

DOI: <https://doi.org/10.9771/rcufba.v19i1.65243>

Audit's Role as a Mitigator of Tax Aggressiveness

Atuação da Auditoria como Mitigadora da Agressividade Tributária

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ABSTRACT

This study aimed to investigate whether the *big four*, generally associated with higher-quality audit firms, can be an effective tool in mitigating tax aggressiveness in Brazilian publicly traded companies listed on the [B]³. To analyze this relationship, regression model estimations were conducted using data from 2010 to 2022 from 340 companies, employing variations of the main tax aggressiveness proxies found in the literature: the accounting and current Effective Tax Rate (ETR) and the Book-Tax Differences (BTD) relativized by earnings before taxes and total assets. The results of the empirical tests demonstrated that, except for the case of the Current ETR, there is a negative relationship between financial statements audited by Big Four firms and the level of tax aggressiveness. This supports the expectation that higher-quality auditing firms serve as mitigators of aggressive tax behavior among companies. Additionally, it was concluded that companies with higher return on assets exhibit a lower effective tax rate on profits and a greater difference between accounting income and taxable income, indicating they are more aggressive. The empirical evidence obtained contributes to the understanding of the relationship between audit quality and tax aggressiveness in the Brazilian context, as studies in this area remain limited in the existing literature.

Keywords: Tax aggressiveness; Audit Quality; Big Four; BTD; ETR.

RESUMO

Este estudo buscou investigar se as *big four*, geralmente associadas a firma de auditoria de maior qualidade, podem ser uma ferramenta eficaz na mitigação da agressividade tributária de companhias brasileiras de capital aberto listadas na [B]³. Para analisar essa relação, foram realizadas estimações de modelo de regressão, com dados de 2010 a 2022 de 340 companhias, utilizando variações das principais *proxies* de agressividade tributária encontradas na literatura: a *Effective Tax Rate* (ETR) contábil e corrente e a *Book Tax Differences* (BTD) relativizada pelo lucro antes dos impostos e pelos ativos totais. Os resultados dos testes empíricos demonstraram que, exceto no caso da ETR Corrente, há uma relação negativa entre as demonstrações financeiras auditadas por *big four* e o nível de agressividade tributária, corroborando a expectativa de que firmas de auditoria de maior qualidade atuam como mitigadoras do comportamento agressivo das empresas em relação à tributação. Neste modelo, também foi possível concluir que empresas com maiores taxas de retorno sobre os ativos apresentam menor alíquota de tributação efetiva sobre o lucro e maior diferença entre o resultado contábil e a base tributável e, portanto, são mais agressivas. As evidências empíricas obtidas contribuem para a compreensão da relação entre qualidade de auditoria e agressividade tributária no contexto brasileiro, uma vez que os estudos ainda são incipientes na literatura.

Palavras-chave: Agressividade tributária; Qualidade de Auditoria; *Big Four*; BTD; ETR.

Received: 01/01/2025. Accepted: 19/04/2025. Published: 05/08/2025. Editor: Thiago Rios Sena



1 INTRODUCTION

Tax aggressiveness is generally associated with tax planning strategies employed by firms to lawfully reduce their tax burdens, considering that tax regulations allow for certain reductions within the legal boundaries of interpretation (Hanlon & Heitzman, 2010). However, the manner in which such strategies are implemented can be perceived as abusive by tax authorities (Martinez, 2017). In this context, tax aggressiveness entails tax-related risks that may extend to other dimensions of the firm, indicating possible deficiencies in the organization's internal controls (Marinho, Almeida & Machado, 2022), which can lead to financial and accounting irregularities (Felix & Teixeira, 2020), as well as compromise the transparency of reported results and increase the likelihood of financial statement restatements (Ramos & Martinez, 2018).

As a consequence, tax aggressiveness may influence the issuance of audit opinions (Marinho, 2019), given the potential impairment of the reliability and credibility of the disclosed information (Braunbeck, 2010). In light of this, the international literature has investigated the role of audit quality in curbing aggressive tax practices adopted by firms (Gaaya & Lakhal, 2017; Kanagaretnam, Lee, Lim & Lobo, 2016; Lestari & Nedya, 2019). In the Brazilian context, Hartmann and Martinez (2020) and Marinho et al. (2022) provided the first empirical evidence on the influence of Big Four auditors on tax aggressiveness, finding that companies audited by these large audit firms are less likely to engage in aggressive tax practices.

Building on this foundation, the present study aims to extend the investigations of Hartmann and Martinez (2020) and Marinho et al. (2022) by examining whether the Big Four—typically associated with higher audit quality—can serve as an effective mechanism for mitigating tax aggressiveness. This practice is defined by Hanlon and Heitzman (2010) and Martinez (2017) as an explicit corporate strategy to reduce tax liabilities through legally based actions that may nonetheless be subject to challenge.

To this end, the scope of this research was expanded in relation to previous studies by including a larger sample—comprising 340 non-financial companies listed on the [B]3—and extending the time frame to cover the years from 2010 to 2022. Additionally, to capture tax aggressiveness more comprehensively, four distinct proxies are employed: Accounting and Current Effective Tax Rates (ETR), and Book-Tax Differences (BTD) measured in relation to both taxable income and total assets. This approach broadens the empirical evidence on the topic, offering a more robust and comprehensive assessment of the role of audit quality in relation to tax aggressiveness, thereby enabling more conclusive insights into this relationship within the Brazilian market.

It is expected that the expansion of the sample, time horizon, and tax aggressiveness proxies will contribute to the development of more robust empirical evidence regarding the role of audit firms in mitigating tax aggressiveness in Brazil, allowing for a deeper understanding of how different metrics influence the analysis of this relationship. Regarding these proxies, a key contribution of this study lies in the use of Current ETR, which allows for the identification of how temporary differences affect both audit practices and tax aggressiveness, addressing a specific gap in the literature given the scarcity of studies exploring this dimension.

Beyond its contribution to the academic literature, the empirical findings offer important practical implications for various stakeholders. For tax authorities, the study provides valuable insights into how audits—especially those perceived as high-quality—can help curb aggressive tax practices, supporting the development of more effective monitoring and regulatory policies. For capital market and audit regulators, the findings assist in shaping guidelines that foster greater transparency and reliability in financial reporting. For companies

and investors, the results highlight the benefits of high-quality audits, underscoring their role in reducing tax-related risks and strengthening organizational credibility.

2 THEORETICAL FRAMEWORK

2.1 Tax Aggressiveness

The definition of tax aggressiveness is widely debated in the literature and is associated with a variety of concepts. The term is used to describe tax planning practices that involve legal procedures aimed at reducing the tax burden that impacts companies' costs (Moraes, Nascimento, Soares & Prímola, 2021). Following the definition proposed by Hanlon and Heitzman (2010), tax aggressiveness refers to the extent to which a company adopts strategies to minimize its tax liability by exploiting legal loopholes and engaging in tax planning, resulting in an effective tax rate lower than that established by tax legislation.

In this sense, the difficulty in conceptualizing tax aggressiveness is closely linked to the gap between when a legal tax planning strategy is deemed acceptable and when it becomes aggressive (Blouin, 2014). Martinez (2017) adds to this idea by pointing out that tax planning strategies tend to become aggressive depending on their intensity and the degree of legal compliance with which they are implemented, becoming more evident as the tax obligations are gradually reduced.

According to Araújo and Leite Filho (2017), two main factors contribute to the adoption of aggressive tax practices by Brazilian companies: (i) the high tax burden compared to other countries; and (ii) the complexity of the tax legislation. Regarding the latter, Martinez (2017) emphasizes that legal systems with clear gaps for interpretation make it possible to reduce the tax burden without these actions being considered illegal. Arpini, Ritter, and Piccoli (2020) support this perspective by highlighting that the tax burden imposes significant costs on organizations, prompting them to adopt tax aggressiveness strategies to enhance performance and competitiveness in the business environment.

Lenkauskas (2014) observes that tax evasion is often used as a synonym for tax aggressiveness, given the blurred line between the two concepts. However, tax aggressiveness refers to practices in which the taxpayer reduces or defers tax payments by applying legal principles and interpretations of the law, while tax evasion involves illegal practices with no legal basis (Lenkauskas, 2014). Despite the distinction, Martinez (2017) notes that aggressive tax practices are not immune to scrutiny by tax authorities, as depending on the magnitude of the intentional tax reduction, they may be deemed abusive.

2.2 Audit Quality as a Mitigator of Tax Aggressiveness

In the capital markets context, the quality of information and the manner in which it is presented to users is a key tool in the decision-making process. This stems from the fact that there is unequal access to information (information asymmetry) among managers, majority shareholders, and investors, generating potential conflicts of interest due to the advantage held by one party over the others (Dantas, Chaves, Silva & Carvalho, 2011). Accordingly, it is assumed that financial statements, when properly and faithfully presented, serve as an instrument to support external users—especially investors—in decision-making.

The purpose of auditing is to contribute to this environment of trust and credibility by issuing an opinion on the reliability of the financial statements (Newman, Patterson & Smith, 2005; Ojo, 2008; Zagonov, 2011). In view of this, auditors must ensure that results and risks

are appropriately disclosed in all material aspects, based on the applicable accounting framework and ethical requirements, providing the highest possible level of assurance within an acceptable level of audit risk.

In this context, the adoption of aggressive tax practices can be seen as an indicator of uncertainty regarding the complete and accurate disclosure of information, as certain measures taken to minimize tax burdens may distort or obscure the entity's actual performance. Therefore, the auditor's role includes identifying such behavior by examining the financial statements to reduce the risk of manipulation and/or misstatements.

Felix and Teixeira (2020) examined the relationship between tax aggressiveness and accounting irregularities in publicly traded companies on the [B]3 from 1999 to 2017. Their findings showed that more aggressive firms are more likely to engage in irregular practices. In this context, auditing emerges as a crucial tool to identify and mitigate aggressive tax practices that undermine the integrity and reliability of information, thereby preventing future irregularities.

A relevant aspect explored in the literature is the relationship between the tax expertise of signing auditors and audit quality. According to studies by DeFond, Qi, Si, and Zhang (2024), auditors specialized in taxation, when exclusively focused on audit services, positively impact the mitigation of corporate tax aggressiveness. This specialization allows them to be more effective in identifying and curbing aggressive tax behavior, reducing the risk of misstatements and promoting greater regulatory compliance. By limiting tax aggressiveness through their expertise, auditors contribute not only to the integrity of financial information but also to the reputation and effectiveness of the audit profession itself.

Supporting this view, Goldman, Harris, and Omer (2022) investigated whether tax-specific task knowledge (TSK) enhances audit quality regarding income taxes, particularly in complex environments that demand substantial tax expertise. Their findings revealed that audit offices with greater exposure to complex tax issues develop stronger TSK, which improves audit quality.

Complementarily, Ramos and Martinez (2018) found a positive relationship between the risk of restatement and the level of tax aggressiveness, resulting in increased audit risk. Based on this, it can be inferred that auditing firms, when auditing companies with aggressive tax practices, tend to invest more time and strengthen audit procedures, including the incorporation of tax specialists on their teams. In this regard, Donohoe and Knechel (2014) and Martinez, Lessa, and Moraes (2014) provide evidence that audit fees are more likely to increase when auditing tax-aggressive firms, due to the overall risk involved and the substantial effort required to ensure greater reliability of the audit conclusions.

As a result, the literature has increasingly sought to identify the relationship between tax aggressiveness and the role of independent audit firms. In this line, the study conducted by Kanagaretnam et al. (2016) stands out as an international reference, analyzing data from 31 countries and concluding that audit quality—measured by Big-N auditors—is negatively associated with the likelihood of tax aggressiveness, particularly in countries with stronger investor protection. The authors argue that these results are consistent with the notion that high-quality auditors are concerned about their market reputation and exposure to litigation. However, despite providing valuable insights, these findings must be interpreted with caution, as the sample encompasses countries with diverse tax systems and corporate cultures, which may generalize results across different contexts.

Gaaya, Lakhal, and Lakhal (2017) investigated whether high-quality audits act as a moderating factor in the tax practices of family-owned firms in Tunisia from 2008 to 2013. Their results showed that Tunisian family businesses are significantly associated with aggressive practices, supporting the hypothesis that controlling families prioritize self-interest over minority shareholders—especially in weak investor protection environments.

Furthermore, using Big Four firms as a proxy for audit quality, the findings suggest that family-owned firms reduce opportunistic behavior when audited by high-quality firms, indicating that well-monitored companies exhibit fewer tax avoidance practices. Nevertheless, these findings are specific to the Tunisian context, where the transitioning economy still presents institutional weaknesses.

Similarly, Lestari and Nedyia (2019) examined the effects of audit quality on tax aggressiveness in companies listed on the Indonesian stock exchange between 2012 and 2017. They found that audit quality—based on auditor size—reduces tax avoidance practices, although longer audit tenures may intensify such practices due to diminished auditor independence. Moreover, still within the Indonesian context, Pratomo and Wibowo (2024) identified consistent results in the food and beverage subsector during a more recent period (2017–2021), suggesting that firms audited by larger firms tend to be less tax aggressive. Despite these important contributions, both studies are limited by their sectoral focus and reliance on the current ETR metric, preventing broader generalization to other economies.

In summary, it is possible to infer that in the Brazilian context, there remains a lack of studies investigating the role of auditing in mitigating tax aggressiveness. A pioneering study in this area was conducted by Hartmann and Martinez (2020), which sought to identify whether abusive tax practices differed between audits performed by Big Four and non-Big Four firms. The study found that more aggressive companies tend to choose non-Big Four auditors.

Building on this, Marinho et al. (2022) examined the relationship between tax aggressiveness and audits conducted by Big Four versus non-Big Four firms. The authors expanded their analysis by employing, in addition to the GAAP ETR, the DVA ETR—an alternative proxy derived from the Statement of Value Added (DVA). Unlike GAAP ETR, DVA ETR focuses not only on income taxes but also on total tax burden (Martinez & Cerize, 2020; Vello & Martinez, 2014). The results revealed that only for GAAP ETR, firms audited by Big Four have fewer incentives to adopt aggressive practices that reduce tax liabilities. However, the study was limited to the year 2019, lacking a more comprehensive analysis over a longer period.

Given the literature reviewed, this study aims to advance the discussion on the role of audit quality in addressing tax aggressiveness. Accordingly, the following hypothesis is proposed:

H1: The tax aggressiveness of non-financial Brazilian companies listed on [B]3 is mitigated when their financial statements are audited by Big Four firms, which are associated with higher audit quality.

The objective of testing this hypothesis is to investigate whether the presumed higher audit quality provided by Big Four firms exerts a direct influence on corporate tax behavior. A negative relationship is expected between Big Four audits and tax aggressiveness, indicating that firms audited by high-quality firms adopt less aggressive practices.

3 METHODOLOGICAL PROCEDURES

The purpose of this section is to present, describe, and explain the methodological design of the research, encompassing the selection of variables, the definition of the regression model, and the specification of the sample used in the study. The research is classified as descriptive, as it aims to analyze the relationship between variables associated with the tax aggressiveness of non-financial companies listed on [B]3.

Based on a quantitative approach, the study employs data obtained from the

Economática® platform and the reference forms submitted to the Brazilian Securities and Exchange Commission (CVM). For the econometric analysis, five different regression approaches are applied — pooled, period fixed effects, cross-sectional fixed effects, two-way fixed effects, and pooled with industry controls — thus ensuring greater robustness in the investigation. This methodology enables the isolation of specific variations and the identification of patterns in the relationship between audit quality and tax aggressiveness.

3.1 Metrics of Tax Aggressiveness

For this study, GAAP ETR, Current ETR, and BTM will be used as dependent variables, serving as proxies for tax aggressiveness. GAAP ETR (**ETR_{gaap}**), calculated as the ratio of total tax expense to pre-tax book income (Hanlon & Heitzman, 2010), as shown in Equation (3.1), is identified in various studies as the most recommended metric for measuring the level of tax aggressiveness, as it captures changes in companies' effective tax rates relative to statutory rates (Gupta & Newberry, 1997; Hanlon & Heitzman, 2010).

$$ETR_{gaap_{it}} = \frac{TLuc_{it}}{LAIR_{it}} \quad (3.1)$$

Em que:

$ETR_{gaap_{it}}$: is the effective tax rate of firm i in period t , in accordance with applicable accounting standards.

$TLuc_{it}$: is the total tax on income of firm i in period t , corresponding to the sum of income tax and social contribution on net profit.

$LAIR_{it}$: is the pre-tax book income of firm i in period t .

The Current ETR (**ETRC**), calculated as the ratio of current income taxes to pre-tax book income, as shown in Equation (3.2), was selected because it enables the identification of how temporary differences affect the level of corporate taxation, as proposed by Hanlon & Heitzman (2010), and has been applied in several studies (Campos & Dantas, 2022; Gomes, 2016; Araújo & Leite Filho, 2017).

$$ETRC_{it} = \frac{TLucCorr_{it}}{LAIR_{it}} \quad (3.2)$$

Em que:

$ETRC_{it}$: is the current effective tax rate of firm i in period t .

$TLucCorr_{it}$: is the current tax on income of firm i in period t .

Finally, the Book-Tax Difference (BTM) was adopted based on the studies by Hanlon & Heitzman (2010), Hartmann & Martinez (2020), and Tang (2005), and is calculated as the difference between pre-tax book income and the estimated taxable income, as shown in Equation (3.3). Since the actual tax computation book, known as *LALUR* (Livro de Apuração do Lucro Real), is not publicly available, taxable income is estimated by dividing the provision for income tax and social contribution by the statutory tax rate (34%), as proposed by Ferreira et al. (2014).

$$BTM_{it} = LAIR_{it} - LT_{it} = LAIR_{it} - \frac{TLuc_{it}}{AliqN_t} \quad (3.3)$$

Em que:

BTM_{it} : is the book-tax difference of firm i in period t .

LT_{it} : is the taxable income of firm i in period t .

$AliqN_t$: is the statutory corporate tax rate for non-financial entities in period t , set at 34% for the 2010–2022 period.

For use in the regression models, the BTM variable will be standardized both by pre-tax book income (**BTM_{lair}**) and by total assets (**BTM_{dat}**), as shown in Equations (3.4) e (3.5):

$$BTD_{lair_{it}} = \frac{BTD_{it}}{LAIR_{it}} \quad (3.4)$$

$$BTD_{at_{it}} = \frac{BTD_{it}}{Total\ Assets_{it}} \quad (3.5)$$

3.2 Big Four as a Proxy for Audit Quality

According to DeAngelo (1981), the larger the audit firm, the fewer incentives the auditor has to engage in opportunistic behavior, as the firm's reputation in the market regarding audit quality acts as a mechanism to maintain its client portfolio and, consequently, its independence in the face of potential irregularities.

Based on this perspective, and considering that Big Four auditors are frequently used in the literature as a proxy for audit quality (Marinho et al., 2022; Hartmann & Martinez, 2020; Lestari & Nedy, 2019; Kanagaretnam et al., 2016), a binary variable was adopted as an independent variable, taking the value 1 for companies audited by one of the Big Four (Deloitte, PwC, EY, and KPMG), and 0 otherwise.

3.3 Regression Model

To examine the role of high-quality audits in mitigating tax aggressiveness, model (3.6) was employed, representing an adaptation of the regression model proposed by Marinho et al. (2022).

$$AgrTrib_{it} = \beta_0 + \beta_1 Big4_{it} + \beta_2 ROA_{it} + \beta_3 Endiv_{it} + \beta_4 Tam_{it} + \beta_5 \sum Setor_i + \varepsilon_{it} \quad (3.6)$$

Em que:

AgrTrib_{it}: corresponds to the measure of tax aggressiveness of firm *i* in period *t*, alternatively taking the proxies *ETRgaap*, *ETRC*, *BTDlair* e *BTDat*, as measured by equations (3.1), (3.2), (3.4) e (3.5), respectively.

Big4_{it}: is the proxy for audit quality of firm *i* in period *t*, assuming the value 1 if audited by one of the Big Four firms and 0 if audited by any other firm.

ROA_{it}: is the return on assets of firm *i* in period *t*, calculated as net income divided by total assets.

Endiv_{it}: is the leverage ratio of firm *i* in period *t*, calculated as total liabilities divided by total assets.

Tam_{it}: is the size of firm *i* in period *t*, measured as the natural logarithm of total assets.

Setor_{it}: refers to the economic sector in which firm *i* operates in period *t*, based on the [B]3 classification. These are dummy variables for the sectors: Industrial Goods (BInd), Consumer Cyclical (CC), Consumer Non-Cyclical (CNC), Oil, Gas and Biofuels (PGB), Communications (Com), Public Utilities (UtPub), Basic Materials (MatBas), Healthcare (Sd), Information Technology (IT), and Others.

Regarding the choice of control variables, it is important to highlight that ROA is a performance indicator sensitive to tax aggressiveness, as actions aimed at reducing tax burdens may directly impact firms' financial outcomes (Araújo & Leite Filho, 2017). Studies by Arpini, Ritter, and Piccoli (2020) and Araújo & Leite Filho (2017) revealed that aggressive tax strategies tend to negatively affect ROA, showing that companies with lower tax aggressiveness present higher profitability when measured by ETR. Conversely, Xavier, Theiss, and Ferreira (2022) found a positive relationship between BTD and profitability,

indicating that greater tax aggressiveness may be associated with higher profitability. However, this association was not observed for ETR, contrary to the authors' expectations.

As for the determination of the leverage ratio (Endiv), its inclusion is primarily supported by the findings of Martinez and Martins (2016), who identified a positive correlation between leverage and aggressive tax behavior, suggesting that firms more intensely engaged in tax minimization are more likely to rely on debt financing.

Firm size (Tam) is among the most frequently examined characteristics in tax aggressiveness research, based on Zimmerman's (1997) premise that larger firms tend to have higher effective tax rates than smaller ones. This assumption aligns with Gaaya et al. (2017), who suggest that larger companies are less aggressive due to concerns about reputational loss and market value, which contrasts with the findings of Lanis and Richardson (2012).

The inclusion of sector dummy variables is justified by the fact that tax burdens (i.e., statutory rates) may vary across industries due to the particularities of each sector in applying Brazilian tax legislation.

To estimate the regressions, five different econometric approaches will be used: pooled OLS; fixed effects for time; fixed effects for entities (cross-sectional); two-way fixed effects (both time and entity); and pooled OLS with sector controls. The pooled model is a simplified approach that does not account for systematic differences across time or entities, instead combining all observations into a single analysis. In contrast, fixed effects models control for unobservable influences specific to either time or entities, identifying entity-specific factors to ensure that results are not biased by unwanted variation. The two-way fixed effects model enhances robustness by simultaneously controlling for time and entity effects. Finally, pooled estimation with sector controls is employed to isolate potential effects arising from sector-specific characteristics.

3.4 Sample and Data Sources

The initial population of the study consists of 439 publicly listed companies from various economic sectors on [B]3. Financial sector companies were excluded due to the differentiated tax rates and specific regulations applicable to corporate income tax (IRPJ) and the social contribution on net income (CSLL) for such entities. Additionally, firms without complete data for the entire study period or with negative pre-tax book income (LAIR) during the sample period were excluded. Applying these criteria, the final sample comprised 340 companies.

Regarding the time frame, the analysis begins in 2010—coinciding with the adoption of International Financial Reporting Standards (IFRS) in Brazil—and ends in 2022, the most recent fiscal year for which data were available at the time of the study. The economic and financial data used were collected from the Economática® platform, based on consolidated annual information from the selected companies. The sector classification adopted in this study follows the same scheme used by [B]3. As information on external audit firms responsible for the financial statements was not available in the Economática® database, audit data were manually collected from reference forms and financial statements disclosed on the website of the Brazilian Securities and Exchange Commission (CVM).

4 ANALYSIS OF RESULTS

4.1 Descriptive Statistics

Considering the initial identification of relevant outliers, the winsorization technique at the 5% level was applied to the non-dichotomous variables. This method consists of replacing

extreme values (either high or low) with a remaining value from the sample distribution, since the presence of outliers can compromise the correct interpretation and inference of the results. Table 1 presents the descriptive statistics of the variables used to estimate model (3.6), after the application of winsorization.

Table 1:

Descriptive statistics of the continuous and binary variables of model (3.6)

Continuous variables	<i>ETRgaap</i>	<i>ETRC</i>	<i>BTDLair</i>	<i>BTDat</i>	<i>ROA</i>	<i>Endiv</i>	<i>Tam</i>
Mean	0,2129	0,2319	0,3738	0,0323	0,0664	0,5840	14,7975
Median	0,2333	0,1962	0,3137	0,0202	0,0564	0,5784	15,0186
Maximum	0,5511	0,7535	1,5252	0,1436	0,1752	1,6118	17,6744
Minimum	-0,1786	0,0000	-0,6210	-0,0180	-0,0653	0,1601	10,5404
Standard Deviation	0,1711	0,1902	0,5031	0,0410	0,0486	0,2499	1,8300
Binary variables	<i>Big4</i>						
Value 1	1.958	77,33%					
Value 0	574	22,67%					

Where: *ETRgaap* is the company's effective tax rate based on applicable accounting standards; *ETRC* is the company's current effective tax rate; *BTDLair* is the company's book-tax differences relative to pre-tax income (EBT); *BTDat* is the company's book-tax differences relative to total assets; *ROA* is the return on total assets; *Endiv* is the company's level of indebtedness; *Tam* is the variable representing company size, measured by the natural logarithm of total assets; *Big4* is the dummy variable identifying whether the company was audited by a Big Four firm.

Source: research data.

From the presented data, it is possible to observe that the companies report, on average, a tax burden of 21.29% on taxable income (*ETRgaap*), a figure slightly higher than that found by Marinho et al. (2022), which was 18.34%. This difference may be justified by the fact that their study analyzed data from 2019 only. Similarly, a comparable behavior is observed for the current effective tax rate (*ETRC*), with an average of 23.19%.

This indicates that, on average, for the *ETRgaap* and *ETRC* variables, non-financial companies listed on [B]3 demonstrate an effective tax burden below the statutory rate (34%), as has already been evidenced in several national studies (Gomes, 2016; Moraes, Nascimento, Soares & Prímola, 2021). On the other hand, the maximum values, even after winsorization, reveal that certain companies pay taxes on income in significantly higher proportions than the statutory rate. Additionally, *ETRgaap* exhibited a negative minimum value (-17.86%), which suggests the existence of tax credits associated with permanent differences at a significant level.

In line with this, when analyzing the variable *BTDLair*, it is noted that the difference between accounting income and taxable income shows a positive mean of 37.38%, meaning that, on average, the companies listed on [B]3 report accounting income higher than taxable income. This difference, on average, represents 37.38% of pre-tax income (EBT), resulting in a lower tax burden. This scenario suggests a significant level of tax aggressiveness or the possibility of earnings management, corroborating the findings of the study by Rosito, Vendruscolo, and Halmenschlager (2021). Regarding the *BTDat* variable, it is concluded that there is, on average, a positive difference between EBT and taxable income (TI) equivalent to 3.23% of total assets. This result is similar to that found in the study by Xavier et al. (2022), which reported an average of 3.41%.

In the case of the independent variable of interest (Big4), it is evident that there is a predominance of financial statements audited by Big Four firms (77.33%), a result that was already expected due to the observed market concentration, as documented by Dantas, Chaves, Sousa, and Silva (2012). However, although the concentration of these firms may limit market competitiveness to some extent, the authors emphasize that it also brings benefits, as it is associated with the quality of services provided. According to DeAngelo (1981) and Herusetya (2020), large firms have greater capacity to invest in technologies that can detect errors and strive to maintain independence due to the need to preserve their reputation.

Regarding the control variables, it is observed that the profitability level (ROA) shows an average return on assets of approximately 6.64%, with significant variations among the company-year observations. Another control variable included in the model estimation is the debt level (Endiv), or leverage, and it was found that the sample companies, on average, have approximately 58.40% of short- and long-term liabilities relative to total assets. This value is similar to the one found in the study conducted by Frabris, Silva, Marques, and Freitag (2021), which reported a proportion of 56%. It is worth noting that the maximum and minimum values indicate the presence of companies with negative equity (more than 100% leverage) and others with leverage of about 16%.

Finally, regarding the size variable (Tam), represented by the natural logarithm of total assets, the presented statistics are similar to those found by Martinez and Martins (2016).

As a final step, a Pearson correlation matrix was constructed in order to assess the risk of multicollinearity among the independent variables. The results showed no risk of multicollinearity, considering the threshold suggested by Gujarati and Porter (2011), which indicates that a correlation above 0.8 could compromise the robustness of the coefficients.

4.3 Model Estimation and Hypothesis Testing

Finally, model (3.6) was estimated with the aim of testing hypothesis H1, which posits that tax aggressiveness is mitigated when non-financial companies listed on [B]3 are audited by high-quality auditors, namely the Big Four firms. Accordingly, four alternative measurements of the dependent variable representing tax aggressiveness were considered, with a total of five estimations for each proxy, using the pooled method, time fixed effects, cross-sectional fixed effects, two-way fixed effects, and pooled estimation with sector controls, as detailed in Section 3.

Initially, the model estimation was carried out using ETRgaap as the proxy, as presented in Table 2.

Table 2:
Model (3.6) estimations using the ETRgaap proxy as a metric of tax aggressiveness

Tested Model:					
	$ETRgaap_{it} = \beta_0 + \beta_1 Big4_{it} + \beta_2 ROA_{it} + \beta_3 Endiv_{it} + \beta_4 Tam_{it} + \beta_5 \sum Setor_i + \varepsilon_{it}$				
<i>constant</i>	0,2995*** (0,0000)	0,2713*** (0,0000)	0,5467*** (0,0000)	0,3351*** (0,0067)	0,2566*** (0,0000)
<i>Big4</i>	0,0224** (0,0387)	0,0171 (0,1196)	0,0537*** (0,0001)	0,0446*** (0,0010)	-0,0170 (0,1062)
<i>ROA</i>	-0,8645*** (0,0000)	-0,8228*** (0,0000)	-0,7102*** (0,0000)	-0,6579*** (0,0000)	-0,8488*** (0,0000)

<i>Endiv</i>	0,0138 (0,2940)	0,0204 (0,1116)	-0,0214 (0,4041)	-0,0091 (0,7224)	0,0009 (0,9410)
<i>Tam</i>	-0,0037* (0,0575)	-0,0020 (0,3245)	-0,0214*** (0,0004)	-0,0073 (0,3734)	-0,0037* (0,0703)
Include Time FE?	No	Yes	No	Yes	No
Include Cross FE?	No	No	Yes	Yes	No
Include Industry Dummies?	No	No	No	No	Yes
Number of Firms	340	340	340	340	340
Number of Observations	2646	2646	2646	2646	2646
Period	2010/2022	2010/2022	2010/2022	2010/2022	2010/2022
R ²	0,0627	0,4069	0,4027	0,0728	0,0981
Ajusted R ²	0,0613	0,3150	0,3138	0,0671	0,0937
F-Statistic	44,1907	4,4269	4,5264	12,9030	22,0446
F (p-value)	0,0000	0,0000	0,0000	0,0000	0,0000

Where: *ETRgaap* represents the company's tax aggressiveness measured by the effective tax rate based on applicable accounting standards; *Big4* is the dummy variable indicating whether the company's audit was conducted by a Big Four firm; *ROA* is the return on total assets; *Endiv* represents the company's leverage; *Tam* is the representative measure of company size, measured by the natural logarithm of total assets. Significance levels: *** 1%; ** 5%; * 10%. P-values in parentheses.

Source: research data.

Based on the results presented, the empirical evidence demonstrates a positive and significant association between the independent variable of interest (*Big4*) and the effective tax rate (*ETRgaap*), given that the coefficients were statistically significant in three out of the five estimations conducted. This finding indicates that companies audited by high-quality audit firms exhibit higher taxation on income and, therefore, are less tax aggressive—consistent with the findings of Hartmann and Martinez (2020) and Marinho et al. (2022). These results suggest that Big Four auditors may play a role in mitigating the degree of tax aggressiveness among these companies, possibly due to the level of tax knowledge required of auditors from such firms, thus supporting the research hypothesis H1.

However, it is important to note that this relationship may also be complex and influenced by multiple factors, such as the nature of tax advisory services provided by audit firms, which can affect auditors' perception of risk and necessitate caution when attributing a mitigating role to auditing (Soares, 2019). This complexity is highlighted in the study by Santos, Soares, Freitas, and Filho (2021), which identified lower effective tax rates in companies that use tax services provided by their auditors. Furthermore, studies by Mättö, Niskanen, and Ojala (2023) on the role of auditors in monitoring tax aggressiveness among Finnish private SMEs reveal that auditors predominantly act as providers of tax planning services rather than exercising a constraining function on tax aggressiveness. Additionally, considering the broad market presence of Big Four firms in Brazil, the distinction between these firms and others may not be effectively significant, which limits the generalizability of the results.

Having identified the negative relationship between tax aggressiveness and Big Four audits using *ETRgaap*, the next step involved testing the same relationship using *ETRc* as the

metric, as detailed in Table 3.

Table 3:

Model (3.6) estimations using the ETRc proxy as a metric of tax aggressiveness

Tested Model:					
$ETRc_{it} = \beta_0 + \beta_1 Big4_{it} + \beta_2 ROA_{it} + \beta_3 Endiv_{it} + \beta_4 Tam_{it} + \beta_5 \sum Setor_i + \varepsilon_{it}$					
<i>constant</i>	0,3782*** (0,0000)	0,3707*** (0,0000)	0,3686*** (0,0011)	0,2917** (0,0370)	0,3185*** (0,0000)
<i>Big4</i>	-0,0033 (0,7034)	0,0049 (0,5759)	0,0124 (0,4698)	0,0067 (0,6925)	-0,0083 (0,3673)
<i>ROA</i>	-1,3861*** (0,0000)	-1,3709*** (0,0000)	-1,4959*** (0,0000)	-1,4746*** (0,0000)	-1,3669*** (0,0000)
<i>Endiv</i>	0,0021 (0,8829)	0,0039 (0,7966)	-0,0071 (0,8306)	0,0004 (0,9900)	-0,0091 (0,5162)
<i>Tam</i>	-0,0035* (0,0618)	-0,0031 (0,1063)	-0,0028 (0,7003)	0,0022 (0,8126)	-0,0009 (0,6459)
Include Time FE?	No	Yes	No	Yes	No
Include Cross FE?	No	No	Yes	Yes	No
Include Industry Dummies?	No	No	No	No	Yes
Number of Firms	340	340	340	340	340
Number of Observations	2532	2532	2532	2532	2532
Period	2010/2022	2010/2022	2010/2022	2010/2022	2010/2022
R ²	0,1211	0,4671	0,4627	0,1257	0,155
Adjusted R ²	0,1197	0,3802	0,3785	0,1201	0,1506
F-Statistic	87,0886	5,3738	5,4953	22,5994	35,5354
F (p-value)	0,0000	0,0000	0,0000	0,0000	0,0000

Where: ETRc represents the company's tax aggressiveness measured by the current effective tax rate; ROA is the return on total assets; Leverage refers to the company's level of indebtedness; Size is the proxy for firm size, measured by the natural logarithm of total assets; Big4 is a dummy variable indicating whether the company's audit was conducted by a Big Four firm.

Significance levels: *** 1%; ** 5%; * 10%. P-values in parentheses.

Source: research data.

Regarding the estimations presented in Table 3, the results reveal that, when considering only current taxation as a measure representative of tax aggressiveness (ETRc), no significant association is identified with audit quality (Big4). These findings contradict the expectations of hypothesis H1, indicating that the tax measure capturing the effects of temporary differences is not influenced by whether the audit is performed by a Big Four firm or not. The combination of these results with those obtained in relation to [ETRgaap] suggests that, although the auditor's role includes ensuring that deferred tax provisions comply with accounting standards, their attention should focus on the total amount recognized, since the differences will only manifest at the tax payment period. Another possible explanation is that the Current ETR may not be considered an appropriate measure of aggressiveness, given that

it represents only a temporary difference rather than a change in the entity's level of tax expenses.

Table 4:

Estimations of model (3.6) using the BTDLair proxy as a measure of tax aggressiveness

Tested Model:					
$BTDLair_{it} = \beta_0 + \beta_1 Big4_{it} + \beta_2 ROA_{it} + \beta_3 Endiv_{it} + \beta_4 Tam_{it} + \beta_5 \sum Setor_i + \varepsilon_{it}$					
<i>constante</i>	0,1201	0,2029**	-0,6076**	0,0146	0,2466***
	(0,1458)	(0,0199)	(0,0229)	(0,9678)	(0,0039)
<i>Big4</i>	-0,0662**	-0,0508	-0,1579***	-0,1312***	-0,0501
	(0,0376)	(0,1160)	(0,0001)	(0,0010)	(0,1048)
<i>ROA</i>	2,5484***	2,4266***	2,0889***	1,9352***	2,4995***
	(0,0000)	(0,0000)	(0,0000)	(0,0000)	(0,0000)
<i>Endiv</i>	-0,0399	-0,0591	0,0622	0,0267	-0,0020
	(0,3040)	(0,1236)	(0,4040)	(0,7208)	(0,9545)
<i>Tam</i>	0,0109*	0,0058	0,0630***	0,0215	0,0110*
	(0,0605)	(0,3356)	(0,0004)	(0,3734)	(0,0724)
Include Time FE?	No	Yes	No	Yes	No
Include Cross FE?	No	No	Yes	Yes	No
Include Industry Dummies?	No	No	No	No	Yes
Number of Firms	340	340	340	340	340
Number of Observations	2647	2647	2647	2647	2647
Period	2010/2022	2010/2022	2010/2022	2010/2022	2010/2022
R ²	0,063	0,4073	0,4031	0,073	0,09865
Ajusted R ²	0,0616	0,3154	0,3142	0,0674	0,0942
F-Statistic	44,4741	4,4351	4,5348	12,9590	22,1676
F (p-value)	0,0000	0,0000	0,0000	0,0000	0,0000

Where: BTDLair represents the company's tax aggressiveness measured by book-tax differences, normalized by pre-tax accounting income (LAIR); ROA is the return on total assets; Leverage refers to the company's level of indebtedness; Size is the proxy for firm size, measured by the natural logarithm of total assets; Big4 is a dummy variable indicating whether the company was audited by a Big Four firm.

Significance levels: *** 1%; ** 5%; * 10%. P-values in parentheses.

Source: research data.

Initially, it is relevant to mention that BTDL, due to its method of measurement, presents an interpretation opposite to ETRgaap, since a positive BTDL indicates that pre-tax accounting profit (LAIR) exceeds taxable income (LT), i.e., greater tax aggressiveness. Based on this premise, the empirical results observed in Table 4 suggest that audit quality is negatively related to tax aggressiveness, as a negative relationship between the variables BTDLair and Big4 was recorded in three of the five estimations. This evidence allows us to infer that entities audited by Big Four firms tend to register smaller differences between accounting profit and

the tax base and, thus, are less prone to adopt aggressive tax practices. These results corroborate the conclusions related to the variable ETR_{gaap} and, consequently, support hypothesis H1.

Finally, the model that uses tax aggressiveness measured by the proxy BTDat, following Araújo, Santos, Leite Filho, and Câmara (2018) and Ferreira et al. (2012), was tested. The results are shown in Table 5.

Table 5:

Estimations of model (3.6) using the BTDat proxy as a measure of tax aggressiveness

Tested Model:					
$BTDat_{it} = \beta_0 + \beta_1 Big4_{it} + \beta_2 ROA_{it} + \beta_3 Endiv_{it} + \beta_4 Tam_{it} + \beta_5 \sum Setor_i + \varepsilon_{it}$					
<i>constante</i>	-0,0082* (0,0685)	-0,0023 (0,6413)	-0,0576*** (0,0009)	-0,0053 (0,8330)	0,0012 (0,7895)
<i>Big4</i>	-0,0038** (0,0179)	-0,0028* (0,0920)	-0,0030 (0,1275)	-0,0007 (0,7072)	-0,0027* (0,0924)
<i>ROA</i>	0,5935*** (0,0000)	0,5854*** (0,0000)	0,5634*** (0,0000)	0,5530*** (0,0000)	0,5892*** (0,0000)
<i>Endiv</i>	-0,0007 (0,7692)	-0,0021 (0,4390)	0,0025 (0,5561)	-0,0008 (0,8587)	0,0013 (0,5612)
<i>Tam</i>	0,0003 (0,2809)	0,0000 (0,9389)	0,0036*** (0,0017)	0,0001 (0,9213)	0,0002 (0,4772)
Include Time FE?	No	Yes	No	Yes	No
Include Cross FE?	No	No	Yes	Yes	No
Include Industry Dummies?	No	No	No	No	Yes
Number of Firms	340	340	340	340	340
Number of Observations	2647	2647	2647	2647	2647
Period	2010/2022	2010/2022	2010/2022	2010/2022	2010/2022
R ²	0,4905	0,7505	0,7462	0,4984	0,5176
Ajusted R ²	0,4898	0,7118	0,7084	0,4953	0,5153
F-Statistic	636,093	19,4163	19,7408	163,3445	217,3893
F (p-value)	0,0000	0,0000	0,0000	0,0000	0,0000

Where: BTDat represents the company's tax aggressiveness measured by book-tax differences, normalized by total assets; ROA is the return on total assets; Leverage refers to the company's level of indebtedness; Size is the proxy for firm size, measured by the natural logarithm of total assets; Big4 is a dummy variable indicating whether the company was audited by a Big Four firm.

Significance levels: *** 1%; ** 5%; * 10%. P-values in parentheses.

Source: research data.

Regarding the regression analysis results presented in Table 5, it can be concluded that tax aggressiveness, represented by the variable BTDat, exhibited a negative relationship with audits performed by Big Four firms (Big4) in three of the five estimations. This allows us to infer that entities audited by Big Four firms tend to register a smaller difference between pre-tax accounting profit (LAIR) and taxable income (LT), when weighted by total assets, thus being considered less aggressive. This evidence is consistent with the study by Hartmann and

Martinez (2020), which suggests that more aggressive firms tend to hire non-Big Four audit firms, corroborating hypothesis H1.

Regarding the control variables, the evidence showed a significant negative relationship between the ROA indicator and the variables ETRgaap and ETRc in all estimations performed. This reveals that even when isolating the effects of temporary differences, entities with higher returns tend to adopt a more aggressive tax posture, since they present a lower effective tax burden compared to others. This behavior allows us to infer that companies with higher returns on assets tend to record lower effective tax rates on profit and, consequently, are more tax aggressive. This conclusion, although aligned with the results found by Araújo and Leite Filho (2017) and Martinez and Silva (2023), diverges from the findings of Gupta and Newberry (1997) and Martinez and Martins (2016), whose coefficients showed a positive association between the variables.

The analysis of the relationship between profitability (ROA) and tax aggressiveness (BTDat) indicates a positive and significant relationship, showing that the more profitable the entity, the greater the difference between LAIR and accounting profit. This finding is consistent with the results found in the literature (Araújo et al., 2018; Xavier et al., 2022).

Regarding the leverage variable (Endiv), the evidence did not show a significant relationship with any of the tax aggressiveness measures (ETRgaap, ETRc, BTDLair, and BTDat), suggesting that changes in leverage levels do not necessarily imply changes in the company's tax burden. This result differs from that obtained by Martinez and Martins (2016), who found a negative coefficient, i.e., companies predominantly financed by debt tend to be more tax aggressive.

On the other hand, for the control variable size (Tam), a negative relationship was identified with the dependent variable ETRgaap in three of the five estimations, indicating that the larger the company, the more aggressive it tends to be, contradicting Zimmerman's (1983) theory that large companies present a higher effective tax rate due to greater exposure to tax audits. Moreover, these results contrast with the studies by Gaaya et al. (2017) and Lestari and Nedyia (2019), which highlight that larger companies tend to be less tax aggressive. Conversely, when considering only current taxes as a measure of tax aggressiveness, the relationship between size and aggressiveness is significant in only one of the five estimations, showing that the level of current taxation is not explained by company size.

However, when considering total assets as the size parameter for book-tax differences, significance was found in only one of the five estimations, unlike the results presented by BTDLair. Thus, based on the estimations obtained by BTDat, it is not possible to infer that company size affects the level of tax aggressiveness. Therefore, further analysis of this relationship is necessary, considering the different scenarios applied in the studies.

5 CONCLUSIONS

This study sought to investigate whether the tax aggressiveness of publicly traded Brazilian companies listed on [B]3 is mitigated when their financial statements are audited by Big Four firms, which are generally regarded as auditors of higher quality. To achieve this objective, regression model estimations were conducted using data from 340 companies spanning 2010 to 2022. The presence of Big Four firms was used as an indicator of audit quality, while tax aggressiveness was measured through variations of the main proxies found in the literature: ETR (both accounting and current) and BTD (normalized by pre-tax accounting profit—LAIR—and total assets). Additionally, control variables included profitability, size, leverage, and economic sector.

The empirical test results demonstrated that, except for the Current ETR, there is a negative relationship between financial statements audited by Big Four firms and the level of tax aggressiveness, corroborating the expectation that large audit firms act as mitigators of aggressive corporate tax behavior. The underlying premise is that the more specialized knowledge of professionals in these firms, compared to others, enables the identification and mitigation of aggressive tax actions by management.

In the case of the Current ETR metric—the only one that did not show significant relationships with Big Four audits—the results suggest that, by excluding deferred taxes, this variable captures only the effects of temporary differences on profit and does not comprehensively represent the auditor's concern, which is focused on the total amount recognized. This is because changes in the timing of tax payments do not imply a reduction or increase in total tax expenses. In summary, this evidence indicates that considering Current ETR as a proxy for tax aggressiveness is debatable.

Regarding the control variables, the findings are consistent with the literature for profitability and leverage variables, allowing us to conclude that the higher the return rate, the more aggressive the company appears from a tax perspective, while changes in capital structure do not affect the degree of tax aggressiveness. On the other hand, results are inconclusive regarding the relationship between company size and the adoption of aggressive practices, which does not allow rejecting the premise that larger companies tend to face higher taxation.

This research contributes to the national literature by expanding investigations into auditing and tax aggressiveness, more comprehensively testing the relationship between the proposed variables through the combination of four different tax aggressiveness metrics and five regression estimation methods/criteria. The results obtained are useful not only for tax authorities but also for capital market regulators and audit regulators by providing different perspectives on the practices of companies and audit firms regarding taxation, given the risk of compromising the transparency of reported results and, consequently, affecting the appropriateness of audit opinions. Moreover, by including Current ETR, the study fills a gap in the literature and offers evidence that calls for caution among researchers regarding the use of this variable as a representative measure of tax aggressiveness.

However, it is important to mention that this study has some limitations. First, the use of ETR GAAP, Current ETR, and BTM proxies restricts the scope of the research, since these variables measure only taxes on profit and do not encompass other implicit taxes. Additionally, the study did not consider the nature and scope of auditing services provided by different firms, the potential impact of audit rotations on corporate tax behavior, nor the possibility of self-selection, where less aggressive companies might prefer to hire higher-quality audit firms. Another limitation concerns the sample, which excludes financial sector companies; thus, results cannot be generalized to the entire Brazilian capital market and apply only to non-financial entities. Finally, it should be noted that tax aggressiveness is a complex multidimensional construct, whose operationalization may be influenced by numerous variables not covered in the current model, such as specific organizational characteristics, sectoral regulatory aspects, and particular business strategies.

As a suggestion for future research, it is recommended to include new variables that more broadly represent tax aggressiveness, allowing the analysis of other taxes to which the entity is subject. A relevant example is the effective tax rate calculated based on information from the Statement of Value Added (DVA), which should be applied over longer periods to enable a more consistent assessment of tax practices over time, revealing patterns or trends.

Furthermore, it would be pertinent to conduct regressions that consider changes in audit firms, as well as to incorporate, as control variables, the hiring of tax consulting services provided by audit firms and aspects related to corporate governance. This would allow investigation of whether hiring consulting services also exerts a mitigating effect on tax

aggressiveness. Additionally, the results indicate that the simple dichotomy of Big Four versus non-Big Four may not adequately capture the nuances of audit quality. Therefore, the development of multidimensional metrics is proposed, considering: (a) the audit firm's sectoral specialization; (b) the auditors' experience and technical qualifications; and (c) the degree of effective independence. This approach would allow a more precise assessment of the actual impact of audit quality on corporate tax practices.

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