

Share-Based Payments and Tax Aggressiveness of Non-Financial Companies Listed on B3

Pagamentos Baseados em Ações e Agressividade Tributária das Empresas Não Financeiras Listadas na B3

Pagos Basados en Acciones y Agresividad Tributaria de las Empresas No Financieras Listadas en la B3

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Abstract: *This study aimed to examine the influence of share-based payments on the tax aggressiveness of non-financial companies listed on B3 between 2019 and 2023. The sample consisted of 310 non-financial firms, and panel data linear regression was employed with fixed effects for industry and year, as well as firm-clustered standard errors. Descriptive analysis revealed that companies compensating executives through share-based payments presented lower average Etr and CashEtr than firms that did not adopt this compensation mechanism, although such differences do not allow causal inferences without controlling for other variables. Regression results indicated a negative and statistically significant association between share-based payments and the effective tax rate (Etr). Since lower Etr levels represent higher levels of tax aggressiveness, the findings suggest that firms adopting share-based payments tend to exhibit more aggressive tax positions. In contrast, no statistical significance was found between share-based payments and the cash effective tax rate (CashEtr). The results remained consistent in additional robustness tests, including models with lagged variables and instrumental variable estimation. Therefore, the findings partially support the hypothesis that share-based payments are associated with higher levels of tax aggressiveness in Brazilian non-financial firms when measured by Etr.*

Keywords: *Executive compensation, Share-based payments, Tax aggressiveness.*

Resumo: O objetivo deste artigo foi verificar a influência dos pagamentos baseados em ações na agressividade tributária das empresas não financeiras listadas na B3 durante os anos de 2019 a 2023. A amostra foi composta por 310 empresas não financeiras, utilizando-se regressão linear com dados em painel, com efeitos fixos de setor e ano e erros-padrão *clusterizados* por firma. A análise descritiva revelou que empresas que remuneraram seus executivos com pagamentos baseados em ações apresentaram médias de Etr e CashEtr inferiores às empresas que não adotam essa forma de remuneração, embora tais diferenças não permitam inferências causais sem o controle das demais variáveis. Os resultados das regressões indicaram associação negativa e estatisticamente significativa entre os pagamentos baseados em ações e a alíquota efetiva de imposto (Etr). Como menores níveis de Etr representam maiores níveis de agressividade tributária, os achados sugerem que empresas que adotam pagamentos baseados em ações tendem a apresentar posicionamentos tributários mais agressivos. Em contrapartida, não foi encontrada significância estatística entre os pagamentos baseados em ações e a alíquota tributária efetiva de caixa (CashEtr). Os resultados permanecem consistentes nos testes adicionais de robustez, incluindo modelos com variável defasada e estimação por variáveis

instrumentais. Dessa forma, os achados corroboram parcialmente a hipótese de que pagamentos baseados em ações estão associados a maiores níveis de agressividade tributária em empresas brasileiras não financeiras quando esta é mensurada pela Etr.

Palavras-Chave: Remuneração de executivos, Pagamentos baseados em ações, Agressividade tributária.

Resumen: El objetivo de este estudio fue verificar la influencia de los pagos basados en acciones sobre la agresividad tributaria de las empresas no financieras listadas en la B3 durante el período de 2019 a 2023. La muestra estuvo compuesta por 310 empresas no financieras, utilizándose regresión lineal con datos de panel, con efectos fijos de sector y año y errores estándar agrupados por empresa. El análisis descriptivo reveló que las empresas que remuneran a sus ejecutivos mediante pagos basados en acciones presentaron promedios de Etr y CashEtr inferiores a los de las empresas que no adoptan esta forma de remuneración, aunque dichas diferencias no permiten inferencias causales sin el control de las demás variables. Los resultados de las regresiones indicaron una asociación negativa y estadísticamente significativa entre los pagos basados en acciones y la tasa efectiva de impuesto (Etr). Dado que menores niveles de Etr representan mayores niveles de agresividad tributaria, los hallazgos sugieren que las empresas que adoptan pagos basados en acciones tienden a presentar posiciones tributarias más agresivas. En contraste, no se encontró significancia estadística entre los pagos basados en acciones y la tasa efectiva de impuesto de caja (CashEtr). Los resultados permanecieron consistentes en pruebas adicionales de robustez, incluyendo modelos con variables rezagadas y estimación por variables instrumentales. De esta manera, los hallazgos corroboran parcialmente la hipótesis de que los pagos basados en acciones están asociados con mayores niveles de agresividad tributaria en empresas brasileñas no financieras cuando esta se mide mediante la Etr.

Palabras Clave: Remuneración de ejecutivos, Pagos basados en acciones, Agresividad tributaria.

Introduction

The concept of tax aggressiveness still lacks a single, consensual definition in the literature. Although several studies use the terms tax avoidance and tax aggressiveness as synonymous, more recent works argue that these constructs represent different levels of tax planning (Hanlon & Heitzman, 2010; Lietz, 2013). According to Lietz (2013), tax practices can be understood along a continuum ranging from clearly legal strategies to reduce the tax burden (tax avoidance), through riskier and legally controversial tax positions (tax aggressiveness), to illegal practices characterized as tax evasion.

Tax-aggressiveness practices are often encouraged by firms through the alignment of interests between executives and shareholders, as suggested by The Agency Theory, which describes an opportunistic relationship between agent and principal and proposes executive compensation as a mechanism to reduce conflicts and align the parties' interests (Jensen & Meckling, 1976). Thus, in order for the agent to be willing to adopt riskier tax positions aimed at maximizing the firm's net results, the principal structures compensation so as to reward the agent according to the attainment of those economic and financial results (Eisenhardt, 1989).

Rego and Wilson (2012) note that, in the absence of incentives, executives tend toward less aggressive tax behavior, and they propose share-based compensation as an incentive for executives to adopt riskier behavior.

Part of the literature has found a positive relationship between executive compensation and tax aggressiveness: in the United States (Rego & Wilson, 2009; Armstrong et al., 2012), in Indonesia (Fen & Riswandari, 2019; Kamilah & Sari, 2022), and in China (Wang & Yao, 2021).

Other studies, however, have not found this relationship or have found an inverse effect: in the United States, Halioui et al. (2016) found no significant link; in Indonesia, Azizah and Kusmuriyanto (2016) found a significant association only for non-financial firms; and in China and

France, Huang et al. (2018) and Jbir et al. (2021), respectively, observed a negative effect. These contradictions indicate that the topic still needs to be further explored.

Internationally, share-based compensation has been associated with higher levels of tax aggressiveness in the United States (Kubick & Masli, 2016; Zolotoy et al., 2021) and in Japan (Ohnuma, 2014), although in India this relationship is not confirmed (Arora & Gill, 2022). In Brazil, Mamede Junior et al. (2023) also found a positive association between share-based compensation and tax aggressiveness, suggesting that incentives that are granted to executives motivate riskier tax positions, with evidence that is detailed in the following section.

Starting from the premise that share-based payments may be used as mechanisms to incentivize executives to adopt more aggressive tax strategies aimed at reducing taxes and improving financial results, the following question arises: What is the influence of share-based payments on the tax aggressiveness of non-financial companies listed on B3 - Brasil, Bolsa, Balcão?

The main objective is to verify if share-based payments have a positive influence on the tax aggressiveness of Brazilian non-financial companies listed on B3 - Brasil, Bolsa, Balcão, from 2019 to 2023.

This study is relevant because the topic of tax aggressiveness can still be more deeply explored in Brazilian firms (Martinez, 2017). In addition, Bebchuk and Fried (2011) emphasize strong support for incentives, such as share-based payments, that lead executives to take greater risks in aggressive tax practices and achieve better economic and financial results for firms.

This research contributes to the literature by investigating executive compensation through share-based payments as a mechanism to incentivize riskier tax behavior, in an institutional context that is still little explored: the Brazilian capital market in the post-pandemic period. Unlike most international studies on the topic, which are concentrated in developed economies, the analysis that is proposed here considers the particularities of Brazil's high tax complexity, strong tax litigation, and regional tax incentives.

Beyond merely updating the time frame, this study's contribution relative to Mamede Junior et al. (2023) is twofold. From a theoretical standpoint, the 2019-2023 period corresponds to a scenario of high macroeconomic and institutional uncertainty marked by the Covid-19 pandemic, abrupt swings in interest rates, and changes in capital-market behavior constituting a more demanding test of The Agency Theory: it is precisely under conditions of greater uncertainty that the literature that predicts risk incentives, such as share-based payments, will tend to exert a more pronounced effect on executives' propensity to adopt more aggressive tax positions.

From a methodological standpoint, the present study advances by incorporating a battery of robustness tests absent from most of the national literature on the topic, including firm-clustered standard errors, a reverse-causality test using the lagged variable, and instrumental-variable estimation (2SLS) to address structural endogeneity, thereby lending greater inferential reliability to the results obtained.

Thus, the current article is not intended as a temporal replication of the study by Mamede Junior et al. (2023), but as a test of the theoretical and empirical robustness of the relationship between risk incentives and tax aggressiveness under adverse macroeconomic conditions, thus offering additional evidence on the limits of validity of the agency theory in the Brazilian context.

Theoretical Framework

Tax aggressiveness and its determinants

Although there is no fully accepted definition, Hanlon and Heitzman (2010) emphasize that tax aggressiveness comprises real activities aimed at reducing taxes, as well as actions deliberately taken to avoid paying taxes.

In this context, there is no clear distinction among strictly legal, legally questionable, or “gray-area” tax practices, which may even encompass illegal practices. Nevertheless, it is necessary to consider the risk that the deliberate reduction of tax obligations may lead the firm to adopt measures that abuse the legislation, especially when an economic substance diverges from a legal form. Tax planning therefore enters this debate by involving the reduction of tax obligations through the use of legitimate concessions and exemptions provided for in the legislation (Hanlon & Heitzman, 2010; Blouin, 2014; Martinez, 2017).

Building on this connection between tax aggressiveness and tax planning, the literature highlights determinants of this behavior at three levels: firm characteristics (quality of the information environment, internal controls, corporate social responsibility, and political connections), attributes of the institutional environment (market competition and capital-market incentives), and the role of gatekeepers, such as institutional investors and tax advisors, who may facilitate or inhibit tax aggressiveness (Martinez, 2017; Dyreng et al., 2019; Wilson, 2009; Wilde & Wilson, 2018; Francis et al., 2022). Finally, manager-level determinants stem from individual characteristics of executives, such as risk profile, political orientation, and the compensation and the incentive package that were received, which condition the tax aggressiveness of the firms they manage (Chyz & White, 2014; Olsen & Stekelberg, 2016).

Executive compensation, share-based payments, and tax aggressiveness

Executive compensation is one of the most complex systems in management and can be defined as the financial consideration for work that is performed, which stimulates the pursuit of ever-better performance while aligning executive behavior with the firm's objectives (Krauter, 2006).

The most widely used approach in research on executive compensation is principal-agent theory, or the agency theory, which is based on the premise that the principal or owner-shareholder delegates authority to an agent or executive to maximize the principal's interests. The theory assumes that compensation influences the executive's behavior, which in turn influences firm performance (Jensen & Meckling, 1976). The shareholder structures compensation packages for executives so that they maximize firm results. Executive compensation may thus comprise fixed compensation, variable compensation tied to accounting performance measures, stock options or the right to buy shares in the future at a predefined price, and, finally, long-term incentive plans (Krauter, 2006).

From this perspective, the literature indicates that executive compensation can be used not only to induce executives to make decisions in pursuit of better firm performance, but also according to studies that found empirical evidence that risk incentives are positively related to and have a significant impact on tax aggressiveness (Rego & Wilson, 2012).

It is thus possible to find studies in the literature that have identified a positive influence of executive compensation on the tax-aggressiveness practices carried out by firms in several countries.

In the United States, Rego and Wilson (2009) found a positive relationship between executive compensation, measured by total compensation, and tax aggressiveness, measured by the effective tax rate (Etr) and the cash effective tax rate (CashEtr). In Indonesia, Fen and Riswandari (2019) concluded that higher compensation amounts result in higher levels of tax aggressiveness when measured by the effective tax rate (Etr). Kamilah and Sari (2022) likewise state that executive compensation has a positive impact on tax aggressiveness, as shown by the Etr.

In China, Wang and Yao (2021) examined executive compensation incentives and their effects on firms' tax aggressiveness. The results showed that executives' monetary compensation has a positive and significant relationship with tax aggressiveness, measured by the Etr.

There are also studies that have found the opposite that the executive compensation structure will not always result in higher levels of tax aggressiveness. Azizah and Kusmuriyanto (2016) concluded that executive-board compensation has no significant effect on the tax aggressiveness of Indonesian non-financial firms, and Halioui et al. (2016) observed a negative relationship between compensation and tax aggressiveness, measured by the Etr, in U.S. firms.

In China, Huang et al. (2018) found that higher compensation paid to executives is associated with lower levels of tax aggressiveness. In France, Jbir et al. (2021) concluded that executive compensation has a negative effect on firms' tax aggressiveness as measured by the Etr.

According to Huang et al. (2018), these negative results may be explained by the fact that executives who receive higher compensation are subject to closer scrutiny and may therefore be pressured to reduce levels of aggressiveness, which could harm corporate transparency, and to avoid adverse-selection problems associated with both shareholders and creditors (Hasan et al., 2014; Chung et al., 2015).

More specifically, executive compensation can be assessed not only through variable compensation, which is usually tied to executives' performance (Krauter, 2006), but also through long-term compensation such as share-based payments, which may be used as incentives for more aggressive tax practices in firms (Rego & Wilson, 2012).

In Japan, Ohnuma (2014) investigated whether executive compensation is associated with firms' tax-aggressiveness practices. The results indicate a positive relationship between executive compensation, measured by share-based compensation, and tax aggressiveness, measured by both the effective tax rate (Etr) and the cash effective tax rate (CashEtr), concluding that greater risk-linked incentives are associated with greater tax risk.

In the United States, Kubick and Masli (2016) examined and confirmed that the relationship between performance-linked executive compensation, such as share-based plans, is positively associated with higher levels of tax aggressiveness in firms. Zolotoy et al. (2021) explored the impact of risk incentives, such as share-based compensation, on the tax aggressiveness of U.S. firms and found that executive compensation is positively associated with tax aggressiveness when measured by the effective tax rate (Etr).

By contrast, in India, Arora and Gill (2022) found no significant relationship between share-based payments which constitute a relatively insignificant part of executive compensation in India and tax aggressiveness in the country's non-financial firms.

Finally, in Brazil, Mamede Junior et al. (2023) investigated and concluded that there is a

positive association between executives' share-based compensation and tax aggressiveness. The study measured executive compensation by the logarithm of the sum of share-based payments during the years 2010 to 2021 and used the effective tax rate (Etr) and the cash effective tax rate (CashEtr) to assess tax aggressiveness.

Rego and Wilson (2012) state that aggressive tax strategies involve significant uncertainty for firms, so executives must be incentivized to become more involved in tax-aggressiveness activities. According to the author, risk incentives such as share-based payments motivate executives and are associated with higher levels of tax aggressiveness in firms. In addition, Huang et al. (2018) present evidence that share-based payments incentivize executives to engage in tax-aggressiveness practices in firms. Accordingly, this study seeks to test the following research hypothesis:

H₁: Share-based payments positively influence tax aggressiveness in Brazilian non-financial companies listed on B3 - Brasil, Bolsa, Balcão.

Research Methodology

Population, Sample, and Data Collection

The research covers non-financial companies listed on B3 - Brasil, Bolsa, Balcão from 2019 to 2023. Firms without the necessary data or with abnormal metrics, such as negative pre-tax income, were excluded (Costa et al., 2023). The final sample consists of 310 companies distributed by sector as shown in Table 1.

The delimitation of the period between 2019 and 2023 encompasses a time window marked by economic, tax, and institutional transformations in the Brazilian context, including the effects of the COVID-19 pandemic on firms' financial dynamics and the intensification of public debate on corporate governance, tax transparency, and ESG practices (Huang et al., 2025).

This scenario makes the period particularly suitable for assessing whether long-term incentives that are granted to executives stimulated more aggressive tax behavior even under greater reputational and institutional pressure. It should also be noted that the study by Mamede Junior et al. (2023), conducted in the Brazilian context, analyzed the period from 2010 to 2022, partially overlapping but not coinciding with the window adopted here, which reinforces the relevance of specifically investigating the 2019-2023 interval, marked by distinct macroeconomic, political, and regulatory conditions.

Table 1 – Sample firms by economic sector

Sector	Nº.	Obs.
Academic and Educational Services	7	35
Basic Materials	31	155
Consumer Cyclical	62	310
Consumer Non-Cyclical	36	180
Energy	11	55
Healthcare	18	90
Industrials	50	250
Real Estate	28	140
Technology	26	130
Public Utilities	41	205
Initial sample	321	1.622
(-) Firms without sector information	1	2

(-) Negative pre-tax income (EBT)	6	30
(-) Aggressiveness metrics below zero or above one	4	40
Final sample:	310	1.550

Source: Prepared by the author.

Data on share-based payments were taken from the Reference Forms, item 8, which address executive compensation, are available in the Economatica® database. Data related to the tax-aggressiveness variables Etr and CashEtr, corporate income tax (IRPJ) and social contribution (CSLL) expenses, total profit taxes paid, and pre-tax income were extracted from the consolidated financial statements provided by the Refinitiv® database, as the data for the control variables were.

Econometric Model and Statistical Approach

To test whether share-based payments increase tax aggressiveness in Brazilian non-financial companies listed on B3, the general panel-data linear regression model is presented below:

$$AT_{i,t} = \beta_0 + \beta_1 Pba_{i,t} + \beta_2 Roa_{i,t} + \beta_3 Alav_{i,t} + \beta_4 Tam_{i,t} + \beta_5 Int_{i,t} + \beta_6 Big4_{i,t} + \beta_7 Setor_{i,t} + \varepsilon_{i,t}$$

Where (AT) represents the dependent variable of tax aggressiveness, measured alternately by the Effective Tax Rate (Etr) and the Cash Effective Tax Rate (CashEtr). The Etr is calculated as the ratio of income tax and social contribution expenses on net income to pre-tax accounting income, and is an inverse measure of tax aggressiveness: the lower the effective rate, the higher the level of aggressiveness (Hanlon & Heitzman, 2010).

The CashEtr, in turn, is defined as the total profit taxes actually paid during the period divided by pre-tax income, capturing the firm's actual cash tax outlay for the year (Dyreng et al., 2008). The terms (i and t) index the firm and the observation period. The control variables Roa, Alav, Tam, Int, Big4, and Setor correspond, respectively, to return on assets, financial leverage, firm size, intangible intensity, audit quality, and economic sector.

Multiple panel-data linear regression was the statistical method used. Sector and year fixed effects were adopted as a strategy to control for unobserved heterogeneity across sectors and for common annual macroeconomic shocks (Sector FE + Year FE), with firm-clustered standard errors (Wooldridge, 2010).

Research Variables

According to Hanlon and Heitzman (2010), the literature offers several ways to measure tax aggressiveness; however, not all variables are suitable for what one intends to investigate. For the authors, by reporting taxable income in tax returns and income-tax expenses in the financial statements, it becomes possible to measure the various proxies for tax aggressiveness. Wang and Yao (2021) listed the different ways of measuring the level of tax aggressiveness; most of them use explicit taxes, as these are easily identified in the financial statements and are commonly used in the literature.

Dependent Variables

The effective tax rate (Etr) is frequently used to measure firms' tax aggressiveness (Martinez et al., 2014) and it is estimated by dividing income tax and social contribution expenses on net

income by pre-tax accounting income (Hanlon & Heitzman, 2010). It should be noted that this rate is an inverse measure of tax aggressiveness, since the lower the effective tax rate, the higher the level of aggressiveness the firm exhibits (Hanlon & Heitzman, 2010; Costa et al., 2023).

In addition to this rate, the cash effective tax rate (CashEtr) is proposed for the analysis of non-financial firms, a broad and valid measure for gauging tax aggressiveness since it captures the firm's tax outlay in a given fiscal year (Hoopes et al., 2012). It can be defined as the effective rate over a given period, that is, the sum of taxes actually paid during the period divided by pre-tax income for the same period (Dyrenge et al., 2008; Wang & Yao, 2021).

Wang and Yao (2021) synthesized the main findings of research on tax aggressiveness and note that the principal measures of tax aggressiveness are those based on effective tax rates. Thus, the dependent variables of this study consist of the effective tax rate (Etr) and the cash effective tax rate (CashEtr), an inverse measure of tax aggressiveness: the lower the effective rate, the higher the level of aggressiveness (Hanlon & Heitzman, 2010).

Independent variable of interest and control variables

The independent variable of interest, share-based payments (Pba), was measured by a dichotomous variable (Ermel & Medeiros, 2020), or dummy, coded 1 if firms compensate executives through share-based payments and 0 if no share-based payments occurred during the years 2019 to 2023. It should be emphasized that the data for classifying the dummy variable were extracted from the Reference Forms, item 8, available in the CVM database, which discloses whether firms offered share-based payments to executives during the years that were analyzed.

Table 2: **Summary of control variables**

Variable	Oper./Sign	References
Return on Assets (Roa)	Operating income / Total assets (+)	(Rego & Wilson, 2009; Martinez & Martins, 2016).
Financial Leverage (Alav)	Total debt / Total assets (+/-)	(Azizah & Kusmuriyanto, 2016; Huang et al., 2018).
Size (Tam)	Natural log of total assets of firm i in year t (+)	(Martinez & Martins, 2016; Arora & Gill, 2022).
Intangibles (Int)	Natural log of the firm's intangible assets (+)	(Chen et al., 2010; Martinez & Ramalho, 2017; Mamede Junior et al., 2023).
Audit quality (Big4)	Dummy – 1 for firms audited by a Big4 and 0 for firms not audited by a Big4. (+/-)	(Huang et al., 2018; Hartmann & Martinez, 2020; Rodrigues & Galdi, 2020).
Sector of each firm (Setor)	Sector dummy based on the Economática® System classification(+/-)	(Rezende et al., 2018; Santos et al., 2021).

Source: Prepared by the author.

Larger firms, although exposed to greater public scrutiny, have greater incentives and greater power to influence the political process, and are therefore expected to exhibit higher levels of tax aggressiveness (Wang & Yao, 2021).

For Martinez and Martins (2016), larger firms are more susceptible to aggressive tax policies than smaller firms. Rego and Wilson (2009) note that larger firms have more resources to invest in tax planning and thus take on greater complexity in their operations and revenues. Accordingly, firm size, measured by the logarithm of total assets, is considered a determinant of tax aggressiveness, and the larger the firms, the more tax-aggressive they are expected to be.

Some authors point to a relationship between tax aggressiveness and firm profitability. Martinez and Martins (2016) state that the more tax-aggressive a firm is, the greater its profitability

and profits. For Blouin (2014), taxes are seen as a factor that directly influence the firm's results and therefore such results directly influence organizations' profitability.

Return on Assets (Roa) is positively associated with the level of tax aggressiveness in firms. For Hartmann and Martinez (2020), profitable firms may achieve lower taxation due to the efficient use of resources resulting from good aggressiveness practices.

For Huang et al. (2018), firm-level attributes such as financial leverage (Alav) are considered a determinant of tax aggressiveness in firms. According to the authors, the level of financial leverage is positively associated with the degree of tax aggressiveness, and both financial leverage and tax aggressiveness are complementary to each other.

On the other hand, Azizah and Kusmuriyanto (2016) analyzed the influence of financial leverage on firms' tax aggressiveness and found that, although a firm's leverage level may have a positive impact on reducing its tax rate, their results showed no significant effect between financial leverage and tax aggressiveness.

Size (Tam) indicates that larger firms are more susceptible to aggressive tax policies than smaller firms (Wang & Yao, 2021; Arora & Gill, 2022). Intangibles (Int) are also considered an important determinant of tax aggressiveness in non-financial firms (Chen et al., 2010). There is evidence that firms with larger intangible assets have greater opportunities to engage in tax aggressiveness (Mamede Junior et al., 2023).

Regarding audit quality, that is, whether or not the firm is audited by a Big4, Huang et al. (2018) note that the (Big4) variable is positively related to tax aggressiveness and suggest that firms are more tax-aggressive when they were audited by one of the Big4. On the other hand, Hartmann and Martinez (2020) investigated 340 Brazilian non-financial firms with shares traded on B3 between 2010 and 2016 and concluded that firms that were audited by the Big4 are less tax-aggressive than firms that were not audited by the Big4. This result corroborates the findings of Rodrigues and Galdi (2020), who also found a negative relationship between the Big4 variable and tax aggressiveness measured by the Etr.

Finally, the sector variable was also used as a control variable in the model because it determines the firm's tax behavior and it is expected to influence the tax aggressiveness of the analyzed firms. In addition, Brazilian research involving taxation should be attentive to the need to account for the (Sector) variable, since firms bear different tax burdens depending on the economic sector (Rezende et al., 2018; Santos et al., 2021).

Presentation and Discussion of Results

First, descriptive statistics were applied for a better understanding of the data. Next, the estimations were performed and the tests were applied to verify compliance with the assumptions of the regression. Finally, the econometric models were estimated through multiple linear regression in order to confirm or reject the research hypothesis.

It should be noted that ETRs below 0 and above 1 were not considered, as they generally result from infrequent transactions such as non-deductible expenses, goodwill recognition, and reversals of material provision amounts.

In addition, negative ETRs result from a negative denominator (pre-tax income); therefore, it is unlikely that a firm that is paying taxes even while it is incurring a loss is in an aggressive tax position (Christensen et al., 2021; Santos et al., 2021).

Table 3 presents the descriptive statistics of the tax-aggressiveness dependent variables. It should be noted that the variables in the descriptive statistics were not winsorized, so that the nature of the data could be better assessed, since, according to Costa et al. (2023), any outliers did not

originate from information or collection errors, but from special situations that occur routinely in business dynamics and carry information that should not be disregarded.

Table 3 – Descriptive statistics

Panel A – Firms that compensate via Pba						
Var	Obs	Mean	Median	Coef.	Minimum	Maximum
ETR	298	0.2132	0.202126	0.13701	0.00699	0.941244
CashETR	249	0.1693	0.150730	0.13492	0.00009	0.775034
Panel B – Firms that do not compensate via Pba						
Var	Obs	Mean	Median	Coef.	Minimum	Maximum
ETR	681	0.2371	0.231730	0.15645	0.00121	0.987976
CashETR	439	0.1861	0.146547	0.15699	0.00009	0.949588
t-test – ETR						
Group	Obs	Mean	Std. Error	Coef.	Minimum	[95% Conf.]
0 (Without Pba)	681	0.2371	0.005986	0.15645	0.22536	0.248872
1 (With Pba)	298	0.2132	0.007936	0.13701	0.19764	0.228880
Combined	979	0.2298	0.004825	0.15114	0.22040	0.239340
						t = 2.2784
t-test – CashETR						
Group	Obs	Mean	Std. Error	Coef.	Minimum	[95% Conf.]
0 (Without Pba)	439	0.1861	0.007493	0.1569980	0.1713766	0.2008305
1 (With Pba)	249	0.1693	0.008550	0.1349243	0.1524823	0.1861639
Combined	688	0.1800	0.005699	0.1495044	0.1688393	0.1912215
						t = 1.4158

Source: Prepared by the author.

Table 3 is divided into Panel A, comprising firms that compensate executives through Pba, coded 1 by the dichotomous variable, and Panel B, comprising firms that do not compensate through Pba, coded 0. Firms that compensate executives with share-based payments exhibited a mean Etr of 21.32% and a mean CashEtr of 16.93%.

These values are lower than those of firms that do not use this form of compensation, which exhibited a mean Etr of 23.71% and a mean CashEtr of 18.61%. This raw difference in means is descriptive and uncontrolled; that is, it does not allow one to infer greater tax aggressiveness, since other factors that differ systematically between the two groups such as sector, size, and profitability may explain part or all of the observed difference in ETRs. Assessing the effect of Pba on tax aggressiveness depends on the results of the econometric model with controls. Regarding the standard deviation, the sample can be considered homogeneous because the standard-deviation values are lower than the mean values of the tax-aggressiveness rates.

The means and medians that are presented are below the statutory rate of 34% applied in Brazil to firms classified as publicly held corporations. This rate comprises 15% income tax, plus a 10% surcharge for exceeding the basic legal threshold, and 9% CSLL. However, means below the statutory rate do not necessarily mean that the firm engaged in tax planning, since mere differences between tax legislation and accounting standards may render lower taxable income than the accounting one (Costa et al., 2023).

Regression Analysis

Before estimating the models, the panel's properties and the adequacy of the econometric strategy were examined (Fávero & Belfiore, 2017). For the effective tax rate (Etr), Panel A, the following tests were applied: the Shapiro-Francia test, which indicated a normal distribution for the model; the Wald test, which indicated heteroskedasticity problems, calibrated by using the

robust command; the VIF (variance inflation factor) test, which indicated severe multicollinearity (VIF above 10); and the Wooldridge test, which showed no serial correlation of the residuals.

It should be noted, as a methodological limitation, that the high VIF (16.40 in Panel A and 17.16 in Panel B) characterizes severe multicollinearity among the regressors, which tends to inflate the standard errors of the correlated variables and to reduce the precision of their individual estimates. This result is expected in models that include sector fixed effects, since the sector dummies are, by construction, mutually exclusive and correlated with one another likely the main source of the observed variance inflation rather than the variable of interest, Pba.

Even so, the stability of the Pba coefficient across the specifications in Table 4, the standard-error comparison in Table 5, and the robustness tests using the lagged variable and instrumental-variable estimation, presented in the following section, provide evidence that the identified multicollinearity does not materially compromise the significance of the estimated association between Pba and tax aggressiveness. For future versions of this study, it is recommended that the individual VIF of each variable be reported, and not only the model's maximum value, so as to allow a more precise assessment of the source of collinearity.

The variable of interest, Pba, is binary and time-invariant: none of the 310 sample firms changed their share-based-payment status over the 2019–2023 period. For this reason, by applying firm fixed effects (entity fixed effects) would completely absorb the Pba variable, making its effect unidentifiable.

The strategy of Sector and Year Fixed Effects (Sector FE and Year FE) was therefore adopted, with firm-clustered standard errors. This specification is more robust than Pooled OLS without fixed effects, since it simultaneously controls for unobserved heterogeneity across sectors such as distinct tax structures and sector-specific tax-planning opportunities and for macroeconomic shocks common to all firms in each year (Fávero & Belfiore, 2017).

Accordingly, the Panel B model exhibited a normal distribution, as shown by the Shapiro-Francia test results, and the model showed no heteroskedasticity problems according to the Wald test. Clustering the errors by firm is correct for the serial correlation of the residuals within each firm across the panel (Fávero & Belfiore, 2017). Table 4 presents the regression results with and without fixed effects, for the purposes of comparison and robustness.

Table 4 – Regression results

	Panel A – ETR		Panel B – CashETR	
	Coef.	Std. Err.	Coef.	Std. Err.
Constant	0,2059**	0,0844	0,2888***	0,0739
Pba	- 0,0285**	0,0132	- 0,0235	0,0154
Roa	- 0,0057***	0,0019	- 0,0054*	0,0028
Alav	- 0,0022	0,0131	- 0,0173	0,0157
Tam	- 0,0514*	0,0265	- 0,0448*	0,0251
Intang	0,0208	0,0115	0,0264	0,0109
Big4	0,0362	0,0372	0,0447	0,0367
Obs.	928		665	
Setor	Significant		Significant	
F	3,18		2,58	
R ²	7,17%		5,76%	
Max VIF	16,40		17,16	

Source: Prepared by the author.

Significance levels: * = $p < 0.10$; ** = $p < 0.05$; *** = $p < 0.01$

Panel A presents the model operationalized through the effective tax rate (Etr). The results found for the Etr proxy suggest a negative association between share-based compensation (Pba)

and the effective tax rate (Etr), which showed a coefficient significant at the 5% level ($p = 0.031$) for the 2019-2023 period; that is, firms with higher Pba are more aggressive. This result corroborates Mamede Junior et al. (2023) and advances the literature by analyzing Brazilian non-financial companies listed on B3 during 2019 a 2023, distinct from the 2010 to 2021 period that was analyzed by those authors and it was marketing by a substantially different economic and political scenario.

This result is also aligned with the findings of Ohnuma (2014), Kubick and Masli (2016), and Zolotoy et al. (2021), who state that share-based payments positively influence the levels of tax aggressiveness of non-financial firms in several countries when measured by the effective tax rate (Etr).

However, these international studies analyzed institutional and methodological contexts distinct from the Brazilian one: Ohnuma (2014) examined Japanese firms (2006–2010) with a corporate governance structure marked by a weak presence of activist institutional investors; Kubick and Masli (2016) measured the CEO–CFO pay gap in U.S. firms between 1994 and 2012, an incentive gradient distinct from the binary Pba variable used here; and Zolotoy et al. (2021) analyzed U.S. firms between 1993 and 2014 using a continuous variable of

accumulated option wealth, in a period prior to the institutional and tax changes of the Brazilian post-pandemic scenario (2019-2023) that is analyzed in this study.

Panel B presents the results that are operationalized through the cash effective tax rate (CashEtr). Although the literature indicates that executive incentives such as share-based compensation influence tax aggressiveness when measured by the CashEtr metric (Rego & Wilson, 2012), no relationship could be found between share-based payments and tax aggressiveness.

This result corroborates Mamede Junior et al. (2023), who also found no relationship between share-based compensation and tax aggressiveness for this rate. A possible justification for this result, already noted by Mamede Junior et al. (2023), is the fact that in Brazil there is no requirement to disclose taxes actually paid on a segregated basis, as there is in the United States, for example.

This result is aligned with the findings of Arora and Gill (2022), who found no significance between variable compensation and share-based compensation on tax aggressiveness measured by the cash effective tax rate (CashEtr). For the authors, the variable component of executive compensation in India, or in other developing countries, constitutes a relatively insignificant share compared with that of developed countries such as the United States, where share-based compensation constitutes the largest part of executive compensation.

The results were in tune with Rego and Wilson (2009) in showing a significant relationship between return on assets (Roa) and the tax-aggressiveness variables, indicating that firms with higher profitability have higher levels of tax aggressiveness. The study also corroborates Martinez and Martins (2016) in finding a significant relationship between asset size (Tam) and tax-aggressiveness rates, indicating that the larger a firm's assets, the higher its levels of tax aggressiveness. Although the literature points to a relationship between intangible assets and tax aggressiveness, no such relationship was found in the results presented (Chen et al., 2010; Martinez & Ramalho, 2017).

Sector also showed significance with the dependent variables and it is explanatory for tax aggressiveness, since economic sectors bear different tax burdens from one another, as noted by Santos et al. (2021). Figure 1 presents the temporal evolution of the mean Etr and CashEtr by group over the analyzed period. It can be observed that in most sample years, firms with share-based

payments (Pba) maintained lower effective rates than firms without Pba. This pattern is consistent across all years for the ETR; for the CashEtr, however, the difference reverses in 2020 and 2023, years in which firms with Pba exhibited a slightly higher cash effective tax rate than firms without Pba.

Figure 1 — Evolution of Tax Aggressiveness Metrics by Group (SBC vs. No SBC)

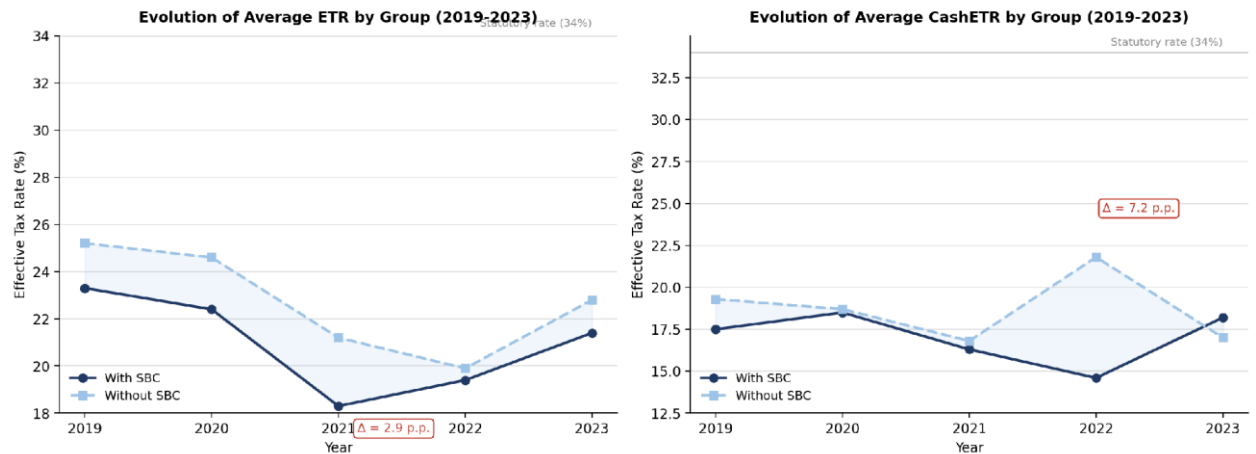


Figure 1: Evolution of Tax-Aggressiveness Metrics by Group (2019–2023)

Source: Prepared by the author based on the research data.

The most pronounced differential occurred in 2021 (a 2.9 p.p. gap in the Etr), coinciding with the peak of post-pandemic uncertainty. Both groups maintained mean rates below the 34% statutory rate, consistent with the literature on tax planning in emerging countries (Martinez, 2017).

Figure 2 complements the previous analysis through boxplots that reveal the dispersion and skewness of the distributions within each group, with asterisks indicating the significance level of the Welch t-test for the difference in means between groups in each year.

The difference between groups is especially pronounced in 2019 and 2021 for the Etr (rejection of the null hypothesis at 5%), whereas for the CashEtr the greater overlap of the distributions is consistent with the absence of significance in the regression models.

Figure 2 — Distribution of Tax Aggressiveness Metrics by Group and Year (Boxplots)

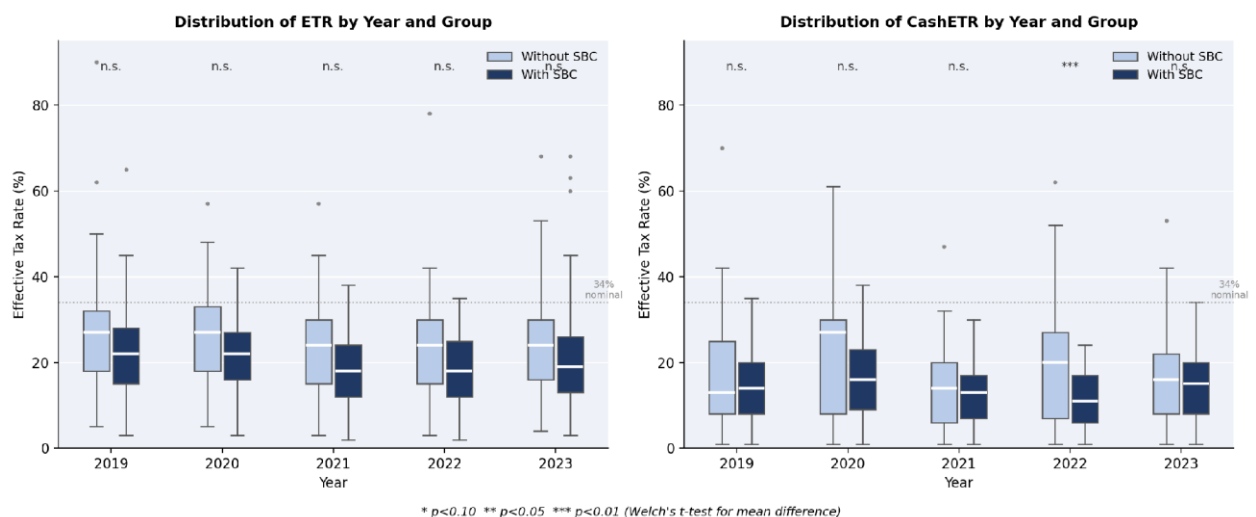


Figure 2: Distribution of Tax-Aggressiveness Metrics by Group and Year

Note: * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$ (Welch t-test). **Source:** Prepared by the author.

Figure 3 introduces a sectoral dimension to the analysis, presenting the mean Etr by economic sector and group. Inter-sector heterogeneity is substantial: sectors such as Real Estate and Energy exhibit lower mean ETRs, reflecting specific tax incentives; and,

in all sectors with sufficient observations, firms with Pba display a lower mean ETR, corroborating the pattern identified in the regressions and justifying the inclusion of sector controls (Sector FE) as a methodological necessity, not merely a convention.

Figure 3 — Average ETR by Economic Sector and Group (2019-2023)

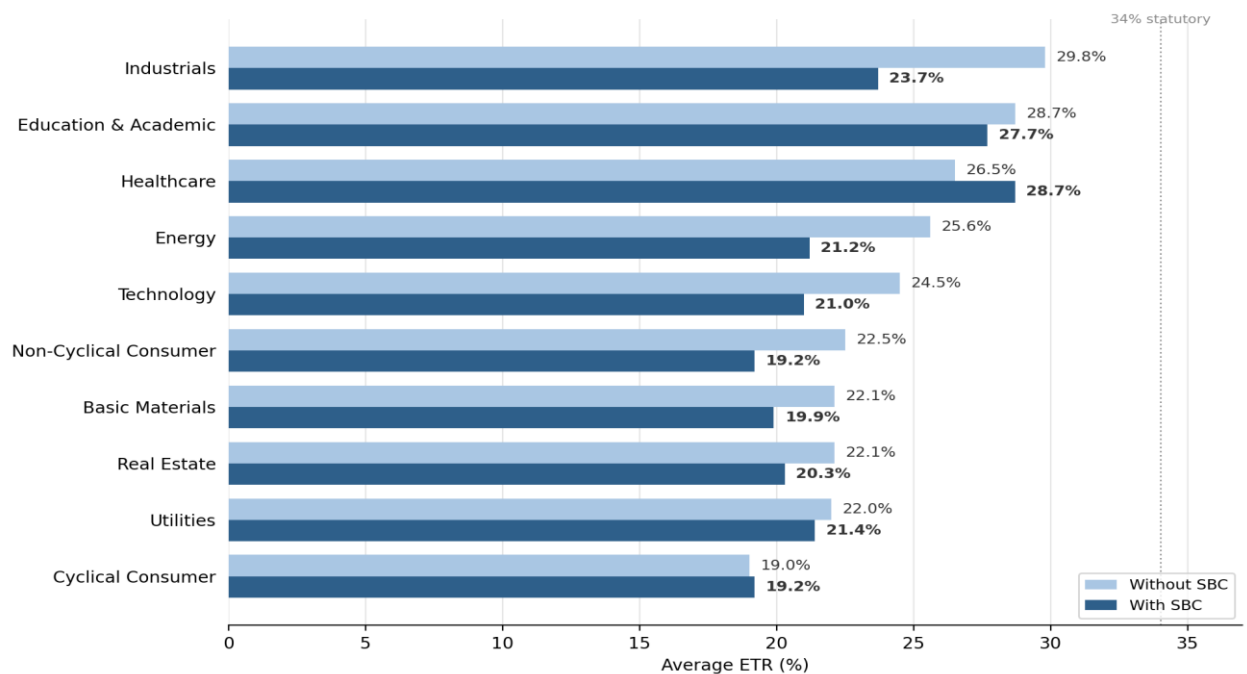


Figure 3: Mean ETR by Economic Sector and Group (2019-2023)

Source: Prepared by the author based on the research data.

In conclusion, the models that were estimated with Sector and Year Fixed Effects (Sector FE and Year FE) and firm-clustered standard errors reveal that, for the Etr, the Pba coefficient is negative and statistically significant at 5% ($\beta = -0.0285$; $p = 0.031$) firms with Pba exhibit an effective rate about 2.9 percentage points lower. For the CashEtr, the coefficient is not significant ($\beta = -0.0235$; $p = 0.127$). The results partially corroborate hypothesis H1, in line with Rego and Wilson (2009), Kubick and Masli (2016), and Mamede Junior et al. (2023): the association between Pba and tax aggressiveness is confirmed when measured by the Etr, but not by the CashEtr.

Robustness Tests and Treatment of Endogeneity

This section presents three additional robustness tests: (i) an explicit treatment of standard-error clustering, (ii) mitigation of reverse causality between Pba and tax aggressiveness, and (iii) an instrumental-variable strategy to address structural endogeneity.

In unbalanced panels, conventional standard errors underestimate the true variance of the estimators (Petersen, 2009; Wooldridge, 2010; Armstrong et al., 2012; Kubick & Masli, 2016). Table 5 compares conventional standard errors with clustered ones: the latter are consistently larger, confirming intra-group serial correlation, but the Pba coefficient remains significant at 5% in the Etr model ($\beta = -0.0285$; $p = 0.031$), ruling out artificial underestimation of the variance.

Table 5 - Comparison of conventional and firm-clustered standard errors

Metric	ETR	CashETR
Pba coefficient	-0,0285**	-0,0235
Conventional standard error (OLS)	0,0102	0,0123
Clustered standard error (by firm)	0,0132	0,0154
Change in standard error (%)	+29,9%	+25,6%
t-statistic (conventional)	-2,80	-1,92
t-statistic (clustered)	-2,15	-1,53
p-value (conventional)	0,0052***	0,0555*
p-value (clustered)	0,0312**	0,1266
Observations	928	665
Firms (clusters)	264	185

Source: Prepared by the author.

Significance levels: * = $p < 0.10$; ** = $p < 0.05$; *** = $p < 0.01$. Models with Sector and Year Fixed Effects; firm-clustered standard errors in the main specification (Table 4).

To mitigate reverse causality, more aggressive firms could adopt Pba because of the greater profit available, the model was re-estimated with Pba lagged by one period (Pba t-1), a common strategy in the literature (Armstrong et al., 2012; Huang et al., 2018). The results corroborate the main findings: the coefficient remains negative and significant in the ETR model ($\beta = -0.0271$; $p < 0.05$), with no significance for the CashEtr, consistent with a causal interpretation in the direction of H1, although the one-period lag does not completely eliminate the concern with simultaneity.

To address structural endogeneity more rigorously, Two-Stage Least Squares (2SLS) estimation was adopted, by using the mean adoption of Pba by the other firms in the same sector (excluding the firm itself) as an instrument, whose relevance rests on the imitation effect of compensation practices within the sector (peer effect) (Cadman & Carter, 2014). The exclusion restriction is satisfied by the argument that the sector mean affects tax aggressiveness only indirectly, via the decision to adopt Pba, and not through direct channels on the Etr or CashEtr. In the first stage, the sector mean of Pba proved to be a relevant, non-weak instrument ($F > 10$; Staiger & Stock, 1997); in the second stage, the instrumented coefficient remained negative and significant for the Etr and non-significant for the CashEtr, indicating that the identified relationship is not entirely attributable to simultaneity bias or endogenous selection.

Final Considerations

The objective of this article was to verify the influence of share-based payments on the tax aggressiveness of non-financial companies listed on B3 during the 2019-2023 period.

To achieve this objective, panel-data linear regression models were estimated, using sector and year fixed effects and firm-clustered standard errors. Tax aggressiveness was measured through the effective tax rate (Etr) and the cash effective tax rate (CashEtr). The variable of interest, share-based payments (Pba), was analyzed together with control variables related to firms' economic and financial characteristics, such as return on assets, financial leverage, size, intangible-asset intensity, and audit quality.

The results revealed a negative and statistically significant association between share-based

payments and the Etr. Considering that lower Etr levels represent higher levels of tax aggressiveness, the findings indicate that firms that compensate executives with share-based payments tend to exhibit more aggressive tax behavior. On the other hand, no statistically significant relationship was identified between share-based payments and the CashEtr metric. Thus, hypothesis H₁ was partially corroborated, since the expected association between share-based payments and tax aggressiveness was observed only when tax aggressiveness was measured by the Etr. The additional robustness tests, including models with a lagged variable and instrumental-variable estimation, reinforced the consistency of the main results.

The findings contribute to the national literature on tax aggressiveness by showing that long-term incentives that are granted to executives may be associated with more aggressive tax strategies in Brazilian non-financial firms. From the perspective of The Agency Theory, the results suggest that share-based payments may function as a mechanism to align the interests of shareholders and executives, encouraging decisions aimed at maximizing firms' net results, including through tax-burden-reduction strategies.

As a practical contribution, the results may help investors, regulators, and boards of directors understand the potential effects of compensation incentives on corporate tax behavior. In addition, the findings reinforce the relevance of corporate governance and transparency in defining executive compensation policies.

For future research, it is suggested that additional measures of tax aggressiveness be used, as well as the analysis of different executive-compensation structures and broader time periods. It is also recommended to investigate the effects of institutional and sectoral characteristics on the relationship between share-based compensation and tax aggressiveness, in addition to the use of parent-company individual data for comparison with consolidated information. A limitation of this study is the operationalization of Pba through a dichotomous variable, which does not capture the magnitude of the incentive received by executives; future research could explore a continuous proxy for Pba, such as the percentage of total compensation paid in shares, so as to allow a more refined analysis of the relationship between incentive intensity and tax-risk propensity.

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