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Taxes Influence on Bank Leverage and Profit Shifting
Efeitos da Tributação na Alavancagem e Transferência de Lucros no Setor Bancário

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À minha esposa.

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Without going outside,
you may know the whole world.
Without looking through the window,
you may see the ways of heaven.
The farther you go,
the less you know.
Lao Tzu

RESUMO

JOIA, A. J. C. B. M. (2019). Efeitos da Tributação na Alavancagem e Transferência de Lucros no Setor Bancário

A forma como a tributação afeta as decisões de financiamento corporativo é uma questão importante na literatura sobre estrutura de capital e um desafio a ser abordado com dados empíricos devido a vários problemas de endogeneidade. Embora muitos estudos tenham abordado a questão, ainda não há evidências decisivas se os efeitos fiscais são relevantes, como sugerido pela teoria do *trade-off*, ou de importância de terceira ordem, como sugerido por outras teorias como a *pecking-order* e a teoria do *market timing*. Isto é especialmente verdadeiro para o setor bancário, considerando que ainda existem poucos estudos incluindo instituições financeiras. Normalmente, preocupações regulatórias foram aceitas como dominantes nas decisões de estrutura de capital dos bancos; no entanto, estudos recentes mostram que essa suposição pode estar incorreta. Concorrência fiscal prejudicial é um assunto relacionado que recebeu pouca atenção de estudos de estrutura de capital anteriores. As estratégias de transferências de lucro, como a mudança de atividades econômicas entre jurisdições, também podem ser entendidas como escudos fiscais não relacionados à dívida. Considerando que a tributação é devida no nível individual da empresa e que os conglomerados bancários têm oportunidades de transferência de lucros entre as empresas do grupo, é avaliado se os bancos brasileiros podem tirar proveito do benefício fiscal da dívida enquanto buscam outros objetivos da estrutura de capital no nível do conglomerado. No que me diz respeito, esta pesquisa é a primeira a reunir evidências empíricas desse fenômeno. Estudos empíricos recentes apresentaram resultados convincentes considerando mudanças na política tributária como experimentos naturais para tentar resolver o problema da endogeneidade. Neste contexto, uma oportunidade única de estudo resulta do aumento em duas etapas da alíquota da tributação dos lucros dos bancos brasileiros de onze pontos percentuais, juntamente com algumas características do ambiente tributário complexo e instável do país. Esta dissertação consiste em uma estratégia de pesquisa empírica quantitativa usando uma abordagem metodológica de diferenças-em-diferenças. Os resultados do primeiro aumento da alíquota do imposto de renda corporativo são consistentes com as previsões da teoria do *trade-off* e com a hipótese de que, em comparação com os bancos, a estrutura de capital dos conglomerados financeiros é menos afetada pela tributação. No entanto, os resultados do segundo período não apoiam as previsões da teoria do *trade-off*, uma possível explicação consistente com a hipótese de dominância regulatória nas decisões de estrutura de capital dos bancos é que a implementação de Basileia III, com exigências regulatórias mais rígidas, deixou pouco espaço para efeitos tributários. Apesar dos resultados mistos, a pesquisa fornece evidência de como a legislação tributária pode ser utilizada para ajudar a atingir objetivos regulatórios.

Palavras-Chave: Estrutura de Capital, Regulação Bancária, Imposto de Renda Corporativo, Concorrência Fiscal Prejudicial, Diferenças-em-Diferenças.

ABSTRACT

JOIA, A. J. C. B. M. (2019). Taxes Influence on Bank Leverage and Profit Shifting

How taxes affect corporate financing decisions is an important question in the capital structure literature and a challenging one to address with empirical data due to several endogeneity issues. Although many studies address this question, there is still no decisive evidence on whether tax effects are relevant, as suggested by the trade-off theory, or of third-order importance, as suggested by other theories, such as the pecking-order and market timing. This situation is especially true for the banking industry, considering that few studies include financial institutions. Regulatory concerns have commonly been accepted as dominant in banks' capital structure decisions; however, recent studies show that this assumption might be incorrect. Harmful tax competition is a related subject that has received little attention from previous capital structure studies. Profit shifting strategies, such as shifting economic activities, may also be understood as non-debt tax shields. Considering that taxation occurs at the individual firm level and that bank conglomerates have profit shifting opportunities among affiliated firms, I evaluate weather Brazilian banks are able to take advantage of the debt tax shield while accomplishing other capital structure goals at the conglomerate level. As far as I am concerned, this research is the first to gather empirical evidence on this phenomenon. Recent empirical studies have presented convincing results on tax policy changes as natural experiments to try to resolve the endogeneity problem. In this context, a two-step 11 p.p. tax rate increase applied to Brazilian banks' corporate tax rate, alongside some features of Brazil's complex and unstable tax environment, provide a unique study opportunity. This dissertation consists of a quantitative empirical research strategy using a difference-in-differences methodological approach. Results from the first corporate income tax rate increase are consistent with trade-off theory predictions and with the hypothesis that, compared to individual banks, financial conglomerates' capital structure are less affected by taxes. However, findings from the second event do not support the trade-off predictions. One possible explanation consistent with regulatory dominance on bank's capital structure decisions is that Basel III implementation with stricter regulatory requirements left little room for tax effects. Even though results are mixed, this research provides evidence on how tax legislation can be used to help achieve regulatory goals.

Keywords: Capital Structure, Bank Regulation, Corporate Income Taxation, Harmful Tax Competition, Difference-in-Differences.

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ACRONYMS

ACE – Allowance for Corporate Equity

BACEN – *Banco Central do Brasil*

BB – *Banco do Brasil*

BCBS – Basel Committee of Banking Supervision

BEPS – Base Erosion and Profit Shifting

BNDES – Banco Nacional de Desenvolvimento Econômico e Social

CEF – *Caixa Econômica Federal*

CDO – Collateralized debt obligation

COFINS – *Contribuição para o Financiamento da Seguridade Social*

FGV – *Fundação Getúlio Vargas*

IGP-M – *Índice Geral de Preços – Mercado*. General Consumer Price Index – Market measured by *Fundação Getúlio Vargas*

G20 – Group of Twenty

IASB – International Accounting Standards Board

JSCP – *Juros Sobre o Capital Próprio*

KPMG - Klynveld Peat Marwick Goerdeler

OECD – Organisation for Economic Co-operation and Development

OLS – Ordinary Least Squares

PIS – *Programa de Integração Social*

RCAP – Regulatory Consistency Assessment Programme

RWA – Risk-Weighted Assets

SELIC – *Sistema Especial de Liquidação e de Custódia*

SIFI – Systemically Important Financial Institutions

IT – Information Technology

TJLP – *Taxa de Juros de Longo Prazo*

USA – United States of America

USD – United States Dollar

VAT – Value Added Tax

CONTENTS

1 INTRODUCTION

1.1 Motivation

It is important to study the determinants of the capital structure of banks because excessive leverage increases bankruptcy costs and leads to an increase in the systemic risk in the financial sector. The 2008 financial crisis triggered a revision of the regulatory and supervisory rules regarding bank liquidity risk and capital buffers (Vazquez & Federico, 2015). However, it is possible that regulatory leverage limits are not as important to banks' capital structure as was once believed and other factors might also be relevant. In this context, taxes might be as important to banks' leverage as they are for non-financial firms. Thus, a tax code reform might be desirable to help prevent future financial crises.

In fact, Gropp, and Heider (2010) present empirical evidence that regulatory supremacy may be inadequate to explain banks' capital structure. The study highlights five novel and interrelated empirical facts including that standard cross-sectional determinants of firms' capital structures also apply to large, publicly traded banks in the United States and in Europe. Moreover, high levels of banks' discretionary capital were not explained by buffers to insure against costs related to raising equity on short notice for complying with capital requirements. The research also found evidence that unobserved time-invariant bank fixed-effects are important to explain the variation of banks' capital structure. The listed evidence from Gropp, and Heider (2010) shows how important it is to investigate how other factors besides regulatory rules affect the capital structure of financial institutions.

Another relevant issue is how multinational conglomerates respond to local taxation. Profit shifting strategies may be adopted to transfer revenues to lower taxed jurisdictions for the purpose of reducing the conglomerate's tax burden. Merz and Overesch (2016) address some of the profit shifting strategies adopted by banks and the findings are that banks have higher tax sensitivity to reported profits, which is compatible with them having enhanced tax-planning opportunities compared to non-financial firms. It is important to highlight how the choice of debt and equity levels within subsidiaries can be used as a profit shifting strategy.

Profit shifting opportunities provided by the tax code, such as an ACE rule (Allowance for Corporate Equity), may also lead firms operating in the same business environment to be subjected to different tax rates. In fact, the same result might be expected for any tax shield opportunity that is not equally available to all firms. For instance, it is reasonable to assume that banks with greater foreign investment, such as participations in foreign firms, have lower

costs of issuing debt abroad and thus have enhanced opportunities for international debt profit shifting. It is also logical that banks within large conglomerates face lower costs reallocating some activities, such as IT (Information Technology) development, in other group firms subjected to lower tax rates. Consequently, they will have more profit shifting opportunities and be less affected by a domestic corporate income tax rate increase.

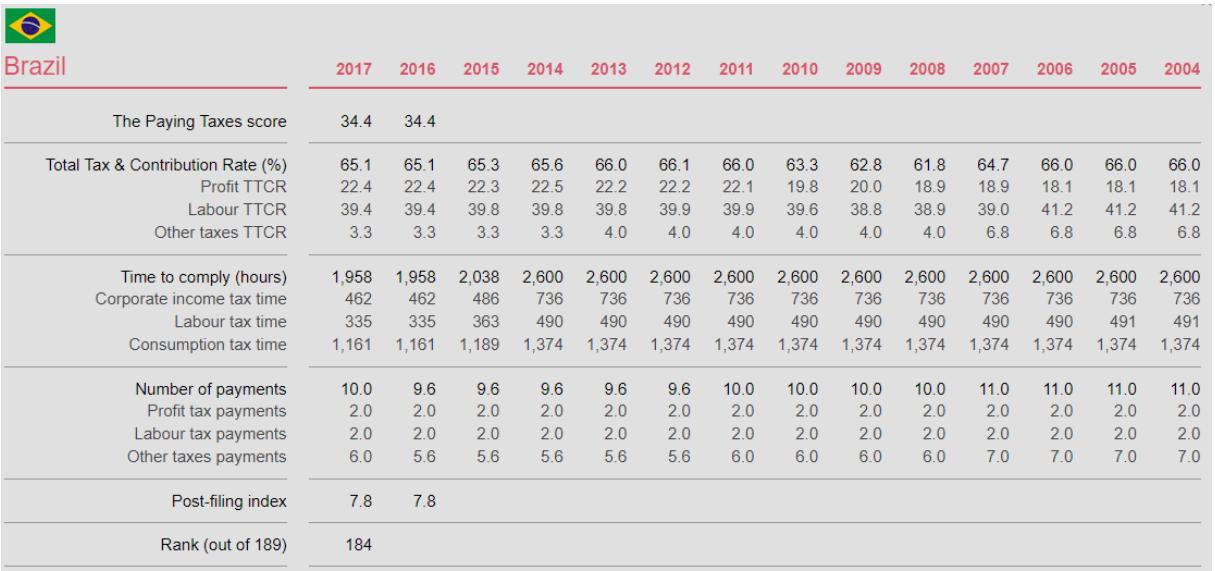
Therefore, there is a link between the trade-off-related capital structure literature and the base erosion and profit shifting (BEPS) studies that are being developed by the Organisation for Economic Co-operation and Development – OECD. This dissertation's main objective is to produce empirical evidence to advance the literature, most specifically regarding the bank industry, to provide useful insights for the development of sensible policy.

1.2 Brazil's unique tax environment

How tax affects corporate financing decisions is a classical question in the capital structure literature; it is also a complex one, given the difficulty of isolating the causal tax effects from confounding factors. Gordon (2010) states that time-series evidence could be helpful, but in the United States, tax rates have varied insignificantly over time, making it difficult to identify the size of their effects on firm behavior. Therefore, there is an opportunity to address the research question with data from countries where the rules change allow the tax effects to be better identified.

Brazil is known to have a complex tax system. A study covering 189 economies showed that Brazil (Rio de Janeiro and São Paulo) was the country that demanded the greatest number of hours to comply with their fiscal obligations (The World Bank & PwC, 2015). The study highlights that tax rules are created and amended in Brazil on almost a daily basis. This unstable legal environment provides a unique opportunity to analyze the tax effects on corporate decisions, particularly in the bank industry, in which the corporate tax rate has been altered several times in recent years. Figure 1 below summarizes data from 2004 to 2017, showing that time to compliance in Brazil is still very high compared to the world 2017 average of 237 hours (World Bank Group & PwC, 2019).

Figure 1 - Overview of the Brazilian Tax System

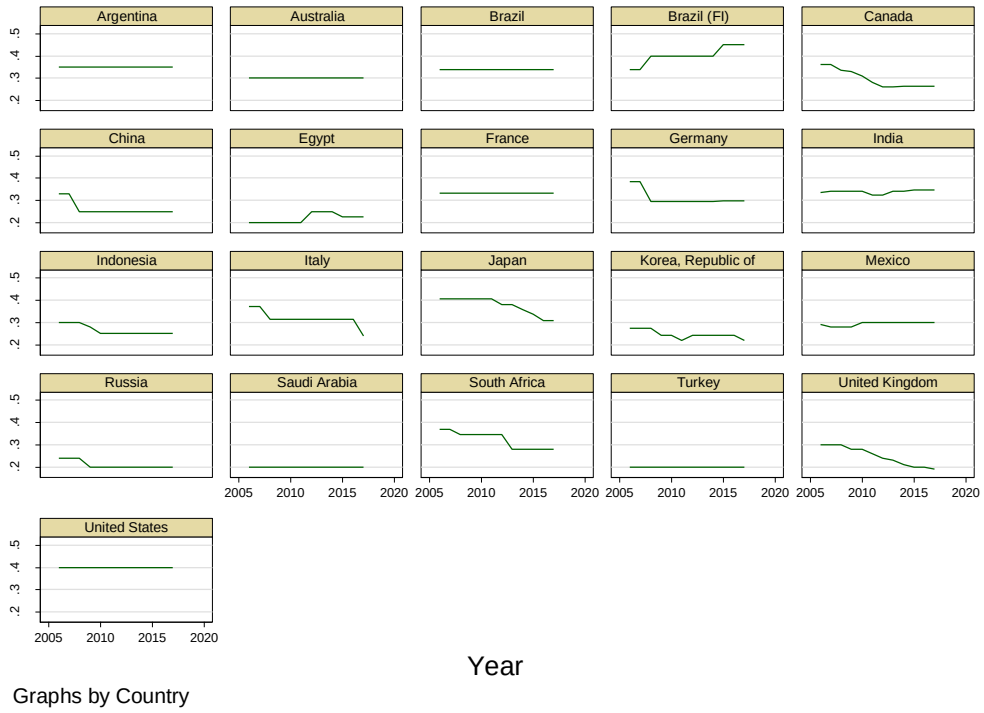


Brazil	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
The Paying Taxes score	34.4	34.4												
Total Tax & Contribution Rate (%)	65.1	65.1	65.3	65.6	66.0	66.1	66.0	63.3	62.8	61.8	64.7	66.0	66.0	66.0
Profit TTCR	22.4	22.4	22.3	22.5	22.2	22.2	22.1	19.8	20.0	18.9	18.9	18.1	18.1	18.1
Labour TTCR	39.4	39.4	39.8	39.8	39.8	39.9	39.9	39.6	38.8	38.9	39.0	41.2	41.2	41.2
Other taxes TTCR	3.3	3.3	3.3	3.3	4.0	4.0	4.0	4.0	4.0	4.0	6.8	6.8	6.8	6.8
Time to comply (hours)	1,958	1,958	2,038	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600
Corporate income tax time	462	462	486	736	736	736	736	736	736	736	736	736	736	736
Labour tax time	335	335	363	490	490	490	490	490	490	490	490	490	491	491
Consumption tax time	1,161	1,161	1,189	1,374	1,374	1,374	1,374	1,374	1,374	1,374	1,374	1,374	1,374	1,374
Number of payments	10.0	9.6	9.6	9.6	9.6	9.6	10.0	10.0	10.0	10.0	11.0	11.0	11.0	11.0
Profit tax payments	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Labour tax payments	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Other taxes payments	6.0	5.6	5.6	5.6	5.6	5.6	6.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0
Post-filing index	7.8	7.8												
Rank (out of 189)	184													

Source: PWC & World Bank website

Note: TTCR is an abbreviation for Total Tax and Contribution Rate.

Figure 2 - Corporate Tax Rates



Source: Data collected from the PWC & World Bank website

Note: Brazil (FI) has a corporate income tax rate with a surcharge applied to financial institutions, other countries did not present any surcharge.

Analyzing data on the financial sector's corporate income tax rates from 2006 to 2017, historical tax rates are available at KPMG website (KPMG, 2019) and summarized in Figure 2 below. It is possible to observe that only a few economies from the G20 (Group of Twenty) experienced a significant rate variation in the period. Brazil is the country with the biggest increase in taxation, of 11 percentage points, and it was the only one with a rise over 5 percentage points. The Brazilian corporate income tax rate remained stable at 34 percentage point for most corporations; however, financial institutions suffered the described increase. Therefore, Brazilian data provide unique information for the period of analysis.

Canada, China, Germany, Italy, Japan, Republic of Korea, South Africa and the United Kingdom had a rate decrease of over 5 percentage points. The other countries had a smaller variation in the period, including the United States, where rates remained stable. Therefore, Gordon's statement (2010) about the lack of variance in the United States tax rates holds true until 2017; only in 2018 did the rate change substantially (Tax Cuts and Jobs Act, 2017). Hence, to study tax effects on corporate financing decisions, it is advisable to gather evidence from outside the United States, even though in the following years, there will be an opportunity for studies with American data.

In addition to rate changes, another reason that makes Brazilian data interesting is that in 2010, Brazil and Italy became the first countries to adopt the IASB rules for both unconsolidated and consolidated financial statements (Martins, Gelbcke, Santos, & Iudícibus, 2013). Thus, firms are still required to present their unconsolidated statements as well, and, as explained by Devereux, Maffini, and Xing (2015), unconsolidated statement are relevant since taxation is due by individual firms and not by consolidated entities. For this reason, ignoring this issue could lead to measurement errors, considering that firms may respond to the tax rate in the location from where they operate rather than the rate in the parent company's country. Financial Institution, Financial Conglomerates and Prudential Conglomerates data are easily available and reliable because they are published by BACEN, the Brazilian Central Bank.

To segregate tax effects from confounding factors, it is helpful when firms that act in the same business environment are subjected to different tax rates. However, as one should expect, firms in the same jurisdiction are usually subjected to the same laws and, therefore, the same corporate income tax rates. Nevertheless, there are exceptions, especially when there are special rates due to factors that are otherwise irrelevant to the corporation decision-making process. Those circumstances may not be as unlikely as they seem, bearing in mind that complex tax systems usually include multiple tax incentives. As an example, the Brazilian allowance for corporate equity – the ACE rule (*Juros Sobre Capital Próprio – JSCP*) – grants firms a tax

benefit conditional on its shareholders' tax situation, inasmuch the benefit is higher when the investor's personal taxation is lower. As a result, banks whose investors are less taxed are subject to a lower tax burden even though they operate in the same business environment as banks owned by highly taxed investors.

The Brazilian case is also unique because the tax increases were due only to financial institutions, as can be easily seen in Figure 2; hence, there was also an opportunity for profit shifting elision strategies using domestic firms only. Usually, profit shifting strategies to reduce taxation must include foreign firms; thus, this exceptionality gives Brazilian banks incentives to also adopt such strategies using domestic corporations.

1.3 Hypotheses

Banks' capital structure decisions might be influenced by several factors, as discussed in the literature review developed in Chapter 2. The trade-off theory on capital structure suggests that optimal leverage will be a result of the balance of the debt tax advantage and of bankruptcy costs associated with high debt levels. The first group of research hypotheses aims to provide evidence on the trade-off theory prediction regarding the effect of the income tax rate on the financial leverage of banks.

- $H_{1.}$: The corporate income tax rate positively affects the leverage of banks.
- H_2: The positive relationship between leverage and the corporate income tax rate is weaker for banks with greater profit shifting opportunities.

The second group of research hypotheses aims to assess whether there is evidence that debt profit shifting strategies, as described in the BEPS literature detailed in Chapter 2, Section 2.5, allows banks to simultaneously reduce taxation at the individual firm level and pursue other capital structure goals at the conglomerate level. Testing these hypotheses is a novel contribution to the literature.

- H_3: The positive effect of the corporate income tax rate on leverage is more pronounced for individual banks compared with financial conglomerates.
- H_4: The positive relationship between leverage and the corporate income tax rate is weaker for individual banks with greater profit shifting opportunities compared with financial conglomerates.

1.4 Contributions

My contribution is to investigate whether tax effects are relevant to banks' capital structure, which some recent papers have suggested (De Mooij & Keen, 2016; Schepens, 2016), and to understand if those effects are different at the conglomerate level and at the individual bank level. It is plausible that a bank conglomerate, subjected to different tax rules, responds to an increase in the tax rate of a given jurisdiction with an increase in leverage of the individual firms subjected to the tax increase and a decrease in leverage in other group affiliates, adopting an intra-group debt profit shifting strategy.

As far as I know, this is the first study to investigate on whether conglomerates (financial or non-financial) are able to benefit from debt tax shields at the individual firm level while achieving other capital structure goals at the conglomerate level. Other possible capital structure goals, which will be further detailed in the literature review, may include addressing agency conflicts between stockholders and management, and protecting existing shareholders from market fluctuations, as argued in the market timing literature. This analysis is easier in the financial sector because banks are required to disclose financial statements simultaneously at the individual firm and at the financial/prudential conglomerate levels.

I study the banking industry exclusively consistent with the extant literature, detailed in the literature review, which separates financial and non-financial firms on the basis that these groups are too heterogeneous to be studied together. The aforementioned Brazilian tax rate increase was imposed only to financial sector firms; thus, it is not possible to study non-financial firms within this context. However, this feature of the tax legislation change is interesting in this dissertation because it allows us to provide evidence on how non-debt tax shields may affect corporate behavior via intra-group profit shifting within domestic financial conglomerates. In this regard, this experiment is a unique one because it allows for domestic profit shifting and base erosion, which is arguably easier/less costly than a profit shifting strategy including foreign firms and subsidiaries.

Another contribution is my ability to investigate the research question with fewer endogeneity concerns than previous studies. I achieve this by exploiting a natural experiment that only includes banks operating in the same jurisdiction. Hence, in this study no endogeneity concerns are derived from country-level omitted variables, which are inherent in studies using banks from distinct jurisdictions (De Mooij & Keen, 2016; Hemmelgarn & Teichmann, 2014; Schepens, 2016). Future research following the 2018 tax decline in the United States might also

benefit from this advantage and use a similar empirical strategy comparing the financial statements of firms and financial/prudential conglomerates.

Finally, I expect to contribute to the Brazilian political debate concerning banks' corporate income taxation. Although it is considered fair to expect higher contributions from the banking industry, perhaps it would be desirable to avoid taxes that would stimulate higher leverage and, therefore, a higher systemic risk. In particular, it is important to understand how effective the Brazilian ACE rule is in reducing the tax advantage of debt and to understand the impact of the 11 percentage points corporate income tax rate increase on the leverage of banks.

1.5 Dissertation Structure

This introduction presented the research question and its context, the motivation, objectives, hypotheses and expected contributions to the literature. The literature review is developed in Chapter 2, focusing on the main topics necessary to contextualize the contribution, including literature on capital structure, bank regulation, base erosion and profit shifting, and some results found in previous empirical studies. I also present a concise review of the effects of the 2008 financial crisis on banks, especially on government-owned banks. In addition, there is a topic dedicated to the normative literature on taxation that can motivate the usage of taxes to achieve regulatory goals.

The third chapter presents the research method, including the empirical strategy and description of the variables. I discuss the identification strategies, which use difference-in-differences regression setups, and describe the treatment and control groups in each regression.

The fourth chapter presents the research results, including the analyses based on descriptive statistics, the quantitative research findings and results, and the research contributions, innovations and limitations.

I close with concluding remarks, including a synthesis of this dissertation and suggestions for future research. After the references, there is an Appendix with details on descriptive results and on the variables used in the empirical analyses, there are also results with alternative research models, as a robustness check.

2 LITERATURE REVIEW

2.1 Capital Structure

How firms choose their capital structure, a subject directly related to firms' cost of capital, is an important question that, despite being intensely studied and the object of a vast literature, is not yet fully understood. The question is relevant because it has implications for corporations' financing decisions, investment behavior and resource allocation, justifying the amount of studies in the area. Modigliani and Miller's (1958) seminal paper proposed a general theory about the valuation of firms in a world of uncertainty and studied the effects of financial structure on market valuations. Under some simplifying assumptions, the theory stated that, in a perfect market equilibrium, a firm's market value should be independent of its capital structure.

The capital structure's irrelevance is a powerful conclusion; however, the result may change if some of the assumptions are relaxed. In fact, any deviation from the restrictive assumptions adopted in the original model, such as transaction costs, information asymmetries, agency problems and government regulations, can make capital structure relevant for determining a firm's market value. In this context, the authors argued that the market value could increase from having debt in the capital structure when companies are subjected to a corporate income tax that allows interest deduction (Modigliani & Miller, 1963).

An important argument against the financial structure's neutrality to the market value is the trade-off hypothesis which states, as presented by Myers (1984), that a firm's optimal debt ratio is determined by a trade-off between the costs and benefits of borrowing, holding the assets and investment plans constant. According to this theory, the debt tax advantage and the costs of financial distress associated with higher leverage are balanced by firms in equilibrium.

In addition to bankruptcy costs, agency costs within a firm may also favor equity over debt (Jensen, 1986; Jensen & Meckling, 1976). In fact, the conflicts of interest between stakeholders in an asymmetric information environment may be aggravated or minimized by the leverage ratio. For instance, a firm without debt does not have costs related to the conflict of interests between its owners and borrowers even though other kinds of agency conflicts remain, such as those resulting from the separation between ownership and management. Thus, many trade-off studies incorporate agency costs (Fama & French, 2002; Lim, 2012).

Dynamic trade-off theory recognizes that, even if the capital structure is relevant, it is costly for firms to adjust it. In this context, Fischer, Heinkel, and Zechner (1989) developed a dynamic

optimal capital structure choice model with tax shields and bankruptcy costs, which provides distinct predictions conditional on firm-specific characteristics. Gropp and Heider (2010) found that after controlling for firm-specific effects, the speed of adjustment of the capital structure in the banking industry was 45% in their sample. In similar studies with non-financial firms, Flannery and Rangan (2006) found a 38% speed of adjustment, while Lemmon, Roberts, and Zender (2008) found 36%. A higher speed of adjustment for the financial sector is reasonable considering the relatively high liquidity of banks' assets. These findings are important because they suggest that banks adjust their capital structure relatively fast. Thus, the four-year timeframe in each identification strategy described in section 3, encompassing approximately two years before and after each tax rate increase, should be adequate to detect the effects of taxes on leverage.

Myers and Majluf (1984) introduced the pecking order theory, which explains capital structure in terms of information asymmetry and assigns no significant role to tax effects. According to the theory, management is assumed to know more about the firm's value than potential investors and is also assumed to act in the interest of existing stockholders. In this setting, management will be more/less inclined to issue new shares when stock prices are overvalued/undervalued in order to transfer wealth to current stockholders. Therefore, a decision to issue new shares should be viewed with suspicion by prospective investors, leading to a decrease in stock value, even though it is possible that the decision is made in the best interest of the company; hence, management may sometimes pass up valuable investment opportunities to avoid value loss following a new issue. Consequently, the pecking order theory predicts that firms would rather rely on internal sources of funds and, if necessary, would rather raise external funds using debt and would issue equity only as a last resort.

The market timing theory of capital structure, as presented by Baker and Wurgler (2002), also assumes that management has better information compared to prospective investors, but concludes that external funds would be raised using equity when the firms' market value is relatively high and using debt when the market value is relatively low. Therefore, fluctuations in market valuations could lead to large effects on capital structure. The market timing theory also does not consider tax effects to be relevant to capital structure.

Graham (2003) surveyed the main theories about taxes and financing structure and outlined some of their predictions. Predictions one to three are essential to this dissertation and the empirical test proposed tries to assess them. The first prediction is that: "(a)ll else being constant, for taxable firms, value increases with the use of debt due to tax benefits" (Graham, 2003, p. 1079). The second one states that: "(c)orporations have a tax incentive to finance with

debt that increases with the corporate marginal tax rate. All else being equal, this implies that firms have differing optimal debt ratios if their tax rates differ" (Graham, 2003, p. 1080). Finally, the third prediction is that "(h)igh personal taxes on interest income (relative to personal taxes on equity income) create a disincentive for firms to use debt" (Graham, 2003, p. 1080). These predictions are all consistent with the trade-off hypothesis.

Miller (1977) opposed the argument that the capital structure neutrality hypothesis demanded unrealistic assumptions and that the trade-off hypothesis better explained reality. The author argued that, in equilibrium, firm value should still be independent of capital structure based on two main arguments. First, in order to understand the real tax benefit of debt, it is necessary to take into account more factors than the deduction of the firm's interest payment, because the gain could be offset by the investor's interest income taxation. Even when those two effects do not balance each other, Miller (1977) argued that in a progressive income tax system, the capital structure would still be neutral due to the "Clientele Effect" meaning that lower/higher levered firms would attract investors in the high/low tax brackets.

Miller (1977) proposed the expression below for the stockholders' gain from leverage G_L, where B_L is the market value of the levered firm's debt, τ_c is the corporate income tax rate, τ_{ps} is the personal income tax rate applicable to income from stocks and τ_{pb} is the personal income tax rate applicable to income from bonds.

$$G_L = \left[1 - \frac{(1-\tau_c)\,(1-\tau_{ps})}{(1-\tau_{pb})}\right] B_L$$

Equation I - Gains from Leverage and Investor Taxation according to Miller (1977, p. 267)

Equation I shows how the personal income tax rate is relevant for computing the gains from leverage. In fact, assuming B_L constant and positive, $\frac{(1-\tau_c)\,(1-\tau_{ps})}{(1-\tau_{pb})}$ is negatively related to G_L. Income tax rates range from 0 to 1, thus $(1-\tau_c)$, $(1-\tau_{ps})$ and $(1-\tau_{pb})$ also range from 0 to 1. Therefore, the numerator and the denominator of $\frac{(1-\tau_c)\,(1-\tau_{ps})}{(1-\tau_{pb})}$ are always positive, and for any value of τ_{pb}, G_L is negatively related to the product $(1-\tau_c)\,(1-\tau_{ps})$. The equation theoretically could lead to a negative value for G_L when τ_{pb} is sufficiently high compared to τ_c and τ_{ps}. However, Brazilian tax rates applied to Equation I lead to a positive G_L throughout the research period. Applying Equation I for financial institutions the G_L started as 0.22 B_L (τ_c =

0.34, τ_{ps} = 0, τ_{ps} = 0.15) and increased to 0.35 after the corporate tax rate increase. Section 3.5 presents further details on the Brazilian taxation rules.

De Angelo and Masulis' (1980) model predicts a negative relationship between debt and non-debt tax shields. The reasoning is straightforward: firms have an incentive to avoid excess corporate tax shields; thus, a substitution effect between alternative tax shields is expected. Later research incorporated non-debt tax shields in the empirical capital structure literature (Fama & French, 2002; Lin, Tong, & Tucker, 2014; Mackie-Mason, 1990; Titman & Wessels, 1988). In this dissertation, profit-shifting opportunities are treated as non-debt tax shields.

Miller (1995) suggested that Modigliani and Miller's propositions should be valid for banks, even though demand deposits seem to differ in many ways from standard corporate securities. Thus, it is reasonable to expect that the tax benefit of debt should also influence a bank's capital structure. Gropp and Heider (2010) analyze data from the largest listed banks from 16 countries and note that their evidence is inconsistent with banking regulations being the only relevant driver of capital structure. In fact, their results suggest that banks optimize their capital structure similarly to non-financial firms. Therefore, although Gropp and Heider (2010) do not address tax effects, it is plausible that if they are relevant to non-financial firms they should also be relevant to banks.

De Mooij (2012) claims that the preferential treatment of debt should be eliminated and argues that banks have a tendency to choose levels of debt that are too high and that the tax benefit of debt only makes the problem worse. Some reasons that could explain why the banking sector has a higher leverage are the existence of deposit insurance and the moral hazard related to the negative externalities given the risk of bank failure. De Mooij and Keen's (2016) empirical findings were favorable to the hypothesis that debt tax shields increase bank leverage. These authors also noted that, in general, the capital structure of banks is about as responsive to tax asymmetries as that of non-financial firms.

2.2 Bank Regulation

The reasons for regulation represent an important question that divides economists. Peltzman's (1989) literature review about economic theory on regulation indicates how market failure was initially the motivating reason for public regulation. Thus, regulatory bodies were supposed to mitigate the inefficiencies created by market failure. Then, in the early 1960s, concerns about natural monopolies became the main justification for regulation, followed by externalities.

Stigler (1971) discusses concerns related to regulators acting in the interest of specific industries or for private gain, showing how regulatory action may lead to unintended consequences. The author offers a bleak and realistic description of the political and regulatory environment in many industries at the time, presenting the hypothesis that every industry or occupation that has enough political power to utilize the state will seek to restrict entry. An interesting example from the study (Stigler, 1971) was from the Federal Deposit Insurance Corporation, which had reduced the rate of entry of new commercial banks by 60 percent.

The moral hazard issue associated with deposit insurance creates externalities in commercial banks' activities and justifies regulatory measures by the state. Kareken and Wallace (1978) argue that if bank liabilities are insured and they hold risky portfolios, there will be numerous bankruptcies in some possible future states of the world; thus, the authors claim that regulation is not an alternative to deposit insurance, but rather a necessary complement.

The question of whether of government deposit insurance is necessary is controversial in the literature, with some authors arguing in favor of alternative models. Calomiris (1990) summarized some of the historical justifications for deposit insurance, highlighting how banks are vulnerable to financial panics and the social impacts of disturbances on the economy payment system. Information asymmetry problems may be the main reason behind the need for insurance, considering that bank; usually, hold long-term assets which are not easily understood by depositors while they offer short-term, often demandable, claims (Calomiris, 1990, p. 284). However, even if the need for deposit insurance is accepted, it does not necessary imply that it should be organized by the government. Calomiris (1990) argue that historically in the United States, more specifically before the first Great War, bank insurance was not exclusively in the government domain, listing some positive experiences in Indiana, Ohio and Iowa involving branch banking with privately administered insurance programs. The main benefit of the privately administered insurance program is the incentive to impose self-regulation on the bank industry. Nevertheless, even though it could be interesting to assess the effects of a change in the deposit insurance scheme in the Brazilian context, this dissertation will investigate how the current model imposes capital requirement regulation and its effects on banks' capital structure.

The model developed in Bryant (1980) shows the economic rationality of deposit insurance when deposit liabilities are backed by risky assets and there is uninsurable risk and asymmetric information. The model helps to explain how deposit insurance may help prevent bank runs, but it does not necessarily keep them from occurring, and how the government must impose reserve requirements in order not to be continually subsidizing banks' intermediaries.

It is considered desirable that banks do not become undercapitalized because it leads to suboptimal risk taking from the social perspective. Some evidence shows how tax influence banks' capital structure (De Mooij & Keen, 2016; Schepens, 2016), and it would be sensible to take into account the regulatory implications of the tax system, as will be detailed in section 2.6, to contribute to banks' regulation goals. It is important to assess how taxes also affect large cross-border banking groups, which Vazquez and Federico (2015) found to be more susceptible to failure because of insufficient capital buffers during the 2008 financial crisis.

2.2.1 Basel Accords

Bank regulation is perceived as an important feature of the financial system, and there is an international cooperation effort to establish proper regulation worldwide. Castro (2009) shows how the Basel Accords are unique in providing internationally valid rules for financial regulation that were centered on capital requirements and not on liquidity risk. In this context, the Basel Committee, which was previously called Committee on Banking Supervision, was founded in 1974. According to Penikas (2015), its effort in developing banking regulation can be broken into five regulatory waves.

The first regulatory wave between 1974 and 1986, was driven by the Concordat, which was the first document published by the Basel Committee and was related to the interaction of bank supervision authorities when needing to issue cross-border resolutions. The second to forth regulatory waves are related to the Basel Accords, respectively, to Basel I (1987-1998), Basel II (1999-2008) and Basel III (2009-2011); and the fifth wave occurred into the Post-Basel III period (2012-2014) (Penikas, 2015).

The Basel I accord initially introduced the basic capital adequacy ratio, which was the foundation for bank regulation, as the ratio of bank capital to risk-weighted assets for credit risk only and was followed by an amendment that included market risk. Operational risk did not receive quantitative treatment in any Basel I amendment, even though some operational risk management principles were published in 1998 (Penikas, 2015).

To elaborate on the Basel Accords, it is advisable to properly define some of the risk types: "Credit risk is most simply defined as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms." (Basel Committee on Banking Supervision, 2000, p. 1); market risk is "the risk of losses in on- and off-balance sheet risk positions arising from movements in market prices." (Basel Committee on Banking Supervision, 2016, p. 10); "(o)perational risk is defined as the risk of loss resulting from

inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk." (Basel Committee on Banking Supervision, 2011, p. 3); liquidity risk is divided into funding and market liquidity risks whereas "Funding liquidity risk is the risk that the firm will not be able to meet efficiently both expected and unexpected current and future cash flow and collateral needs without affecting either daily operations or the financial condition of the firm. Market liquidity risk is the risk that a firm cannot easily offset or eliminate a position at the market price because of inadequate market depth or market disruption" (Basel Committee on Banking Supervision, 2008, p. 1).

The Basel I model was originally designed to be relatively simple; each asset in a bank portfolio received a pre-established risk classification in percentage terms and the ratio Capital/RWA (risk-weighted assets) should equal at least 8%, but each banking regulatory authority could increment this value (Castro, 2009). For instance, credit operations had a risk classification of 100%, thus it required at least 8% of capital, while sovereign debt had a risk classification of 0%, demanding no extra capital. Capital was divided into Tier 1 and Tier 2 for regulation purposes, the Tier 1 included paid-in capital, retained earnings, and hybrid instruments, while Tier 2 included long-term subordinated debt to be amortized linearly over 5 years.

The Basel II regulatory wave took place in an unstable economic environment due to the 2001 dotcom bubble burst and the 2007 collateralized debt obligation - CDO crash. It had a three pillar structure: Pillar I implemented minimal capital requirements with the introduction of internal modelling of credit risk; Pillar II included a supervisory review that was needed considering that banks were authorized to use internal models to measure risk; and Pillar III summarized the approach to information disclosure (Penikas, 2015).

Castro (2009) criticizes the procyclical nature of the Basel II framework, which is partially true also for Basel I. In expansion periods, capital requirements would be lowered, and during crisis periods, the capital requirements would be increased. In fact, the procyclical nature is derived from the fact that market risk is positively related to loans' expected losses; thus, such a system demands higher capital requirements during unstable periods. Castro (2009) also explained that internal models for credit risk allowed in Basel II could generate undesirable economic results, such as further hindering riskier types of credit, like long-term loans and credit for smaller firms. In addition, banking concentration could increase because smaller banks were not allowed or could not afford the usage of internal models of credit risk.

Basel III came as a response to the 2008 financial crisis and brought innovations such as a change in the definition of capital; the introduction of extra capital buffers; the quantification

of liquidity risk; the monitoring of unweighted capital; and the creation of unified rules for the remuneration of risk-taking staff (Penikas, 2015). The fifth regulatory wave is viewed as an independent wave because it was marked by certain proposals that are significantly novel, such as the introduction of intraday liquidity management, the revision of capital charges relating to securitization and credit protection, the regulation of credit concentration risk and the revision of information disclosure standards (Penikas, 2015).

The Basel III required capital buffers in addition to minimal capital requirements. The capital conservation buffer "is designed to ensure that banks build up capital buffers outside periods of stress which can be drawn down as losses are incurred" (Bank for International Settlements, 2011, p. 54); the countercyclical buffer "aims to ensure that banking sector capital requirements take account of the macro-financial environment in which banks operate" (Bank for International Settlements, 2011, p. 57). Systemically Important Financial Institutions – SIFIs can also be required to have capital surcharges to prevent problems affecting individual firms from spreading and thereby undermining financial stability (Penikas, 2015).

Countercyclical capital buffers "will be deployed by national jurisdictions when excess aggregate credit growth is judged to be associated with a build-up of system-wide risk to ensure the banking system has a buffer of capital to protect it against future potential losses" (Bank for International Settlements, 2011, p. 57). The argument in favor of countercyclical capital buffers is related to a macroprudential approach to bank regulation.

Hanson, Kashyap, and Stein (2011) explain that the microprudential approach focuses on preventing the costly failure of an individual financial institution, while the macroprudential approach seeks to safeguard the financial system as a whole. In synthesis, to deal with the moral hazard related to deposit insurance, a microprudential approach would demand that each bank keeps its minimum capital requirements. Hence, during a crisis involving mass asses devaluation, leading to an increase in overall bank leverage, a microprudential regulator would be indifferent to a bank decreasing its leverage by selling assets or by increasing capital. Nevertheless, a macroprudential regulator would recognize that if, in order to comply with capital requirements, several financial institutions sell assets at the same time, the result would be an aggravation of the crisis. Consequently, a macroprudential regulator would not be indifferent and would favor new capital injections. Thus, Basel III provides a framework to minimize the critique of the procyclical nature of Basel I and II.

If the predictions of the market timing theory of capital structure are correct, financial institutions will be unlikely to raise capital during crises unless forced to do so, considering that

stocks are usually undervalued in times of financial distress. Thus, the Basel III rules regarding reducing the procyclical amplification of financial shocks seem sensible but costly for firms.
It is important to highlight that previous studies found evidence against the hypothesis that capital requirements are the only relevant drivers of banks' capital structure (Berger, DeYoung, Flannery, Lee, & Öztekin, 2008; Gropp & Heider, 2010) and the findings suggest that banks are optimizing their capital structures in the same way as non-financial firms. However, those studies do not imply that capital requirements are irrelevant and, for this dissertation purposes, it is important to describe the changes in regulation that occurred during the sample period and how these changes may have affected the banks and financial conglomerates in the sample.

2.2.2 Brazilian Basel Accords Implementation

This short review on banks' capital requirements regulation serves the purpose to introduce banking regulation in the Brazilian environment. First, it must be highlighted that BACEN is one of the 60 central banks that own the Bank for International Settlements – BIS. In this context, Brazil implemented Basel II in 2007 and Basel III in 2013. As stated by the Regulatory Consistency Assessment Programme - RCAP, Brazilian regulations comply with Basel III (Basel Committee on Banking Supervision, 2013). Tables 1 and 2 detail the Brazil's minimum capital requirements in relation to the regulatory minimum based on the Basel accords.
For the purposes of this dissertation it is not necessary to further elaborate on the Brazilian regulatory system under the Basel Accords. In fact, the main highlight is that banking capital regulation has significantly changed during the sample period of this study, especially in the period beginning in 2013. The increase in capital requirements was even more substantial for SIFIs, which are designated by BACEN, following international standards.

Table 1 - Summary of Brazilian Capital Requirements Regulation

Brazil	Basel I		Basel II	Basel III						
	1994-1996	1997-2006	2007 - 2012	2013	2014	2015	2016	2017	2018	2019
Minimum Common Equity Ratio				4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Minimum Tier 1 Capital	4%	5.5%	5.5%	5.5%	5.5%	6%	6%	6%	6%	6%
Minimum Total Capital	8%	11%	11%	11%	11%	11%	9.875%	9.25%	8.625%	8%
Capital Conservation Buffer							0.625%	1.25%	1.875%	2.5%
Countercyclical Capital Buffer				0%	0.625%	1.25%	1.875%	2.5%	2.5%	2.5%
SIFIs Capital Buffer				0%	0%	0%	0%	0.5%	1%	2%
Minimum Total Capital and Buffers for SIFIs	8%	11%	11%	11%	11.625%	12.25%	12.375%	13.5%	14%	15%
Minimum Total Capital and Buffers	8%	11%	11%	11%	11.625%	12.25%	12.375%	13%	13%	13%

Source: Adapted from Tanda (2015, p. 35) with Brazilian data (Basel Committee on Banking Supervision, 2013)

Table 2 - Summary of Basel Minimum Capital Requirements Regulation

Basel Minimum	Basel I	Basel II	Basel III						
			2013	2014	2015	2016	2017	2018	2019
Minimum Common Equity Ratio			3.5%	4%	4.5%	4.5%	4.5%	4.5%	4.5%
Minimum Tier 1 Capital	4%	4%	4.5%	5.5%	6%	6%	6%	6%	6%
Minimum Total Capital	8%	8%	8%	8%	8%	8%	8%	6%	8%
Capital Conservation Buffer						0.625%	1.25%	1.875%	2.5%
Countercyclical Capital Buffer					Varies for each jurisdiction				
SIFIs Capital Buffer					Varies for each jurisdiction				
Minimum Total Capital and Buffers	8%	8%	8%	8%	8%	8.625%	9.25%	7.875%	10.5%

Source: Adapted from Tanda (2015, p. 35)

2.3 Government Owned Banks

The Brazilian banking industry is substantially influenced by government-controlled banks. According to my database, even though government-controlled banks represent only 8% to 10% of total banks, they control a significant percentage of total assets. In fact, during the twelve-year sample period the market share of government-controlled banks varied from 32% (in 2007) to 45% (in 2017).

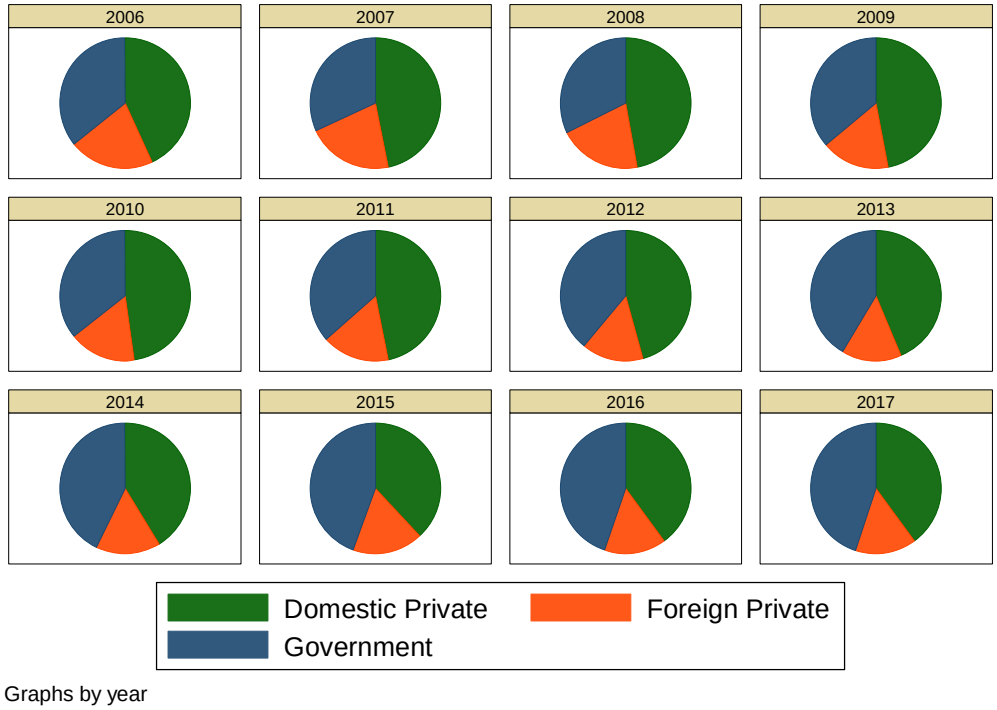
Consistent with the database, the Basel Committee on Banking Supervision stated that "(t)he Brazilian banking system is characterized by conglomeration, public sector presence, limited foreign bank participation, and a low level of international interconnectedness compared to some other Basel Committee member countries." (Basel Committee on Banking Supervision, 2013, p. 5).

Table 3 - Bank Ownership by Year

Year	Domestic Private	Foreign Private	Government	Total
2006	97 (54.19%)	64 (35.75%)	18 (10.06%)	179
2007	96 (54.24%)	63 (35.59%)	18 (10.17%)	177
2008	98 (54.75%)	65 (36.31%)	16 (8.94%)	179
2009	97 (54.49%)	66 (37.08%)	15 (8.43%)	178
2010	97 (54.49%)	67 (37.64%)	14 (7.87%)	178
2011	98 (54.44%)	68 (37.78%)	14 (7.78%)	180
2012	96 (53.04%)	71 (39.23%)	14 (7.73%)	181
2013	91 (51.7%)	71 (40.34%)	14 (7.95%)	176
2014	87 (50.29%)	72 (41.62%)	14 (8.09%)	173
2015	85 (49.42%)	73 (42.44%)	14 (8.14%)	172
2016	87 (49.71%)	74 (42.29%)	14 (8%)	175
2017	86 (50%)	72 (41.86%)	14 (8.14%)	172

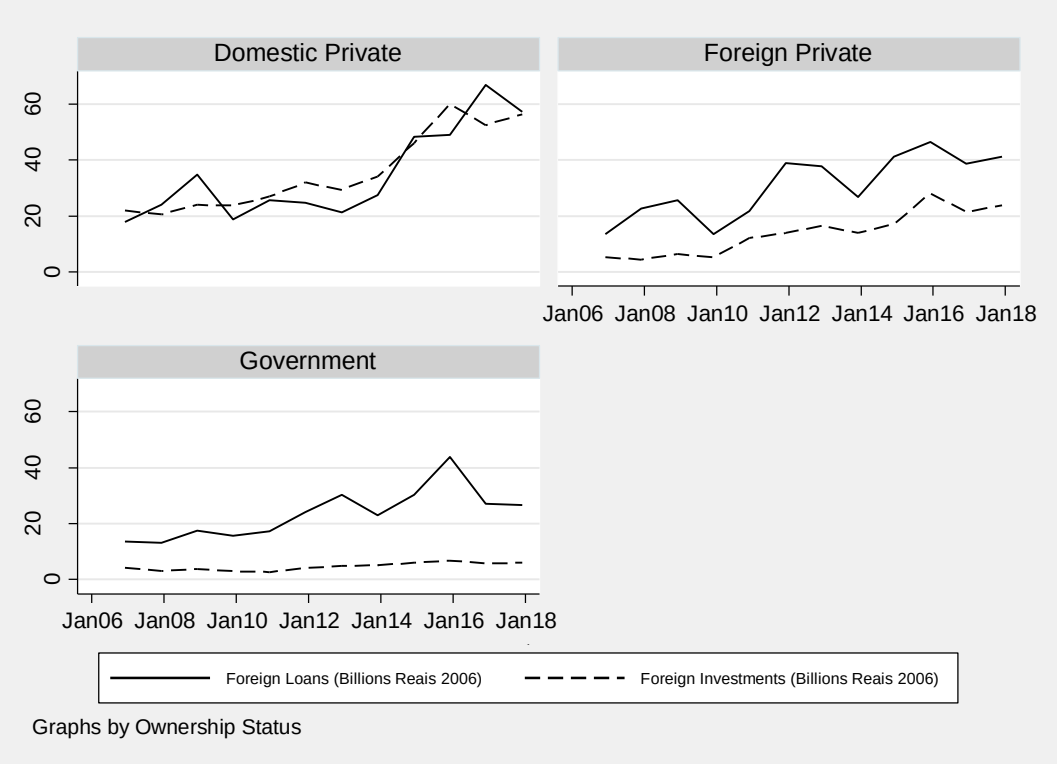
Source: BACEN database adapted. Number of institutions (% of each type)

Figure 3 - Total Assets by Ownership



Source: BACEN database adapted

Figure 4 - Foreign Investments/Loans by Ownership Status (Inflation January 2006)



Source: BACEN database adapted, data adjusted by IGP-M/FGV inflation

Considering the relevance of government-controlled banks in Brazil it is pertinent to review the literature on direct government intervention in the banking industry and its benefits and drawbacks. As summarized by Sapienza (2004), there are social, political and agency economic theories of state ownership. According to social theory, based on the economic theory of institutions, government-owned banks have positive effects in the sense that they contribute to economic development and improve general welfare by addressing capital-market failures. In contrast, according to the political view state-owned enterprises function as means to achieve the individual goals of politicians and thus hinder economic efficiency. Banerjee (1997) developed a misgovernance theory for a benevolent government that responds to market failure but simultaneously has agents who are primarily interested in their own welfare rather than collective goals. Sapienza (2004) classified Banerjee's (1997) misgovernance theory as an agency theory, which is sensible because a conflict of interest between the government and the bureaucrat is key to Banerjee's (1997) results.

Using data from 107 countries primarily from the year 1999, Barth et al. (2004) provide empirical evidence in favor of the political theory of state ownership. Their findings suggest that: (I) restricting bank activity is negatively associated with bank development; (II) barriers to foreign-bank entry are positively associated with bank fragility; (III) stringent capital regulations are not closely associated with bank development, performance or stability when controlling for other features of bank regulation and supervision; (IV) generous deposit insurance schemes are strongly and negatively associated with bank stability; (V) there is no strong relationship between a range of official supervisory indicators and bank performance and stability; (VI) regulations that encourage and facilitate private monitoring of banks are associated with better banking-sector outcomes; and (VII) government ownership of banks is negatively correlated with favorable banking outcomes and positively linked with corruption, with no positive association with bank development, efficiency or stability. Thus, the latter finding corroborates the political theory of state ownership; however, as stated by the authors, their analysis cannot establish causality.

The findings in Sapienza (2004) also lean in favor of the political theory, although less assertively. Using Italian data from 1991 through 1995, the main findings are as follow: (I) state-owned banks charge systematically lower rates, 44 basis points lower on average, even to firms that are able to borrow from private banks, without superior efficiency or lower costs; (II) state-owned banks apply a higher rate discounts in poorer regions (southern Italy); and (III) the party affiliation of state-owned banks has a positive impact on the interest rate discount given, meaning that lower interest rates are charged when firms borrow in areas that the political party

in power had stronger electoral results. The first finding is consistent with the political and agency theories, the second finding is consistent with the political and social theories, and the third finding corroborates the political view only. Hence, all findings are consistent with political theory.

Shen and Li (2012) corroborate the underperformance of state-owned banks, due to political interference, for several indicators, such as return on assets, return on equity, net interest margin and non-performing loans. Their findings highlight the differences between state-owned banks operating in developed and developing countries, showing that the underperformance is greater in developing countries. The paper also shows that non-political state-owned banks, characterized by a *proxy* that tries to measure the degree of political interference, perform similarly to privately owned banks. The data collected consists of banks from 65 countries, including Brazil, in the period from 2003 to 2007.

State-owned banks are divided into development and commercial banks. Development banks are government-sponsored financial institutions concerned primarily with the provision of long-term capital do industry (De Aghion, 1999), their purpose are distinct to state-owned commercial banks which, in general, tend to provide generalized lending similar to that of private banks (Lazzarini, Musacchio, Bandeira-de-Mello, & Marcon, 2014). De Aghion (1999) provides a framework for evaluating the contribution of development banking to industrialization and economic development, which is problematic considering the social objectives that are not as easily measured as profitability.

In fact, Brei and Schclarek (2013) suggest that government-owned banks may help to provide liquidity during a financial crisis, performing a valuable counter-cyclical role consistent with social theory. According to the study, countries with a higher share of government banks experienced smaller economic declines and faster recoveries. Their sample include banks from 50 countries for the period from 1994 to 2009, and Brazil is highlighted as a case of relative success in the aftermath of the financial crisis.

These results relate to my analysis because of the relevance of government-controlled banks in the Brazilian financial system and because the sample period encompasses the 2008-2009 financial crisis. Coleman and Feler (2015) study how the 2008-2009 financial crisis affected Brazilian local lending, production and employment. The authors argue that Brazil only had a mild economic downturn during the financial crisis in part due to state-owned banks that increased lending while private banks acted more conservatively. However, the evidence also suggests that state-owned banks became less profitable and more dependent on government funding, as a result of an increase on delinquent loans and charge-offs (Coleman & Feler, 2015).

Lazzarini et al (2014) investigate the role played by BNDES (*Banco Nacional de Desenvolvimento Econômico e Social*), the main Brazilian development bank, between 2002 and 2009. The objective of the study, encompassing a period when BNDES's presence in the Brazilian economy increased substantially, was to determine whether its loans and equity injections increased firm-level performance and investments, as predicted by the industrial policy view of development banks, or if the selection of firms was distorted as predicted by the political view. The findings are mixed, failing to detect an increase in performance in invested firms, in addition to the reduction of financial costs due to the subsidized cost of capital, but also failing to detect the malinvestment that would be expected according to the political theory. As will be further detailed in section 3.5.1 Brazilian government-controlled banks usually have low taxed investors, which puts them into the low taxed shareholder classification, as discussed In the context of the first identification strategy. There is evidence that during financial crises government-controlled banks increase loans compared to private banks, however there is no evidence that this behavior affects capital structure. It is reasonable to assume that if there is an effect on capital structure it will be by increasing leverage in order to induce more lending. This possible effect would increase the leverage of government-controlled banks, which is in the opposite direction than the one expected by H_1, in the first identification strategy. Therefore, findings in favor of H_1 are not due to the policies adopted by government-controlled banks during financial crises.

2.4 Financial Crisis

The empirical analysis encompasses a turbulent period for the banking industry globally, including the 2008 banking crisis and the subsequent years, when a new international regulation was implemented by central banks, as detailed in section 2.2. Thus, to understand the effects of the crisis on the Brazilian banking industry, it is crucial to study the literature on the crisis, even though, as discussed in section 2.3, Brazil was not among the countries most affected by the crisis. Shehzad and De Haan (2013) corroborate that the financial crisis affected more banks operating in industrialized countries than those in emerging countries, such as Brazil, the research also indicates that bigger banks were more affected.

The evidence in Vazquez and Frederico (2015) provides support for the Basel III initiatives, showing that banks with weaker liquidity structure and higher leverage were more vulnerable to subsequent failures. Another important finding is that smaller banks were more vulnerable to liquidity problems, while large cross-border banking groups were more susceptible to

insufficient capital buffers. An important feature of this study is how the authors used the net stable funding ratio, a concept adopted to measure liquidity structure by the Basel Committee of Banking Supervision - BCBS.

Ivashina and Scharfstein (2010) investigated the effects of the 2008 financial crisis on lending behavior. The paper sheds light on the syndicated loan market, part of the "shadow banking system", which declined 79% in the fourth quarter of 2008 when compared with its peak in the second quarter of 2007. The main finding is that new lending declined substantially across all types of loans; however, the authors observed a type of bank run on previously available credit-lines, meaning that firms fully drew from theirs credit lines to ensure access to liquidity.

For the purposes of this dissertation the effects of the financial crisis are relevant to the extent that it differentially affected the groups of banks used in the identification strategies described in section 3.5. The 2008 financial crisis was not as strong in Brazil; hence, it is plausible that banks controlled by foreigners were more affected by it. However, there is no evidence on the effects of the crisis over the capital structure the subsidiaries of foreign banks operating in Brazil. It must be highlighted that a possible decline in profits would already be expected to affect leverage and, following previous studies, this research controls for profitability, as explained in section 3.3.6. Another, indirect, effect of the crisis as discussed above, was to spur a new wave of international regulation that substantially changed the capital requirements of banks during the second natural experiment (tax increase event) exploited in this research.

2.5 Profit Shifting in the Financial Sector

Tax avoidance is an important factor to consider when addressing the economic effects of taxes. The trade-off theory of capital structure posits that firms will change their behavior in response to tax incentives in order to maximize after-tax profits. For the purpose of this dissertation, it is used a broad definition of tax avoidance, including any reduction in tax expenses, as in Atwood et al. (2012).

There has been a recent debate around base erosion and profit shifting – BEPS because it undermines income taxation. Companies use aggressive tax planning to shift profits from high-taxed to lower-taxed jurisdictions; this objective can be accomplished in several ways, such as manipulating transaction prices, using controlled foreign companies, manipulating interest deductions and others. Brauner (2014) describes work of the Organization for Economic Co-Operation and Development – OECD on BEPS and In the context of this dissertation, it is

important to note how action item 4 aims to limit tax base erosion via interest deductions and other financial payments.

The BEPS Project aims to improve the international tax standards to ensure the sustainability of the current international framework for the taxation of cross-border activities and the elimination of double taxation (OECD, 2015). According to one estimate, corporate income tax revenue loss due to BEPS could be between 4% and 10% of global revenues, encompassing 100 to 240 billion USD annually (OECD, 2015). All groups of G20 and OECD countries worked together to design common responses to international tax challenges and a comprehensive package of measures was agreed upon (OECD, 2015). The BEPS package contains 15 actions; action 15 proposes the development of a multilateral instrument to implement the BEPS treaty-related measures and amend bilateral tax treaties (OECD, 2015).

As stated, BEPS package action item 4 aims to limit base erosion via interest deductions and other financial payments. The OECD/G20 explanatory statement (OECD, 2015) recognized that multinational groups can easily multiply the level of debt at the individual firm level via intra-group financing. The statement proposes a coordinated response from countries to ensure that an entity's net interest deductions are directly linked to the taxable income generated by its economic activities in each jurisdiction (OECD, 2015). However, it is important to observe that action 4 propositions have not yet been implemented, and the base erosion and profit shifting via debt financing are a reality that needs further understanding.

International profit shifting is a complex subject and has important repercussions on trade and even on the ability of states to effectively tax income and wealth. The subject is closely related to harmful tax competition, as modeled in Haufler, and Schjelderup (2000). Avi-Yonah (2005) highlights how tax competition effects go beyond developed countries, because developing countries need high level revenues for social spending. Although the OECD guidelines help to harmonize tax codes, they cannot do much against international harmful tax competition for several reasons. Avi-Yonah (2005) listed some of those reasons: the OECD has only the power to persuade, not to adjudicate; it has only 30 members and is viewed as a rich country club; hence proposals may be deemed unacceptable to developing countries. There is no international agreement on taxes and countries usually have several bilateral treaties to avoid double taxation for their residents. However, in this scenario, it is almost impossible to prevent tax avoidance through double non-taxation from multinational corporations.

Most studies that deal with BEPS focus only on non-financial firms (Hines & Rice, 1994; Huizinga & Laeven, 2008; Weichenrieder, 2009); an exception is Merz and Overesch (2016), who study banks' response to international taxation. As stated by the authors, international

differences in tax rates provide an incentive to adopt profit shifting strategies in favor of lower-taxed subsidiaries. Merz and Overesch (2016) find that reported earnings of multinational banks' subsidiaries responded significantly to tax incentives and that this sensitivity was larger than what previous studies found for non-financial multinational corporations. Thus, they argue that banks conceivably have more profit shifting opportunities than non-financial firms.

This conclusion is sensible for two reasons: banking activities rely upon many intangible assets that enables activity transfers, and banks operating in high-taxed jurisdictions could find it less costly to take advantage of debt tax shields compared to non-financial institutions due to their financial expertise and access to interbank operations. The relatively high speed of adjustment of banks' capital structure, documented by Gropp and Heider (2010), also helps to explain how bank may benefit from debt tax shields more quickly.

Merz and Overesch (2016) suggest that future research could assess whether not only the location of reported profits but also the location of certain banking activities are affected by taxation. This dissertation shed light on this question by investigating the profit shifting strategies of Brazilian banks, assessing how they use debt tax shields or exploit the location of banking activities. In this sense, this dissertation may contribute to the debate over action 4 of the BEPS package.

The BEPS project relates to capital structure decisions to the extent that base erosion and profit shifting are strategies used to take advantage of tax shields. When profits are shifted via debt, such as with an increase in overseas loans from international subsidiaries, it affects leverage as predicted by the trade-off theory. On the other hand, profit shifting via an increase in reported earnings in subsidiaries due to a reallocation of activities in favor of lower-taxed subsidiaries is a non-debt tax shield which may reduce the sensitivity of leverage to taxation. The measures of Foreign Investment and Domestic Participations, described in sections 3.3.9 and 3.3.10, aim to proxy for profit shifting opportunities of banks and financial conglomerates.

2.6 Tax Policy Goals

The normative literature about optimal taxation addresses the important problem of how a tax system should be designed. As explained by Sandmo (1976), the issue is complex, and the difficulty begins with the meaning of optimal taxation because there are at least three criteria to define optimality: the first refers to a system that minimizes the cost involved in assessing, collecting and paying taxes; the second evaluates the tax code in terms of fairness; and the third

refers to economic efficiency, which means a system that minimizes the aggregate deadweight loss for any given tax revenue or level of public expenditure.

An economically efficient tax system should be consistent with the Pareto optimal allocation of resources, and this system should be neutral with respect to all marginal evaluations made by consumers and producers (Sandmo, 1976). Most authors believe that taxation should be neutral, but how this goal could be accomplished and, ultimately, how to finance the state is a subject of political debate. What an ideal tax system would be like is a question that will not be addressed in this dissertation, which is limited to addressing its effects on banks' capital structure and how it could be useful to achieve regulatory goals.

Arlen and Weiss (1995) posit that corporate income taxes should not coexist with personal income taxes on dividends because this entails double taxation and is inconsistent with currently accepted views of tax equity. The authors believed that this double taxation distorts the American economy and suggested that, as a result, creates an increase in the debt financing to corporations. This view is consistent with trade-off theory and, since 1996, Brazil has been one of the few countries that do not tax dividends (Federal Law nº 9,249, 1995).

For this reason, in principle, the tax system should not discriminate in favor or against any economic choice. Any tax benefit of debt over equity violates tax neutrality, and Arlen and Weiss (1995) proposed to extinguish the corporate income taxes but recognized that such a move would be unpopular. Another possible solution, as explained in greater length by Isaac (1997), is the adoption of an ACE rule, which enables firms to take advantage of an equity deduction from taxable income that is equivalent to the deduction of interest expenses.

In 1995, Brazil adopted an ACE rule called JSCP (*Juros Sobre o Capital Próprio*) and simultaneously abolished the taxation of dividend distribution (Federal Law nº 9,249, 1995). However, it is not possible to argue that the tax advantage of debt was fully eliminated because there are strict limits to ACE deductions. The legislation limits ACE deductions to 50% of net income and the interest rate applied over equity, called TJLP (*Taxa de Juros de Longo Prazo*), is systematically and considerably lower than the market interest rates. For instance, in 2016, the TJLP was 7.5% while the BACEN key interest rate – *taxa SELIC* – was approximately 14.18%. Thus, even though there is still a tax advantage of debt financing the benefit is somewhat reduced by the provision of ACE deductions.

Avi-Yonah (2006) listed three goals of taxation: the first, and possibly the most obvious and least controversial, is to raise revenues necessary for governmental functions; the second is to redistribute wealth, which is a more controversial goal, as stated by the author; and the last one is a regulatory goal because taxes can be used to steer private sector activities in the directions

desired by governments. Avi-Yonah (2006) argues that the income tax, which includes the corporate income tax, has been seen as a potential regulatory tool in the United States from the beginning. In this context, tax expenditures are sometimes more efficient than direct subsidies, and income taxation can be used to regulate investment and saving behavior. In this context, the ACE rule could help bank regulation efforts by providing incentive to increase equity.

The concept of tax expenditures is based on the notion that a government could incur expenditures through the tax code, meaning that it could forego some tax revenue to accomplish objectives that, in theory, could also be obtained through direct government spending. The relation between tax expenditures and subsidies seems natural because the same economic result can be accomplished if a state foregoes the revenues from corporate income taxation or, instead, collects the tax revenues and subsequently gives it back to the firms through an aid program. Therefore, tax expenditures could be used to accomplish redistributive and regulatory goals.

It is interesting to note that an ACE rule can be considered a tax expenditure. However, this argument could be controversial because, as explained by Vettori (2011), in order to demonstrate that a tax deduction or incentive is a tax expenditure, one must first define what is the 'normal' parameter of taxation, before stating that some deviation from it is a tax benefit. Therefore, to accept the argument that an ACE rule is a tax expenditure, one must first acknowledge that the country tax system's 'normal' income parameter does not allow any interest deduction on equity.

The Brazilian tax and customs administration does not include ACE in its annual publication on tax expenditures (Receita Federal do Brasil, 2016a). However, it seems contradictory not to define ACE as a tax expenditure and, simultaneously, to impose strong limits on ACE deductions. In fact, it is hard to argue that equity deduction is a 'normal' parameter of the Brazilian tax system on the measurement of income when there are strict limits on it.

2.7 Empirical Literature

To rise to the challenge of producing compelling empirical evidence on the effects of taxation on capital structure, a promising path is to take advantage of natural experiments. Meyer (1995) argued that policy changes may allow the researcher to obtain exogenous variation in the main explanatory variable; thus, policy changes are usually good sources of natural experiments, which could be useful in situations when standard estimation procedures are ordinarily biased.

Doidge and Dyck (2013) studied the Canadian Tax Fairness Plan, which increased taxation for Canadian income trusts, and claimed to cleanly address the impact of taxes on capital structure. One of the findings was that the mean leverage of trusts increased 6% more than other corporations, which is a statistically and economically relevant number because the mean leverage for the full sample was 20% in 2006. This dissertation applies a similar methodology in the context of the banking industry. Doidge and Dyck (2013) control for size (logarithm of total assets) and, in some regressions, they control for after-tax earnings, investment and industry-level variables, such as industry payout.

In a similar article, Moore (2014) studies the adoption of an ACE rule in Belgium, but the expected decrease in leverage was not found, possibly due to confounding factors, as argued by the author. Moore (2014) uses non-Belgian European firms in the control group. One concern is that the economic environments in Belgium and in the other European countries may evolve in substantially different ways, motivating the inclusion of country dummies and country-level controls, such as GDP, growth rate, and inflation. The regressions also featured firm-level controls for profitability, tangibility, size, net operating loss, and non-debt tax shields.

Schepens (2016) investigates the same Belgian event studied by Moore (2014) but restricts the analyses to banks, documenting that the tax effects were relevant to banks' capital structure. Schepens (2016) uses a difference-in-differences empirical approach to compare Belgian banks with a control group of similar European banks selected by a matching procedure. Schepens (2016) also finds that the decrease in leverage resulted from higher equity and not from a decrease in banking activities. There also evidence of risk reduction, possibly due to stronger incentives for banks to monitor borrowers. The results are economically relevant because the adoption of the Belgian ACE rule resulted, according to the estimated model, in an equity ratio increase of around 13.5% on average. This effect could be considered desirable according to a macroprudential approach to financial regulation, as discussed in section 2.7. However, the concerns regarding possible omitted-variables related to differences among the Belgian and other European countries' economic realities remain valid. Another possible source of bias relates to the matching process that dropped many non-Belgian banks from the study to produce a similar control group from European Banks.

De Mooij and Keen (2016) also document that tax rates are statistically relevant predictors of banks' capital structure. The results from one of their empirical specifications imply that a 10 p.p. increase in the corporate tax rate is expected to increase the leverage ratio by 1.7 p.p.. The authors also find that the speed of adjustment of banks' capital structure is relatively fast (faster

than the speed of adjustment documented by Gropp and Heider (2010)), with a half-life of around 0.8 year, in contrast to approximately 3.7 years for non-financial firms.

Merz and Overesch (2016) use a panel with 2,415 bank-year observations from 1991 to 2014 to document that earnings from multinational banks' subsidiaries significantly respond to the tax incentives of host countries, which indicates that international tax evasion might be a concern. Changing the capital structure is a possible profit shifting strategy, but the authors conclude that other strategies may be more important.

Another evidence from Merz and Overesch (2016) is that the sensitivity of reported profitability to changes in taxation seems to be more pronounced in non-financial multinational corporations. The authors call for future research to investigate if, in addition to the location of reported profits, the activities of banks are also affected by taxation. The BEPS project explains how multinational corporations can shift taxable profits without any real change in their economic activities. This dissertation aims to contribute to the literature by assessing if banks employ debt profit shifting strategies in response to increases in the corporate income tax rate.

Heckemeyer and de Mooij (2017) compare the responsiveness of banks and non-financial firms to tax incentives and show that banks are far less affected by tax incentives. For non-financial firms the authors find a U-shaped pattern between size and tax responsiveness, implying that the largest responses are observed for very small and very large companies. However, even though small banks are also responsive to tax incentives, the responsiveness of larger banks is much lower, irrespective of their conditional leverage. The responsiveness of small and medium banks is higher at lower conditional leverage, like non-financial firms, regardless of size. The data was collected between 1996 and 2010, including 63 countries. It is important to highlight that it consists of consolidated financial statement, therefore it could not evaluate debt shifting strategies in favor of low-tax jurisdictions.

Figure 4 provides evidence that during the period of analysis foreign loans increased substantially for Brazilian banks. Private banks also increased foreign investments in the period while state-controlled banks retained relatively few foreign investments. Domestic privately controlled banks' foreign loans increased 232%, and in the same period, foreign-privately controlled bank's foreign loans increased 206%, while government-controlled banks' foreign loans increased 97%. This rate of growth is greater than the growth of total assets during the same period, which, combined with the documented tax rate increase, suggests that substantial debt shifting could be occurring.

3 RESEARCH METHOD

According to (Smith, 2015), a research question which can be evaluated with a large set of quantitative data from reliable secondary data sources and which allows for the modelling of relationships and for the usage of regression-type methods is ideally suited to archival research. More specifically, my research design consists of a quantitative analysis using inferential statistics to estimate the effects of taxation on the capital structure decisions of banks. I exploit a natural experiment to assess the effects of a corporate income tax rate rise on groups of banks that were differentially affected by the rate change but are otherwise similar.

3.1 Hypotheses Development

The trade-off theory of capital structure, presented in section 2.1, requires empirical evidence to confirm if the available data are consistent with the prediction that taxes are relevant to firms' capital structure. Most empirical studies in this area exclude the financial sector, resulting in insufficient evidence for the banking industry, which presents unique features. Bank regulations, as detailed in section 2.2, particularly those on capital requirements established by the Basel Accords, might be such a powerful determinant of banks' capital structure that little room is left for other variables, such as taxes, to play a significant role. Thus, to contribute to the literature, this research tests H_1, that the corporate income tax rate positively affects the leverage of banks, as described in section 1.3. Additionally, will be assessed if the evidence collected is also consistent with H_2, that the positive relationship between leverage and the corporate income tax rate is weaker for banks with greater profit shifting opportunities.

H_2 is developed based on the findings by Merz and Overesch (2016) that the earnings of bank' subsidiaries respond to the level of corporate income taxation in different jurisdictions, with a stronger response than non-financial companies. Hence, it is reasonable that non-debt tax shields, such as profit shifting opportunities, might reduce the benefit of using debt as a tax shield. H_2 is also consistent with the BEPS project, as detailed in section 2.5, given that banks, similarly to other firms, actively seek profit-shifting strategies.

H_3, that the positive effect of the corporate income tax rate on leverage is more pronounced for individual banks compared with financial conglomerates, is also based on the trade-off theory on capital structure and on the literature on profit shifting. The regression models investigate if the response to a corporate tax rate increase differs substantially between the individual bank and the financial conglomerate it belongs to. This could happen because taxation is due at the

individual bank level and financial conglomerates, particularly those with investments outside of the banking sector, could benefit from intra-group profit shifting strategies in order to reduce taxation. Thus, I should expect findings consistent with H_3 only if taxes are relevant to banks' capital structure decisions and, simultaneously, they increase leverage more significantly at the firm level than at the conglomerate level. Finally, H_4 states that the positive relationship between leverage and the corporate income tax rate is weaker for individual banks with greater profit shifting opportunities compared with financial conglomerates. Empirical results supporting this hypothesis would suggest that taxes are relevant to determine the capital structure of banks and that banks with more profit shifting opportunities rely less on debt tax shields.

3.2 Data Description

The population of interest comprises the banks and financial conglomerates operating in Brazil. Data was mostly collected from the BACEN website. The period of analysis encompasses the years 2006 through 2017; therefore, I collect data beginning two years before the tax rate change in 2008 until two years after the second tax rate increase of 2015. There were data available on all active Brazilian banks during this twelve-year period, comprising 225 banks and a total of 4,258 bank-semester observations.

Although, for comparability purposes with studies on other countries, it would be desirable to collect data applying the IFRS standards, in this dissertation this will not be possible. The first reason is that Brazilian financial institutions were not required to issue statements applying IFRS standards prior to the 2009, and even after 2010, only financial institutions organized as publicly traded companies (*Sociedade por Ações Aberta*) or firms required to form an audit committee, were required to disclose financial statement prepared under IFRS.

Fé Júnior, Nakao and Ribeiro (2015) run an event study showcasing the effects of IFRS on the stock prices of financial institutions. The findings suggest that IFRS adoption provided investors with new and useful information, even after the publication of the financial statement under the usual COSIF standards referring to the same period. The evidence suggests that, at least for 2010, the differences between the COSIF and IFRS standards were relevant. Therefore, there is an opportunity to revisit this study using statements produced under IFRS in order to assess the stability of my findings. However, as a downside, such a study would lose data on many financial institutions.

The data on financial conglomerates collected in this dissertation followed the COSIF standards, which, despite its lower comparability with other studies, present some advantages. The most obvious is related to trustworthiness, considering that this dissertation used the same information that was presented and is subject to auditing from BACEN, which is charged with regulating and monitoring the Brazilian financial system. Simultaneously, BACEN enforces the presentation of the data following a homogenous chart of accounts that must be observed by all financial institutions, rendering all statements comparable and homogenous (Banco Central do Brasil, 2019). Finally, considering that financial statements under IFRS standards are only readily available for publicly traded financial institutions, using COSIF standards makes it possible to include in the analysis all Brazilian banks and financial conglomerates.

It would be desirable to collect data from prudential conglomerates instead of financial conglomerates, but for the purposes of this study this is not possible because data on prudential conglomerate were not available for most of the period. Probably, a regression using prudential conglomerate data would be more likely to favor H_3 and H_4because prudential conglomerates encompass a greater number of in-group firms; therefore, enhancing profit shifting opportunities. Thus, future studies using similar empirical strategies should favor prudential conglomerate data.

A total of 225 single Banks during the twelve-year period were studied. The months with the greatest number of active banks were June and July 2006 with 186, and the months with the smallest number of active banks were August, September and October 2014, with 171 active banks. In total, 133 banks were active during the whole period. It is important to highlight that, although financial statements data are available monthly, information on financial and prudential conglomerates is available only for the last month of each trimester. Another feature of the data is that information on revenues and expenses are aggregated every semester, in such a way that data from the second and the fourth trimesters encompass, respectively, the revenues and expenses of the first and second semesters. Because of that, semester data were used in the quantitative analysis.

Data were also collected on the main shareholders of each financial institution; however, it is not required that all banks released this information; hence, there is no consolidated data source containing this information on all Brazilian banks. To overcome this problem, I collected the information from a variety of data sources, mostly and when possible, from public statements released by the financial institutions or from documents released by the BACEN, especially in a yearly summary of all ownership changes of financial institutions. For the few financial institutions for which it was not possible to gather data about the main shareholder in one of

those official sources, shareholder information was collected from business newspapers, which are consistent but less reliable.

3.3 Variable Descriptions

Table 4 shows the operational definition of the main variables of the quantitative study.

Table 4 - Variable Descriptions

Variable	Description
Leverage	(Total Debt) / (Total Assets)
High Taxed Shareholder	Dummy variable equal to 1 when the main shareholder is subject to high income tax
Bank Institution	Dummy variable equal to 1 for a bank Institution and zero for a Financial Conglomerate
Size	Ln (Total assets in 2006 *Reais*)
Size^2	Size * Size
Collateral	((Cash and equivalents) + (interbank investments) + (long-term investments) + (tangible assets not leased)) / (total assets)
Profitability	(Result before taxes - participations on profits) / (total assets)
Regulatory Constraint	Dummy variable equal to 1 if the financial/prudential conglomerate's Basel index is close to or below the regulatory minimum
Riskiness	(Operations with risk level D, E, F, G and H) / (total assets)
Foreign Investments	(Foreign investments) / (total assets)
Domestic Participations	(Domestic participations) / (total assets)

Note: Appendix I details which COSIF accounts were used to compute each variable. Most of the data was collected from the BACEN website. Inflation data was collected from FGV, IGP-M inflation index in order to compute Size in 2006 *Reais*. The High Taxed Shareholder dummy data collection is described in section 3.2.

3.3.1 Leverage

Leverage is the dependent variable and is calculated as the ratio between total debt and total assets. I use only book leverage because most banks are not publicly traded; thus, it is not possible to obtain market equity value. Kayo and Kimura (2011) explain that some authors argue that book value can better measure the value of assets in place because it is not affected

by growth opportunities as market value is. The problem with measuring leverage using market value is potentialized by the evidence that managers do not readily adjust capital structure, as described in the speed of adjustment literature presented in section 2.1. Therefore, market leverage would poorly reflect capital structure decisions. On the other hand, market leverage may be less subject to distortions caused by accounting rules and the market value of a firm is arguably closer to its intrinsic value (Kayo & Kimura, 2011).

In the literature, there are studies using book leverage (De Mooij & Keen, 2016; Gu, de Mooij, & Poghosyan, 2014; Hemmelgarn & Teichmann, 2014; Lin et al., 2014), market leverage (Flannery & Rangan, 2006) and others presenting results with both measures (Doidge & Dyck, 2013; Gropp & Heider, 2010; Kayo & Kimura, 2011; Lemmon et al., 2008). It would be desirable to check if these dissertation results are robust to a market leverage measure; however, the available data does not allow such a test.

Some previous studies also present their results with alternative dependent variables excluding some components of banks' liabilities in their measurement of the ratio between debt and assets. Gropp and Heider (2010) decompose banks' leverage into deposit and non-deposit liabilities, but argue that the measure including deposits has the benefit of being directly linked to the regulatory view of bank capital structure. Gu et al. (2014) also presented their results using the ratio between short-term debt and assets as the dependent variable, and their findings suggest that long-term debt is less influenced by taxes. De Mooij and Keen (2016) included hybrid debt, defined as instruments that are treated as capital for regulatory purposes and as debt for tax purposes. The dataset available for this dissertation does not allow me to decompose banks' liabilities in short-term debt and long-term debt or to segregate conventional and hybrid debt.

3.3.2 High Taxed Shareholder x Low Taxed Shareholder Groups

The High Taxed Shareholder dummy variable divides the banks into two groups. The first one (dummy equal to 1) is composed of banks whose main shareholder was subject to a higher income tax rate on ACE revenues during most of the sample period, and the second group is composed by banks whose main shareholder was subject to a lower income tax rate.

The main shareholder is defined as the one with the greatest number of voting shares within the Bank's control group. The higher taxed shareholder group is composed of Brazilian domestic corporations, which are subject to a 34% corporate income tax rate besides the financial institutions' surcharge seen in Figure 2. In contrast, the lower taxed group is composed of banks controlled by all levels of Brazilian government, which are exempt from taxation by the

Brazilian Constitution reciprocal immunity rule on income (Constituição da República Federativa do Brasil, 1988, Article 150, VI, *a*), of individual investors, which are subject to a fixed 15% income tax on ACE revenues, and of foreign investors.

Foreigners are considered low taxed, even though it is possible that they are subjected to high tax rates in their home countries. However, it seems reasonable to classify foreigners as low taxed comparatively to Brazilian corporations, considering the high taxation of Brazilian firms shown in Figure 2. Furthermore, foreign investors may benefit from tax avoidance structures that could not be assessed with available data, as detailed in section 2.5. This dummy variable is used in the second identification strategy, as described in section 3.5.1.

3.3.3 Bank Institution x Financial Conglomerates Groups

The Bank Institution dummy variable splits banks and their financial conglomerates such that data from banks is coded 1 and data from financial conglomerates is coded 0. COSIF data on financial conglomerate are presented as document 4040 and bank data are identified as document 4010. This dummy variable is used in the second identification strategy as described in section 3.5.2.

3.3.4 Size

The Size variable is computed as the natural logarithm of Total Assets inflation-adjusted by 2006 Brazilian *Reais*. In the quantitative analysis I also use the square of Size in order to capture nonlinear effects of Size on leverage. The square size variable is common in previous capital structure studies (De Mooij & Keen, 2016; Gu et al., 2014; Heckemeyer & de Mooij, 2017).

3.3.5 Collateral

Collateral measures the assets available to secure loans and is calculated as the ratio between assets available as collateral and total assets. Assets available as collateral includes fixed assets and long-term investments in shares and bonds. I follow previous studies on the definition of banking industry collateral (Gropp & Heider, 2010; Merz & Overesch, 2016).

In theory, an enterprise with more tangible assets is able to offer them as collateral, thus decreasing its cost of debt; according to this reasoning, most previous research on the determinants of capital structure include a control variable that measures available collateral,

usually defined as tangible assets (Fan, Titman, & Twite, 2012; Lemmon et al., 2008; Myers, 2001). However, the collateral variable is not as well suited for the banking industry as it is for the non-financial sector, primarily because banks have relatively few investments in fixed tangible assets and may have large investments in safe treasury bills that may potentially serve as collateral. Gropp and Heider (2010), without much discussion on the subject, check the robustness of their empirical results to alternative definitions of collateral and their main definition include liquid assets such as bills, securities, interbanking credits and cash, besides fixed assets.

It must be said that there is also a risk in including all forms of liquid assets in the collateral measure given that some of those assets, such as securities, despite being liquid, can be subject to severe price fluctuations during financial crises. There is a trade-off, therefore, because, on the one hand, a collateral definition similar to the one used for non-financial firms, based on fixed assets only, does not adequately capture the ability of banks to repay their obligations but, on the other hand, a broader definition includes assets that fail to preserve value during crises.

Following Gropp and Heider (2010), I use several definitions of collateral value. However, the main definition used in this dissertation includes only fixed assets plus assets with low associated risk, including cash equivalents and interbank credits.

3.3.6 Profitability

Profitability measures the return on invested assets and is calculated as the ratio between results before taxes deducted by participation on profits and total assets. The reason to deduct participation on profits is that they are usually expenses with employees and management and thus should not be treated as profit because it is not due to the owners (Federal Law n^{o} 10,101, 2000).

Measuring profitability for the banking industry is not as straightforward as it is for other sectors. Most authors studying the capital structure of non-financial firms use earnings before interest and tax divided by total assets (Kayo & Kimura, 2011; Lim, 2012; Titman & Wessels, 1988).

However, even though there are also studies that follow this measurement for the financial sector (Gropp & Heider, 2010), it does not seem as reasonable because interest is the main operational expense in the banking industry, which makes its deduction questionable. Nevertheless, it must be stated that not deducting interest expenses is also problematic because,

ceteris paribus, a more leveraged bank will have higher interest expenses. Hence, deducting interest expenses generates a simultaneity issue, as will be mentioned in section 3.4.3.
Some studies (Heckemeyer & de Mooij, 2017; Kayo & Kimura, 2011) measure profitability as the ratio between operational income and total assets, which deducts interest expenses that are treated as operational expenses. Another option adopted by Shepens (2016), that also deducts interest expenses, is to measure profitability as the ratio between profits before taxes and total assets. This option seems to be the most sensible one because it also takes into account non-operational income; thus, this will follow Shepens (2016) in the main regressions.

3.3.7 Regulatory Constraint

The dummy variable Regulatory Constraint aims to identify the banks and financial conglomerates that are restrained by their regulatory capital requirements under the Basel Accords, as they were implemented in Brazil. The dummy variable is equal to 1 when the Basel index of the financial conglomerate or the prudential conglomerate is at least 0.05 lower than the regulatory minimum for the semester, as detailed in Table 4. Therefore, this dummy variable has the same value for all banks in the same financial/prudential conglomerate in each semester. This variable is unique for this study. However, it relates to a bankruptcy *proxy* adopted in previous studies (Graham, Lemmon, & Schallheim, 1998).

3.3.8 Riskiness

Riskiness is measured by the ratio between non-performing loans and total assets. Non-performing loans are defined as those classified with a risk level of C, D, E, F, G or H. In other words, the loans with a delay in payment above 60 days. De Mooij and Keen (2016) also use a riskiness proxy, with a different specification that uses RWA, which is a conglomerate-level variable. For the purposes of this dissertation it is preferable to use a bank-level variable, considering that taxation is due at the firm level and I will compare individual banks with their respective conglomerates. Some previous studies (Gropp & Heider, 2010; Jucá, 2011) measured riskiness based on stock market volatility, which is possible only for publicly traded banks and is thus inadequate for this research.

3.3.9 Foreign Investments

The Foreign Investment variable is defined as the ratio between foreign investments and total assets. This variable was included due to the possibility of using foreign subsidiaries as an instrument for profit shifting strategies including activities shifting, which can be considered a form of non-debt tax shield. Graham (2003) listed empirical studies that test the hypothesis that non-debt tax shields could reduce the use of debt to avoid taxes, which would lead to a prediction that they would be negatively correlated to debt, as explained in section 2.1. This prediction is consistent with H_3 and H_4.

3.3.10 Domestic Participations

The Domestic Participations variable is defined as the ratio between the participations in controlled or affiliated domestic firms and total assets. Like, Foreign Investments, Domestic participations can also be used in profit shifting strategies considering the higher taxation of financial institutions in Brazil.

3.4 Model for Empirical Investigation

3.4.1 Population and Sample

I collect data on all Brazilian banks and financial conglomerates (except financial conglomerates without banks) in the sample period. Very few observations were dropped in the quantitative study due to data inconsistency or in cases of extreme outliers. Therefore, while most previous studies limit their analyses to stock-exchange listed firms, my sample represents the entire population of interest and, thus, is free from sampling selectivity concerns.

3.4.2 Panel Data Model Setup

The quantitative research includes four main regressions, each of them encompassing an eight-semester period. In the first regression setting there are 197 banks, in the second 185 banks, in the third 130 banks and 74 financial conglomerates and in the fourth 115 banks and 70 financial conglomerates. Therefore, the available data is consistent with an unbalanced short panel, as

described in Wooldridge (2010), since the number of cross-sectional units is much larger than the number of time periods.

All regression models are similar in that they follow a difference-in-differences setup in which two comparable groups are differentially affected by the same tax rate increase. The specifications of the regressions are based on the equation shown below.

$$Lev_{i,t} = \alpha + \beta_1 TR_{i,t} + \beta_2 Post_t + \beta_3 G_i + \boldsymbol{\delta^T X}_{i,t} + \varepsilon_{i,t}$$

Equation II - Regression Model for H_1 and H_3

The dependent variable is Leverage ($Lev_{i,t}$), as described in section 3.3.1, and it changes for each bank/financial conglomerate (represented by the subscript "i") in each semester (represented by the subscript "t"). For each regression, there is a group dummy variable (G_i), which is either the one described in section 3.3.2 or the one described in section 3.3.3. There is also a dummy variable that indicates whether the period is before or after the tax increase ($Post_t$) and a treatment response dummy variable ($TR_{i,t}$) obtained by the multiplication of $G_{i,t}$ and $Post_t$. In each regression, the variable of interest is the treatment response variable. There is also a set of control variables ($\boldsymbol{X}_{i,t}$), described in sections 3.3.4 through 3.3.10. I also include a set of time dummy variables. Finally, $\varepsilon_{i,t}$ represents the idiosyncratic error term.

The main justification for the adoption of a difference-in-differences setup is the occurrence of an exogenous source of variation in the corporate income tax rate, which in other situations would be endogenously related to leverage. Section 3.5 describes the exogenous variations that justify the research design.

3.4.3 Endogeneity

One of the main problems in capital structure studies is endogeneity. Graham (2003) argues that tax expenses are endogenous to debt policy because if a company issues debt it reduces the taxable income. In other words, there is a simultaneity concern which means, as explained by Wooldridge (2010), that the explanatory variable is correlated with the regression error, which can lead to a biased inferences. As demonstrated in Section 3.5.1 below, the Brazilian ACE rule may minimize the problem, but it does not eliminate it. Another issue is that the Brazilian tax system has few tax brackets for corporations, and, for practical purposes, all taxable income is

subject to the same corporate tax rate. Indeed, a monthly profit over 20,000 *Reais* places a firm to be subjected to the top tax bracket,.

Another obvious source of endogeneity in regressions relates to omitted variables. This research aims to mitigate this concern by exploiting the difference-in-differences setup, using Post_t and $\mathrm{G}_{\mathrm{i,t}}$ as crucial controls, capturing the effects of any omitted variables that vary exclusively across periods or groups. Here the benefit of a single country study is evident, since it is easier to argue that banks operating in the same jurisdiction are subjected to the same economic environment.

As for measurement errors, even with a reliable database the problem cannot be fully eliminated. In this dissertation the main concern is, probably, the measurement of profitability for the banking industry, for the reasons stated in section 3.3.6.

3.4.4 OLS, Random Effects, Fixed Effects

All models were estimated using the Ordinary Least Squares - OLS, Random Effects and Fixed Effects estimators. Given that results are very similar across these alternatives and that OLS is the estimator of choice in most difference-in-differences studies, I present only the OLS estimates in section 4.3. The others models' results are presented in Appendix III.

I cluster observations at the bank/financial conglomerate level for computing standard errors, as recommended by Wooldridge (2010) in the context of short panel data sets, thus allowing for arbitrary error heteroscedasticity and within-cluster autocorrelation.

3.5 Identification Strategies

In this section, I explain the reason why an increase in the bank corporate tax income should not be equally perceived by the groups of interest in this dissertation, thus granting the opportunity for a difference-in-differences strategy. The first rate increase of 6 p.p., from 34% to 40%, took place in April 2008 (Federal Law nº 11,727, 2008), the second rate increase of 5 p.p., from 40% to 45%, was a temporary one aimed to take effect from September 2015 through December 2018 (Federal Law nº 13,169, 2015).

3.5.1 First Identification Strategy - ACE Rule

To isolate the tax effects from confounding factors, I argue that the corporate tax rate increases for financial institutions do not affect all banks equally. The Brazilian ACE rule (*Juros Sobre o Capital Próprio – JSCP*) allows, when some requirements are met, firms to deduct interest expenses from equity in a similar way that they would deduct from debt. However, those equity interest payments are taxed at the equity holder level, while regular dividend income is exempt from taxes.

A numerical example helps to understand the differential rate increase effects. A Brazilian bank in 2006 with R$ 200.00 (two hundred Brazilian *Reais*) profits would be allowed, if it had enough equity, to deduct up to R$ 100.00 from interest expenses under the ACE rule. Thus, the bank would have a taxable income of R$ 100.00. The corporate tax rate for financial institutions in 2006 was 34%, thus it would have to pay R$ 34.00 in taxes and R$ 66.00 would remain in the bank plus R$ 100.00 would be distributed to the bank's equity holders as interest income from equity. However, the R$ 100.00 ACE is considered a taxable income at the equity holder level, who would pay, for instance, 15% in taxes if they were an individual investor or 34% if they were a private corporation. Accordingly, under this scenario, where the bank had sufficient equity to take advantage of the ACE rule's full deduction, the marginal income tax rate for banks owned by individual investors would be 24.50% (i.e., (34+15)/200), whereas it would be 34% ((34+34)/200) for by banks owned by corporations, which is a significant difference.

Tables 5 and 6 give a numerical example of real income taxation in 2006 and 2017 for banks owned by the government, individual investors, private corporations and other financial institutions. Those tables are computed under the assumption that bank equity is sufficiently high as to allow the deduction of 50% of the taxable income, the cap under the Brazilian ACE rule. If equity is not sufficiently high the amount of the benefit would decrease but not disappear.

Tables 5 and 6 make it easier to understand how the tax rate increase affected banks operating in the same business environment in significantly different ways. Government-owned banks had their real income marginal tax rate increased from 17.00% to 22.50%, a 5.50 p.p. increase. At the same time, the increase was from 34% to 46.825% or a 12.825 p.p. for banks owned by other financial institutions. The increase for banks owned by corporation or individual investors was 5.5 p.p. in the period, whereas it was 7.325 p.p. for banks owned by private corporations.

It is important to explain that, since 2009, ACE revenues have been taxed by the Brazilian Value Added Taxes – VAT, called PIS and COFINS. Hence, Table II also included the financial

burden of those taxes for an average Brazilian corporation. The Brazilian tax authority published a recent rule over VAT taxation on ACE revenues (Receita Federal do Brasil, 2016b).

Table 5 - Brazilian ACE Example 2006

Owner	State Owned	Individual Investor	Private Corporation	Financial Institution
Bank Income (A)	200.00	200.00	200.00	200.00
ACE Deduction (B) = (A) * 50%	100.00	100.00	100.00	100.00
Bank Taxable Income (C) = (A) – (B)	100.00	100.00	100.00	100.00
Bank Tax Rate 2016 (D)	34.00%	34.00%	34.00%	34.00%
Bank Corporate Income Tax (E) = (C) * (D)	34.00	34.00	34.00	34.00
Investor Taxable Income (F) = (B)	100.00	100.00	100.00	100.00
Investor Tax Rate 2016 (G)	0.00%	15.00%	34.00%	34.00%
Investor Income Tax (H) = (F) * (G)	0.00	15.00	34.00	34.00
Total Taxation (I) = (E) + (H)	34.00	49.00	68.00	68.00
Total Tax Rate (J) = (I) / (A)	17.00%	24.50%	34.00%	34.00%

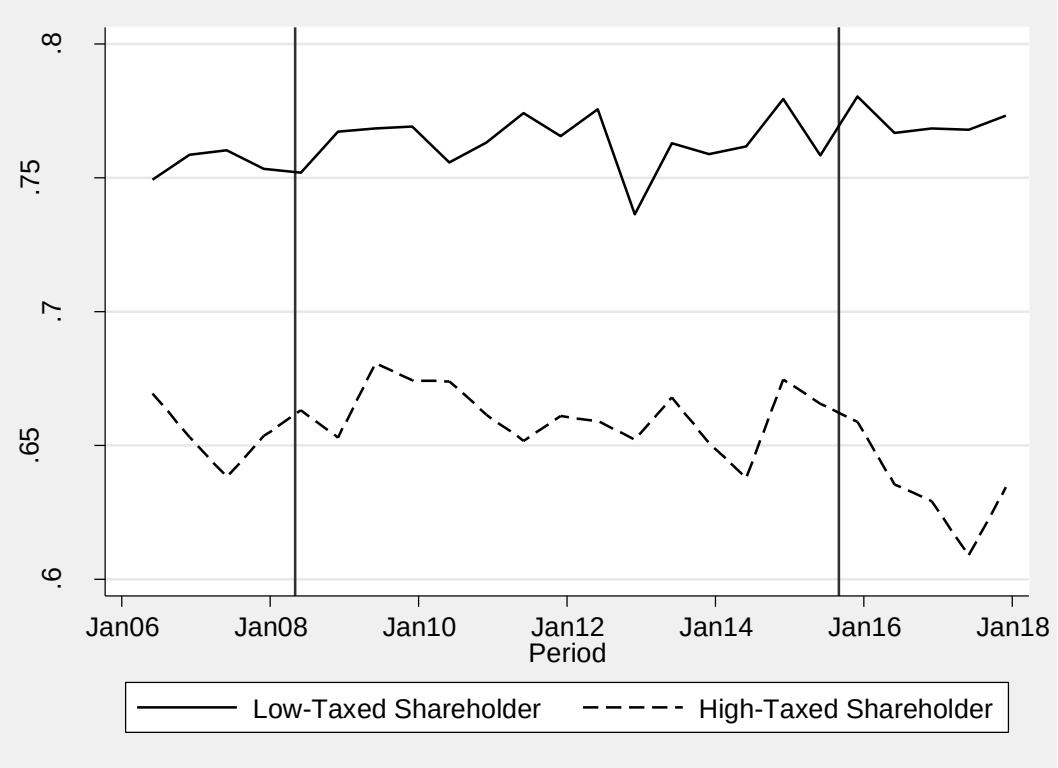
Table 6 - Brazilian ACE Example 2017

Owner	State Owned	Individual Investor	Private Corporation	Financial Institution
Bank Income (A)	200.00	200.00	200.00	200.00
ACE deduction (B) = (A) * 50%	100.00	100.00	100.00	100.00
Bank Taxable Income (C) = (A) – (B)	100.00	100.00	100.00	100.00
Bank Tax Rate 2016 (D)	45.00%	45.00%	45.00%	45.00%
Bank Corporate Income Tax (E) = (C) * (D)	45.00	45.00	45.00	45.00
Investor Taxable Income (F) = (B)	100.00	100.00	100.00	100.00
Investor Tax Rate 2016 (G)	0.00%	15.00%	37.65%	48.65%
Investor Income Tax (H) = (F) * (G)	0.00	15.00	37.65	48.65
Total Taxation (I) = (E) + (H)	45.00	60.00	82.65	93.65
Total Tax Rate (J) = (I) / (A)	22.50%	30.00%	41.325%	46.825%

Thus, when a Brazilian firm takes advantage of the ACE rule, it reduces its taxable income, but its investors have their taxable income increased by the same amount. Therefore, because the ACE rule only deducts the firm taxation by the difference of its own tax rate and the rate applicable to its investors, a corporate income tax rate increase affects more heavily Brazilian firms with highly taxed investors. In fact, there is little gain, or even a loss, to shift profits via the ACE rule to high-taxed equity holders. It is important to highlight that, as argued in the literature review, section 2.1, firms should also take into account the investor-level taxation (Graham, 2003; Miller, 1977).

Therefore, if taxes are relevant to banks' capital structure, an increase in leverage would be expected during the studied period, from 2006 through 2015, in which banks' corporate taxation increased 11 p.p., or 32.35%, from 34% to 45%. Most importantly, I expect that banks controlled by high-taxed shareholders have a stronger leverage response to tax increases. Figure 5 shows how the mean leverage of the two groups evolved during the period of the analysis. At first glance, and without applying the necessary controls, it seems that, following the first tax rate increase, leverage increased more for banks with higher taxed shareholders, as expected; however, the same pattern does not seem to be replicated in the second period.

Figure 5 - Mean Leverage by Shareholder Taxation



Source: BACEN data

Note: The vertical lines represent the increases in corporate income tax rates for financial institutions.

The first identification strategy will be used to test H_1 against the null hypothesis that the tax rate does not significantly influence banks' corporate policy regarding leverage. If the null hypothesis is true, there is no reason to expect that β_1 would be significantly different from zero, because the shareholder-level taxation should not be relevant for the leverage policy of banks.

However, if the evidence supports H_1, that would be consistent with the predictions of the trade-off theory. The first identification strategy is also used to test H_2, which is a stronger deviation from the null hypothesis that would only be supported by the empirical evidence if additional profit shifting opportunities decrease the effects of taxes on leverage.

To test H_2, Equation II is slightly altered to include $DP_{i,t}$ and its interactions, in particular the interaction ($DP_{i,t} \times TR_{i,t}$), allowing us to assess if Domestic Participations, used as a *proxy* for non-debt profit shifting opportunities, reduces the expected increase in leverage due to a higher taxation. A negative value for β_4 would be expected if profit shifting opportunities affect leverage decisions.

$$Lev_{i,t} = \alpha + \beta_1 TR_{i,t} + \beta_2 Post_t + \beta_3 G_i + \beta_4 (DP_{i,t} \times TR_{i,t}) + \beta_5 DP_{i,t} + \beta_6 (Post_t \times DP_{i,t}) + \beta_7 (G_{i,t} \times DP_{i,t}) + \boldsymbol{\delta^T X}_{i,t} + \varepsilon_{i,t}$$

Equation III - Regression Model to test H_2 and H_4

3.5.2 Second Identification Strategy – Banks and Financial Conglomerates

The second identification strategy uses the same tax rate increase as a source of exogenous variation, but this time the financial conglomerates are used as the control group. Thus, I contrast individual banks with the financial conglomerates to which they belong. I expect that the capital structure of these entities would evolve similarly (i.e., following 'parallel trends') in the absence of an exogenous shock to the tax rate.

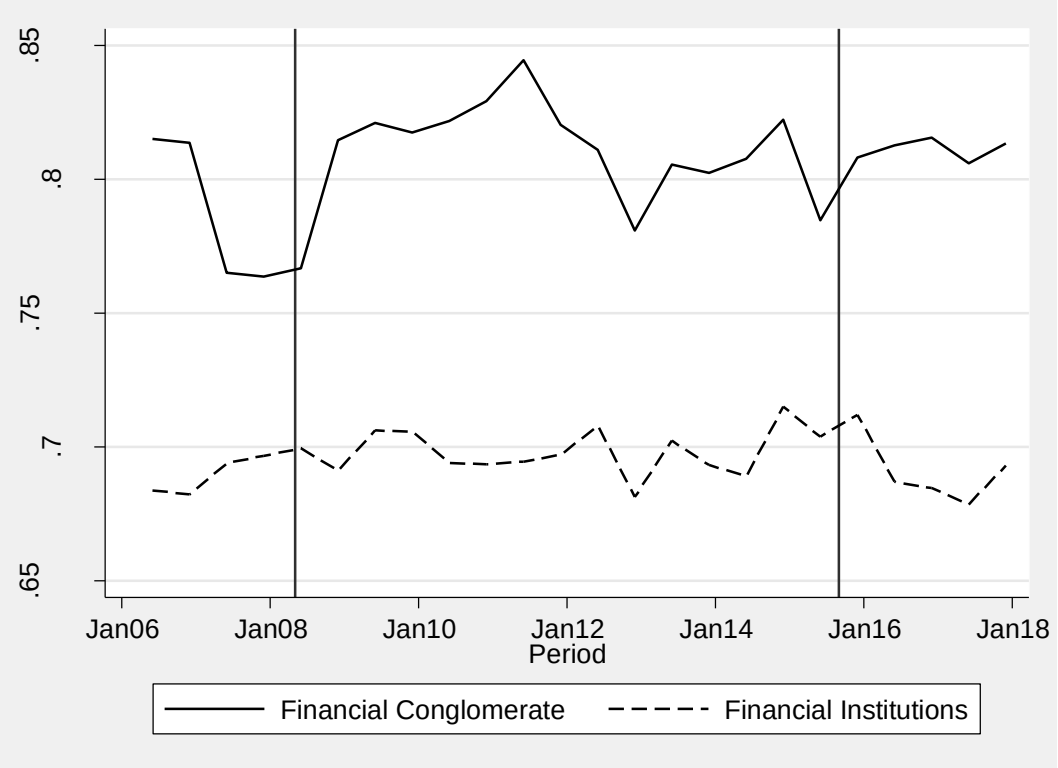
The rationale is that taxation is due at the individual bank level and not at the conglomerate level. In addition, financial conglomerates could plausibly use profit shifting strategies to achieve other capital structure goals. In other words, conglomerates should have fewer incentives to change their capital structure in response to an increase in the corporate income tax rate. If H_3, as described in section 1.3, is true, one should expect that the tax increase does not affect the leverage at the financial conglomerate level as much as it affects the leverage at the individual bank level.

Although there is some evidence in the literature that taxes are relevant to bank-level capital structure decisions the research hypothesis H_3, that the positive effect of the corporate income tax rate on leverage is more pronounced for individual banks compared with financial conglomerates, is a novel contribution. For this hypothesis to be supported by the data, an increase in the income corporate tax rate should not only lead to a leverage increase at the

individual bank level but should also lead to some sort of intra-group profit shifting so that leverage at the conglomerate level remains relatively stable.

Figure 6 shows the evolution of mean leverage for banks and financial conglomerates. It is important to highlight that data was dropped from banks without an associated financial conglomerate, because it would make little sense to compare those banks with other conglomerates. At first glance, the figure suggests that the first tax rate increase, marked by the first vertical line, in fact led to a higher growth in leverage for individual banks relative to financial conglomerates. However, the effect seems to have reversed after the second tax increase.

Figure 6 - Mean Leverage, Financial Conglomerates and its Banks



Source: BACEN data

Note: The vertical lines represent the increases in the corporate income tax rate of financial institutions.

I use the second identification strategy to test H_3, against the null hypothesis that the leverage decisions of individual banks and financial conglomerates are equally (un)affected by the corporate income tax rate changes. If the null hypothesis is true, there is no reason to expect that β_1 will be significantly different from zero. The null hypotheses in both identification strategies are similar in the sense that both imply that taxes do not affect the capital structure

decisions of banks. However, the null hypothesis in this second identification strategy is stronger because the evidence would support it even if banks' capital structure is affected by taxation but there are no profit shifting opportunities, resulting in a similar leverage increase at the individual bank and financial conglomerate levels.

However, if the evidence supports H_3, it would favor the predictions of the trade-off theory. I also test H_4, which implies a stronger deviation from the null hypothesis than H_3. H_4 states that the positive relationship between leverage and the corporate income tax rate is weaker for individual banks with greater profit shifting opportunities compared with financial conglomerates and it would only be supported by the empirical evidence if additional profit shifting opportunities reduce the tax leverage effect and if financial conglomerates present enhanced profit shifting opportunities compared to individual banks.

To test H_4, I use Equation III in the same way described in section 3.5.1. A negative value for β_4 in Equation III would be expected if profit shifting opportunities affect leverage decisions.

4 EMPIRICAL RESEARCH AND RESULTS

This chapter aims to present and discuss the results from the empirical research in order to further the literature on capital structure, taxation and banking.

4.1 Descriptive Statistics

Tables 13 and 14 in Appendix 1 contain descriptive statistics for the main variables of this study. The descriptive statistics for the Leverage variable show a mean (median) leverage of 69.50% (81.82%). The mean leverage remained relatively stable over the twelve-year sample period and peaked in 2009 at 70.61%. Financial conglomerates presented an even higher Leverage level with a mean of 82.15% and a median of 87.03%. The standard deviation of leverage was substantially lower for financial conglomerates than for individual banks. Previous studies report comparable leverage figures for the bank industry. For example, Gu, Mooij and Poghosyan (2014) collect data from the 100 largest multinational commercial banks worldwide; using the Bankscope database, for the period from 1997 to 2011, and find a mean leverage of 86.57%.

Other interesting figures relate to the regulatory capital under Basel II and Basel III. The regulatory capital is not an individual bank level variable; in fact, it was computed for the financial conglomerates until 2014 and for the prudential conglomerates beginning in 2015. The median level of regulatory capital for financial conglomerates was 0.1759, and it was surprisingly stable for a period in which minimum capital requirements increased from 0.11 to 0.13. It is important to highlight that the median Basel index was consistently above the regulatory requirements. The mean Basel index was higher than the median for every year studied, with a global mean of 0.2443.

Collateral values remained relatively stable in the period. Mean Collateral represented 23.80% of banks' assets, while the median value represented 16.99%. The mean value oscillated from 22.47% in 2006 to 25.07%, in 2017. Financial conglomerates presented lower Collateral with, mean and median values of 19.42% and 15.05%, respectively.

It is interesting to observe that mean Profitability corresponds to 0.97% of the total assets of individual banks and to 0.8% of the total assets of financial conglomerates, which seems low at a first glance. However, it must be considered that, in the case of the banking industry, net income deducts interest expenses, such as funding expenses. Thus, an operational income level

of 0.97% per semester together with a 69.45% leverage ratio is more attractive than it would be if banks had no leverage. Financial conglomerates presented a mean and median profitability of 0.8% per semester. The mean profitability of Brazilian banks is close to the 1.75% per annum mean profitability ratio of international banks reported in Gu, Mooij and Poghosyan (2014).

The mean Riskiness in the sample, measured by a proxy based on non-performing loans, varied between 3.65% of total banks' assets in 2006 and 3.54% in 2016. This variable evolution is interesting because it shows that the Brazilian banking industry was more affected by the Brazilian economic downturn of 2015 and 2016, when non-performing loans increased to 4.48% of total assets and the Brazilian GDP dropped by more than 3 p.p. each year, than by the 2008 financial crisis described in section 2.4. Gu, Mooij and Poghosyan (2014) report a mean value of non-performing loans equal to 4.90% of banks' total assets in their international sample.

Foreign Investments remained stable and low during the sample period. In fact, its median value was zero for both banks and financial conglomerates. The mean value was smaller than 1%. This finding confirms the Basel Committee on Banking Supervision (2013) statement that Brazilian banks are focused predominantly on domestic banking activities.

The mean of Domestic Participations during the sample period represented 5.03% of total assets for individual banks and only 1.45% for financial conglomerates, which is a substantial difference. The median vale for banks was 0.26% and for financial conglomerates the median was slightly higher, reaching 0.40%. These numbers, together with the standard deviations, show that the variation of Domestic Participations is more pronounced in individual banks, which may use them as a non-debt tax shields via profit shifting.

Tables 7 and 8 show Pearson correlation matrices for banks and financial conglomerates, respectively. They show that Leverage is highly positively correlated to Size, particularly at the financial conglomerate level, and highly negatively correlated to Collateral and Domestic Participations. These findings are further discussed in section 4.4.

Table 7 - Correlation Matrix - Banks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage (1)	1	-0.22	0.46	-0.18	-0.37	-0.18	0.16	0.11	-0.38
High-Taxed Shareholder Group (2)		1	-0.01	-0.13	0.15	0.08	0.11	-0.03	0.25
Size (3)			1	-0.23	-0.19	-0.01	-0.04	0.31	0.1
Capital Requirement (Fin. Congl.) (4)				1	0.07	0.03	-0.07	-0.04	-0.05
Collateral (5)					1	0.08	-0.25	-0.03	-0.08
Profitability (6)						1	-0.15	-0.01	0.12
Riskiness (7)							1	-0.07	-0.13
Foreign Investments (8)								1	0.09
Domestic Participations (9)									1

Table 8 - Correlation Matrix – Financial Conglomerates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Leverage (1)	1	0.63	-0.41	-0.13	-0.06	0.01	0.07	-0.15
Size (2)		1	-0.29	-0.11	0.05	0.02	0.16	0.01
Capital Requirement (Fin. Congl.) (3)			1	0.16	0.11	-0.18	0.05	0.09
Collateral (4)				1	0.04	-0.20	0.02	-0.11
Profitability (5)					1	-0.21	0.01	0.01
Riskiness (6)						1	-0.03	0.00
Foreign Investments (7)							1	0.03
Domestic Participations (8)								1

The high-taxed shareholder group is not related to size, which is counterintuitive because it could be expected that banks owned by corporations will usually be larger than banks owned by individuals. However, the expected associations are not so straightforward considering that foreign corporations and government-owned banks are also included in the low taxed shareholder group. Size is also highly positively related to foreign investments, as expected. Considering the low value of median Foreign Investments described above, this association suggests foreign investments are highly concentrated among larger institutions.

4.2 Trending Patterns of Banks and Financial Conglomerates

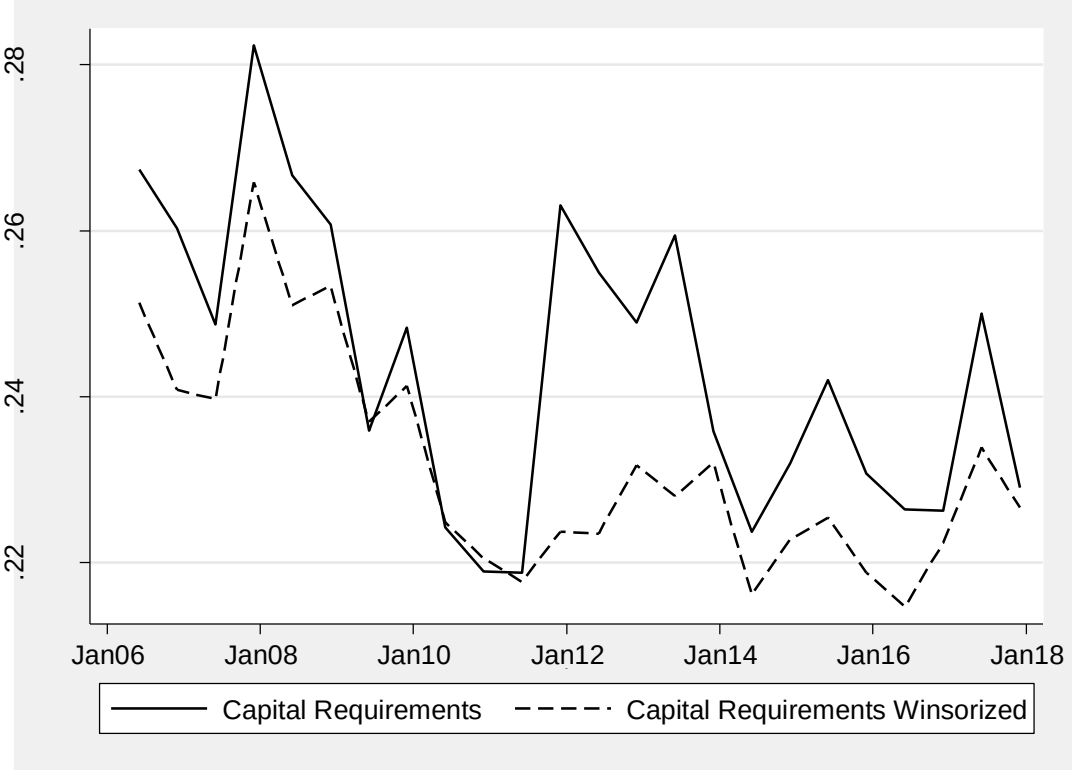
As described in Section 3.2.1, the data gathered encompasses 225 single banks during a twelve-year period, ranging from 2006 to 2017, with 4,258 bank-semester observations. Most of the data consist of commercial banks or universal (multiple) banks, i.e., banks that provide more than one type of banking service including commercial banking activities. In fact, 160 banks, comprising 71.43% of the database, were authorized to perform commercial banking activities in the period. The sample also includes 4 development banks. Thus, 60 banks did not operate either as a commercial or as a development bank during the sample period. Most of these are investment banks but the database also contains 3 currency exchange banks and 8 subsidiaries of foreign banks operating in Brazil.

Although in the period of the analysis, Brazil adopted a more rigorous regulatory framework, in accordance with Basel III, the mean regulatory capital of Brazilian financial conglomerates declined from about 0.27 to 0.24. It must be highlighted that in the regression models it was used the dummy variable Regulatory Constraint derived from each financial conglomerate regulatory capital requirements, as described in section 3.3.7. However, as highlighted in section 2.2.2, the mean is still well above the regulatory minimum. These results, together with the descriptive statistics in Appendix I, suggest that regulatory concerns are not the only determinants of the capital structure of Brazilian banks. This finding is consistent with the hypothesis that many financial conglomerates could increase leverage without violating the Basel III capital requirements.

I picture the evolution of capital requirements in Figure 7. As stated in section 3.3.7, capital requirements under Basel III are defined at the conglomerate level; thus, it is more sensible to evaluate only the evolution of the financial conglomerates. To reduce the influence of outliers I also plot the variable after winsorizing it at the 5th and 95th percentiles. This adjustment does not change the main conclusion that mean capital requirements dropped during the period.

During the sample period, The total assets of Brazilian banks increased substantially from about 1.881 Trillion *Reais* to 4.141 trillion *Reais* (120.20% growth rate. numbers presented in 2006 *Reais*). Total Debt also expanded considerably in the period from 1.656 Trillion *Reais* to 3.727 Trillion *Reais* (125.08% growth rate). Figure 8 shows how both assets and debt started a decline in 2015, possibly because of the Brazilian economic downturn described in section 4.1.

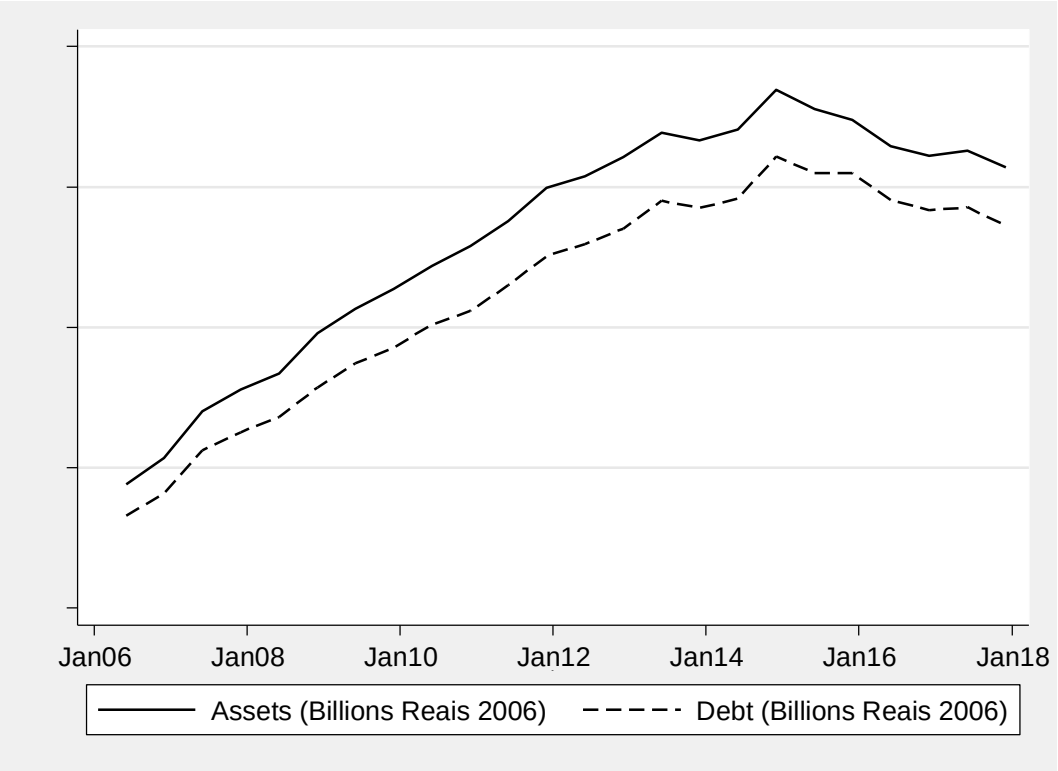
Figure 7 - Banks' Regulatory Capital Requirements



Source: BACEN data, variable winsorized at 5th and 95th percentiles

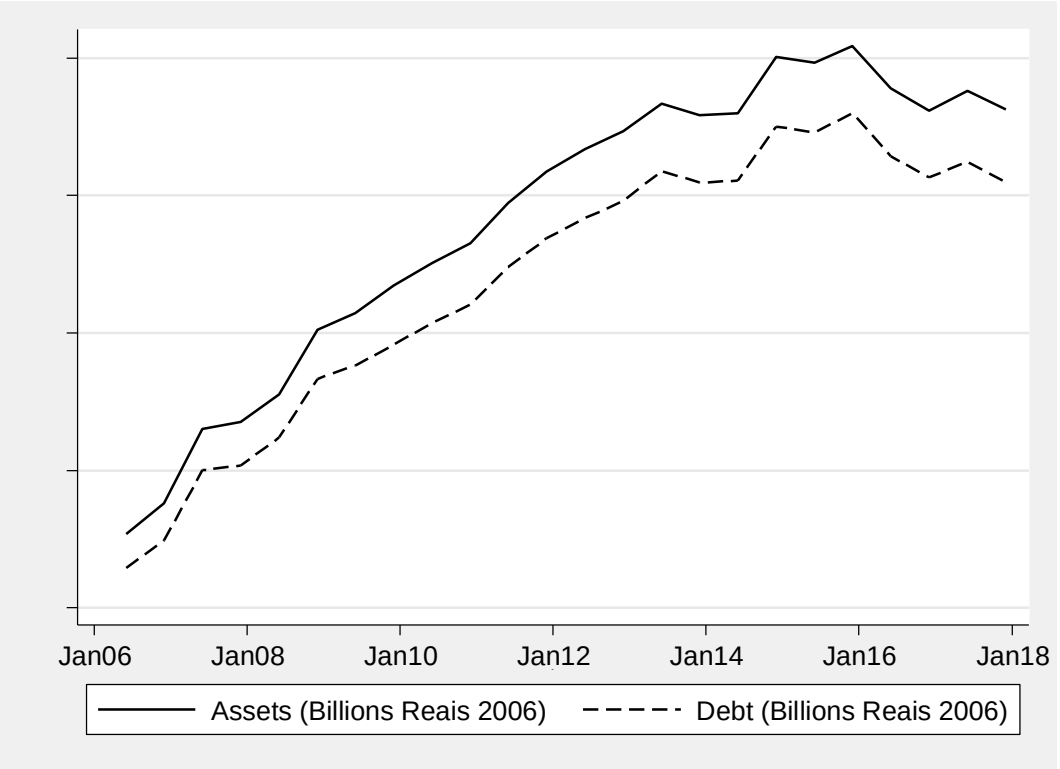
I note, however, that these figures might overestimate total assets and debt because of double counting. The problem occurs, for instance, when an individual bank must consolidate in its financial statements the assets of a controlled bank. Thus, even though the data shows that individual banks encompass approximately 8.134 trillion Brazilian *Reais* in assets (4.141 trillion 2006 Brazilian *Reais*) in December 2017, it overestimates the real size of the Brazilian banking market.

Figure 8 - Banking Institutions' Assets/Debt (Inflation January 2006)



Source: BACEN website, data adjusted by IGP-M/FGV inflation

Figure 9 - Financial Conglomerates' Assets/Debt (Inflation January 2006)



Source: BACEN data, data adjusted by IGP-M/FGV inflation

To solve the double counting issue, it is convenient to use data on financial conglomerates. However, this data could also overestimate the size of the banking industry because it consolidates non-banking institutions included in each conglomerate. On the other hand, a few banks are not included in any financial conglomerate, thus underestimating the industry's total assets; therefore, using data on financial conglomerates is also imprecise. In any event, I document a similar pattern of growth in total assets and debt at the financial conglomerate level. In fact, both total assets and debt of financial conglomerates, adjusted by inflation, grew substantially, respectively 121.72% and 125.08%, during the twelve-year period. Financial conglomerates, in December 2017, had 5.525 trillion Brazilian *Reais* in assets (2.812 trillion Brazilian 2006 *Reais*). These figures are substantially lower than those for individual banks because *Caixa Econômica Federal* and BNDES, which are major Brazilian banking institutions, are not included in any financial conglomerate.

The Brazilian banking sector is highly concentrated, as shown in Figures 10 and 11. In fact, in December 2017, the top 4 financial conglomerates combined had 4.482 trillion Brazilian *Reais* in assets (2.282 trillion 2006 Brazilian *Reais*), representing 81.15% of the total assets of financial conglomerates. Likewise, in December 2017, the 6 major Brazilian banks combined had total assets of 6.291 trillion Brazilian *Reais* (3.202 trillion Brazilian 2006 *Reais*), representing 77.34% of the industry total. The list of major bank list encompasses only the leading banking institutions representing the top 4 financial conglomerates (Banco do Brasil, Itaú, Bradesco and Santander); thus, it does not include the other banks controlled by these financial conglomerates.

Figure 10 - Largest Banks' Assets

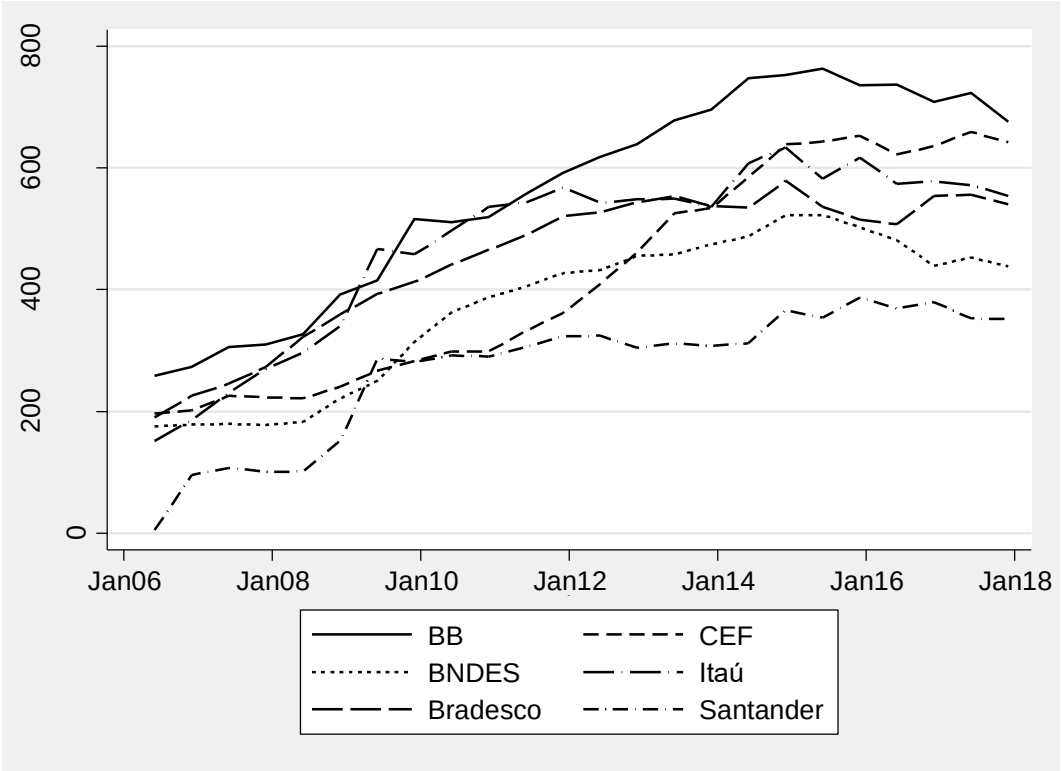
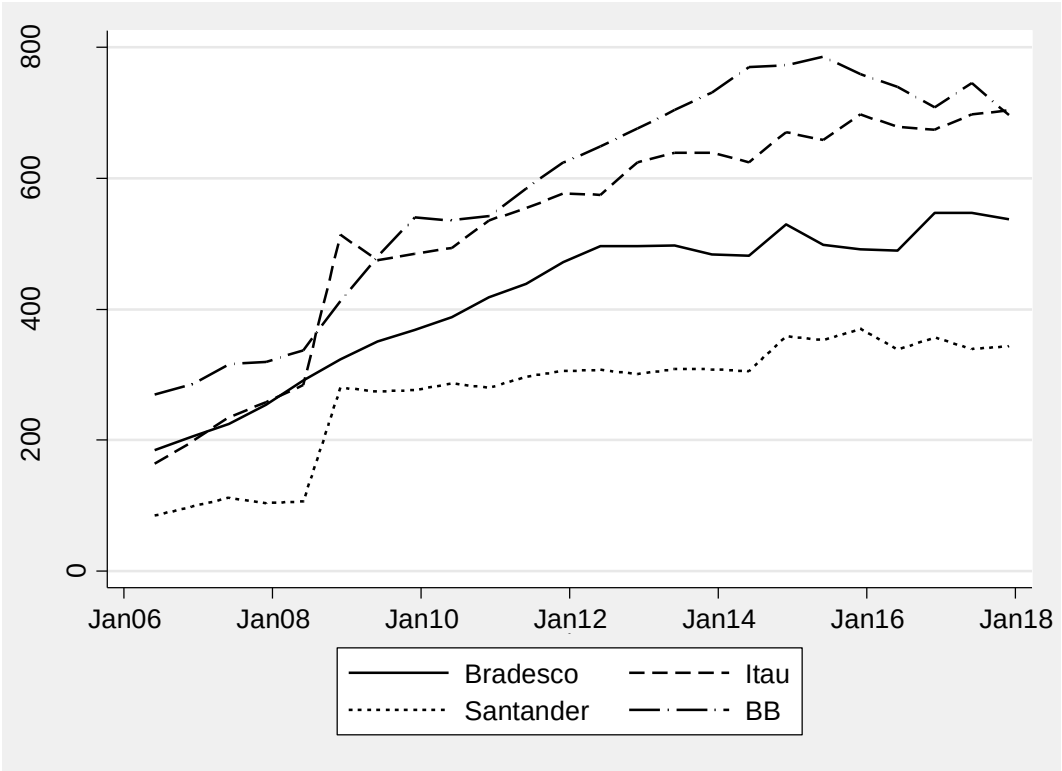


Figure 11 - Largest Financial Conglomerates' Assets



4.3 Regression Analysis

The regression analysis employs two alternative identification strategies within a difference-in-differences design using panel data. As discussed in section 3.5, the first identification strategy compares banks owned by high and low-taxed shareholders; whereas, the second identification strategy compares individual banks with their financial conglomerates. The hypotheses to be tested are presented in the Introduction, section 1.3.

Tables 9 and 10 describe the regression results using the first identification strategy, respectively focusing on the first and second tax increase events. All four model in each table tested H_1 and the fourth one in each table also tested H_3. The variable of interest in order to test H_1 is Treatment Result (HT SH), which measures the effects on leverage of the interaction between the group dummy and the time dummy indicating the period after the tax increase. In the fourth model, to test H_2, I include the variable Dom. Participations * Treat. Results that measures the interaction between the Domestic Participations control variable and the Treatment Result (HT SH).

Table 11 and 12 describe regression results using the second identification strategy, respectively focusing on the first and second tax increase events. The variable of interest in order to test H_3 is Treatment Result (Bank), which measures the effects on leverage of the interaction between the group dummy and the time dummy indicating the period after the taxes increase. In the fourth model, to test H_4 was included the variables $DP_{i,t} \times TR_{i,t}$ (see Equation III), which captures the interaction of the Treatment Result with the Domestic Participations variable.

Table 9 - Regression Results, First Period, First Control Group, OLS

Leverage	(1)	(2)	(3)	(4)
Treatment Result (HT SH, 1st Per)	0.0515**	0.0598***	0.0585***	0.0505**
	(0.0212)	(0.0193)	(0.0194)	(0.0208)
Dom. Participations * Treat. Result				0.3430
				(0.2337)
Dom. Part. * Group Variable				-0.7837***
				(0.2426)
Group Variable (HT SH)	-0.1045***	-0.0969***	-0.0480*	-0.0170
	(0.0333)	(0.0334)	(0.0263)	(0.0271)
Size	0.0548***	0.4231***	0.3397***	0.3640***
	(0.0069)	(0.0971)	(0.0847)	(0.0855)
Size²		-0.0086***	-0.0067***	-0.0072***
		(0.0022)	(0.0019)	(0.0019)
Collateral	-0.3116***	-0.2767***	-0.3561***	-0.3553***
	(0.0712)	(0.0706)	(0.0691)	(0.0691)
Profitability	-1.5036***	-1.6120***	-1.1430***	-1.1063***
	(0.3300)	(0.3220)	(0.2082)	(0.1986)
Regulatory Constraint (Fin. Congl.)		0.0551**	0.0573***	0.0544***
		(0.0240)	(0.0185)	(0.0183)
Riskiness	0.0834	0.0076	-0.2454	-0.2500
	(0.3218)	(0.2889)	(0.1986)	(0.1931)
Domestic Participations			-0.8236***	-0.1778
			(0.0796)	(0.2295)
Foreign Investments			0.8640*	0.7652
			(0.5016)	(0.5628)
Constant	-0.3256**	-4.2415***	-3.3036***	-3.6030***
	(0.1558)	(1.0649)	(0.9421)	(0.9514)
Time Dummies	yes	yes	yes	yes
Number of Observation	1,378	1,378	1,378	1,378
Number of Banks	197	197	197	197
F	17.71***	23.04***	30.26***	35.75***
R^2	0.4050	0.4501	0.5862	0.5995
Adjusted R^2	0.3993	0.4440	0.5810	0.5936
Root MSE	0.2161	0.20791	0.18048	0.17775

Note: The models are estimated via OLS. Standard-errors are presented in parenthesis, with errors clustered at the bank level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (High Taxed Shareholder - HT SH) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations.

Table 10 - Regression Results, Second Period, First Control Group, OLS

Leverage	(1)	(2)	(3)	(4)
Treatment Result (HT SH, 2nd Per)	-0.0359 (0.0217)	-0.0374* (0.0213)	-0.0415** (0.0204)	-0.0467* (0.0239)
Dom. Participations * Treat. Result				-0.0298 (0.2266)
Dom. Part. * Group Variable				-1.0515*** (0.3334)
Group Variable (HT SH)	-0.1146*** (0.0379)	-0.1144*** (0.0381)	-0.0332 (0.0288)	-0.0076 (0.0312)
Size	0.0515*** (0.0073)	0.3090*** (0.0802)	0.3164*** (0.0694)	0.3303*** (0.0674)
Size²		-0.0061*** (0.0018)	-0.0061*** (0.0015)	-0.0064*** (0.0015)
Collateral	-0.1883** (0.0836)	-0.1455* (0.0831)	-0.2227*** (0.0812)	-0.2218*** (0.0806)
Profitability	-0.2200* (0.1194)	-0.2022 (0.1267)	-0.1633** (0.0765)	-0.1569** (0.0707)
Regulatory Constraint (Fin. Congl.)		0.0341 (0.0228)	0.0311* (0.0186)	0.0317* (0.0186)
Riskiness	0.8532*** (0.2839)	0.8211*** (0.2704)	0.4381** (0.1969)	0.3904** (0.1969)
Domestic Participations			-0.9927*** (0.1400)	-0.0309 (0.2886)
Foreign Investments			0.2983 (0.7006)	0.3753 (0.6571)
Constant	-0.3255* (0.1693)	-3.0479*** (0.8882)	-3.1500*** (0.7867)	-3.3115*** (0.7640)
Time Dummies	yes	yes	yes	yes
Number of Observation	1,361	1,361	1,361	1,361
Number of Banks	185	185	185	185
F	11.73***	12.60***	17.63***	15.91***
R^2	0.3427	0.3718	0.5243	0.5350
Adjusted R^2	0.3363	0.3647	0.5183	0.5281
Root MSE	0.23112	0.22611	0.1969	0.1944

Note: The models are estimated via OLS. Standard-errors are presented in parenthesis, with errors clustered at the bank level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (High Taxed Shareholder - HT SH) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations.

The regression specification shown in the first column includes controls for Size, Profitability and Riskiness, which are common in most previous studies of the banking industry (De Mooij & Keen, 2016; Gropp & Heider, 2010; Schepens, 2016). In the model shown in the second column I include the Regulatory Constraint dummy and Size squared, in order to capture the non-linear association of size and leverage.

The model shown in the third column additionally includes Foreign Investments and Domestic Participations, aiming to capture profit shifting opportunities as described in the BEPS literature. To the best of my knowledge, these variables, together with Capital Requirement, have not been used in the extant empirical capital structure literature.

Finally, in the fourth column I include another variable of interest in order to also test H_2, the triple interaction of my proxy for profit shifting opportunities, the period dummy ($Post_t$) and the group dummy ($G_{i,t}$).

I defer a more thorough analysis of results to section 4.4. However, I highlight here that, considering the period around the first income tax raise, the coefficient estimates for Treatment Result ($TR_{i,t}$) are positive and statistically significant at least at the 5% level in all regressions, in accordance with the predictions of the trade-off theory; thus, the evidence is compatible with H_1. However, the evidence does not support H_2, as shown in Table 9, column 4, since the coefficient estimate for the interaction Dom. Participations * Treat. Result is not significant at the conventional levels. The estimates for most of the control variables are statistically significant at the conventional levels and their signs are in accordance with those reported in previous studies.

In contrast, when I consider the period around the second income tax raise, the estimates for Treatment Result were mostly statistically significant only at the 10% level and not in accordance with trade-off theory predictions. Therefore, I find no evidence that the second tax rate change affected leverage. Similarly, I find no support for H_2, since the estimate for the interaction Dom. Participations * Treat. Result, shown in Table 10, column 4, is close to zero and statistically insignificant at the conventional levels.

Table 11 - Regression Results, First Period, Second Control Group, OLS

Leverage	(1)	(2)	(3)	(4)
Treatment Result (Bank, 1st Per)	0.0304*	0.0326**	0.0403**	0.0378**
	(0.0163)	(0.0154)	(0.0156)	(0.0174)
Dom. Participations * Treat. Result				0.1407
				(0.3313)
Dom. Part. * Group Variable				-0.0176
				(0.2024)
Group Variable (Bank)	-0.0938***	-0.0943***	-0.0408**	-0.0405**
	(0.0224)	(0.0215)	(0.0179)	(0.0181)
Size	0.0485***	0.4310***	0.2745***	0.2744***
	(0.0059)	(0.0798)	(0.0662)	(0.0673)
$Size^2$		-0.0087***	-0.0053***	-0.0053***
		(0.0018)	(0.0015)	(0.0015)
Collateral	-0.3044***	-0.2677***	-0.3663***	-0.3666***
	(0.0692)	(0.0700)	(0.0676)	(0.0678)
Profitability	-1.5784***	-1.6817***	-1.1387***	-1.1381***
	(0.3334)	(0.3257)	(0.1884)	(0.1895)
Regulatory Constraint (Fin. Congl.)		0.0296	0.0248*	0.0247*
		(0.0199)	(0.0143)	(0.0143)
Riskiness	-0.4642*	-0.3889*	-0.5766***	-0.5772***
	(0.2630)	(0.2323)	(0.1537)	(0.1555)
Domestic Participations			-0.8792***	-0.8633***
			(0.0693)	(0.1919)
Foreign Investments			1.0218**	1.0230**
			(0.4321)	(0.4329)
Constant	-0.1177	-4.2860***	-2.5013***	-2.5001***
	(0.1358)	(0.8971)	(0.7459)	(0.7580)
Time Dummies	yes	yes	yes	yes
Number of Observation	1,383	1,383	1,383	1,383
Number of Banks	130	130	130	130
Number of Financial Conglomerates	74	74	74	74
F	16.31***	22.40***	34.19***	32.01***
R^2	0.4170	0.4622	0.6425	0.6425
Adjusted R^2	0.4114	0.4563	0.6380	0.6373
Root MSE	0.1939	0.18636	0.15205	0.15221

Note: The models are estimated via OLS. Standard-errors are presented in parenthesis, with errors clustered at the bank or at the financial conglomerate level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (Bank) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations.

Table 12 - Regression Results, Second Period, Second Control Group, OLS

Leverage	(1)	(2)	(3)	(4)
Treatment Result (Bank, 2nd Per)	-0.0222 (0.0182)	-0.0195 (0.0176)	-0.0265 (0.0175)	-0.0225 (0.0195)
Dom. Participations * Treat. Result				-0.2895 (0.3105)
Dom. Part. * Group Variable				0.0947 (0.3337)
Group Variable (Bank)	-0.0928*** (0.0303)	-0.0959*** (0.0294)	-0.0320 (0.0262)	-0.0332 (0.0285)
Size	0.0433*** (0.0069)	0.2478*** (0.0844)	0.2893*** (0.0779)	0.2897*** (0.0784)
Size²		-0.0047** (0.0018)	-0.0055*** (0.0017)	-0.0055*** (0.0017)
Collateral	-0.2511*** (0.0825)	-0.2036** (0.0856)	-0.2797*** (0.0819)	-0.2795*** (0.0823)
Profitability	-0.2408** (0.1170)	-0.2138* (0.1184)	-0.1395*** (0.0486)	-0.1389*** (0.0484)
Regulatory Constraint (Fin. Congl.)		0.0189 (0.0204)	0.0225 (0.0154)	0.0226 (0.0155)
Riskiness	0.4821** (0.2203)	0.4241* (0.2206)	0.0950 (0.1607)	0.0944 (0.1606)
Domestic Participations			-1.0579*** (0.1415)	-1.1550*** (0.2899)
Foreign Investments			0.6785 (0.7564)	0.6773 (0.7564)
Constant	-0.1121 (0.1633)	-2.3361** (0.9673)	-2.8001*** (0.9050)	-2.8030*** (0.9118)
Time Dummies	yes	yes	yes	yes
Number of Observation	1,305	1,305	1,305	1,305
Number of Banks	115	115	115	115
Number of Financial Conglomerates	70	70	70	70
F	9.47***	10.44***	13.64***	13.56***
R^2	0.3361	0.3539	0.5633	0.5634
Adjusted R^2	0.3294	0.3464	0.5576	0.5566
Root MSE	0.21967	0.21687	0.17843	0.17862

Note: The models are estimated via OLS. Standard-errors are presented in parenthesis, with errors clustered at the bank or at the financial conglomerate level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (Bank) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations.

Tables 11 and 12 show the regression results using the second identification strategy, respectively for the first and second tax increase events. All four models in each table tested H_3 against the null hypothesis that the leverage of banks and financial conglomerates are equally affected (or unaffected) by an increase in the corporate tax income, as described in section 3.5.2. The fourth model in each table also tested H_4. The specifications are similar to the ones shown in tables 9 and 10. Considering the period around the first income tax change, all of the estimates for Treatment Result are positive and statistically significant and most of them at the 5% level. The estimate for Dom. Participations * Treat. Result in Table 11, column 4, is statistically insignificant at the conventional levels, therefore failing to support H_4.

When I consider the period around the second income tax raise the estimates for Treatment Result are negative and statistically indistinguishable from zero at the conventional levels in all models. In regression models 1 and 3 the estimates are negative and statistically significant at the 10% and 5% levels, respectively. Again, I find no evidence that the second tax rate change positively affected leverage. Similarly, the results shown in Table 12, column 4 are not supportive of H_4, since the coefficient estimates of interaction Dom. Participations * Treat. Result is negative, as expected, but statistically insignificant at the conventional levels.

4.4 Discussion of Results

4.4.1 Expected Results x Regression Results

Employing two alternative identification strategies, my findings lend support to the predictions of the trade-off theory when I consider the first tax income change event occurred during the sample period. In contrast, I find no support for the trade-off hypothesis when analyzing the second tax income change. Thus, the evidence is mixed; however, it is interesting to note that results are highly consistent across the alternative identification strategies. I believe that such consistency would be unlikely if the identification strategies did not capture the effects of the tax rate increase on leverage by comparing groups that were unevenly affected by the changes. The leverage increase associated with the corporate income tax change in the first period is economically significant. The evidence from the first identification strategy suggests that banks with higher taxed shareholders, thus less beneficiated by the ACE rule, responded to it by increasing their leverage by approximately 5 p.p. relative to banks with lower taxed

shareholders. Similarly, evidence from the second identification strategy suggests that banks increased their leverage by approximately 3 p.p. relative to their financial conglomerates.

Most previous studies use some proxy for size, such as the logarithm of total assets, to explain leverage decisions (De Mooij & Keen, 2016; Gropp & Heider, 2010; Heckemeyer & de Mooij, 2017; Lin et al., 2014). Based on this literature, it is expected a positive association between size and leverage and this expectation was confirmed in all of the regressions models. In all specifications including Size squared I find evidence of a non-linear relationship between size and leverage, with significantly negative coefficient estimates for Size squared, also consistently with previous research (De Mooij & Keen, 2016; Hemmelgarn & Teichmann, 2014).

It is usually expected in the capital structure literature that a high collateral will be positively associated with leverage. However, my findings do not support this prediction, possibly because measures of collateral value are not as well defined for the banking industry as they are for other industries. Results are robust to alternative specifications of this variable, for instance excluding liquid assets, such as cash and equivalents. Inferences are also robust to excluding the proxy for Collateral altogether. De Mooij and Keen (2016) argue that for the banking sector the share of tangible assets is usually less important than for other sectors. Hemmelgarn and Teichmann (2014) and Gu et al. (2014) also found negative coefficient estimates for their proxy for collateral. One possible explanation in the literature is that collateral can reduce the costs associated with the issuance of both debt and equity by lowering asymmetric information (Gu et al., 2014). Jucá (2011) found a statistically insignificant coefficient estimate for Collateral in a study about the relation between bank leverage and executive compensation programs using a sample of 15 Brazilian banks and 24 U.S. banks, encompassing the years from 2007 to 2010.

Most of the extant literature documents a negative association between profitability and leverage, as in Heckemeyer and de Mooij (2017). My findings corroborate this prediction, particularly for the first period of analysis. However, it must be highlighted that profitability measured as net operational income is not as suited for the banking industry considering that funding costs include interest expenses, as explained in section 3.3.6. Nevertheless, results are similar when I use the alternative proxies for profitability described in section 3.3.6.

It is expected in the literature (Gropp & Heider, 2010) that, at least when close to regulatory limits, capital requirements may be of first-order importance. It is also expected that this dummy variable will be positively correlated to leverage, considering that banks demanded to increase capital ratios are, usually, the ones with more leverage. My findings corroborate the prediction that Regulatory Constraint is positively related to Leverage.

Riskiness was expected to be negatively correlated with leverage because higher bankruptcy costs should lead to lower leverage. However, analyzing tables 9 to 12, the evidence is mixed, which could be related to the interaction with the capital requirements dummy that, arguably, is also related to bankruptcy costs. In fact, Table 8 shows a positive relation between these control variables.

Domestic Participations, as was expected in this dissertation, presented in all regressions a negative relation to leverage. One possible explanation is that domestic participations may be related to opportunities for non-debt profit shifting strategies, because in Brazil banks are taxed higher than other corporations. However, alternative explanations must not be discarded, which could be an opportunity for further research. The lack of evidence in support to H_3 and H_4 justifies the search for alternative explanations.

Foreign Investments could also proxy for profit shifting opportunities, suggesting that it should correlate negatively with leverage. However, in most regressions the coefficient estimate is not significant at the conventional levels while; in other, regressions the coefficient estimates are significantly positive. A positive association would be expected if greater Foreign Investments indicate greater debt profit shifting opportunities, in opposition to non-debt profit shifting strategies. My results should be viewed with caution due to the low median value, actually near zero, of the foreign investment variable, as shown in tables 13 and 14. Another point to be highlighted is that Table 8 shows a strong correlation between Foreign Investments and Size. Thus, Foreign Investments could also be proxying for size, additionally capturing its positive association with leverage.

4.4.2 Insights and Further Research

One explanation that seems to be consistent with the findings and the literature review is that taxes are relevant to the capital structure of banks only when regulatory capital requirements are not a first-order concern. As described in section 2.2, and detailed in Table 1, Basel III capital requirements were strengthened in the second part of the sample period, encompassing the years from 2014 to 2017, which could explain the stark contrast in the main inferences when comparing the effects of the two income tax changes. In fact, although Brazilian banks were less affected than banks in other jurisdictions because domestic capital requirements were higher than the ones recommended in Basel II, starting in 2014 the changes effectively affected Brazilian banks, especially SIFIs, which included the largest Brazilian banking conglomerates. Thus, it seems reasonable to argue that in the second period, regulatory concerns were

predominant and tax effects were of second-order importance. Another possible explanation for the second period results is that banks did not adjust their capital structure to the second tax rate increase because it was a provisional rate increase. In fact, as detailed in section 3.5, it would only take effect until 2018.

The results were remarkably consistent for both identification strategies, which strengthens the analysis. The first identification strategy takes advantage of a particularity of the Brazilian tax law, which is a limitation in the sense that it hinders replication efforts to other jurisdictions. However, the second identification strategy has the advantage of being replicable in other jurisdictions that underwent significant tax rate changes. In fact, the 2018 American corporate tax cut (Tax Cuts and Jobs Act, 2017) provides an interesting opportunity to replicate the methodology proposed in this dissertation using United States data. A banking industry with greater levels of foreign investment, such as the US, could allow a more conclusive analysis of the importance of profit shifting strategies.

Another contribution of this study is detailed in the descriptive analysis that contains evidence of how the recession of 2015 and 2016 seemed to affect Brazilian banks more strongly than the 2008 financial crisis. This observation is consistent with the low level of foreign investments in the industry and may also have affected the second period results.

This study is subject to endogeneity concerns, similarly to most previous capital structure research. My single country study helps to eliminate omitted variable concerns due to banks operating in different jurisdictions, and the difference-in-differences approach is able to isolate omitted variables that affect similarly the treatment and control groups. However, the first period of analysis included a global financial crisis, and the second period included a major overhaul in capital requirements regulation and a major domestic economic downturn. Even though it is difficult to point a reason to explain why those events would affect the analyzed groups in a different way, it is possible that some desirable control variables were missing.

Regarding errors in measurement, as previously explained, there are valid concerns regarding the use of the Collateral and Profitability controls for the banking industry. The peculiarities of this industry make it hard to develop uncontroversial measures of constructs relevant for this research. Another source of measurement error that may be mitigated in future research is the unavailability of prudential conglomerate data during most of the sample period, since this data is richer than the data related to financial conglomerates because it consolidates more affiliated firms. Another limitation is the quality of the proxy for profit shifting opportunities. In fact, domestic participation may help intra group profit shifting; however, it cannot capture the difference between domestic participations that are and are not used for tax planning reasons.

Further research using a better proxy would also be helpful, particularly for the BEPS project literature.

5 CONCLUSION

This dissertation contributes to the understanding of how taxes affect the capital structure of banks, as proposed by trade-off theory, and how corporations factor in investor level taxation when developing their corporate policies, as argued by Miller (1977). One innovation of this research is to study profit shifting strategies in banks, which might reduce the effect of taxes on capital structure at the banking conglomerate level. Another innovation is the methodological approach developed for the second identification strategy, which can be easily replicated in other jurisdictions, as explained in section 3.5.2.

This dissertation also aims to contribute to the related literature by using a methodological approach with fewer endogeneity concerns than the ones employed in previous studies. This contribution derives from the fact that I exploit a natural experiment including only Brazilian banks; therefore, there are no concerns about country-level omitted variables. Although previous studies tried to minimize endogeneity by using country-level controls (De Mooij & Keen, 2016; Hemmelgarn & Teichmann, 2014; Schepens, 2016), it is nearly impossible to include all potentially relevant variables. In addition, I use BACEN data, which is more reliable than many datasets used in previous research because it is subject to regulation and follows strict disclosure rules. Another advantage of this database is that it includes all Brazilian banks and financial conglomerates; therefore, the analyses are not limited to traded banks. One downside of using BACEN data is that it does not follow IFRS standards, which makes it harder to compare my results with those of other papers.

However, it is important to note that the methodological improvements are possible because I limit the analysis to Brazilian data. Hence, the same advantage that increases the internal validity of this study, limits its external validity, making it harder to extrapolate the findings to other countries or contexts. This external validity limitation is inherent to the identification strategies adopted and to the goal of improving internal validity by reducing endogeneity concerns. Thus, for future research, there is an opportunity to apply a similar methodological approach to different countries in order to evaluate if the results are compatible across jurisdictions. Figure 2 in the introduction could be used to identify possibly interesting countries for future research, i.e., those that experienced a substantial change in corporate income tax rates, like the United States after 2018 (Tax Cuts and Jobs Act, 2017) and the United Kingdom, where there was also a substantial drop in the corporate income tax rate.

Another contribution is to support policy makers with insights about the possible effects of changing the Brazilian ACE rules. This subject is present in the Brazilian political debate and,

usually, the ACE (JSCP) rule is unfairly viewed as a tax subsidy for the wealthy, instead of an economic neutrality rule and a possibly useful tool to achieve other regulatory goals. In this dissertation I find supportive evidence that the ACE rule, at least in the period around the first tax increase, stimulated a lower leverage increase for banks. Thus, a tax incentive such as an ACE rule may benefit society by lowering bank leverage and thus increasing banks' capital buffers. Perhaps there is an opportunity to use taxation to mitigate the risk of future financial crises in cooperation with direct banking regulation.

My findings also suggest that in the period around the second tax rate increase the context faced by banks had changed and became much less favorable to any tax effect on leverage. This change in context could be related to the implementation of Basel III and the strengthening of capital requirements, which affected SIFIs more heavily. During this period, capital requirement concerns possibly became more relevant for capital structure decisions, leaving little room for tax effects.

The findings of this dissertation might also allow economists to have a more substantiated debate about Action 4 of the OECD and G20 BEPS project. I provide some evidence of domestic profit shifting strategies, but not related to debt, since domestic participations were negatively related to leverage. On the other hand, the low degree of internationalization of Brazilian banks leaves little room for relevant levels of international profit shifting strategies, which could not be detected in the empirical analysis. In fact, although there is a positive correlation between foreign investment and leverage, which is consistent with international debt profit shifting, this evidence should be interpreted with caution, as explained in section 4.4.1.

Harmful tax competition and tax harmonization are relevant themes in the political debate and it is important to understand which strategies financial institutions actually use to minimize their fiscal obligations. Perhaps, debt profit shifting is not as relevant, and Action 4 is of little importance in comparison to other initiatives in the Brazilian context. For instance, bank activities could be shifted in response to tax increases and debt profit shifting might not be a relevant concern. I do not find evidence consistent with debt profit shifting from higher taxed firms (i.e., banks), to other firms within financial conglomerates, as measured by domestic participation.

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APPENDIX I – CORPORATE INCOME TAX RATES

Country/Region	2003	2004	2005	2006
Argentina	35.00%	35.00%	35.00%	35.00%
Australia	30.00%	30.00%	30.00%	30.00%
Brazil	34.00%	34.00%	34.00%	34.00%
Brazil (FI)	34.00%	34.00%	34.00%	34.00%
Canada	36.60%	36.10%	36.10%	36.10%
China	33.00%	33.00%	33.00%	33.00%
Egypt	42.00%	42.00%	20.00%	20.00%
France	34.33%	34.33%	33.83%	33.33%
Germany	39.58%	38.29%	38.31%	38.34%
India	36.75%	35.88%	36.59%	33.66%
Indonesia	30.00%	30.00%	30.00%	30.00%
Italy	38.25%	37.25%	37.25%	37.25%
Japan	42.00%	42.00%	40.69%	40.69%
Korea, Republic of	29.70%	29.70%	27.50%	27.50%
Mexico	34.00%	33.00%	30.00%	29.00%
Russia	24.00%	24.00%	24.00%	24.00%
Saudi Arabia	30.00%	30.00%	30.00%	20.00%
South Africa	37.78%	37.78%	37.78%	36.89%
Turkey	30.00%	33.00%	30.00%	20.00%
United Kingdom	30.00%	30.00%	30.00%	30.00%
United States	34.00%	34.00%	40.00%	40.00%
Global average	29.42%	28.95%	28.00%	27.55%
Latin America average	30.81%	30.02%	29.68%	29.07%
North America average	35.30%	35.05%	38.05%	38.05%
Oceania average	30.20%	30.60%	30.60%	30.60%
OECD average	30.08%	29.28%	28.37%	27.67%
South America average	30.81%	30.02%	29.68%	29.07%

Country/Region	2007	2008	2009	2010
Argentina	35.00%	35.00%	35.00%	35.00%
Australia	30.00%	30.00%	30.00%	30.00%
Brazil	34.00%	34.00%	34.00%	34.00%
Brazil (FI)	34.00%	40.00%	40.00%	40.00%
Canada	36.10%	33.50%	33.00%	31.00%
China	33.00%	25.00%	25.00%	25.00%
Egypt	20.00%	20.00%	20.00%	20.00%
France	33.33%	33.33%	33.33%	33.33%
Germany	38.36%	29.51%	29.44%	29.41%
India	33.99%	33.99%	33.99%	33.99%
Indonesia	30.00%	30.00%	28.00%	25.00%
Italy	37.25%	31.40%	31.40%	31.40%
Japan	40.69%	40.69%	40.69%	40.69%
Korea, Republic of	27.50%	27.50%	24.20%	24.20%
Mexico	28.00%	28.00%	28.00%	30.00%
Russia	24.00%	24.00%	20.00%	20.00%
Saudi Arabia	20.00%	20.00%	20.00%	20.00%
South Africa	36.89%	34.55%	34.55%	34.55%
Turkey	20.00%	20.00%	20.00%	20.00%
United Kingdom	30.00%	30.00%	28.00%	28.00%
United States	40.00%	40.00%	40.00%	40.00%
Global average	26.96%	25.66%	25.32%	24.65%
Latin America average	28.30%	27.96%	27.96%	27.52%
North America average	38.05%	36.75%	36.50%	35.50%
Oceania average	30.20%	29.60%	29.20%	29.00%
OECD average	27.00%	25.99%	25.64%	25.70%
South America average	28.30%	27.96%	27.96%	27.52%

Country/Region	2011	2012	2013	2014
Argentina	35.00%	35.00%	35.00%	35.00%
Australia	30.00%	30.00%	30.00%	30.00%
Brazil	34.00%	34.00%	34.00%	34.00%
Brazil (FI)	40.00%	40.00%	40.00%	40.00%
Canada	28.00%	26.00%	26.00%	26.50%
China	25.00%	25.00%	25.00%	25.00%
Egypt	20.00%	25.00%	25.00%	25.00%
France	33.33%	33.33%	33.33%	33.33%
Germany	29.37%	29.48%	29.55%	29.58%
India	32.44%	32.45%	33.99%	33.99%
Indonesia	25.00%	25.00%	25.00%	25.00%
Italy	31.40%	31.40%	31.40%	31.40%
Japan	40.69%	38.01%	38.01%	35.64%
Korea, Republic of	22.00%	24.20%	24.20%	24.20%
Mexico	30.00%	30.00%	30.00%	30.00%
Russia	20.00%	20.00%	20.00%	20.00%
Saudi Arabia	20.00%	20.00%	20.00%	20.00%
South Africa	34.55%	34.55%	28.00%	28.00%
Turkey	20.00%	20.00%	20.00%	20.00%
United Kingdom	26.00%	24.00%	23.00%	21.00%
United States	40.00%	40.00%	40.00%	40.00%
Global average	24.52%	24.38%	24.15%	23.85%
Latin America average	28.88%	28.30%	27.96%	27.31%
North America average	34.00%	33.00%	33.00%	33.25%
Oceania average	28.60%	28.60%	27.00%	27.00%
OECD average	25.42%	25.18%	25.32%	24.98%
South America average	28.88%	28.30%	27.96%	27.31%

Country/Region	2015	2016	2017	2018
Argentina	35.00%	35.00%	35.00%	30.00%
Australia	30.00%	30.00%	30.00%	30.00%
Brazil	34.00%	34.00%	34.00%	34.00%
Brazil (FI)	45.00%	45.00%	45.00%	45.00%
Canada	26.50%	26.50%	26.50%	26.50%
China	25.00%	25.00%	25.00%	25.00%
Egypt	22.50%	22.50%	22.50%	23.00%
France	33.33%	33.30%	33.33%	33.00%
Germany	29.72%	29.72%	29.79%	30.00%
India	34.61%	34.61%	34.61%	35.00%
Indonesia	25.00%	25.00%	25.00%	25.00%
Italy	31.40%	31.40%	24.00%	24.00%
Japan	33.86%	30.86%	30.86%	30.86%
Korea, Republic of	24.20%	24.20%	22.00%	25.00%
Mexico	30.00%	30.00%	30.00%	30.00%
Russia	20.00%	20.00%	20.00%	20.00%
Saudi Arabia	20.00%	20.00%	20.00%	20.00%
South Africa	28.00%	28.00%	28.00%	28.00%
Turkey	20.00%	20.00%	20.00%	22.00%
United Kingdom	20.00%	20.00%	19.00%	19.00%
United States	40.00%	40.00%	40.00%	27.00%
Global average	23.74%	23.58%	24.04%	24.03%
Latin America average	27.16%	27.38%	27.98%	28.11%
North America average	33.25%	33.25%	33.25%	26.75%
Oceania average	27.00%	27.00%	28.43%	28.43%
OECD average	24.77%	24.69%	23.95%	23.50%
South America average	27.16%	27.38%	27.98%	28.11%

Source: PWC & World Bank website

APPENDIX II – VARIABLES AND DESCRIPTIVE STATISTICS

Variable	COSIF Accounts
Leverage	(4.0.0.00.00-8) / (1.0.0.00.00-7 + 2.0.0.00.00-4)
Size	Ln ((1.0.0.00.00-7 + 2.0.0.00.00-4)/(Cumulative Inflation 2006))
Collateral	(1.1.0.00.00-6 + 1.2.0.00.00-5 + 2.1.4.00.00-5 + 2.1.5.00.00-8 + 2.2.0.00.00-2) / (1.0.0.00.00-7 + 2.0.0.00.00-4)
Riskiness	(3.1.5.00.00-5 + 3.1.6.00.00-8 + 3.1.7.00.00-1 + 3.1.8.00.00-4 + 3.1.9.00.00-7) / (1.0.0.00.00-7 + 2.0.0.00.00-4)
Foreign Investments	(2.1.1.00.00-6) / (1.0.0.00.00-7 + 2.0.0.00.00-4)
Domestic Participations	(2.1.2.00.00-9) / (1.0.0.00.00-7 + 2.0.0.00.00-4)
Profitability	(7.1.1.00.00-1 + 7.1.9.10.00-2 + 7.1.9.15.00-7 + 7.1.9.20.00-9 + 7.1.9.25.00-4 + 7.1.9.50.00-0 + 7.1.9.80.00-1 + 8.1.9.45.00-5 + 8.1.9.50.00-7 + 8.1.9.15.00-4 + 7.1.2.00.00-4 + 8.1.9.40.00-0 + 7.1.4.00.00-0 + 7.1.5.00.00-3 - 7.1.5.80.00-9 + 7.1.9.40.00-3 + 7.1.9.45.00-8 + 7.1.9.47.00-6 + 7.1.9.90.05-3 + 7.1.9.90.10-1 + 7.1.9.90.15-6 + 7.1.9.90.20-4 + 8.1.5.00.00-0 – 8.1.5.50.00-5 + 8.1.8.30.05-5 + 8.1.8.30.10-3 + 8.1.8.30.15-8 + 8.1.8.30.20-6 + 7.1.5.80.00-9 + 8.1.5.50.00-5 + 7.1.9.90.26-6 + 8.1.8.30.26-8 + 7.1.3.00.00-7 + 8.1.4.00.00-7 + 7.1.9.55.00-5 + 7.1.9.60.00-7 + 7.1.9.65.00-2 + 7.1.9.90.12-5 + 8.1.8.30.12-7 + 8.1.1.00.00-8 + 8.1.9.80.00-8 + 8.1.9.86.00-2 + 8.1.9.12.00-7 + 8.1.1.00.00-8 + 8.1.9.80.00-8 + 8.1.9.86.00-2 + 8.1.9.12.00-7 + 8.1.3.00.00-4 + 8.1.8.30.55-0 + 7.1.3.00.00-7 + 8.1.4.00.00-7 + 7.1.9.90.30-7 + 7.1.9.90.35-2 + 7.1.9.90.40-0 + 7.1.9.90.50-3 + 7.1.9.90.60-6 + 8.1.8.30.30-9 + 8.1.8.30.35-4 + 8.1.8.30.40-2 + 8.1.8.30.50-5 + 8.1.8.30.60-8 + 7.1.7.00.00-9 – 7.1.7.94.00-8 – 7.1.7.95.00-7 – 7.1.7.96.00-6 – 7.1.7.97.00-5 – 7.1.7.98.00-4 + 7.1.9.70.00-4 + 7.1.7.94.00-8 + 7.1.7.95.00-7 + 7.1.7.96.00-6 + 7.1.7.97.00-5 + 7.1.7.98.00-4 + 8.1.7.18.00-5 + 8.1.7.27.00-3 + 8.1.7.30.00-7 + 8.1.7.33.00-4 + 8.1.7.36.00-1 + 8.1.7.37.00-0 + 8.1.9.90.20-1 + 7.1.9.30.00-6 + 8.1.7.00.0-6 – 8.1.7.18.00-5 – 8.1.7.27.00-3 – 8.1.7.30.00-7 – 8.1.7.33.00-4 – 8.1.7.36.00-1 – 8.1.7.37.00-0 + 8.1.8.10.00-6 + 8.1.8.20.00-3 + 8.1.9.10.00-9 + 7.1.9.30.00-6 + 8.1.7.00.00-6 – 8.1.7.18.00-5 – 8.1.7.27.00-3 – 8.1.7.30.00-7 –

8.1.7.33.00-4 – 8.1.7.36.00-1 – 8.1.7.37.00-0 + 8.1.8.10.00-6 + 8.1.8.20.00-3 + 8.1.9.10.00-9 + 7.1.8.00.00-2 + 7.1.9.90.80-2 + 7.1.9.90.90-5 + 7.1.9.90.70-9 + 8.1.6.00.00-3 + 8.1.8.30.80-4 + 8.1.8.30.90-7 + 8.1.8.30.70-1 + 7.1.9.00.00-5 – 7.1.9.10.00-2 – 7.1.9.15.00-7 – 7.1.9.20.00-9 – 7.1.9.25.00-4 – 7.1.9.30.00-6 – 7.1.9.40.00-3 – 7.1.9.45.00-8 – 7.1.9.47.00-6 – 7.1.9.50.00-0 – 7.1.9.55.00-5 – 7.1.9.60.00-7 – 7.1.9.65.00-2 – 7.1.9.70.00-4 – 7.1.9.80.00-1 – 7.1.9.90.05-3 – 7.1.9.90.10-1 – 7.1.9.90.12-5 – 7.1.9.90.15-6 – 7.1.9.90.20-4 – 7.1.9.90.26-6 – 7.1.9.90.30-7 – 7.1.9.90.35-2 – 7.1.9.90.40-0 – 7.1.9.90.50-3 – 7.1.9.90.60-6 – 7.1.9.90.70-9 – 7.1.9.90.80-2 – 7.1.9.90.90-5 + 8.1.8.00.00-9 – 8.1.8.10.00-6 – 8.1.8.20.00-3 – 8.1.8.30.05-5 – 8.1.8.30.10-3 – 8.1.8.30.12-7 – 8.1.8.30.15-8 – 8.1.8.30.20-6 – 8.1.8.30.26-8 – 8.1.8.30.30-9 – 8.1.8.30.35-4 – 8.1.8.30.40-2 – 8.1.8.30.50-5 – 8.1.8.30.55-0 – 8.1.8.30.60-8 – 8.1.8.30.70-1 – 8.1.8.30.80-4 – 8.1.8.30.90-7 + 8.1.9.00.00-2 – 8.1.9.10.00-9 – 8.1.9.12.00-7 – 8.1.9.15.00-4 – 8.1.9.25.00-1 – 8.1.9.30.00-3 – 8.1.9.33.00-0 – 8.1.9.40.00-0 – 8.1.9.45.00-5 – 8.1.9.50.00-7 – 8.1.9.55.00-2 – 8.1.9.60.00-4 – 8.1.9.80.00-8 – 8.1.9.86.00-2 – 8.1.9.90.10-8 – 8.1.9.90.20-1 – 8.1.9.90.30-4 – 8.1.9.90.90-2 + 7.3.0.00.00-6 + 8.3.0.00.00-3) / (1.0.0.00.00-7 + 2.0.0.00.00-4)

Note: Expenses accounts begins with the number 8 and are usually negative in BACEN database in contrast with revenues account which begins with the number 7 and are usually positive.

Table 13 - Descriptive Statistics for Banks

Year	Leverage	Assets (Billions)	Debt (Billions)	Net Assets (Billions)	Size	Collateral
	0.6830	11.6499	10.2455	1.4002	20.9367	0.2247
2006	(0.7945)	(1.2891)	(0.8251)	(0.2083)	(20.9773)	(0.1483)
	[0.2829]	[37.0209]	[34.0754]	[3.7355]	[2.0917]	[0.2329]
	0.6953	14.2372	12.5786	1.6546	21.1074	0.2342
2007	(0.8122)	(1.5014)	(1.0605)	(0.2586)	(21.1297)	(0.1623)
	[0.2778]	[45.2593]	[41.9471]	[4.4604]	[2.0771]	[0.2297]
	0.6952	16.3617	14.3351	2.0216	21.1356	0.2405
2008	(0.8151)	(1.5301)	(1.0466)	(0.2513)	(21.1486)	(0.1684)
	[0.2839]	[53.6755]	[49.5961]	[5.7233]	[2.1477]	[0.2403]
	0.7060	18.4455	16.1365	2.3033	21.0607	0.2623
2009	(0.812)	(1.5219)	(1.0808)	(0.2157)	(21.1432)	(0.1941)
	[0.2715]	[68.6758]	[63.2993]	[7.258]	[2.2221]	[0.2413]
	0.6938	20.1522	17.6332	2.5122	21.0202	0.2308
2010	(0.8152)	(1.5199)	(1.1246)	(0.2273)	(21.1419)	(0.164)
	[0.2764]	[77.0303]	[70.9834]	[7.981]	[2.2797]	[0.2266]
	0.6958	22.2047	19.5096	2.6847	21.1029	0.2275
2011	(0.8196)	(1.7389)	(1.0849)	(0.2699)	(21.2765)	(0.1665)
	[0.2858]	[84.9829]	[78.5252]	[8.4063]	[2.3086]	[0.2287]
	0.6944	23.2716	20.4907	2.7702	21.0943	0.2399
2012	(0.8169)	(1.8222)	(1.0102)	(0.2707)	(21.3233)	(0.1588)
	[0.2898]	[89.7542]	[83.4001]	[8.5112]	[2.3447]	[0.2412]
	0.6977	25.1860	22.4046	2.7693	21.1490	0.2390
2013	(0.8208)	(1.9507)	(0.9393)	(0.2964)	(21.3915)	(0.1612)
	[0.2874]	[96.6776]	[90.8046]	[8.2471]	[2.3655]	[0.238]
	0.6994	26.8502	23.9904	2.8473	21.1217	0.2289
2014	(0.8193)	(1.7671)	(0.9827)	(0.3132)	(21.2926)	(0.1572)
	[0.2742]	[106.9374]	[101.1335]	[8.4855]	[2.3879]	[0.2315]
	0.7061	26.7966	24.3203	2.4625	21.1199	0.2306
2015	(0.8307)	(1.9393)	(1.135)	(0.3092)	(21.3856)	(0.1761)
	[0.2784]	[107.5262]	[101.881]	[7.9989]	[2.3981]	[0.2226]
	0.6869	25.1101	22.8274	2.2706	21.0271	0.2473
2016	(0.8299)	(1.8206)	(1.2088)	(0.2872)	(21.3224)	(0.1907)
	[0.2952]	[103.4895]	[97.6959]	[7.7612]	[2.3925]	[0.2328]
	0.6867	25.0796	22.6342	2.4333	21.0685	0.2507
2017	(0.8245)	(1.794)	(1.2574)	(0.2895)	(21.3077)	(0.1851)
	[0.2889]	[103.1914]	[96.8112]	[8.4494]	[2.3707]	[0.2346]
	0.6950	21.2602	18.9054	2.3457	21.0789	0.2380
Total	(0.8182)	(1.6081)	(1.0405)	(0.2605)	(21.1983)	(0.1699)
	[0.2825]	[84.5208]	[79.1157]	[7.43]	[2.2823]	[0.2334]

Year	Profitability	Basel	Riskiness	Foreign Investments	Domestic Participations
	0.0198	0.3390	0.0365	0.0043	0.0533
2006	(0.0146)	(0.1846)	(0.0183)	(0)	(0.0093)
	[0.0428]	[0.62]	[0.0574]	[0.0137]	[0.1282]
	0.0240	0.3128	0.0326	0.0031	0.0503
2007	(0.0147)	(0.1874)	(0.0163)	(0)	(0.0059)
	[0.0399]	[0.3748]	[0.0493]	[0.0099]	[0.1242]
	0.0154	0.3264	0.0317	0.0029	0.0592
2008	(0.0112)	(0.1849)	(0.0154)	(0)	(0.0065)
	[0.0492]	[0.4987]	[0.0506]	[0.0096]	[0.1435]
	0.0126	0.3605	0.0385	0.0026	0.0574
2009	(0.0092)	(0.1775)	(0.0198)	(0)	(0.0041)
	[0.0553]	[0.7437]	[0.0694]	[0.0087]	[0.1433]
	0.0125	0.3529	0.0274	0.0026	0.0578
2010	(0.0112)	(0.1706)	(0.0154)	(0)	(0.0051)
	[0.0331]	[0.6891]	[0.0389]	[0.0097]	[0.1457]
	0.0102	0.3485	0.0285	0.0029	0.0501
2011	(0.0101)	(0.1717)	(0.0162)	(0)	(0.0033)
	[0.0471]	[0.6629]	[0.0386]	[0.012]	[0.1262]
	0.0079	0.3225	0.0323	0.0034	0.0507
2012	(0.0085)	(0.1699)	(0.0201)	(0)	(0.0023)
	[0.0272]	[0.6258]	[0.0417]	[0.0139]	[0.1309]
	0.0169	0.3094	0.0362	0.0032	0.0446
2013	(0.0072)	(0.1827)	(0.0197)	(0)	(0.0013)
	[0.2073]	[0.4111]	[0.0574]	[0.0111]	[0.1128]
	0.0113	0.2840	0.0371	0.0033	0.0483
2014	(0.0091)	(0.1746)	(0.0173)	(0)	(0.0012)
	[0.0285]	[0.3099]	[0.0579]	[0.0108]	[0.1317]
	0.0066	0.2960	0.0396	0.0042	0.0449
2015	(0.0052)	(0.1771)	(0.0213)	(0)	(0.0015)
	[0.0438]	[0.4887]	[0.0566]	[0.0132]	[0.1224]
	0.0100	0.2845	0.0448	0.0035	0.0430
2016	(0.0075)	(0.182)	(0.0236)	(0)	(0.0003)
	[0.0476]	[0.2888]	[0.0636]	[0.0112]	[0.1191]
	0.0153	0.3058	0.0399	0.0038	0.0438
2017	(0.0097)	(0.1847)	(0.0218)	(0)	(0.0002)
	[0.0518]	[0.3392]	[0.053]	[0.012]	[0.1263]
	0.0136	0.3204	0.0354	0.0033	0.0503
Total	(0.0097)	(0.1799)	(0.0184)	(0)	(0.0026)
	[0.073]	[0.5285]	[0.0537]	[0.0114]	[0.1299]

Source: Data collected from BACEN database and adapted. Note: For each year I present the mean, the median, between parentheses, and the standard deviation, between brackets. Variable are described in section 3.3.

Table 14 - Descriptive Statistics for Financial Conglomerates

Year	Leverage	Assets (Billions)	Debt (Billions)	Net Assets (Billions)	Size	Collateral
	0.8414	21.0225	18.9664	2.0467	21.8680	0.1743
2006	(0.877)	(2.2559)	(2.0077)	(0.3167)	(21.5366)	(0.1298)
	[0.1056]	[50.4772]	[45.6996]	[4.9602]	[1.971]	[0.1679]
	0.8324	24.6408	22.3558	2.2762	22.0280	0.1815
2007	(0.8706)	(3.0988)	(2.7845)	(0.4306)	(21.8543)	(0.1448)
	[0.117]	[60.1879]	[54.8939]	[5.463]	[1.9675]	[0.1647]
	0.8247	28.7023	26.1468	2.5436	21.9397	0.1654
2008	(0.8565)	(3.0876)	(2.7284)	(0.4002)	(21.8506)	(0.1171)
	[0.1169]	[81.7003]	[75.1668]	[6.811]	[2.028]	[0.1693]
	0.8193	33.4253	30.2201	3.1907	21.9312	0.1882
2009	(0.8586)	(3.138)	(2.7923)	(0.4684)	(21.8669)	(0.1383)
	[0.1397]	[101.2345]	[92.726]	[9.2851]	[2.1138]	[0.1626]
	0.8300	36.9273	33.3733	3.5372	22.0813	0.1708
2010	(0.8741)	(3.3826)	(3.0665)	(0.5557)	(21.9405)	(0.1291)
	[0.1181]	[109.5618]	[100.0739]	[10.1863]	[2.0842]	[0.1604]
	0.8323	40.7890	36.9694	3.7924	22.1676	0.1699
2011	(0.8709)	(3.8565)	(3.2267)	(0.5507)	(22.073)	(0.1232)
	[0.1286]	[121.574]	[111.2062]	[10.785]	[2.1247]	[0.1647]
	0.7993	41.8661	37.9582	3.8800	22.0082	0.1877
2012	(0.8694)	(3.4148)	(3.0146)	(0.5165)	(21.9514)	(0.1355)
	[0.1826]	[128.3194]	[117.4543]	[11.2017]	[2.2974]	[0.1671]
	0.8032	44.6571	40.7609	3.8659	22.0335	0.1988
2013	(0.8706)	(3.0561)	(2.5894)	(0.493)	(21.8404)	(0.1496)
	[0.1846]	[136.5842]	[125.811]	[11.0857]	[2.3137]	[0.172]
	0.8149	46.7948	42.7808	3.9838	22.0616	0.1978
2014	(0.8669)	(3.5747)	(3.0111)	(0.4769)	(21.9972)	(0.1651)
	[0.159]	[144.2381]	[133.1067]	[11.4868]	[2.2896]	[0.1575]
	0.8209	48.1975	44.2209	3.9437	22.0761	0.2187
2015	(0.8699)	(4.1805)	(3.8529)	(0.4531)	(22.1537)	(0.1837)
	[0.1586]	[146.2749]	[135.1553]	[11.5075]	[2.3405]	[0.1725]
	0.8294	46.7053	42.6908	3.9836	22.0461	0.2385
2016	(0.8704)	(4.4322)	(3.6795)	(0.511)	(22.2122)	(0.1934)
	[0.1287]	[144.5652]	[133.0945]	[11.8584]	[2.2991]	[0.1846]
	0.8102	46.2973	42.0381	4.2268	22.0546	0.2431
2017	(0.8733)	(4.2363)	(3.2272)	(0.4625)	(22.167)	(0.2075)
	[0.1665]	[146.6108]	[134.0746]	[12.8406]	[2.2157]	[0.1877]
	0.8215	38.1630	34.7156	3.4248	22.0238	0.1942
Total	(0.8703)	(3.491)	(2.9172)	(0.4603)	(21.9735)	(0.1504)
	[0.1444]	[118.2274]	[108.5742]	[10.0485]	[2.1659]	[0.1706]

Year	Profitability	Basel	Riskiness	Foreign Investments	Domestic Participations
	0.0176	0.2639	0.0270	0.0007	0.0102
2006	(0.0122)	(0.1712)	(0.016)	(0)	(0.0038)
	[0.0253]	[0.2583]	[0.0364]	[0.0028]	[0.0137]
	0.0242	0.2654	0.0244	0.0005	0.0124
2007	(0.0131)	(0.1938)	(0.0169)	(0)	(0.0037)
	[0.0372]	[0.23]	[0.0276]	[0.002]	[0.0286]
	0.0051	0.2637	0.0254	0.0005	0.0154
2008	(0.0093)	(0.1844)	(0.0151)	(0)	(0.005)
	[0.0378]	[0.2257]	[0.0306]	[0.0019]	[0.0303]
	0.0060	0.2421	0.0411	0.0004	0.0160
2009	(0.0095)	(0.1775)	(0.0238)	(0)	(0.0044)
	[0.0356]	[0.1659]	[0.0817]	[0.0015]	[0.0316]
	0.0115	0.2216	0.0241	0.0005	0.0153
2010	(0.0096)	(0.1666)	(0.0168)	(0)	(0.0063)
	[0.0305]	[0.1356]	[0.0239]	[0.0022]	[0.0278]
	0.0065	0.2413	0.0231	0.0006	0.0145
2011	(0.007)	(0.1707)	(0.0172)	(0)	(0.0053)
	[0.021]	[0.3125]	[0.0223]	[0.003]	[0.027]
	0.0024	0.2519	0.0248	0.0004	0.0183
2012	(0.0066)	(0.1683)	(0.0197)	(0)	(0.0054)
	[0.0294]	[0.2999]	[0.0285]	[0.0019]	[0.0307]
	0.0015	0.2476	0.0306	0.0004	0.0145
2013	(0.0056)	(0.1741)	(0.0188)	(0)	(0.0042)
	[0.0411]	[0.2581]	[0.0632]	[0.0015]	[0.026]
	0.0082	0.2278	0.0277	0.0005	0.0142
2014	(0.0063)	(0.1715)	(0.017)	(0)	(0.0025)
	[0.0176]	[0.1792]	[0.0485]	[0.0024]	[0.0255]
	0.0062	0.2363	0.0273	0.0007	0.0143
2015	(0.005)	(0.1711)	(0.0167)	(0)	(0.0029)
	[0.0341]	[0.222]	[0.0368]	[0.0032]	[0.0281]
	0.0098	0.2263	0.0316	0.0010	0.0143
2016	(0.0056)	(0.1774)	(0.0194)	(0)	(0.0022)
	[0.0472]	[0.1959]	[0.0362]	[0.0048]	[0.0321]
	0.0163	0.2396	0.0360	0.0011	0.0150
2017	(0.0062)	(0.1775)	(0.0186)	(0)	(0.0022)
	[0.0608]	[0.2189]	[0.0478]	[0.0045]	[0.0365]
	0.0096	0.2443	0.0285	0.0006	0.0145
Total	(0.008)	(0.1759)	(0.0179)	(0)	(0.004)
	[0.037]	[0.2305]	[0.0437]	[0.0028]	[0.0286]

Source: Data collected from BACEN database and adapted. Note: For each year I present the mean, the median, between parentheses, and the standard deviation, between brackets. Variable are described in section 3.3.

APPENDIX III –RANDOM EFFECTS AND FIXED EFFECTS ESTIMATION

Table 15 - Regression Results, First Period, First Control Group, Random Effects

Leverage	(1)	(2)	(3)	(4)
Treatment Result (HT SH, 1st Per)	0.0198 (0.0141)	0.0281** (0.0123)	0.0337*** (0.0121)	0.0311** (0.0122)
Dom. Participations * Treat. Result				-0.0242 (0.1442)
Dom. Part. * Group Variable				-0.0358 (0.1821)
Group Variable (HT SH)	-0.0945** (0.0401)	-0.0847** (0.0403)	-0.0680* (0.0359)	-0.0634* (0.0376)
Size	0.1127*** (0.0130)	0.5874*** (0.1626)	0.5669*** (0.1421)	0.5783*** (0.1448)
Size²		-0.0112*** (0.0040)	-0.0109*** (0.0034)	-0.0112*** (0.0035)
Collateral	-0.0867** (0.0389)	-0.0765** (0.0362)	-0.1234*** (0.0373)	-0.1217*** (0.0374)
Profitability	-0.3570*** (0.0885)	-0.3883*** (0.0894)	-0.4187*** (0.0912)	-0.4097*** (0.0884)
Regulatory Constraint (Fin. Congl.)		0.0415*** (0.0105)	0.0369*** (0.0094)	0.0365*** (0.0092)
Riskiness	-0.2992* (0.1751)	-0.2141* (0.1153)	-0.2759*** (0.0931)	-0.2701*** (0.0907)
Domestic Participations			-0.3535*** (0.1000)	-0.3822** (0.1531)
Foreign Investments			2.0319 (1.3260)	2.0516 (1.3216)
Constant	-1.5843*** (0.2715)	-6.5753*** (1.6494)	-6.2580*** (1.4646)	-6.3761*** (1.4951)
Time Dummies	Yes	Yes	Yes	Yes
Number of Observation	1,378	1,378	1,378	1,378
Number of Banks	197	197	197	197
Wald Chi²	167.53***	405.94***	416.75***	422.10***
R² Within	0.4478	0.4970	0.5124	0.5127
R² Between	0.2660	0.3085	0.3987	0.4037
R² Overall	0.2723	0.3235	0.4109	0.4162

Note: The models are estimated with Random Effects. Standard-errors are presented in parenthesis, with errors clustered at the bank level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (High Taxed Shareholder - HT SH) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations.

Table 16 - Regression Results, Second Period, First Group, Random Effects

Leverage	(1)	(2)	(3)	(4)
Treatment Result (HT SH, 2nd Per)	-0.0241 (0.0160)	-0.0273* (0.0152)	-0.0330** (0.0145)	-0.0456*** (0.0167)
Dom. Participations * Treat. Result				-0.0153 (0.1271)
Dom. Part. * Group Variable				-0.2644 (0.2459)
Group Variable (HT SH)	-0.1158** (0.0464)	-0.1082** (0.0454)	-0.0574 (0.0405)	-0.0501 (0.0415)
Size	0.1138*** (0.0122)	0.5312*** (0.1884)	0.5854*** (0.1450)	0.5786*** (0.1432)
Size²		-0.0099** (0.0046)	-0.0115*** (0.0035)	-0.0113*** (0.0035)
Collateral	-0.1381** (0.0574)	-0.1202** (0.0550)	-0.1808*** (0.0599)	-0.1767*** (0.0595)
Profitability	-0.0620*** (0.0162)	-0.0587*** (0.0185)	-0.0692*** (0.0176)	-0.0676*** (0.0169)
Regulatory Constraint (Fin. Congl.)		0.0037 (0.0070)	0.0066 (0.0058)	0.0093* (0.0056)
Riskiness	0.5938*** (0.1871)	0.5647*** (0.1794)	0.4551*** (0.1434)	0.4790*** (0.1431)
Domestic Participations			-0.6091*** (0.1863)	-0.4027** (0.1798)
Foreign Investments			0.3989 (1.1977)	0.2775 (1.1655)
Constant	-1.6551*** (0.2585)	-5.9913*** (1.8985)	-6.4139*** (1.4946)	-6.3601*** (1.4770)
Time Dummies	Yes	Yes	Yes	Yes
Number of Observation	1,361	1,361	1,361	1,361
Number of Banks	185	185	185	185
Wald Chi²	200.92***	299.96***	364.46***	437.67***
R² Within	0.4462	0.4713	0.4899	0.5026
R² Between	0.2719	0.2968	0.4089	0.4092
R² Overall	0.2906	0.3269	0.444	0.4443

Note: The models are estimated with Random Effects. Standard-errors are presented in parenthesis, with errors clustered at the bank level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (High Taxed Shareholder - HT SH) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations.

Table 17 - Regression Results, First Period, Second Group, Random Effects

Leverage	(1)	(2)	(3)	(4)
Treatment Result (Bank, 1st Per)	0.0086 (0.0112)	0.0113 (0.0103)	0.0207** (0.0103)	0.0163 (0.0106)
Dom. Participations * Treat. Result				-0.2619 (0.2204)
Dom. Part. * Group Variable				0.2971** (0.1465)
Group Variable (Bank)	-0.0957*** (0.0275)	-0.0954*** (0.0262)	-0.0800*** (0.0236)	-0.0798*** (0.0237)
Size	0.0973*** (0.0119)	0.5556*** (0.1379)	0.5137*** (0.1191)	0.5262*** (0.1199)
Size²		-0.0106*** (0.0033)	-0.0099*** (0.0028)	-0.0102*** (0.0028)
Collateral	-0.0762* (0.0401)	-0.0666* (0.0371)	-0.1259*** (0.0399)	-0.1208*** (0.0399)
Profitability	-0.4544*** (0.0922)	-0.4531*** (0.0905)	-0.5008*** (0.0903)	-0.4901*** (0.0889)
Regulatory Constraint (Fin. Congl.)		0.0392*** (0.0096)	0.0343*** (0.0086)	0.0344*** (0.0084)
Riskiness	-0.5178*** (0.1350)	-0.3388*** (0.0927)	-0.4253*** (0.0723)	-0.4106*** (0.0734)
Domestic Participations			-0.3988*** (0.0939)	-0.7560*** (0.1197)
Foreign Investments			1.9184* (1.1487)	1.9696* (1.1500)
Constant	-1.2294*** (0.2585)	-6.1587*** (1.4370)	-5.5643*** (1.2719)	-5.6977*** (1.2805)
Time Dummies	Yes	Yes	Yes	Yes
Number of Observation	1,383	1,383	1,383	1,383
Number of Banks	130	130	130	130
Number of Financial Conglomerates	74	74	74	74
Wald Chi²	222.16***	444.30***	576.57***	624.11***
R² Within	0.4288	0.4734	0.4829	0.4882
R² Between	0.2855	0.3324	0.4706	0.4705
R² Overall	0.282	0.3328	0.4666	0.4661

Note: The models are estimated with Random Effects. Standard-errors are presented in parenthesis, with errors clustered at the bank or at the financial conglomerate level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (Bank) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations.

Table 18 - Regression Results, Second Period, Second Group, Random Effects

Leverage	(1)	(2)	(3)	(4)
Treatment Result (Bank, 2nd Per)	-0.0106 (0.0118)	-0.0100 (0.0114)	-0.0147 (0.0114)	-0.0203 (0.0127)
Dom. Participations * Treat. Result				-0.1358 (0.2898)
Dom. Part. * Group Variable				-0.0149 (0.4552)
Group Variable (Bank)	-0.0956*** (0.0367)	-0.0971*** (0.0349)	-0.0675** (0.0323)	-0.0650* (0.0337)
Size	0.1078*** (0.0131)	0.5329*** (0.1896)	0.5769*** (0.1387)	0.5774*** (0.1388)
Size²		-0.0099** (0.0046)	-0.0112*** (0.0033)	-0.0112*** (0.0033)
Collateral	-0.1271** (0.0588)	-0.1095* (0.0564)	-0.1733*** (0.0616)	-0.1671*** (0.0611)
Profitability	-0.0677*** (0.0168)	-0.0609*** (0.0215)	-0.0700*** (0.0187)	-0.0685*** (0.0177)
Regulatory Constraint (Fin. Congl.)		-0.0021 (0.0065)	0.0003 (0.0055)	0.0019 (0.0054)
Riskiness	0.7158*** (0.2585)	0.6107** (0.2376)	0.4725*** (0.1811)	0.4762*** (0.1801)
Domestic Participations			-0.5909*** (0.1716)	-0.6094 (0.4259)
Foreign Investments			0.4926 (1.1892)	0.4619 (1.1957)
Constant	-1.5581*** (0.2895)	-6.0855*** (1.9411)	-6.3696*** (1.4598)	-6.3959*** (1.4610)
Time Dummies	Yes	Yes	Yes	Yes
Number of Observation	1,305	1,305	1,305	1,305
Number of Banks	115	115	115	115
Number of Financial Conglomerates	70	70	70	70
Wald Chi²	186.99***	240.52***	292.93***	361.76***
R² Within	0.4580	0.4855	0.4999	0.5112
R² Between	0.2857	0.3083	0.4431	0.4365
R² Overall	0.2890	0.3192	0.4584	0.4526

Note: The models are estimated with Random Effects. Standard-errors are presented in parenthesis, with errors clustered at the bank or at the financial conglomerate level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (Bank) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations.

Table 19 - Regression Results, First Period, First Group, Fixed Effects

Leverage	(1)	(2)	(3)	(4)
Treatment Result (HT SH, 1st Per)	0.0155	0.0237*	0.0283**	0.0251*
	(0.0145)	(0.0126)	(0.0123)	(0.0129)
Dom. Participations * Treat. Result				-0.0258
				(0.1251)
Dom. Part. * Group Variable				0.0718
				(0.2172)
Group Variable (HT SH)	-	-	-	-
Size	0.1504***	0.6130***	0.5961***	0.6036***
	(0.0201)	(0.2018)	(0.1746)	(0.1778)
$Size^2$		-0.0110**	-0.0107**	-0.0109**
		(0.0051)	(0.0043)	(0.0044)
Collateral	-0.0841**	-0.0760**	-0.0978***	-0.0957***
	(0.0339)	(0.0330)	(0.0303)	(0.0305)
Profitability	-0.2714***	-0.3011***	-0.3127***	-0.3068***
	(0.0992)	(0.1093)	(0.1096)	(0.1107)
Regulatory Constraint (Fin. Congl.)		0.0398***	0.0354***	0.0353***
		(0.0111)	(0.0096)	(0.0094)
Riskiness	-0.2508*	-0.1592	-0.2114**	-0.2072**
	(0.1483)	(0.0965)	(0.0853)	(0.0842)
Domestic Participations			-0.2183**	-0.3137*
			(0.1074)	(0.1803)
Foreign Investments			2.7759*	2.8360*
			(1.5846)	(1.5781)
Constant	-2.4030***	-7.2400***	-7.0011***	-7.0783***
	(0.4225)	(2.0011)	(1.7543)	(1.7875)
Time Dummies	Yes	Yes	Yes	Yes
Number of Observation	1,378	1,378	1,378	1,378
Number of Banks	197	197	197	197
F	10.22***	25.18***	26.14***	23.38***
R^2 Within	0.4558	0.5071	0.5357	0.5373
R^2 Between	0.232	0.2694	0.3074	0.3077
R^2 Overall	0.234	0.2786	0.3169	0.3155

Note: The models are estimated with Fixed Effects. Standard-errors are presented in parenthesis, with errors clustered at the bank level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (High Taxed Shareholder - HT SH) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations. The group variable was dropped because it did not change in the period (section 3.4.2).

Table 20 - Regression Results, Second Period, First Group, Fixed Effects

Leverage	(1)	(2)	(3)	(4)
Treatment Result (HT SH, 2nd Per)	-0.0155	-0.0195	-0.0245*	-0.0381**
	(0.0160)	(0.0155)	(0.0145)	(0.0166)
Dom. Participations * Treat. Result				-0.0140
				(0.1174)
Dom. Part. * Group Variable				-0.1250
				(0.3159)
Group Variable (HT SH)	-	-	-	-
Size	0.1561***	0.5398**	0.6214***	0.6048***
	(0.0195)	(0.2263)	(0.2048)	(0.2016)
Size²		-0.0092	-0.0115**	-0.0110**
		(0.0056)	(0.0050)	(0.0050)
Collateral	-0.1083*	-0.0964	-0.1367**	-0.1303**
	(0.0649)	(0.0587)	(0.0602)	(0.0604)
Profitability	-0.0513***	-0.0497**	-0.0570***	-0.0551***
	(0.0163)	(0.0203)	(0.0198)	(0.0183)
Regulatory Constraint (Fin. Congl.)		0.0027	0.0049	0.0075
		(0.0070)	(0.0061)	(0.0057)
Riskiness	0.5061***	0.4883***	0.4204***	0.4502***
	(0.1918)	(0.1875)	(0.1613)	(0.1618)
Domestic Participations			-0.4158*	-0.3381
			(0.2449)	(0.2395)
Foreign Investments			0.8842	0.7599
			(1.2102)	(1.1641)
Constant	-2.5914***	-6.5226***	-7.2195***	-7.0709***
	(0.4163)	(2.2641)	(2.0677)	(2.0375)
Time Dummies	Yes	Yes	Yes	Yes
Number of Observation	1,361	1,361	1,361	1,361
Number of Banks	185	185	185	185
F	11.37***	12.32***	12.81***	14.01***
R² Within	0.4584	0.4820	0.5067	0.5205
R² Between	0.2185	0.2429	0.3161	0.3129
R² Overall	0.2376	0.2706	0.3501	0.3470

Note: The models are estimated with Fixed Effects. Standard-errors are presented in parenthesis, with errors clustered at the bank level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (High Taxed Shareholder - HT SH) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations. The group variable had few changes in the period and thus was not dropped (section 3.4.2).

Table 21 - Regression Results, First Period, Second Group, Fixed Effects

Leverage	(1)	(2)	(3)	(4)
Treatment Result (Bank, 1st Per)	0.0078 (0.0119)	0.0107 (0.0109)	0.0179* (0.0105)	0.0138 (0.0112)
Dom. Participations * Treat. Result				-0.2420 (0.2234)
Dom. Part. * Group Variable				0.0000 (0.0000)
Group Variable (Bank)	-	-	-	-
Size	0.1361*** (0.0199)	0.5585*** (0.1926)	0.5331*** (0.1724)	0.5515*** (0.1738)
Size²		-0.0098** (0.0047)	-0.0094** (0.0042)	-0.0098** (0.0042)
Collateral	-0.0669* (0.0349)	-0.0592* (0.0335)	-0.0853*** (0.0309)	-0.0802** (0.0313)
Profitability	-0.3511*** (0.0980)	-0.3457*** (0.1052)	-0.3636*** (0.1036)	-0.3554*** (0.1030)
Regulatory Constraint (Fin. Congl.)		0.0408*** (0.0105)	0.0366*** (0.0091)	0.0368*** (0.0089)
Riskiness	-0.4075*** (0.1342)	-0.2373** (0.0984)	-0.2986*** (0.0919)	-0.2844*** (0.0914)
Domestic Participations			-0.2367** (0.1047)	-0.7118*** (0.1207)
Foreign Investments			2.6487* (1.4929)	2.6938* (1.4889)
Constant	-2.1258*** (0.4298)	-6.6430*** (1.9613)	-6.3040*** (1.7894)	-6.4971*** (1.8023)
Time Dummies	Yes	Yes	Yes	Yes
Number of Observation	1,383	1,383	1,383	1,383
Number of Banks	130	130	130	130
Number of Financial Conglomerates	74	74	74	74
F	16.28***	31.90***	41.58***	38.14***
R^2 Within	0.4425	0.4879	0.5188	0.5233
R^2 Between	0.2312	0.2677	0.3203	0.3209
R^2 Overall	0.2300	0.2694	0.3224	0.3225

Note: The models are estimated with Fixed Effects. Standard-errors are presented in parenthesis, with errors clustered at the bank or at the financial conglomerate level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (Bank) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations. The Bank group dummy was dropped because it does not vary in time.

Table 22 - Regression Results, Second Period, Second Group, Fixed Effects

Leverage	(1)	(2)	(3)	(4)
Treatment Result (Bank, 2nd Per)	-0.0042 (0.0119)	-0.0044 (0.0116)	-0.0078 (0.0112)	-0.0141 (0.0126)
Dom. Participations * Treat. Result				-0.1823 (0.3013)
Dom. Part. * Group Variable				
Group Variable (Bank)	-	-	-	-
Size	0.1511*** (0.0208)	0.5646** (0.2411)	0.6431*** (0.2139)	0.6360*** (0.2116)
Size²		-0.0097 (0.0059)	-0.0118** (0.0052)	-0.0116** (0.0051)
Collateral	-0.0988 (0.0653)	-0.0881 (0.0595)	-0.1271** (0.0615)	-0.1191* (0.0615)
Profitability	-0.0563*** (0.0186)	-0.0519** (0.0235)	-0.0574** (0.0221)	-0.0555*** (0.0208)
Regulatory Constraint (Fin. Congl.)		-0.0027 (0.0067)	-0.0008 (0.0060)	0.0011 (0.0058)
Riskiness	0.6415** (0.2690)	0.5483** (0.2509)	0.4566** (0.2124)	0.4609** (0.2109)
Domestic Participations			-0.3851* (0.2324)	-0.4015 (0.4447)
Foreign Investments			0.8473 (1.1868)	0.8059 (1.1753)
Constant	-2.5654*** (0.4584)	-6.9105*** (2.4561)	-7.5877*** (2.1983)	-7.5455*** (2.1774)
Time Dummies	Yes	Yes	Yes	Yes
Number of Observation	1,305	1,305	1,305	1,305
Number of Banks	115	115	115	115
Number of Financial Conglomerates	70	70	70	70
F	10.54***	9.59***	9.51***	9.86***
R^2 Within	0.4709	0.4956	0.5211	0.5331
R^2 Between	0.2334	0.2563	0.3318	0.3252
R^2 Overall	0.2474	0.2762	0.3557	0.3492

Note: The models are estimated with Fixed Effects. Standard-errors are presented in parenthesis, with errors clustered at the bank or at the financial conglomerate level. *, **, *** denotes $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively. Variables are defined in Section 3.3. Treatment Result is the interaction of the group dummy (Bank) and the time dummy indicating the corporate income tax rate increase. Dom. Participations * Treat. Result is the interaction of the Treatment Result Dummy and Domestic Participations. The Bank group dummy was dropped because it does not vary in time.