their theoretical model. The results show a positive relationship between the banking spread and changes in the economy's interest rate, loan maturity, and market concentration, as expected. Additionally, they find a negative relationship between bank size and the spread rates charged, as larger banks exhibited greater efficiency due to higher competition exposure. Similar results are found by Angbazo (1997) and Saunders and Schumacher (2000).

In European countries, Maudos and Guevara (2004) find a positive relationship between loan interest margins and banks' market power, the volatility of the economy's base interest rate, credit risk, risk aversion, and operating costs. Although not explicitly included in the model, implicit costs and reserve requirements also positively affect interest margins, while the quality of bank management has a negative impact. In the authors' approach, this means that less efficient banks charge lower interest margins. On one hand, some results by Maudos and Guevara (2004) are supported by Valverde and Fernández (2007) and Serrano et al. (2017). However, regarding banking efficiency, some European countries show a positive relationship with the banking spread, as demonstrated by Claeys and Vennet (2008) and Angori et al. (2019). This indicates a lack of consensus on the impact direction of efficiency on the banking spread in this region.

For developing countries, Brock and Suarez (2000) base their analysis on the Ho-Saunders model to explain the determinants of banking spread for six Latin American countries from 1991 to 1996. The results vary by country, but they find a positive relationship between banking spread and operating cost for all analysed nations, highlighting the importance of this variable for determining loan interest margins in Latin America. This result is confirmed by Gelos (2009) and Maudos and Solís (2009). Regarding banking efficiency and size, Brock and Franken (2003) find a negative relationship between these variables and the banking spread in Chile, indicating that larger banks tend to be more efficient and consequently charge lower interest rates on loans. This result appears to hold for other Latin American countries, as shown by Chortareas et al. (2012).

Turning to more general studies involving both developed and developing countries, Dermiguç-Kunt and Huizinga (1998) present a comprehensive study using weighted least squares methodology

applied to data from 80 countries from 1988 to 1995. A key contribution is showing that the banking spread is positively correlated with market concentration. The same result is found by Jorgensen and Apostolou (2013) covering 197 countries or economic areas, and Oliveira and Barros (2021) involving 208 nations. According to these authors, market concentration leads to a lack of competition, which increases loan interest rates.

Specifically for Brazil, a significant early study is by Afanasieff et al. (2002), where the authors apply the Ho-Saunders model to a panel of monthly data from 142 Brazilian commercial banks from February 1997 to November 2000. They conclude that macroeconomic variables are the main determinants of the banking spread in Brazil, although some microeconomic variables are also relevant. They find a positive relationship between the banking spread and the economy's base interest rate, GDP growth, financial taxation, bank size, the ratio of demand deposits to total assets, operating costs, market liquidity, and service revenue relative to total revenue. Additionally, they conclude that the banking spread is negatively affected by foreign capital control and the ratio of remunerated funds to total assets.

Regarding operating costs, Almeida and Divino (2015) and Cavalcanti et al. (2021) corroborate the findings of Afanasieff et al. (2002), establishing a positive relationship with the banking spread. However, regarding bank size – a variable directly affected by M&A processes – Dantas et al. (2011) find a different result, showing a negative relationship with the banking spread. Again, there is no consensus on the direction of this variable's impact on the spread.

As shown in the studies so far, there is clear heterogeneity in results for different geographical areas and periods, such as the issue of bank size, which can be associated with both greater efficiency and lower spreads, as well as greater market power and higher interest rates. However, the role of some variables is well-established, as shown in studies considering banks' market power – not necessarily linked to market concentration (Valverde and Fernández 2007) – and operating costs, being two of the main positively determining variables of the banking spread.

Given this, it is important to analyse the role of mergers and acquisitions in the banking sector and how they affect these variables studied in banking spreads, and consequently, how they affect the credit market and the spread itself. DeYoung et al. (2009) analyse over 150 studies post-2000 and conclude that for the U.S. and the European Union (EU), mergers and acquisitions processes have increased the efficiency of banking firms and, in the EU case, have generated greater value for shareholders. According to these results, a negative relationship between M&A and the banking spread is expected in these regions due to efficiency gains.

For Brazil, although Nakane and Weintraub (2005) focus on the role of privatizations on the productivity of Brazilian institutions, mergers and acquisitions are also considered. The authors find that banks undergoing privatization showed increased productivity over time. Part of the productivity increase came from the reduction in the number of branches and, consequently, increased efficiency of institutions. Another important result is that state-owned banks not undergoing ownership changes remained less productive, with similar findings presented by Beck et al. (2005).

Faria Júnior (2006), using data envelopment analysis, and Ferreira (2020), using stochastic frontier analysis, examine the impacts of mergers and acquisitions on the efficiency of the six main private banks in Brazil involved in M&A events. They show that there were increases in both intermediation efficiency – improved management, cost cutting, and economies of scale and scope – and profit efficiency, although the latter was to a lesser extent, aligning with the international literature on the topic. Another important finding is that domestically controlled private firms showed greater efficiency gains than foreign banks, and even with increased market concentration, there are indications that competition was not reduced, establishing a negative relationship between M&A and the Brazilian banking spread.

Using intervention analysis, Pessanha et al. (2012) show that, in general, banks involved in mergers and acquisitions in the Brazilian banking market experienced increased profitability. Although not

thoroughly explored by the authors, this increase in institutions' earnings could result from both improved operational efficiencies, with cost reductions and scale gains, and greater market power, indicated by higher loan interest rates, meaning higher banking spreads. For example, Barros and Wanke (2014) conclude that the M&A process increased bank efficiency and allowed the exploitation of scale gains, supporting the first alternative.

In contrast, the study by Joaquim et al. (2019) uses data on loans to corporations and M&A processes as exogenous shocks in the banking market to show that M&A increased market concentration and decreased competitiveness, giving banks greater market power, reflected in higher banking spreads and lower loan volumes. They show that banks' efficiency improved, but the efficiency gains were insufficient to offset the decline in competition. Finally, they demonstrate that reduced competition and consequently higher credit costs led to lower employment and economic output.

This section reviewed a series of studies on banking spread, the credit market, mergers and acquisitions processes, and the efficiency of banking firms, highlighting the importance of studying these variables – including for the real economy – and illuminating the heterogeneity of results obtained according to different methodologies, regions, and periods. An important observation is that many studies, particularly in the Brazilian context, do not address the issue of endogeneity, which may be linked to the interest margins charged and the performance of financial institutions, casting doubt on the consistency of the results.

3 PANORAMA OF BANKING SPREAD AND MERGERS AND ACQUISITIONS IN THE BRAZILIAN BANKING MARKET AND THE RELATIONSHIP BETWEEN VARIABLES

Data from the World Bank (2023) shows that from 1997 to 2022, Brazil had the highest average banking spread in the world. However, although the difference between the interest rate charged to borrowers and the interest rate paid to lenders remains high for Brazil compared to international peers, there has been a significant decline in this variable over the analysed period. According to information from the Central Bank of Brazil (Bacen) (2022a), between 2000 and 2019, there was a reduction of 33.1 percentage points. However, when analysing data on interest rates only for credit operations with free resources, the reduction in the Brazilian banking spread is considerably smaller, with a decrease of 7.6 percentage points between 2000 and 2019, and a decrease of 26.5 percentage points between 1997 and 2022, according to World Bank data (2023).

As shown in Graph 1, between 1997 and 2014, there was a strong downward trend in the Brazilian banking spread, a period that also includes the main mergers and acquisitions among the most important Brazilian banking institutions, especially between 1997 and 2008. The combination of Provisional Measure No. 1.179/1995 with Resolution No. 2.208/1995 of the National Monetary Council (CMN) led to the creation of the *Programa de Estímulo à Reestruturação e ao Fortalecimento do Sistema Financeiro Nacional* (PROER), whose premise was to manage mergers and acquisitions among banking firms of the National Financial System (SFN) according to rules established by the monetary authority (Bacen 2022b).

Furthermore, through Provisional Measure No. 1,514/1996, the *Programa de Incentivo à Redução do Setor Público Estadual na Atividade Bancária* (PROES) was created with the aim of reducing the participation of state-owned banks – which had highly concentrated operations – in the Brazilian banking market. The creation of PROER and PROES appears to be a preventive measure against a possible financial crisis in SFN soon after achieving inflation control with the Real Plan. According to Pessanha et al. (2012) and Barros and Wanke (2014), the stabilization of the Brazilian banking sector – mainly with the creation of the mentioned programs and the opening of the Brazilian economy to foreign capital – led to a significant wave of mergers and acquisitions (M&A) in the Brazilian financial system from 1997 onwards, as well as a strong influx of foreign companies into the Brazilian banking market. This M&A movement, coupled with the collapse of many banking institutions post-Real Plan, led to increased concentration in the Brazilian banking market.

GRAPH 1 - EVOLUTION OF THE BRAZILIAN BANKING SPREAD BETWEEN 1997 AND 2021
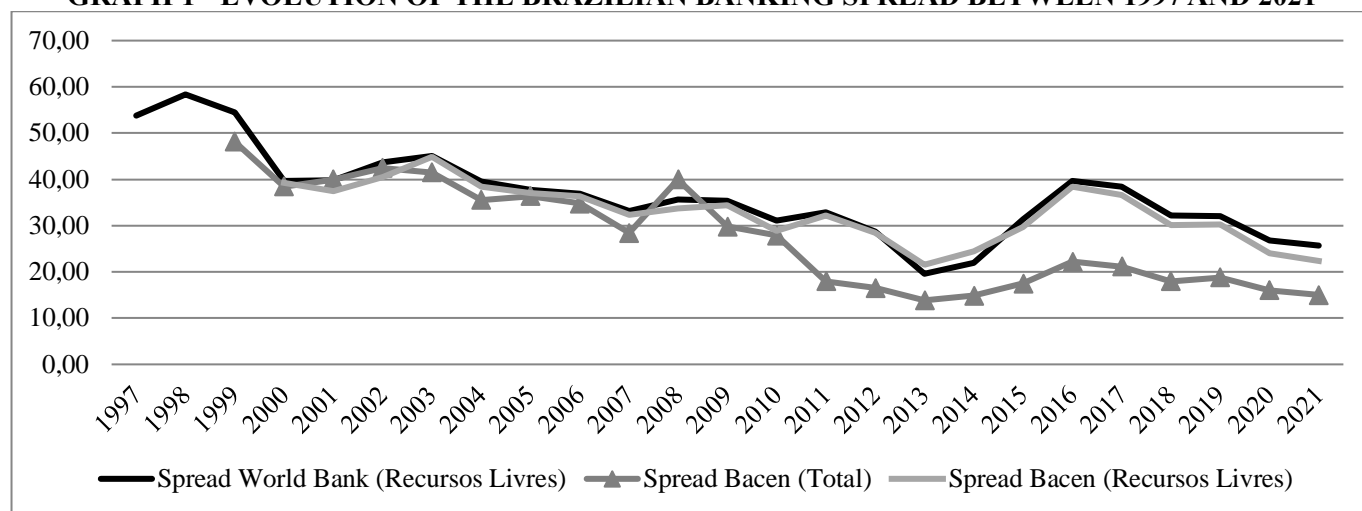
Note: Credit operations with "Recursos Livres" are those arranged through negotiation between credit institutions and borrowing agents, without any subsidy. Personal loans and working capital loans are some examples of credit operations with free resources. Credit operations with directed resources refer to operations linked to subsidies and/or government programs. Credit operations under the "Minha Casa Minha Vida" housing program are an example of credit operations with directed resources. The total spread considers both types of operations.

Source: Adapted from Nascimento (2021), according to information from Bacen (2022a) and World Bank (2023).

According to DeYoung et al. (2009), the main gains obtained by a financial institution engaging in an M&A are related to improvements in operational efficiency and increased market power. Taking this into account, and following Berger and Humphrey (1994), two different hypotheses emerge regarding the impact of M&A on the banking spread:

i) Gains in operational efficiency reduce bank costs, leading to lower spread rates: among other advantages, the M&A process transforms the involved companies into larger firms, providing economies of scale and scope, risk diversification, reduction in operational expenses, managerial improvement, and informational gains.

ii) Increased market power leads banks to charge higher spread rates: other consequences of the M&A process are linked to greater market concentration in the banking sector, often associated with reduced competition, and lower cost of funds for banking firms due to risk diversification.

In light of the above, the importance of studying the relationship between M&A and the banking spread in the Brazilian context becomes evident. Therefore, this study aims to contribute to the literature by demonstrating the direction of this relationship through a descriptive analysis, using an econometric estimator of Differences-in-Differences for multiple periods, which is novel for the studied topic.

4 METHODOLOGY AND DATA

4.1 ECONOMETRIC STRATEGY

As described earlier, for the econometric strategy, this study employs a descriptive approach using a Differences-in-Differences (Diff-in-Diff) research design, which is relatively underexplored in studies on banking spreads. In the "traditional" format, the Diff-in-Diff design is used to analyse the effect of a treatment in the period following the occurrence of an event, with the comparison based on the period immediately before the treatment. That is, it considers a single treatment in a specific period. However, as shown later, this study addresses multiple M&A events occurring in different periods, necessitating the use of a non-"conventional" Diff-in-Diff approach.

Specifically, this study utilizes the Diff-in-Diff methodology for multiple periods, as proposed by Callaway and Sant'Anna (2020) (hereafter referred to as CS). This approach allows for the consideration of various periods and different periods for treatment. In contrast to the "traditional" Diff-in-Diff, the proposed methodology enables different entities (banks) to undergo treatment (M&A) at different times (semesters). Moreover, it facilitates the dynamic observation of treatment effects over various periods – akin to event study estimates – rather than solely focusing on post-treatment effects, as commonly observed in Diff-in-Diff strategies.

Another advantage of the CS methodology for this study's research object is its ability to include anticipation periods of treatment. It is noteworthy that an M&A process does not occur unexpectedly – it is not an exogenous shock – as there is a period of exploration and negotiation before the actual agreement, during which agents could make decisions regarding the dependent variable based on the imminent possibility of treatment. By incorporating this possibility into the estimation procedure, the likelihood of biased results is reduced.

As an identification strategy, the study relies on the conditional parallel trends' assumption. According to Huntington-Klein (2022), this assumption implies that, in the absence of treatment (M&A), the difference in the response variable (spread) remains constant between treated entities (banks that underwent M&A) and the control group (banks that did not undergo M&A). Any change observed in the treated group compared to the comparison group is attributed to the treatment itself. This assumption is not directly observable due to what Holland (1986) refers to as the Fundamental Problem of Causal Inference (FPCI), which states that it is impossible to know what would happen to the response variable in the absence of treatment, given that the treatment occurred.

Primarily due to the unobservable factor, the parallel trends assumption can be quite strong in certain situations, particularly during periods marked by multiple environmental changes that could affect the response variable, such as the banking spread in Brazil. To address this potential violation of the assumption, the CS approach borrows from Abadie (2005) by adopting conditional parallel trends on covariates, which involves adding control variables to the equation. Thus, assuming that the dependent variable between the treatment and control groups, conditioned on a vector of covariates, should follow the same trend in the absence of treatment, enhances the plausibility of accepting the parallel trends hypothesis.

Due to the FPCI, Diff-in-Diff configurations generally use a measure of the average treatment effect on the treated (ATT). However, the CS approach generalizes the ATT parameter to accommodate the various and different treatment periods, referred to as the group-time average treatment effect. According to Cunningham (2022), four main assumptions must be met to obtain consistent ATT results in the CS estimator, as per Equation 1.

Firstly, this approach should be applied to panel data – as is the case in this study – or cross-sectional data. Secondly, conditional parallel trends must be assumed, as mentioned earlier. Thirdly, once a unit is treated, it remains treated for the remainder of the period. Lastly, at some point, the treatment group and the control group must have units with similar propensity scores; that is, the probability of a unit (bank) being exposed to treatment (M&A) should be comparable among considered individuals, conditional on covariates.

$$ATT(g,t) = E\left[\left(\frac{G_g}{E[G_g]} - \frac{\frac{\hat{p}(X)C}{1-\hat{p}(X)}}{E\left[\frac{\hat{p}(X)C}{1-\hat{p}(X)}\right]}\right)(Y_t - Y_{g-1})\right] \quad (1)$$

In which g is the period in which the unit is first treated; t is the treatment period; G_g is the time group of treated units; $\hat{p}$ is the propensity score; X is a vector of covariates; C is a dummy variable that takes the value 1 if the unit belongs to the control group and 0 otherwise; Y_t is the potential outcome in period t; Y_{g-1} is the potential outcome one period before the first treatment. For the estimation of Equation 1, Callaway

and Sant'Anna (2020) employ a bootstrapping approach, which leads to asymptotically consistent estimates, and also constructs valid confidence intervals simultaneously for both the treatment group and the treatment period, with a probability of $1 - \alpha$, where α is the chosen significance level.

As pointed out by Cunningham (2022), for a long time, studies involving different treatment periods relied on Two-Way Fixed Effects (TWFE) regressions, which essentially use time dummies to estimate the parameters of interest. However, due to heterogeneity and varying weights assigned to events during the study period (Goodman-Bacon 2018), this approach can lead to serious interpretation issues.

To the best of current knowledge, this is the first application of the CS estimator in studying bank spread and the mergers and acquisitions process. The choice of this estimator appears appropriate due to its alignment with the phenomenon studied in this paper, as well as the limited alternatives available. Working with Diff-in-Diff for observational data, in general, is not a straightforward task. The CS estimator is available in the R software, through the "did" package, and automatically retrieves the ATT value. Therefore, this study utilizes this tool for econometric estimations.

4.2 Database

To achieve the research objectives, data from various sources, primarily from the Central Bank of Brazil, are employed. These data are analysed semi-annually from the first half of 1995 to the second half of 2021 at the level of financial conglomerates – or individual firms for those not affiliated with any conglomerate – that are deemed relevant. Development banks are excluded from the sample due to their distinct operational dynamics that diverge from the rest of the market. Including these institutions could potentially distort results concerning bank spread. Additionally, banks with fewer than two observations during the analyzed period are also excluded from the sample. This approach results in an unbalanced panel dataset comprising 5,461 observations.

Table 1 summarizes the variables utilized in the study, how they are constructed, and their data sources. The variable "bank spread" represents the calculated value of bank spread, the primary focus of this study. Following Dantas et al. (2011), this variable is computed as the ratio of credit revenue to the average credit balance for the current and immediately preceding periods, minus the ratio of funding expenses to the average total deposits for the same periods, as shown in Equation 2.

$$SPREAD_{i,t} = \left\{ \left[\frac{RC_{i,t}}{\left(\frac{SOC_{i,t} + SOC_{i,t-1}}{2} \right)} \right] - \left[\frac{DC_{i,t}}{\left(\frac{DT_{i,t} + DT_{i,t-1}}{2} \right)} \right] \right\} * 100 \qquad (2)$$

Where $RC_{i,t}$ is credit revenue in period t; $SOC_{i,t}$ is credit operations balance in period t; $DC_{i,t}$ is funding expenses in period t; $DT_{i,t}$ is total deposits in period t.

The variables banking efficiency (EFICIENCIA), bank size (TAMANHO), average return on assets (ROA), and credit portfolio as a share of total assets (CREDITO) are used as dependent variables in auxiliary estimations – to assess the impact of mergers and acquisitions on key operational and performance indicators of banking firms – because they are also likely influenced by the M&A process. In turn, the variable PFA represents the merger and acquisition process, functioning as a dummy variable that serves as a treatment, stemming from the banking consolidation in Brazil during the 1990s, which constituted a market intervention in the banking sector.

TABLE 1 – DESCRIPTION OF STUDY VARIABLES

Variable	Description	Source
SPREAD	(Interest Income / Credit Operations Balance) (Funding Expenses / Total Deposits)	COSIF
EFICIENCIA	1 / (Operating Expenses / Total Revenue)	COSIF
CREDITO	Credit Portfolio / Total Assets	COSIF
TAMANHO	Total Bank Assets / Gross Domestic Product	COSIF/IPEADATA
ROA	Net Income / Total Assets	IFDATA/COSIF
PFA	Merger and Acquisition Process	BACEN/DIVERSOS
TCB	Type of Banking Consolidation	IFDATA
CONTROLE	Type of Banking Firm Control	IFDATA

Source: Authors' compilation (2022).

The PFA variable takes a value of 1 if the bank participated in a merger and acquisition process, and 0 otherwise. Once an M&A event occurs, the variable remains 1 for all subsequent periods, regardless of whether the resulting bank participates in further M&A activities. Additionally, it is possible for a bank to acquire another institution and later be incorporated into another group. In such cases, the sample period for the acquired bank ends at the time of the second operation.

Furthermore, the bank that continues to be reported in subsequent periods following the M&A operation is considered the acquirer, while the bank that ceases to be reported is considered the acquired. As highlighted by Joaquim et al. (2019), mergers and acquisitions involving banking firms in Brazil require approval from both the Central Bank (Bacen) and the Administrative Council for Economic Defense (CADE), which can take a considerable amount of time, resulting in a significant gap between the announcement date and approval date of the process. Therefore, the treatment date considered in this study equals the last semester in which the acquired institution is reported in the database.

The variable type of banking consolidation (TCB) indicates whether the financial institution is a commercial bank, multiple bank, investment bank, among others. According to Azevedo and Gartner (2020), the type of consolidation tends to influence banks' managerial decisions and, as it is not affected by the treatment, it is used as a control variable in the econometric estimates. In turn, the banking control type (CONTROL) indicates whether the institution is public, privately controlled by nationals, or privately controlled by foreigners. Similar to the TCB variable, it is not affected by the merger and acquisition process in this study but influences banks' decision-making power (Ornelas et al., 2022), hence serving as a control variable.

TABLE 2 – DESCRIPTIVE STATISTICS OF VARIABLES OF INTEREST

Variable	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
SPREAD (Percentage points)	-475,0790	-1,7050	4,2930	2,1750	11,6920	583,2340
EFICIENCIA (Proportion)	0,0910	1,0025	1,0437	1,0731	1,1114	5,0417
TAMANHO (Proportion)	0,0004	0,0970	0,4978	9,8093	1,9792	984,6705
ROA (%)	-35,4000	0,0200	0,0900	0,1400	0,2700	31,1800
CREDITO (%)	-0,0651	1,7185	6,0271	8,9301	12,8571	90,9985

Source: Authors' compilation based on data and information from the Central Bank of Brazil (2022a, d) and Ipeadata (2022).

Table 2 presents descriptive statistics for the study's variables of interest. Regarding banking spread, 52 observations – 48 on the lower limit and 4 on the upper limit – were excluded as outliers, identified through Box Plot analysis due to their significant deviation from other values. It is important to note that none of these observations involve banking firms that participated in the merger and acquisition process.

Given this, the lowest recorded value for banking spread was in the first semester of 1998, approximately -475.08 for Banco Destak S.A, which transformed into a non-financial company in the following year's first semester. This value is explained by significant funding expenses incurred by the bank

during the period. Conversely, the highest recorded value for this variable was approximately 583.23 for Banco Patente S.A in the first semester of 1999, the same period when the bank ceased operations. As the mentioned bank was in the process of winding down operations, its credit balance during that period was considerably low, which, being used in the denominator of the spread calculation formula, resulted in this 'elevated' value. Moreover, the average recorded for banking spread across institutions between the first semester of 1995 and the last semester of 2021 was approximately 2.18 percentage points.

For banking efficiency, Table 2 shows that the lowest value was approximately 0.09, recorded for Banco HNF S.A in the second semester of 1997. During this period, the bank experienced a significant decline in total revenues, contributing to its transformation into a non-financial company in the first semester of 1999. In contrast, the value of approximately 5.04, recorded by the conglomerate Cunha Guedes in the first semester of 2013, was the highest value in the series, driven by a substantial increase in the bank's total revenues, boosted by record operations with securities, and derivative financial instruments. Furthermore, the average for the variable was approximately 1.07.

Regarding bank size, there is considerable variability and a wide range in the series. The smallest proportion was recorded for the investment bank Induscred in the second semester of 2019, with a value of 0.0004% of GDP. The bank underwent a significant reduction in its assets during the second decade of the 21st century, contributing to this outcome. On the other hand, the largest value was recorded by Banco Bradesco in the second semester of 1995, where the total assets of the bank were approximately 9.8 times larger than the Brazilian GDP, a remarkably high value. It is important to note that excluding this value from the sample did not alter the results, hence it was retained. Furthermore, the average for the variable was approximately 9.81% of GDP.

In terms of banking profitability, the average recorded over the period was 0.14%, which is considerably low. One factor contributing to this result is the negative profitability many banks experienced in the late 1990s during price stabilization and banking consolidation. The lowest value for ROA was -35.40%, reported by Banco do Estado do Maranhão (BEM) in the first semester of 1997, a period when the institution incurred record losses, continuing a trend of negative profitability for several semesters, a common situation for state banks at that time. In contrast, Banco Rendimento reported the highest profitability of the period, with a value of 31.18% in the first semester of 1995, likely driven by inflationary gains before price stabilization, as the institution's profitability showed a significant downward trend in subsequent periods.

Lastly, the availability of credit from institutions, measured by the ratio of credit operations to total assets, was approximately 8.93%. The negative value of approximately -0.07%, the lowest in the series, is explained by the similarly negative credit balance reported by Banco Euroinvest in the first semester of 1996. Conversely, OMNI Financeira had approximately 91% of its assets composed of credit operations in the second semester of the same year, a notably high value attributable to the company's sector of operation, which consistently shows above-average values for nearly all periods.

As shown in Graph 2, 78 merger and acquisition events were identified during the analyzed period, involving 103 different banking institutions (further details on the institutions can be found in Table A1 of Appendix A of the study). However, the sample comprises 222 financial conglomerates or individual institutions, including treated and non-treated units. Moreover, the majority of events occurred between the latter half of the 1990s and the first half of the 2000s, as depicted in Graph 2. Each bar in the graph represents a treatment period; thus, 36 treatments were identified in this study.

GRAPH 2 – MERGERS AND ACQUISITIONS DISTRIBUTED ACROSS STUDY SEMESTERS
(06-1995 / 12-2021)
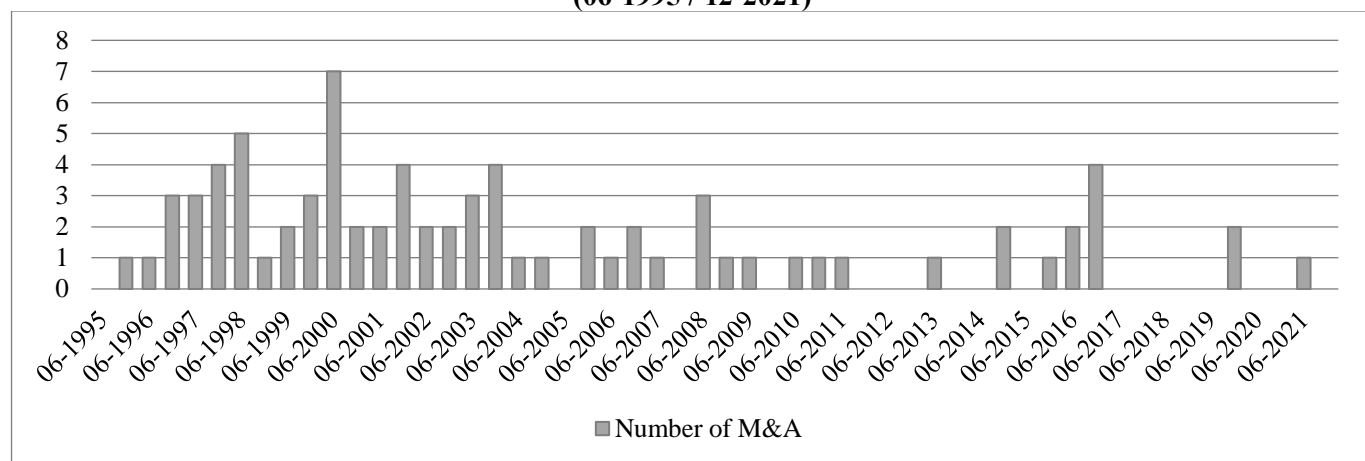
Source: Authors' compilation based on information from Bacen (2022a, c).

As shown in Graph 3, most of the financial institutions included in the sample are categorized as b1, with a strong presence of commercial banks where credit operations constitute the primary business of the company. The graph also illustrates a significant reduction in the number of institutions operating in the Brazilian credit market, with much of this reduction occurring through mergers and acquisitions, as well as a portion of banks being liquidated by the Central Bank of Brazil and/or ceasing operations.

GRAPH 3 – FINANCIAL INSTITUTIONS BY TYPE OF BANKING CONSOLIDATION
(06-1995 / 12-2021)
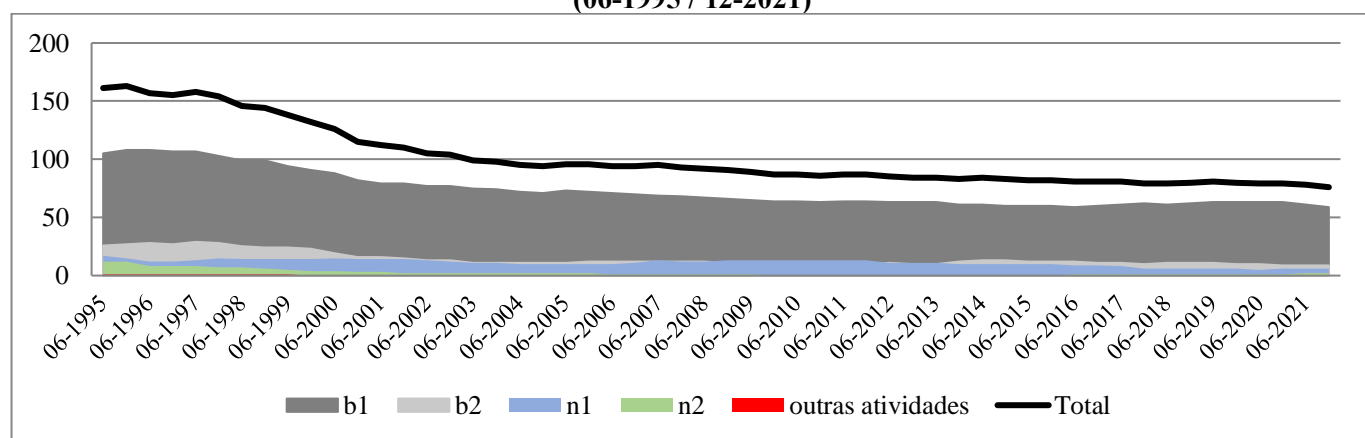
Source: Authors' compilation based on information from Bacen (2022a).

As shown in Table A2 of Appendix A, there is considerable variation in the number of banking firms comprising the treatment group, as well as the number of potential institutions in the control group for each period of the study. For the treatment group, the lowest value appears at the beginning of the series, with 1 institution in the second semester of 1995, while the highest value is 25 institutions in the first and second semesters of 2021. As for the control group, the lowest value is recorded in the second semester of 2021 with 51 institutions, whereas the highest value is recorded in the second semester of 1995 with 163 banks.

This section has presented the methodological approach, along with the database and some stylized facts regarding the sample of financial institutions used in the study. It emphasizes the use of the Diff-in-Diff research design with a strategy for identifying parallel trends conditioned on covariates, a method less commonly employed in the study of banking spreads. Regarding the data, the sample encompasses a significant number of banking firms over a relatively extensive period, which, combined with the chosen econometric methodology, allows for dynamic and comprehensive results to be obtained.

5 ECONOMETRIC ESTIMATIONS

Following the methodological approach introduced in the previous section, the results of the econometric estimations of Equation 1 are presented below. The first subsection displays the impacts of mergers and acquisitions on banking spread, institution efficiency, bank size, banking firms' profitability, and credit availability. The second part introduces robustness exercises for the study and discusses potential limitations.

5.1 IMPACT OF MERGERS AND ACQUISITIONS ON THE BRAZILIAN CREDIT MARKET

According to Table 3, mergers and acquisitions in the Brazilian banking market are associated with a decrease of 5.24 percentage points in the banking spread of treated entities compared to untreated ones from 1996 to 2021. It is observed that the effect is more pronounced for the treatment groups in the early periods and diminishes over time. It is noteworthy that the group from the first semester of 2013 was the only one to exhibit a positive effect of M&A on banking spread during the analyzed period.

TABLE 3 – IMPACT OF M&A ON STUDY DEPENDENT VARIABLES

		Average Treatment Effect (ATT)		
SPREAD	Ln(EFICIENCIA)	Ln(TAMANHO)	ROA	Ln(CREDITO)
-5,2448 ***	0,0363	0,3484 **	-0,9461 ***	-0,1087
(1,4599)	(0,0547)	(0,1393)	(0,1952)	(0,0800)

		Treatment Effect by Group-Time		
Group	SPREAD	Ln(EFICIENCIA)	Ln(TAMANHO)	ROA	Ln(CREDITO)
12-1996	-12,2211 **	-0,1053 ***	0,7801 ***	-0,1219	-0,5280 *
	(5,9531)	(0,0286)	(0,2532)	(0,0896)	(0,2295)
06-1997	-13,2140	-0,0809 ***	-1,9750 ***	-0,0151	1,9516 ***
	(6,7530)	(0,0177)	(0,2794)	(0,0668)	(0,3154)
12-1997	-19,8505 ***	0,1005	3,2095 ***	-9,5549 ***	-0,4532
	(3,6983))	(0,0604)	(0,4249)	(0,0596)	(0,3536)
06-2000	-	-0,0257	0,0160	0,0057	-0,8230 ***
	-	(0,0209)	(0,2745)	(0,0374)	(0,2580)
06-2004	3,2123	0,0221	1,8039 ***	-	0,7693
	(7,4215)	(0,0393)	(0,2673)	-	(0,4453)
06-2008	0,0013	0,0035	-0,2764	-0,0130	-0,0613
	(1,5449)	(0,0590)	(0,3725)	(0,0322)	(0,1238)
06-2011	-8,5124 ***	0,2463 **	0,4157	0,3722	0,0363
	(2,3839)	(0,0418)	(0,5486)	(0,4057)	(0,1152)
06-2013	2,7597 **	-0,1442 ***	-0,5487 ***	-0,3530 ***	-1,0549 ***
	(1,2743)	(0,0109)	(0,1065)	(0,0145)	(0,1018)
06-2015	-4,0187 ***	0,2385 ***	-0,0403	-0,1826 ***	-0,1566
	(1,2533)	(0,0247)	(0,3575)	(0,0227)	(0,1782)
12-2016	-1,1855	0,0050	0,0041	0,0106 ***	-0,1132
	(1,4713)	(0,0099)	(0,1708)	(0,0030)	(0,1079)
06-2021	-0,2105	-0,0388	0,7201 ***	-	-0,9040 ***
	(0,5075)	(0,0218)	(0,0944)	-	(0,1037)
Observations:	5.260	5.276	5.276	4.841	5.272

Anticipation Periods: 0; Control Group: Not treated yet; Estimation Method: Doubly Robust (dr)

Note: CI = Confidence Interval. ***CI: 99%; **CI: 95%; *CI: 90%. Standard error in parentheses.

Source: Authors' compilation based on data and information from the Central Bank of Brazil (2022a, d).

On the other hand, Table 3 shows that there is no overall effect of M&A on banking efficiency, with the value statistically equal to zero. However, considering effects by each treatment group, the results from the second semester of 1996, the first semester of 1997, and the first semester of 2013 indicate a negative impact of M&A on banking efficiency, with these values being statistically significant. Conversely, for the groups in the first semester of 2011 and 2015, the impact is positive and also statistically significant.

Regarding the variable of bank size, overall, mergers and acquisitions in the Brazilian credit market led to a 34.84% increase in the size of banks that participated in the treatment, with a 95% confidence interval, as shown in Table 3. The groups from the second semester of 1996 and 1997, and the first semester of 2004 and 2021, presented estimated values significantly positive and statistically significant, whereas the groups from the first semester of 1997 and 2013 show a negative impact of the M&A process on the dependent variable.

The Table 3 also shows a negative impact of mergers and acquisitions on the profitability of financial institutions, such that, overall, banks participating in the treatment group experienced a reduction of approximately 0.95 percentage points in this variable. However, considering the treatment effects individually for each treated group, there is a positive and statistically significant result within a 99% confidence interval only for the second semester of 2016, while the groups from the second semester of 1997, and the first semesters of 2013 and 2015 show negative effects of the M&A process on profitability, also within a 99% confidence interval.

Another variable of interest impacted by the mergers and acquisitions process is the credit availability of banking firms, measured as the ratio of credit portfolio to total assets of institutions. According to Table 3, the overall ATT value is not statistically significant, considering a 90% confidence interval. However, concerning effects by treatment group, only the first semester of 1997 shows a positive and statistically significant value, while the groups from the first semesters of 1996, 2000, 2013, and 2021 show negative and statistically significant values.

Overall, Table 3 demonstrates some heterogeneity in the specific results of each time group for the analyzed variables. The results shown pertain to the treatment effect immediately following the event occurrence; however, for the banking market, a dynamic effect is expected for mergers and acquisitions, where synergies between institutions lead to effects extending beyond the immediate event period. To test this hypothesis, the CS estimator can be used to recover the Dynamic ATT.

TABLE 4 – DYNAMIC EFFECT OF M&A ON STUDY DEPENDENT VARIABLES

Model	SPREAD	Ln(EFICIENCIA)	Ln(TAMANHO)	ROA	Ln(CREDITO)
		Average Treatment Effect (Dynamic ATT)			
No Covariates	-6,4511 ***	0,0001	0,5845	-1,7548	0,1312
	(2,5756)	(0,0449)	(0,6879)	(1,9213)	(0,4839)
With Covariates	-10,1605 ***	0,0048	0,5722	-1,7494	0,0776
	(3,3114)	(0,0430)	(0,7724)	(2,0939)	(0,4910)
Observations:	5.260	5.276	5.276	4.841	5.272

Anticipation Periods: 0; Control Group: Not treated yet; Estimation Method: Doubly Robust (dr)

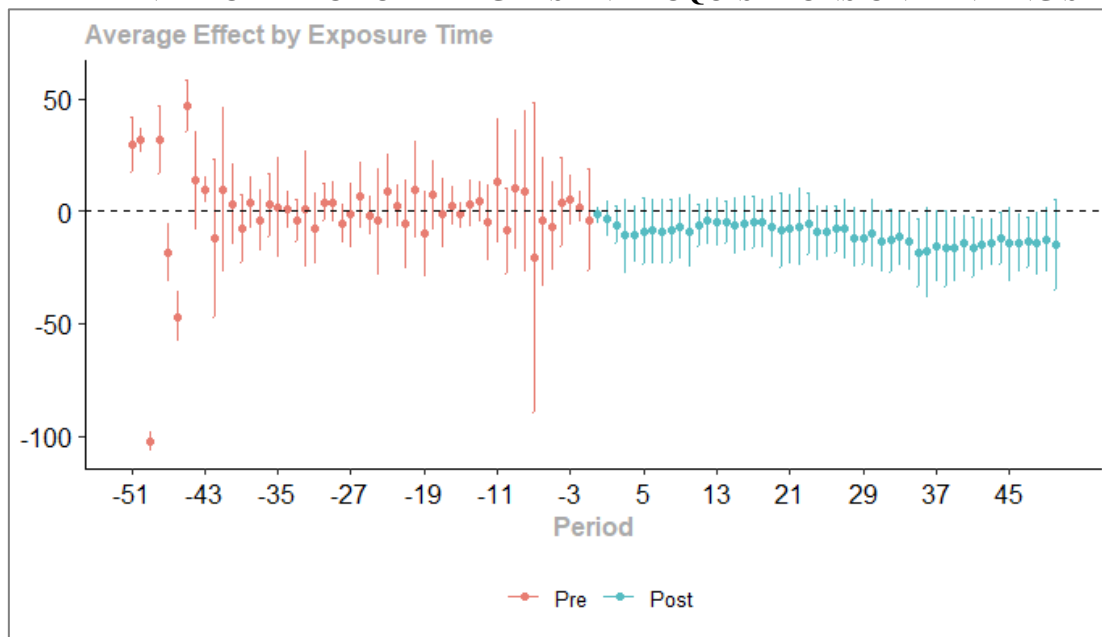Note: CI = Confidence Interval. ***CI: 99%; **CI: 95%; *CI: 90%. Standard error in parentheses.

Source: Authors' compilation based on data and information from the Central Bank of Brazil (2022a, d).

As expected, Table 4 shows that over time, the effect of M&A was greater in reducing the banking spread, with banks participating in the treatment group experiencing a reduction of approximately 10 percentage points in this variable – considering the model with covariates – compared to institutions in the control group, a significant reduction. For the other dependent variables, however, similar to the static model, both approaches – without covariates and with covariates – show no dynamic impacts of M&A on banking efficiency and credit availability, with values statistically equal to zero. Additionally, although they showed statistically significant values in the static model, it cannot be asserted that the variables of bank

size and return on assets exhibited dynamic relationships with the mergers and acquisitions process during the analyzed period.

The dynamic treatment effect on the banking spread can be better observed in Graph 4. First, it's important to highlight that in periods prior to treatment events, the units exhibit similar behaviour, except for outliers such as the period -49, which stands out in the graph. That said, Graph 4 illustrates how the M&A process negatively impacts the banking spread, with a greater effect over the exposure period. This suggests that when a bank engages in a merger and acquisition process, the effects on the banking spread are not static, supporting the choice of the CS estimator over the TWFE.

GRAPH 4 – DYNAMIC EFFECT OF MERGERS AND ACQUISITIONS ON BANKING SPREAD

Source: Authors' compilation based on data and information from the Central Bank of Brazil (2022a).

This subsection presented the main econometric results of the study, where the primary variable of interest is the banking spread of financial institutions. Additionally, the efficiency, size, profitability, and credit availability of the institutions composing the sample were analyzed. It is noteworthy that the study highlights the negative impact of M&A processes on banking spread and profitability, alongside a considerable increase in institutional size.

5.2 ROBUSTNESS EXERCISES

As previously discussed, a plausible hypothesis is that financial institutions anticipate the treatment, causing it to no longer be an exogenous shock. In other words, a bank may adjust its credit policy, for instance by reducing its market niche served by a bank it intends to acquire, or by adjusting interest rates and services offered, thereby affecting its balance sheet. Consequently, the treatment effect may be accommodated by this anticipation, resulting in non-significant outcomes. Therefore, it is important to incorporate anticipation periods into the model to verify this assumption. If the impacts in models using such an approach are more significant, it could provide evidence supporting the anticipation hypothesis.

In relation to the banking spread, overall, an increase in treatment effect can be observed for one and two anticipation periods, with a reduction of approximately 8.6 and 7.5 percentage points in the banking spread, respectively. The effect becomes null for three anticipation periods. For bank efficiency and ROA (Return on Assets), the results from Table 3 closely resemble those of the banking spread, with the overall effect being statistically significant for models with one and two anticipation periods, and not significant for three anticipation periods. As for bank size and credit availability, there is little variation in the results.

TABLE 5 – EFFECT OF MERGERS AND ACQUISITIONS ON STUDY DEPENDENT VARIABLES, CONSIDERING ANTICIPATION PERIODS

		Average Treatment Effect (ATT)		
Variable	T = 0	T = 1	T = 2	T = 3
SPREAD	-5,2448 ***	-8,6406 ***	-7,4973 **	-4,0865
	(1,4599)	(3,3055)	(3,6230)	(2,6322)
Ln(EFICIENCIA)	0,0363	-0,0370 **	-0,0576 ***	-0,0082
	(0,0547)	(0,0169)	(0,0203)	(0,0208)
Ln(TAMANHO)	0,3484 **	0,2803 **	0,3183 **	0,3320 **
	(0,1393)	(0,1426)	(0,1373)	(0,1542)
ROA	-0,9461 ***	-1,2321 ***	-0,9963 ***	0,0071
	(0,1952)	(0,1524)	(0,1259)	(0,0481)
Ln(CREDITO)	-0,1087	0,1004	-0,0992	-0,1273
	(0,0800)	(0,0813)	(0,0929)	(0,0878)

Control Group: Not treated yet; Estimation Method: Doubly Robust (dr)

Note: CI = Confidence Interval. ***CI: 99%; **CI: 95%; *CI: 90%. Standard error in parentheses. T = Anticipation Periods

Source: Authors' compilation based on data and information from the Central Bank of Brazil (2022a, d).

Thus, overall, it appears that the anticipation hypothesis holds true for up to two periods, but not for all variables. Therefore, the results presented in Table 3 may underestimate the effects of the intervention, except for the bank size variable. However, it is important to note that the sign of the impact did not change for the Overall ATT (Average Treatment Effect on the Treated), maintaining the direction of the relationship between the mergers and acquisitions process and the variables studied.

A second crucial point to analyse concerns the parallel trends assumption, used as an identification strategy in the study. As previously discussed, there is no direct way to test this assumption, but indirect tests can be employed to evaluate it. As shown by Roth et al. (2022), the CS estimator itself allows testing the parallel trends hypothesis by creating "placebos" – treatment groups with periods before the effective treatment – in the dynamic effects estimator, as already done in this study.

For the banking spread, the results are depicted in Graph 4. To support the parallel trends hypothesis, ideally, none of the placebo groups should be statistically significant, which is not the case in this study, as 8 out of 51 groups showed statistical significance. However, it is important to highlight that these significant results are between 43 and 51 periods before the effective treatment, i.e., in periods far removed from the treatment. In summary, the lack of statistical significance in observations from placebo groups closer to the treatment lends reasonable support to the acceptance of the conditional parallel trends hypothesis. Similar results are found for the other variables of interest in the study.

Following the discussion in Gertler et al. (2016), it is also possible to conduct a placebo test different from that used by the CS estimator. In this case, treatments are assigned to units known not to have undergone treatment, but not in previous periods; rather, they are assigned in the correct intervention periods, where the results should not be statistically significant since these units were not actually treated and thus should follow the same trend. For this test, units were randomly assigned to receive a placebo – false treatment – in each time group.

The results for the placebo test assigning false treatments to untreated units can be observed in Table 4. First, it is noted that the estimated value of Overall ATT is not statistically significant, considering a 90% confidence interval. The same applies to the specific values for time groups. Thus, there seem to be indications supporting the hypothesis of parallel trends among the control group.

TABLE 6 – PLACEBO TEST TO VERIFY IF THE CONTROL GROUP FOLLOWS PARALLEL TRENDS

Dependent Variable: SPREAD			
Overall ATT	Standard Error	[Confidence Interval]	
1,2020	2,3120	-2,6010	5,0050

Treatment Effect by Group-Time			
Group	Estimate	Standard Error	[Simultaneous Confidence Band]
06-2000	-5,7416	3,6354	-13,0432	1,5600
06-2004	0,1281	1,9577	-3,8038	4,0600
06-2008	9,0744	7,8170	-6,6258	24,7746
06-2015	0,8551	2,6365	-4,4402	6,1504
12-2016	-1,7054	1,4082	-4,5337	1,1230

Anticipation Periods: 0	Number of observations: 3.837

Control Group: Not treated yet; Estimation Method: Doubly Robust (dr)

Note: CI = Confidence Interval. ***CI: 99%; **CI: 95%; *CI: 90%. Standard error in parentheses.

Source: Authors' compilation based on data and information from the Central Bank of Brazil (2022a).

This section presented the econometric results of the study, showing the effects of mergers and acquisitions on the spread, efficiency, size, profitability, and credit availability of banks. Additionally, robustness exercises were conducted, and potential limitations of the study were identified. Overall, the results are significant and consistent with the literature on the subject, as further discussed ahead.

6. DISCUSSION OF RESULTS

This section aims to provide a deeper analysis of the econometric findings presented in the previous section, discussing the direction of treatment impact on the variables of interest and how these results relate to the economic literature on banking spread and mergers and acquisitions (M&A) in the Brazilian market.

As shown in Table 3, there is evidence that mergers and acquisitions in the Brazilian banking market between 1996 and 2021 are correlated with a reduction of approximately 5.2 percentage points in banking spread. Furthermore, when considering the dynamic effects of treatment, this reduction amounts to approximately 10.16 percentage points, thus supporting the hypothesis that institutions involved in M&A gain economies of scale and scope, greater risk diversification, and informational advantages, which allow for lower interest margins on credit operations.

An important consideration regarding the negative effect of mergers and acquisitions on banking spread relates to the level of competition in the Brazilian credit market. Despite considerable market concentration, it cannot be conclusively stated that there has been a decrease in competitiveness. This is evidenced by Azevedo and Gartner (2020), who found that market competitiveness – measured by the Lerner Index – remained nearly constant between 2000 and 2019, while market concentration – measured by the five largest banks' concentration ratio – increased significantly over the same period. Thus, the contemporary view from the New Empirical Industrial Organization, which suggests that concentration does not necessarily explain competition, appears to be supported in the case of the Brazilian banking market.

On one hand, this result aligns with studies by Berger (1998) and Al-Sharkas (2008) for the United States, and Huizinga et al. (2001) for European countries, although these studies do not directly address banking spread but rather focus on efficiency, scale, and scope gains. On the other hand, findings from this study contradict those of Joaquim et al. (2019), who found a positive effect – between 1.17 and 5.10 percentage points – of mergers and acquisitions on banking spread. However, direct comparison is challenging due to differences in methodology; Joaquim et al. focused solely on credit operations for legal entities with free resources, whereas this study considers total operations including both free and directed resources, and operates at an aggregated bank level rather than municipal level.

Thus, accepting the hypothesis that mergers and acquisitions have a negative effect on banking spread, it is believed that synergies created among institutions lead to operational efficiency gains for the sector, as shown by Faria Júnior (2006) and Ferreira (2020). However, it is important to note that the overall measure found in this study was not statistically significant, considering a 90% confidence interval.

Nevertheless, specific groups did show statistical significance, as indicated in Table 3. A notable point is that some treatment groups, particularly in the early years of the study, exhibited decreased efficiency levels after M&A processes, which can partly be explained by the acquisition of public banks during that period. As shown by Ferreira (2020), public banks had considerably lower efficiency levels than private banks before M&A, such that their acquisition had a negative impact on the overall efficiency level of the acquiring bank. However, this effect dissipated over time, which helps explain the lack of dynamic effects on efficiency levels in this study.

Another expected result of mergers and acquisitions is the increase in institution size, again highlighting potential scale and scope gains. Accordingly, this study shows a growth of approximately 34.8% in the size of Brazilian banking firms between the second half of 1996 and the last half of 2021. This value, which is statistically significant within a 95% confidence interval, is also influenced by multiple acquisitions of a single banking firm.

Regarding studies specific to Brazil, the negative relationship indirectly observed here between bank size and banking spread is supported by Nascimento (2021) and Dantas et al. (2011), but differs from Afanasieff et al. (2002) and Bignotto and Rodrigues (2005). This discrepancy may be linked to the calculation methodology used for banking spread, as the latter studies consider the ex-ante spread concept.

Despite the overall positive effect, Table 3 also shows a negative effect of M&A on bank size – which may initially seem counterintuitive – for some time groups, such as the first half of 1997. This result is mainly due to the trend of asset reduction observed at Banco Bradesco. This institution had assets approximately 9 times Brazil's GDP in the second half of 1995, but since then underwent a significant reduction in assets – not linked to credit operations – such that by the pre-merger period, asset value was approximately 3 times Brazil's GDP. This suggests that the negative effect may not have been directly caused by the M&A process.

Furthermore, considering that increased concentration did not lead to enhanced market power for banking firms, the negative impact of mergers and acquisitions on banking spread negatively affected institutional profitability. This positive relationship – indirectly observed – between banking spread and return on assets is also noted in the study by Were and Wambua (2014) for Kenya. However, Pessanha et al. (2012) found different results for Brazil, indicating a positive effect of M&A on institutional profitability. Their methodology, however, only considers what happened to banks that underwent treatment, without a control group for comparison. Therefore, this difference in results underscores the importance of using difference-in-differences methodology in this study.

Given that both interest margins and bank profitability decreased after mergers and acquisitions, it is expected that banks would reduce their credit availability, seeking to diversify their operations into more profitable investments. However, similar to efficiency, the value for this variable was not statistically significant within a 90% confidence interval. Conversely, important results can be gleaned from the individual analysis of treatment groups. First, most groups showing statistical significance exhibit a negative sign, indicating a diminishing effect of mergers and acquisitions on banking firms' credit availability. Second, the first half of 1997 group shows a positive sign for the relationship, suggesting that institutions participating in M&A processes during this period increased their credit availability, implying a specialization in lending activities.

Using Banco Bradesco again as an example, the credit availability growth rate was approximately 234%, considering the difference between the first half of 1995 and the last half of 2021. These results reinforce the notion that the effects of mergers and acquisitions are not homogeneous across treatment

groups. However, excluding the first half of 1997 group from the analysis, the overall impact of mergers and acquisitions on credit availability would result in a reduction of approximately 28% (statistically significant within a 99% confidence interval).

This section discussed the main findings of the study and how these findings relate to the economic literature, focusing on the Brazilian case. Overall, there is evidence that the mergers and acquisitions process significantly increased the size of banking firms, decreased return on assets, depressed credit availability, and consequently reduced banking spread reported by banks between the second half of 1996 and the last half of 2021. Additionally, it is plausible that operational efficiency increased and market competitiveness did not suffer a significant impact, despite the observed high market concentration.

7. CONCLUDING REMARKS

This study combines research on mergers and acquisitions in financial institutions with bank spread, both in the international context and for the Brazilian experience. Although there is a wide range of studies on M&A and bank efficiency in the international literature, with studies mainly involving the United States of America and Europe, quantitative studies are scarcer for the Brazilian case.

Results may vary depending on the development level of the countries analyzed. Recent literature indicates a positive effect of mergers and acquisitions on operational efficiency and reduction of interest margins in developed countries, where costs are usually more affected than profitability. This is due to advantages such as economies of scale and scope, and reduction of operating expenses. For developing countries like Brazil, discussions are more complex due to the macroeconomic environment and level of competition observed in the studied market. Competition is not necessarily linked to concentration but rather to the ability of institutions to adjust their profit margins.

Addressing the research question, this study suggests that mergers and acquisitions led to a reduction in Brazilian bank spread between the second half of 1996 and the second half of 2021. Despite the spread still being high compared to its peers, there was a considerable decrease during the analyzed period, part of which can be attributed to the treatment studied.

Furthermore, the M&A process resulted in increased institution size, facilitating economies of scale and scope, possibly improving operational efficiency, although the latter aspect was not statistically significant in the estimated models. The reduction in interest margins also led to a decrease in profitability on assets during the study period. Therefore, even with market concentration not leading to an increase in market power for banking firms, the results suggest that competition was not significantly affected. The contemporary view of the New Empirical Industrial Organization supports this conclusion, highlighting that concentration and competition are not directly correlated.

It is important to note that the results of this study are not absolute. The study has limitations, such as measuring the variable of interest using proxies for bank spread, missing data for some periods, and the assumption of treatment exogeneity that cannot be directly tested. A valid criticism is the hypothesis of treatment exogeneity, as the M&A process in Brazil was not a random experiment. To extrapolate them to future periods and establish a causal relationship, it is necessary to assume that the decision to participate in an M&A process is random, which is a strong hypothesis and requires further studies and economic modelling for validation.

This study paves the way for future research that can estimate the market power of Brazilian banking firms individually and explore whether these results are affected by mergers and acquisitions. Additionally, it encourages reflection on whether the differences in results found compared to previous studies are due to the data used or the chosen econometric approach.

From the perspective of political and regulatory bodies, this study provides insights for future decisions on incentive programs and authorization of new mergers and acquisitions. By establishing a

relationship between mergers and acquisitions and bank spread using a unique econometric approach and extensive analysis of the Brazilian experience, this study contributes to the economic literature on the subject.

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APENDIX A

TABLE A1 – MERGERS AND ACQUISITIONS IDENTIFIED IN THE STUDY

Acquirer	Acquired	Date	Acquirer	Acquired	Date
Bilbao Vizcaya	Econômico	12/1995	Unibanco	Ponto frio	06/2002
Unibanco	Nacional	06/1996	Bradesco	Bilbao Vizcaya	12/2002
Itaú	BANERJ	12/1996	Itaú	FIDIS	12/2002
BCN	Bisa-Itamarati	12/1996	HSBC	Lloyds	06/2003
Banco General Eletric	Mappin	12/1996	ABN Amro	Sudameris	06/2003
HSBC	Bamerindus	06/1997	Rural	Sul América	06/2003
Bradesco	BCN	06/1997	Bankboston	Bank of America	12/2003
Lloyds	Multiplic	06/1997	Bradesco	BEM	12/2003
Santander	Bozano,Simonsen	12/1997	Unibanco	BNL	12/2003
Bradesco	Dibens	12/1997	Bradesco	ZOGBI	12/2003
Bradesco	Credireal	12/1997	Société Générale	Cacique	06/2004
Santander	Noroeste	12/1997	Grupo Seculus-Semear	Emblema	12/2004
Sudameris	América do Sul	06/1998	Bradesco	Amex	12/2005
Bradesco	BCR	06/1998	Bradesco	BEC	12/2005
Itaú	Bemge	06/1998	Itaú	Bankboston	06/2006
Bradesco	Pontual	06/1998	Scotiabank	Dresdner	12/2006
BTG	Sistema	06/1998	Société Générale	Pecúnia	12/2006
ABN Amro	BANDEPE	12/1998	Bradesco	BMC	06/2007
Bradesco	BANEBE	06/1999	BB	BESC	06/2008
ING	Fenícia	06/1999	Itaú	Unibanco	06/2008
ABN Amro	Banco Real	12/1999	Santander	ABN Amro	06/2008
Unibanco	Credibanco	12/1999	BNP Paribas	BGN	12/2008
HSBC	Republic Nation	12/1999	BB	Nossa caixa	06/2009
Unibanco	Bandeirantes	06/2000	Rendimento	Concordia	06/2010
Itaú	Banestado	06/2000	Original	Matone	12/2010
Bradesco	Boavista	06/2000	BMG	Schahin	06/2011
HSBC	CCF Brasil	06/2000	Voiter	Intercap	06/2013
Unibanco	Fininvest	06/2000	Andbank	Lemon Bank	12/2014
JP Morgan Chase	Graphus	06/2000	CCB	BIC	12/2014
Santander	Meridional	06/2000	Haitong	BES	12/2015
Santander	Banespa	12/2000	Bradesco	HSBC	06/2016
Unibanco	Morada	12/2000	Santander	PSA Finance	06/2016
Itaú	BEG	06/2001	Agibank	Agiplan	12/2016
BBA-Creditanstalt	Icatu	06/2001	Bocom	BBM	12/2016
ABN Amro	Paraiban	12/2001	Itaú	Citibank	12/2016
Bradesco	Bancocidade	12/2001	OMNI	Pecúnia (Société Générale*)	12/2016
Bradesco	Ford	12/2001	C6 Bank	FICSA	12/2019
Bradesco	Mercantil SP	12/2001	BTG	Ourinvest	12/2019
Itaú	BBA-Creditanstalt	06/2002	Credit Suisse	Modal	06/2021

Note: *OMNI acquired Banco Pecúnia, which belonged to the Société Générale conglomerate.

Source: Source: Authors' compilation based on data and information from the Central Bank of Brazil (2022c), the official websites of the institutions, and news reported in the Brazilian press.

TABLE A2 – COMPOSITION OF TREATMENT AND CONTROL GROUPS OVER TIME

Date	Group			Date	Group		
	Treatment	Control	Total		Treatment	Control	Total
06-1995	0	161	161	12-2008	14	77	91
12-1995	1	162	163	06-2009	14	75	89
06-1996	2	155	157	12-2009	14	73	87
12-1996	5	150	155	06-2010	14	73	87
06-1997	8	150	158	12-2010	14	72	86
12-1997	8	146	154	06-2011	16	71	87
06-1998	10	136	146	12-2011	16	71	87
12-1998	11	133	144	06-2012	16	69	85
06-1999	13	125	138	12-2012	16	68	84
12-1999	13	119	132	06-2013	17	67	84
06-2000	14	112	126	12-2013	16	67	83
12-2000	14	101	115	06-2014	16	68	84
06-2001	14	98	112	12-2014	17	66	83
12-2001	14	96	110	06-2015	19	63	82
06-2002	14	91	105	12-2015	19	63	82
12-2002	13	91	104	06-2016	19	62	81
06-2003	13	86	99	12-2016	21	60	81
12-2003	12	86	98	06-2017	22	59	81
06-2004	13	82	95	12-2017	22	57	79
12-2004	13	81	94	06-2018	22	57	79
06-2005	14	82	96	12-2018	22	58	80
12-2005	14	82	96	06-2019	22	59	81
06-2006	14	80	94	12-2019	23	57	80
12-2006	13	81	94	06-2020	23	56	79
06-2007	14	81	95	12-2020	23	56	79
12-2007	14	79	93	06-2021	25	53	78
06-2008	15	77	92	12-2021	25	51	76

Source: Authors' compilation based on data and information from the Central Bank of Brazil (2022a).