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DOES BOARD INTERLOCK INCREASE CEO COMPENSATION?
EVIDENCE FROM BRAZILIAN LISTED COMPANIES

PORTO ALEGRE
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DISSERTATION submitted as partial fulfill-
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Advisor:
Prof. Dr. Cristiano Machado Costa

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ABSTRACT

This study investigates the effects of board interlocking on CEO compensation, the impact of gender diversity on boards on CEO compensation, and whether gender diversity mitigates board interlocking effects on CEO compensation. Our sample contains 275 Brazilian companies listed on the Brazilian Stock Exchange (B3), covering 2011 to 2018. This sample made it possible to evaluate Brazilian companies' corporate governance framework and evaluate the Brazilian market's peculiarities, such as many economic groups organization. The empirical findings of our study threefold. First, our results indicate that the higher is the level of board interlocking, the higher is CEO compensation in the Brazilian companies covered by our study. Second, the percentage of women on boards negatively affects CEO compensation. Third, by analyzing the moderating role of gender diversity, our results show that gender diversity reduces the effect of board interlocking on CEO compensation. Overall, our study supports the agency and managerial power theory perspectives, as per the board of directors' role in setting CEO compensation package, and the issues that can influence this role.

RESUMO

Este estudo investiga os efeitos do board interlocking na remuneração do CEO, os efeitos de boards com diversidade de gênero na remuneração do CEO e se a diversidade de gênero mitiga os efeitos do board interlocking na remuneração do CEO, atuando como moderadora. Nossa amostra contempla 275 companhias brasileiras listadas na Bolsa de Valores brasileira (B3), cobrindo o período de 2011 até 2018. Essa amostra fez com que fosse possível avaliar a estrutura de governança corporativa das companhias brasileiras, bem como as peculiaridades do mercado Brasileiro, como a existência de grandes grupos econômicos. Nossos resultados empíricos são triplos. Primeiramente, nossos resultados indicam que o board interlocking tem um impacto positivo e significante na remuneração do CEO. Segundamente, nossos resultados indicam o percentual de mulheres no conselho de administração tem um impacto negativo e significante na remuneração do CEO. Finalmente, analisando a função moderadora da diversidade de gênero, nossos resultados mostram que a diversidade de gênero reduz os efeitos do board interlocking na remuneração do CEO. De forma geral, nosso estudo suporta as perspectivas da Teoria da Agência e da Teoria do Poder Gerencial, em relação à função do conselho de administração de desenhar o pacote de remuneração do CEO e outras questões que podem influenciar esta atribuição.

Palavras-chave: Remuneração do CEO, Board Interlocking, Conselho de administração, Diversidade de gênero.

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1 INTRODUCTION

Executive compensation has become a focus of increasing attention (ALBUQUERQUE; FRANCO; VERDI, 2013; WONG; GYGAX; WANG, 2015; COSTA et al., 2016; LARCKER; MCCLURE; ZHU, 2019). In particular, from corporate governance practices, CEO compensation is an essential internal governance mechanism. A well-designed package of benefits retains CEOs with good performance and, at the same time, it helps to mitigate the risk of opportunistic behavior and agency conflicts (JENSEN; MECKLING, 1976). Many elements help to explain CEO compensation, such as firm size, business complexity, performance, CEO power, board vigilance, and the CEO's human capital (FINKELSTEIN; HAMBRICK, 1989).

Taking a closer look at a corporate governance structure, the board of directors is responsible for designing and approving CEO compensation. This role can be affected by the CEO's power over the board (BEBCHUK; COHEN, 2005) to extract higher benefits. The board of directors is considered the first line of defense against managers who would act contrary to shareholders' interests (BRENNAN, 2006). Having the responsibility to provide strategic management and monitoring, the board of directors plays an essential role in corporate governance (GILLAN, 2006). Besides, board's responsibilities include aligning the interests of directors, management, shareholders, and stakeholders, mitigating potential agency conflicts between managers and owners with transparency and accountability.

The proper compensation design will depend on the effectiveness of the board of directors (LUCAS-PÉREZ et al., 2015). In order to guarantee compliance of the board of directors with its duties, it is essential to consider its composition. The board of directors' members' choice should consider some unique features: the diversity of knowledge, cultural aspects, age, and gender (IBGC, 2015). The difference of opinions, experience, and diversity features contributes to the board's monitoring and advisory roles. Also, following the findings of Adams e Ferreira (2009), women tend to improve the monitoring role of the board of directors, helping it fulfill your duties. Claims for increasing the number of women on the board of directors have been doing for some regulators in different countries, including recommendations and sometimes requirements of a minimum percentage of women on boards in their corporate governance codes. Although the recommendations, gender diversity in the board of directors is a still little explored issue in Brazil, and women are underrepresented on the boards of directors of Brazilian companies, with approximately 8.6% of representative on the board (CREDIT SUISSE RESEARCH INSTITUTE, 2019).

Another point that could impact the board of directors' duties is the relationship between directors, which might reduce board members' independence. It could reflect in the board of

directors' decisions, such as CEO compensation package design (LARCKER et al., 2005). Following this perspective, this study proposes evaluating the level of board interlocking in Brazilian companies by investigating whether the directors usually serve to more than one board in Brazil. This is also a little-explored issue in Brazil, having just a few studies as per board interlocking. Most of them measured the impacts of board interlocking on firm value or earnings management (SILVEIRA; BARROS; FAMÁ, 2008; SANTOS; SILVEIRA; BARROS, 2012; CUNHA; PICCOLI, 2017; VESCO; BEUREN, 2016). Silveira, Barros e Famá (2008) describes that board interlocking has been frequent in Brazilian companies listed by B3.

This study aims to deepen our knowledge of board interlocking in Brazilian listed companies by assessing its effects on CEO compensation. It is a field of study that, to our knowledge, does not have been explored in Brazilian studies. Even though this issue already was evaluated abroad (HALLOCK, 1997; FICH; WHITE, 2003; WONG; GYGAX; WANG, 2015), we did not find studies evaluating the effect of board interlocking on CEO compensation in Brazil. Also, we aim to explore this issue even further by evaluating the gender diversity on board composition in Brazilian companies. Sarabi e Smith (2021) argue that even though the busy directors' topic has gained increased attention in recent years, the gender of these directors is regularly dismissed. Considering that, we aim to identify whether gender diversity on the boards has effects on CEO compensation. It is another non-explored point in Brazil. Also, we evaluated the combined effect of board interlocking and gender diversity in board composition on CEO compensation to identify if women on boards mitigate the effects of board interlocking on CEO compensation.

Our study brings several contributions to the literature, such as an increase of board interlocking knowledge in Brazilian companies, the exploration of different effects of board interlocking (CEO Compensation), and evaluating the effects of women's presence on the board of directors on CEO compensation. We also created a new proxy of board interlocking, considering the interlocks created inside the same economic group. We have done this to identify if the relationship established inside the groups influences the level of board interlocking, or even if board interlocking occurs only in cases in which the companies are part of an economic group. It is a methodological contribution of this study, providing a new measure of board interlocking and promoting new reflections as per this issue, considering the Brazilian market's peculiarities, with the presence of substantial economic groups. Ultimately, we propose to create and evaluate an issue that, to our knowledge, was not explored in the literature yet: we investigate whether the gender diversity on the board of directors works as a moderator in the relationship between board interlocking and CEO compensation.

We built a dataset using information from the Reference Form from CVM (Comissão de Valores Mobiliários), in which Brazilian listed companies have to disclose governance information once a year. As a large amount of data was not structured, we did several procedures to treat them and in order to guarantee its reliability and reach a significant sample to do our analyses. Using panel data pooled of 275 Brazilian publicly companies, covering the period from 2011 to 2018, we find that board interlocking positively influences CEO compensation. It means that the higher is the level of board interlocking, the higher is CEO compensation in Brazilian companies of our sample. We also conducted an additional analysis testing our proxy of the board interlock group. Our findings of the relationship between the interaction of board interlocking and board interlocking group with CEO compensation shows that the level of board interlocking found in our first analysis actually reflects that directors usually sit on more than one board in Brazilian listed companies, not only in boards of companies that belong to the same economic groups. We also find a negative influence of women on board on CEO compensation by measuring two gender-diversity proxies in board composition. Our finding entails that the presence of women on the board makes CEO compensation lower. Finally, we found that women on board reduces the effect of board interlocking on CEO compensation, turning CEO compensation lower when the companies are interlocked and have women on the board, than when the companies are interlocked and have no women on the board.

This study's main limitations were the lack of data from some companies, which did not have disclosure all of the information that we needed to do our analyses. Besides, in many cases, the data was not structured, so as we mentioned above, many procedures and treatments were necessary to improve the data quality to run our models. The dissertation is organized as follows: Section 2 presents the literature review and develops the hypotheses; Section 3 outlines with sample and data and presents the methodology; Section 4 reports and discusses the main empirical findings, and the last section presents the paper's conclusions.

1.1 RESEARCH PROBLEM

What is the relationship between Board Interlocking and CEO compensation in Brazilian companies listed on B3?

1.2 OBJECTIVES

1.2.1 Objective

Analyze the relationship between board interlocking and CEO Compensation in Brazilian companies listed on B3.

1.2.2 Specific Objectives

- Estimate the level of board interlocking in Brazilian companies;

- Evaluate if women on board affects CEO compensation;

- Investigate if the women's presence on board of directors' mitigates the effect of board interlocking on CEO Compensation.

1.3 MOTIVATION AND RELEVANCE

Although the increase of CEO compensation (ALBUQUERQUE; FRANCO; VERDI, 2013; WONG; GYGAX; WANG, 2015; COSTA et al., 2016; LARCKER; MCCLURE; ZHU, 2019) and board interlocking (FICH; WHITE, 2003; WONG; GYGAX; WANG, 2015; SILVEIRA; BARROS; FAMÁ, 2008; SANTOS; SILVEIRA; BARROS, 2012) studies in recent years, little is known about the effects of board interlocking in the design of CEO compensation. Hallock (1997), Wong, Gygax e Wang (2015), and Fich e White (2003) investigated the effects of Board Interlocking on CEO Compensation in U.S. Companies, using different samples, times, and measures of board interlocking. Fich e White (2003) evaluated the effects of mutual interlocks on CEO Compensation and found a positive link between them. Wong, Gygax e Wang (2015) analyzed the effects of board interlock - when the director of Company A sits on the board of Company B -, and found that "board interlocks are positively linked with similarities in the design of executive compensation packages in interlocked firms." Hallock (1997) evaluated the effects of mutual CEO interlocks - when the CEO of Company A sits on the board of Company B, and the CEO of Company B sits on the board of Company A - on CEOs compensation. He also found a positive relationship between interlocks and CEO compensation, which implies that CEO compensation in interlocked companies is higher than in non-interlocked ones. This study focuses on measure the network established among directors from the board of different companies. In other words, we analyze the levels of board

interlocking (when the director of company A sits on the board of company B) in Brazilian companies and their effects on CEO Compensation. To our knowledge, no previous studies are evaluating the effects of board interlocking on CEO compensation in Brazil. There is an opportunity to enhance the literature, especially in emerging countries, and including new variables to measure board interlocking outcomes, like executive compensation.

Brazilian market does not prohibit Board interlocking practice. The Brazilian Federal Law 6.404/76 establishes that directors should have a good business reputation. The companies cannot elect directors who already sit in concurrent companies or companies, which may cause conflicts of interest. A director who sits on more than one board has to communicate with both companies about potential interest conflicts (IBGC, 2015). Furthermore, there are several non-regulatory recommendations elaborated by institutions, such as IBGC (Corporate Governance Brazilian Institute), which publishes codes of best practices of corporate governance to Brazilian companies (IBGC, 2015). Among these best practices, there are recommendations about board composition, including the guidance of diversity on the boards, director characteristics, audit practices, disclosure requirements, and control and monitoring practices.

Taking a closer look in gender diversity' recommendations worldwide, many countries have established quotas for women in Norway companies' boards, in a number of 40%. Following this trend, other european countries also established these quotas. As Sarabi e Smith (2021) shows, the implementation of gender quotas for boards in Norway has started a "snowball effect" that has been recognized as an instance to follow throughout Europe. Hence, some countries implemented quotas, such as Spain, Italy, and France. Many countries did not establish quotas for women on boards. However, they implemented the "comply or explain" practice, in which companies that did not adopt the recommended governance corporate practices need to explain their reasons. That is is a kind of enforcement for companies to adopt a significant amount of the best governance practices. An example of countries that have adopted the "comply or explain" is the UK and Brazil. The two countries do not have any law requirements of gender diversity in the boardroom, but Brazil has on average 8% women's representativity on boards; meanwhile, the UK has a little over 30% (CREDIT SUISSE RESEARCH INSTITUTE, 2019). Both adopt the "comply or explain" practice to improve corporate governance structure in their public companies, but the percentage of women's representativity on boards is significantly different. The situation in Brazil is pretty worse. According to the study made by Credit Suisse Research Institute (2019), in 2019 Brazilians' companies used to have a little over 8% of women on boards, and only 5% of women as CEOs, CFOs, and strategy. Therefore, it is an opportunity to contribute to the literature by analyzing how gender diversity on boards

could influence public companies' strategic decision-making process in Brazil, a country that women are underrepresented on boards.

Besides, concerns with the effects of board interlocking on CEO compensation made it SEC established in 1992 the firms' requirement to disclose interlocks and executive compensation (FICH; WHITE, 2003). In Brazil, the CVM (Comissão de Valores Mobiliários), a regulator equivalent of SEC in the United States, established requirements for publicly traded companies of corporate governance practices and disclosure governance information. However, the interlocks do not need to be disclosed. Publicly traded companies listed on B3 have to disclose their executive compensation practices and other information once a year. However, only the amount maximum, minimum, and average compensation paid to the executive officers (CVM, 2009). In Brazil, we do not have segregated data from CEO compensation, such as fixed salary, stocks, and other benefits. The disclosure requirement was embedded in Brazil by CVM Ordinance 480 in 2009, and the companies have to disclose that information through the Reference Form (CVM, 2009), which we used to extract the data set of this study. However, Costa et al. (2016) shows that many Brazilian companies refused to comply with the regulation, despite it applying to all publicly traded firms in Brazil. They found that these firms claimed that disclosing executive compensation information would expose top executives' identities, and criminals would use it to plan kidnappings and other crimes against executives or their families. They also found that companies that do not disclose their executive compensation present higher CEO compensation and are located in places with more inequality and higher human development levels.

Considering Brazilian regulatory framework regarding corporate requirements, this study also contributes to the government and other institutions that make corporate governance recommendations by providing more data to make their documents with governance rules. Also, we explore the peculiarity of the Brazilian market, which has a high ownership concentration. Most of the Brazilian companies have a majority shareholder with an average of 50% of the stock of the Company (HOLANDA; COELHO, 2014, 2012). It is different from the United States market, for instance, which has ownership pulverized. Therefore, there is a higher practice of board interlocking on countries with ownership concentration because these countries have fewer actors on their market network. Moreover, according to Pinto e Leal (2013) and Bebchuk e Fried (2003), the level of ownership concentration can influence executive compensation. This study also clarifies ownership concentration and identifies if it has any effect on board interlocking level and, consequently, on CEO compensation; so, we bring innovation. We created a proxy of board interlocking in economic groups to measure the number of interlocks inside the group and identify if this proxy has some impact on CEO compensation.

Moreover, board interlocking studies have been more frequent in several countries around the world, as Singapore (PHAN; LEE; LAU, 2003), Saudi Arabia (HAMDAN, 2018), United States (FICH; WHITE, 2003; WONG; GYGAX; WANG, 2015), India (HELMERS; PATNAM; RAU, 2017), Italy (DRAGO et al., 2015) and France (YEO; POCHET; ALCOUFFE, 2003). Despite these studies that deepen the board interlocking' analysis in several countries, there are few studies in this specific field in Brazil. Therefore, this analysis is fundamental because it helps increase governance literature by evaluating a different perspective of CEO compensation design, board composition and duties, and gender diversity in an emergent country.

2 LITERATURE REVIEW

2.1 CEO Compensation

Jensen e Meckling (1979) defines Agency Relationship as a contract in which one person - the principal - hire another person - the agent - to be responsible for his activity, including delegate some decision-making power to the agent. It creates a relation of dependence between the principal and the agent. If both sides of the relationship are profit maximizers, there is a good reason to think that the agent will not always work in the principal's most beneficial interests. By the Agency Theory, the segregation between ownership and control may turn on interest conflicts among shareholders, and managers (BERLE; MEANS, 1932), which are called "agency conflicts" by the literature. According to Bebchuk e Fried (2003), the separation between ownership and management empowers the managers, and the highest corporate managers have "almost complete management discretion." (BERLE; MEANS, 1932).

One of the internal governance mechanisms used to mitigate agency problems is executive compensation. It has received more evidence in recent years, mainly due to the advance of corporate governance legal requirements, the disparity between CEO compensation and employees or other executives compensation, and the concern of a disconnect between pay and performance (GILLAN, 2006; LARCKER; MCCLURE; ZHU, 2019; HOI; WU; ZHANG, 2019; COSTA et al., 2016; ALBUQUERQUE; FRANCO; VERDI, 2013; BEBCHUK; FRIED, 2009; VO; CANIL, 2019). An additional reason is a compelling increase in executive compensation of U.S companies since the 1990s, during the bull market, and the corporate scandals of 2001 (BEBCHUK; FRIED, 2009).

Executive compensation is seen as an essential governance mechanism of attraction, motivation, and retention of CEO, and it promotes the aligning among CEO interests, and company interests (IBGC, 2015). Economists argue that payment arrangements are designed by executives trying to get the best potential deal for themselves and boards trying to get the best deal for shareholders. The literature calls this trade as an "optimal contracting approach" (BEBCHUK; FRIED, 2003). A properly executive compensation design can help to mitigate the agency conflicts between the board of directors and executives (BEBCHUK; FRIED, 2005). These conflicts would result in managerial rent extraction in CEO compensation, beginning to opportunistic pay methods that improperly favor the CEO and give him higher compensation levels (HOI; WU; ZHANG, 2019; BEBCHUK; FRIED, 2003).

Even though Agency Theory helps explain the importance of executive compensation as a mechanism of agency conflict mitigation, the 'optimal contract' argument could not explain

all executive compensation design aspects. In opposition to the preceding traditional view, a secondary idea, the 'managerial power' approach, argues that CEOs can influence board decisions, including compensation decisions. These compensation contracts do not necessarily maximize shareholder wealth (GRINSTEIN; HRIBAR, 2004). In this case, considering the CEO's power over the board, especially when CEO is the chairman of the board of directors (GRINSTEIN; HRIBAR, 2004; BEBCHUK; FRIED; WALKER, 2002), the CEO can extract higher compensation arrangements from the board. To clarify the association between the two theories, Bebchuk, Fried e Walker (2002) explains that under the optimal contract approach (agency theory), the board of directors sets CEO compensation to maximize shareholders value. On the other hand, the managerial power theory brings the idea that boards "do not operate under market conditions in the preparation of executive compensation arrangements," rather than boards working on setting CEO compensation under a strong influence of the CEO.

Wong, Gygax e Wang (2015) also have shown that Managerial Power Theory serves as a complement for the Agency Theory by introducing the CEO's power over the board of directors. The broader idea of this theory is that as more powerful the CEO is over the board, they can influence the board to accept higher executive compensation packages. The theory also posits that when the company has an effective board of directors, the CEO tends to be less paid because he could not increase his influence at this point. An effective board could be a large board, have specialized committees, or that the CEO does not elect the outside directors. Besides that, Bebchuk, Fried e Walker (2002) claims that managerial power theory should be taken into account in any examination of executive compensation arrangements. If the CEO has a strong power over the board of directors, it could imply decisions that benefit the CEO, such as higher CEO compensation.

The literature provides evidence that the CEO usually can appoint a new board of directors (BEBCHUK; FRIED, 2009). Bebchuk e Fried (2005) analyze how the CEO power over the board of directors can influence his/her compensation in U.S. companies. They found that managerial influence over the design of pay arrangements has given substantial distortions in these arrangements, resulting in costs to investors and to the economy. From this point of view, the CEO's power over the board of directors is a limitation to establishing an "optimal contracting," which is excellent both to CEO and shareholders. Besides that, Fich e White (2003) posit that board composition, including the links between directors from different companies (interlocks), is mostly determined by CEOs' efforts to influence the choice of new directors so that they are receptive to that particular CEO's interests. Then, CEOs have meaningful influences in setting their own pay. They tend to use their power to employ more opportunistic pay practices that significantly favor themselves and extract higher compensation (HOI; WU;

ZHANG, 2019).

Jensen e Meckling (1979) show that the principal can restrict deviations from the CEO's interest by establishing proper incentives and inciting monitoring, costs meant to limit the wrong actions for the agent. Moreover, to provide it with the CEO compensation design, companies usually select peer companies to compare their CEO's salary, as a benchmark (ALBUQUERQUE; FRANCO; VERDI, 2013; LARCKER; MCCLURE; ZHU, 2019). Albuquerque, Franco e Verdi (2013) have shown that firms are more likely to choose peer companies that pay higher compensation to their CEO to justify opportunistic behavior and CEO compensation increase. They also found that the choice of firms that pay higher compensation to their CEOs as a benchmark also represents a reward for CEO talent.

In large companies, the board of directors often delegate executive compensation design to compensation committees or use it to help the CEO compensation package configuration. These committees comprise three or four members. Usually, most of them are independent, which means that they are not employees of the company or do not have a direct relationship with the executives of the company (BEBCHUK; FRIED, 2009). Considering the CEO's managerial influence on the board of directors, Larcker et al. (2005) has shown in his study that CEOs can extract higher pay when they have links with the directors who sit on the board or that serve on the compensation committee of companies. Likewise, Shivdasani e Yermack (1999) evaluated if the CEO takes part in the director's appointment process to influence the directors' selection effectively. They found that when the CEO participates in the compensation committee or has no such committee, the company tends to appoint fewer outside members, which can cause less monitoring by the board of directors. Therefore, from the Managerial Power Theory perspective, CEOs may have more or less influence to indicate to the board of directors who accept and extract high compensation contracts depending on the company's governance structure.

2.2 Board of Directors

Corporate governance can be defined as the set of laws, rules, bylaws, and internal control instruments of the company (GILLAN, 2006). The board of directors is regarded as one of the essential internal instruments of corporate governance. It serves as a link between shareholders and management and helps both to achieve their objectives. The board of directors also has an important role: advising and monitoring top management, protecting shareholder's interests, and designing CEO compensation (BRICK; PALMON; WALD, 2006).

There are two major roles of the board of directors: advisory and monitoring managers

(ADAMS; FERREIRA, 2007). First, the board of directors works like a counselor of managers, helping them with the decision-making process and collaborating with the company's strategic direction. Second, the monitoring role involves controlling, reviewing, and approving the managers' financial decisions. Besides that, the board of directors is considered the first line of defense against managers who would act contrary to shareholders' interests (BRENNAN, 2006).

Additionally, to ensure its monitoring role, the board of directors is responsible for hiring, firing, and determining the CEO compensation package (JENSEN, 1993). Design CEO compensation packages are straightly related to the principal-agent problem (HOITASH, 2011). In many companies, the CEO has the power to make all the significant decisions (ADAMS; ALMEIDA; FERREIRA, 2005). On the other hand, other firms look for more consensus between CEOs and the board of directors. The power of CEOs over the board of directors depends on the features of the company, such as board size, firm size, and the governance structure (BEBCHUK; FRIED, 2003). Moreover, the CEO could be powerful to indicate new members to the board of directors (BEBCHUK; FRIED, 2009), and the directors typically wish to be re-appointed to the board. Thus, concerning in keep belonging to the board of directors, they can influence the decision-making process in favor to the CEO (BEBCHUK; FRIED, 2003). It is a sort of favor exchange game, in which both CEOs and directors are looking for advantages for themselves.

Thus, according to Bebchuk e Fried (2003), directors have an excuse to "go along" with the CEO's pay arrangement, at least as long as the compensation package persists within the range of what can reasonably be supported. Besides, due to being on the company's slate is the pass to being appointed, developing a status for haggling with the CEO about compensation would harm rather than help a director's chances of being invited to sit in other companies' boards. Still, another incentive to favor the CEO is that the CEO can influence directors' earnings and perks.

Moreover, the owners entrust their companies' governance to boards composed of insiders and outsiders directors (GILLETTE; NOE; REBELLO, 2003). We can call outsider - or independent - director, who is not a current or former employee of the firm and does not have another affiliation whit the firm than directorship (BEBCHUK; FRIED, 2009). Outside directors monitor management more strongly because they are less likely to have a conflict of interest with the management (ADAMS; FERREIRA, 2007). Therefore, to ensure the board's monitoring role, it is essential to have as high as possible amount directors on the board. A sizeable number of outside shareholders could involve in closer monitoring and thereby decrease managers' influence beyond their pay (BEBCHUK; FRIED, 2009).

There are important issues as per board composition that influence the board's duties, and that should be considered when new directors are chosen. New members must be appointed to the board of directors due to their experience and knowledge. Also, directors' features must be considered so that the board can fulfill its duties. In this context, the board of directors' composition must observe the diversity of knowledge, behavior, cultural aspects, age, and gender (IBGC, 2015).

2.3 Gender Diversity and Board Composition

Blau (1977) explains that the social structure begins with simple definitions of actors and their relationships. The actors of relations are parts of person groups, like men and women, ethnic groups, or economic groups. Social structure can also be defined as the study of the differences between persons' role in their relationships. Advocacy groups, investors, regulators, and corporations themselves have recognized the need for more increased diversity on boards (NILI, 2019). Claims for increasing the number of women on the board of directors have been put in place for some regulators in different countries, including recommendations and sometimes requirements in their corporate governance codes. Although recommendations, women are still underrepresented on the boards of directors in Brazil, with approximately 8.6% of participation on the board (CREDIT SUISSE RESEARCH INSTITUTE, 2019).

Besides that, diversity on board composition can provide various opinions and different points of view to discussions among board members. Likewise, having gender and racially diversity on boards must signal that the company is greatly located to satisfy the necessities of a diverse market (MILLER; TRIANA, 2009). In other words, a gender-diverse board might increase the company's reputation as a signal of compliance with the requirements and trends from the market, improving diversity.

Also, gender diversity studies on board composition have increased in recent years (ADAMS; FERREIRA, 2009; GORDINI; RANCATI, 2017; CASTEUBLE; LEPETIT; TRAN, 2019), evidencing a short number of women sitting on the board of directors worldwide. Policies of diversity are trying to change the organizational structure on balance, non-discrimination, and inclusion issues by assessing and challenging the firm's discourses, norms, programs, and methods (BRUNA et al., 2019). Following this perspective and the claims for more women representatives on the boards, some countries have established women's board composition requirements to ensure gender diversity. The first was Norway in 2006, that established a minimum percentage of 40% of women on the board of directors. Some other countries also adopted this trend and established quotas of women on boards, as France, Spain, Italy, Fin-

land, and Belgium (CREDIT SUISSE RESEARCH INSTITUTE, 2019). Currently, Brazil has no legal requirements for the minimum number of women on the board of directors. There is a project law in process at the Brazilian National Congress proposing a quote of at least 30% of women on the board of directors of public companies and companies that the state has some part. However, the project law is still under evaluation.

Moreover, according to Credit Suisse Research Institute (2019), with data of 2019, the percentage of women on the board of directors in European countries that contain legal requirements of women in board of directors is higher than countries that have not these requirements. Some examples of this are France, which has 44.4% of women on boards, Norway (40.9%), Belgium (35.9%), and Sweden (35%). It implies that the requirements have increased the women's representative on the boards in these countries. In Brazil, this percentage is much lower (8.6%). At worldwide, the overall rate of women on boards was 20.6% in 2019.

The agency theory framework holds the benefits of women representation on boards by providing that it diminishes conflicts of interest between managers and shareholders (BENKRAIEM et al., 2017). Moreover, Carter, Simkins e Simpson (2003) argues that a more diverse board could act in a better monitoring role, leading to better and effective decisions, including decisions as per CEO compensation package design. Lucas-Pérez et al. (2015) evaluated the relationship between gender diversity and compensation of top managers in the Spanish context. They found gender diversity positively affects boards' effectiveness, influencing a proper design of top executive compensation linked to company performance. Likewise, Adams e Ferreira (2009) evaluated the effects of a gender-diverse board with a U.S companies sample. They found that women directors have better attendance records than male directors. Male directors have fewer attendance problems than the more gender-diverse the board is, and women are more likely to join monitoring committees. Their findings entail that gender-diverse boards input more effort into the board of directors' monitoring role. Additionally, Lazzaretti et al. (2013) investigated the 100 most liquid Brazilian publicly traded companies and found that in 2011 only 5.4 percent of the positions in the boards of these companies are occupied by women. Also, they found that firms that have been listed for longer in the stock market and have more seats in their boards are more likely to have women directors in these boards, inferring gender inequality in the 99 companies examined. They also analyzed "the glass ceiling effect," which is considered a central phenomenon in gender studies. It consists of an imaginary barrier that prevents women from having career and promotion opportunities in the same proportion as men. This phenomenon contributes to explain the historical low ratios of women on board of directors and to occupy senior management positions at the companies.

The preceding discussion helps clarify gender diversity towards the board of directors'

composition and the relevance of analyzing this issue. As we discussed, although the low representation of women in Brazilian boards, our study contributes to the literature by investigating whether the number of women on the board in Brazilian listed companies improves the monitoring role of the board of directors, following the findings of Adams e Ferreira (2009).

2.4 Board Interlocking and Social Network Analysis

Social Network Analysis (SNA) is a field of social systems that concentrates attention on the relationship among the participants that make up the system (BORGATTI; EVERETT; JOHNSON, 2018). A social network can be defined as the set of individuals or companies that are interconnected by several types of relationships (LAZZARINI, 2008). According to Wasserman, Faust et al. (1994), a social network can be set as a finite circle of actors and the relationship established among them. The network is composed of nodes and lines. The nodes, also denominated actors, represent the individuals who are inside the system. The lines represent the relationship between them (LAZZARINI, 2008). For example, we can observe the people who serve on the board of directors in companies of a specific country or market. The members of the board of directors are called "actors" or "nodes." If there is a relationship among the members of boards of different companies, it is illustrated with lines on the network drawing.

The study of social networks has attracted more attention in recent years. Most of this interest might focus on social network analysis on relationships between entities and the implications of these links. BI is a kind of social network, which occurs when a director who belongs to the board of directors in the company 'A' also belongs to company 'B' (MIZRUCHI, 1996). According to Fich e White (2003), board interlock occurs when a person sits on the board of more than one company. It also can be defined as a relationship created among two company boards when they share at least one board member (WONG; GYGAX; WANG, 2015).

On their systematic board interlocking review study, Lamb e Roundy (2016) explain that the board interlocking can be analyzed from two perspectives: the firm view and the director's view. From the firm's perspective, board interlocking may occur to search resources through established relationships with financial institutions or companies of similar markets or industries or to engage firms to improve their monitoring ability. Nevertheless, it may occur as a signal to current and potential investors and to include directors with desirable skills on their boards. On the other hand, from the director's perspective, board interlocking can occur to career advancement - recognition and higher financial benefits - and to gain social ties by

Figure 1: Board interlocking, executive compensation, and gender diversity
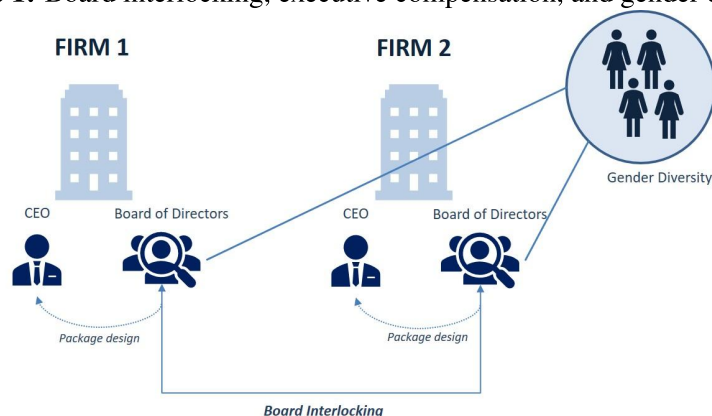
Source: Wong, Gygax e Wang (2015). Adapted by the author.

reinforcing cohesion among the executive elite.

Board interlocking is also considered one of the most usually applied measures of inter-firm networks (MIZRUCHI, 1996). Furthermore, researches suggest that interlocks can influence a firm's strategies, compositions, performance, and how company boards make corporate decisions (LAMB; ROUNDY, 2016; WONG; GYGAX; WANG, 2015). A deeply centralized and dense network of directors can produce a social arrangement in which the directors are loyal to each other and may act on interest (VESCO; BEUREN, 2016). According to Bebchuk e Fried (2009), the presence of directors who serve on many boards makes the directors less focused on ensuring the company's interests and more susceptible to agree with opportunistic behaviors of CEOs. Furthermore, the director's behavior is too into the agency problem, which reduces their ability to effectively mitigate the agency problems in the relationship among managers and shareholders (BEBCHUK; FRIED, 2003).

Besides that, some researchers argue that companies use the practice of board interlocks as a mechanism to improve the contracting relationship with other companies. Other studies focus on the importance of established ties between firms in reducing the information uncertainties created by resource dependence among them (FICH; WHITE, 2003). Most of these studies treat interlocks as a communication mechanism, and their behavioral consequences in the companies instead of a tool of control (MIZRUCHI, 1996). Regardless of the reasons for interlock progress, director interlocks have been shown as consequences as dissemination channels for information, policies, and opinions (BOHMAN, 2012).

Figure 1 illustrates the dynamic of board interlocking adopted in this study and its predicted association with CEO compensation. Firm 1 and Firm 2 have their own governance

structure, with a CEO and a board of directors. Considering the board of directors' duty of executive compensation package design, the possibility that a director of the board of directors of Firm 1 sits on the board of Firm 2 could influence both companies' strategic decisions - like CEO compensation. This study also aims to evaluate whether women's presence on the board of directors' composition affects CEO compensation and its influence on the relation between board interlocking and CEO compensation design.

Some previous studies also evaluated the effects of board interlocking on the design of CEO compensation (LARCKER et al., 2005; FICH; WHITE, 2003; HALLOCK, 1997). The presence of directors who serve to more than one board is also associated with the increase of the CEO's relative power over the board of directors. It happens because directors who sit in many companies' boards are less concentrated on each company's interests. Therefore, payment designs can be expected to be more advantageous to the CEO when directors sit on many boards (BEBCHUK; FRIED, 2009). Following this point, it is possible that the level of board interlocking influences the design of executive compensation.

2.5 Background and Hypotheses Development

Board Interlocking's studies have been increasing in recent years worldwide (WONG; GY-GAX; WANG, 2015; LAMB; ROUNDY, 2016; HELMERS; PATNAM; RAU, 2017; HAM-DAN, 2018; WANG; LIU; YANG, 2019). However, the possible outcomes of board inter-locking in the Brazilian environment are still little explored. For instance, Silva et al. (2019) evaluated the effects of board interlocking between Brazilian companies in corporate gov-ernance quality. They found that board interlocking has a positive influence in corporate governance quality. Also, Silveira, Barros e Famá (2008) studied the effects of board in-terlocking on Firm Value and Profitability in Brazilian companies. They found evidence that board interlocking is a common practice in Brazil and a negative effect of board interlocking on firm value. Ultimately, they found that a high degree of board interlocking could dam-age firm performance. In their study, Wong, Gygax e Wang (2015) investigate if interlocking relationships between company boards are relevant to the executive compensation packages designed by these boards. They found that board interlocking is essential for companies to define executive compensation packages similarly. Considering that, the personal relationship between directors could reduce board members' independence, and it might impact the board of directors' decision-making process.

Furthermore, managers can have a strong influence over the board of directors. Consider-ing that, they can influence their compensation by using this influence to extract higher pay.

(BEBCHUK; FRIED, 2004; LARCKER et al., 2005). Moreover, Hallock (1997) proposes a test for the board of directors' specific role in determining CEO salaries. In his study, he assumes that CEOs and their subordinates are often directors on other boards, and CEOs have much preference in indicating new board members. If two CEOs, or their assistants, serve on each other's boards, these CEOs may have both the motivation and the opportunity to grow each other's pay. Therefore, he found that CEOs' salaries in interlocked firms are higher than in other firms. Fich e White (2003) also evaluated the relation between interlocked boards and CEO compensation and have founded a positive effect of board interlocking on CEO compensation. Besides that, Larcker et al. (2005) showed that CEOs could extract higher pay when they have links with the directors who sit on the board. Hence, these studies have shown that as more interconnected the directors are, the CEO compensation in their firms tends to be higher.

As indicated by the literature and following the assumptions of agency theory, the board of directors has the duty of properly design the CEO compensation package in order to mitigate the interest conflicts that could arise in the agent-principal relationship. Moreover, managerial power theory posits that the power of the CEO over the board of directors could influence the choice of new directors to the board (FICH; WHITE, 2003) and the higher rent extraction by the CEO. It happens because CEOs would be encouraged to choose those individuals who will be more susceptible to accepting their interests. Besides that, the empirical setting available shows the influence of board interlocking in executive decisions - including CEO compensation -, and the lack of studies in this field in Brazil. Therefore, we predict that a high level of board interlocking between companies can increase CEO compensation, implying that the more connected the firms are, the more susceptible the board of directors is to design higher compensation packages. Taken together with the theoretical approaches and the empirical setting, we state our first hypothesis:

Hypothesis 1: The level of board interlocking increases CEO compensation.

While we are evaluating the effects of the links between companies through board interlocking on CEO compensation, it is important to take into account the interactions between boards of different companies and the board composition features. This study focuses on gender diversity, as we have explored in the literature review section. Even though there are many recommendation from regulators and other claims of gender diversity in the board of directors, the reality in the Brazilian company's boardrooms is quite different. Women are still unrepresented in the boardroom of Brazilian companies. Moreover, women's presence on

the board of directors can entail some differences in the decision-making process, effectiveness, and monitoring role. Adams e Ferreira (2009) evaluated the effect of gender diversity on the boards of directors on governance and performance in U.S companies. They found that the gender-diverse boards input more effort into the role of monitoring. They also found that female directors are more likely to join monitoring committees. Besides that, studies in both the psychology and economics literature have shown that women tend to be more averse to risk than men (SILA; GONZALEZ; HAGENDORFF, 2016). Following the literature, we predict that women could be more likely to comply with the board of directors' monitoring role, and they could be less susceptible to accept high CEOs rent extraction in their compensation arrangements. The preceding discussion suggests that the proportion of women appointed to boards may intensify the board's monitoring role and develop its CEO compensation packages' design. This suggestion drives to the following hypothesis:

Hypothesis 2: Women's presence on the board is negatively associated with CEO compensation.

Considering the previous analyses proposed, measuring the impacts of board interlocking and women's presence on the board of directors on CEO compensation, this study proposes going a little further. As we did predict that the effect of board interlocking on CEO compensation might be positive, and the effect of women on the board of directors on CEO compensation can be negative, we also aim to evaluate these two proxies' combined effect on CEO compensation. Considering that board interlocking could imply a higher level of CEO compensation, increasing agency conflicts in a company; meanwhile, women's presence on boardroom could imply lower CEO compensation. Therefore, we aim to identify if women's presence on the board could mitigate this effect because women help the company improve its governance and monitoring roles. Considering the theoretical and empirical basis, we predict that women's presence on the board of directors could mitigate the effect of board interlocking on CEO compensation, making it increases in a somewhat lower level. To our knowledge, the moderation of gender diversity on the relationship between board interlocking and CEO compensation was not investigated in the literature yet. To verify our thesis, we state our third hypothesis:

Hypothesis 3: Gender diversity in the board of directors mitigates the positive effect of the level of board interlocking on CEO compensation.

Figure 2 illustrates the dynamic of the three hypotheses of this study. We have proposed to evaluate the direct relationship between board interlocking and CEO compensation (H1),

the direct relationship between women on board on CEO compensation (H2), and finally, the relationship between board interlocking and CEO compensation, moderated by women on board (H3). Following Baron e Kenny (1986) a moderating variable affects the direction or strength of the relationship between a dependent variable and an independent variable. Hence, the moderator is a third variable that affects the relationship between two others, changing the first two directions. Thus, moderation occurs when an independent variable's effect on a dependent variable depends or the effect is modified by a third variable, the moderator.

Figure 2: Hypotheses
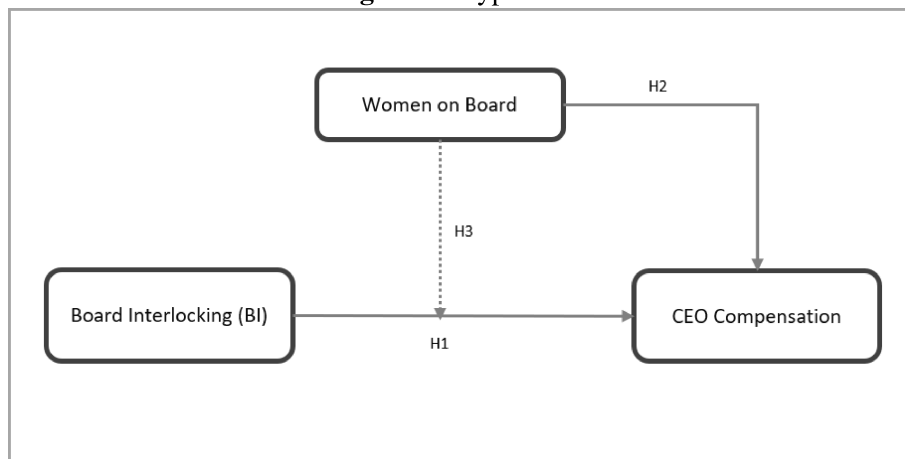
Source: Elaborated by the author

3   DATA AND RESEARCH METHOD

The sample is composed of 275 Brazilian firms listed on B3, covering the period from 2011 to 2018. The corporate governance and CEO data set was extracted from Reference Form (CVM, 2009). In order to do the data extraction, we used GetDFPData package (PERLIN; KIRCH; VANCIN, 2018) from R statistical software. The financial data set was extracted from Economática®, and from DFP (Demonstrações Financeiras Padronizadas) from CVM (Comissão de Valores Mobiliários).

Table 1: Sample of Econometric model

Number of companies registered on B3 in 01/10/2021	524
Number of active and listed companies registered on B3 in 01/10/2021	345
(-) Holdings	40
(-) Companies without CEO compensation data from any year	16
(-) Companies without Governance data from any year	11
(-) Companies without Financial data from any year	3
Final sample of companies to the models	275
Final sample of observations to the models (2011 - 2018)	1,635

Source: Elaborated by the author.

Table 2: Sample of BI_Degree and BI_Group Variables

Number of companies	345
Number of directors (2011 - 2018)	16,587

Source: Elaborated by the author.

As we shown on Table 1, we have considered 275 companies that have all of the information from the variables of the models. From all 345 companies active and listed on B3 in 01/10/2021, we excluded holdings, companies without CEO compensation data from any year, companies without governance data for any year, and companies without financial data from any year. To estimate the econometric model we considered 1635 observations from these 275 companies. The observation distribution across the years is presented on Figure 3.

To measure interlocks between companies that share directors, we consider all of the data set available as per the board of directors' composition of Brazilian Companies, as shown in Table 2. To create our measure of board interlocking, we also considered companies that are not included in the econometric model, considering that our focus is creating a broader picture of board interlocking level in Brazilian companies during the covered period. Therefore,

we have considered 16,587 directors in this sample in order to measure the interlocks. The distribution of the observations across the years is shown in Figure 4.

Figure 3: Observations per year - Econometric model

Source: Elaborated by the author

Figure 4: Observations per year - Board Interlocking
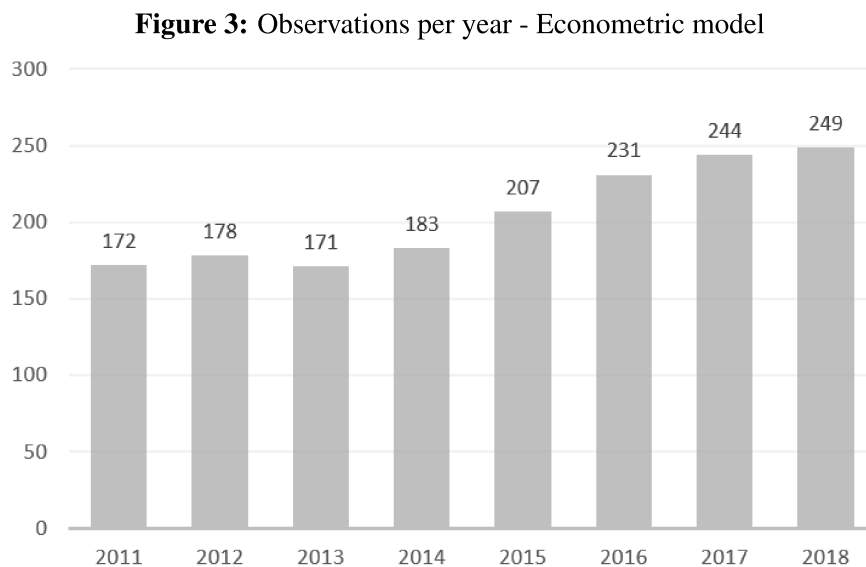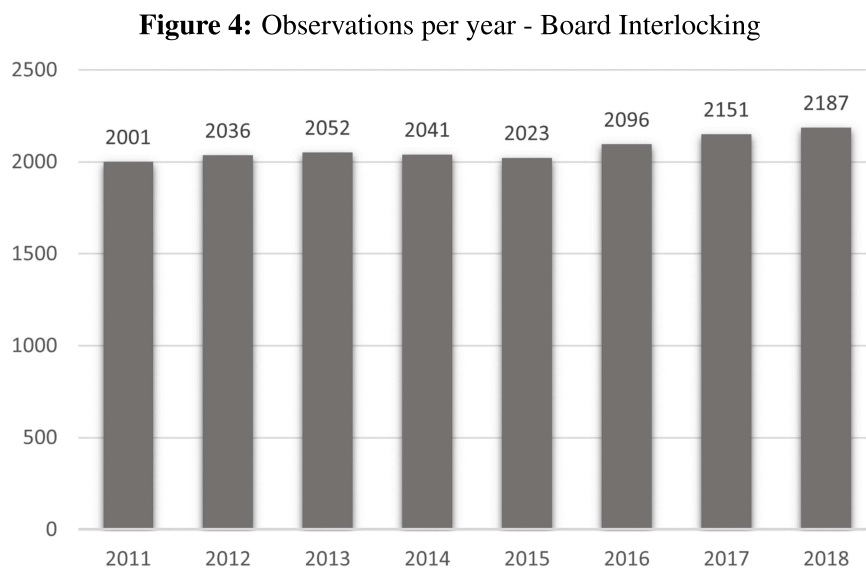
Source: Elaborated by the author

3.1 Representing and measuring networks with graphs

One of the easiest ways to identify and measure the interlocks between companies that share directors is by making a relational matrix. Each cell of the matrix shows whether the actor A and B are interconnected (LAZZARINI, 2008). In order to create a relational matrix, it is necessary to put the directors in rows and the companies in which directors sit on the board in the columns. Then, the next step is to multiply this matrix by the transpose of itself to get its adjacent matrix. The outcome will be the matrix with companies in both rows and columns, identifying the relationship among companies sharing at least one director. When a director of Company 'A' sits on the board of Company 'B', then the companies are interlocked. This association is represented on the relational matrix with the number of directors they are sharing. If the companies do not share any director, this is represented in the relational matrix as zero. When matching the same company on the row and column (diagonal), the cell's value is filled to zero on the relational matrix, not considering the relationship between the directors in the same company. We have created a different relational matrix per year, from 2011 to 2018, to reach the board interlocking measure from each year.

A network can be shown with a set of points connected by lines, and that idea began the earliest enthusiasts of Social Network Analysis to turn to the mathematical theory of graphs in the hope of finding a formal model for the representation of network structure (SCOTT, 1988). A graph $G(V, E)$ consists of a set of vertices V (also called nodes or points), and a set of edges E (or links or lines). The edges join pairs of vertices (BORGATTI; EVERETT; JOHNSON, 2018). Then, after done the relational matrix, we proceeded with two steps: network mapping and degree centrality measure. To map the network, we admit the relational matrix in R statistic software. Using specific commands, the outcome is a graph for each year of the sample, showing companies' network, and the relation between them by sharing at least one director.

An important concept of networks is centrality, which can be defined as the network's existence of central actors. These central actors connect the actors who are in the most peripheral points of the network (LAZZARINI, 2008). Specifically, degree centrality measures the number of links that an actor has with other actors on the network (ZHU; WATTS; CHEN, 2010). An actor with a high degree's centrality plays a hub on the network by connecting many different actors. By the adjacency matrix, X of a network, degree centrality is a simple sum of rows or columns of the adjacency matrix. This is the concept that we used in this study to measure board interlocking in our sample. If d_i is the degree centrality of actor i and x_{ij} is the (i, j) record of the adjacency matrix, then it is be calculated by the equation 3.1 (BORGATTI

et al., 2009). Besides that, the degree centrality measure was provided from the sum of links between companies by sharing their directors on R software.

$$d_i = \sum_{j=1}^{N} x_{ij} \tag{3.1}$$

3.2 Variable measurement

To test each hypothesis, we use three models with independent, dependent, and control variables. CEO compensation, our variable of interest, was extracted from the Reference Form (CVM, 2009), which contains the maximum salary paid by companies in each year. We used the natural logarithm to include this variable in our models. Our proxy of board interlocking is Bi_Degree_{it}, which was created using the Degree Centrality measure. As our focus is to identify the ties between companies by sharing at least one director, we have decided to use this measure because it could give us the information we need. In order to create a proxy of Gender diversity, we created two variables to measure the presence of women on the board of directors: $Gender_{it}$ represents the percentage of women on the board of directors, and WoB_{it} is a variable that identifies whether the board of directors has at least one women. If there are one or more women on board, the dummy assumes value 1; otherwise, it assumes 0.

We included control variables to control aspects that could impact the effects of independent variables in our variable of interest. Three groups of control variables were included in this study: financial variables, governance variables, and CEO feature variables. Taking a closer look at the financial control variables, in order to control the financial characteristics of the companies (especially towards CEO compensation), we controlled by $Firm\_Size_{it}$, the total assets of the company, expressed by its natural logarithm; $Debt/Assets_{it}$, the ratio of total debt to total assets of the company; and ROA_{it}, which represents the percentage of return on assets. All of these variables were extracted from Economática®.

The second control variable group is Governance. They are included to control some aspects of corporate governance that could impact in our variable of interest. The first is $Board\_Size_{it}$, which represents the total number of directors on the board of directors. According to Bebchuk e Fried (2005), CEO compensation is higher when the board is large because it makes it hard for directors to act against the CEO. In the Reference Form (CVM, 2009), it is possible to access the listed companies' board composition per year. The second variable is $Outsider_{it}$, representing the percentage of outsider directors on the board of directors. As we could see in the previous sections, outsiders do not have any relationship with the

company, just their board position. It could help the board of directors comply with their duties and reduce the CEO's power over the board of directors. The outsider directors are identified in the Reference Form (CVM, 2009) with a specific code. Another governance control variable is $Fiscal\_Board_{it}$. The Brazilian Federal Law 6404/76 establishes that the fiscal board is a committee responsible for inspecting the administrators' acts and verifying compliance with their legal and statutory duties. So, it is expected that the presence of a fiscal board in a company mitigates CEOs' opportunistic behavior, trying to increase their compensation. It is a dummy that assumes 1 when the company has a fiscal board in each year and 0 otherwise. $Comp\_Committee_{it}$ is a dummy that identifies if the company has a compensation committee. As we could see in the literature review, the compensation committee helps the board of directors to design the CEO compensation package. Another variable is $Ownership_{it}$, which is the percentage of stocks that the higher shareholder has. We also have the dummy to identify whether the company is a family firm or not. If the company is a family firm, it assumes value 1, and 0 otherwise.

All of the governance control variables were collected from the Reference Form (CVM, 2009), using GetDFPData package (PERLIN; KIRCH; VANCIN, 2018) from R statistic software. The only variable that was manually collected was $Fiscal\_Board_{it}$, because the data was not available in the GetDFPData package. So, we extracted the data from Reference Form (CVM, 2009), item 12.7/8.

Our last group of control variables brings CEO features to the model. We collected the variables from Reference Form (CVM, 2009) and using GetDFPData package (PERLIN; KIRCH; VANCIN, 2018). ECS_{it} is a dummy variable, which identifies if the controller shareholder has elected the CEO, assuming value one if the shareholder has elected the CEO, and 0 otherwise. $CEO\_Duality_{it}$ identifies if the CEO is also the chairman of the board of directors. It is a dummy that assumes value one if the CEO is also the chairman and 0 otherwise. CEO_Age_{it} represents the CEO's age, represented by the number of years old. This is the only variable in this group of control variables that were not collected from the Reference Form (CVM, 2009), because the information was not available. So, we have collected the information manually from the internet for each CEO in our sample. Our last variable is CEO_Tenure_{it}, which identifies the number of years the CEO is in this position in the company.

To sum up, it is possible to observe the variables used in this study in Table 3, its brief description, and the theoretical foundation.

Table 3: Variables

Proxy	Description	Theoretical foundation
Variable of interest		
CEOcomp	Natural logarithm of CEO's anual compensation.	Fich e White (2003), Hallock (1997), Larcker et al. (2005), Wong, Gygax e Wang (2015), Larcker, McClure e Zhu (2019), Hoi, Wu e Zhang (2019), Costa et al. (2016)
Independent/ Moderate		
BI_Degree	Board interlocking degree, expressed by the number of direct links between members of the nerwork.	Lazzarini (2008), Wasserman, Faust et al. (1994), Silva et al. (2019), Zhu, Watts e Chen (2010), El-Khatib, Fogel e Jandik (2015)
Gender	Women's presence on the board of directors, expressed by the percentage of women on the board of directors.	Gull et al. (2018), Adams e Ferreira (2009)
WoB	Dummy: 1 if there is at least one women on the board of directors; 0 otherwise.	Gull et al. (2018), Adams e Ferreira (2009)
Control		
Financial		
Firm Size	The natural log of total assets.	Silva et al. (2019), Fich e White (2003)
Debt/Assets	The ratio of total debt to total assets.	Brick, Palmon e Wald (2006)

Table 3 – *Continued from previous page*

Proxy	Description	Theoretical foundation
ROA	Percentage of return on assets.	Fich e White (2003), Hoi, Wu e Zhang (2019), Albuquerque, Franco e Verdi (2013)

Corporate Governance

Proxy	Description	Theoretical foundation
Board_Size	Number of directors on Board.	Hallock (1997), Larcker et al. (2005), El-Khatib, Fogel e Jandik (2015), Adams e Ferreira (2009)
Outsider	Percentage of outsiders members in the board of directors.	Wong, Gygax e Wang (2015), Santos, Silveira e Barros (2012), Fich e White (2003)
Fiscal_Board	Dummy: 1 if the Company has a fiscal board; 0 otherwise.	Brugni et al. (2013), Baioco e Almeida (2017)
Comp_Comittee	Dummy: 1 if the Company has a compensation committee; 0 otherwise.	Larcker et al. (2005)
Ownership	Percentage of stocks of higher shareholder.	Silva et al. (2019), Gordini e Rancati (2017)
Family_Firm	Dummy: 1 if the company is controlled by a family; 0 otherwise.	Chi et al. (2015)

CEO characteristics

Proxy	Description	Theoretical foundation
ECS	Dummy if controller shareholder elects the CEO, assuming 1 if the controller shareholder has elected the CEO; and 0 otherwise	Wong, Gygax e Wang (2015)

Table 3 – *Continued from previous page*

Proxy	Description	Theoretical foundation
CEO_Duality	Dummy: 1 if CEO is chairman; 0 otherwise.	Hoitash (2011), El-Khatib, Fogel e Jandik (2015)
CEO_Age	CEO age	Wong, Gygax e Wang (2015), Hoi, Wu e Zhang (2019), Hallock (1997)
CEO_Tenure	Tenure as CEO (in years)	Hoitash (2011), Fich e White (2003)

Source: Elaborated by the author.

Dummy variables were also included in each model to control for a year, and different sectors particularities (GRINSTEIN; HRIBAR, 2004). This data set was extracted from Reference Form (CVM, 2009). Also, $Control\_Type$ is a dummy that identifies the type of control, which could be: state-owned, state-owned holding, foreign, private, private holding. This data set was extracted from Registration Form of B3. Table 4 shows the variables construction.

Table 4: Dummies to control company's particularities

Proxy	Description	Theoretical foundation
Control_Type	Type of control, expressed by dummies: which could be: state-owned, state-owned holding, foreign, private, private holding.	Cambini et al. (2018)
Sector	Company's sector, expressed by dummies. The sector could be: Agriculture and Fishing; Chemistry; Construction; Electric Energy; Electro electronics; Finance and Insurance; Food & Drink; Industrial machines; Mining; Non-Metals; Oil and gas; Others; Paper And Cellulose; Siderur & Metalur; Software and Data; Telecommunications; Textile; Trade; Transportation Service; Vehicles and parts	Grinstein e Hribar (2004)

| Year | Year of observation, expressed by dummies from 2011 to 2018. | Grinstein e Hribar (2004) |

Source: Elaborated by the author.

3.3 Empirical Strategy

To measure the effect of our independent variables on CEO compensation, we have used three regression models, one for each hypothesis. To test the first hypothesis (H1), as per the effects of BI_Degree on CEO Compensation, the first model (3.2) is used. The model was elaborated as follow:

$$CEOcomp_{it} = \beta_0 + \beta_1 BI\_Degree_{it} + \sum_{k=1}^{16} \delta_k Controls_{k,it} + \varepsilon_{it}, \tag{3.2}$$

where $CEOcomp_{it}$ is the log of total compensation of the CEOs of the companies i on the time t; BI_Degree_{it} represents the number of direct links between companies i by sharing at least one directors in the year t. As we did predict in H1, we expect a positive and significant coefficient between BI_Degree_{it} and $CEOcomp_{it}$.

To test H2, identifying the effect of the presence of women on the board of directors on CEO compensation, the model 3.3 was applied, measuring gender diversity on the board of directors.

$$CEOcomp_{it} = \beta_0 + \beta_1 Gender_{it} + \sum_{k=1}^{16} \delta_k Controls_{k,it} + \varepsilon_{it}, \tag{3.3}$$

where $Gender_{it}$ represents the percentage of women on board of the company i in the year t.

To test H3 and identify if there is a moderating effect of gender diversity on the relationship between board interlocking and CEO compensation, model 3.4 was applied:

$$CEOcomp_{it} = \beta_0 + \beta_1 BI\_Degree_{it} + \beta_2 Gender_{it} + \beta_3 BI\_Degree_{it} * Gender_{it} + \sum_{k=1}^{16} \delta_k Controls_{k,it} + \varepsilon_{it}$$

$$\tag{3.4}$$

where $Gender_{it}$ represents the percentage of women on board of the company i in the year t and $BI\_Degree_{it}Gender_{it}$ represents the interaction between Board Interlocking and Gender.

To estimate our models, we used ordinary least square (OLS) as the pooled specification by *plm* package for panel data econometric (CROISSANT; MILLO, 2008). For the specification and design of the models, this method is enough to reach the goals. We recognize as

a limitation of our model the possibility of reverse causality, assuming that the results can be interpreted so that the CEO's compensation affects the connections between companies that share at least one director, not the other way as described in our hypotheses. It could also occur in our H3, considering that the results could be interpreted so that the CEO compensation affects the likelihood of appointing women to the board. Besides, to reduce the potential endogeneity, we used contemporary variables. The interlocks and relative resources jointly affect the CEO compensation at the same period. In Appendix A.1, we estimate the first model with lagged economics variables of the firms, and the results as per our hypothesis still the same as our first specification. Second, to characterize firms' particularities that would influence the intercept, we used some proxies to distinguish the firms by their features and used the sector instead of used the fixed-effect method. This procedure allows us to have a broader economic interpretation of the results. Finally, to mitigate potential heteroscedasticity, we used the heteroscedasticity consistent matrix adjusted of small samples, to calculate the White estimator on pooled data. Thus, our analysis gives reliable and consistent estimations.

4 RESULTS

This section begins showing the board interlocking between Brazilian companies of our sample throughout our period of analysis (subsection 4.1) and a broader picture of gender diversity across our sample (subsection 4.2). Also, we show the descriptive statistics of the variables in section 4.3; the results of the models are reported in subsections 4.4, 4.5, and 4.6. Finally, we present a discussion of the results on 4.7 and the concluding remarks in section 5.

4.1 Board Interlocking in Brazilian Companies

The level of board interlocking between Brazilian companies was estimated using the degree centrality measure. It consists of the number of directors that companies share in each year of our sample.

In Table 5 it is possible seeing that the number of directors in Brazilian listed companies of our sample keep constant across the years, in a number of little over two thousand directors. The column "BI_Degree" represents the number of connections between companies in each year. Also, it is possible to compare the number of interlocks with the total number of directors each year. The ratio of board interlocking and directors is roughly 50% each year. So, there is a considerable level of board interlocking between directors of different companies in Brazil across the years covered by our study, which is consistent with Silveira, Barros e Famá (2008) showing that board interlocking is a common practice in Brazilian companies. The higher degree centrality (number of interlocks) in our sample was in 2018, with 1220 interlocks between companies.

Table 5: Board Interlocking in Brazil

Year	Directors	BI_Degree	% BI_Degree
2011	2001	1180	59%
2012	2036	1072	53%
2013	2052	1126	55%
2014	2041	1130	55%
2015	2023	1020	50%
2016	2096	1106	53%
2017	2151	1096	51%
2018	2187	1220	56%

Source: Elaborated by the author.

Figure 5 illustrates the networks between Brazilian companies covered in our sample that

shares at least one director, excluding that companies that do not have any interlocks in the current year. To make it, we did not consider only the 275 firms covered by our sample, but all of the 345 Brazilian companies listed on B3 from 2011 to 2018 in order to show a broader picture of board interlocking in Brazil. However, to measure our BI_Degree_{it} variable, we did consider only our sample of analysis (275 companies) to include in our model.

4.2 Gender diversity in Brazilian companies

Many analyses could be done from statistics related to gender diversity that we found in our study. First, taking the companies in each year of our sample, the number of companies with at least one woman on the board of directors was on average 40%. The year 2018 was the one in our sample with a higher percentage of companies with women on board, reaching 47%. Table 6 shows the number of companies (Comp.) in each year of our sample, the number of companies with women on board (Comp._W) and the ratio of the number of companies with women on board and the total number of companies in our sample (Comp._W %).

Table 6: Companies with women on board

Year	Comp.	Comp._W	Comp._W %
2011	172	61	36%
2012	178	65	37%
2013	171	66	39%
2014	183	78	43%
2015	207	84	41%
2016	231	90	39%
2017	244	99	41%
2018	249	117	47%

Source: Elaborated by the author.

Board interlocking data is not different considering the gender diversity. On average, Brazilian companies of our sample has 635 interlocks in our covered period. Of this number, on average only 5% were interlocks made by women. In other words, the number of women that sit in more than one board of directors in our sample is low. When a woman takes a seat on the board of directors, she usually only sits on one board. Table 7 shows the number of interlocks (BI_Degree) in each year of our sample, the number of interlocks made only by women (BI_Degree_W) and the ratio of the interlocks made by women, and the total number of interlocks (BI_Degree_W %).

Figure 5: Interlocks between Brazilian companies
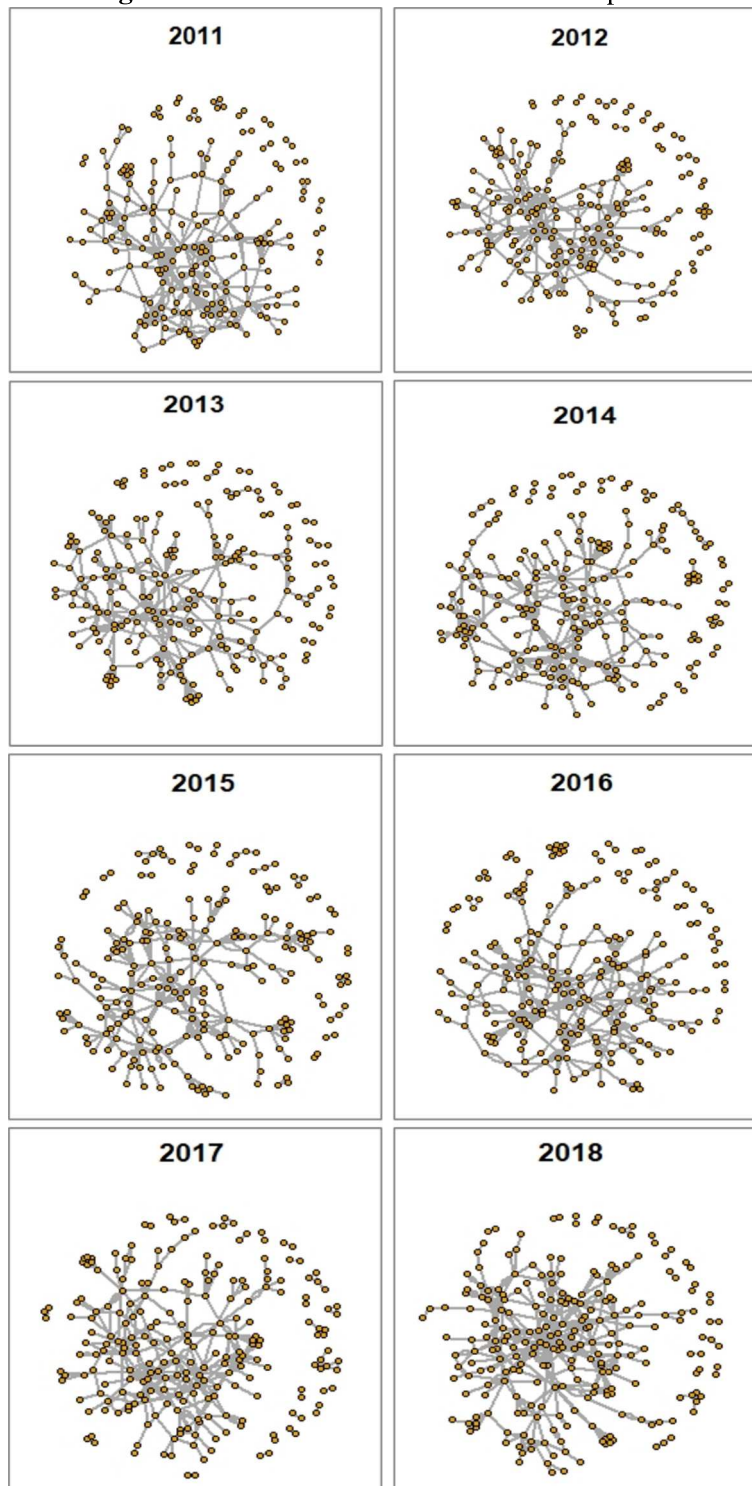
Table 7: Board Interlocking and Gender Diversity

Year	BI_Degree	BI_Degree_W	BI_Degree_W %
2011	547	25	5%
2012	547	25	5%
2013	519	29	6%
2014	565	34	6%
2015	612	26	4%
2016	717	37	5%
2017	735	48	7%
2018	843	59	7%

Source: Elaborated by the author.

Looking at the number of directors considered in our models, taking 2011 as an example, from 1216 directors in our sample, only 91 were women. It is possible noting the percentage of women on the board of directors increased slowly from 2011 to 2018 and reached a higher level in 2018 (10%). On average, the percentage of women on board is 8% in Brazilian companies of our sample. Table 8 shows the number of directors in each year of our sample (Directors), the number of women directors (Directors_W), and the ratio of the number of women directors and the total (Directors_W %).

Table 8: Directors x Women Directors

Year	Directors	Directors_W	Directors_W %
2011	1216	91	7%
2012	1264	94	7%
2013	1189	100	8%
2014	1274	109	9%
2015	1445	120	8%
2016	1581	125	8%
2017	1636	141	9%
2018	1678	168	10%

Source: Elaborated by the author.

We can also observe that the percentage of women on board in our sample is quite different across the economic sectors. Throughout our analysis, Siderurgy and Metallurgy, Mining and textile are the sectors with a higher percentage of women in their board of directors. Some sectors have no women on the board of directors. The majority of the sectors are following the overall trend of our sample, with 8% of women on board in average.

Table 9: Women on board per sector

Sector	2011	2012	2013	2014	2015	2016	2017	2018
Agriculture and Fishing	0%	0%	0%	0%	0%	0%	-	0%
Food & Drink	9%	7%	5%	4%	7%	10%	10%	6%
Trade	11%	15%	16%	14%	9%	11%	10%	10%
Construction	0%	3%	2%	2%	2%	3%	5%	4%
Electroelectrics	0%	0%	0%	0%	0%	0%	0%	17%
Electric Energy	4%	7%	11%	7%	10%	8%	10%	12%
Finance and Insurance	13%	8%	8%	13%	10%	8%	8%	8%
Industrial machines	16%	10%	16%	5%	4%	4%	6%	7%
Mining	0%	0%	0%	0%	8%	25%	29%	23%
Non-Metals	0%	0%	0%	0%	0%	0%	7%	7%
Other	9%	7%	9%	11%	8%	8%	8%	10%
Paper and Cellulose	8%	8%	5%	3%	2%	5%	5%	12%
Oil and Gas	8%	8%	6%	0%	3%	6%	8%	14%
Chemistry	0%	0%	0%	4%	4%	3%	4%	2%
Siderurgy & Metallurgy	13%	13%	18%	18%	19%	16%	17%	16%
Software e Data	0%	4%	7%	13%	11%	10%	8%	11%
Telecommunications	-	-	-	13%	5%	10%	2%	13%
Textile	12%	10%	12%	12%	12%	7%	13%	13%
Transportation Service	5%	6%	8%	8%	6%	7%	7%	8%
Vehicles and Parts	5%	5%	3%	3%	3%	3%	5%	5%

Source: Elaborated by the author.

4.3 Descriptive Statistics

The descriptive statistics are presented on Table 10. It shows a data overview of the variables analyzed in this study. The first variable showed the variable of interest, $CEOcomp_{LOg_{it}}$, the natural logarithm of CEO compensation. Table **??** indicates that the average CEO compensation in Brazilian listed companies is 14.07, the maximum is 18.24, and the minimum 4.28 (in natural logarithm). Taking a closer look at board interlocking (BI_Degree_{it}), the average of interlocks established between companies is 3.11. Meanwhile the median is 2, which means that interlocked companies usually share 2 directors. The maximum number of directors shared by companies is 28, and the minimum is 0 (when a company has no interlocks with another company).

Regarding our proxies of gender, the first is $Gender_{it}$ shows the percentage of women on the board of directors. We can see that the average of women on the board of directors in our sample is 8%, the maximum is 67%, and the minimum is 0%. In this case, the company does not have any women on the board of directors. WoB_{it} shows women's presence on the board of directors, and on average 40% of the Brazilian companies in our sample have at least one woman on the board of directors. Comparing the statistics of our gender-diversity proxies, it is possible to conclude that 40% of the Brazilian companies in our sample have at least one woman on the board. However, women represent only 8% of the total number of directors.

$Board\_Size_{it}$ shows that the largest board has 19 directors, the minimum number of directors is one, and the average is 6,9 members. As per $Outsider_{it}$ on average, Brazilian companies has 22% of outsider directors in their boards. The maximum percentage is 100% of outsiders and the minimum is 0%, in which the company does not have any outsider director in its board. $Fiscal\_Board_{it}$ shows that on average 52% of the Brazilian companies have a fiscal board. $Comp\_Committee_{it}$ provides information as per the existence of the compensation committee in the company. It is possible to observe that 21% of the Brazilian companies have a compensation committee in their governance structure. $Ownership_{it}$ represents the percentage of stocks of the highest shareholder. The highest shareholder has at means 42% of the total stocks of the company. The maximum percentage is 100% of the stocks, and the minimum is 2%. $Family\_Firm_{it}$ shows that on average 43% of the Brazilian companies are familiar. Besides, $CEO\_Duality_{it}$ shows that 14% of the CEOs is also chairman of the board of directors. $CEO_{Age_{it}}$ illustrates that, on average, CEOs are 53.9 years old. The youngest is 24, and the oldest, 90 years old. ECS_{it} (elected by shareholder controlling) is a dummy that represents '1' if the CEO was elected by the controller shareholder and '0' otherwise. On average, 81% of the CEOs were elected by the controller shareholder.

Table 10: Descriptive Statistics

	Variable	Obs.	Mean	SD	Min	Q1	Median	Q3	Max	Correl
1	$CEOcomp_{it}$	1635	14.07	1.46	4.28	13.46	14.15	14.94	18.24	1.00
2	BI_Degree_{it}	1635	3.11	3.89	0.00	0.00	2.00	5.00	28.00	0.26
3	WoB_{it}	1635	0.40	0.49	0.00	0.00	0.00	1.00	1.00	-0.01
4	$Gender_{it}$	1635	0.08	0.12	0.00	0.00	0.00	0.14	0.67	-0.13
5	$Firm\_Size_{it}$	1635	19.47	3.58	6.04	16.39	20.34	22.18	28.05	0.12
6	$Debt/Assets_{it}$	1635	0.72	1.03	0.04	0.46	0.63	0.80	35.64	-0.08
7	ROA_{it}	1635	0.01	0.39	-11.74	0.00	0.04	0.09	4.02	0.07
8	$Board\_Size_{it}$	1635	6.90	2.51	1.00	5.00	7.00	9.00	19.00	0.24
9	$Outsider_{it}$	1635	0.22	0.23	0.00	0.00	0.20	0.38	1.00	0.33
10	$Fiscal\_Board_{it}$	1635	0.51	0.50	0.00	0.00	1.00	1.00	1.00	-0.01
11	$Comp\_Comittee_{it}$	1635	0.21	0.41	0.00	0.00	0.00	0.00	1.00	0.16
12	$Ownership_{it}$	1635	0.42	0.24	0.02	0.23	0.37	0.57	1.00	-0.20
13	$Family\_Firm_{it}$	1635	0.32	0.47	0.00	0.00	0.00	1.00	1.00	0.02
14	$CEO\_Duality_{it}$	1635	0.13	0.34	0.00	0.00	0.00	0.00	1.00	-0.19
15	CEO_Age_{it}	1635	53.97	10.07	24.00	47.00	54.00	60.00	90.00	-0.12
16	CEO_Tenure_{it}	1635	5.14	8.02	0.00	0.00	2.00	6.00	65.00	-0.02
17	ECS_{it}	1635	0.81	0.40	0.00	1.00	1.00	1.00	1.00	-0.16

Source: Elaborated by the author.

Figure 6 shows the scatter chart of the relationship between the independent variables and our variable of interest. As the illustration does not clarify the relationship between the variables, we show the descriptive statistics to explain our data accurately. The scatter chart is an excellent way to identify possible outliers in a sample, and as we can see in Figure 6, does not occur in our sample.

Table 11 reports the correlation between the variables used in our analyses. Regarding our variables of interest, BI_Degree_{it} and $CEOcomp_{it}$ are positively correlated, providing initial evidence of the positive association between them. The coefficient between our proxies of gender diversity ($Gender_{it}$ and WoB_{it}) presents a negative with $CEOcomp_{it}$, which could initially indicate that they are negatively associated. Taking a closer look at our control variables, just $Debt\_Assets_{it}$ and ROA_{it} presents a above 0.50, but the economic interpretation of these variables is distinguished. Whereas we used these variable as a control variable, this high correlation does not influence the estimates of interest.

Figure 6: Scatter Chart
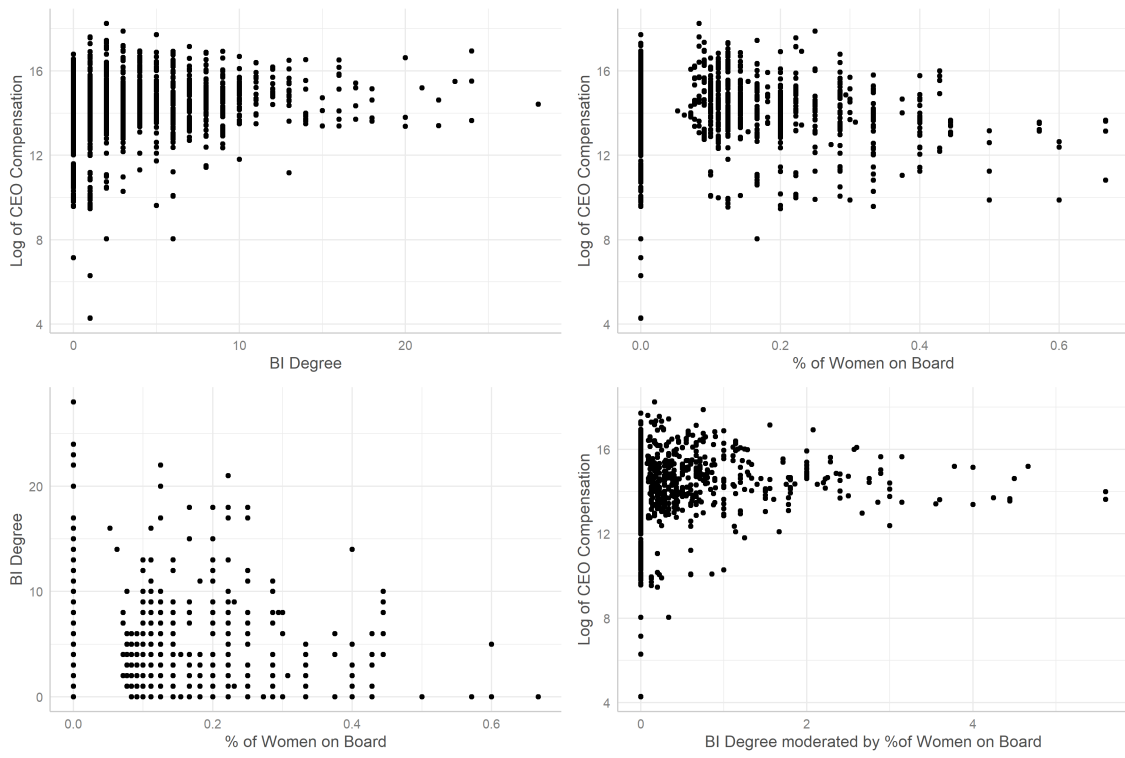
Elaborated by the author.

Table 11: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17
$CEOcomp_{it}$	1	0.26	-0.01	-0.13	0.12	-0.08	0.07	0.24	0.33	-0.01	0.16	-0.20	0.02	-0.19	-0.12	-0.02	-0.16
BI_Degree_{it}	0.26	1	0.04	-0.04	0.12	-0.07	0.06	0.28	0.22	0.12	0.11	-0.01	0.02	-0.07	-0.02	-0.12	-0.09
WoB_{it}	-0.01	0.04	1	0.81	0.01	-0.05	0.07	0.30	-0.05	0.03	0.05	0.00	-0.09	-0.01	0.07	-0.03	-0.02
$Gender_{it}$	-0.13	-0.04	0.81	1	-0.11	-0.05	0.07	0.05	-0.13	-0.03	-0.02	0.07	-0.02	0.08	0.12	0.10	-0.04
$Firm\_Size_{it}$	0.12	0.12	0.01	-0.11	1	-0.13	0.14	0.24	0.18	0.08	0.15	-0.07	-0.01	-0.06	0.03	-0.06	0.01
$Debt\_Assets_{it}$	-0.08	-0.07	-0.05	-0.05	-0.13	1	-0.83	-0.12	-0.07	-0.08	-0.03	0.08	-0.02	0.06	-0.07	-0.02	0.05
ROA_{it}	0.07	0.06	0.07	0.07	0.14	-0.83	1	0.10	0.01	0.04	0.01	-0.06	0.03	0.00	0.09	0.05	0.01
$Board\_Size_{it}$	0.24	0.28	0.30	0.05	0.24	-0.12	0.10	1	0.15	0.20	0.21	-0.14	-0.10	-0.25	-0.05	-0.17	-0.01
$Outsider_{it}$	0.33	0.22	-0.05	-0.13	0.18	-0.07	0.01	0.15	1	-0.09	0.14	-0.30	0.18	-0.19	-0.17	-0.05	-0.32
$Fiscal\_Board_{it}$	-0.01	0.12	0.03	-0.03	0.08	-0.08	0.04	0.20	-0.09	1	0.06	0.01	0.01	-0.05	0.10	-0.06	0.14
$Comp\_Committee_{it}$	0.16	0.11	0.05	-0.02	0.15	-0.03	0.01	0.21	0.14	0.06	1	-0.05	-0.18	-0.16	-0.09	-0.08	-0.06
$Ownership_{it}$	-0.20	-0.01	0.00	0.07	-0.07	0.08	-0.06	-0.14	-0.30	0.01	-0.05	1	-0.13	0.05	-0.02	-0.07	0.28
$Family\_Firm_{it}$	0.02	0.02	-0.09	-0.02	-0.01	-0.02	0.03	-0.10	0.18	0.01	-0.18	-0.13	1	0.02	-0.01	0.19	0.09
$CEO\_Duality_{it}$	-0.19	-0.07	-0.01	0.08	-0.06	0.06	0.00	-0.25	-0.19	-0.05	-0.16	0.05	0.02	1	0.25	0.27	0.13
CEO_Age_{it}	-0.12	-0.02	0.07	0.12	0.03	-0.07	0.09	-0.05	-0.17	0.10	-0.09	-0.02	-0.01	0.25	1	0.38	0.01
CEO_Tenure_{it}	-0.02	-0.12	-0.03	0.10	-0.06	-0.02	0.05	-0.17	-0.05	-0.06	-0.08	-0.07	0.19	0.27	0.38	1	0.01
ECS_{it}	-0.16	-0.09	-0.02	-0.04	0.01	0.05	0.01	-0.01	-0.32	0.14	-0.06	0.28	0.09	0.13	0.01	0.01	1

Source: Elaborated by the author.

4.4 Board Interlocking and CEO Compensation

We have estimated the significance of BI_Degree_{it} on $CEOcomp_{it}$ to test H1. To identify the effect of each group of variables on CEO compensation, we estimated four different specifications, as shown in Table 12. It also helps to identify the power of explanation of the variables applied. Dummy variables are included in each model to control for year and industry (the coefficients are not tabulated for a convenient reason). In the first specification, the only independent variable is BI_Degree_{it}, in which we aim to verify its pure effect on $CEOcomp_{it}$. As a result, we found a positive and statistically significant effect of BI_Degree_{it} on $CEOcomp_{it}$ ($\beta = 0.10, \rho < 0.001$). It implies that an increase of 1 interlock affects $CEOComp_{it}$ in a range from 0.8 to 0.12. It could be expressed in the currency as an increase on CEO compensation average (R\$ 1,289,802.93), from R\$ 107,423.90 to R\$ 164,445.81.

The second specification is applied including financial control variables. In this stage, BI_Degree_{it} also has a positive and statistically significance on $CEOcomp_{it}$ ($\beta = 0.09, \rho < 0.001$). The third specification includes variables of internal corporate governance mechanisms. A dummy variable were included in models 3 and 4 for control type (the coefficients are not tabulated for a convenient reason). The main result in the third specification is that BI_Degree_{it} remains positive and significant related with $CEOcomp_{it}$ ($\beta = 0.03, \rho < 0.001$). Moreover, we must observe that $Board\_Size_{it}$ presents a positive and significant ($\beta = 0.11, \rho < 0.001$) effect on CEO compensation, which could means that large boards usually pay higher compensations to their CEOs. It is consistent with Bebchuk e Fried (2005) showing that CEO compensation is higher when the board is large because it makes hard for directors to act against the CEO. This result is also in concordance with Benkraiem et al. (2017), who also found that large boards lead to a decrease in managerial supervision which, in turn, increases the CEO's compensation. $Comp\_Committee_{it}$ is positive and significant related with $CEOcomp_{it}$ ($\beta = 0.23, \rho < 0.05$). It implies that when a company has a compensation committee, the CEO earns higher compensation. Albuquerque, Franco e Verdi (2013) supported this finding, saying that companies usually choose peer companies to help them design the CEO compensation package. In this case, the compensation committee seems to be confirming compensation peer groups that include companies with higher CEO Compensation. It helps to justify the higher CEO compensation. In this case, the positive association between compensation committee and CEO compensation could not be seen only as a rent extraction of CEO but a signal of the market forces, as a bonus for CEO talent. So, it could be considered a proper way to retain the CEO. Other points might be considered to identify the compensation committee's influence on CEO compensation, such as its composition and scope of activities inside the company.

Also, $Fiscal\_Board_{it}$ has positive and significant effect on $CEOcomp_{it}$ ($\beta = 0.29, \rho < 0.001$). It means that companies with fiscal board usually pay higher salaries to their CEOs. Ultimately, $Outsiders_{it}$ is positively and significantly associated with $CEOcomp_{it}$ ($\beta = 1.32, \rho < 0.001$), which entails that the higher is the percentage of outsiders in the board of directors, the higher is CEO compensation. This result confronts the usually affirmed sense of independent directors as safeguards of shareholder value, as Adams e Ferreira (2007) who claims that outside directors monitor management more strongly because it is less likely that

they have a conflict of interest with the management. However, our result is consistent with Andrés, Arranz-Aperte e Rodriguez-Sanz (2017). They evaluated the effects of independent and non-independent directors on CEO compensation in 2308 Western European firms, covering 15 countries from 1999 and 2007. They found that the proportion of independent directors is positively related to CEO compensation, particularly equity-linked salary. Following this perspective, a high percentage of outsiders in the board of directors might come at the cost of restricting the principal shareholders' role, represented by the directors elected by them to guarantee their rights. It could imply a decrease in the monitoring role of the board of directors.

We included CEO characteristics in the last specification. One of them is Duality, which is considered one of the measures of CEO power. $CEO\_Duality_{it}$ is negatively and significantly related to $CEOcomp_{it}$ ($\beta = -0.35, \rho < 0.01$). It entails that when CEOs are also the chairman of the board of directors, they earn a lower compensation. It is not consistent with empirical evidence from the U.S, such as Larcker e Tayan (2012) who shows that companies with powerful CEOs tend to pay higher salaries to them. However, Fernandes et al. (2013) explains that duality has a positive effect on compensation level on U.S firms, but a negative effect for non-US firms. By this point, Conyon e Peck (1998) evaluated a sample of U.K. companies and found that there is not a positive and significant association between CEO duality and CEO compensation, which could entails that if the CEOs are also a chairman of the board, their compensation tend to be lower. The literature also posits that the level of CEO compensation sometimes might be higher in companies where CEO also holds the chair position because that person is doing two roles (BRICKLEY; COLES; JARRELL, 1997; KRAUSE; SEMADENI; JR, 2014). Considering that, it would not to be an evidence that if the CEO is also a chairman, he could extract higher pay from the board of directors. Therefore, our finding is consistent with the overall empirical evidence, even reinforcing evidence from Brazilian companies, which also shows that the CEOs usually earn lower compensation when them also perform as a chairman (PEREIRA et al., 2016).

Even though the coefficient has slightly decreased over the specifications, BI_Degree_{it} remains positive and significant associated with $CEOcomp_{it}$ across four specifications ($\beta = -0.04, \rho < 0.001$, in the fourth specification). Also, from the first to the fourth specification, R^2 grown from 0.20 to 0.40, which indicates that being covered for such control variables, the model can better explains the effects of board interlocking on CEO compensation. This results indicates a non-rejection of the first hypothesis, assuming that the higher the level of Board Interlocking between companies, higher is CEO Compensation. It is consistent with the literature, in which Fich e Shivdasani (2005) have found that busy directors tend to be less monitoring, and they could accept easily the rent extraction by CEOs, paying greater compensations to them. The result is also consistent with Hallock (1997) finding that CEO compensation is higher in companies where the board of directors is interlocked. Besides that, we note that Board Size, Outsider Directors and the presence of fiscal board keeping positive and significant across the third and four specifications.

Table 12: Board Interlocking and CEO Compensation

	(1) $CEOcomp_{it}$	(2) $CEOcomp_{it}$	(3) $CEOcomp_{it}$	(4) $CEOcomp_{it}$
BI_Degree_{it}	0.10***	0.09***	0.03***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
$Firm\_Size_{it}$		0.03***	0.02*	0.02*
		(0.01)	(0.01)	(0.01)
$Debt\_Assets_{it}$		-0.12	-0.01	0.00
		(0.15)	(0.09)	(0.08)
ROA_{it}		0.03	0.27	0.30
		(0.15)	(0.16)	(0.16)
$Board\_Size_{it}$			0.11***	0.11***
			(0.01)	(0.01)
$Outsider_{it}$			1.32***	1.25***
			(0.14)	(0.14)
$Fiscal\_Board_{it}$			0.29***	0.31***
			(0.07)	(0.08)
$Comp\_Committee_{it}$			0.23*	0.19*
			(0.09)	(0.09)
$Ownership_{it}$			-0.21	-0.20
			(0.15)	(0.15)
$Family\_Firm_{it}$			-0.11	-0.14
			(0.07)	(0.07)
$CEO\_Duality_{it}$				-0.35**
				(0.11)
CEO_Age_{it}				-0.01
				(0.00)
CEO_Tenure_{it}				0.01
				(0.01)
ECS_{it}				-0.03
				(0.10)
$Control\_Type_{it}$			Yes	Yes
$Sector_{it}$	Yes	Yes	Yes	Yes
$Year_t$	Yes	Yes	Yes	Yes
$Intercept$	11.99***	11.53***	8.74***	9.12***
	(0.95)	(0.94)	(0.97)	(0.96)
R^2	0.20	0.22	0.39	0.40
Adj. R^2	0.19	0.20	0.38	0.38
Num. obs.	1635	1635	1635	1635

Source: Elaborated by the author.

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

To ensure the reliability of our board interlocking proxy and considering that it was not continuous, we did a robustness test. We calculated a continuous variable of the network using the network density measurement, which is the feature that improves the number of the interrelationship between members of the network. It can be measured by dividing the number of observed ties between the network actors by the maximum number of relationships in this network (LAZZARINI, 2008). According to Coleman (1988), density provides a high flow of information between the network. How much dense is the network, more information flow between its actors. The results are available in Appendix A.2, which shows that board interlocking continuous variable also has a positive and significant effect on CEO compensation. It provides the reliability of our board interlocking measure.

4.4.1 Additional analysis - Board Interlocking in Economic Groups

Considering Brazilian market's peculiarities, such as the high ownership concentration and the existence of large economic groups, we conducted additional analysis in order to check if the level of board interlocking that we have found in our first model is actually a trend in Brazilian companies or if it is just a consequence of companies from the same economic group that share directors in their boards.

We created a proxy BI_Group_{it} to identify the number of interlocks between directors of the same economic group. To do that, we got the interlocks between directors and their respective companies. Then, we verified if these companies had a kind of controller's relation (as a controller or controlled). We made a loop to identify if these interlocked companies have other controllers or controlled companies related to them to form the economic group. We did it because there is no data set available with information as per Brazilian companies' economic groups.

To identify the controller/controlled relationship between companies and to create our proxy, we have based ourselves on two premises:

- The information as per "Controller shareholder" available in the Reference Form (CVM, 2009) (item 15 - "Control and economic group"). If the company listed as a shareholder of the company we are consulting is identified as "controller," we considered our analysis.

- The information as per "Percentage of Ordinary stocks" available in the Reference Form (CVM, 2009) (item 15 - "Control and economic group"). If the company listed as a shareholder of the company that we are consulting has at least 20% of the stocks, we considered as an economic group, based on Federal Law 6404, which considers that if the investor has a percentage of 20% of the stocks, it is considered that having a significant influence on the controlled company.

After that, we did a test to identify if the interlocks of variable BI_Degree_{it} were between companies from the same group. As a result, we found the percentage of interlocks in the same economic group, creating a new variable BI_Group.

As we can observe in Table 13, throughout the years covered in our sample, the level of board interlocking between Brazilian companies has increased. BI_Degree column shows the

Table 13: Descriptive statistics - Board Interlocking in Economic Groups

Year	Companies	BI_Degree	BI_Group	% BI_Group
2011	172	547	211	39%
2012	178	547	209	38%
2013	171	519	193	37%
2014	183	565	194	34%
2015	207	612	210	34%
2016	231	717	242	34%
2017	244	735	256	35%
2018	249	843	271	32%

Source: Elaborated by the author.

number of interlocks between companies each year. Likewise, considering the total number of interlocks, in "BI_Group" we present the number of interlocks that occur between companies that belong to the same economic group. It is remarkable that the percentage of BI_Group is in average 30%, which means that 30% of the board interlocking in Brazilian companies are formed by companies from the same economic group. This feature could be harmful to corporate governance quality in these companies with a high percentage of BI_Group, because it could reduce the independence and the monitoring of the board of directors.

To test the effect of BI_Group_{it} on CEO compensation, we ran a multiple regression with BI_Group_{it} and its interaction with BI_Degree_{it}, using the equation 4.1. As we did in the previous models, we have used four specifications, which can be seen in Table 14. In the first two specifications, we found a positive and significant relation between BI_Degree_{it} and $CEOcomp_{it}$; we did not find a statistical significance between of BI_Group_{it} on $CEOcomp_{it}$. However, the interaction between BI_Degree_{it} and BI_Group_{it} was negative and significant related to $CEOcomp_{it}$ in the first two specifications. It could imply that when companies that belong to the same economic groups share their directors, the CEO receives a lower compensation. In some cases, these companies could share even the CEO, making his compensation lower in each company.

$$CEOcomp_{it} = \beta_0 + \beta_1 BI\_Degree_{it} + \beta_2 BI\_Group_{it} + \beta_3 BI\_Degree_{it} * BI\_Group_{it} \sum_{k=1}^{16} \delta_k Controls_{k,it} + \varepsilon_{it},$$

(4.1)

In the last two specifications, BI_Group_{it} became positively and significantly related to $CEOcomp_{it}$ and from the third specification, which a higher β than BI_Degree_{it}. The interaction between BI_Degree_{it} and BI_Group_{it} remains negatively and significantly related to $CEOcomp_{it}$. It could imply that the higher the level of board interlocking in the companies covered by our sample, the lower the number of interlocks between companies that belong to the same economic group. Therefore, we have evidence that Brazilian companies indeed have a high level of board interlocking. In other words, the effect of board interlocking on CEO

compensation, which we found in our first model, does not occur due to the interlocked companies belonging to the same group. Brazilian companies of our sample have a great board interlocking level, and its effects on CEO compensation are positive and significant.

Table 14: Board Interlocking - Economic Groups

	(1) $CEOcomp_{it}$	(2) $CEOcomp_{it}$	(3) $CEOcomp_{it}$	(4) $CEOcomp_{it}$
BI_Degree_{it}	0.16***	0.14***	0.04**	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
BI_Group_{it}	-0.02	-0.01	0.06*	0.07*
	(0.03)	(0.03)	(0.03)	(0.03)
$BI\_Degree_{it} * BI\_Group_{it}$	-0.01***	-0.01***	-0.00**	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)
$Firm\_Size_{it}$		0.03**	0.02*	0.02*
		(0.01)	(0.01)	(0.01)
$Debt\_Assets_{it}$		-0.11	-0.00	0.01
		(0.13)	(0.09)	(0.08)
ROA_{it}		0.04	0.28	0.30*
		(0.16)	(0.15)	(0.15)
$Board\_Size_{it}$			0.11***	0.11***
			(0.01)	(0.02)
$Outsider_{it}$			1.33***	1.27***
			(0.14)	(0.14)
$Fiscal\_Board_{it}$			0.28***	0.29***
			(0.07)	(0.08)
$Comp\_Committee_{it}$			0.25**	0.21*
			(0.09)	(0.09)
$Ownership_{it}$			-0.20	-0.20
			(0.15)	(0.15)
$Family\_Firm_{it}$			-0.12	-0.15*
			(0.07)	(0.07)
$CEO\_Duality_{it}$				-0.35***
				(0.11)
CEO_Age_{it}				-0.01
				(0.00)
CEO_Tenure_{it}				0.01*
				(0.01)
ECS_{it}				-0.03
				(0.10)
$Control\_Type_{it}$			Yes	Yes
$Sector_{it}$	Yes	Yes	Yes	Yes
$Year_{it}$	Yes	Yes	Yes	Yes
$Intercept$	11.90***	11.55***	8.79***	9.19***
	(0.94)	(0.94)	(0.96)	(0.96)
R^2	0.22	0.24	0.40	0.40
Adj. R^2	0.21	0.22	0.38	0.39
Num. obs.	1635	1635	1635	1635

Source: Elaborated by the author.

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

4.5   Gender Diversity and CEO Compensation

To evaluate the effects of gender diversity in board composition on CEO Compensation, we have estimated the significance $Gender_{it}$ variable on $CEOcomp_{it}$, in order to identify the effect of the percentage of women on the board of directors on CEO compensation. The results are shown in Table 15. Dummy variables are also included in each model to control for year and industry (the coefficients are not tabulated for a convenient reason).

In the first specification of our second model, we have only $Gender_{it}$ as independent variable. We found a negative and significant association between $Gender_{it}$ and $CEOcomp_{it}$ ($\beta = -1.48, \rho < 0.001$). It implies that the higher percentage of women on board, the lower is CEO compensation.

The second specification is applied, including financial control variables. In this stage, $Gender_{it}$ also has a negative and statistically significance on $CEOcomp_{it}$ ($\beta = -1.46, \rho < 0.001$). The third specification includes variables of internal corporate governance mechanisms. As we did in the previous models, a dummy variable were included in the third and fourth specifications for control type (the coefficients are not tabulated for a convenient reason). The main result was that $Gender_{it}$ still has a negative and statistically significance on $CEOcomp_{it}$ ($\beta = -1.14, \rho < 0.001$).

CEO characteristics were included in the last specification. Although the coefficient has decreased, $Gender_{it}$ remains negative and statistically related to $CEOcomp_{it}$ across four specifications ($\beta = -1.13, \rho < 0.001$, in the fourth specification). Moreover, from the first to the fourth specification, adjusted R^2 grown from 0.16 to 0.40, which entails that being covered for such control variables, the model can better explains the effects of the percentage of women on the board on CEO compensation.

Table 15: Percentage of Women on Board and CEO compensation

	(1) $CEOcomp_{it}$	(2) $CEOcomp_{it}$	(3) $CEOcomp_{it}$	(4) $CEOcomp_{it}$
$Gender_{it}$	-1.48***	-1.46***	-1.14***	-1.13***
	(0.29)	(0.29)	(0.25)	(0.26)
$Firm\_Size_{it}$		0.04***	0.02	0.02*
		(0.01)	(0.01)	(0.01)
$Debt\_Assets_{it}$		-0.15	-0.01	0.01
		(0.19)	(0.10)	(0.09)
ROA_{it}		0.04	0.31*	0.33*
		(0.15)	(0.15)	(0.15)
$Board\_Size_{it}$			0.13***	0.12***
			(0.01)	(0.02)
$Outsider_{it}$			1.39***	1.31***
			(0.13)	(0.14)
$Fiscal\_Board_{it}$			0.33***	0.35***
			(0.07)	(0.08)
$Comp\_Comittee_{it}$			0.24**	0.21*
			(0.09)	(0.09)
$Ownership_{it}$			-0.12	-0.09
			(0.15)	(0.15)
$Family\_Firm_{it}$			-0.09	-0.10
			(0.07)	(0.07)
$CEO\_Duality_{it}$				-0.31**
				(0.11)
CEO_Age_{it}				-0.00
				(0.00)
CEO_Tenure_{it}				0.01
				(0.00)
ECS_{it}				-0.09
				(0.10)
$Control\_Type_{it}$			Yes	Yes
$Sector_{it}$	Yes	Yes	Yes	Yes
$Year_t$	Yes	Yes	Yes	Yes
$Intercept$	12.17***	11.67***	8.57***	8.85***
	(0.96)	(0.96)	(0.97)	(0.96)
R^2	0.16	0.18	0.40	0.40
Adj. R^2	0.14	0.16	0.38	0.38
Num. obs.	1635	1635	1635	1635

Source: Elaborated by the author.

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

As a robustness test of our findings, we also ran the same model, but changing $Gender_{it}$ by WoB_{it}, a dummy representing if the board of directors has any women in its composition. The results are shown in Table 16. Dummy variables are also included in each model to control for year and industry (the coefficients are not tabulated for convenient reason). As we did to test the firs hypothesis, we ran the models using four specifications. In each specification, we included different groups of control variables. First specification shows that WoB_{it} is not significantly related to $CEOcomp_{it}$. In the second specification, we included financial control variables, and WoB_{it} remains not significant associated with $CEOcomp_{it}$. In this stage, only $Firm\_Size_{it}$ is positive and significantly related to $CEOcomp_{it}$ ($\beta = 0.04, \rho < 0.001$). Third specification has shown that WoB_{it} becomes negative and significantly related to $CEOcomp_{it}$ ($\beta = -0.18, \rho < 0.01$), which could entail that the women's presence on boards decreases CEO compensation. Besides, other proxies are significantly associated with $CEOcomp_{it}$: $Firm\_Size_{it}$ is positively related to $CEOcomp_{it}$ ($\beta = 0.02, \rho < 0.05$); ROA_{it} is positively related to $CEOcomp_{it}$ ($\beta = 0.30, \rho < 0.05$); $Board\_Size_{it}$ is positively related to $CEOcomp_{it}$ ($\beta = 0.13, \rho < 0.001$); $Outsider_{it}$ is positively related to $CEOcomp_{it}$ ($\beta = 1.43, \rho < 0.001$); $Fiscal\_Board_{it}$ is positively related to $CEOcomp_{it}$ ($\beta = 0.34, \rho < 0.0001$); and $Comp\_Committee_{it}$ is positively related to $CEOcomp_{it}$ ($\beta = 0.24, \rho < 0.001$). In the last specification, we included CEO characteristics as control variables, and we found that WoB_{it} remains negative and significantly related to $CEOcomp_{it}$ ($\beta = -0.17, \rho < 0.001$).

Our findings in the last specification imply that companies with at least one woman on the board of directors show a decrease of 17% on CEO compensation. On average of the natural logarithm of CEO compensation ($R\$1,289,803.00$, exponential of $14,07$), it represents an amount of $R\$219,266.00$ lower in CEO compensation in companies with at least one woman on the board than companies that do not have women on the board.

According to our results under both models, H2 is supported. Considering that our findings show the higher is the percentage of women on the board of directors, the lower is CEO compensation. If there are women on board composition, CEO compensation is low. This is consistent with Adams e Ferreira (2009) who found that gender-diverse boards input more effort to the role of monitoring. These results imply that having women on board and having a significant percentage of women on the boards of directors could improve their monitoring function. We could interpret that gender-diverse boards become less influenced by the CEO's power, considering that it becomes harder for the CEO to extracting higher compensation from the board of directors.

Table 16: Women on Board - Dummy - and CEO Compensation

	(1) $CEOcomp_{it}$	(2) $CEOcomp_{it}$	(3) $CEOcomp_{it}$	(4) $CEOcomp_{it}$
WoB_{it}	-0.05	-0.07	-0.18**	-0.17**
	(0.07)	(0.07)	(0.06)	(0.06)
$Firm\_Size_{it}$		0.04***	0.02*	0.02*
		(0.01)	(0.01)	(0.01)
$Debt\_Assets_{it}$		-0.15	-0.00	0.01
		(0.18)	(0.09)	(0.08)
ROA_{it}		0.00	0.30*	0.33*
		(0.14)	(0.15)	(0.15)
$Board\_Size_{it}$			0.13***	0.13***
			(0.01)	(0.02)
$Outsider_{it}$			1.43***	1.36***
			(0.13)	(0.14)
$Fiscal\_Board_{it}$			0.34***	0.35***
			(0.07)	(0.07)
$Comp\_Committee_{it}$			0.24**	0.21*
			(0.09)	(0.09)
$Ownership_{it}$			-0.15	-0.13
			(0.15)	(0.15)
$Family\_Firm_{it}$			-0.10	-0.12
			(0.07)	(0.07)
$CEO\_Duality_{it}$				-0.31**
				(0.11)
CEO_Age_{it}				-0.00
				(0.00)
CEO_Tenure_{it}				0.01
				(0.01)
ECS_{it}				-0.07
				(0.10)
$Control\_Type_{it}$			Yes	Yes
$Sector_{it}$	Yes	Yes	Yes	Yes
$Year_t$	Yes	Yes	Yes	Yes
$Intercept$	12.17***	11.59***	8.49***	8.79***
	(0.96)	(0.96)	(0.97)	(0.96)
R^2	0.14	0.17	0.39	0.40
Adj. R^2	0.13	0.15	0.37	0.38
Num. obs.	1635	1635	1635	1635

Source: Elaborated by the author.

$***p < 0.001; **p < 0.01; *p < 0.05$

4.6 Gender Diversity moderating the effect of Board Interlocking on CEO Compensation

We already have found in the first two models that BI_Degree_{it} is positive and significantly related to $CEOcomp_{it}$ and that the gender diversity on the board are negative and significantly related to $CEOcomp_{it}$. In order to test our H3 hypothesis, we include on the models of $CEOcomp_{it}$ the interaction between BI_Degree_{it} and the proxies of gender diversity, using equation 3.4

We were focused in check if the gender diversity on the board of directors moderates the effect of board interlocking on CEO compensation. The model was elaborated as we did the previous two. In the first specification, we have estimated the significance of BI_Degree_{it}, $Gender_{it}$, and the interaction between them on $CEOcomp_{it}$. The coefficients are shown in Table 17. Dummy variables are also included in each model to control for year and industry (the coefficients are not tabulated for convenient reason). Throughout the four specifications, we found a positive and significant association between BI_Degree_{it} and $CEOcomp_{it}$ ($\beta = 0.09, \rho < 0.001$, in the last specification). We found a negative and significant association between $Gender_{it}$ and $CEOcomp_{it}$ ($\beta = -1.56, \rho < 0.001$, in the last specification). The coefficient of interaction between BI_Degree_{it} and $Gender_{it}$ is positive and significant on $CEOcomp_{it}$ across four specifications ($\beta = 0.21, \rho < 0.001$, in the last specification).

As a robustness test, we also ran the same model, but changing $Gender_{it}$ for WoB_{it} (dummy of women's presence on board). The results are shown in table 18. As in the previous models, we found a positive and significant association between BI_Degree_{it} and $CEOcomp_{it}$ ($\beta = 0.09, \rho < 0.001$), and also, WoB_{it} is negatively but not significantly related to $CEOcomp_{it}$ in the first specification. On our first specification, we did not find a significant association between the interaction on $CEOcomp_{it}$. The second specification is applied including financial control variables. In this stage, BI_Degree_{it} remains positively and significantly related to $CEOcomp_{it}$ ($\beta = 0.08, \rho < 0.0001$), and we still not find a significant association between WoB_{it} and the interaction on $CEOcomp_{it}$. The third specification includes variables of internal corporate governance mechanisms. In this stage, BI_Degree_{it} remains positively and significantly related to $CEOcomp_{it}$ ($\beta = 0.02, \rho < 0.05$) and WoB_{it} remains negative, but now statistically significant on $CEOcomp_{it}$ ($\beta = -0.27, \rho < 0.01$). Also, in this stage, the coefficient of interaction is positively and significantly related to $CEOcomp_{it}$ ($\beta = 0.03, \rho < 0.05$). Dummy variables were included in the third and fourth specifications for control type (the coefficients are not tabulated for convenient reason).

CEO characteristics were included in the last specification. BI_Degree_{it} still have pos-

itive and significance on $CEOcomp_{it}$, as we have found in the third specification ($\beta = 0.02, \rho < 0.05$). WoB_{it} remains negative and statistically related to $CEOcomp_{it}$ in this stage ($\beta = -0.26, \rho < 0.01$; and the interaction is still positively and significantly related to $CEOcomp_{it}$ as we have found in the third specification ($\beta = 0.03, \rho < 0.05$). Moreover, from the first to the fourth specification, R^2 adjusted grown from 0.19 to 0.39, which entails that being covered for such control variables, the model can better explains the effects of board interlocking, the percentage of women on boards and the interaction between them on CEO compensation.

Table 17: Percentage of women on board moderating the effect of BI on CEO Compensation

	(1) $CEOcomp_{it}$	(2) $CEOcomp_{it}$	(3) $CEOcomp_{it}$	(4) $CEOcomp_{it}$
BI_Degree_{it}	0.08***	0.07***	0.02*	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
$Gender_{it}$	-1.74***	-1.77***	-1.54***	-1.56***
	(0.35)	(0.35)	(0.30)	(0.31)
$BI\_Degree_{it} * Gender_{it}$	0.17*	0.18**	0.19***	0.21***
	(0.07)	(0.07)	(0.05)	(0.05)
$Firm\_Size_{it}$		0.03**	0.02	0.02*
		(0.01)	(0.01)	(0.01)
$Debt\_Assets_{it}$		-0.12	-0.01	0.00
		(0.16)	(0.10)	(0.09)
ROA_{it}		0.07	0.30	0.32*
		(0.15)	(0.15)	(0.15)
$Board\_Size_{it}$			0.12***	0.11***
			(0.01)	(0.01)
$Outsider_{it}$			1.26***	1.18***
			(0.13)	(0.14)
$Fiscal\_Board_{it}$			0.29***	0.30***
			(0.08)	(0.08)
$Comp\_Committee_{it}$			0.24**	0.20*
			(0.09)	(0.09)
$Ownership_{it}$			-0.21	-0.19
			(0.15)	(0.15)
$Family\_Firm_{it}$			-0.09	-0.12
			(0.07)	(0.07)
$CEO\_Duality_{it}$				-0.34**
				(0.11)
CEO_Age_{it}				-0.00
				(0.00)
CEO_Tenure_{it}				0.01*
				(0.00)
ECS_{it}				-0.06
				(0.09)
$Control\_Type_{it}$			Yes	Yes
$Sector_{it}$	Yes	Yes	Yes	Yes
$Year_t$	Yes	Yes	Yes	Yes
$Intercept$	12.01***	11.64***	8.83***	9.18***
	(0.95)	(0.94)	(0.97)	(0.96)
R^2	0.22	0.23	0.40	0.41
Adj. R^2	0.20	0.22	0.39	0.39
Num. obs.	1635	1635	1635	1635

Source: Elaborated by the author.

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

Table 18: Women's presence on board moderating BI on CEO Compensation

	(1) $CEOcomp_{it}$	(2) $CEOcomp_{it}$	(3) $CEOcomp_{it}$	(4) $CEOcomp_{it}$
BI_Degree_{it}	0.09***	0.08***	0.02*	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
WoB_{it}	-0.12	-0.15	-0.27**	-0.26**
	(0.10)	(0.09)	(0.08)	(0.08)
BI_Degree_{it} * WoB_{it}	0.02	0.02	0.03*	0.03*
	(0.02)	(0.02)	(0.01)	(0.01)
$Firm\_Size_{it}$		0.03***	0.02*	0.02*
		(0.01)	(0.01)	(0.01)
$Debt\_Assets_{it}$		-0.12	-0.00	0.01
		(0.15)	(0.09)	(0.08)
ROA_{it}		0.04	0.29	0.31*
		(0.15)	(0.15)	(0.16)
$Board\_Size_{it}$			0.12***	0.12***
			(0.01)	(0.02)
$Outsider_{it}$			1.31***	1.24***
			(0.13)	(0.14)
$Fiscal\_Board_{it}$			0.30***	0.31***
			(0.08)	(0.08)
$Comp\_Committee_{it}$			0.24**	0.20*
			(0.09)	(0.09)
$Ownership_{it}$			-0.21	-0.21
			(0.15)	(0.15)
$Family\_Firm_{it}$			-0.10	-0.14
			(0.07)	(0.07)
$CEO\_Duality_{it}$				-0.34**
				(0.11)
CEO_Age_{it}				-0.00
				(0.00)
CEO_Tenure_{it}				0.01*
				(0.01)
ECS_{it}				-0.03
				(0.10)
$Control\_Type_{it}$			Yes	Yes
$Sector_{it}$	Yes	Yes	Yes	Yes
$Year_t$	Yes	Yes	Yes	Yes
$Intercept$	12.01***	11.55***	8.74***	9.11***
	(0.95)	(0.95)	(0.97)	(0.96)
R^2	0.20	0.22	0.40	0.40
Adj. R^2	0.19	0.20	0.38	0.39
Num. obs.	1635	1635	1635	1635

Source: Elaborated by the author.

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

4.6.1 Marginal Effect on CEO Compensation

To verify if our H3 is supported, we also evaluated the marginal effect based on the results we have found. First, we analysed the women's presence in the board of directors, by using the results of the last specification shown on Table 18. It is possible to observe that the average marginal effect of BI_Degree_{it} is 0.05 (sum of BI_Degree_{it} and interaction coefficients) with women's presence on board and 0.02 otherwise. This effect can be seen in the left graphic on the Figure 7. Considering an increment of one standard deviation in BI_Degree_{it} ($SD = 3.98$) and the average marginal effect found, we would have an impact of 0.080 ($3.98 * 0.02$) on CEO compensation (logarithm) without woman on board and of 0.19 ($3.98 * 0.05$) with woman on board. However, the direct effect estimated of WoB_{it} is higher than the marginal effect of BI_Degree_{it} with woman's presence on the board. Thus, with woman on board, the effect of CEO compensation (logarithm) is -0.061 ($0.199 + (-0.26)$).

In economic terms, using the mean of CEO compensation (exponential of 14.07 = R\$ 1,289,802.93), an increment of one standard deviation on BI_Degree_{it} without woman on the board would imply in an increment of CEO compensation in an amount of $R\$102,668.00$, meanwhile with woman's presence on the board, it would be reduced in an amount of $R\$78,678$.

Following the coefficients from Table 17 and the mean of $Gender_{it}$, we found that the average marginal effect of BI_Degree_{it} on $CEO\_Compensation_{it}$ is $0.0368(0.2 + 0.21 * 0.08 = 0.0368)$. As both variables are continuous, the average marginal effect of BI_Degree_{it} could vary according to the variation of $Gender_{it}$. The right graphic of Figure reffig:marg shows the behavior of the average marginal effect of BI_Degree_{it} varying according to $Gender_{it}$. Also, it is possible noting that this variation is linear. Therefore, we used four distinct values of $Gender_{it}$ (minimum, mean, increment of standard deviation at means and maximum) to evaluate the net marginal effect of BI_Degree_{it} and $Gender_{it}$ on CEO Compensation. Considering again an increment of one SD on BI_Degree_{it} ($SD = 3.98$), the $Gender_{it}$ values, CEO compensation mean (exponential of 14.07 = $R\$1,289,802.93$), and the coefficients from Table 17, we created Table 19 to exemplify the net marginal effect over CEO compensation.

Table 19 shows that even with the average marginal effect of BI_Degree_{it} on CEO_Comp_{it} being positive, as the percentage of women on the board increases, the direct and indirect effects added to BI_Degree_{it} and $Gender_{it}$ on CEO Compensation are negative. We used different values of $Gender_{it}$ to simulate the direct and indirect effects of BI_Degree_{it} and $Gender_{it}$ on CEO_Comp_{it}. In the "Gender values" column, we selected the minimum, the mean, the mean plus standard deviation, and the maximum values from Table 10. Then, we used these values and the estimates from Table 17 to calculate the direct and indirect effects

Figure 7: Average of marginal effect on CEO Compensation
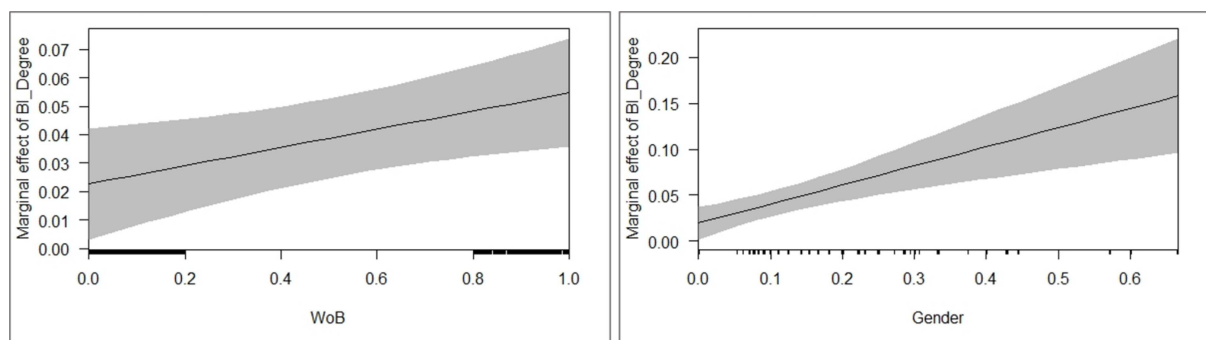
Source: Elaborated by the author

of BI Degree on CEO compensation ($\beta_1 + \beta_2 * Gender_k$ for each Gender value). On "Direct effect of gender," we calculated the direct effect of Gender on CEO compensation, based on Table 17 coefficients, multiplying by different gender values of this table. Finally, we sum the direct and indirect effects of BI Degree with the direct effect of Gender to find the "Net effect on log CEO compensation." In the last column, we have shown the net effect in currency.

These results entail that the women's presence on board and the significant percentage of women on board could mitigate the BI_Degree influence on CEO Compensation.

Table 19: Net marginal effect over CEO compensation

Gender values		Direct and in-direct effects of BI Degree	Direct effect of Gender	Net Effect On Log CEO Compensation	Net Effect On Log CEO Compensation (R$)
Minimum	0.000	0.080	0.000	0.080	102,668
Mean	0.080	0.146	- 0.125	0.022	27,942
+ 1 SD	0.200	0.247	- 0.312	- 0.065	- 84,147
Maximum	0.670	0.640	- 1.045	- 0.406	- 523,162

Source: Elaborated by the author.

Therefore, our findings suggest that the H3 hypothesis is supported because they show that the interaction between board interlocking and the women on boards mitigates the effect of board interlocking on CEO compensation. It entails that if the companies have a great percentage of women on the board of directors, it decreases the positive effect of interlocks on CEO compensation.

4.7 Discussion

Table 20 summarize our findings for each hypothesis. All of our three hypotheses were supported by the models that we have used.

The first hypothesis had predicted that board interlocking increases CEO compensation. Our findings indicate a positive and significant association between board interlocking and CEO compensation, which implies that the higher is board interlocking level between Brazilian companies of our sample, the higher is CEO compensation. It is consistent with Fich e White (2003) and Hallock (1997) finding that CEO compensation is higher in companies with a higher level of board interlocking. It also endorses the results found by Finkelstein e Hambrick (1989), in which they suggested that "for some firms, the optimal board design entails a lower reliance on outside directors that serve on numerous boards". They argue that firms with busy - interlocked - directors are less monitoring and have a lower corporate governance quality. It could imply in practices like a higher CEO compensation design. On the other hand, the connections provided by board interlocking allow companies to share information, including compensation practices adopted by them. This information flow between companies, as a benchmark, could also increase CEO compensation, and this issue additionally can be seen as a signal of the market forces, as a bonus for CEO talent and not only for a higher rent extraction albuquerque2013peer, larcker2019peer.

The second hypothesis conjectured that the higher is women's percentage in the board of directors, the lower is CEO compensation. We found a negative and significant association between gender diversity proxies and CEO compensation, which follows the studies such as Adams e Ferreira (2009) and Carter, Simkins e Simpson (2003) saying that the monitoring role of the board of directors is improved when the board relies upon a significant number of women. Following our findings, women could be less susceptible to accept rent extraction by the CEO, influencing the board of directors to comply with their monitoring duty.

Ultimately, our study has focused on increasing the literature evaluating if gender diversity on board composition works as a moderator on the relationship between board interlocking and CEO compensation. We found a positive and significant association between the interaction of board interlocking and our gender proxies on CEO compensation. The association is positive but lower than the association between board interlocking and CEO compensation, that we have found in our first hypothesis. To verify if gender diversity works as a moderator, we calculated the direct and indirect marginal effect of Board interlocking on CEO compensation for different scenarios of gender. The Net marginal effect shows us that the women's presence on board and the significant percentage of women on board could mitigate the board interlock-

ing' influence on CEO compensation. Having women on the board of directors means that the effects of the links formed by companies that share the same directors could be lower.

Table 20: Results recap

Hypothesis	Variable of interest	Explanatory Variable	Expected association	Found association
H1	CEO Compensation	BI_Degree	Positive	Positive
H2	CEO Compensation	Gender	Negative	Negative
	CEO Compensation	WoB	Negative	Negative
H3	CEO Compensation	BI_Degree*Gender	Less Positive	Less Positive
	CEO Compensation	BI_Degree*WoB	Less Positive	Less Positive

5 CONCLUDING REMARKS

This study examines the effects of board interlocking on CEO compensation in a sample of Brazilian listed companies. Also, we investigate the effects of our two proxies of gender diversity on board composition on CEO compensation. Ultimately, we investigate to what extent gender diversity mitigates the effects of board interlocking on CEO Compensation. Gender diversity as a moderator of the relationship between board interlocking and CEO compensation is an innovation of our study. Additionally, to improve our findings' reliability, we create a new proxy to providing specific knowledge as per board interlocking between companies that belong to the same economic group. We have developed this measure to catch the Brazilian market's peculiarities, which, as we could see, is characterized by high ownership concentration and huge economic groups. Even though we have relied on the data set from Reference Form (CVM, 2009) to do our analysis, we conducted several data extraction procedures and treatments to improve the data quality. Some data was also collected and checked manually by searching on the internet or on companies' sites.

This dissertation adds to the literature in several ways. First, our study enhances the understanding of board interlocking practice in Brazil and its effects on CEO compensation. This study also contributes to the literature by analyzing the relationship between gender diversity on the board of directors and CEO compensation. At least, we contribute to the growing literature on extending our analysis evaluating the effects of a gender-diverse board as a moderator to the relationship between board interlocking and CEO compensation. All of our directions of analyses have not been analyzed in the Brazilian context yet. Thus, we contribute to the literature increase by providing new analyses to the corporate governance field, which practitioners and regulators could use to improve the Brazilian regulatory framework.

We provide evidence that the higher is the level of CEO compensation in Brazilian companies of our sample, the higher is CEO compensation. It implies that CEOs earn higher salaries when Brazilian companies are interlocked, considering our sample of the study. Also, we did an additional analysis, which helped us provide a methodological contribution by creating a new proxy to identify companies that belong to the same economic group and then measure the interlocks between them. Doing this, we were able to confirm the effects of board interlocking on CEO compensation by checking if this effect was not a result of the same economic group's companies sharing their directors. Also, both of our proxies of gender diversity show that the higher is the gender diversity on the boards, the lower is CEO compensation. We confirm this finding by measuring gender diversity on board composition with a dummy of women's presence on the board and measuring the percentage of women on the board. Finally, we find

when there are women on the board of directors, the effect of board interlocking on CEO compensation is reduced. It implies that the monitoring role that is improved with women on board contributes to reducing the positive effect of board interlocking on CEO compensation.

There is an opportunity to deepen the analysis of other outcomes for board interlocking in Brazilian companies, even making comparisons of these outcomes between different countries with board interlocking as a practice. We also suggest that future research can improve our Board Interlock Group metric, including other premises on it. Also, as we have found a positive and significant relationship between the presence of compensation committee and CEO compensation in our first model, we believe that this issue could be deepen evaluated in future studies by analyzing the gender diversity in compensation committees. Following the findings of Bugeja, Matolcsy e Spiropoulos (2016) who found that CEO compensation levels are negatively associated with gender-diversity of the compensation committee, it could be applied to the Brazilian context. Finally, for future research, we suggest the evaluation of board interlocking formed by male and female directors and its impacts on CEO compensation, following the approach of Crabtree (2011) saying that "almost every major board now has a woman on it, but it is often the same woman". Our results highlight the importance of enhancing the knowledge of board interlocking, its outcomes in the decision-making process, the board of directors' duties, the claims of gender diversity on the boards, and its possible effects. This study attempted to extend the prior literature by revealing CEO compensation determinants in an emerging market.

The findings of this study should be interpreted in light of their limitations. Despite careful procedures developed for data extraction and treatment, and good statistical validity and reliability, our data may contain noise because our data set was not structured. Despite these limitations, we are convinced that our study makes a relevant contribution to the analysis of board interlocking, gender diversity on the board of directors in Brazilian companies, and its effect on CEO compensation design.

REFERENCES

ADAMS, R. B.; ALMEIDA, H.; FERREIRA, D. Powerful ceos and their impact on corporate performance. **The Review of Financial Studies**, Oxford University Press, v. 18, n. 4, p. 1403–1432, 2005.

ADAMS, R. B.; FERREIRA, D. A theory of friendly boards. **The journal of finance**, Wiley Online Library, v. 62, n. 1, p. 217–250, 2007.

ADAMS, R. B.; FERREIRA, D. Women in the boardroom and their impact on governance and performance. **Journal of financial economics**, Elsevier, v. 94, n. 2, p. 291–309, 2009.

ALBUQUERQUE, A. M.; FRANCO, G. D.; VERDI, R. S. Peer choice in ceo compensation. **Journal of Financial Economics**, Elsevier, v. 108, n. 1, p. 160–181, 2013.

ANDRÉS, P. de; ARRANZ-APERTE, L.; RODRIGUEZ-SANZ, J. A. Independent versus non-independent outside directors in european companies: Who has a say on ceo compensation? **BRQ Business Research Quarterly**, Elsevier, v. 20, n. 2, p. 79–95, 2017.

BAIOCO, V. G.; ALMEIDA, J. E. F. d. Effects of the audit committee and the fiscal council on earnings quality in brazil. **Revista Contabilidade & Finanças**, SciELO Brasil, v. 28, n. 74, p. 229–248, 2017.

BARON, R. M.; KENNY, D. A. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. **Journal of personality and social psychology**, American Psychological Association, v. 51, n. 6, p. 1173, 1986.

BEBCHUK, L. A.; COHEN, A. The costs of entrenched boards. **Journal of Financial Economics**, Elsevier, v. 78, n. 2, p. 409–433, 2005.

BEBCHUK, L. A.; FRIED, J. M. Executive compensation as an agency problem. **Journal of economic perspectives**, v. 17, n. 3, p. 71–92, 2003.

BEBCHUK, L. A.; FRIED, J. M. **Stealth compensation via retirement benefits**. [S.l.], 2004.

BEBCHUK, L. A.; FRIED, J. M. Pay without performance: Overview of the issues. **Journal of applied corporate finance**, Wiley Online Library, v. 17, n. 4, p. 8–23, 2005.

BEBCHUK, L. A.; FRIED, J. M. **Pay without performance: The unfulfilled promise of executive compensation**. [S.l.]: Harvard University Press, 2009.

BEBCHUK, L. A.; FRIED, J. M.; WALKER, D. I. **Managerial power and rent extraction in the design of executive compensation**. [S.l.], 2002.

BENKRAIEM, R. et al. Board independence, gender diversity and ceo compensation. **Corporate Governance: The international journal of business in society**, Emerald Publishing Limited, 2017.

BERLE, A. A.; MEANS, G. C. **The modern corporation and private property**. [S.l.: s.n.], 1932. v. 45.

BLAU, P. M. A macrosociological theory of social structure. **American journal of sociology**, University of Chicago Press, v. 83, n. 1, p. 26–54, 1977.

BOHMAN, L. Bringing the owners back in: An analysis of a 3-mode interlock network. **Social Networks**, Elsevier, v. 34, n. 2, p. 275–287, 2012.

BORGATTI, S. P.; EVERETT, M. G.; JOHNSON, J. C. **Analyzing social networks**. [S.l.]: Sage, 2018.

BORGATTI, S. P. et al. Network analysis in the social sciences. **science**, American Association for the Advancement of Science, v. 323, n. 5916, p. 892–895, 2009.

BRENNAN, N. Boards of directors and firm performance: is there an expectations gap? **Corporate Governance: An International Review**, Wiley Online Library, v. 14, n. 6, p. 577–593, 2006.

BRICK, I. E.; PALMON, O.; WALD, J. K. Ceo compensation, director compensation, and firm performance: Evidence of cronyism? **Journal of Corporate Finance**, Elsevier, v. 12, n. 3, p. 403–423, 2006.

BRICKLEY, J. A.; COLES, J. L.; JARRELL, G. Leadership structure: Separating the ceo and chairman of the board. **Journal of corporate Finance**, Elsevier, v. 3, n. 3, p. 189–220, 1997.

BRUGNI, T. V. et al. Corporate governance: A panoramic view of brazilian boards of directors. **International Journal of Disclosure and Governance**, Springer, v. 10, n. 4, p. 406–421, 2013.

BRUNA, M. G. et al. Does board gender diversity affect firm risk-taking? evidence from the french stock market. **Journal of Management and Governance**, Springer, v. 23, n. 4, p. 915–938, 2019.

BUGEJA, M.; MATOLCSY, Z.; SPIROPOULOS, H. The association between gender-diverse compensation committees and ceo compensation. **Journal of Business Ethics**, Springer, v. 139, n. 2, p. 375–390, 2016.

CAMBINI, C. et al. Ceo compensation in eu telecom companies: Does the state design the right incentives? **Telecommunications Policy**, Elsevier, v. 42, n. 6, p. 474–488, 2018.

CARTER, D. A.; SIMKINS, B. J.; SIMPSON, W. G. Corporate governance, board diversity, and firm value. **Financial review**, Wiley Online Library, v. 38, n. 1, p. 33–53, 2003.

CASTEUBLE, C.; LEPETIT, L.; TRAN, T. T. Women on boards: do quotas affect firm performance? 2019.

CHI, C. W. et al. Family firms and earnings management in taiwan: Influence of corporate governance. **International Review of Economics & Finance**, Elsevier, v. 36, p. 88–98, 2015.

COLEMAN, J. S. Social capital in the creation of human capital. **American journal of sociology**, University of Chicago Press, v. 94, p. S95–S120, 1988.

CONYON, M. J.; PECK, S. I. Board control, remuneration committees, and top management compensation. **Academy of Management Journal**, Academy of Management Briarcliff Manor, NY 10510, v. 41, n. 2, p. 146–157, 1998.

COSTA, C. M. et al. Non-compliance in executive compensation disclosure: the brazilian experience. **Journal of Business Finance & Accounting**, Wiley Online Library, v. 43, n. 3-4, p. 329–369, 2016.

CRABTREE, J. One woman, multiple boards: Rise of the 'super-connected'director. **Financial Times**, 2011.

CREDIT SUISSE RESEARCH INSTITUTE. **The CS Gender 3000 in 2019: The changing face of companies**. https://www.credit-suisse.com/about-us-news/en/articles/news-and-expertise/cs-gender-3000-report-2019-201910.html, 2019.

CROISSANT, Y.; MILLO, G. Panel data econometrics in r: The plm package. **Journal of statistical software**, v. 27, n. 2, 2008.

CUNHA, P. R. da; PICCOLI, M. R. Influência do board interlocking no gerenciamento de resultados. **Revista Contabilidade & Finanças**, SciELO Brasil, v. 28, n. 74, p. 179–196, 2017.

CVM. **Instrução CVM n 480, de 7 de março de 2009: Dispõe sobre o registro de emissores de valores mobiliários admitidos à negociação em mercados regulamentados de valores mobiliários**. 2009.

DRAGO, C. et al. Corporate governance reforms, interlocking directorship and company performance in italy. **International Review of Law and Economics**, Elsevier, v. 41, p. 38–49, 2015.

EL-KHATIB, R.; FOGEL, K.; JANDIK, T. Ceo network centrality and merger performance. **Journal of Financial Economics**, Elsevier, v. 116, n. 2, p. 349–382, 2015.

FERNANDES, N. et al. Are us ceos paid more? new international evidence. **The Review of Financial Studies**, Oxford University Press, v. 26, n. 2, p. 323–367, 2013.

FICH, E.; WHITE, L. J. Ceo compensation and turnover: The effects of mutually interlocked boards. **Wake Forest L. Rev.**, HeinOnline, v. 38, p. 935, 2003.

FICH, E. M.; SHIVDASANI, A. Are busy boards effective monitors? **Journal of Finance, forthcoming**, 2005.

FINKELSTEIN, S.; HAMBRICK, D. C. Chief executive compensation: A study of the intersection of markets and political processes. **Strategic Management Journal**, Wiley Online Library, v. 10, n. 2, p. 121–134, 1989.

GILLAN, S. L. **Recent developments in corporate governance: An overview**. [S.l.]: Elsevier, 2006.

GILLETTE, A. B.; NOE, T. H.; REBELLO, M. J. Corporate board composition, protocols, and voting behavior: Experimental evidence. **The Journal of Finance**, Wiley Online Library, v. 58, n. 5, p. 1997–2031, 2003.

GORDINI, N.; RANCATI, E. Gender diversity in the italian boardroom and firm financial performance. **Management Research Review**, Emerald Publishing Limited, v. 40, n. 1, p. 75–94, 2017.

GRINSTEIN, Y.; HRIBAR, P. Ceo compensation and incentives: Evidence from m&a bonuses. **Journal of financial economics**, Elsevier, v. 73, n. 1, p. 119–143, 2004.

GULL, A. A. et al. Beyond gender diversity: How specific attributes of female directors affect earnings management. **The British Accounting Review**, Elsevier, v. 50, n. 3, p. 255–274, 2018.

HALLOCK, K. F. Reciprocally interlocking boards of directors and executive compensation. **Journal of financial and Quantitative Analysis**, Cambridge University Press, v. 32, n. 3, p. 331–344, 1997.

HAMDAN, A. Board interlocking and firm performance: The role of foreign ownership in saudi arabia. **International Journal of Managerial Finance**, Emerald Publishing Limited, v. 14, n. 3, p. 266–281, 2018.

HELMERS, C.; PATNAM, M.; RAU, P. R. Do board interlocks increase innovation? evidence from a corporate governance reform in india. **Journal of Banking & Finance**, Elsevier, v. 80, p. 51–70, 2017.

HOI, C. K. S.; WU, Q.; ZHANG, H. Does social capital mitigate agency problems? evidence from chief executive officer (ceo) compensation. **Journal of Financial Economics**, Elsevier, v. 133, n. 2, p. 498–519, 2019.

HOITASH, U. Should independent board members with social ties to management disqualify themselves from serving on the board? **Journal of Business Ethics**, Springer, v. 99, n. 3, p. 399–423, 2011.

HOLANDA, A. P.; COELHO, A. C. D. Dividendos e efeito clientela: evidências no mercado brasileiro. **RAE-Revista de Administração de Empresas**, Fundação Getulio Vargas, v. 52, n. 4, p. 448–463, 2012.

HOLANDA, A. P.; COELHO, A. C. D. Estrutura de propriedade em firmas brasileiras: Trajetória entre 1998-2012. **Revista de Finanças Aplicadas**, v. 3, p. 1–39, 2014.

IBGC. **Código das Melhores Práticas de Governança Corporativa**. 2015.

JENSEN, M. C. The modern industrial revolution, exit, and the failure of internal control systems. **the Journal of Finance**, Wiley Online Library, v. 48, n. 3, p. 831–880, 1993.

JENSEN, M. C.; MECKLING, W. H. Theory of the firm: Managerial behavior, agency costs and ownership structure. **Journal of financial economics**, Elsevier, v. 3, n. 4, p. 305–360, 1976.

JENSEN, M. C.; MECKLING, W. H. Theory of the firm: Managerial behavior, agency costs, and ownership structure. In: **Economics social institutions**. [S.l.]: Springer, 1979. p. 163–231.

KRAUSE, R.; SEMADENI, M.; JR, A. A. C. Ceo duality: A review and research agenda. **Journal of Management**, Sage Publications Sage CA: Los Angeles, CA, v. 40, n. 1, p. 256–286, 2014.

LAMB, N. H.; ROUNDY, P. The "ties that bind" board interlocks research: a systematic review. **Management Research Review**, Emerald Group Publishing Limited, v. 39, n. 11, p. 1516–1542, 2016.

LARCKER, D. F.; MCCLURE, C.; ZHU, C. Peer group choice and chief executive officer compensation. **Rock Center for Corporate Governance at Stanford University Working Paper**, n. 240, 2019.

LARCKER, D. F. et al. Back door links between directors and executive compensation. **Available at SSRN 671063**, 2005.

LARCKER, D. F.; TAYAN, B. Is a powerful ceo good or bad for shareholders? **Rock Center for Corporate Governance at Stanford University Closer Look Series: Topics, Issues and Controversies in Corporate Governance and Leadership No. CGRP-28**, 2012.

LAZZARETTI, K. et al. Gender diversity in the boards of directors of brazilian businesses. **Gender in Management: An International Journal**, Emerald Group Publishing Limited, 2013.

LAZZARINI, S. G. Empresas em rede. **São Paulo: Cengage Learning**, p. 17–34, 2008.

LUCAS-PÉREZ, M. E. et al. Women on the board and managers' pay: Evidence from spain. **Journal of Business Ethics**, Springer, v. 129, n. 2, p. 265–280, 2015.

MILLER, T.; TRIANA, M. del C. Demographic diversity in the boardroom: Mediators of the board diversity–firm performance relationship. **Journal of Management studies**, Wiley Online Library, v. 46, n. 5, p. 755–786, 2009.

MIZRUCHI, M. S. What do interlocks do? an analysis, critique, and assessment of research on interlocking directorates. **Annual review of sociology**, Annual Reviews 4139 El Camino Way, PO Box 10139, Palo Alto, CA 94303-0139, USA, v. 22, n. 1, p. 271–298, 1996.

NILI, Y. Beyond the numbers: Substantive gender diversity in boardrooms. **Ind. LJ**, HeinOnline, v. 94, p. 145, 2019.

PEREIRA, B. da S. et al. Relación entre las características observables de los ceo y su salario. **Contabilidad y Negocios: Revista del Departamento Académico de Ciencias Administrativas**, Pontificia Universidad Católica del Perú, v. 11, n. 21, p. 5–24, 2016.

PERLIN, M.; KIRCH, G.; VANCIN, D. Accessing financial reports and corporate events with getdfpdata. **Available at SSRN 3128252**, 2018.

PHAN, P. H.; LEE, S. H.; LAU, S. C. The performance impact of interlocking directorates: The case of singapore. **Journal of Managerial Issues**, JSTOR, p. 338–352, 2003.

PINTO, M. B.; LEAL, R. P. C. Ownership concentration, top management and board compensation. **Revista de Administração Contemporânea**, SciELO Brasil, v. 17, n. 3, p. 304–324, 2013.

SANTOS, R. L.; SILVEIRA, A. d. M. D.; BARROS, L. A. Board interlocking in brazil: directors' participation in multiple companies and its effect on firm value and profitability. **Latin American Business Review**, Taylor & Francis, v. 13, n. 1, p. 1–28, 2012.

SARABI, Y.; SMITH, M. Busy female directors: an exploratory analysis of the impact of quotas and interest groups. **Gender in Management: An International Journal**, Emerald Publishing Limited, 2021.

SCOTT, J. Social network analysis. **Sociology**, British Sociological Association Publications Limited, v. 22, n. 1, p. 109–127, 1988.

SHIVDASANI, A.; YERMACK, D. Ceo involvement in the selection of new board members: An empirical analysis. **The journal of finance**, Wiley Online Library, v. 54, n. 5, p. 1829–1853, 1999.

SILA, V.; GONZALEZ, A.; HAGENDORFF, J. Women on board: Does boardroom gender diversity affect firm risk? **Journal of Corporate Finance**, Elsevier, v. 36, p. 26–53, 2016.

SILVA, L. K. S. et al. Influência do board interlocking e do controle acionário na qualidade da governança corporativa no mercado de ações brasileiro. 2019.

SILVEIRA, A. D. M. d.; BARROS, L. A. B. d. C.; FAMÁ, R. Atributos corporativos e concentração acionária no brasil. **Revista de Administração de Empresas**, SciELO Brasil, v. 48, n. 2, p. 51–66, 2008.

VESCO, D. G. D.; BEUREN, I. M. Do the board of directors composition and the board interlocking influence on performance? **BAR-Brazilian Administration Review**, SciELO Brasil, v. 13, n. 2, 2016.

VO, T. T. N.; CANIL, J. M. Ceo pay disparity: Efficient contracting or managerial power? **Journal of Corporate Finance**, Elsevier, v. 54, p. 168–190, 2019.

WANG, Z.; LIU, S.; YANG, H. The influence of social network structure on stock price disclosure. **Physica A: Statistical Mechanics and its Applications**, Elsevier, v. 533, p. 122064, 2019.

WASSERMAN, S.; FAUST, K. et al. **Social network analysis: Methods and applications**. [S.l.]: Cambridge university press, 1994. v. 8.

WONG, L. H. H.; GYGAX, A. F.; WANG, P. Board interlocking network and the design of executive compensation packages. **Social Networks**, Elsevier, v. 41, p. 85–100, 2015.

YEO, H.-J.; POCHET, C.; ALCOUFFE, A. Ceo reciprocal interlocks in french corporations. **Journal of Management and governance**, Springer, v. 7, n. 1, p. 87–108, 2003.

ZHU, B.; WATTS, S.; CHEN, H. Visualizing social network concepts. **Decision Support Systems**, Elsevier, v. 49, n. 2, p. 151–161, 2010.

APPENDIX A   ROBUSTNESS TEST

A.1   Alternative Financial Variables

Table 21: Robustness Test - Financial variables

	(1) $CEOcomp_{it}$	(2) $CEOcomp_{it}$	(3) $CEOcomp_{it}$
BI_Degree_{it}	0.04***	0.03***	0.03***
	(0.01)	(0.01)	(0.01)
$Lag(Firm\_Size_{it})$	0.02		
	(0.01)		
$Revenue_{it}$		0.02	
		(0.01)	
$Lag(Revenue_{it})$			0.01
			(0.01)
$Debt\_Assets_{it}$		0.01	
		(0.13)	
$Lag(Debt\_Assets_{it})$	0.03		0.02
	(0.14)		(0.16)
ROA_{it}		0.32	
		(0.19)	
$Lag(ROA_{it})$	0.12		0.07
	(0.17)		(0.21)
$Board\_Size_{it}$	0.11***	0.11***	0.12***
	(0.02)	(0.02)	(0.02)
$Outsider_{it}$	1.26***	1.18***	1.19***
	(0.14)	(0.14)	(0.15)
$Fiscal\_Board_{it}$	0.32***	0.28***	0.28***
	(0.08)	(0.08)	(0.08)
$Comp\_Committee_{it}$	0.20*	0.24*	0.25*
	(0.09)	(0.10)	(0.10)
$Ownership_{it}$	-0.23	-0.21	-0.23
	(0.15)	(0.17)	(0.16)
$Family\_Firm_{it}$	-0.13	-0.10	-0.09
	(0.07)	(0.07)	(0.07)
$CEO\_Duality_{it}$	-0.35**	-0.31**	-0.31**
	(0.11)	(0.11)	(0.11)
CEO_Age_{it}	-0.00	-0.01	-0.00
	(0.00)	(0.00)	(0.00)
CEO_Tenure_{it}	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
ECS_{it}	-0.03	-0.09	-0.08
	(0.10)	(0.10)	(0.10)
$Control\_Type_{it}$	Yes	Yes	Yes
$Sector_{it}$	Yes	Yes	Yes
$Year_t$	Yes	Yes	Yes
$Intercept$	9.13***	9.37***	9.34***
	(0.98)	(0.97)	(0.99)
Adj. R^2	0.38	0.37	0.37
Num. obs.	1634	1557	1556

Source: Elaborated by the author.

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

A.2 Alternative of BI Degree - Board Interlocking Density

Table 22: Board Interlocking - Density

	(1) $CEOcomp_{it}$	(2) $CEOcomp_{it}$	(3) $CEOcomp_{it}$	(4) $CEOcomp_{it}$
$BI\_Density_{it}$	132.11***	124.62***	46.11***	50.05***
	(11.83)	(11.87)	(9.95)	(10.02)
$Firm\_Size_{it}$		0.03***	0.02*	0.02*
		(0.01)	(0.01)	(0.01)
$Debt\_Assets_{it}$		-0.12	-0.01	0.00
		(0.15)	(0.09)	(0.08)
ROA_{it}		0.03	0.27	0.30
		(0.15)	(0.16)	(0.16)
$Board\_Size_{it}$			0.11***	0.11***
			(0.01)	(0.01)
$Outsider_{it}$			1.33***	1.26***
			(0.14)	(0.14)
$Fiscal\_Board_{it}$			0.29***	0.31***
			(0.07)	(0.08)
$Comp\_Committee_{it}$			0.23*	0.19*
			(0.09)	(0.09)
$Ownership_{it}$			-0.21	-0.20
			(0.15)	(0.15)
$Family\_Firm_{it}$			-0.11	-0.14
			(0.07)	(0.07)
CEO_Age_{it}				-0.00
				(0.00)
CEO_Tenure_{it}				0.01
				(0.01)
ECS_{it}				-0.02
				(0.10)
$Control\_Type_{it}$			Yes	Yes
$Sector_{it}$	Yes	Yes	Yes	Yes
$Year_t$	Yes	Yes	Yes	Yes
$Intercept$	11.97***	11.51***	8.74***	9.11***
	(0.95)	(0.94)	(0.97)	(0.96)
R^2	0.20	0.22	0.39	0.40
Adj. R^2	0.19	0.20	0.38	0.38
Num. obs.	1635	1635	1635	1635

Source: Elaborated by the author.

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$