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Essays on government ownership in publicly traded companies in Brazil
Ensaio sobre propriedade estatal em empresas de capital aberto no Brasil

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Tese apresentada ao Programa de Pós-Graduação em Controladoria e Contabilidade do Departamento de Contabilidade e Atuária da Faculdade de Economia, Administração, Contabilidade e Atuária da Universidade de São Paulo como requisito parcial para a obtenção do título de Doutora em Ciências.

Orientador: Prof. Dr. Francisco Henrique Figueiredo de Castro Junior

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Resumo

Bianchi, M. R. M. (2022). *Ensaio sobre propriedade estatal em empresas de capital aberto no Brasil* (Tese de Doutorado, Universidade de São Paulo, São Paulo).

A participação do estado na economia tem sido intensamente discutida, em especial no Brasil com diversas crises envolvendo a atuação do governo brasileiro. Afinal, a intervenção do Estado nas empresas de capital aberto, está associada a ineficiências no controle e monitoramento das atividades empresariais, aliadas a possíveis interferências políticas capazes de distorcer os objetivos primários das empresas em prol de objetivos políticos ou eleitoreiros. Além da ineficiência, escândalos de corrupção recentes envolvendo o poder público e empresas privadas no Brasil reacendem o debate do quanto o Estado deveria se envolver nas atividades produtivas. O Brasil passou por longos períodos de privatizações, mas ainda exerce grande influência em empresas. Minha pesquisa buscou mapear quão influente é o Estado brasileiro através da estrutura acionária das empresas e a influência que o governo detém sobre aspectos primordiais de seu gerenciamento, como a remuneração do principal executivo das empresas que ele detém participação. Além disso, busquei verificar, através de estudo de evento, se o mercado reagiu a tentativas legislativas de coibir abusos em empresas controladas pelo governo, com a promulgação da Lei 13.303/2016. A Lei das Estatais é conhecida por endurecer as regras de governança e outros aspectos para empresas de controle estatal. Eu analisei as empresas de capital aberto brasileiras ao longo de 10 anos (2010 a 2019) e delinee a participação do governo brasileiro entre participação direta ou indireta, e ainda considerando os diferentes direitos a votos de algumas empresas. Apesar do governo brasileiro exercer o controle de apenas 24 empresas de capital aberto durante este período, o governo brasileiro possuía ações em 26% da amostra, direta ou indiretamente. Em minha pesquisa, encontrei evidências de que a participação estatal na estrutura acionária das empresas é negativamente relacionada ao salário de seu maior executivo. Apesar de não ter evidências de que crises políticas possam majorar esta relação negativa, crises financeiras, representadas pelos anos 2015-2016 em minha pesquisa, parecem ter alguma influência a depender do tipo de participação do governo. Quando o governo possui participação direta, a relação negativa entre remuneração do executivo e participação estatal durante crises financeiras é acentuada, mas quando o governo possui uma participação indireta na empresa, a relação é positiva e significativa, especialmente para ações sem direito a voto e total das ações (com e sem direito a voto). O impacto da promulgação e do início da vigência da Lei 13.303/2016 gerou um retorno acumulado anormal positivo para as empresas estatais durante os eventos. Durante a discussão do projeto de lei, não foram encontrados retornos anormais em torno das datas do evento. Estes resultados contribuem com a discussão do papel do estado no mercado de capitais, em especial relacionado a remuneração de executivos, importante ferramenta de governança que visa alinhar os interesses dos gestores e acionistas. Com a classificação entre diferentes participações do governo nas empresas de capital aberto brasileiras,

possibilitam-se novas pesquisas utilizando-se dessa categorização. Ainda, é possível evidenciar que o mercado parece reagir positivamente a tentativas de controles mais rígidos e combate à corrupção em empresas estatais.

Palavras-chave: Finanças. Participação estatal. Empresas estatais. Governança Corporativa. Mercado de capitais.

Abstract

Bianchi, M. R. M. (2022) *Essays on government ownership in publicly traded companies in Brazil* (Doctoral dissertation, University of São Paulo, São Paulo).

The State's participation in the economy has been intensely discussed, especially in Brazil with several crises involving the actions of the Brazilian government. After all, the State intervention in publicly traded firms is associated with control and monitoring inefficiencies of business activities. Thus, political interference can distort the primary objectives of companies in favor of political or electoral goals. Besides inefficiency issues, recent corruption scandals involving public authorities and private companies in Brazil rekindle the debate on how much the State should be involved in productive activities. Brazil has gone through long periods of privatization but still exerts considerable influence on companies. My research pursues to map the influence of the Brazilian government through the shareholding structure of companies and the possible influence that the government has on key aspects of their management, such as CEO compensation. Furthermore, I analyzed through an event study whether the stock market reacted to legislative attempts to curb abuses in State-Owned Enterprises (SOEs) with the enactment of Law 13,303/2016. The Brazilian SOEs Law is known for tightening the rules of governance and other aspects for state-controlled companies. I analyzed all publicly traded Brazilian companies over 10 years (2010 to 2019) and classified Brazilian government ownership into direct and indirect, besides the different voting rights in some companies. Although the Brazilian government controlled only 24 publicly traded companies during this period, the Brazilian government owned shares in 26% of the sample, directly or indirectly. In my research, I found evidence that the Brazilian government ownership is negatively related to CEO compensation. Although there is no evidence that political crises can increase this negative relationship, financial crises, represented by the years 2015-2016, seem to have some influence depending on the type of government ownership. When there is a direct government ownership, the negative relationship between executive compensation and state participation during financial crises is accentuated. But when the government has shares indirectly, the relationship is positive and significant, especially for non-voting and total shares (voting and non-voting shares). The impact of the enactment and commencement of Law 13,303/2016 generated an abnormal positive cumulative return for fully Brazilian SOEs during the events. During the Senate bill's discussion, there is no abnormal returns around the event date. These results contribute to the discussion of the role of the state in the capital market, especially related to executive compensation, an important governance tool that aims to align the interests of managers and shareholders. With the classification between different government ownership in Brazilian publicly traded companies, future research can use this categorization. Still, it is possible to show that the market seems to react positively to attempts at stricter controls and fighting corruption in Brazilian state-owned companies.

Keywords: Government ownership. State-owned enterprises. Finance. Corporate Governance. Capital market.

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Abbreviations and Acronyms

ABRASCA Brazilian Association of Listed Companies. 35

B3 Brasil, Bolsa e Balcão - Brazilian Exchange. 20, 70

BNDES Brazilian Development Bank. 9–13, 19, 31

CAR Cumulative Abnormal Return. 72, 73, 77

CEO Chief Executive Officer. 31, 36, 63, 65

CODACE The Brazilian Economic Cycle Dating Committee. 40

CVM Securities and Exchange Commission of Brazil. 25, 35, 77

EPU Economic Policy Uncertainty. 40, 41, 47, 48, 51–60

EU European Union. 37

FUNCEF Fundação dos Economiários Federais - the pension fund for Caixa's employees. 20

IBEF Brazilian Institute of Finance Directors. 35

IPCA Extended National Consumer Price Index. 46, 47

OECD Organisation for Economic Co-operation and Development. 14, 66

OLS Ordinary Least Squares. 42, 50, 71–73, 77

PETROS the pension fund for Petrobras's employees. 19, 20, 23

Postalis the pension fund for Correios's employees. 20

Previ the pension fund for Banco do Brasil's employees. 19, 20, 23

ROA Return on Assets. 29, 31, 42, 44, 47, 65

ROE Return on Equity. 65

SOEs state-owned enterprises. 6, 9–17, 19–21, 26–28, 31, 37, 38, 40, 61, 63–67, 70–72, 77–80, 83

1 Introduction

Government ownership has been highlighted since the privatization wave in recent decades. As Megginson and Netter (2001, p. 321) mention, “(i)t is tempting to point to the spread of privatization programs around the world during the past two decades and conclude that the debate on the economic and political merits of government versus private ownership has been decided”. Since the 1980s, privatization programs around the world have become very popular, and one of the motivations is that SOEs pursue goals other than profits. In fact, Shleifer and Vishny (1994) cite many situations in which companies controlled by the State sought not to maximize profits but rather to achieve political goals.

As of 1999, revenues generated due to the privatization process exceeded US\$1 trillion around the world (Megginson & Netter, 2001). Specifically in Brazil, from 1991 to 2001, the Brazilian government transferred control of 119 firms to the private sector, besides revenues and debt transfer to private hands. Anuatti Neto, Barossi Filho, Carvalho, and Macedo (2003) highlight at that time the Brazilian government sold US\$6 billion in shares of firms that remained SOEs, obtained US\$10 billion from new concessions of public services to the private sector, and sold US\$1.1 billion in scattered non-control stakes in various private companies owned by Brazilian Development Bank (BNDES). According to the authors, this massive numbers involving privatization programs place Brazil’s privatization among the largest in the world.

Several empirical studies compare characteristics among state-owned and privately owned companies. The criticism about government ownership of publicly traded companies is related to poor monitoring of executive government and political indications of management positions (Zinnes, Eilat, & Sachs, 2001). In fact, some studies pointed out that firms with government ownership can perform worse than private firms (e.g., Ben-Nars, Boubakri, & Cosset, 2012; Dewenter & Malatesta, 2001; Fan, Wong, & Zhang, 2007; La Porta, Lopez-de Silanes, & Shleifer, 2002). If this premise were always true, there would be no place for government ownership of firms, and there would be no investors for companies for which the State holds part of their capital.

However, governments have acquired more assets than they sold through privatization around the world, as pointed out by Borisova, Fotak, Holland, and Megginson (2015): between 2003 and 2013, government entities acquired \$1.52 trillion of stock purchases and sold \$1.48 trillion through privatization programs. In fact, Musacchio and Lazzarini (2015) identify several SOEs or companies indirectly controlled by the government are listed on the Fortune

Global 500¹. As an example, in 2021, three SOEs (all Chinese) were among the top ten companies of the Fortune Global 500.

In addition, many Brazilian SOEs² are listed on the Bovespa Index (e.g., Petrobras and Banco do Brasil), whose criterion is to represent the average performance of the quotations of the assets of greater negotiability and representativeness of the Brazilian stock market³. Petrobras is also part of the Fortune Global 500 and is the most valuable Brazilian company (181st place in the 2021 global ranking). A total of six Brazilian companies are also part of the 2021 Fortune Global 500. Among them, two are SOEs (Petrobras and Banco do Brasil), and the Brazilian government has minority shareholdings in other two: Vale, in which the Brazilian government was in the control group of Vale until 2019, through BNDESPAR, a wholly-owned Subsidiary of the Public Federal Company BNDES and Litel's participation, and still owns Vale's golden shares⁴, and JBS through BNDESPAR's ownership. Although political interference is an issue, especially in Brazil at present, once corruption problems surrounding government participation in public companies have become subject to scrutiny, investors have apparently continued to buy shares of these companies, and the government has maintained its participation in publicly traded companies.

Shleifer (1998, p. 142) argues that "(...) state firms are inefficient not just because their managers have weak incentives to reduce costs, but because inefficiency is a result of the government's deliberate policy to transfer resources to supporters". Following this premise, it is reasonable to assume these companies can be more risky and shareholders demand higher returns from these companies. This hypothesis is corroborated by the research of Ben-Nars et al. (2012), who use a multinational sample of 238 firms from 38 countries to demonstrate that the cost of equity is higher when the government is a shareholder. Boubakri, Cosset, and Guedhami (2005) also find evidence that control relinquishment by the government is related to higher performance of newly privatized firms, in addition to macroeconomics reforms in developing countries. Dewenter and Malatesta (2001)' study performances differences between SOEs and private firms. They found evidence that government-owned firms are significantly less profitable than privately owned firms, although they did not find an indication that privatization itself increases firm profitability.

However, Chen, Firth, and Xu (2009) empirically verify that Chinese firms whose control

¹The Fortune Global 500 is the annual ranking of the 500 largest corporations worldwide as measured by total revenue published by Fortune Magazine. More details about the classification and methodology are available at fortune.com/global500.

²The classification of SOEs can vary from country to country. In Brazil, e.g., SOEs are listed companies for which the government owns more than half of voting rights shares, according to the Brazilian SOEs Law (Lei nº 13.303, 30 de junho de 2016). In Portuguese, they are called by "sociedade de economia mista" i.e. mixed capital company in a free translation. Information about different classifications around the world is available in Kowalski, Buge, Sztajerowka, and Egeland (2013).

³The Bovespa Index criterion is available at B3 (2021).

⁴According Form 20-F, "The Brazilian government owns 12 golden shares of Vale, granting it limited veto power over certain company actions, such as changes to our name, the location of our headquarters and our corporate purpose as it relates to mining activities"(Vale S.A., 2018, p.27).

is totally private cannot perform better than Chinese firms controlled by the State. They argue certain types of government ownership can be superior to private ownership, specially where the institutional environment and law enforcement is weak. This can be viewed as, in transition economies, the pervasive influence of government in business can help to improve firm performance. As a matter of fact, several studies discuss the distinct effect of government ownership on firms under different institutional environments (e.g., Borisova, Brockman, Salas, & Zagorchev, 2012; Boubakri, El Ghouli, Guedhami, & Megginson, 2018; Estrin, Liang, Shapiro, & Carney, 2019).

In Brazil, Bandeira-de Mello, Marcon, and Alberton (2011) present this symbiotic relationship among businessmen and politicians. The authors justify there is a dependency on each other: the entrepreneurs pursue protection and different treatment for their businesses, and the politicians depend on firm's finance to contribute for their political campaigns.

There are few studies in Brazil that address the influence of the State in publicly traded companies, despite Brey, Camilo, Marcon, and Bandeira-De-Mello (2014) emphasizing that there is relevant government participation, direct or indirect, in Brazilian companies even after privatization policy adopted in the 1990s in the country. Even the investment decisions are related to political influence: Carvalho (2014) finds evidence that government bank loans follow political needs regarding employment in attractive regions for politicians.

There are some studies that verify Brazilian firms' performance after privatization, such as Anuatti Neto et al. (2003). The authors study the performance changes after privatization in Brazil since 1991 and verify that firms became more efficient after privatization, mainly through a reduction in direct employment and increased prices. The authors also provide a relevant literature review of Brazil's privatization in previous studies. However, there is little research that examines the permanence of the State in public companies even after the wave of privatization in Brazil. The importance of studying this relation after this privatization wave is that the government tends to privatize firms that perform better than other SOEs (Knyazeva, Knyazeva, & Stiglitz, 2013). Dewenter and Malatesta (2001) also emphasize that governments tend to restructure firms before selling them, which may explain part of their performance improvement. This results can indicate a significant bias in research that analyzes relationships immediately after privatization.

Bandeira-de Mello et al. (2011) collect information about Brazilian public companies from 2000 to 2004 and test if political and community connections can influence firm performance. Their findings indicate political connections may provide protection and privileged information that lead to better performance. Lazzarini, Musacchio, Bandeira-de Mello, and Marcon (2015) verify the role of the State in the lending market through BNDES between 2002 and 2009. Their evidence indicates firms that had access to the credit market were the ones that obtained lending with subsidized interests from BNDES. This evidence may indicate that in the Brazilian institutional environment, the presence of the State as a shareholder is always related to a lower cost of debt due to political connections and ease of obtaining credit from state banks.

Carrera Junior (2018) studied the impact of state ownership on the degree of internationalization of Brazilian firms and financial performance. The author found a positive relationship between state ownership and the company's degree of internalization, especially when the state ownership is through pension funds and BNDES. Regarding financial performance, firms in which the government was the largest shareholder performed worse during the Brazilian economic and political crisis (2014-2016).

Inoue, Lazzarini, and Musacchio (2013) hypothesize that if the government participates publicly in companies' capital structure as a minority shareholder in emerging economies (e.g., Brazil), the companies would benefit from the government as a venture capitalist, but with limited political interference. In their words,

In a context of poorly developed capital markets, state-backed, long-term equity can allow firms to undertake performance - enhancing projects and promote capital expenditures needed to achieve efficiency gains. The potential for political distortions associated with government ownership is attenuated in the case of minority holdings because these holdings leave other investors and managers to play the key roles in the private companies in which government invests. (p.1796)

Actually, Lazzarini and Musacchio (2018) analyze data from listed SOEs and private firms from 66 emerging countries and empirically verify that when the government has a majority of shares, the firm performance of these firms is worse than private ones in the economic downturn, but this effect can be attenuated if the country has mechanisms to constrain political interference. The authors could not find statistical differences among minority SOEs and private firms related to firm performance in economic downturns.

There is no consensus in the recent literature about the government's interference in the capital market that fits all the different markets or economic situations. Even in developed markets, where State interference would be seen as a threat to economic liberalism, it is possible that shareholders benefit from the State presence in the financial crisis, regarding the cost of debt (Borisova et al., 2015) or market value (Beuselinck, Cao, Deloof, & Xia, 2017). Even the CEO compensation and corporate governance mechanisms are affected by the State presence in public companies (Borisova et al., 2012; Borisova, Salas, & Zagorchev, 2019; Pargendler, 2011). There are few studies that examine government ownership in publicly traded companies in Brazil related to corporate governance structure, firm performance or CEO compensation. Nevertheless, this is a current subject due to corruption problems surrounding government influence and/or its participation as owner.

To fill this gap and better understand the State's influence on firms and capital market, I propose to discuss the effects of government ownership of publicly traded companies in the Brazilian institutional and economic context in three essays. First, I analyse the Brazilian Government ownership in publicly traded companies through a meticulous investigation of the ownership structure of the Brazilian companies. I also investigate the influence of government ownership on CEO compensation, and the potential legislative impacts with the advent of the Brazilian

SOEs Law (Lei nº 13.303, 30 de junho de 2016). Choosing only one country can enable to concentrate and exploit heterogeneity across different firms and economic sectors instead of cross-country differences and understand more about the Brazilian context, which has not been approached.

I also verify whether the level of government ownership can influence the results through majority or minority participation of shares, as suggested by Inoue et al. (2013). Additionally, it is possible the State presence in a company's control group, even with minority shares of firms, could also influence the CEO's compensation level and corporate governance. I investigate these possible differences between totally private firms and SOEs under distinct equity arrangements. The impact of economic and political changes in the Brazilian economy during the sample period will also be taken into account because they can exert significant influence, as seen in recent studies (e.g., Beuselinck et al., 2017; Borisova et al., 2015).

The focus on Brazil allows this research to shed a light on this specific scenario about market vs. state-oriented development: as Baer (2014) presents, although the neoliberal reforms use as main argument the market is the best instrument to select winners, the Brazilian government still exerts a considerable influence on public companies and the capital market. He also emphasizes the importance of BNDES, since most firms, especially the large ones, depend on long-term loans from the Brazilian Development Bank.

The investigation of possible outcomes related to government interaction in publicly traded companies in Brazil can encourage debate about State presence in economic sectors whose purposes are not linked to social objectives. Actually, Chen et al. (2009) contrast different types of owners have distinct goals and motivations, which lead to different outcomes.

1.1 Theoretical background

Privatization⁵ programs became very popular in the 1980s, due to Margaret Thatcher in England. Despite Thatcher's government not being the first to launch a large privatization program, the word "privatization" was first used by her. Megginson and Netter (2001) present a relevant literature review about empirical studies on privatization, and they indicate that denationalization was first implemented in the Federal Republic of Germany in 1961. The authors illustrate the objective set with the privatization program: raise revenue for the State, promote economic efficiency, reduce government interference in the economy, promote wider share ownership, provide the opportunity to introduce competition, and subject SOEs to market discipline.

The success of the British privatization program inspired other countries to implement their own privatization programs in the 1980s and 1990s, including Brazil. This wave of privatizations highlighted the corporate governance principles, improved shareholder's protection and enhanced efficiency and transparency.

⁵The definition of privatization provided by Shleifer and Vishny (1997) is the replacement of political control by private control.

However, even with the privatization wave in the 1980s and 1990s, the State still figures as a shareholder or controller in the structure of many publicly traded companies around the world. Bortolotti and Faccio (2009) studied the change in government control of privatized firms in Organisation for Economic Co-operation and Development (OECD) countries, and they discovered that the government retained control of 62.4% of privatized firms in 2000. Brey et al. (2014) emphasize that there is relevant government participation, direct or indirect, in Brazilian companies even after privatization policies adopted since the 1990s in the country. This evidence denotes the relevance of studying the potential conflicts that emerges from the relationship of investors and management of publicly traded firms when an important figure also is present: the government.

Conflicts between stakeholders in publicly traded companies can arise in different forms depending on distinct aspects regarding capital structure, managerial and voting rights control. The conflicts between shareholders and managers are the typical agency problems introduced by Jensen and Meckling (1976) when there is dispersed ownership, as in the United States. In other countries, corporate ownership has another feature, particularly at countries with poor shareholder protection. Conflicts of interest can arise from controlling shareholders, which can be family members or even the State (La Porta, Lopez-de Silanes, & Shleifer, 1999)

When the corporate structure is highly concentrated, and/or in presence of family control, the conflicts fall on majority versus minority shareholders (Gorga, 2006). The presence of state control in public companies also has the potential to generate conflicts (Shleifer, 1998). The government could have other objectives than profit maximization, such as preventing monopoly pricing, reducing negative externalities, or encouraging specific investment or economic sectors over others (Laffont & Tirole, 1993). Indeed, SOEs fully owned by the government are the ultimate form of share dispersion: all the taxpayers would be the shareholders of this state enterprise.

As Zinnes et al. (2001) identify, asymmetric information and incomplete contracting problems can lead to two viewpoints when the ownership belongs to the State: the managerial view and the political view. The managerial view is related to the inability of the state to monitor managers. Monitoring problems are typical agency problems brought by Jensen and Meckling (1976), but these problems are increased, as pointed out by Borisova et al. (2015): “(...) since it is less likely that a firm with state ownership would be allowed to fail” (p. 170). This implicit guarantee from the government could allow managers to increase levels of risk-taking, and other shareholders would be less motivated to supervise management due to this guarantee. The political view is corroborated by Shleifer and Vishny (1994) and refers to possible interference to distort the firm objectives (profit maximization) to political goals and/or employment maximization. Privatization could correct some of these distortions caused by government ownership.

Laffont and Tirole (1993) relate conventional wisdom about the costs and benefits from government ownership in firms: generally, the costs are associated with the absence of cap-

ital market monitoring, soft budget constraints, expropriation of investments, lack of precise objectives and lobbying. The benefits around government ownership are supposed to generate social welfare and benefits from centralized control. However, they argue the relations are not straightforward, and sometimes any aspect related to costs could benefit the firm and vice-versa.

Much of the empirical research about government ownership is concentrated on private control and *majority* state ownership, as Inoue et al. (2013) point out. If the government holds most of voting shares, the negative effect of firm-level economic performance can be seen as a result of agency problems, politicians interference, and objectives other than profits, such as employment and/or low consumer prices. However, they argue that if the government holds minimum shares of firms, these problems may be attenuated: if the majority owners are profit maximizers, they will monitor the management and implement pay-performances practices or other governance mechanisms that can reduce agency conflicts. If there is no other form of residual interference by the State, the politicians will have little ability to interfere in investments or pricing decisions, leaving them to the controlling owners.

Musacchio, Lazzarini, and Aguilera (2015) highlight differences among SOEs related to the government ownership degree and classify them into four categories: wholly owned state-owned enterprises, the state as a majority investor, the state as a minority investor, and the state as a strategic supporter of specific sectors. They also propose three country-level conditions that should influence the effectiveness of each model of state capitalism and combine them with the four types of SOEs. According to them, for each scenario characterized by a lack of conditions (they use voids in production, capital markets, and key government capabilities), there is a type of SOEs that allows performance not so far from private companies. This proposed framework is relevant, as Musacchio et al. (2015) say, because “advocating privatization as a ‘solution’ can be immaterial because many governments (and their constituencies) remain reluctant to privatize firms in nationally strategic sectors” (p. 127).

However, this state capitalism view presented by Musacchio et al. (2015) is far from being a consensus. Megginson (2017) believes that state ownership has a distorting effect on corporate policies, as in capital spending, and the implicit guarantees to avoid bankruptcy also causes distortion. In his words,

(...) the research surveyed here convinces me that ‘state capitalism’ is an essentially failed model, at least for all but the most under-developed economies. The economic rise of China and the high oil-price regime of 2005-2014 made this seem a plausible model for development, but the abysmal relative performance of state-controlled versus private owned firms in key industries — especially petroleum, banking, and technology — clearly shows the model’s inherent weakness. State ownership of business will certainly remain an important economic fact, due to the size of the economies where state ownership is most prevalent and the currently dominant ownership position of national oil companies over petroleum reserves, but state capitalism is not the future. (p.140)

Despite the above, Megginson (2017) recognizes that it is difficult to determine whether government ownership is increasing or decreasing its relevance in the 21st century. This fact

relies on the rise of China as a global economic power, the importance of the oil sector (mostly SOEs) and the global crisis of 2008-10, in addition to others.

Gupta (2005) find that partial privatization has a positive impact on the profitability, productivity and investment of Indian SOEs. This result is important to determine the effect of partial privatization, where the government remains the controlling owner, and not only as a minority shareholder. This result suggests that performance improvement occurs due to managerial efficiency, and not by eliminating political interference.

Even when the equity stake size of government in public firms is not an issue, government ownership of public companies is not a consensus in the literature. Boubakri et al. (2005), e.g., study control relinquishment by the government in a diversified sample of 230 firms across 32 developing countries. The authors choose to study privatization in developing countries because generally, it is part of a major structural adjustment program, with macroeconomic reforms. They also argue that in developing countries, the privatization process is gradual and partial, whereby the government remains a shareholder. They empirically verify that privatization resulted in greater profitability and efficiency, but part of these results are explained by economic environment and reforms in addition to corporate governance variables, and not just by privatization itself. In their words, “(i)n countries where the legal protection of investors is weak, the efficiency gains and output increases are modest” (p. 788). They also contrast the results with those of previous studies concerning newly privatized firms from developed countries and argue that institutional factors in developing countries appear to drive performance improvement instead of firm-level factors in developed countries.

Government ownership can be harmful to minority shareholders but also generate improvements in operational and firm performance, as found by Pargendler, Musacchio, and Lazzarini (2013). The authors use three case studies of state-owned oil companies and claim that despite a possible disadvantage, investors can benefit from the existence of countervailing privileges from partnering with the government. The institutional environment is also relevant: they argue an independent regulatory presence can reduce the government interference, if the regulatory agency has equal influence on private and state-owned firms.

Borisova et al. (2012) investigate the relationship between corporate governance and government ownership in European countries from January 2003 to June 2009. These findings reveal a negative relationship among government ownership and governance quality, with this negative effect being stronger in civil law countries. The use of the golden share also increases the negative effect on corporate governance⁶. They found when publicly traded firms have the government as a shareholder, the numbers of board committees are smaller and the CEO has more power. This results can indicate that the State’s interests are not completely in line with firm’s objectives and there is an attempt to maintain control by concentrating power.

⁶The sub components that measure corporate governance quality in Borisova et al. (2012)’s study are based on board independence, the number of board committees, board entrenchment, committee independence, board transparency and CEO power.

Beuselinck et al. (2017) examine the value of firms with government ownership in Europe, finding that such firms faced a smaller reduction than firms without government ownership during the 2008-2009 financial crisis. This inference corroborates the perception of the government's commitment to bail out firms in times of economic distress. The authors argue that the government can bring facilities to financial resources, provide implicit guarantees to secure debt financing and help public companies during tough times (e.g., financial crisis). In fact, the government's active participation in the economy was crucial in some periods of history, as Megginson and Netter (2001) contrast:

The Depression, World War II, and the final breakup of colonial empires pushed government into a more active role, including ownership of production and provision of all types of goods and services, in much of the world. In western Europe, governments debated how deeply involved the national government should be in regulating the national economy and which industrial sectors should be reserved exclusively for state ownership. (p.323)

Regarding the capital structure and cost of debt, Abreu (2015) find the passenger transport companies owned by the government in Europe faced a higher cost of debt than non-SOEs enterprises during all period analyzed (2005-2012). However, different results can be observed in Borisova et al. (2015), with a larger sample and other economic sectors. The authors analyze a sample of public companies from 43 countries between 1991 and 2010 and find that on average, the cost of debt is greater for SOEs, but the relationship becomes negative and significant in financial crisis periods. Therefore, government ownership would assist in reducing the cost of capital in periods of exogenous financial difficulties, such as crises of global impact, but would be unnecessary in periods without financial constraints.

This evidence may provide a broader picture: the presence of the government may undermine some fundamentals to shareholders, but in times of financial crises, they can assist and preserve firm's value.

Even the dichotomy among pros and cons about government ownership can have a prevailing vision. Boubakri et al. (2018)'s research uses data from East Asia companies, and they found empirical evidence there is a premium from government-owned firms compared to their peers, especially when the government is the second blockholder. It appears that the benefits surpass the political and managerial costs concerning government ownership in publicly traded companies, but the relation is not linear: if government control rights are greater than 50%, this is related to lower market valuation. Once again, the results reinforce the idea government ownership must be analyzed through participation forms, i.e., majority, minority, control group and so on.

2 Government Ownership in Brazilian Public Companies

Brazilian companies are well known in the literature as family-led enterprises, with great influence by family groups, as seen in Aldrighi and Mazzer Neto (2005); Estrin et al. (2019); Fainshmidt, Judge, Aguilera, and Smith (2018). Notwithstanding this, the Brazilian government has considerable influence on Brazilian public companies, as described by Musacchio and Lazzarini (2015). Furthermore, if we consider the indirect influence of the Brazilian government, a greater importance of the State in Brazilian publicly traded companies can be deduced, as seen in Abreu, Grassi, and Del-Vecchio (2019). The authors analyze the structure of control through centrality measures and assortativity to reveal the pyramidal structure in Brazilian public companies. In their research, they reveal that the Brazilian government owns a significant number of companies directly or through ties. The results indicate that four of five major companies with a greater diversification of their portfolios are public banks (in this case, BNDES), SOEs (Eletrobras), and SOEs' pension funds—the pension fund for Petrobras's employees (PETROS) and the pension fund for Banco do Brasil's employees (Previ). Only Blackrock, the world's largest financial asset manager, presents itself as a relevant investor in publicly traded Brazilian companies that are not linked to the Brazilian government.

This evidence highlights the important role and influence of the Brazilian government in the capital market, as well as a major investor among companies in Brazil.

To analyze the main interest variable, *Government ownership*, it is imperative to understand the ownership structure of Brazilian companies. Lazzarini (2011) refers to its structure as ties, that is, the strong presence of pyramids, marked by interconnected agglomerations.

2.1 Government ownership classification

To conduct my research, I selected all the Brazilian publicly traded companies that were active during the sample period for at least for one year. For example, companies that went out of business or closed capital in 2010, the first year of our sample, were not included in the analysis, as well as companies that went public in 2019, the last year of our sample.

Once shares with different voting rights are common in Brazil, it is imperative to investigate the differences vis-à-vis control and cash flow rights. Notwithstanding the efforts, especially

regarding the existence of voluntary listing levels on the stock exchange in Brazil, Brasil, Bolsa e Balcão - Brazilian Exchange (B3), many companies still have had dual-class shares. The existence of non-voting shares is widely used to maintain control with less than 50% of the company's total equity, as discussed by Matos (2017). The author highlights that it is possible for companies to issue 2/3 of their capital in non-voting class shares until 2002. From that date, this proportion was reduced by 1/2, but only for new companies.

Owing to this dual-class share structure in Brazilian companies, it is crucial to investigate whether the government ownership of non-voting shares also has some influence on Brazilian publicly traded companies' decisions or if the results are driven only when the government has voting shares and the benefits of control.

For *Government ownership*, the main variable of interest, State ownership is defined by those shares that belong to the National Treasury (Tesouro Nacional), public banks (e.g., Caixa Econômica Federal and Banco do Brasil), development banks (BNDES), Brazilian SOEs, pension funds of Brazilian SOEs (e.g., Fundação dos Economiários Federais - the pension fund for Caixa's employees (FUNCEF), Previ, PETROS, and the pension fund for Correios's employees (Postalis)), and companies that are created to manage these holdings by the Brazilian government (e.g., BNDESPar or CaixaPar).

I follow Brey et al. (2014)'s work and classify government ownership as direct or indirect, albeit with some modifications. When the government has shares through the National Treasury, state agencies (municipal, state, and federal levels), public banks, government managed funds, development banks, and public holdings (e.g., BNDESPar or CaixaPar), it would be classified as direct government ownership (*dgo*). When the pension funds of Brazilian SOEs or other Brazilian SOEs have shares from other companies, I consider this as indirect government ownership (*igo*)¹. In the A Appendix, two tables present all the government institutions, pension funds, and other private companies that I consider to be direct or indirect government ownership in this study².

However, Brey et al. (2014) classify government ownership in distinct levels in the context of direct and indirect ownership. If the government itself is a shareholder of a company, it should be considered as first-level direct ownership. If this company wherein the government is a shareholder has shares of another public company, this should be classified as second-level direct ownership, and so on. In my study, as the main objective is to relate the degree of government ownership with other variables, I propose the use of the percentage of government ownership, even when the government is not the direct shareholder, but through levels as in Brey et al. (2014)'s work. Nevertheless, it would not be necessary to distinguish the government's participation in levels once I compute the proportion of ownership.

The pension funds of Brazilian SOEs are a spotlight on indirect government ownership be-

¹In Brey et al. (2014)'s work, SOEs ownership is also considered as direct government ownership.

²In Table A.2, I do not mention all the public companies that the government has direct or indirect ownership and also owns other public companies.

cause they are responsible for several investments in capital markets. Although they are not directly controlled by the government, they are still highly influenced by it. Recently, some investments of Brazilian SOEs pension funds have been under investigation by the Brazilian Federal Police (Greenfield Operation) because there are suspicions of misconduct, administrative dishonesty, and corruption, as seen in Casado, Schincariol, Torres, and Goes (2016).

It is important to highlight some aspects of ownership structure: several Brazilian firms have pyramidal structures of ownership and control. Even if the government does not directly participate (through the National Treasury, state agencies, or development banks), it can also appear as a shareholder of another company that owns shares of other companies. This situation can be illustrated via pyramidal structures, that is, when Firm A controls Firm B, which in turn owns Firm C. Indirectly, Firm A controls Firm C through this pyramidal structure. As a practical example, in 2018 Petrobras controlled Petrobras Distribuidora SA with 71.25% of the total shares. Once the Brazilian government controls Petrobras with 63.52% of the voting shares (sum of Brazilian government, BNDESPAR, Caixa, and BNDES's ownership, as seen in Figure 2.1), the Brazilian government indirectly controls Petrobras Distribuidora at the time.

Analyzing the pyramidal structure is also essential to verify not only the control rights but also the cash flow rights when the government does not directly appear in the firm's ownership structure, as seen in Petrobras Distribuidora's example given above. In this case, even though the Brazilian government does not own Petrobras Distribuidora's shares directly, it has 32.79% of the cash flow rights through Petrobras³.

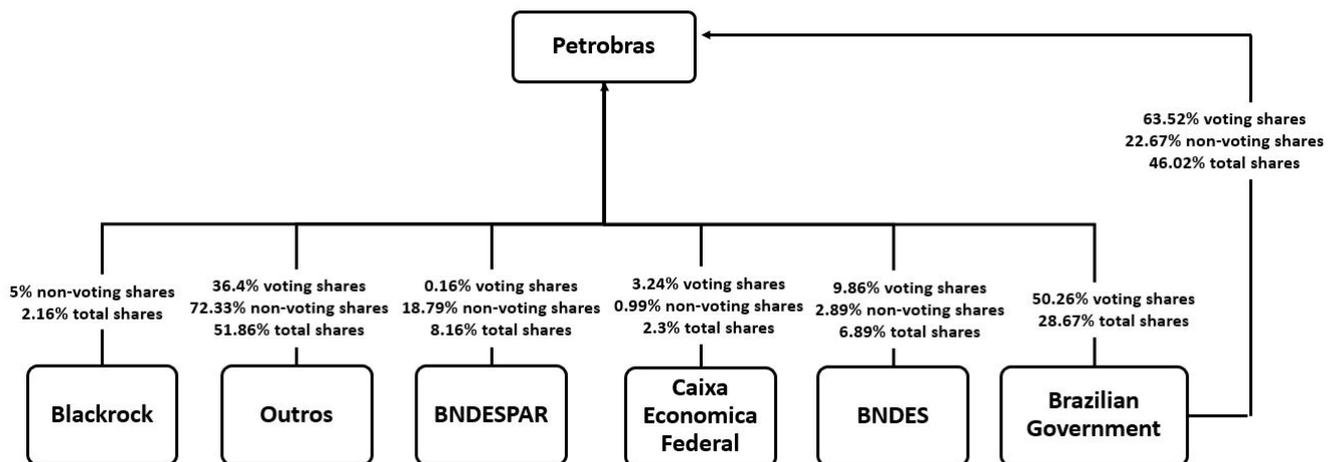


Figure 2.1
Petrobras' shareholders' composition - 2018

³Once Petrobras owns 71.25% of the ordinary shares of Petrobras Distribuidora, and the Brazilian government owns 46.02% of the total shares of Petrobras; thus, indirectly, the Brazilian government has $46.02\% \times 71.25\% = 32.79\%$ of Petrobras Distribuidora's shares. These data refer to 2018, and Petrobras Distribuidora does not have dual-class shares.

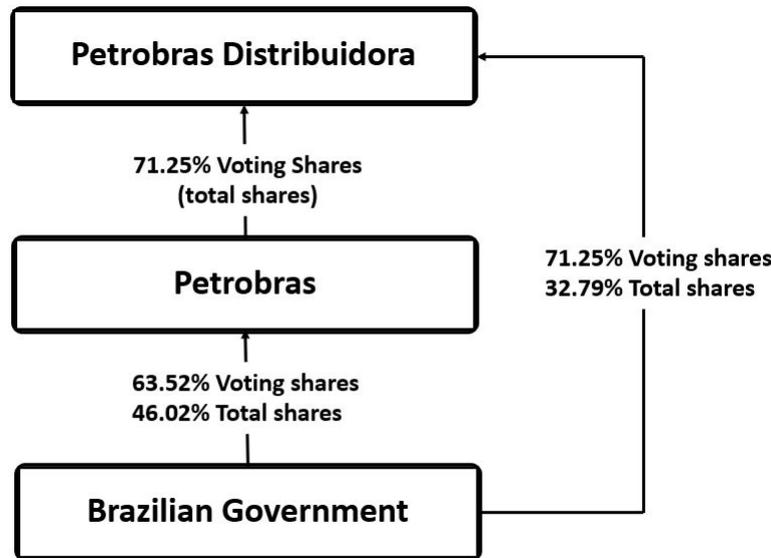


Figure 2.2
Petrobras' shareholders' composition - 2018

It is worth noting that the method of computing the percentage of shares owned indirectly by the Brazilian government can vary when the issue is about control or cash flow rights. Following the methodology proposed by Aldrighi and Mazzer Neto (2005), we can obtain the cash flow rights by multiplying the total shares owned by one company to the percentage of the total shares owned by the government, especially in this specific case. The result would be the percentage of cash flow rights indirectly owned by the Brazilian government, as explained before.

However, to measure the percentage of control rights, Aldrighi and Mazzer Neto (2005) state that it is imperative to examine if the ultimate shareholder is the controller of the publicly traded company. If the shareholder who controls the company is an SOE, this means that Brazilian government also controls it. Nevertheless, when the shareholder that has ties to the government is not the controller of the public company to be analyzed, the percentage of control rights is defined as well as that of the cash flow rights, that is, by multiplying the ordinary shares owned by one company to the percentage of that owned by the government.

Thus, illustrating this situation with Petrobras Distribuidora's example described above, it could be considered that in 2018, the Brazilian government indirectly had 71.25% of its control rights. This occurs because Petrobras is controlled by the Brazilian government at the time. Once Petrobras controlled Petrobras Distribuidora, the Brazilian government also controlled it through Petrobras. Petrobras Distribuidora's 2018 ownership structure can be depicted as shown in Figure 2.2.

Conversely, I can present Braskem's example. In 2018, Petrobras had 47.03% of its ordinary shares, but it did not control Braskem at the time. Following Aldrighi and Mazzer Neto (2005)'s methodology, the Brazilian government had 29.88% of the control rights of Braskem in 2018 (47.03% of Petrobras's ordinary shares \times 63.52% the Brazilian government's ordinary

shares of Petrobras). This example is illustrated in Figure 2.3.

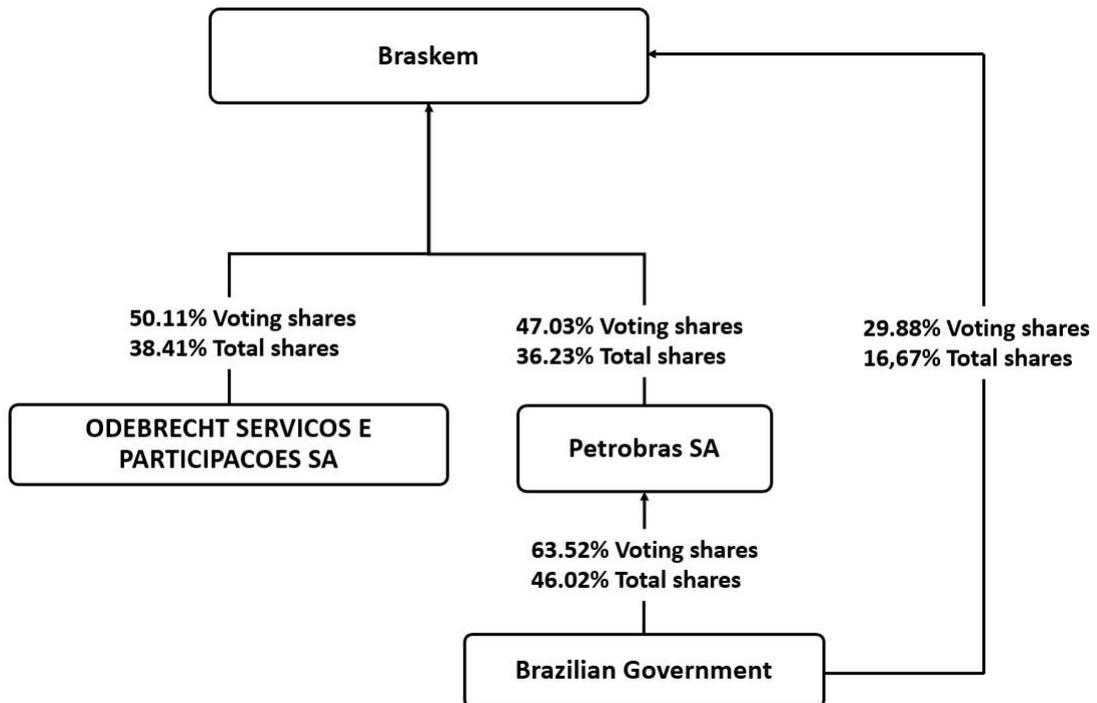


Figure 2.3
Braskem's shareholders' composition - 2018

It should be noted that, in the aforementioned Petrobras Distribuidora and Braskem examples, the Brazilian government held indirect shares according to this methodology, that is, through a Brazilian SOE (in this case, Petrobras). Elektro is another example of indirect government ownership through the pyramidal structure and SOE's pension funds. In 2018, Previ, a pension fund for Banco do Brasil employees, held shares in Neoenergia SA, which in turn controlled Elektro. Elektro's shareholders' composition can be seen in Figure 2.4.

However, it is possible that the Brazilian government has both direct and indirect ownership in some Brazilian public companies. Vale SA is a good example. In 2018, BNDESPAR had shares of Vale, such as Litel Participações. Once Previ and PETROS had shares of Litel at the time, the Brazilian government had an indirect ownership through these pension funds, and a direct ownership via BNDESPAR's shares. This diagram is shown in Figure 2.5.

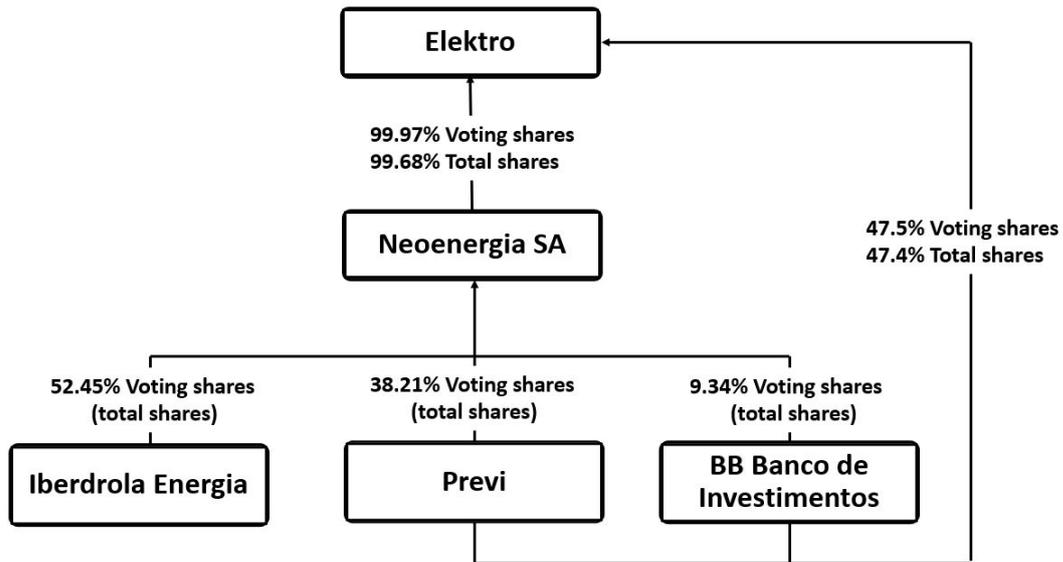


Figure 2.4
Elektro’s shareholders’ composition - 2018

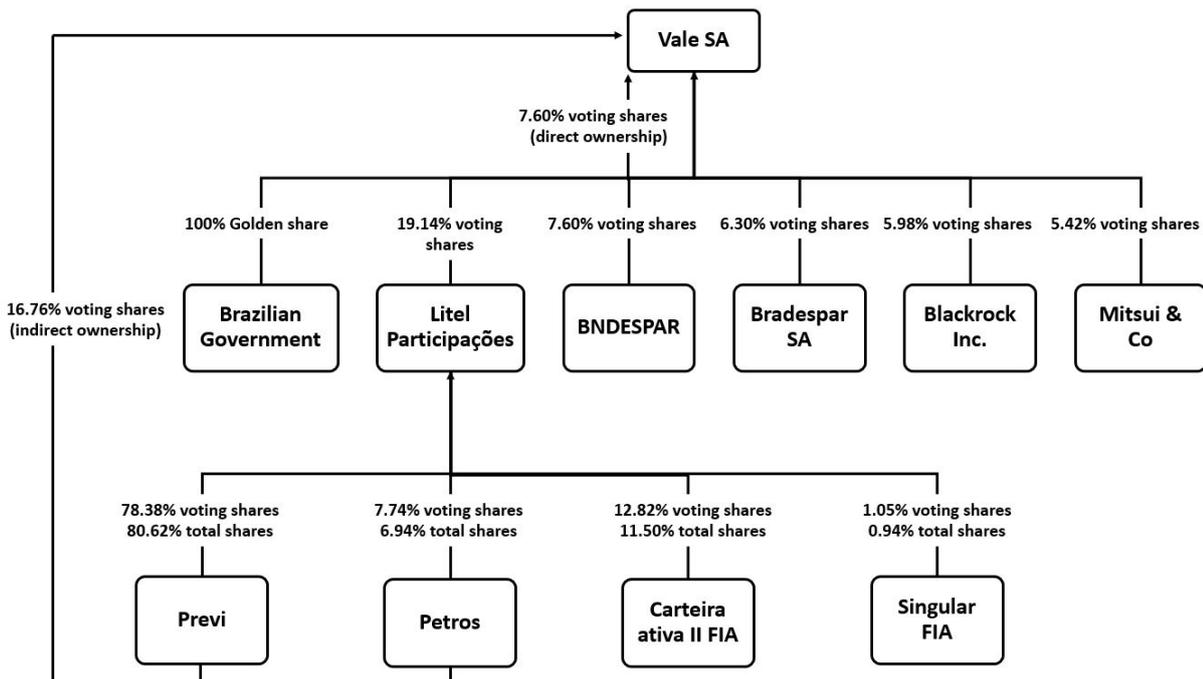


Figure 2.5
Vale’s shareholders’ composition - 2018

In this research, I assume that a controller is the company (or person) that has 50% or more of the voting shares. I do not consider the shareholders’ agreement because, in this case, the decision-making power would be diluted among different types of shareholders, thereby moving us away from the objective of analyzing the government’s influence on publicly traded companies.

To establish a threshold about the minimum ownership of shares that the government can somewhat influence a public firm, I rely on Lei n° 6.404 (15 de setembro de 1976), the Brazilian law that provides the rules about business corporations. By this law, when a shareholder has a minimum of 10% of the total shares, a stockholder can require a company's management to call a special shareholders' meeting. If the shareholder has 10% of the voting shares, he/she can also require the adoption of multiple votes for the board of directors. It is also possible to elect non-voting share owners and remove one member as well as his/her alternate member of the board of directors if they have at least 10% of a company's total capital stock. Therefore, I consider a relevant ownership to be one where the government holds 10% or more, or more of the company's shares. This 10%-minimum ownership can be through common or preferred shares, with direct and/or indirect participation.

2.2 Sample and Statistics

I seek to verify the level of Brazilian government ownership in Brazilian publicly traded companies between the years 2010 to 2019. Notwithstanding that Brazil transformed itself from a system whereby the State controlled several enterprises to a system that privatized many firms and opened up to foreign competition between 1980 and 2014, the Brazilian government still maintained its ownership in some strategic businesses (Musacchio, Lazzarini, & Schneider, 2016).

I collected the ownership data of all Brazilian publicly traded companies through the Comdinheiro platform, as well as the information available in the balance sheets and Securities and Exchange Commission of Brazil (CVM)'s mandatory reports, especially in the Reference Form. Although the Comdinheiro platform provides data about the names and percentages of the shareholders, it is crucial to verify if the Brazilian government can benefit itself through pyramidal structures, as seen in the examples given in the previous section. For this reason, I analyzed all the companies' ownership data manually.

I collect the data of 422 Brazilian publicly traded companies from 2010 to 2019, totaling 3367 firm-year observations⁴.

To verify the government ownership in each firm-year observation, this study uses a unique set of variables to capture and understand these distinctiveness of government ownership in Brazilian publicly traded companies. First, I classify all the companies that have a dual-class share, considering its importance, to define the government participation in control and cash flow rights. It is worth mentioning that 207 of 422 firms (49% of all public companies' sample) have had dual class shares for at least one year in the sample period. This fact shows the relevance of studying the control and cash flow rights in the Brazilian stock market. Table 2.1 presents all the classifications for government ownership used in this research.

⁴The total number of observations was because some firms held their initial public offering and others went private during the sample period.

Table 2.1
Government ownership variables

Government ownership variables (%)	Description
<i>dgo_on</i>	direct government ownership through voting rights
<i>igo_on</i>	indirect government ownership through voting rights
<i>tgo_on</i>	total government ownership (both direct and indirect) through voting rights
<i>dgo_pn</i>	direct government ownership through non-voting shares
<i>igo_pn</i>	indirect government ownership through non-voting shares
<i>tgo_pn</i>	total government ownership (both direct and indirect) through non-voting shares
<i>dgo_cf</i>	direct government ownership through cash-flows rights
<i>igo_cf</i>	indirect government ownership through cash-flows rights
<i>tgo_cf</i>	total government ownership (both direct and indirect) through cash-flows rights
<i>government ownership</i>	dummy variable equal to 1 if the government had shares (directly or indirectly) of any kind of voting rights of a firm <i>i</i> , and 0 otherwise

The Brazilian government had (and still has until this publication) golden shares for three companies: Vale, Embraer, and IRB Brazil—the Brazilian Reinsurance Institute. Once these golden shares represented a small fraction of government ownership I did not consider their influence in the present study.

Table 2.2 summarizes all the descriptive statistics involving government ownership variables.

We should notice that although the government had considerable ownership in some public companies, reaching 100% of the total shares in some cases, the mean was very low. In an additional analysis, Table 2.3 presents the descriptive statistics only for public companies that the Brazilian government has had some influence through ownership shares, direct or indirectly, in the sample period. Applying this filter, we have 881 firm-year observation, and unique 131 firms the Brazilian government have shares according to the methodology presented in Section 2.1.

We can infer from Table 2.3 that the Brazilian government ownership in publicly traded companies is usually through voting shares, and it captures the benefits of control. However, only 24 companies were government-controlled and matched the Brazilian definition of SOEs: listed companies for which the government owned more than half of the voting right shares.

Table 2.2
Descriptive statistics - government ownership variables - Total sample

Variable	Min	Pctl(25)	Median	Mean	Pctl(75)	St. Dev.	Max
DGO_ON	0	0	0	6.60	0	21.07	100
DGO_PN	0	0	0	2.51	0	12.55	100
DGO_CF	0	0	0	5.89	0	18.33	100
IGO_ON	0	0	0	4.07	0	13.47	100
IGO_PN	0	0	0	2.09	0	9.85	100
IGO_CF	0	0	0	4.45	0	13.79	100
TGO_ON	0	0	0	10.67	0	24.73	100
TGO_PN	0	0	0	4.60	0	15.99	100
TGO_CF	0	0	0	10.34	8.3	22.82	100

Note: These statistics refer to all the 3367 firm-year observations (422 unique firms). The description of government ownership variables are presented in Table 2.1.

Table 2.3
Descriptive statistics - Firms with government ownership

Variables	Min	Pctl(25)	Median	Mean	Pctl(75)	St. Dev.	Max
DGO_ON	0	0	0	25.24	50.3	35.04	100
DGO_PN	0	0	0	9.57	0	23.12	100
DGO_CF	0	0	8.4	22.51	36.0	30.19	100
IGO_ON	0	0	7.77	15.54	22.24	22.71	100
IGO_PN	0	0	0	7.97	0	18.00	100
IGO_CF	0	0	10.43	17.02	22.35	22.64	100
TGO_ON	0	15.03	29.08	40.78	66.25	33.32	100
TGO_PN	0	0	0	17.54	22.9	27.40	100
TGO_CF	1.84	17.46	29.60	39.53	55.04	28.93	100

Note: These statistics refer to only the 881 firm-year observations and unique 131 firms (when the Brazilian government owned some of the firms' shares). The description of government ownership variables is presented in Table 2.1.

Although the Brazilian SOEs' legal definition from the Brazilian SOEs Law (Lei nº 13.303, 30 de junho de 2016) is when the government has the majority of voting shares through the municipal, state, district, federal, or indirect administration (e.g., public foundations and SOEs), in this study I do not consider the Brazilian SOEs' ownership as direct ownership, unless they are

public/development banks. I make this methodological choice to distinguish government influence when it is directly related to the control of Brazilian publicly traded companies. When public companies are SOEs through other SOEs ownerships, government control is not as evident as when the government owns shares by public administration, public banks, or development banks. Moreover, there are few companies that match this legal definition of SOEs through other SOEs ownership, as Petrobras Distribuidora, Eletropar, CEE Distribuição, and CEE Geração e distribuição in this sample's study. The list of SOEs, as well the control ownership is presented in Table A.3 of the Appendix.

In Table 2.4, I present the numbers of firm-year observations by sector. For this classification, I used the sector information provided by the Economatica database, using its own classification. In this table, I exhibit the firm-year observations with government ownership and their proportion related to the full sample. The electric power sector is a good example of strategic business that the government still maintains ownership, according to Musacchio et al. (2016): the Brazilian government is a shareholder in 75% of all the firm-year observation related to this sector. This is also evident in firms wherein the Brazilian government has control: eight out twenty four SOEs are related to the electric power sector. The government ownership in the finance and insurance sector also deserves some consideration: 37.5% of Brazilian SOEs in the sample belong to it, and the proportion of the government ownership for all this sector is approximately 33%. However, the government has almost no shares in certain sectors such trade and construction.

Table 2.4
Proportion of government ownership by sector

Sector	Only companies with Full Sample government ownership		Proportion
	Companies*	Companies*	
Agriculture & Fisheries	3	43	7%
Basic & Fab Metal	50	208	24%
Chemical	34	98	35%
Construction	1	255	0.4%
Electric Electron	2	62	3%
Electric Power	317	425	75%
Finance and Insurance	104	317	33%
Food & Beverage	42	153	27%
Industrial Machine	9	53	17%
Mining	13	43	30%
Nonmetallic Minerals	0	33	0
Oil & Gas	14	81	17%
Other	110	721	15%
Pulp & Paper	20	49	41%
Software & Data	31	57	54%
Telecommunication	27	68	40%
Textile	11	198	5%
Trade	0	170	0
Transport Services	39	181	22%
Vehicle & Parts	54	152	36%
Total	881	3,367	26%

Note: *Company-year observations.

Table 2.5 shows the descriptive statistics of assets in two groups: firms with and without government ownership. In all the sample years, the average asset of companies where the government is a shareholder, directly or indirectly, is higher, and the difference is statistically significant.

The Return on Assets (ROA) for the firm's sample are presented in Table 2.6. Although the return seems to be higher in firms whereby the government has shares, the t-test cannot reject the null hypothesis, and the mean values are the same.

Table 2.5
Descriptive statistics - assets

Year	Firms without Government Ownership				Firms with Government Ownership			
	Mean	St dev	Max	Min	Mean	St dev	Max	Min
2010	13.89	2.14	20.44	3.43	15.14	2.21	20.51	8.50
2011	14.15	2.09	20.56	4.91	15.16	2.15	20.70	9.44
2012	14.21	2.00	20.73	6.24	15.15	2.19	20.86	9.03
2013	14.24	2.10	20.83	4.66	15.12	2.09	20.99	9.97
2014	14.37	2.14	20.91	5.26	15.10	2.22	21.09	9.73
2015	14.47	2.10	21.03	6.36	15.03	2.29	21.06	9.90
2016	14.39	2.13	21.08	6.38	14.98	2.39	21.06	9.87
2017	14.43	2.14	21.13	7.79	15.18	2.33	21.04	9.82
2018	14.43	2.20	21.22	6.04	15.36	2.30	21.07	9.77
2019	14.71	2.11	21.28	9.20	15.46	2.37	21.11	9.75

Note: The assets are represented by the natural logarithm of total assets in thousands (local currency - R\$). The t-test rejects the null hypothesis the two means are equal with 99% confidence ($t = 10.1$; $df = 15.389$; $p\text{-value} = 3.46e^{-08}$).

Table 2.6
Descriptive statistics - return on assets

Year	Firms without Government Ownership				Firms with Government Ownership			
	Mean	St dev	Max	Min	Mean	St dev	Max	Min
2010	-1.23	19.57	1.99	-314.76	0.03	0.15	0.49	-0.87
2011	-0.03	0.52	1.12	-6.83	0.04	0.10	0.36	-0.39
2012	-0.06	0.62	0.52	-6.61	-0.02	0.28	0.24	-1.73
2013	-2.82	42.81	0.80	-670.09	0.01	0.20	0.28	-1.80
2014	-0.41	6.58	11.89	-100.18	0.00	0.16	0.33	-0.92
2015	-0.06	0.46	0.29	-5.92	-0.03	0.29	0.55	-2.27
2016	-0.08	0.73	2.22	-8.26	0.08	0.50	4.50	-0.66
2017	-0.11	0.92	0.78	-11.19	0.03	0.10	0.30	-0.52
2018	-0.03	1.28	14.54	-11.74	0.03	0.10	0.38	-0.33
2019	-0.05	0.87	0.59	-13.55	0.04	0.12	0.45	-0.44

Note: The t-test does not reject the null hypothesis the two means are equal ($t = 1.785$; $df = 9.0214$; $p\text{-value} = 0.1078$).

2.3 Discussions and Implications

In this chapter, I presented all the methodology to classify government ownership in Brazilian publicly traded companies. In the next chapters, I use this singular classification and data to verify if the government presence can influence Chief Executive Officer (CEO)'s compensation, a significant corporate governance mechanism. I also use the Brazilian SOEs classification to identify Brazilian companies that are fully controlled by the Brazilian government to perform an event study about the discussion and implementation of the Brazilian SOEs Law (Lei n^o 13.303, 30 de junho de 2016), an important milestone for Brazilian SOEs.

These data corroborate the relevance of the Brazilian government in the Brazilian capital market: as shown in Table 2.4, 26% of all the firm-year observations had some government influence through shares, directly or indirectly. Even with the privatization wave in the last decades, the Brazilian government still figures as an important player in the Brazilian capital market.

Additionally, with this unique database, it was possible to analyze the sectors with great government influence through shares. It appears that the Brazilian government endorses investments in these strategic sectors, such as electric power and finance. In addition, the firms with government ownership are bigger than firms without it. In line with Lazzarini et al. (2015)'s conclusion, the Brazilian government neither promotes nor assist companies through capital markets, as well as the BNDES' loans and equity allocation does not appear to have any effect on firm performance, once firms that borrow from the Brazilian development bank could raise money from the market, with no need for governmental subsidies. Nonetheless, the Brazilian government does not seem to invest in smaller, less profitable companies, thus contradicting the political view that state-owned companies are less profitable, as there are not significant differences in ROA among them in this research' sample.

3 Government Ownership and CEO Compensation in Brazilian Public Companies

Asymmetric information is a market failure relevant to the capital market, especially when there is separation of ownership and control, as in publicly traded companies. The conflicts between shareholders and managers are the typical agency problems introduced by Jensen and Meckling (1976, p. 308), when there is dispersed ownership: “(i)f both parties to the relationship are utility maximizers there is good reason to believe that the agent will not always act in the best interests of the principal”.

Since the manager has more information than the owners, the shareholders appeal to the monitoring expenditures in order to ensure that the manager’s actions are on their behalf. The manager also resorts to bonding expenditures to guarantee that he will not take certain actions that would harm the owners (and his job). These two costs, *bonding* and *monitoring*, plus the *residual loss* (monetary equivalent loss of welfare) are the agency costs inherent due to this relationship (Jensen & Meckling, 1976).

Several corporate governance mechanisms may mitigate this agency problem. Executive compensation is one of these recognized mechanisms for aligning managerial interests to investors (Becht, Bolton, & Röell, 2003), once there should be a link between compensation and firm performance. However, there is a different approach that points out executive compensation as an *agency problem itself*: some features of this compensation could reflect managerial rent-seeking rather than efficient incentives. Bebchuk and Fried (2003) mention that to the extent that executive compensation moves away from optimal contracting, the more powerful is the CEO. The CEO’s pay could be higher or less sensitive to performance in firms in which managers have relatively more power.

In fact, Bebchuk, Cremers, and Peyer (2011) offer a new proxy to measure CEO power as the fraction of the aggregate compensation of the firm’s top-five executive team captured by the CEO: the CEO pay slice. They argue that the higher the CEO pay slice is, the higher should be the CEO’s managerial power. They find a statistical association between higher CEO pay slices and lower firm value, accounting profitability, quality of acquisition decisions, CEO turnover and higher odds of opportunistically timed option grants to the CEO. These findings justify

the managerial power hypothesis and the perception the compensation arrangement is far away from optimal contracting.

Therefore, there are two distinct alternatives with theoretical explanations this issue: CEO compensation as a corporate governance mechanism and CEO compensation as a managerial power expression and hence an agency problem.

However, Bugeja, Matolcsy, and Spiropoulos (2017) analyze a sample of 9948 U.S. listed firm-year observations and do not find evidence that supports managerial power's approach based on CEO pay slices and excessive compensation. This result suggests CEO compensation is consistent with an efficient contracting explanation. Murphy (2012), on the other hand, says these two approaches are not mutually exclusive. He argues that political factors and government influence through disclosure requirements, tax policies, accounting rules, legislation, and the general political climate also have a substantial impact on compensation policy:

Indeed, what makes CEO pay both interesting and complicated is the fact that the efficient contracting, managerial power, and political paradigms co-exist and interact. In introducing plans that tie pay more strongly to performance as demanded by shareholders, directors routinely agree to pay more than necessary to compensate for the increased risk. Self-interested CEOs seek employment protection through overly generous severance provisions; directors acquiesce believing that the probability of failure is low (and because it is not their money anyway). When compensation failures occur (such as those overly generous severance payments), Congress gets outraged, triggering disproportionate reforms with little regard for shareholders or value creation. In turn, companies and their executives respond by circumventing or adapting to the reforms, usually in ways that increase pay levels and produce other unintended (and typically unproductive) consequences.(p. 156)

In his article, Murphy (2012) conducts a remarkable historical survey about the changes in US legislation that has influenced executive compensation since the Great Depression. He also offers a new approach to the influence of executive compensation: government intervention. He explains that the government can influence through the legislative process and it can distort the compensation arrangement, as seen in the stock option explosion¹.

However, the main focus concentrates on government indirect intervention in the form of securities laws, accounting rules, tax policies and other mechanisms that can influence CEO pay. Borisova et al. (2019), on the other hand, study the direct impact of government intervention: their research compares the level of CEO compensation and its structure in private and privatized firms.

Using a sample of 677 EU firms from 2003 to 2008, Borisova et al. (2019) compare CEO compensation in publicly traded firms that have never been under government control (referred to as *de novo* private firms) and privatized firms, including those still partially owned by governments. They argue that even if government relinquishes ownership in privatized firms, there is still the government's influence on those firms. The authors show that CEOs of privatized firms

¹Murphy (2012) cites executive and director's preferences in the 1990s but also highlights change in tax accounting rules and disclosure as responsible for large quantities of stock options being granted to executives.

have lower total pay compared to those of *de novo* private firms. They also found the larger is the government ownership in privatized firms, the lower the total compensation.

These findings are consistent with political and media pressure limiting compensation in privatized firms. In their sample, privatized firms also have lower equity pay components of compensation, suggesting government-owned companies are less risk-taking than *de novo* private firms.

However, in an environment in which the government still controls most resources and has a significant influence on the economy, such as China, even the compensation of private firms could be affected by it. Wu, Li, Ying, and Chen (2018) find that the presence of politically connected CEOs is positively related to CEO compensation and even firm performance. In countries with weak institutions and low shareholder protection, state involvement can be vital to the success of the company.

In Brazil, mandatory disclosure about CEO compensation is relatively new. Brazil's Security and Exchange Commission - CVM - imposed the mandatory executive compensation disclosure through 480 Instruction (Comissão de Valores Mobiliários, 2009). All the public Brazilian companies were supposed to provide details about compensation of the Executive Board and the Board of Directors from the 2010 Reference Form.

However, as Schiehl, Terra, and Victor (2013) and Barros, Silveira, Bortolon, and Leal (2015) relate, the association of Brazilian publicly traded companies -Brazilian Association of Listed Companies (ABRASCA) - and the Brazilian institute of financial executives - Brazilian Institute of Finance Directors (IBEF) - contested this mandatory disclosure, specially about the exposure of minimum, maximum, and average individual compensation. They alleged risks to executive' security due to higher crime rates in Brazil.

Although Barros et al. (2015) argue that it is possible that agency conflicts rather than safety issues motivate this attitude against mandatory disclosure, this issue was the subject of a judicial battle until 2018. Several Brazilian public companies had obtained an injunction from the court in 2010 that allowed them to not disclose all details about executive and board compensation. In 2018, the Brazilian Federal Regional court decided to granted CVM and overturn the injunction (Schincariol, 2018). On June 13, 2018, the CVM communicated by letter to all the firms protected by the injunction that they must provide compensation data for the last three fiscal years (since 2015) until June 26, 2018 (Comissão de Valores Mobiliários, 2018).

Now, the mandatory disclosure about compensation in Brazil enables new research, including studies about the Brazilian government influence on executive compensation in publicly traded companies. Even when the executive and board compensation in Brazil was not full disclosed, there was previous notable research that approaches this issue, such as Barros et al. (2015); Ermel and Do Monte (2018); Krauter and Sousa (2013); Schiehl et al. (2013).

3.1 Research Question and Hypotheses

Borisova et al. (2019) argue that the government can directly affect the level of compensation among public firms through voting power or its significant influence. This can happen due to differences in corporate governance, managerial power, risk taking, non-pecuniary benefits or media pressure.

From the corporate governance perspective, Jiraporn, Kim, and Davidson (2005) find empirical evidence that CEO pay is inversely related to the strength of shareholder rights: when corporate governance mechanisms are weak, the CEO can extract more rents from shareholders.

Borisova et al. (2012) argue that corporate governance is weaker in the presence of government ownership. So, it is reasonable to suggest that firms with government ownership could pay more to the CEO due to weak corporate governance mechanisms, based on evidence from Borisova et al. (2012) and Jiraporn et al. (2005).

However, Borisova et al. (2019) relate that it is possible that CEOs of government-owned firms accept lower compensation in return for non-pecuniary benefits, such as job security and/or political benefits. Even social status is a valuable non-monetary symbol that can substitute for monetary compensation (Siming, 2016). Then, it is possible that CEOs from firms with government ownership have lower levels of compensation. In fact, Borisova et al. (2019) find that CEOs of privatized firms have lower total pay than those of private firms.

In addition to the level of executive pay, the type of compensation can vary depending on the shareholder: from the agency theory perspective and efficient-contracting hypothesis, linking CEO compensation to firm performance could decrease agency costs and aligning interests between principals and agents (Holmstrom, 1979). Nonetheless, this type of compensation impacts the level of risk: the greater the equity-based pay, the more risk the CEO is willing to take.

Thus, the payoff from stock options or other equity-based pay is riskier than other compensation forms (e.g., restricted options and base salaries). This type of remuneration can indicate the risk level of the firm: when the compensation arrangement includes high stock options pay-offs, one can expect the executive members will be more audacious to achieve their goals (e.g., choosing more risky projects) and receive higher compensation from shareholders.

It's important to recognize the government influence on executive pay brings a new dimension to the analysis of CEO compensation, since the government's interests differ from other shareholders (Murphy, 2012). Boubakri, Cosset, and Saffar (2013) assert that the government's objectives as maximizing employment and wages to ensure re-election and maintain political tenure in power are not necessarily in line with profit or value maximization. In their research, they find empirical evidence that state ownership is negatively related to corporate risk-taking.

Furthermore, Borisova et al. (2019) cite media and political pressure as possible explanations to lower salaries in government-owned firms. Public pay disclosure encourages revolts about CEO pay, and it is highly influenced by the media, labor unions, and political forces

operating inside and outside companies (Murphy, 2012).

Thus, according to the theoretical and empirical evidence, my main research question on this study is to investigate whether government ownership can induce differences in the compensation level amidst Brazilian publicly traded companies. Related to this main question, I consider whether different types of government ownership (direct and indirect) and control can also affect the CEO's compensation level. The chapter 2 brings all the types of government ownership I used in this research.

This research differs from other papers published about this subject because it intends to take the Brazilian scenario and all institutional, financial and political characteristics. Borisova et al. (2019)'s sample include several countries from the European Union (EU), and their work does not include potential differences in compensation level during the financial crisis.

Despite the efforts and remarkable work of Anuatti Neto et al. (2003); Bandeira-de Mello et al. (2011); Inoue et al. (2013); Lazzarini and Musacchio (2018); Musacchio et al. (2015), there are few studies that address this issue in Brazil. Furthermore, the implications of the world financial crisis of 2008-2009 are not the same for all the countries, especially in Brazil. While the world's GDP growth in 2009 was about $-1,733\%$, in Brazil, the GDP growth was $-0,126\%$. On the other hand, the Brazilian GDP dramatically declined in 2015 and 2016 ($-3,55\%$ and $-3,468\%$, respectively), whereas the world GDP increased (2,856 and 2,513, respectively)². These data reinforce the Brazilian scenario heterogeneity, and my research allows understanding more about government influence in Brazilian capital markets and its unique set.

Furthermore, it is important to stress that studying government participation in publicly traded companies suffer from potential selection bias. As Borisova et al. (2015) highlight, government ownership is not random; rather, it usually focuses on strategic acquisitions and national champions, and it is not unusual that SOEs are the largest publicly traded companies in developing countries (Musacchio & Lazzarini, 2015). Table 2.5 reinforces this view. I take this issue into account through matching techniques, presented in subsection 3.2.

This work also differentiates from others because the individual data about CEO compensation in Brazil have been available to all public companies since 2018. Other studies that used compensation data used only the total (for all the Executive Board) average compensation and data from firms that voluntarily disclosed and/or were not protected by the judicial injunction.

3.1.1 Hypotheses development

The research question is about CEO compensation and government ownership. Under the managerial power premise and some empirical evidence about weaker corporate governance in public companies with government ownership (Borisova et al., 2012; Shleifer, 1998), one can argue this expected result described below:

H1_a: CEO compensation is positively related to government ownership.

²The GDP growth data was retrieved from the World Bank, available at <https://data.worldbank.org/>.

However, as Borisova et al. (2019) empirically verify, the compensation level can be lower because there is more social and media pressure, in addition to other non-pecuniary benefits, such as political visibility when the government is a shareholder. This lead us to the next hypothesis:

H1_b: CEO compensation is negatively related to government ownership.

In Brazil, following the findings of Borisova et al. (2019)'s work who found a negative and significant relationship between CEO compensation and government ownership in EU firms, it's expect that my empirical findings corroborate the hypothesis **H1_b**. In Brazil, Ermel and Do Monte (2018) found empirical evidence the executive compensation is lower when the government is the controlling shareholder. In my research, in my research, I intend to extend this analysis by verifying whether the government influences executive compensation even when the Brazilian government does not control the company, but participates in its shareholding structure, directly or indirectly.

In recent years, there has been a lot of media pressure on SOEs due to recent corruption scandals involving them. This also can corroborate the non-pecuniary benefits related to work in public companies partially owned by Brazilian government, such as prestige, lower turnover and the possibility to work in another SOEs. This prestige hypothesis is in line with Focke, Maug, and Niessen-Ruenzi (2017)'s empirical findings that CEOs of prestigious firms earn less in American firms.

It is possible the type of government ownership can affect the CEO's compensation level. Then, hypotheses **H1_a** and **H1_b** also differ for direct and indirect government ownership. The effective control of Brazilian public companies was also taken into account: if the Brazilian government has 50% or more of the voting rights shares, it would be considered that the State has control.

Additionally, the interaction of Brazilian government ownership with financial crisis or political crisis was taken into account. As seen in Beuselinck et al. (2017); Borisova et al. (2015) and Boubakri et al. (2018), the government's influence in publicly traded companies can be beneficial during financial crises, mainly due to implicit guarantees against default. My main argument is that financial crisis could negatively change the compensation level of the CEO during these years, but the presence of the government as a shareholder could neutralize it. While fully private firms must adapt and reduce their production, the government can maintain the level of employment and production in times of economic downturn, and thus maintain the CEO's compensation. However, one can argue that the government presence could have a negative on CEO's salary impact due to the economic crisis: the scrutiny and bad publicity around the compensation of SOEs' CEOs can put pressure on salaries. This is consistent with hypothesis **H2_a** and **H2_b** respectively listed below:

H2_a: CEOs' compensation is positively related to government ownership during financial crisis.

H2_b:CEOs' compensation is negatively related to government ownership during financial crisis.

However, when the government itself is in a crisis with internal political instabilities, corruption scandals and the president' impeachment process, as seen in Brazil in 2016, it is possible that the CEOs' compensation level of firms with government ownership decreases. This could occur due to the media and society's pressure about reducing public spending. My assumption is that CEOs' compensation level can be lower during political crisis for firms with government ownership, as described in hypothesis H3_b:

H3_b:CEOs' compensation is negatively related to government ownership during political crisis.

3.2 Data and Methodology

The sample consists of Brazilian publicly traded companies from 2010 to 2019. The financial variables were collected through Economica. Data related to individual maximum, minimum and average compensation are released on the Reference Form and also available at software *COMDINHEIRO* which I used to collect this information.

The main dependent variable is CEO compensation, and it is calculated as the natural logarithm of total pay of CEO in local currency (R\$, in thousands). The amount of the highest individual compensation informed in the Reference Form was used as a proxy to the CEO Compensation. CEO compensation is used in the regression as a lead variable because it might take some time to reflect the firm's characteristics, and usually relies on the past performance of the firm.

Table 2.1 summarizes all the government ownership variables. These variables are presented as a government ownership *quota - %*, a continuous measure of government ownership, similar to the study of Borisova et al. (2015). I also include the *government ownership* variable, also described in the Table 2.1: it is a binary variable assuming a value of one if the Brazilian government had any shares the firm during a specific calendar year and zero otherwise.

Following the work of Beuselinck et al. (2017); Borisova et al. (2015) and Boubakri et al. (2018), I also investigated if the financial crisis affects the CEO level compensation when the government is a shareholder.

As seen in Borisova et al. (2015)'s research, financial crisis is a dummy variable that takes a value of one for the years 2008, 2009, and 2010 and zero otherwise. However, as discussed in subsection 3.1, the world financial crisis affects countries in distinct manners, especially in Brazil. Thus, I employ the economic downturn as another proxy for financial crises, named *financial crisis*. This proxy follows the work of Lazzarini and Musacchio (2018): an economic downturn in a year t occurs when Brazil exhibits two years of positive GDP growth ($t - 1$ and $t - 2$) followed by two years of negative GDP growth (t and $t + 1$). According to the authors,

private firms can downsize and adjust to new economic conditions, while the government can use the SOEs to avoid layoffs and attenuate political costs. Thus, the *fin. crisis* variable is a dummy that takes a value of one for the 2015 year according to this methodology.

One can argue that use only the 2015 year to consider a financial crisis in Brazil is not appropriate, because the Brazilian economy was in recession from the 2nd quarter of 2014 to 4th quarter of 2016, according to The Brazilian Economic Cycle Dating Committee (CODACE), (CODACE, 2020). So I included the 2016 year as a financial crisis, as well as the 2015 year.

My hypothesis is that the government ownership also influences the CEO compensation during financial crisis: it could attenuate the possible reduction of the CEOs' salaries due to economic downturn, once the Government could maintain or increase the production of its controlled firms as a counter cyclical economic policy. Contrastingly, the effect could be the opposite: it can reduce the CEO's Compensation in companies with government ownership due to media and popular pressure on the state companies.

To understand the effect that government participation as a shareholder has in financial crisis' years, I created an interaction with the *financial crisis* variable and each government ownership variable presented in Table 2.1, depending on the variable used in the estimation.

As presented in subsection 3.1.1, it is possible firms with government influence can be affected by the political crisis in Brazil. In order to test this hypothesis, I used the Economic Policy Uncertainty (EPU) Index for Brazil as a proxy to political uncertainty, using the methodology proposed by Baker, Bloom, and Davis (2016).

The EPU is constructed through a search of 17 words in the Folha de São Paulo newspaper to create an index about policy uncertainty. Then the raw EPU counts were scaled by the number of all articles in the same newspaper and month. Several studies used this methodology as a proxy to measure the political concerns in Brazil, as seen in Barboza and Zilberman (2018); Formiga, Barros, Cezário, and Scherer (2019) and Schwarz and Dalmácio (2021). Once the EPU index data is monthly, I used the annual average of the index to match the data frequency of the other variables. To illustrate how the average of EPU index is similar to the monthly data, I present two graphics: the figure 3.1 shows the monthly EPU data and the figure 3.2 shows the annual average of the monthly EPU.

Figure 3.1
Brazilian EPU Index - monthly data

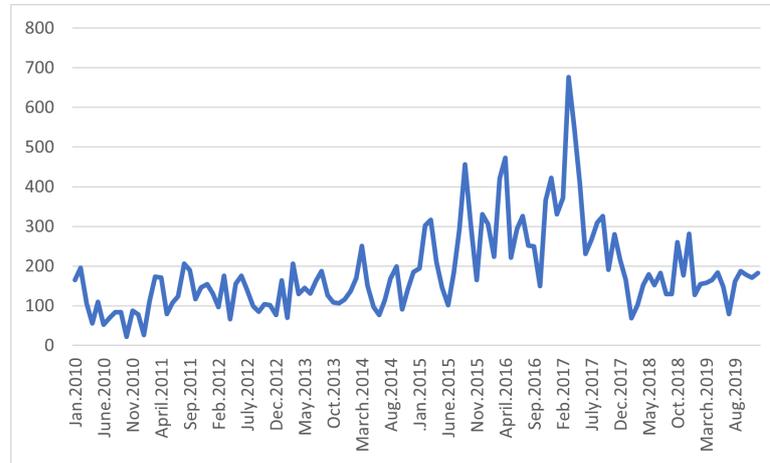
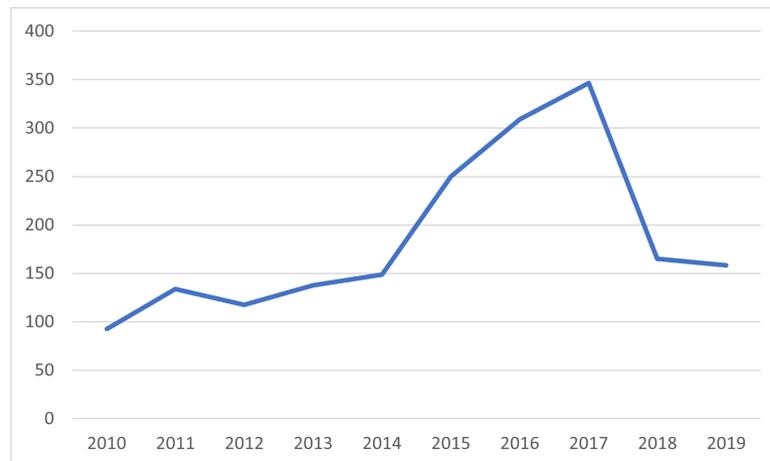


Figure 3.2
Brazilian EPU Index -annual data (average)



The higher the EPU, the greater the political uncertainty measured by this proxy. As we can see in both figures, the highest index of the Brazilian EPU is around the impeachment of the then president Dilma Rousseff, occurred in 2016, and a political scandal involving the world's biggest meat-packing company, family-run JBS and then president Michel Temer, as known as "Joesley Day" in 2017 (The Guardian, 2019).

Following the treatment as the financial crisis variable, I interact this dummy with the government ownership variable. If it remains significant, it could be argued the effect of government ownership on compensation level is affected by political instability. As seen in section 3.1.1, it is expected the coefficient of this interaction is negative.

Several control variables could be used to avoid the omitted variable problem and to link another firm characteristic with government ownership.

The main control variables are described in Table 3.1.

I used the regression analysis to verify the relationship between the CEO compensation and the interest variables. The Ordinary Least Squares (OLS) estimation was used in the inference. However, the data structure has the form of panel data, i.e., repeated observation on the same cross-section of firms over time (Wooldridge, 2010). Therefore, I also included the year and firm fixed effects to control for unobserved cross-section heterogeneity and employ firm-clustered robust standard errors³. I present the results for OLS estimation and fixed effect panel data in the subsection 3.3.

However, as discussed in subsection 3.1, government ownership can suffer from selection bias: generally, the government does not choose its investments at random, and it can focus on a specific sector or aim to achieve distinct objectives.

First, I conduct a mean comparison of the main variables concerning eventual differences between those two groups: firms with government in their ownership structure and firms without the Brazilian government as shareholder. All the government ownership was taken into account for this classification: all control types and both direct and indirect participation. Table 3.2 presents the results: as seen in subsection 2.2 of the previous chapter, the mean differences of total assets are statistically significant, whereas the t-test doesn't reject the null hypothesis that the ROA and Leverage mean are the same between the two groups.

Table 3.1
Control variables

Variables	Description	References
Total assets	Natural logarithm of the book value of assets	Beuselinck et al. (2017); Zou and Adams (2008)
Leverage	Total of debt to total assets ratio	Beuselinck et al. (2017); Nardi and Nakao (2009); Shailer and Wang (2015)
Investment opportunities	Tobin's Q measure	Inoue et al. (2013)
Duality	Dummy variable, taking a value of one if the CEO is also the chairman of the Board of Directors	Borisova et al. (2019); Wu et al. (2018)
Δ Revenue	Ratio of Revenue _t to Revenue _{t-1}	Borisova et al. (2019)

The dependent variable of econometric analysis - CEO compensation - indicates there are differences statistically significant between the firms with government ownership and firms

³For the matched sample, when I estimate the regression using fixed effects, the errors are clustered by the subclass made by the matching technique.

without it. Other variables, as Enterprise value, and Tobin's Q also indicates differences between groups, which reinforces the need of the matching techniques. According to Stuart (2010), the matching method aims to equate the distribution of covariates in the treated and the control groups. Therefore, if the distribution of the covariates is equal in the two groups, the results could be considered closer to a random experiment.

I take into consideration this potential bias selection problem through matching techniques, as seen in Borisova et al. (2019) and Lazzarini and Musacchio (2018)' work. The matching techniques are used in order to guarantee firms with government ownership have counterfactual firms without government ownership (Imbens, 2004). For selecting the covariates used to to match among firms with government ownership and firms without government ownership, I prioritized the variables that showed differences between these groups in Table 3.2. Once the CEO Compensation is the dependent variable that we want to measure the treatment effect, it can't be used as a covariate. Total assets, Enterprise value and Tobin's Q showed statistical differences among the groups, ergo I used Total assets (measured as the natural logarithm of total assets in local currency - R\$ thousands), and Tobin's Q as covariates⁴. I also stipulated in the matching method that the matching could occur only in observations with the same year. Thereby, a firm was not combined with itself in different years.

⁴The total assets and Enterprise value are are highly correlated variables. Thence, I chose one of them (Total assets) to perform the matching with the observations.

Table 3.2
Mean variables - Firms without government ownership X Firms with government ownership

Variables	Firms without government ownership (1)	Firms with government ownership (2)	<i>T – test</i> (3)
CEO compensation	7.33 (1.52)	6.98 (1.70)	3.49***
Total assets	14.54 (1.49)	15.54 (1.79)	–9.47***
Enterprise Value	13.81 (1.99)	14.60 (1.93)	–6.69***
Leverage	0.64 (0.61)	0.65 (0.39)	–0.17
ROA	0.02 (0.17)	0.02 (0.13)	0.25
Tobin's Q	0.95 (0.08)	0.94 (0.07)	1.83*
Observations	1142	354	

*Significance: *p<0.1; **p<0.05; ***p<0.01.*

Note: This table presents the mean of CEO Compensation, total assets, enterprise value (all three variables are represented by the natural logarithm in local currency - R\$ thousands), leverage, ROA and Tobin's Q for firms without government ownership in their ownership structure (1) and firms with government ownership in their ownership structure (2). The values in parenthesis in column (1) and (2) are the standard deviation.

Firstly, I checked the initial imbalance prior to matching using the R package MatchIt (Ho, Imai, King, & Stuart, 2011). After this, several matching methods were tested in order to assess appropriate balance. I used the Nearest Neighbor Matching, Optimal Pair Matching, Optimal Full Matching, Genetic Matching, Coarsened Exact Matching, and Subclassification method. The Optimal Full Matching delivered the best results⁵. The full technique matches every treated unit to at least one control and vice-versa. In this study, the control observations are those whose firm is not owned by the government, and the treated observations are firms in which the Brazilian government has some shares, directly or indirectly.

⁵For the sake of brevity, these results are not reported and they are available under request.

The figure 3.3 illustrates the results of the Optimal Full Matching on the Total assets and Tobin's Q variables. Points far from the solid diagonal line are the areas of the covariate distributions that differ between the treatment groups. So, the matching allows a better balance into the treatment and control group.

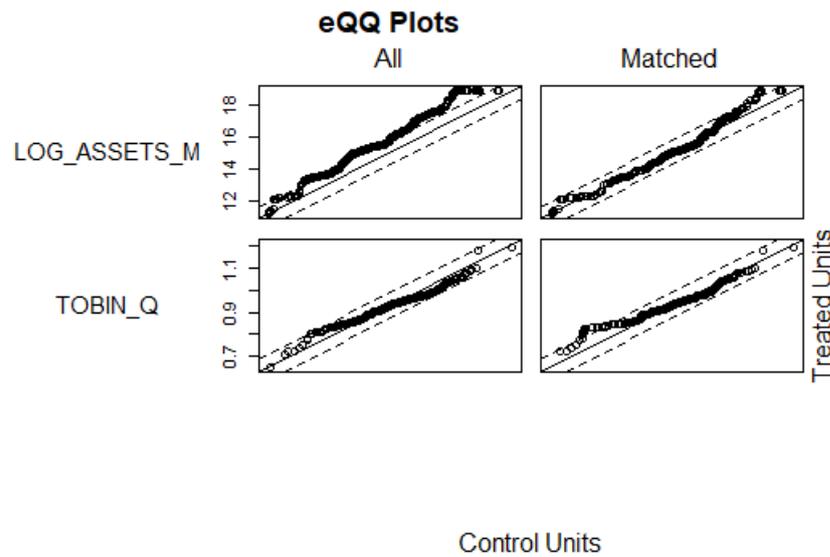


Figure 3.3
Quantile-quantile plot - Total and Matched variables

After using the matching techniques to obtain a matched sample, I used both the full and matched sample in order to infer the possible influence of government ownership and the CEO Compensation. The functional form of econometric model used to test the hypotheses described in 3.1.1 are described below:

$$\begin{aligned}
 \text{CEO Compensation}_{it+1} = & \beta_1 \cdot \text{government ownership variable}_{it} \\
 & + \beta_2 \cdot \text{government ownership variable}_{it} \times \text{financial crisis}_{it} \\
 & + \beta_3 \cdot \text{government ownership variable}_{it} \times \text{political crisis}_{it} \\
 & + \mathbf{X}_{it} \cdot \beta_4 + u_{it}.
 \end{aligned} \tag{3.1}$$

\mathbf{X}_{it} represent the matrix of control variables presented in Table 3.1. u_{it} is the compound error i.e., a component of error e_{it} and unobserved cross-section heterogeneity. The *government ownership variable* assumes the variables described in Table 2.1.

3.3 Results

3.3.1 CEO Compensation

Before doing the regression analysis, I investigate if there are differences about CEO compensation through years. In 2018 all the firms protected by the injunction about disclosing the maximum, minimum and average individual compensation were obliged to provide these data for the last three fiscal years (i.e, since 2015). This disclosure can enable verifying whether the mean compensation in firms that did not disclose the compensation data is superior whose already disclosed them. When the companies did not know that they would be obliged to disclose this data, it is possible that there were differences in the compensation levels of those firms, reinforcing the findings of Barros et al. (2015) about worse corporate governance.

Table 3.3
CEO Compensation - mean by year

Year	n	CEO Compensation	CEO Compensation (deflated)
2010	289	1,680.63	1,680.63
2011	278	2,029.91	1,906.02
2012	278	1,922.86	1,705.89
2013	273	2,037.66	1,706.85
2014	282	2,372.32	1,867.47
2015	335	3,605.22	2,564.39
2016	336	3,687.89	2,467.95
2017	330	4,257.28	2,767.35
2018	319	4,207.87	2,636.37
2019	299	4,930.50	2,961.48

Note: n is the number of observations, CEO Compensation is the mean of CEO Compensation (thousands) in local currency and CEO compensation deflated is the CEO Compensation mean deflated by Extended National Consumer Price Index (IPCA). The t-test rejects the null hypothesis the mean are the same for 2010-2014 and 2015-2019 in both nominal and deflated values (Nominal values - $t = -8.099$; $df = 5.6733$; $p\text{-value} = 0.0002521$, Deflated values: $t = -9.2693$; $df = 6.1977$; $p\text{-value} = 7.371e^{-05}$).

Table 3.3 describes the mean of CEO compensation from 2010 to 2019. As the companies were forced to disclose this information about remuneration from 2015 fiscal year, the number of observations increased from that, as well as the CEO compensation's average. One can argue the mean differences could refer to the inflation rate, and that would not be related to the

mandatory disclosure. So I deflated all the CEO compensation mean using IPCA (base year = 2010) and verify if the differences between two groups are statistically significant. In both situations, the mean of 2010-2014 to 2015-2019 is statistically different.

This results corroborates the findings of Barros et al. (2015) that non-compliant firms have weaker corporate governance practices and that their CEO can extract more rents. Additionally, firms that voluntarily disclosed data before 2018 could suffer more scrutiny from the media and general public, pushing executives' wages down.

3.3.2 Descriptive statistics

Tables 3.4 and 3.5 synthesize the descriptive statistics for the government ownership variables, management and board variables, firm characteristic and the EPU. From the table, we can see that some variables present extreme values, specially total assets, enterprise value, CEO Compensation, Leverage, ROA and revenue variation. To reduce the influence of outliers in the regression, I winsorized these variables at 1% and 99% levels. Table 3.6 shows the statistics of the winsorized variables.

Table 3.4
Descriptive Statistics - Government ownership variables

Variables	Mean	Median	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Government ownership (%)							
DGO_ON	5.44	0	18.49	0	0	0	100
DGO_PN	1.46	0	7.06	0	0	0	79
DGO_CF	4.38	0	14.03	0	0	0	100
IGO_ON	3.38	0	12.61	0	0	0	100
IGO_PN	2.04	0	8.81	0	0	0	65
IGO_CF	3.96	0	12.92	0	0	0	98.51
TGO_ON	8.81	0	22.26	0	0	0	100
TGO_PN	3.50	0	11.62	0	0	0	82
TGO_CF	8.34	0	19.29	0	0	0	99.69

Note: This table summarises the statistics of the 1496 firm-year observation.

Table 3.5
Descriptive Statistics

Variables	Mean	Median	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Management and Board							
Manag._members	5	4	2	1	3	6	31
BoD_members	7	7	3	1	5	9	30
CEO Comp	7.25	7.42	1.57	0.00	6.65	8.13	11.34
Firm characteristics							
Total assets	14.78	14.89	1.62	10.82	13.69	15.81	20.62
Enterprise	13.99	14.27	2.01	7.71	12.60	15.45	19.76
Leverage	0.64	0.57	0.56	0.01	0.44	0.72	12.23
ROA	0.02	0.03	0.17	-1.24	-0.004	0.07	2.22
Δ Revenue	26.04	9.57	302.18	-263.10	-1.78	19.86	10,977.11
Tobin's Q	0.95	0.95	0.08	0.59	0.90	1.00	1.21
Economic Policy Uncertainty Index							
EPU (Mean)	0.04	-0.46	1.05	-1.15	-0.64	0.79	1.98

Note: This table summarises the statistics of the 1496 firm-year observation. Total assets, enterprise value (enterprise) and CEO compensation (CEO Comp) are presented as the natural logarithm of the values in local currency (thousands R\$). Enterprise value is represented as the market value of firm. Δ Revenue is ratio of $\frac{revenue_t}{revenue_{t-1}}$. The EPU is represented by the normalized mean by year of the monthly index obtained in <https://www.policyuncertainty.com/>.

Table 3.6
Descriptive statistics - winsorized variables

Variables	Mean	Median	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
CEO Compensation	7.24	7.42	1.56	0.16	6.65	8.13	10.21
Total assets	14.77	14.89	1.58	11.16	13.69	15.81	18.83
Enterprise value	13.99	14.27	1.97	9.11	12.60	15.45	17.98
Leverage	0.63	0.57	0.39	0.09	0.44	0.72	2.70
ROA	0.02	0.03	0.11	-0.48	-0.004	0.07	0.36
Δ Revenue	14.31	9.57	44.06	-65.47	-1.78	19.86	315.78

The frequency of the dummy variables are presented in Table 3.7. The existence of dual-

class share in the Brazilian capital market is evident: almost half of the firm-year observation had shares with different voting rights. CEO was also the chairman in the Board of Directors in 17.05% of firm-year observations. It's worth noting that the the accumulation of the position of board of directors' Chairman by the CEO was prohibited by the Lei n° 14.195 (26 de agosto de 2021). This law came into force in February 2022, 180 days after its publication.

Table 3.7
Frequency table - dummy variables

Variables	1 (%)	0 (%)
Dual-class shares	42.31	57.69
CEO Duality	17.05	82.95
SOE	6.28	93.72
Control group	23.66	76.34

3.3.3 Empirical results

In this subsection I present the results of all the regressions using the different measures of the Brazilian government ownership presented in Table 2.1.

It's worth noting that, in almost all regressions, the variables total assets, leverage and Tobin's Q remain positive and significant. Several research reveal a positive association with CEO compensation and firm size (Borisova et al., 2019; Ermel & Do Monte, 2018; Gabaix & Landier, 2008).

About the leverage and CEO Compensation, Ortiz-Molina (2007) says that the pay- performance sensitivity to debt depends on the type of debt. But also the agency costs of equity could result in lower sensitivity in more levered firms. That's because the lenders also have a monitoring function in agency theory, reducing the free cash flow available to managers. Following this, the relation would be weak or none, as seen in Borisova et al. (2019)'s research. However, in the Brazilian firms in my sample, the results indicate a positive and significant relationship.

The positive and significant relation between Tobin's Q and CEO Compensation is in line with the findings of Borisova et al. (2019) and Ozkan (2007). So, the greater the investment opportunities, the higher the CEO's salary. In several studies, Tobin's Q is used as a stock-market performance proxy, as in Carpenter and Sanders (2002); Jiang, Habib, and Smallman (2009), or proxy for growth options (Ozkan, 2007). My results about growth opportunities and total assets corroborates the findings of Ozkan (2007): larger firms with growth opportunities pay higher salaries to the CEOs.

The government ownership variables, the main focus of my research, show consistent results in all the regressions: the relationship between CEO Compensation and government own-

ership variables prevails negative and significant for all the types of the Brazilian government ownership. Specifically, there seems to be no distinction between types of control or direct and indirect participation in the firm's ownership structure regarding CEO compensation: when the Brazilian government is a shareholder, CEO compensation would be smaller than fully private firms.

Table 3.8 shows the results using the government ownership dummy, a variable also used to define the treatment in the matching technique. Tables 3.9, 3.10, and 3.11 present the results of OLS and fixed effect panel data estimation for both full and matched sample using a continuous variable for direct government ownership, and when the Brazilian government only had voting shares, non-voting shares and total shares respectively.

Tables 3.12, 3.13, and 3.14 summarize the results of econometric regressions for indirect government ownership when the government has voting shares, non-voting shares and total shares, respectively.

The three last tables, Table 3.15, Table 3.16, and Table 3.17 present the econometric results using a continuous variable representing the percentage of government shares regarding voting shares, non-voting shares and total shares.

Political crisis, according to my results, doesn't appear to influence the CEO's compensation: except for the regressions (3) and (4) in Table 3.12, and regression (4) in Table 3.15, the coefficients of the Political crisis variable are not significant or cannot maintain the results using fixed effects. Only when the government has indirect or total voting shares of firms, the political instability is negatively related to CEO compensation.

For financial crisis and the interaction with the government ownership variables, it appears that when the government has direct voting or non-voting shares, as seen in Table 3.10 and Table 3.9, the impact on CEO compensation is negative and significant. Conversely, when the government has indirect ownership of non-voting shares or total shares, the relation is positive and significant (Table 3.12 and Table 3.14).

Table 3.8
Government ownership dummy

Variables	<i>Dependent variable:</i>			
	CEO Compensation _{t+1}			
	OLS		Fixed effects	
	(1)	(2)	(3)	(4)
Total assets _t	0.239*** (0.045)	0.223*** (0.073)	0.236 (0.150)	0.381*** (0.072)
Leverage _t	0.107 (0.228)	-0.082 (0.349)	0.413* (0.250)	1.181*** (0.406)
Tobin's Q _t	4.505*** (1.111)	3.687*** (1.141)	2.164** (1.032)	6.811*** (1.023)
ΔRevenue _t	0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.002* (0.001)
Govn. Owner _t	-0.635*** (0.174)	-0.539** (0.249)	-0.170 (0.254)	-0.561*** (0.150)
CEO Duality _t	-0.223 (0.212)	0.136 (0.269)	0.009 (0.232)	-0.035 (0.181)
Pol.crisis _t	0.170* (0.090)	0.182** (0.090)	-0.056 (0.089)	-0.087 (0.109)
Fin. crisis _t	0.204 (0.181)	0.213 (0.182)	0.199 (0.188)	0.194 (0.266)
Constant	-0.449 (1.247)	0.578 (1.707)		
Observations	1,495	1,495	1,495	1,495
R ²	0.148	0.098	0.604	0.589
Adjusted R ²	0.143	0.093	0.502	0.466
Residual Std. Error	1.442 (df = 1486)	1.593 (df = 1486)	1.100 (df = 1186)	1.223 (df = 1148)

Note: Significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Equations (1) and (3) are estimated with the full sample, whereas Equations (2) and (4) are estimated with the matched sample. Gov. ownership_t is a dummy variable assuming 1 when the Brazilian Government owned any shares of firm *i*, directly or indirectly, and 0 instead. Pol. crisis is the interaction of EPU with Gov. ownership_t. Fin. crisis ownership is the interaction of financial crisis, a dummy variable assuming 1 for year = 2015 or year = 2016, with Gov. ownership_t dummy. The description of the control variables is presented in the table 3.1.

Table 3.9
Direct government ownership - voting shares (%)

	<i>Dependent variable:</i>			
	OLS		Fixed effects	
	(1)	(2)	(3)	(4)
	CEO Compensation _{t+1}			
Total assets _t	0.243*** (0.045)	0.248*** (0.078)	0.243 (0.150)	0.396*** (0.072)
Leverage _t	0.095 (0.219)	-0.045 (0.349)	0.447* (0.256)	1.243*** (0.389)
Tobin's Q _t	4.216*** (1.122)	3.461*** (1.132)	2.278** (1.035)	6.787*** (0.989)
ΔRevenue _t	0.001* (0.001)	-0.0003 (0.001)	0.001 (0.001)	0.002* (0.001)
DGO_ON	-0.012*** (0.003)	-0.011*** (0.003)	-0.016 (0.012)	-0.008*** (0.003)
CEO Duality _t	-0.214 (0.206)	0.132 (0.256)	-0.012 (0.233)	0.034 (0.173)
Pol.Crisis* DGO_ON	0.004** (0.002)	0.005** (0.002)	0.003 (0.002)	-0.003 (0.002)
Fin. crisis* DGO_ON	-0.006* (0.003)	-0.006* (0.003)	-0.007** (0.003)	-0.006 (0.005)
Constant	-0.297 (1.226)	0.326 (1.783)		
Observations	1,495	1,495	1,495	1,495
R ²	0.145	0.097	0.606	0.586
Adjusted R ²	0.140	0.092	0.503	0.461
Residual Std. Error	1.444 (df = 1486)	1.594 (df = 1486)	1.098 (df = 1186)	1.228 (df = 1148)

*Note: Significance: *p<0.1; **p<0.05; ***p<0.01.* Equations (1) and (3) are estimated with the full sample, whereas Equations (2) and (4) are estimated with the matched sample. DGO_ON_t is a continuous variable representing the % of direct voting shares owned by the Brazilian government on firm *i*. Pol.Crisis** DGO_ON is the interaction of EPU with DGO_ON_t. Fin. crisis* DGO_ON is the interaction of financial crisis, a dummy variable assuming 1 for year = 2015 or year=2016, with DGO_ON_t variable. The description of the control variables is presented in the table 3.1.

Table 3.10
Government direct ownership - non-voting shares (%)

	<i>Dependent variable:</i>			
	CEO Compensation _{t+1}			
	OLS		Fixed effects	
	(1)	(2)	(3)	(4)
Total assets _t	0.208*** (0.043)	0.238*** (0.076)	0.225 (0.150)	0.349*** (0.073)
Leverage _t	0.099 (0.226)	-0.023 (0.361)	0.392 (0.251)	1.240*** (0.419)
Tobin's Q _t	4.563*** (1.114)	3.663*** (1.172)	2.198** (1.034)	7.038*** (1.053)
ΔRevenue _t	0.001 (0.001)	-0.0005 (0.001)	0.001 (0.001)	0.002 (0.001)
DGO_PN	-0.002 (0.005)	-0.003 (0.005)	0.012 (0.017)	0.004 (0.006)
CEO Duality _t	-0.181 (0.211)	0.192 (0.245)	-0.005 (0.233)	0.071 (0.168)
Pol.Crisis* DGO_PN	0.015*** (0.004)	0.015*** (0.004)	0.014*** (0.005)	0.006 (0.005)
Fin. crisis* DGO_PN	-0.016** (0.008)	-0.016** (0.008)	-0.021** (0.010)	-0.039*** (0.010)
Constant	-0.181 (1.237)	0.221 (1.809)		
Observations	1,495	1,495	1,495	1,495
R ²	0.123	0.082	0.606	0.576
Adjusted R ²	0.118	0.077	0.504	0.449
Residual Std. Error	1.463 (df = 1486)	1.607 (df = 1486)	1.097 (df = 1186)	1.242 (df = 1148)

*Note: Significance: *p<0.1; **p<0.05; ***p<0.01.* Equations (1) and (3) are estimated with the full sample, whereas Equations (2) and (4) are estimated with the matched sample. DGO_PN_t is a continuous variable representing the % of direct non voting shares owned by the Brazilian government on firm *i*. Pol.Crisis** DGO_PN is the interaction of EPU with DGO_PN_t. Fin. crisis* DGO_PN is the interaction of financial crisis, a dummy variable assuming 1 for year = 2015 or year=2016, with DGO_PN_t variable. The description of the control variables is presented in the table 3.1.

Table 3.11
Direct government ownership - total cash flows (%)

	<i>Dependent variable:</i>			
	CEO Compensation _{t+1}			
	OLS		Fixed effects	
	(1)	(2)	(3)	(4)
Total assets _t	0.238*** (0.045)	0.244*** (0.078)	0.227 (0.151)	0.397*** (0.072)
Leverage _t	0.121 (0.220)	-0.008 (0.360)	0.408 (0.255)	1.316*** (0.395)
Tobin's Q _t	4.296*** (1.121)	3.539*** (1.138)	2.215** (1.036)	6.987*** (0.985)
ΔRevenue _t	0.001* (0.001)	-0.0002 (0.001)	0.001 (0.001)	0.002* (0.001)
DGO_CF	-0.014*** (0.004)	-0.013** (0.005)	0.007 (0.019)	-0.011** (0.004)
CEO Duality _t	-0.200 (0.208)	0.146 (0.255)	-0.001 (0.231)	0.040 (0.171)
Pol.Crisis*DGO_CF	0.007** (0.003)	0.007** (0.003)	0.005 (0.003)	-0.004 (0.004)
Fin. crisis*DGO_CF	-0.007 (0.005)	-0.007 (0.005)	-0.008 (0.005)	-0.006 (0.009)
Constant	-0.326 (1.232)	0.276 (1.798)		
Observations	1,495	1,495	1,495	1,495
R ²	0.142	0.095	0.605	0.584
Adjusted R ²	0.137	0.090	0.502	0.458
Residual Std. Error	1.447 (df = 1486)	1.596 (df = 1486)	1.099 (df = 1186)	1.231 (df = 1148)

*Note: Significance: *p<0.1; **p<0.05; ***p<0.01. Equations (1) and (3) are estimated with the full sample, whereas Equations (2) and (4) are estimated with the matched sample. DGO_CF_t is a continuous variable representing the % of direct voting and non voting shares owned by the Brazilian government on firm *i*. Pol.Crisis* DGO_CF is the interaction of EPU with DGO_CF_t. Fin. crisis* DGO_CF is the interaction of financial crisis, a dummy variable assuming 1 for year = 2015 or year=2016, with DGO_CF_t variable. The description of the control variables is presented in the table 3.1.*

Table 3.12
Indirect government ownership - voting shares (%)

	<i>Dependent variable:</i>			
	OLS		Fixed effects	
	(1)	(2)	(3)	(4)
	CEO Compensation _{t+1}			
Total assets _t	0.208*** (0.043)	0.234*** (0.075)	0.234 (0.151)	0.363*** (0.073)
Leverage _t	0.110 (0.226)	-0.024 (0.358)	0.427* (0.253)	1.310*** (0.416)
Tobin's Q _t	4.627*** (1.103)	3.720*** (1.170)	2.252** (1.040)	7.049*** (1.060)
ΔRevenue _t	0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.002 (0.001)
IGO_ON	-0.011*** (0.003)	-0.010** (0.004)	-0.00001 (0.012)	-0.013*** (0.003)
CEO Duality _t	-0.223 (0.207)	0.161 (0.256)	0.011 (0.231)	0.015 (0.176)
Pol. crisis*IGO_ON	-0.002 (0.002)	-0.002 (0.002)	-0.004*** (0.002)	-0.005** (0.002)
Fin. crisis*IGO_ON	0.012** (0.005)	0.012** (0.005)	0.011*** (0.004)	0.013 (0.008)
Constant	-0.221 (1.235)	0.244 (1.792)		
Observations	1,495	1,495	1,495	1,495
R ²	0.125	0.081	0.605	0.580
Adjusted R ²	0.120	0.076	0.503	0.454
Residual Std. Error	1.461 (df = 1486)	1.608 (df = 1486)	1.099 (df = 1186)	1.236 (df = 1148)

*Note: Significance: *p<0.1; **p<0.05; ***p<0.01.* Equations (1) and (3) are estimated with the full sample, whereas Equations (2) and (4) are estimated with the matched sample. IGO_ON_t is a continuous variable representing the % of indirect voting shares owned by the Brazilian government on firm *i*. Pol.Crisis** IGO_ON is the interaction of EPU with IGO_ON_t. Fin. crisis* IGO_ON is the interaction of financial crisis, a dummy variable assuming 1 for year = 2015 or year=2016, with IGO_ON_t variable. The description of the control variables is presented in the table 3.1.

Table 3.13
Indirect government ownership - non voting shares (%)

	<i>Dependent variable:</i>			
	CEO Compensation _{t+1}			
	OLS		Fixed effects	
	(1)	(2)	(3)	(4)
Total assets _t	0.205*** (0.043)	0.232*** (0.075)	0.231 (0.151)	0.350*** (0.074)
Leverage _t	0.099 (0.226)	-0.036 (0.356)	0.411 (0.253)	1.247*** (0.420)
Tobin's Q _t	4.564*** (1.106)	3.655*** (1.170)	2.243** (1.040)	6.977*** (1.062)
ΔRevenue _t	0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.002 (0.001)
IGO_PN	-0.014*** (0.004)	-0.012** (0.005)	0.0003 (0.013)	-0.014*** (0.005)
CEO Duality _t	-0.228 (0.207)	0.158 (0.255)	0.005 (0.233)	0.018 (0.174)
Pol.Crisis*IGO_PN	0.003 (0.003)	0.003 (0.003)	-0.001 (0.003)	-0.002 (0.004)
Fin.Crisis*IGO_PN	0.004 (0.005)	0.004 (0.005)	0.004 (0.005)	0.003 (0.010)
Constant	-0.107 (1.238)	0.346 (1.791)		
Observations	1,495	1,495	1,495	1,495
R ²	0.124	0.081	0.604	0.577
Adjusted R ²	0.120	0.076	0.501	0.450
Residual Std. Error	1.462 (df = 1486)	1.608 (df = 1486)	1.100 (df = 1186)	1.240 (df = 1148)

*Note: Significance: *p<0.1; **p<0.05; ***p<0.01.* Equations (1) and (3) are estimated with the full sample, whereas Equations (2) and (4) are estimated with the matched sample. DGO_PN_t is a continuous variable representing the % of direct non voting shares owned by the Brazilian government on firm *i*. Pol.Crisis** DGO_PN is the interaction of EPU with DGO_PN_t. Fin. crisis* DGO_PN is the interaction of financial crisis, a dummy variable assuming 1 for year = 2015 or year=2016, with DGO_PN_t variable. The description of the control variables is presented in the table 3.1.

Table 3.14
Indirect government ownership - total cash-flows (%)

	<i>Dependent variable:</i>			
	OLS		Fixed effects	
	(1)	(2)	(3)	(4)
	CEO Compensation _{t+1}			
Total assets _t	0.209*** (0.043)	0.223*** (0.075)	0.232 (0.152)	0.358*** (0.071)
Leverage _t	0.099 (0.226)	-0.063 (0.353)	0.424* (0.253)	1.269*** (0.411)
Tobin's Q _t	4.563*** (1.083)	3.641*** (1.143)	2.272** (1.040)	6.785*** (1.034)
ΔRevenue _t	0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
IGO_CF	-0.019*** (0.007)	-0.018** (0.008)	0.004 (0.013)	-0.022*** (0.005)
CEO Duality _t	-0.257 (0.206)	0.130 (0.260)	0.014 (0.231)	-0.066 (0.182)
Pol.Crisis*IGO_CF	0.002 (0.003)	0.002 (0.004)	-0.004*** (0.001)	-0.001 (0.003)
Fin.Crisis*IGO_CF	0.015** (0.006)	0.015** (0.006)	0.010*** (0.004)	0.017** (0.008)
Constant	-0.130 (1.226)	0.557 (1.755)		
Observations	1,495	1,495	1,495	1,495
R ²	0.141	0.093	0.605	0.590
Adjusted R ²	0.136	0.088	0.502	0.466
Residual Std. Error	1.448 (df = 1486)	1.597 (df = 1486)	1.099 (df = 1186)	1.222 (df = 1148)

*Note: Significance: *p<0.1; **p<0.05; ***p<0.01. Equations (1) and (3) are estimated with the full sample, whereas Equations (2) and (4) are estimated with the matched sample. IGO_CF_t is a continuous variable representing the % of indirect voting and non voting shares owned by the Brazilian government on firm *i*. Pol.Crisis** IGO_CF is the interaction of EPU with IGO_CF_t. Fin. crisis* IGO_CF is the interaction of financial crisis, a dummy variable assuming 1 for year = 2015 or year=2016, with IGO_CF_t variable. The description of the control variables is presented in the table 3.1.*

Table 3.15
Total government ownership - voting shares (%)

	<i>Dependent variable:</i>			
	CEO Compensation _{t+1}			
	OLS		Fixed effects	
	(1)	(2)	(3)	(4)
Total assets _t	0.244*** (0.044)	0.237*** (0.076)	0.240 (0.151)	0.399*** (0.071)
Leverage _t	0.092 (0.220)	-0.071 (0.347)	0.428* (0.254)	1.243*** (0.392)
Tobin's Q _t	4.176*** (1.128)	3.423*** (1.128)	2.223** (1.040)	6.520*** (1.024)
ΔRevenue _t	0.001* (0.001)	-0.0004 (0.001)	0.001 (0.001)	0.002* (0.001)
TGO_ON	-0.012*** (0.002)	-0.011*** (0.003)	-0.007 (0.008)	-0.010*** (0.002)
CEO Duality _t	-0.250 (0.206)	0.104 (0.267)	-0.004 (0.232)	-0.030 (0.179)
Pol.Crisis*TGO_ON	0.002 (0.002)	0.002 (0.002)	0.0003 (0.002)	-0.004* (0.002)
Fin.Crisis*TGO_ON	-0.001 (0.003)	-0.0002 (0.003)	-0.001 (0.003)	-0.001 (0.005)
Constant	-0.237 (1.227)	0.580 (1.744)		
Observations	1,495	1,495	1,495	1,495
R ²	0.149	0.098	0.604	0.590
Adjusted R ²	0.144	0.093	0.501	0.466
Residual Std. Error	1.441 (df = 1486)	1.593 (df = 1486)	1.100 (df = 1186)	1.222 (df = 1148)

*Note: Significance: *p<0.1; **p<0.05; ***p<0.01.* Equations (1) and (3) are estimated with the full sample, whereas Equations (2) and (4) are estimated with the matched sample. TGO_ON_t is a continuous variable representing the % of total (direct and indirect) voting shares owned by the Brazilian government on firm *i*. Pol.Crisis** TGO_ON is the interaction of EPU with TGO_ON_t. Fin. crisis* TGO_ON is the interaction of financial crisis, a dummy variable assuming 1 for year = 2015 or year=2016, with TGO_ON_t variable. The description of the control variables is presented in the table 3.1.

Table 3.16
Total government ownership - non-voting shares (%)

	<i>Dependent variable:</i>			
	CEO Compensation _{t+1}			
	OLS		Fixed effects	
	(1)	(2)	(3)	(4)
Total assets _t	0.209*** (0.043)	0.230*** (0.074)	0.226 (0.151)	0.350*** (0.073)
Leverage _t	0.097 (0.226)	-0.040 (0.357)	0.393 (0.253)	1.231*** (0.420)
Tobin's Q _t	4.499*** (1.121)	3.611*** (1.165)	2.213** (1.034)	6.909*** (1.064)
ΔRevenue _t	0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.002* (0.001)
TGO_PN	-0.009*** (0.004)	-0.009** (0.004)	0.003 (0.011)	-0.007 (0.004)
CEO Duality _t	-0.197 (0.208)	0.174 (0.252)	0.0002 (0.233)	0.052 (0.171)
Pol. crisis* TGO_PN	0.006* (0.003)	0.006* (0.003)	0.003 (0.004)	0.0001 (0.004)
Fin. Crisis* TGO_PN	-0.002 (0.006)	-0.002 (0.005)	-0.002 (0.006)	-0.011 (0.009)
Constant	-0.111 (1.243)	0.418 (1.767)		
Observations	1,495	1,495	1,495	1,495
R ²	0.126	0.083	0.604	0.577
Adjusted R ²	0.121	0.078	0.502	0.450
Residual Std. Error	1.460 (df = 1486)	1.606 (df = 1486)	1.100 (df = 1186)	1.241 (df = 1148)

*Note: Significance: *p<0.1; **p<0.05; ***p<0.01. Equations (1) and (3) are estimated with the full sample, whereas Equations (2) and (4) are estimated with the matched sample. TGO_PN_t is a continuous variable representing the % of total (direct and indirect) non voting shares owned by the Brazilian government on firm *i*. Pol.Crisis** TGO_PN is the interaction of EPU with TGO_PN_t. Fin. crisis* TGO_PN is the interaction of financial crisis, a dummy variable assuming 1 for year = 2015 or year=2016, with TGO_PN_t variable. The description of the control variables is presented in the table 3.1.*

Table 3.17
Total government ownership - total cash-flows (%)

	<i>Dependent variable:</i>			
	CEO Compensation _{t+1}			
	OLS		Fixed effects	
	(1)	(2)	(3)	(4)
Total assets _t	0.243*** (0.043)	0.227*** (0.075)	0.227 (0.152)	0.402*** (0.071)
Leverage _t	0.105 (0.221)	-0.071 (0.353)	0.392 (0.253)	1.272*** (0.394)
Tobin's Q _t	4.180*** (1.100)	3.428*** (1.109)	2.220** (1.037)	6.471*** (0.999)
ΔRevenue _t	0.001* (0.001)	-0.0004 (0.001)	0.001 (0.001)	0.002* (0.001)
TGO_CF	-0.017*** (0.004)	-0.015*** (0.005)	0.004 (0.010)	-0.015*** (0.003)
CEO Duality _t	-0.256 (0.207)	0.098 (0.268)	0.008 (0.231)	-0.073 (0.182)
Pol.Crisis* TGO_CF	0.004 (0.002)	0.004* (0.002)	0.00001 (0.002)	-0.002 (0.003)
Fin.Crisis* TGO_CF	0.003 (0.004)	0.003 (0.004)	0.002 (0.004)	0.002 (0.006)
Constant	-0.204 (1.229)	0.751 (1.718)		
Observations	1,495	1,495	1,495	1,495
R ²	0.160	0.107	0.604	0.594
Adjusted R ²	0.156	0.102	0.501	0.472
Residual Std. Error	1.432 (df = 1486)	1.585 (df = 1486)	1.100 (df = 1186)	1.216 (df = 1148)

*Note: Significance: *p<0.1; **p<0.05; ***p<0.01.* Equations (1) and (3) are estimated with the full sample, whereas Equations (2) and (4) are estimated with the matched sample. TGO_CF_t is a continuous variable representing the % of total (direct and indirect) of voting and non voting shares owned by the Brazilian government on firm *i*. Pol.Crisis** TGO_CF is the interaction of EPU with TGO_CF_t. Fin. crisis* TGO_CF is the interaction of financial crisis, a dummy variable assuming 1 for year = 2015 or year=2016, with TGO_CF_t variable. The description of the control variables is presented in the table 3.1.

3.4 Discussion and Implications

In this chapter, I study the influence of Brazilian government ownership on CEO compensation. The negative and significant relationship between these variables remains for all distinct measures of state participation in publicly traded Brazilian companies used in this research.

These results corroborate the findings of Borisova et al. (2019)'s research: firms with government ownership pay less to the CEO. Whereas, for the authors, this can be related to government risk aversion, for Brazil's scenario it could be argued that it is related to recent corruption scandals involving Brazilian SOEs and media and popular pressure involving them.

However, there is little evidence linking political crises to CEO compensation. Nevertheless, when the Brazilian economy is in recession, the *direct* government ownership in the shareholding structure of companies appears to reduce the salary of the CEOs. The financial crises are often attributed to the government and its inertia in reversing the economic situation. So, it is plausible that there is a pressure to reduce CEO's salaries of companies with state government participation.

But when the Brazilian government owns shares indirectly, the relationship reverses: the econometric results indicate a positive relation between CEO compensation and Financial crisis and government ownership interaction variable. Once the Brazilian government ownership is not easily observable, these CEOs can benefit themselves with the government influence due to implicit guarantees against default (Beuselinck et al., 2017; Borisova et al., 2015) and raise their salaries without attracting media and public attention.

Other variables, although not addressed by this study, may be an interesting path for future research, such as risk taking in firms with government ownership and CEO compensation.

4 The Brazilian SOEs Law: an event study

State presence in economic sectors is controversial. Occasionally, it is a subject of economic, political, and even ideological discussions. Recently, the debate about the Brazilian government's participation achieved prominence due to corruption scandals involving Brazilian SOEs and political influence, even in private firms.

In the last decades, corruption scandals have occupied Brazilian news headlines; for instance, the Mensalão Scandal or the Car Wash Operation, among others. As a result of popular dissatisfaction, the Brazilian Congress enacted a new legislation on anti-corruption, criminal organizations, and a new judicial emphasis on prioritizing corruption cases. One example was the Clean Slate Law (Ficha Limpa), Lei complementar nº 135 (04 de junho de 2010) which banned the election of politicians with a criminal record (Michener & Pereira, 2016). Another important law enacted to fight against corruption and avoid the impunity of the Brazilian judicial system were the Anti-Corruption Law, Lei nº 12.846 (01 de agosto de 2013) and Criminal Organization Law, Lei nº 12.850 (02 de agosto de 2013).

Even with the enactment of these laws, the political influence, especially in SOEs, was also considered a serious problem and permissive with corruptions and political interference. The Brazilian SOEs Law, Lei nº 13.303 (30 de junho de 2016) was accomplished within this anti-corruption context. Pinho and Ribeiro (2018) synthesize its main objectives:

The main objectives of Law 13.303/2016, according to its own explanatory statement, are to implement: (a) standards for managing the business of state-owned companies; (b) rules for risk management and internal controls, while diminishing the occurrence of corrupt practices by setting compliance and corporate governance standards for state-owned companies; (c) specific procedures for appointing management, limiting the possibility of political appointees for technical positions; (d) rules for contractual arrangements and procurement of goods and services; and, (e) rules for oversight by external control bodies and by society. (p.243)

According to Lei nº 13.303 (30 de junho de 2016), all Brazilian SOEs, Brazilian mixed capital companies¹, and their subsidiaries have strict governance rules defined by it, as well as rigorous rules for choosing the Board and executive members including the CEO. Notwithstanding that several Brazilian SOEs are fully owned by the Brazilian government, that is, they are

¹ Brazilian mixed capital companies are defined by the Brazilian SOEs Law as a corporation whose majority of voting right shares belongs to the municipal, state, district, federal or indirect administration.

not publicly traded companies, there are considerable Brazilian publicly traded stated-owned companies, as seen in Table A.3 of the Appendix.

The implementation of the Brazilian SOEs Law makes it possible to verify, through an event study, the reaction of the market and investors in the Brazilian SOEs. Event studies are particularly useful to measure the impact of a change in the regulatory environment (MacKinlay, 1997) on the firm.

After the implementation of the Brazilian SOEs Law, with stricter corporate governance rules as well as attention to misconduct by managers and corruption problems, it would be expected that the market reacts positively to this news. However, Silva (2018) did not find any evidence of improvement in Brazilian SOEs after the implementation of the Brazilian SOEs Law. Notwithstanding, Oliveira, Holland, and Sampaio (2020) found a reduction in the risk perception of most of the Brazilian SOEs as an effect of this law.

This research aims to contribute to the literature by verifying the impact of the Brazilian SOEs Law on the Brazilian SOEs listed on the stock exchange through an event study. Owing to the legislative process that led to the sanctioning of the law and the two-year adaptation period, the impacts were analyzed on three different event dates: the Brazilian federal Senate bill (08/25/2018), the Brazilian SOEs Law enactment (06/30/2016) and the commencement of the law (06/30/2018).

Numerous papers discuss the effects of legislative/regulatory changes through event studies. The work of Fama, Fisher, Jensen, and Roll (1969) is a theoretical basis for several research works using the event study methodology to examine the effect of new information on asset price (Binder, 1985).

Campbell, Lo, MacKinlay, and Whitelaw (1996); MacKinlay (1997) describe the main procedure for event studies:

1. Define the event of interest and the event window;
2. Determine the selection criteria for firms' inclusion;
3. Measure of abnormal return;
4. Define the estimation window and the estimation procedure;
5. Define the design of the testing procedure;
6. Present the empirical results; and
7. Interpret the results.

However, when the event is a regulatory change or implementation of a law, the event window is not categorical. It is not unusual that the law or regulation has been a result of intense debate until it is enacted or defeated (Lamdin, 2001). Events of this nature can have multiple event periods, as indicated in the Brazilian SOEs Law in the previous section. At least

three events were identified during the discussion, implementation, and commencement date. Thus, in this research, I identified these three events as **Senate bill date**, **Enactment date**, and **Commencement date**.

Several studies use the event study methodology to address the market reaction to regulatory and law changes. In the American market, we can highlight the works of Andriosopoulos, Chan, Dontis-Charitos, and Staikouras (2017); Gao, Liao, and Wang (2018); Jain and Rezaee (2006).

Guimarães and Silva (2020) also use the event study methodology to address the effects of political events, such as presidential elections, or CEO succession in three Brazilian SOEs. They found some impact of political events on Brazilian SOEs, but not in a general, consistent way.

Regarding anti-corruption laws and event studies, Lin, Morck, Yeung, and Zhao (2016) found a significant rise of 81 mainland-based firms trading in Hong-Kong around the anti-corruption campaign announcement date. But, when differentiating Chinese SOEs and nonSOEs, this campaign appears to create value to all firms; however, it seems to create more value when nonSOEs are located in advanced free markets than in location where bureaucrats still allocate key resources. That is, if the market perceives the differences in law enforcement in different environments, the reaction is distinct.

In Brazil, the Brazilian SOEs Law has been the main study subject for several articles. In Pinho and Ribeiro (2018)'s study, the authors highlighted the main requirements for Brazilian SOEs through this legislation. They also emphasized the agency conflicts that emerge due to differences between the interests of those holding controlling power (the government) and those of other shareholders.

Notwithstanding the efforts to establish stricter governance rules for SOEs, Silva (2018) did not find any evidence that suggested the Brazilian SOEs improved their performance after the law was published. The author used performance measures as ROA, Return on Equity (ROE), and also Tobin's Q.

Oliveira et al. (2020) used an artificial counterfactual approach to verify if the Brazilian SOEs Law affected the volatility and the returns of Brazilian SOEs' stocks. Although the share returns did not have any statistical changing, the volatility of most companies analyzed showed lower volatility. These results could corroborate the effectiveness of the Brazilian SOEs Law in improving the governance mechanisms and reducing the risk perception.

Guimarães and Silva (2020) use the event study methodology to verify if there is a correlation between Brazilian presidential elections and CEO succession in Brazilian SOEs. They analyzed the effects in the capital market for three Brazilian SOEs: Banco do Brasil, Eletrobras, and Petrobras. They found some evidence of political events on the firms, but not in a generalizable way. In the case of fiercely disputed elections, it appears the abnormal returns are more common than when it is clear who the president will be. The results about CEO turnover in SOEs are mixed, but it appears that there is no significant impact on the stock prices. Nevertheless, the CEO succession's event is hard to define because of succession rumors and the

succession effective date.

4.1 Research Question

The Brazilian SOEs Law emerged due the urgency of establishing a governance standard for state-owned companies. Although there is no global governance standard for these companies, the OECD provides a guideline on corporate governance on SOEs as a benchmark with best practices (OECD, 2015).

Through a bibliographic and documentary research, Caldeira and Dufloth (2021) consider that the Brazilian SOEs Law is in line with OECD guidance about anti-corruption and integrity in state-owned enterprises. The authors believe this law “introduced a system of integrity, compliance, and anti-corruption relatively adherent to the best international practices that, although incomplete, seems to be moving towards what could be considered cutting-edge practices” (Caldeira & Dufloth, 2021, p.686). Hence, it is plausible to believe that the market would react positively to the new legislation.

The main hypothesis in this research is about the existence of abnormal returns in Brazilian SOEs involving the Brazilian SOEs Law’s events. The null and alternative hypotheses can be written as:

H₀: The abnormal returns of Brazilian SOEs in the event window are statistically equal to zero;

H₁: The abnormal returns of Brazilian SOEs in the event window are not statistically equal to zero.

As mentioned in the previous section, due to legislative process and the deadlines for the beginning of the law’s effectiveness, I stipulated three dates for the empirical analysis, listed in Table 4.1².

Table 4.1
Event dates and description

Event Date	Name	Description
08/25/2015	Senate bill	Beginning of discussion on the 555/2015 Senate Bill at the Brazilian National Congress, which served as the basis for the final text of the Lei n° 13.303 (30 de junho de 2016).
06/30/2016	Enactment	Presidential sanction and publication of the Brazilian SOEs Law.
06/30/2018	Commencement	Commencement of Lei n° 13.303 (30 de junho de 2016).

²For more information on the entire rite of law approval, see Faria (2020).

These dates are relevant to verify the market reaction about the discussion and the implementation of the law. The first date, the **Senate bill**, started the main arguments about strict rules for Brazilian SOEs. In fact, the 555/2015 Senate bill was the main basis for the Brazilian SOEs Law (Faria, 2020). In **Enactment**, the final version of the law is made public after all legislative discussions and presidential vetoes. But the Brazilian SOEs Law provided a two-year adaptation, and the law **commencement** was only after this period.

4.1.1 Sample and Methodology

Once it is defined the event dates (Table 4.1), I set all the Brazilian companies that the Brazilian government controlled during all the events, i.e. 2015 to 2018. Despite I identified 24 Brazilian SOEs in my research, I have chosen for this event study only SOEs the control ownership was directly through a governmental entity, not other Brazilian SOEs. That's because the market reaction for these Brazilian SOEs may not be as strong as for other state companies. For this reason, I excluded BB Seguridade, a company controlled by Banco do Brasil. The last criterion I used was about stock trading: I only used the shares of the Brazilian SOEs that were traded daily in both the event and estimation window. As a result, the event study was conducted for 9 Brazilian SOEs, namely: Cemig, Sanepar, Petrobras, Sabesp, COPASA, COPEL, Banrisul, Eletrobras and Banco do Brasil.

Following the work of Binder (1985); Brown and Warner (1980); Gibbons and Hess (1981), I use a multivariate regression model methodology to measure the event effects on asset prices. The abnormal returns (AR) are used to measure these effects: AR is the actual *ex-post* return of an asset minus the normal, expected return if the event did not take place (MacKinlay, 1997). For a firm i and event τ , we have:

$$AR_{i,\tau} = r_{i,\tau} - E[r_{i,\tau}|X_\tau], \quad (4.1)$$

where r is the actual asset return and $E[r_{i,\tau}|X_\tau]$ is the conditional expected return. Assuming the market model to compute the abnormal returns, the conditional expected return of an asset is derived from the market return. So, in that case, we have:

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + u_{i,t} \quad (4.2)$$

$$E[u_{i,t}] = 0 \text{ and } Var[u_{i,t}] = \sigma_{i,t}^2 \text{ so:}$$

$$E[r_{i,t}|r_{m,t}] = \alpha_i + \beta_i r_{m,t}, \quad (4.3)$$

where $r_{m,t}$ is the market return. To estimate the values of the abnormal returns, we can replace Equation 4.3 in 4.1 for $t = \tau$:

$$\widehat{AR}_{i,\tau} = r_{i,\tau} - (\hat{\alpha}_i + \hat{\beta}_i r_{m,\tau}^e), \quad (4.4)$$

where $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the unbiased estimators and $r_{m,\tau}^e$ is the market return from the event period. As exposed by Pynnönen (2005), each day in a event window would have a distinct effect, that is:

$$r_{i,\tau}^e = \alpha_i + \gamma_{i,\tau} + \beta_i r_{m,\tau}^e + u_{i,\tau}^e, \quad (4.5)$$

where $r_{i,\tau}^e$ is the expected return of asset of a company i from the event period. $\tau = 0$ is the event day (and $t_1 \leq \tau \leq t_2$ is the event window) and γ is the true effect on day τ . Replacing Equation 4.5 on 4.4, we have:

$$\widehat{AR}_{i,\tau} = \alpha_i + \gamma_{i,\tau} + \beta_i r_{m,\tau}^e + u_{i,\tau}^e - (\hat{\alpha}_i + \hat{\beta}_i r_{m,\tau}^e), \quad (4.6)$$

$$= (\alpha_i - \hat{\alpha}_i) + (\beta_i - \hat{\beta}_i) r_{m,\tau}^e + \gamma_{i,\tau} + u_{i,\tau}^e. \quad (4.7)$$

Assuming that $\hat{\alpha}_i$ and $\hat{\beta}_i$ are non-biased estimators from α_i and β_i , the expected value of abnormal returns are:

$$E[\widehat{AR}_{i,\tau} | r_{m,\tau}^e] = \gamma_{i,\tau}. \quad (4.8)$$

So, the traditional event study is equivalent to Equation 4.5 with a dummy variable over the combined sample and event window, once the expected value of the abnormal returns is equal to $\gamma_{i,\tau}$, QED. For a portfolio, we have:

$$r_{p,t} = \alpha_p + \beta_p r_{m,t} + \sum_{\tau=t_1}^{t_2} \gamma_{p,\tau} D_{\tau,t} + u_{p,t}, \text{ where :} \quad (4.9)$$

$$r_{p,t} = \frac{1}{n} \sum_{i=1}^n r_{i,t};$$

$$\alpha_p = \frac{1}{n} \sum_{i=1}^n \alpha_i;$$

$$\beta_p = \frac{1}{n} \sum_{i=1}^n \beta_i;$$

$$\gamma_{p,\tau} = \frac{1}{n} \sum_{i=1}^n \gamma_{p,\tau};$$

$$u_{p,t} = \frac{1}{n} \sum_{i=1}^n u_{i,t}; \text{ and}$$

$$D_{\tau,t} = \text{dummy variables}$$

The dummy variables assumes 1 if $t = \tau$ and zero otherwise. Pynnönen (2005) cites this approach could be utilized in the non-overlapping case. So we have:

$$\bar{r}_t = \alpha_p + \beta_p^* \bar{r}_{m,t} + \sum_{\tau=t_1}^{t_2} \gamma_{p,\tau} D_{\tau,t} + \bar{u}_{p,t}, \quad (4.10)$$

where the bar indicates the average of n firms³. Equation 4.10 synthesizes the econometric modelling for this event study using R software.

Following the steps proposed by MacKinlay (1997), once is defined the measure of the abnormal return, it is necessary to define the estimation window. For each event date, I used 120 days before the event as the estimation window and 9 days (-4, +4) for the event window.

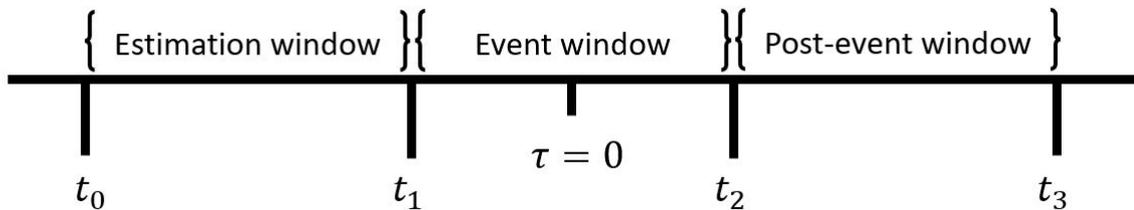


Figure 4.1
Timeline of an event study - Adapted from MacKinlay (1997)

The figure 4.1 illustrates the timeline of an event study. The estimation window goes from t_0 to t_1 , in this research, 120 days prior to event. The event window comprises the event date, 4

³All the proprieties about these estimations can be seen in Pynnönen (2005).

pre-event days, and 4 post-event days.

For computing the asset and the market returns, I used the Continuously compounded return, or log-returns, as seen in equation 4.11 (Tsay, 2005):

$$r_t = \ln \frac{P_t}{P_{t-1}}, \quad (4.11)$$

where r_t is the log-return and P_t (P_{t-1}) is the share price in t ($t - 1$). I used the daily closing shares prices to each period event provided by Yahoo Finance. The data was extracted using `quantmode` package in R software (Ryan et al., 2022). For SOEs that had dual-class shares, I compute the daily log-return using the most tradable shares at the time. The Ibovespa Index, the main performance indicator of the stocks traded in B3 was used to compute the market return.

Table 4.2 summarizes the shares and the dates used in this research.

Table 4.2
Description of the events, estimation window and event window

Event	Shares	Estimation window	Event window
Senate bill	CMIG4, SAPR4, PETR4, SBSP3, CSMG3, CPLE6, BRSR6, ELET3, BBAS3	02/25/2015 to 08/18/2015	d(-4)= 08/19/2015, d(-3)= 08/20/2015, d(-2)= 08/21/2015, d(-1)= 08/24/2015, d (0)= 08/25/2015, d(+1)= 08/26/2015, d(+2)= 08/27/2015, d(+3)= 08/28/2015, d(+4) = 08/31/2015.
Enactment	CMIG4, SAPR4, PETR4, SBSP3, CSMG3, CPLE6, BRSR6, ELET3, BBAS3	12/29/2015 to 06/23/2016	d(-4)= 06/24/2016, d(-3)= 06/27/2016, d(-2)= 06/28/2016, d(-1)= 06/29/2016, d (0)= 06/30/2016, d(+1)= 07/01/2016, d(+2)= 07/04/2016, d(+3)= 07/05/2016, d(+4) = 07/06/2016.
Commencement	CMIG4, SAPR4, PETR4, SBSP3, CSMG3, CPLE6, BRSR6, ELET3, BBAS3	12/28/2017 to 06/25/2018	d(-4)= 06/26/2018, d(-3)= 06/27/2018, d(-2)= 06/28/2018, d(-1)= 06/29/2018, d (0)*= 07/02/2018, d(+1)= 07/03/2018, d(+2)= 07/04/2018, d(+3)= 07/05/2018, d(+4) = 07/06/2018.

*Note: The event window dates are dummies on the estimation of equation 4.10. *The commitment of the Brazilian SOEs Law began on 06/30/2018, Saturday. Once there is no trading session, I consider the next business day as the event day.*

4.2 Results

Once the log returns of the Brazilian SOEs shares used in this research was aggregated in a portfolio, as presented in the previous section, I used the OLS method to estimate the coefficients

of regression 4.10. The results are presented in Table 4.3.

Table 4.3
Abnormal returns - OLS estimation

Variables	Dependent variable: \bar{r}_t		
	Senate Bill	Enactment	Commencement
$r_{m,t}$	1.034*** (0.077)	1.214*** (0.055)	1.163*** (0.056)
d (-4)	-0.242 (1.040)	1.608 (1.171)	-0.847 (0.799)
d (-3)	-0.084 (1.031)	1.286 (1.164)	-0.148 (0.800)
d (-2)	0.406 (1.041)	2.196* (1.162)	-0.041 (0.804)
d (-1)	-1.377 (1.056)	-0.085 (1.164)	0.365 (0.802)
d (0)	-0.638 (1.032)	-0.418 (1.161)	1.369* (0.798)
d (+1)	-0.592 (1.063)	-1.944* (1.162)	-0.476 (0.801)
d (+2)	0.460 (1.068)	0.631 (1.160)	1.505* (0.802)
d (+3)	-0.242 (1.034)	1.989* (1.163)	-1.126 (0.798)
d (+4)	0.461 (1.034)	-0.656 (1.160)	-0.053 (0.799)
Constant	-0.101 (0.094)	0.129 (0.106)	-0.038 (0.073)
Observations	129	129	129
R ²	0.665	0.813	0.801
Adjusted R ²	0.636	0.797	0.785
Residual Std. Error (df = 118)	1.027	1.155	0.795
F Statistic (df = 10; 118)	23.407***	51.267***	47.629***

Notes: Significance *p<0.1; **p<0.05; ***p<0.01. The numbers in parentheses are the standard errors.

This table presents the estimation by OLS of Equation 4.10. \bar{r}_t is the average of the log-returns of the SOEs shares used in this research for day t ; $r_{m,t}$ is the market return in day t and the dummies d represent the event dates for each event. The event dates are presented in Table 4.2.

In event studies, the abnormal returns are aggregated to draw some inferences about the event (Kirch, 2019; MacKinlay, 1997). This aggregation results in the Cumulative Abnormal Return (CAR), which is the cumulative sum of the abnormal returns:

$$CAR_{i,\tau_1,\tau_2} = \sum_{\tau=t_1}^{t_2} AR_{i,\tau}, \quad (4.12)$$

where $\tau_1 = t_1$ and $\tau_2 = t_2$ are the event window days and AR_i is the abnormal return of asset i . Therefore, to verify the CAR in the event window, I calculated the cumulative return comprising 10 distinct event windows. Assuming a normal distribution of the CAR, I performed a parametric, F-test to verify if $\sum_{\tau=t_1}^{t_2} \gamma_{i,\tau} = 0$ for each event window. The F-test is useful when we want to test multiple restrictions simultaneously (Wooldridge, 2015). The results are presented in Table 4.4.

Notwithstanding the abnormal returns on days $d(-2)$, $d(+1)$, and $d(+3)$ of the Enactment event and also $d(0)$ and $d(+2)$ from the Commencement event are statistically significant according to Table 4.3, there are not statistically significant for the CAR. Only the event window $(-1,+2)$ around the Commencement date shows that the cumulative abnormal return is statistically different from zero.

However, these parametric tests are reliable under a series of assumptions: no multicollinearity, homoscedastic, and the residuals are serially independent and normally distributed. Particularly, residuals autocorrelation should be a problem when using a database with time series (Fávero & Belfiore, 2017).

To ensure that the errors are not correlated, I perform a Ljung–Box test (Ljung & Box, 1978). However, the test did not reject the null hypothesis, that is, the errors are correlated during the event Enactment for $lag = 10$ and Commencement for $lag = 1^4$.

I run an additional estimation using fixed effects panel data with cluster-robust standard errors for Enactment and Commencement events because of the potential residual autocorrelation⁵. So, instead aggregating the returns in a portfolio, the log-return of each share was used to calculate the estimation. The panel data allow us to remove some unobserved heterogeneity constant in t and the cluster-robust standard errors are useful when unobserved components of outcomes for units within clusters are correlated, but independent across cluster (Wooldridge, 2010). Thus, the statistical tests of the parameters calculated in the model are asymptotically robust.

Table 4.5 summarizes the estimates from the fixed effects panel regression. In contrast to the OLS estimation presented in Table 4.3, only dates in the Enactment window are statistically significant.

I also calculated the CAR from the abnormal returns estimated through panel data, following Equation 4.12. The Commencement event is statistically significant in the $(-1,+1)$

⁴For brevity, these results are not reported, and they are available under request.

⁵I also estimated the abnormal returns for the Senate bill event using effects panel data with cluster-robust standard errors. However, the Ljung–Box test indicated serial correlation for its residuals. Therefore, I chose not to report the parameter values of this estimation.

event window, while the Enactment event is significant in the $(-4, +4)$ event. The results are presented in Table 4.6.

Table 4.4
Cumulative abnormal returns - OLS estimation

Event window	<i>Cumulative abnormal returns</i>		
	Senate Bill	Enactment	Commencement
(-4,+1)	-2.527 (1.008)	2.642 (1.108)	0.220 (0.007)
(-3,+1)	-2.285 (1.002)	1.034 (0.204)	1.068 (0.216)
(-2,+1)	-2.201 (1.170)	-0.251 (0.015)	1.216 (0.349)
(-1,+1)	-2.607 (2.207)	-2.447 (1.925)	1.257 (0.507)
(-1,+2)	-2.147 (1.085)	-1.816 (0.790)	2.762* (1.804)
(-1,+3)	-2.390 (1.083)	0.172 (0.006)	1.636 (0.505)
(-1,+4)	-1.929 (0.588)	-0.483 (0.037)	1.583 (0.390)
(-2,+2)	-1.741 (0.578)	0.379 (0.027)	2.721 (1.373)
(-3, +3)	-2.067 (0.576)	3.654 (1.799)	1.447 (0.278)
(-4, +4)	-1.849 (0.353)	4.606 (2.193)	0.546 (0.030)

Notes: *p*-value significance of *F* test * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. The numbers in parentheses are the standard errors.

Table 4.5
Abnormal returns - Fixed effects panel data

Variables	<i>Dependent variable: $r_{i,t}$</i>	
	Enactment	Commencement
$r_{m,t}$	1.214*** (0.176)	1.163*** (0.157)
d (-4)	1.608** (0.590)	-0.847 (0.990)
d (-3)	1.286* (0.687)	-0.148 (0.886)
d (-2)	2.196* (0.958)	-0.041 (0.615)
d (-1)	-0.085 (0.808)	0.365 (0.597)
d (0)	-0.418 (0.997)	1.369 (0.802)
d (+1)	-1.944** (0.734)	-0.476 (0.447)
d (+2)	0.631 (0.570)	1.505 (1.643)
d (+3)	1.989* (0.883)	-1.126 (1.006)
d (+4)	-0.656 (0.563)	-0.053 (0.408)
Observations	1,161	1,161
R ²	0.392	0.348
Adjusted R ²	0.383	0.338
Residual Std. Error (df = 1142)	2.899	2.110

*Notes: Significance: *p<0.1; **p<0.05; ***p<0.01* The numbers in parentheses are the standard errors. The table presents the estimation of equation $r_{i,t} = \beta_i r_{m,t} + \sum_{\tau=t_1}^{t_2} \gamma_{i,\tau} D_{\tau,t} + u_{i,t}$, where $r_{i,t}$ is the log-return of share i , $r_{m,t}$ is the market log-return, and $D_{\tau,t}$ is the dummies during the event window. The regression was calculated with fixed effects per firm (i). The standard errors are also clustered by firm i . I performed a Ljung–Box test for the residuals of Equations (1) and (2); $lag = 1$ and $lag = 10$. The tests indicate that we can reject the null hypothesis the errors are correlated.

Table 4.6
Cumulative abnormal returns - Fixed effects panel data

Event window	Cumulative abnormal returns	
	Enactment	Commencement
(-4,+1)	2.642 (2.775)	0.220 (0.052)
(-3,+1)	1.034 (0.527)	1.068 (2.505)
(-2,+1)	-0.251 (0.028)	1.216 (1.443)
(-1,+1)	-2.447 (2.801)	1.257* (4.061)
(-1,+2)	-1.816 (1.585)	2.762 (1.672)
(-1,+3)	0.172 (0.011)	1.636 (1.740)
(-1,+4)	-0.483 (0.118)	1.583 (1.402)
(-2,+2)	0.379 (0.067)	2.721 (1.307)
(-3, +3)	3.653 (2.756)	1.447 (1.946)
(-4, +4)	4.606* (5.074)	0.546 (0.232)

Notes: Significance *p<0.1; **p<0.05; ***p<0.01. The numbers in parentheses are the F statistics.

This Table presents Cumulative Abnormal Returns from the estimation presented in Table 4.5 for the Enactment and Commencement.

4.3 Discussion and Implications

The corruption problems in Brazil are secular. The Transparency International, a non-governmental organization, publishes the Corruption Perceptions Index that provides perceptions by business people and country experts of the level of corruption in the public sector yearly. The index scale varies from 100 (very clean) to 0 (highly corrupt) (Transparency International, 2022). The actual Brazil's score is 38 (for 2021 dataset), and the average score from 2015 to 2018 is 37.5. The Transparency International considers that countries with scores below 50 have serious corruption problems.

Several corruption scandals and even a political crisis that culminated in a recent presidential impeachment in Brazil led to strict rules about corruption, especially when the government is involved, as in Brazilian SOEs. This research intended to verify if the market reaction about events was related to the discussion and implementation of the Brazilian SOEs Law. Assuming that the events around the new rules about the corporate governance of Brazilian SOEs Law are exogenous with respect to the change in market value of the SOEs' shares, this investigation allows us to understand if the law causes some abnormal returns on the firms controlled by the Brazilian government.

Using a multivariate regression to measure the event effects on the Brazilian SOEs' shares, I stipulated three different event dates due to the nature of legislative discussion: the Senate bill, the Enactment of Lei n^o 13.303 (30 de junho de 2016), and the Commencement of the law. First, I estimated the abnormal returns using the OLS method. Once the residuals of the regressions for the Enactment and Commencement event appear to be serially correlated, I run a fixed effects panel data analysis to measure the results for these two events. Although the Senate Bill event did not show abnormal returns that were statistically different from zero, the CAR indicated that there was a positive reaction around the Enactment and Commencement dates.

The events around the Enactment date appears to be more robust, once several days the abnormal returns presented in Table 4.5 are statistically significant. The absence of abnormal returns around the Senate bill could be due to uncertainties about the law approval, the possible vetoes, and the political interference that could occur in the legislative process. The cumulative abnormal returns presented in Table 4.6 around the Commencement date could indicate that the market reacted positively to the new Brazilian law.

Despite the fact near the Commencement date, several news reported most of Brazilian SOEs still had not adapted to the requirements of Lei n^o 13.303 (30 de junho de 2016), Ryngeblum and Gutierrez (2018) stated that the Brazilian SOEs that were publicly traded already followed rules from the CVM and several practices from the Brazilian Corporate Governance Code. So, the positive CAR from the Commencement event window in Table 4.6 could be due to this perception about Brazilian publicly traded SOEs that had already adapted to the new legislation.

Nevertheless, we cannot reject these results, as it could indicate another phenomenon or event in the capital markets in Brazil, once the research from Silva (2018) did not indicate several changes in the main performance indicators from Brazilian SOEs.

Moreover, my research showed the impact from the market capital and the investors' perception through share prices through an event window using several phases of the Brazilian legislative process. It is to be expected that the discussion of the bill in the National Congress has no impact on the stock price: the discussion around the bill generally takes some time and the political decisions can take longer than expected.

Thus, this research contributes to the literature, such as Guimarães and Silva (2020); Oliveira

et al. (2020), considering the political events in the Brazilian capital market, specifically for Brazilian SOEs. Studying the succession of different CEOs of Brazilian SOEs under Lei n^o 13.303 (30 de junho de 2016) and other aspects of this law, or even a case study in Brazilian privately held SOEs after the commencement of Lei n^o 13.303 (30 de junho de 2016) can also contribute to the literature.

5 Conclusion

The Government's role has always been a topic of discussion in the Brazilian economy, whether advocates for greater government participation in the economy or those who prefer a more liberal stance on the part of the state. The fact is that there is no consensus on the implications of government interference in the economy, especially when it influences companies and productive activities in the country. The government can influence companies and the economy in distinct ways, and some of them could be less harmful, or even beneficial to companies (Inoue et al., 2013). There are several ways for the government to intervene in companies without controlling them or exerting such a significant influence that it implies political costs, especially when dealing with publicly traded companies.

However, when the government owns shares of publicly traded companies, its actions may harm other shareholders, especially in cases of political influence or corruption. A recent case is the indemnification that Petrobras agreed to pay to the American authorities to end a judicial process that demanded compensation to minority shareholders due to the losses resulting from the alleged corruption schemes (Fernandes, Romero, Torres, & Rostás, 2018).

But what is the extent of the Brazilian government's influence on publicly traded companies in Brazil? To answer this question, in Chapter 2 I analyzed the shareholding structure of Brazilian publicly traded companies from 2010 to 2019 to verify the government ownership in these companies. Since the Brazilian government can buy shares through National Treasury, public, and development banks, and other state-owned enterprises and also exerts significant influence on SOEs' pension funds, I intended to cover all types of government ownership. The voting rights were also considered, and it generates 9 different classification from the Brazilian government ownership.

Although the Brazilian government controlled few companies in my sample, it was a shareholder in 26% of firm-year observation. This evidence shows how valid it is to study the influence of the government in Brazil, as it is a relevant player in the Brazilian capital market.

Using these unique set of Brazilian government ownership data, I was able to analyze whether the government as a shareholder influences the CEO's compensation in Chapter 3. Surprisingly, the government ownership has a negative and significant relationship with CEO compensation for all types of government ownership, and not only when the government has a direct voting-share ownership. During financial crisis, the CEO can benefit himself/herself from the indirect government ownership: the negative relationship is attenuated by indirect

government ownership in times of economic distress.

These results can corroborate the findings of Borisova et al. (2019): the CEO compensation level can be lower because there is more social and media pressure on SOEs. When government ownership is not evident, CEOs can capture the benefits of having the government as a shareholder, enjoying the implicit and explicit government guarantees (Beuselinck et al., 2017).

In Chapter 4, I use the data collected in Chapter 2 to identify the fully Brazilian SOEs and through an event study, verify if the Lei n^o 13.303 (30 de junho de 2016) caused any abnormal return on the SOEs' shares. The evidence indicates that the Enactment and the Commencement of the Brazilian SOEs Law were linked to cumulative abnormal returns on the event window. Once the law was conceived surrounding corruption issues and aimed to increase the governance of the Brazilian SOEs avoiding political interference, it is plausible that the market assigned a positive signal to the new Law.

I intended to contribute with the finance studies through the relationship of publicly traded companies with a relevant market player in Brazil: the government. Although several questions remain unanswered, its an interesting path for future research. As an example, it is intriguing to verify if in Brazilian market, the negative influence on CEO compensation translates into less risk-taking by the executives. Another interesting research question is about dividends distribution and the Brazilian government ownership. This research also could be linked with electoral cycles, and using the government ownership classification presented in Table 2.1.

This research is pertinent not only to investors and shareholders but also for the Brazilian government to increase the debate on how to encourage an economy and foster the growth of companies without harming other shareholders and increase governance mechanisms through laws and supervision.

A Government ownership

Table A.1
List of all Brazilian government institutions
considered as a direct government ownership in this study

Direct Government ownership
BNDES
BNDESPar
Banco Regional de Desenvolvimento do Extremo Sul - BRDE
Caixa
CaixaPar
Fundo de Apoio aos Contribuintes do Estado de São Paulo - FUNAC
Fundo de Garantia de Operações de Crédito Educativo - Fgduc
Fundo Garantidor de Operações - FGO
Fundo de Investimento do FGTS - Fi - FGTS
Financiadora de Estudos e Projetos - Finep
Fundo de Garantia de Operações de Crédito Educativo
Fundo Fiscal de Investimentos e Estabilização
Fundo Garantidor à Exportação
Fundo Garantidor das Parcerias Público e Privadas
Fundo Garantidor de Habitação - Fghab
Fundo Garantidor para Investimentos
Fundo Nacional de Desenvolvimento - FND
Governo do estado do Espírito Santo
Governo do estado de Goiás
Governo do estado de Minas Gerais
Governo do estado do Paraná
Governo do estado de Santa Catarina
Governo do estado de Sergipe
Governo do estado do Rio Grande do Sul
Governo do estado de São Paulo
União Federal/ Governo Federal

Table A.2
List of all SOEs pension funds and other private companies
considered as indirect government ownership in this study

Direct Government ownership
Fundacao Banco Central - Centrus
BB Banco De Investimento
Companhia Estadual De Energia Eletrica Participacoes - Ceee Par
Energia Sao Paulo Fundo De Investimento Em Participacoes
Fundação CELESC
Fundação Cesp
Fundação Chesf
Fundação de Assistência De Previdência Social Do BNDES FAPES
Fundação dos Economiários Federais - FUNCEF
Instituto de Previdencia Dos Sevidores Do Distrito Federal - Iprev Df
Instituto Infraero De Previdência Social
Petros
Postalis
Previ
Sabesprev
Public SOEs (e.g. Petrobras)

Table A.3
State-owned enterprises

Ticker	Company's name	Sector	Control ownership
AHEB3	SP Turismo	Others	Municipal Government (municipality of São Paulo)
BAZA3	Banco da Amazonia	Finance and Insurance	Federal Government
BBAS3	Banco do Brasil	Finance and Insurance	Federal Government
BBSE3	BB Seguridade	Finance and Insurance	Federal Government ¹
BEES3	Banestes	Finance and Insurance	State Government (Espírito Santo)
BGIP3	Banese	Finance and Insurance	State Government (Sergipe)
BNBR3	Banco do Nordeste	Finance and Insurance	Federal Government
BPAR3	BANPARA	Finance and Insurance	State Government (Pará)
BRSR3	BANRISUL	Finance and Insurance	State Government (Rio Grande do Sul)
BSLI3	Banco de Brasília	Finance and Insurance	Districtal Government (Distrito Federal)
CASN3	CASAN	Others	State Government (Santa Catarina)
CEBR3	CEB	Electric Power	District Government (Distrito Federal)
CESP3	CESP	Electric Power	State Government (São Paulo) ²
CLSC3	CELESC	Electric Power	State Government (Santa Catarina)
CMIG3	CEMIG	Electric Power	State Government (Minas Gerais)
CPLE3	COPEL	Electric Power	State Government (Paraná)
CSMG3	COPASA	Others	State Government (Minas Gerais)
ELET3	ELETROBRAS	Electric Power	Federal Government
EMAE3	EMAE	Electric Power	State Government (São Paulo)
GPAR3	CELGPAR	Electric Power	State Government (Goiás)
PETR3	Petrobrás	Oil & Gas	Federal Government
SAPR3	SANEPAR	Utilities	State Government (Paraná)
SBSP3	SABESP	Others	State Government (São Paulo)
TELB3	TELEBRAS	Telecommunication	Federal Government

¹ Through Banco do Brasil. ² Until 2017.

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