

## **PAY-PERFORMANCE SENSITIVITY AND OWNERSHIP CONCENTRATION IN BRAZILIAN PUBLIC FIRMS**

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### **Resumo:**

*The influence of ownership concentration on executive compensation has been analyzed by international studies, but it had not been investigated in the Brazilian context, which has as particularity the high ownership concentration. In this sense, we examine whether the firm performance influence on executive compensation and how the ownership concentration moderates this pay-performance relationship. For this purpose, we used a sample of 205 Brazilian public firms listed on B[3] with available data between 2010 and 2018. The results indicate, after controlling for endogeneity through Generalized Method of Moments IV (IV-GMM) regressions, that although the positive influence of firm performance proxies (return on equity and return on assets) on executive compensation, the ownership concentration decrease the pay-performance sensitivity. Our study contributes to the literature by showing that the high level of ownership concentration reduces the propensity of aligning the interests of managers for higher levels of compensation with the interests of shareholders for better firm profitability, not reflecting the recommended practices of corporate governance.*

**Palavras-chave:** *Pay for Performance; Executive Compensation; Ownership Concentration.*

**Área temática:** *Mercado Financeiro, de Crédito e de Capitais*

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### **Abstract**

The influence of ownership concentration on executive compensation has been analyzed by international studies, but it had not been investigated in the Brazilian context, which has as particularity the high ownership concentration. In this sense, we examine whether the firm performance influence on executive compensation and how the ownership concentration moderates this pay-performance relationship. For this purpose, we used a sample of 205 Brazilian public firms listed on B<sup>[3]</sup> with available data between 2010 and 2018. The results indicate, after controlling for endogeneity through Generalized Method of Moments IV (IV-GMM) regressions, that although the positive influence of firm performance proxies (return on equity and return on assets) on executive compensation, the ownership concentration decrease the pay-performance sensitivity. Our study contributes to the literature by showing that the high level of ownership concentration reduces the propensity of aligning the interests of managers for higher levels of compensation with the interests of shareholders for better firm profitability, not reflecting the recommended practices of corporate governance.

**Keywords:** Pay for Performance; Executive Compensation; Ownership Concentration.

**Thematic area of the event:** Financial, Credit and Capital Markets.

### **1 INTRODUCTION**

Grounded on the conflict of interests that arises from the separation of ownership and control (BERLE; MEANS, 1932), executive compensation can be viewed as one of the corporate governance mechanisms that disciplines, monitors and motivates the managers. It provides incentives for the agents making choices that will maximize the shareholder's wealth due to the existence of imperfect monitoring (JENSEN; MECKLING, 1976).

The optimal contracting view posits that if executive compensation is closely related to the company performance (pay-performance sensitivity), this compensation may aligning the interests of managers for higher levels of compensation with the interests of shareholders for better firm performance (YANG; CULLINAN; LIU, 2018). However, in a competing way, the managerial power view considers that managers might exercise significant bargaining power over the board, which leads to compensation contracts that are not aligned with the shareholders best interests (ATAAY, 2018).

Based on these two competing views, we examine whether the firm performance influence on the executive compensation of Brazilian publicly-traded firms and how the ownership concentration moderate this pay-performance relationship. This moderating effect may occur since, with the help of large controlling shareholders, entrenched managers may be prone to maximize personal monetary benefits by using compensation schemes that have little relationship with firm performance. Thus, managers from companies with high ownership concentration degree tend to adopt less pay for performance packages (JIANG; HABIB; SMALLMAN, 2009).

Despite the possible influence of firm performance on executive compensation, the compensation also may act as a mechanism of motivation, stimulating managers to obtain a superior performance (AGUIAR; PIMENTEL, 2017). In this way, we control this possible

endogeneity problem between firm performance and executive compensation, in a sample of 205 non-financial Brazilian public firms in the period 2010-2018, using instrumental variables in a Generalized Method of Moments IV (IV-GMM) regression.

Our main results reveal that although the positive influence of firm performance on executive compensation, the ownership concentration may decrease the pay-performance sensitivity. However, it is important to highlight that our results are not consistent across all estimations, being susceptible to the different proxies of executive compensation and ownership concentration.

Based on these findings, our study contributes to the literature by showing that the high level of ownership concentration tends to reduce pay-performance sensitivity, not reflecting the recommended practices of corporate governance. If executive compensation is tied to the firm performance, it may align the interests of managers for higher levels of compensation with the interests of shareholders for better firm profitability.

In this sense, fills the gap regarding the moderating effect of ownership concentration on pay for performance relationship in the Brazilian context since, to the best of our knowledge, it is the first to consider that ownership concentration plays a role on pay-performance sensitivity. Moreover, contributes due to the lack of convergence of previous studies that examine the pay-performance sensitivity, especially in the Brazilian context (AGUIAR; PIMENTEL, 2017; PINTO; LEAL, 2013), which has high ownership concentration degree of public firms.

The rest of the paper is organized as follows: In the second section, we expose the hypothesis development. In the third section, we describe our sample selection procedure and outline our research design. Finally, in the last two sections, we present the empirical results and the conclusions, respectively.

## **2 HYPOTHESIS DEVELOPMENT**

Agency theory assumes that individuals are rational, risk-averse, and inclined to take actions that maximize their personal wealth (GOMEZ-MEJIA; WISEMAN, 1997; JENSEN; MECKLING, 1976). In this sense, managers may be driven by self-interest and motivated by financial incentives, which may induce opportunistic actions that not necessarily include the same objectives as those of the shareholders (LUBATKIN; DURAND; LING, 2007; MICHIELS et al., 2012).

According to the agency theory, executive compensation is one of the mechanisms to motivate managers to act in the best interest of the shareholders, which should (partly) depend on firm performance (MURPHY, 1986). In this respect, an optimal pay-for-performance contract will tie the manager's expected utility to the shareholder's wealth (JENSEN; MURPHY, 1990; ROSS, 1973).

Consistent with this optimal contracting view, previous studies show a significant positive association between firm performance proxies (e.g., return on assets, return on equity and Tobin's Q) and executive compensation both in developed (KE, PETRONI; SAFIEDDINE, 1999; MICHIELS et al., 2012), and emerging countries (ATAAY, 2018; CAO; PAN; TIAN, 2011; KOHLI, 2018; YANG; CULLINAN; LIU, 2018). These results suggest that executive compensation mechanisms, when tied to firm performance, may mitigate or eliminate potential agency conflicts.

However, in the Brazilian context, the relationship between firm performance and executive compensation seems inconclusive (FERNANDES; MAZZIONI, 2015). While some evidences show that there is a positive (negative) influence of firm performance on executive

compensation (DANI et al., 2017; VASCONCELOS; MONTE, 2013), depending on the firm performance proxy, other evidences show that there is no significant association between firm performance and executive compensation (ALVES; KRAUTER, 2014; BEUREN; SILVA; MAZZIONI, 2014).

Based on these inconclusive evidences and considering the optimal contracting view that executive compensation may reduce agency conflicts when the compensation is tied to firm performance, our first hypothesis is stated as follows:

**H1:** Firm performance has a positive and significant impact on executive compensation in Brazilian public firms.

Nevertheless, the relationship between firm performance and executive compensation may vary significantly depending on the institutional and organizational aspects, such as the structure of ownership (DEVERS et al., 2007; ATAAY, 2018). This occurs due to the influence of managerial power on the compensation design arrangements, in which the ownership concentration level may play a significant role on the pay-performance sensitivity since the controlling shareholders are often in charge of setting managerial compensations (CAO; PAN; TIAN, 2011).

In line with managerial power view, executive compensation may be viewed not only a potential mechanism for addressing the agency problem but also as part of the agency problem itself (BEBCHUK; FRIED, 2003). It may happen since controlling shareholders may extract private benefits by setting executive compensation schemes unrelated to the wealth of minority shareholders (CAO; PAN; TIAN, 2011; MICHIELS et al., 2012).

Under this view, previous studies show that higher levels of ownership concentration tend to reduce the pay-performance sensitivity, suggesting that the performance sensitivity of compensation is weaker when executives have more control over decisions, especially those related to their compensation (ATAAY, 2018; JIANG; HABIB; SMALLMAN, 2009). Based on this effect, it is possible that one explanation for the mixed results on the pay-performance relationship in Brazilian context (ALVES; KRAUTER, 2014; BEUREN; SILVA; MAZZIONI, 2014; DANI et al., 2017; FERNANDES; MAZZIONI, 2015; VASCONCELOS; MONTE, 2013) lies in the fact that these studies don't consider the effect of ownership concentration.

We believe that this is particularly important because, despite the reduction in the degree of ownership concentration by Brazilian public firms in recent years, the degree of ownership concentration still high (AGUIAR; PIMENTEL, 2017; PINTO; LEAL, 2013). Thus, considering that higher levels of ownership concentration tend to reduce the pay-performance sensitivity, our second hypothesis stated as follows:

**H2:** Ownership concentration has a negative and significant impact on the pay-performance relationship in Brazilian public firms.

### 3 SAMPLE SELECTION AND RESEARCH DESIGN

#### 3.1 Sample Selection

To test our hypotheses, we use a sample of Brazilian public firms listed on B<sup>3</sup> with available data between 2010 and 2018. We consider this period for two reasons. First, due to the data availability, since the Brazilian Securities Exchange Commission normative instruction #480 led to the mandatory disclosure of executive compensation data in 2010. Second, due to

the mandatory adoption of the International Financial Reporting Standard in Brazil began in 2010, which led to an increase in the accounting information quality (PELUCIO-GRECCO et al., 2014; SOUSA, SOUSA; DEMONIER, 2016).

In line with previous studies (ATAAY, 2018; CAO; PAN; TIAN, 2011; JIANG; HABIB; SMALLMAN, 2009; KOHLI, 2018), we exclude financial firms due to their specific financial and operating structures, which provide misleading results regarding the calculation of performance variables. In addition, following Fama and French (1995), we exclude firms with negative equity. Finally, we also exclude firms with no available data in three years' time window to avoid observations that not capture the time effect (average of observations per group is 6.9).

After the exclusion of firms that are missing necessary data, the final sample consists of 1,416 observations of 205 firms in the 2010-2018 time window, as shown in Table 1 of the sample selection procedure.

Table 1 – Sample selection

	Firms	Observations
Total of Brazilian public firms	463	4,167
(-) Financial industry firms	(216)	(1,944)
(-) Missing data from executive compensation	(7)	(337)
(-) Missing data from ownership concentration	(12)	(283)
(-) Firms with negative equity	(3)	(158)
(-) Firms with no data in three years time window	(20)	(29)
(=) Final sample	205	1,416

We do not require company data in all years in order to avoid survival bias. Thus, our analyses are based on unbalanced data. We require financial data from Thomson Reuters Eikon© and Economatica© databases as well as executive compensation data from the Brazilian Securities Exchange Commission website. Hence, we obtain the executive compensation data from the Total Remuneration of the Board of Directors section of Reference Form (#13). After data collection, we applied data winsorization at 1% and 99% levels to mitigate the outliers identified through boxplots.

### 3.2 Research Design

Prior literature posits simultaneous relations between firm performance and executive compensation. On the one hand, the positive influence of firm performance on executive compensation may reduce potential agency conflicts (ATAAY, 2018; CAO, PAN; TIAN, 2011; KOHLI, 2018; YANG, CULLINAN; LIU, 2018). However, on the other hand, executive compensation may act as a mechanism of motivation, stimulating managers to obtain a superior performance (AGUIAR; PIMENTEL, 2017).

To control the simultaneity effect of firm performance and executive compensation, we run the following model using a Generalized Method of Moments IV (IV-GMM) regression:

$$TotComp_{i,t} = \beta_0 + \beta_1 Perf_{i,t} + \beta_2 Owner_{i,t} + \beta_3 Perf * Owner_{i,t} + \sum_{j=4}^{12} \phi Controls_{i,t} + \mu_{i,t}$$

Following Ataay (2018), Kohli (2018) and Michiels et al. (2012), we use Total Compensation (*TotComp*) as a measure for executive compensation. This measure is composed



by the sum of the logarithms of fixed compensation (salary, benefits, participation and other fixed compensations), variable compensation (bonus, results participation, meetings participation, commissions' participation and other variable compensations), and stock options exercised. The log transformation of compensation data reduces the scale of difference to other variables included in the equation (1). The variables definitions are presented on Appendix A.

Regarding the performance variables (*Perf*), we adopted both accounting-based indicators used by prior studies (ATAAY, 2018; CAO; PAN; TIAN, 2011; JIANG; HABIB; SMALLMAN, 2009; KE; PETRONI; SAFIEDDINE, 1999; KOHLI, 2018; MICHIELS et al., 2012; YANG, CULLINAN; LIU, 2018). The Return on Equity (*ROE*) is measured by the ratio of net income to total equity, and Return on Assets (*ROA*) is measured by the ratio of net income to total assets.

To identify whether controlling shareholders, who often manage the firms that they control, expropriate minority shareholders by increasing the level of their own compensation (CHEUNG; STOURAITIS; WONG, 2005), we use three different proxies. In line with prior studies, we capture ownership concentration by the percentage of total voting shares of the largest shareholder (*Owner1*), of the three largest shareholders (*Owner3*), and of the five largest shareholders (*Owner5*) (AL-JAIFI, 2017; EARLE; KUCSERA; TELEGDY, 2005; SHEHZAD; HAAN; SCHOLTENS, 2010; YEN; ANDRÉ, 2007).

Considering that the ownership concentration may be categorized into three categories: (i) dispersed – equal or lower to 20%, (ii) dominated - above 20% and equal or lower to 50% and, (iii) concentrated - above 50% (ANJOS et al., 2015), we use a dummy variable to capture ownership concentration levels above 50% of total voting shares. Furthermore, the interaction between performance variables (*Perf*) and the three ownership concentration proxies aims to examine the moderating effect of ownership concentration on the pay-performance relationship.

In line with Banghøj, Gabrielsen, Petersen and Plenborg (2010) and Michiels et al. (2012), we use leverage (*Lev*) and sales growth ( $\Delta Sales$ ) as instrumental variables for IV-GMM regression. The argument that supports the influence of sales growth on accounting-based performance indicators considers that increases in sales should improve profits, whereas this growth generally distributes fixed costs on higher levels of revenues; which results in higher profitability (BROMILEY; HENDRICKX, 2000).

The inclusion of leverage as an instrument of accounting-based indicators is based on the traditional trade-off models of capital structure that predict that leverage and profitability are associated. According to Xu (2012), the trade-off theory predicts an increase in book leverage when expected profitability increases because of the costs of financial distress decrease and the tax benefits of debt increase. Thus, the tax benefits of debt dominate up to a certain optimal debt ratio, resulting in higher profitability. However, it is important to point out that the lower income tax that the firm pays for increasing debt, higher is the risk of bankruptcy (JANG; TANG, 2009; YOON; JANG, 2005).

We consider prior evidence that leverage (ATAAY, 2018; KOHLI, 2018) and sales growth (BORISOVA; SALAS; ZAGORCHEV, 2018; COUGHLAN; SCHMIDT, 1985) do not influence significantly on executive compensation. Furthermore, we confirm that the instrumental variables are valid and that the structural models are specified correctly through Hansen's J test for overidentifying restrictions.

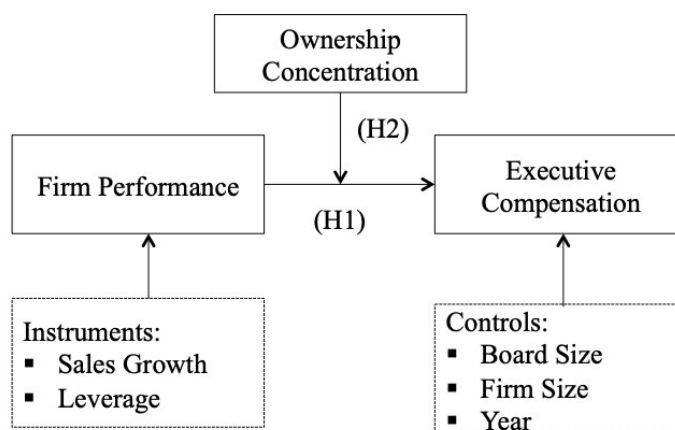
Regarding the control variables, we control for *BoardSize*, defined as the number of total board members, considering that prior studies show a positive association between board

size and executive compensation (BANGHØJ et al., 2010; MALTOCSY; SHAN; SEETHAMRAJU, 2012). This positive influence may be due that larger boards are less effective in controlling management (MALTOCSY; SHAN; SEETHAMRAJU, 2012) since the monitoring capacity is weakened and the actions become more dispersed on larger boards.

We control *FirmSize*, defined as the logarithm of net sales revenue, insofar as larger firms have better conditions to pay higher levels of executive compensation due to the larger volume of business, which results in higher revenues and profits (SRIDHAR; KUMAR, 2015). Finally, in line with prior studies (CAO; PAN; TIAN, 2011; KOHLI, 2018 YANG, CULLINAN; LIU, 2018), we also include year dummies to control for the possible time fixed effect.

Based on the research design and variables presented above, Figure 1 shows our conceptual framework.

Figure 1 – Conceptual Framework



Source: Authors.

The relationship presented above considers that the Firm Performance positively affects the Executive Compensation (which is the pay-performance sensitivity), while the moderating effect of Ownership Concentration negatively affects the pay-performance relationship.

## 4 RESULTS AND DISCUSSION

### 4.1 Descriptive Analysis

Table 2 presents a statistical summary of the data. The average log of total compensation is 15.9, with 1.276 of standard error. The firm included in our sample with the higher executive compensation level is Ambev, which compensate its executives with fixed and variable compensation, including stock options. Regarding the ownership concentration, Table 2 shows, on average, that the percentage of the largest controlling shareholder is 47.4%. However, this percentage increases significantly when we consider the sum of the three and five largest shareholders, reaching 76.3% and 83.3%, respectively.

This ownership concentration level suggests that although the ownership patterns have been diluted, indicating the first stage of dispersed ownership (GORGA, 2009). The Brazilian scenario is similar to other countries in Latin America, characterized by a highly concentrated structure with shareholders who hold a predominant role as a manager too. Consequently, they

could engage in accounting decisions that reflect personal reasons (SAONA; MURO, 2018), such as the misaligning between pay-performance relationship.

Table 2 – Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
<i>TotComp</i>	1,415	15.908	1.276	11.097	18.291
<i>ROE</i>	1,415	-0.043	0.624	-4.276	0.735
<i>ROA</i>	1,415	0.024	0.086	-0.369	0.222
<i>Owner1</i>	1,415	0.474	0.499	0	1
<i>Owner3</i>	1,415	0.763	0.425	0	1
<i>Owner5</i>	1,415	0.833	0.372	0	1
<i>ΔSales</i>	1,415	0.094	0.339	-0.731	2.163
<i>Lev</i>	1,415	0.551	0.245	-0.362	0.976
<i>FirmSize</i>	1,415	21.950	1.709	17.713	26.311
<i>BoardSize</i>	1,415	14.803	5.453	3	27

Source: Authors.

Table 2 also shows that firms have, on average, low return on assets, negative return on equity, moderate leverage levels and low sales increase. This overall result may occur due to the Brazilian economic crisis during the period 2012-2018, as evidenced by Lopes et al. (2016) and Barbosa (2017). The *BoardSize* reveals that, on average, the firms have 14 members, having the Energy Company of Minas Gerais the largest.

## 4.2 Regression Results

Before the estimation of equation (1), which examines the firm performance influence on the executive compensation and the moderating effect of ownership concentration in this relationship, we perform specification tests for multicollinearity, heteroskedasticity, overidentifying restrictions and presence of endogeneity.

We first perform the Variance Inflation Factor (VIF) test in a Pooled Ordinary Least Square (POLS) model, which suggest that there are no multicollinearity problems across all estimations (all mean VIFs are below 5). Considering the possible endogeneity between firm performance and executive compensation, we perform a Two-Stage Least Squares (IV-2SLS) model, using sales leverage (*Lev*) and sales growth (*ΔSales*) as instrumental variables for *ROE* and *ROA*, following Banghøj et al. (2010) and Michiels et al. (2012).

The Pagan-Hall test for heteroskedasticity in IV-2SLS models leads to rejecting the null hypothesis of homoscedastic residuals across the specifications. We use the Generalized Method of Moments (IV-GMM) regression due to the presence of heteroskedasticity (statistic results are in Table 3 and 4).

Hansen's J test for overidentifying restriction indicates that the structural models are correctly specified and that the instruments are valid, leading to not reject the null hypothesis across all models. However, regarding the test of endogeneity (orthogonality conditions), we reject the null hypothesis that *ROA* is exogenous in the models 5 and 6, as shown by the statistic results of endogeneity tests reported in Table 4.



Table 3 – Second stage estimations of return on equity model

	<i>TotComp</i> (1)	<i>TotComp</i> (2)	<i>TotComp</i> (3)
<i>ROE</i>	0.630*** (2.57)	1.229* (1.80)	1.427* (1.74)
<i>Owner1</i>	-0.596*** (-11.33)		
<i>Owner3</i>		-0.787*** (-13.38)	
<i>Owner5</i>			-0.901*** (-13.11)
<i>ROE*Owner1</i>	-0.842** (-2.42)		
<i>ROE*Owner3</i>		-1.291* (-1.74)	
<i>ROE*Owner5</i>			-1.461* (-1.66)
<i>FirmSize</i>	0.316*** (14.64)	0.312*** (14.03)	0.309*** (13.85)
<i>BoardSize</i>	0.055*** (8.03)	0.051*** (7.31)	0.051*** (7.27)
<i>Constant</i>	8.187*** (19.64)	8.642*** (20.08)	8.875*** (20.16)
<i>Year</i>	Included	Included	Included
<i>R2</i>	0.402	0.379	0.368
<i>Wald chi2</i>	956.464***	1126.62***	1150.89***
<i>Mean VIF</i>	1.76	2.16	2.36
<i>Pagan-Hall test</i>	59.223***	24.777***	26.686***
<i>Hansen's J test</i>	0.267	0.228	0.204
<i>Test of endogeneity</i>	3.583**	4.699**	4.349**

*TotComp* is measured as the sum of the logarithms of fixed compensation, variable compensation and stock options exercised. *ROE* is the ratio of net income to total equity. *Owner1* is an indicator variable that equals one if the firm has its largest shareholder with more than 50% of voting shares, and zero otherwise. *Owner3* is an indicator variable that equals one if the firm has its three largest shareholders with more than 50% of voting shares, and zero otherwise. *Owner5* is an indicator variable that equals one if the firm has its five largest shareholders with more than 50% of voting shares, and zero otherwise. *FirmSize* is the logarithm of total assets. *BoardSize* is the total board members. Z statistic is reported in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 3 reports the influence of return on equity estimates, instrumented by sales growth and leverage, on executive compensation (*ROE*). In this sense, all three models support the expected positive influence of *ROE* on *TotComp*. However, we find that the statistical significance of this association is susceptible to the control variables included in the model. When we use *Owner1* as a proxy for ownership concentration (model 1), *ROE* is statistically significant at 5%, different from the models 2 and 3, in which it is statistically significant at 10%.

This result suggests that executives tend to have higher levels of compensation in firms that perform well in terms of profitability. It supports the optimal contracting view that predicts that firm performance has a positive and significant impact on executive compensation, aligning the interests of managers for higher levels of compensation with the interests of shareholders for better firm performance (YANG; CULLINAN; LIU, 2018).

Our findings stand in contrast with the negative influence of return on equity on executive compensation in the Brazilian context reported by Dani et al. (2017), which investigates 71 firms over the period 2012-2014. Besides that, our results do not converge with

the non-significant association reported by Alves and Krauter (2014) and Fernandes and Mazzioni (2015), which examine only 3 and 41 Brazilian firms, respectively.

Nevertheless we highlight that our results, based on a representative sample for Brazilian public firms (205), are in line with international findings both from emerging (ATAAY, 2018; CAO; PAN; TIAN, 2011; KOHLI, 2018; YANG; CULLINAN; LIU, 2018) and developed capital markets (KE; PETRONI; SAFIEDDINE, 1999; MICHIELS et al., 2012). It shows that executive compensation mechanisms are associated positively with firm performance, reducing potential agency conflicts.

Contrary to the view that controlling shareholders, who often manage the firms that they control, can expropriate minority shareholders by increasing the level of their own compensation (CHEUNG; STOURAITIS; WONG, 2005), our results show negative and significant associations at 1% level between ownership concentration proxies and executive compensation. In addition, our results demonstrate that centred ownership structures have a negative and significant impact on the pay-performance relationship in Brazilian public firms. However, this association is susceptible to the proxies, since the statistic significance varies between 5% (model 1) and 10% (models 2 and 3) among the models.

In this sense, our results reveal that the ownership concentration reduces the propensity of tying executive compensation to firm performance since they influence negatively on the pay-performance relationship. This finding is consistent with the view that controlling shareholders may obtain private benefits by setting executive compensation schemes unrelated to the wealth of minority shareholders (CAO; PAN; TIAN, 2011; MICHIELS et al., 2013).

Considering that controlling shareholders often manage the firms that they control, it is possible that they prefer compensation plans that are not tied to the firm's financial performance to grant higher levels of compensation, even when the firm is not profitable in a given period. This fact may also explain the fact that the fixed part of Brazilians executive compensation tends to be larger than the variable part.

Our results corroborate Ataay (2018) and Jiang, Habib e Smallman (2009) findings that the performance sensitivity of compensation is weaker when executives have more control over decisions, especially those related to their compensation.

Table 4 reports robustness tests, using return on assets estimates, instrumented by sales growth and leverage, as a proxy for firm performance (*ROA*). Overall results are consistent with those presented in Table 3, supporting the expected positive influence of *ROA* on *TotComp*, although that *ROA* is statistically significant at 10% on models 5 and 6.

Table 4 – Second stage estimations of return on assets model

	<i>TotComp</i> (4)	<i>TotComp</i> (5)	<i>TotComp</i> (6)
<i>ROA</i>	4.473*** (2.67)	7.672* (1.93)	9.348* (1.69)
<i>Owner1</i>	-0.465*** (-6.28)		
<i>Owner3</i>		-0.558*** (-4.20)	
<i>Owner5</i>			-0.605*** (-3.50)
<i>ROA*Owner1</i>	-4.712** (-2.39)		
<i>ROA*Owner3</i>		-7.327* (-1.77)	
<i>ROA*Owner5</i>			-8.878

			(-1.55)
<i>FirmSize</i>	0.318*** (14.87)	0.318*** (14.7)	0.311*** (13.98)
<i>BoardSize</i>	0.055*** (8.00)	0.050*** (7.28)	0.052*** (7.40)
<i>Constant</i>	8.001*** (19.80)	8.283*** (19.90)	8.512*** (0.433)
<i>Year</i>	Included	Included	Included
<i>R2</i>	0.419	0.408	0.389
<i>Wald chi2</i>	997.40***	1155.70***	1160.38***
<i>Mean VIF</i>	1.76	2.08	2.24
<i>Pagan-Hall test</i>	57.731***	36.239***	32.765***
<i>Hansen's J test</i>	0.267	0.136	0.216
<i>Test of endogeneity</i>	3.583**	2.714*	2.438

*TotComp* is measured as the sum of the logarithms of fixed compensation, variable compensation and stock options exercised. *ROA* is the ratio of net income to total assets. *Owner1* is an indicator variable that equals one if the firm has its largest shareholder with more than 50% of voting shares, and zero otherwise. *Owner3* is an indicator variable that equals one if the firm has its three largest shareholders with more than 50% of voting shares, and zero otherwise. *Owner5* is an indicator variable that equals one if the firm has its five largest shareholders with more than 50% of voting shares, and zero otherwise. *FirmSize* is the logarithm of total assets. *BoardSize* is the total board members. Z statistic is reported in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

The negative and significant association at a 5% level between the *ROA\*Owner1* and the *TotComp*, supports the view that ownership concentration has a negative and significant impact on the pay-performance relationship in Brazilian public firms. However, *ROA* does not present the endogeneity problem on models 5 and 6 presented on Table 4. The p-values of the endogeneity test lead to not reject the null hypothesis of exogeneity (statistically significant only at 10% and non-significant, respectively).

Considering that the estimated coefficients may be inefficient when there is no evidence of endogeneity, we perform Ordinary Least Square (OLS) regressions as robustness tests for models 5 and 6, as shown in Table 5.

Regarding the control variables, we find similar results for all models on Tables 4, 5 and 6. The positive influence of *BoardSize* on *TotComp* confirm our predictions that the monitoring capacity is weakened and the actions become dispersed on larger boards, allowing executives to exercise greater influence over their remuneration.

This results corroborates international findings (BANGHØJ et al., 2010; MALTOCSY; SHAN; SEETHAMRAJU, 2012) but do not converge with prior findings in Brazilian context (ANJOS et al., 2015; CUNHA; VOGT; DEGENHART, 2016), since they did not find a positive association between board size and executive compensation. However, we highlight that this not convergence may be due that we analyze a larger number of companies, as well as a longer period of time in comparison to those related studies.

Our results also show that *FirmSize* has a positive and significant influence on executive compensation across all estimations, supporting the view that larger firms have better conditions to pay higher levels of executive compensation (SRIDHAR; KUMAR, 2015).

### 4.3 Additional Tests

To avoid inefficient estimators in the models (5) and (6), we perform the specification tests to verify the assumptions of OLS models. Considering that the results of Chow, Breusch-Pagan and Hausman indicate that the panel model with fixed effects is an adequated model

(statistic results are reported in Table 5), we test the presence of heteroskedasticity through Wald test, which rejects the null hypothesis of homoscedasticity, indicating that robust standard errors are necessary. Aiming to capture the time effect in the fixed effects models (GUJARATI; PORTER, 2011), we realize the test Parm, which indicates the inclusion of time dummies (two-way model).

Table 5 – Ordinary least squares estimations of return on assets model

	<i>TotComp</i> (7)	<i>TotComp</i> (8)
<i>ROA</i>	0.295 (0.74)	0.079 (0.16)
<i>Owner3</i>	-0.048 (-0.70)	
<i>Owner5</i>		-.0184* (-1.93)
<i>ROA*Owner3</i>	-0.129 (-0.26)	
<i>ROA*Owner5</i>		0.192 (0.32)
<i>FirmSize</i>	0.405*** (8.12)	0.398*** (4.59)
<i>BoardSize</i>	0.059*** (11.51)	0.059*** (5.04)
<i>Constant</i>	5.998*** (1.077)	6.275*** (3.34)
<i>Year</i>	Included	Included
<i>R2 Overall</i>	0.391	0.404
<i>Prob &gt; F</i>	32.44***	12.81***
<i>Mean VIF</i>	2.08	2.24
<i>Chow test</i>	19.55***	20.11***
<i>Breusch-Pagan test</i>	1903.14***	1986.02***
<i>Hausman test</i>	46.99***	22.92**
<i>Wald test</i>	1.805***	2.905***
<i>Test parm</i>	6.04***	3.03***

*TotComp* is measured as the sum of the logarithms of fixed compensation, variable compensation and stock options exercised. *ROA* is the ratio of net income to total assets. *Owner3* is an indicator variable that equals one if the firm has its three largest shareholders with more than 50% of voting shares, and zero otherwise. *Owner5* is an indicator variable that equals one if the firm has its five largest shareholders with more than 50% of voting shares, and zero otherwise. *FirmSize* is the logarithm of total assets. *BoardSize* is the total board members. T-statistic (z statistic) is reported in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Our OLS estimations do not converge with IV-GMM estimations, indicating that there is no significant association between return on assets and executive compensation in models (7) and (8). Due to the non-consistency of statistically significant association between firm performance proxies (*ROE* and *ROA*) and executive compensation (*TotComp*) across all the econometric models (1 to 8), our results not support our first hypothesis (H1), which predicts that firm performance has a positive and significant impact on executive compensation in Brazilian public firms.

We also find inconclusive results regarding the moderating effect of ownership concentration on pay-performance sensitivity since the variables *ROA\*Owner3* and *ROA\*Owner5* are non-significant on models 7 and 8. Based on this evidence, we also reject our second hypothesis (H2) that ownership concentration has a negative and significant impact on

the pay-performance relationship in Brazilian public firms.

The coefficients of *FirmSize* and *BoardSize* corroborate previous estimations presented on Tables 3 and 4, indicating that larger boards allow executives to exercise higher influence over their remuneration (BANGHØJ et al., 2010; MALTOCSY et al., 2012) and that larger firms have better conditions to pay higher levels of executive compensation (SRIDHAR; KUMAR, 2015).

## 5 CONCLUSION

We examine whether the firm performance influence on the executive compensation of 205 Brazilian publicly-traded firms and how the ownership concentration moderates this pay-performance relationship. Our main results reveal that Brazilian firms, on average, tie executive compensation to firm performance since the return on equity influence positively and significantly on executive compensation across the models, although the statistical significance of this association is susceptible to the variables included in the model.

Nevertheless, when we consider the return on assets as a proxy for firm performance, we find inconclusive results. Thus, we do not reject our first hypothesis that firm performance has a positive and significant impact on executive compensation in Brazilian public firms.

Concerning the moderating factor of the ownership concentration in the pay-performance relationship, our results varied among the estimated models. When we use the return on equity as a proxy for the firm's performance, we find that ownership concentration reduces the pay-performance relationship. However, this result is not consistent when we consider the return on assets as a proxy for firm performance, which leads us not support that ownership concentration has a negative and significant impact on the pay-performance relationship in Brazilian public firms.

Our study contributes to the literature by showing that the high level of ownership concentration tends to reduce pay-performance sensitivity, not reflecting the best practices of corporate governance. If executive compensation is closely related to the company performance, it may align the interests of managers for higher levels of compensation with the interests of shareholders for better firm performance.

Based on this evidence, it can be considered that the development of the Brazilian capital market may reduce this negative effect of ownership concentration on pay-performance sensitivity. This may occur because, in scenarios with a predominance of firms with dispersed control, minority shareholders have greater power over compensation design arrangements.

Despite the contributions made, our paper also has its limitations. For instance, the non-inclusion of market-based performance measures, as Tobin's Q and Stock Return. In this sense, we encourage new studies exploring the influence of these variables on executive compensation.

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## APPENDIX

### Appendix A – Variables Definition

Variable	Definition	Source
<i>TotComp</i>	Measure of executive compensation, computed as the sum of the logarithm of fixed compensation, variable compensation and stock options exercised. Fixed compensation is the sum of salary, fixed benefits, fixed participation and other fixed compensations. Variable compensation is the sum of bonus, results participation, meetings participation, commissions participation and other variable compensations.	Hand-collected
<i>ROE</i>	Measure of return on equity, computed as the ratio of net income to total equity.	Economatica©
<i>ROA</i>	Measure of return on assets, computed as the ratio of net income to total assets.	Thomson Reuters©
<i>Owner1</i>	Measure of ownership concentration, computed as a dummy variable that takes value of 1 if the cumulative percentage of voting shares from the largest shareholder is higher than 50% and zero, otherwise.	Economatica©
<i>Owner3</i>	Measure of ownership concentration, computed as a dummy variable that takes value of 1 if the cumulative percentage of voting shares from the top three shareholders is higher than 50% and zero, otherwise.	Economatica©
<i>Owner5</i>	Measure of ownership concentration, computed as a dummy variable that takes value of 1 if the cumulative percentage of voting shares from the top five shareholders is higher than 50% and zero, otherwise.	Economatica©

<i>ΔSales</i>	Measure of sales growth, computed as the change in net sales scaled by net sales in $t-1$	Thomson Reuters©
<i>Lev</i>	Measured as the ratio of total debt scaled by total assets.	Thomson Reuters©
<i>BoardSize</i>	Measured as the sum of board members.	Hand-collected
<i>FirmSize</i>	Measured as the logarithm of total assets.	Thomson Reuters©

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