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IMPACT OF TAX AGGRESSIVENESS ON THE PROFITABILITY OF PUBLICLY TRADED COMPANIES LISTED ON B3

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ABSTRACT

The practice of tax aggressiveness aims to alleviate the high cost of taxes caused by the complexity of tax legislation, aims to reduce tax expenditures and maximize the organizations' performance. The present study analyzes the impact of tax aggressiveness on the profitability of publicly traded companies listed on B3 in the period from 2016 to 2020, since in the Brazilian context, evidence on the relationship between this practice and the companies' profitability is still limited. The final study sample consisted of 204 Brazilian companies and the proxies used to measure tax aggressiveness were the total Book Tax Difference (BTD) and Effective Tax Rate (ETR). Regarding the variables of profitability, the return on investments, return for shareholders and operational activities were observed. The analysis was performed using descriptive statistics, multiple regressions (with random effects) and quantiles, and the results found did not show consensus between the proxies. While the BTD points out that the greater the tax aggressiveness, the greater the profitability, the ETR shows an inverse relationship. As tax aggressiveness proxies do not show consensus in the results, it was not possible to state that higher levels of tax aggressiveness increase the profitability of publicly traded companies listed on B3. Thus, the empirical evidence allows reflections on the use of tax aggressiveness in Brazil and the managers' decision-making.

Keywords*:* Tax Avoidance. Tax Aggressiveness. Profitability.

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1 INTRODUCTION

Upon entering the market, companies face the numerous complexities, competition and competitiveness among organizations, where tax management is pointed out as a mechanism of management efficiency for performance. The organizations' performance is related to the high tax burden, since when participating in the formation of the selling price, taxes imply a reduction in profit (Arpini, Ritter & Piccoli, 2020).

To contain expenses and maximize profit, seeking ways to reduce tax burdens becomes crucial in managerial decisions. The Brazilian tax burden, when compared to the countries of Latin America and the Caribbean between 2008 and 2017, is the highest, because while its average in this period is 32.4%, the average of the other countries is 21.9% (Brazilian Federal Revenue - RFB, 2020). When analyzing the high tax burden in Brazil, Santos and Oliveira (2020) state that such measures can and should be formed by tax planning in order to improve the organizations' performance, since high taxes also negatively impact cash flow and return on investment (Tang, 2005).

For Martinez (2017), although there are no concepts defined by the Brazilian tax legislation, tax aggressiveness is considered by the literature as synonymous for tax planning, defined according to the intensity and legality of this planning (Martinez & Silva, 2020). Thus, tax planning or tax aggressiveness (*tax avoidance)* is a set of practices that has the common objective of providing for the reduction of tax obligations, i.e. represents the legal method chosen by taxpayers, which optimizes, through concessions and planned exemptions, the tax obligations. This means that if there are two or more acceptable methods, the method chosen will be the one that provides a lower tax obligation for the company (Martinez, 2017).

In addition to the result, taxes directly affect the companies' liquidity and profitability (Araújo, 2017). By reducing the tax cost through tax aggressiveness, more aggressive companies would have higher profitability than conservative companies (Katz, Khan & Schmidt, 2013). The authors show that the economy resulting from tax planning is directed to new projects and these increase not only profitability but also the value of the company.

In view of this, this Article questions: What is the impact of tax aggressiveness on the profitability of publicly traded companies listed in B3? Therefore, the objective is to analyze the impact of tax aggressiveness on the profitability of the publicly traded companies listed in B3 in the period from 2016 to 2020.

Araújo (2017) reports that studies related to the tax aggressiveness impact on profitability is new, especially in the Brazilian scenario. This article verifies if there is an impact of this aggressiveness on profitability and also contributes similar studies on the subject (Katz et al., 2013; Martinez & Reinders, 2018). In the international context, Mulyadi and Anwar (2015) consider tax aggressiveness as a management metric, since the entities that exercise practical tax burden reduction procedures portray lower profits and then pay less taxes (Omar & Zolkaflil, 2015).

Among the studies carried out, different results are observed. Martinez and Reinders (2018) reject the hypothesis that tax aggressiveness has a significant relations with future profitability, while Katz et al. (2013) conclude that companies practicing tax aggressiveness have lower future profitability compared to more conservative companies. In view of these differences, there is a need to verify what the result would be in a scenario characterized by an unstable economy, with complexity in the tax legislation, high in the exchange rate variation and high tax risk of Brazilian companies, where demand for tax planning is expected to reduce the tax obligation within what is allowed by the legislation.

2 THEORETICAL FRAMEWORK

2.1 Tax aggressiveness and its measurement

Martinez (2017) ensures that, when faced with a growing willingness of the Government to obtain tax revenues, companies are under pressure to reduce tax costs. Therefore, the author states that companies that are aggressive when it comes to taxes, profit from all the alternatives and opportunities they have for the tax reduction.

Hanlon and Heitzman (2010) point to the difficulty defining what tax aggressiveness is, since in literature the concept differs. Lisowsky, Robinson and Schmidt (2013) define tax aggressiveness as a subset of the tax avoidance that tends to possess little legal backing in their underlying positions. Also, tax aggressiveness is the tax planning limit that would not last after an audit by the competent federal body (Lietz, 2013).

Tax aggressiveness practices change among companies (Araújo, Santos, Leite Filho & Camara, 2018). When done by legal means, tax aggressiveness can result in tax avoidance, being a synonym for reduced taxation. However, excessively aggressive companies tend to exceed the limit of legality and therefore can practice tax evasion or tax fraud (Araújo et al., 2018).

Tax aggressiveness can be measured by various forms and *proxies*, developed first by Shackelford and Shevlin (2001). These measures are focused on evaluating tax aggressiveness in the taxes calculated on the accounting result, in Brazil they are the Legal Person Income Tax (IRPJ) and the Social Contribution on Net Profit (CSLL) (Martinez, 2017). Some of the most widely employed *proxies* are *Book-Tax Differences total (BTD), Effective Tax Rates (ETR), Current Effective Tax Rate (ETRc), Cash Effective Tax Rate (CashETR), Generally Accepted Accounting Principles Effective Tax Rate (GAAP ETR),* Effective Tax Rate based on the taxation evidenced in DVA (ETR_DVA), among others. In this study, the focus will be on *BTD proxies*, which relates accounting profit and tax profit and ETR, which focuses on total tax expenses on accounting profit (Hanlon & Heitzman, 2010; Carvalho, 2015).

2.1.1 Book Tax Difference total (BTD)

For Wahab and Holland (2015), there are two forms of compulsory measurement to calculate companies' annual revenues. The first measure is determined by financial reporting regulations, which results in accounting profit, while the second measure, in turn, uses tax legislation to make tax profit. BTD can be considered as the difference between profit before tax deduction (accounting profit) and tax profit (Hanlon, 2005; Wahab & Holland, 2015).

BTD is a commonly used measure in measuring tax aggressiveness, since the Government defines tax rules with the objective of avoiding and mitigating possible tax avoidance and evasions (Carvalho, 2015). Moreover, the author explains that a negative BTD is ideal from the perspective of the Government, with tax profit being higher than the accounting profit in this case. However, for managers, from an aggressive tax perspective, a higher accounting profit than tax profit is more desirable, resulting in a positive BTD.

The BTD calculation follows the model used by Carvalho (2015), which is:

$$BTD\ total_{i,t} = \frac{LAIR_{i,t} - \left(\left(IRPJ_{it} + CSLL_{i,t} \right)/0{,}34 \right)}{Ativo\ Total_{it}} \qquad \text{(Equation 1)}$$

Where:
$BTD\ total_{i,t}$ = Total BTD of company i in period t;

$LAIR_{i,t}$ = Profit Before Income Tax and CSLL of Company i in period t;
$IRPJ_{it}$ = amount of current Income Tax current Legal Person of company i in period t;
$CSLL_{i,t}$ = amount of the Social contribution on the Company's Current net profit i in the period t.

It is worth pointing out that the 34% percentage inferred in the BTD calculation is attributed to the Brazilian legal tax rate, which corresponds to 15% of IRPJ tax, 10% of IRPJ compulsory surplus for companies with profit above 20 thousand reais monthly and 9% of CSLL tax.

2.1.2 Effective Tax Rate (ETR)

ETR is *a proxy* that has several forms of calculation, such as GAAP ETR, *Current* ETR, *Cash* ETR, *Long Cash* ETR, ETR *Differential*, among other methods *(Hanlon & Heitzman, 2010; Araújo, 2017).* It is one of *the most* used *proxies* to indicate aggressive tax planning in international literature, calculated by the relationship between total tax expense and accounting profit (Hanlon & Heitzman, 2010; Carvalho, 2015; Araújo, 2017).

According to Araújo (2017), the measurement of ETR, adjusted for the Brazilian context, is made by the following formula:

$$ETR = \frac{Total\ de\ Despesa\ com\ IRPJ\ e\ CSLL}{Resultado\ antes\ do\ IRPJ\ e\ CSLL\ (LAIR)} \quad \text{(Equation 2)}$$

For this study, the BTD and ETR variables are the *tax* aggressiveness *proxies*, related to profitability indices.

More aggressive companies from a tax standpoint comprise a higher BTD rate and a lower ETR rate, according to Chen, Chen, Cheng and Shevlin (2010). This occurs as these measures have similar forms of tax aggressiveness measurement, even though they present divergent interpretations (Gebhart, 2017). However, for companies that operate in a tax system that favors taxes on consumption, ETR may not adequately express tax aggressiveness (Martinez, 2017).

2.2 Analysis of profitability

The profitability measures allow analysts and investors to assess the company's profits from levels of sales, assets and equity investments (Gitman, 2010). They are recommended for analysis of the perspective of return on investments, return to shareholders and operational activities carried out in the company.

Similar to the studies of Martinez and Reinders (2018) and Santos and Oliveira (2020), the present study employs the profitability metric the Return on Assets (ROA) and Return on Equity (ROE) to relate to tax aggressiveness. For an operational cash flow perspective, still focusing on profitability, *the Earning before interest, taxes, depreciation and amortization* (EBITDA) is also used.

2.2.1 Return on Assets (ROA)

The Return on Assets (ROA) is one of the most used indicators when analyzing profitability, because it shows the proportion of results in relation to the available assets (Gitman, 2010; Martins, Miranda & Diniz, 2019).

According to Gitman (2010), the Return on Assets is calculated by the equation:

$$ROA = \frac{Profit\ available\ for\ the\ ordinary\ shareholders\ (Net\ Profit)}{Total\ Assets} \quad \text{(Equation 3)}$$

The higher the net profit of a company due to the total asset, the better this ratio of profitability is.

2.2.2 Return on Equity (ROE)

The Return on Equity (ROE) expresses the results obtained from the management of the company's own resources and third parties for the benefit of the shareholders (Iudícibus, 2017). Also, this return ratio influences market value in a long-term perspective of the company. Similar to ROA, the higher the net profit of a company due to the Equity, the better the value of this index is (Gitman, 2010; Iudícibus, 2017).

Braga, Nossa and Marques (2004) clarify that the Return on Equity is given by the following equation:

$$ROE = \frac{Net\ Profit}{Net\ Equity} \quad \text{(Equation 4)}$$

2.2.3 Earning Before Interest, Taxes, Depreciation and Amortization (EBITDA)

The Earning Before Interest, Taxes, Depreciation and Amortization (EBITDA) or *Lucro antes dos Juros, Impostos, Depreciação e Amortização (LAJIDA)* is a financial indicator calculated from the perspective of the company's operating cash flow generated during the period (Frezatti & Aguiar, 2007). Because it is fully operational, this index disregards financial results, thus demonstrating the potential for the formation of the company's operational result (Iudícibus, 2017).

Martins et al. (2019) show that EBITDA is calculated by the following equation:

EBITDA= Net Earning + Depreciation Expenses + Depletion Expenses + Depreciation Expenses + Financial Expenses + Income Tax and Social Contribution (Equation 5)

2.3 Tax aggressiveness and profitability

Ramos, Niveiros e Carneiro Júnior (2019) describe that the survival of organizations demands, among other factors, an adequate tax administration. In addition, the authors complement that tax planning is a lawful way to organize operations, considered a preventive option and less costly. However, aggressive tax planning differs by using means of paying less taxes on proposal through actions that are not mentioned in the legislation, using the subjectivity of interpretations (Martinez & Reinders, 2018).

Chen et al. (2010) they report that more aggressive companies from a tax standpoint comprise a higher BTD rate and a lower ETR rate. Blaylock, Shevlin and Wilson (2012) state that companies with a high BTD rate caused by aggressive tax planning tend to exhibit greater future profitability.

Katz et al. (2013) assess the relationship between fiscal aggressiveness and current and future profitability, with the use of ROA, ROE, net operating profit margin, leverage of operating liabilities and net turnover of operating assets for the analysis. The authors concluded that future profitability in more tax-aggressive companies was lower than in companies that did not practice tax aggressiveness.

Katz et al. (2013), as well as Martinez and Reinders (2018), used the DuPont method as a variable to analyze the influence of tax aggressiveness on current and future profitability. With the focus on the ROA variable, the authors concluded that there was no significant relationship between tax aggressiveness and future profitability.

Araújo e Leite Filho (2019) observed a reflection of the level of tax aggressiveness and profitability of the companies listed in B3 and NYSE in the period from 2010 to 2015. For this analysis, the return on assets was considered as dependent variable, while the measures of tax aggressiveness, ETR and CashETR, were the independent variables of interest. The findings of the study show that, on average, higher levels of tax aggressiveness of the companies listed in B3 and NYSE result in lower profitabilities.

Santos and Oliveira (2020), in turn, assessed the impact of the degree of tax aggressiveness on the profitability of the electric sector companies. With the use of net margin, ROA and ROI as profitability indices, the authors confirmed the hypothesis that tax aggressiveness positively impacts the net margin, ROA and ROI.

In view of the divergence of results presented and based on the above mentioned studies, as well as the findings of the studies of Tang (2005), Chen et al. (2010) and Araújo et al. (2018) the following research hypotheses are accepted:

H1a: The tax aggressiveness, measured by the BTD proxy, positively impacts the future ROA of the companies listed in B3.

H1b: The tax aggressiveness, measured by the BTD proxy, positively impacts the future ROE of the companies listed in B3.

H1c: The tax aggressiveness, measured by the BTD proxy, positively impacts the future EBITDA of the companies listed in B3.

H2a: The tax aggressiveness, measured by the ETR proxy, negatively impacts the future ROA of the companies listed in B3.

H2b: The tax aggressiveness, measured by the ETR proxy, negatively impacts the future ROE of the companies listed in B3.

H2c: The tax aggressiveness, measured by the ETR proxy, negatively impacts the future EBITDA of the companies listed in B3.

Profitability is one of the measures that provides, through past and present performance indices, a basis for the projection of future performance of companies (Martinez & Reinders, 2018). In tax planning, there is the belief that greater tax aggressiveness results in a higher level of profitability, because with tax aggressiveness there is a reduction in the tax cost and maximization of the organization's performance (Katz et al., 2013; Arpini et al., 2020). In this context, the tax burden reduction due to tax aggressiveness increases the company's profitability.

3 METHOLOGY

3.1 Research delimitation

This research presents a quantitative approach, with the objective of empirically analyzing the impact of tax aggressiveness on the profitability of the public traded companies listed in B3 by means of regression technique. As for the objective, it is characterized as descriptive, since it uses a data survey for the statistical analyzes of the selected companies. Also, the procedure of this study is documentary, by collecting data from secondary information from the companies found in the Economatica® database.

The initial sample consists of 352 Brazilian non-financial and non-insurance publicly-traded companies listed in B3. Of this amount, 140 companies were disregarded for not submitting all data every year and, after excluding *the* outliers comments, from the procedures established by the Hadi technique (1994), of the 212 remaining companies, 204 companies remained and 829 observations-year for the analysis, with a time horizon that comprised the years from 2016 to 2020.

The choice for this period reflects the continuation of the similar study of Araújo and Leite Filho (2019), which also analyzed tax aggressiveness and profitability in the Brazilian companies listed in B3 and NYSE in the range from 2010 to 2015. Companies classified in the "Finance" and "Insurance" sectors were withdrawn due to their specific regulations dictated by Banco Central and the Private Insurance Superintendence.

3.2 Identification of variables

The dependent variables on the present study are ROA, ROE and EBITDA; the independent variables of interest represent the BTD and ETR tax aggressiveness measures; and the control variables correspond to the size of the company (SIZE), financial leverage (LEV), corporate governance level (CGL) of the companies and economic sector (SECTOR). Table 1 describes the study variables as well as their calculation methods.

Table 1
Variables used in the study

Variables		Type	Description	Calculation	Source
Profitability	ROA	Dependent	Return on Assets	Net Profit / Total Asset	Gupta and Newberry (1997); Araújo and Leite Filho (2019); Martinez and Reinders (2018); Santos and Oliveira (2020)
	ROE	Dependent	Return on Net Assets	Net Profit / Net Assets	Martinez and Reinders (2018); Santos and Oliveira (2020)
	EBITDA	Dependent	*Earnings Before Interest, Taxes, Depreciation and Amortization*	Profit before taxes and financial expenses + Depreciation + Amortization + Depletion / Total assets	Arpini et al. (2020)
Tax Aggressiveness	BTD	Independent of interest	*Book Tax Difference* total	Profit before income tax – ((IRPJ + CSLL) / 0.34) / Total Assets	Hanlon and Heitzman (2010); Carvalho (2015)
	ETR	Independent of interest	*Effective Tax Rate*	Total expense on IRPJ and CSLL/ Result before IRPJ and CSLL (LAIR)	Hanlon and Heitzman (2010); Araújo and Leite Filho (2019); Martinez and Reinders (2018); Santos and Oliveira (2020)
Company Size	SIZE	Control	Company Size	Logarithm of the total assets at the beginning of the year	Araújo and Leite Filho (2019); Martinez and Reinders (2018); Santos and Oliveira (2020)
Financial Leverage	LEV	Control	Company's Financial Leverage	Long-term debt divided by the total assets of the	Gupta and Newberry (1997); Frank, Lynch and

				previous year	Rego (2009); Araújo and Leite Filho (2019); Santos and Oliveira (2020)
Level of Corporate Governance	CGL	Control	Segment of B3 Listing of the Company	*Dummy* equal to (1) for companies participating in the New Market and (0) for the other companies	Arpini et al. (2020)
Economic Sector	SECTOR	Control	Company's Economic Sector	Reference sector (0), other sectors (1), (2), (3) and successively	Santos and Oliveira (2020)

Source : Research data.

The dependent variables are composed of ROA, ROE and EBITDA. ROA and ROE tend to deliver better results according to the level of tax aggressiveness. While higher tax rates imply lower post-tax performance, this is because income tax negatively affects the returns and cash flows of the organization (Tang, 2005), EBITDA represents a third dependent variable and is intended to observe the performance and flow of pre-tax income cash. It should be noted that the EBITDA variable was relativized to the Total Asset, given the need to convert monetary values to index values. Relativization is made by the Total Asset, as it was considered for the ROA index.

The intensity of tax aggressiveness is measured by BTD *and* ETR *proxies*. BTD represents a controversial result when managers decide to use accounting standards and tax laws in a timely manner (Tang, 2005). Thus, the higher the value of the BTD variable, the higher the level of tax aggressiveness (Chen et al., 2010). The ETR, in turn, allows a proportional view of the impact of taxes paid on profit before taxes. Thus, a low ETR rate means tax aggressiveness higher than a high ETR rate (Martinez, 2017). In order to characterize a company as aggressive, the ETR needs to present values below 34%, i.e. values below the legal tax rate in Brazil (Geblart, 2017).

The control variables of the present study are composed of SIZE, LEV, CGL and SECTOR. The variable SIZE is formed by the logarithm of the Total Asset, in an equivalent way to the studies of Martinez and Martins (2016) and Santos and Oliveira (2020). Due to that, it is a relevant variable to assess if the size of the company influences profitability. LEV was calculated by the ratio between long-term debts by the total asset of the previous financial year, also composing the control variables, according to Martinez and Reinders (2018) and Araújo et al. (2018). Moreover, size and financial leverage may be related to tax aggressiveness, by increasing fixed assets that generate depreciation expenses and increasing debt with financial expenses. As in the study by Arpini et al. (2020), the CGL is one of the control variables, represented by a *dummy* which considers the value equal to 1 for companies belonging to the New Market and 0 for the other companies. Santos and Oliveira (2020) reinforce the importance of the economic sector for the purposes of analyzing tax aggressiveness and profitability, so SECTOR is also a control variable and has the objective of demonstrating if different sectors have different relations of tax aggressiveness and profitability.

3.3 Regression models

Before the literature presented and based on the studies of Araújo et al. (2018) and Santos and Oliveira (2020), the regression models are:

$$ROA_{i,t} = \beta_0 + \beta_1 TAXAGG_{i,t} + \beta_2 TAM_{i,t} + \beta_3 ALAV_{i,t} + \beta_4 NGC_{i,t} + \beta_5 SETOR_{i,t} + \varepsilon_{i,t} \qquad (Equação\ 6)$$

$$ROE_{i,t} = \beta_0 + \beta_1 TAXAGG_{i,t} + \beta_2 TAM_{i,t} + \beta_3 ALAV_{i,t} + \beta_4 NGC_{i,t} + \beta_5 SETOR_{i,t} + \varepsilon_{i,t} \quad (Equação\ 7)$$

$$EBITDA_{i,t} = \beta_0 + \beta_1 TAXAGG_{i,t} + \beta_2 TAM_{i,t} + \beta_3 ALAV_{i,t} + \beta_4 NGC_{i,t} + \beta_5 SETOR_{i,t} + \varepsilon_{i,t} \quad (Equação\ 8)$$

It should be noted that by using two *proxies* to measure tax aggressiveness (TAXAGG), each regression model is estimated twice, once considering the BTD and again considering the ETR. This allows a more complete view of tax aggressiveness, as more than one *proxy* is used.

The descriptive research statistics and *Pearson*'s correlation matrix are considered, and to confirm or not the research hypotheses, multiple regressions are used, with panel data with random and quantitative effects. The *Shapiro-Francia* and *Breusch-Pagan* tests are performed to verify, respectively, the distribution and variance of the residues, and the absence of multicollinearity is verified by the VIF calculation (Ribeiro, 2014).

4 PRESENTATION OF RESULTS

4.1 Descriptive statistics

Table 2 shows the variables adopted in this research, as well as the descriptive statistics of each one. The sample, until then, consisted of 212 companies and totaled 1,060 observations over the period from 2016 to 2020. However, when running the statistical tests, it is noted that *the* outliers observations need to be removed, since they may bias the analysis of the results. Thus, the final sample corresponds to 204 companies and 829 observations-year.

Table 2
Descriptive statistics of variables in the period from 2016 to 2020

Variable		Mean	Median	Standard Deviation	Minimum	Maximum	Observations	
ROA	overall	0.0274250	0.0314991	0.0746839	-0.3641337	0.2450894	N=	829
	between			0.0776994	-0.3388676	0.2130120	n=	204
	within			0.0396167	-0.2021489	0.2528698	T-bar=	4.06373
ROE	overall	0.0880916	0.0873180	0.1550894	-0.6529320	0.7387203	N=	829
	between			0.1489621	-0.6034232	0.7387203	n=	204
	within			0.1033290	-0.4534006	0.5577089	T-bar=	4.06373
EBITDA	overall	0.0944150	0.1007988	0.0752486	-0.1691947	0.3349222	N=	829
	between			0.0734920	-0.1450497	0.2789480	n=	204
	within			0.0405696	-0.0857370	0.3199832	T-bar=	4.06373
BTD	overall	0.0341659	0.0352214	0.0579805	-0.1690266	0.2499635	N=	829
	between			0.0556909	-0.1479082	0.2414683	n=	204
	within			0.0350679	-0.1486933	0.1880520	T-bar=	4.06373
ETR	overall	0.1167712	0.1318542	0.1945020	-0.6933160	0.8288257	N=	829
	between			0.1446526	-0.4361561	0.5182253	n=	204
	within			0.1433299	-0.5293156	0.8172786	T-bar=	4.06373
SIZE	overall	15.2514300	15.2593000	1.7736620	10.5666900	20.7106100	N=	829
	between			1.7895000	10.6268700	20.5950100	n=	204
	within			0.2310106	13.6228300	16.5049300	T-bar=	4.06373
LEV	overall	1.4771630	1.4903610	1.8962870	-5.4702370	9.0203650	N=	829
	between			1.5598920	-4.4716490	7.0635050	n=	204
	within			1.4202010	-4.4599520	8.2695780	T-bar=	4.06373

Source: Research data (2021).

According to Table 2, it is observed that among the dependent variables, ROA presents the lowest rate of return (2.74%), while ROE and EBITDA present close values (8.81% and 9.44%,

respectively). It is important to point out that both ROA and EBITDA are relative to the total asset, that is, the discrepancy between these returns is not caused by the total asset, since they share it.

As for the independent variables, BTD has a positive mean in the selected sample. For each real of total assets, 0.034166 cents of positive difference is generated between accounting profit and tax profit. Therefore, it is possible to state that the companies' accounting profit, on average, is greater than the tax profit, which may be a sign of tax aggressiveness. Regarding ETR, it is observed that the mean of 11.68% is well below the tax burden of 34%. This result is an indication of the presence of tax aggressiveness in B3 companies, because a low ETR rate means greater tax aggressiveness (Martinez, 2017).

For the control variables, the variable size has a mean of 15.25143, a value very close to its median. The variable leverage, in turn, shows a mean of 1.477163. About the qualitative variables, 118 companies belong to the New Market and the sectors of electricity with 22 companies, of construction with 20 companies and textile with 18 companies stand out.

4.2 Regression analysis

At this stage of the study, multiple regression analyzes with panel data are presented. Linear regression models are estimated by the Ordinary Least Squares (OLS) method, which means that the intercept and angular coefficients are determined so that the sum of the residue squares results in the lowest possible representation (Fávero & Belfiore, 2017).

The *Chow*, *Lagrangian Multiplier* of *Breusch-Pagan* and *Hausman* tests are performed to verify which multiple regression model is the most indicated among the POLS, fixed effects and random effects. The *Chow* test rejects H0 (p-value lower than 0.05), i.e. between fixed effects and POLS, the fixed effects model is the most appropriate. In the *Breusch-Pagan LM* test, the comparison between POLS and random effects also rejects H0 (p-value lower than 0.05) and then indicates this as the most appropriate. In the *Hausman* test, between the fixed and random effects models, the test suggests that the fixed effects model is the most indicated (p-value lower than 0.05).

However, the model of fixed effects does not indicate the estimates of the marginal coefficients and effects of variables that are invariant over time, as the model of random effects reports (Ribeiro, 2014). In view of the above, the results of Table 2 show predominance of variation *between* in the standard deviation of all variables in relation to the variations *within*, therefore the model of random effects is adopted in this research.

In order to identify if the residues follow normal distribution and show constant variance, the *Shapiro-Francia* and *Breusch-Pagan* tests, which reject the null hypothesis (p-values lower than 0.05), are applied. Thus, in order to minimize the heteroscedasticity, the regression models are estimated with robust standard errors with grouping by individual, i.e. with robust standard errors *clustered* by company. In the VIFs calculation, there is no evidence of multicollinearity among the explanatory variables, since all of them present results below 4 and a total mean of 1.11 (Fávero & Belfiore, 2017).

In the sequence, the *Pearson*'s Correlation Matrix is performed, which demonstrates the statistically significant correlations at 5% among the variables. Since all the explanatory variables have a correlation lower than 0.70, it is observed that there is no autocorrelation between the independent and control variables, as it can be seen in Table 3.

In Table 3, significant positive correlations can be observed between the variables of profitability and tax aggressiveness. These correlations demonstrate evidence of higher profitability related to tax aggressiveness, because, according to Tang (2005), income tax

negatively affects the returns and cash flows of the organization. BTD and ETR have a correlation, since these measures have a similarity of measurement, despite presenting different interpretations (Geblart, 2017). The negative correlation between the two measures is expected (-0.2594), due to the high level of BTD associated with the low level of ETR, which indicates the occurrence of tax aggressiveness (Chen et al., 2010).

Table 3
***Pearson* Correlation Matrix**

	ROA	ROE	EBITDA	BTD	ETR	SIZE	LEV	CGL	SECTOR
ROA	1.0000								
ROE	0.5043*	1.0000							
EBITDA	0.7598*	0.5368*	1.0000						
BTD	0.5588*	0.3233*	0.6893*	1.0000					
ETR	0.2465*	0.2174*	0.1775*	-0.2594*	1.0000				
SIZE	0.1943*	0.0881*	0.2329*	0.2133*	-0.0079	1.0000			
LEV	0.2904*	0.2474*	0.0946*	-0.0581	0.2916*	0.0405	1.0000		
CGL	0.0909*	0.0080	0.0911*	0.0751*	-0.0405	0.2003*	0.0538	1.0000	
SECTOR	-0.0174	0.0104	0.0776*	0.0237	0.0154	-0.1754*	-0.0780*	-0.1237*	1.0000

Note: *Significance at 5% level (p-value < 0.05).
Source : Research data (2021).

On the control variables, the correlations among profitability and size, leverage and corporate governance level are positive. Thus, it is stated that large companies, with greater financial leverage and participants in the new market, on average, have higher rates of profitability. However, it should be noted that the correlation between ROE and CGL does not present significance, and hence, companies belonging to the New Market of B3 do not provide a relationship with the return on shareholders. The sector variable only shows significance in the correlation with EBITDA, which represents the operational return.

When analyzing the correlation between the variables of tax aggressiveness and the control variables, the positive relationship of size and belonging to the segment of the New Market of B3, with the BTD measure, stands out. This result can be an indication that in such companies there is the use of tax-deductible expenses on income, and the value of accounting profit is greater than the tax profit. Highlight is the positive and significant relationship between financial leverage and the ETR measure, in which long-term indebted companies have a higher effective rate of tax paid.

In the multiple regression analysis with panel data, shown in Table 4, the mean functions of each variable and *cross-sections* are verified over the time of each model proposed in this study. The panel analysis approach provides several advantages, such as greater amounts of data and degrees of freedom, greater efficiency in measuring estimation and lower volume of problems with identification (Ribeiro, 2014).

Table 4
Multiple regressions results (OLS)

	Dependent Variables		
Independent and Control variables	**ROA**	**ROE**	**EBITDA**
BTD	0.7643961***	0.8880974***	0.8903947***
ETR	0.1094252***	0.1709381***	0.1170171***
SIZE	0.0027653	-0.0031716	0.0037807**
LEV	0.0053572***	0.0220109***	0.0014117
CGL	0.0056635	-0.0079749	0.0067966

SECTOR	-0.0001829	0.0014184	0.001257***
R^2	0.6552	0.0787	0.7082
Observations		829	

Note. ***Significance at 1% level; **at 5% level and *at 10% level.
Source: Research data (2021).

Table 4 shows that the independent variables BTD and ETR have a positive and statistically significant relationship at the level of 1% for all the dependent variables, so hypothesis *H1a*, *H1b* and *H1c* are confirmed. In other words, it is observed that there is a positive and significant relationship between tax aggressiveness and profitability when analyzed from the point of view of the companies' aggressive attitudes by the difference between accounting and tax profits; this aspect generates a return to investments for shareholders and for the companies' operational activity.

In the tax aggressiveness measured by the *ETR proxy* (effective tax rate paid), a negative relationship was expected, since companies that collect fewer effective taxes offer higher cash flows and, consequently, are more profitable. As the coefficients are positive, the hypothesis *H2a*, *H2b* and *H2C* are rejected, since the results suggest that the increase in ETR is associated with the increase in profitability, that is, that companies paying more taxes have higher profitability.

Financial leverage is in line with the ROA and ROE variables. That is, for each real investment in assets and shareholder return, financial leverage also increases by 0.005 and 0.022 cents, respectively. EBITDA, in turn, presents statistically significant results at the level of 1% in SECTOR variable and at the level of 5% in the SIZE variable, which diverges from the other profitability measures.

Additional tests are performed by means of quantile regressions to confirm the results found. Quantile regression is a technique that considers estimates for conditioned quintile functions and, thus, makes a more robust evaluation of the effects of explanatory variables on dependent variables (Ferreira, Coneglian, Carmo & Ribeiro, 2020), the models of this study are also estimated by the Minimum Absolute Error (MEA) method using quintiles 0.10, 0.25, 0.50, 0.75 and 0.90 (Table 5). Also, according to Santos and Oliveira (2020), this method has as its advantage to solve heteroscedasticity problems in the variables.

Table 5
Quantile regressions result (MEA)

Dependent Variable ROA	**Q10**	**Q25**	**Q50**	**Q75**	**Q90**
BTD	0.87374049***	0.86401021***	0.87731745***	0.90041952***	0.86530568***
	0.08018376	0.03563816	0.02247396	0.03154448	0.04875606
	0.0000	0.0000	0.0000	0.0000	0.0000
ETR	0.17419217***	0.14620842***	0.11508549***	0.10869826***	0.11541292***
	0.02434802	0.01082163	0.00682428	0.00957857	0.01480491
	0.0000	0.0000	0.0000	0.0000	0.0000
Dependent Variable ROE					
BTD	1.6930019***	1.4913614***	1.3507731***	1.0306931***	0.41593894*
	0.22058148	0.04882929	0.03404327	0.08401795	0.22771149
	0.0000	0.0000	0.0000	0.0000	0.0681
ETR	0.27106837***	0.21616768***	0.16849226***	0.17356462***	0.19108362***
	0.06698018	0.01482715	0.01033733	0.02551228	0.06914522
	0.0000	0.0001	0.0000	0.0000	0.0058
Dependent Variable EBITDA					
BTD	0.99286445***	1.0404438***	1.0126298***	1.0003304***	0.9163662***
	0.05288689	0.02243087	0.02489509	0.04266084	0.06947677
	0.0000	0.0000	0.0000	0.0000	0.0000
ETR	0.10135509***	0.1469456***	0.16043183***	0.15579044***	0.19449808***
	0.01605925	0.0068112	0.00755946	0.01295408	0.02109681

	0.0000	0.0000	0.0000	0.0000	0.0000

Note. Q10 = Quintile 10; Q25 = Quintile 25; Q50 = Quintile 50; Q75 = Quintile 75; Q90 = Quintile 90.
***Significance at 1% level; **at 5% level and *at 10% level.
Source : Research data (2021).

The independent variable of interest BTD presents results similar to those already observed in the multiple regression method, the difference is in the Q90 of the ROE with a statistically significant value at the level of 10%. This same dependent variable obtained a statistically significant value at the level of 1% by the multiple regression model. Thus, the hypotheses *H1a*, *H1b* and *H1c* are still confirmed by the significance of the coefficients and positive sign representing a positive relationship between tax aggressiveness and profitability. The results are similar to Tang (2005), Araújo et al. (2018) and Santos and Oliveira (2020).

Regarding ETR, the variable presents statistical significance at the level of 1% and positive coefficient for all the dependent variables, as well as in OLS estimation. This fact confirms the rejections of the research hypotheses *H2a*, *H2b* and *H2C,* in which it is suggested that the companies analyzed carry out tax planning to pay their tax over profit. These results are in line with the research by Martinez and Reinders (2018), who did not find a significant relationship between aggressive tax planning and profitability, and Gupta e Newberry (1997), Chen et al. (2010) and Katz et al. (2013), which showed a positive relationship between ETR and ROA. On the other hand, the evidence is in line with the studies of Tang (2005) and Desai and Dharmapala (2006), which also identified a significant and negative statistical relationship between *the ETR proxy* and profitability.

5 CONCLUSION

This research aimed to analyze the impact of tax aggressiveness on the profitability of the public traded companies listed in B3 in the period from 2016 to 2020, using multiple and quantile regression techniques. The variables ROA, ROE and EBITDA were used as profitability *proxies* and the variables BTD and ETR as tax aggressiveness *proxies*, with all the information collected in the Economatica® database.

In general, by means of multiple analysis, the results found are discrepant to those of Santos and Oliveira (2020). The variable tax aggressiveness, measured by the difference between accounting and fiscal profit (BTD), shows a positive impact on profitability, i.e., more aggressive companies from a tax standpoint have higher profitability. However, from the ETR perspective, this result is not confirmed, since the evidence indicated that tax aggressiveness, measured by the effective tax rate paid, results in lower profitability. This confirmation occurs through the quantile analyzes and, again, by BTD, ROA, ROE and EBITDA show higher values when the companies are more aggressive from a tax standpoint and, then, the hypotheses *H1a*, *H1b* and *H1c* are confirmed. Whereas the ETR does not support the same conclusion, therefore the hypothesis *H2a*, *H2b* and *H2C* are rejected.

Therefore, it is concluded that companies benefit from tax aggressiveness, from the point of view of the difference between accounting and fiscal profit, in order to generate greater profitability. By the BTD metric, this study confirms the positive impact of tax aggressiveness on profitability, similar to the studies of Tang (2005), Araújo et al. (2018) and Santos and Oliveira (2020), and by the ETR metric, it is similar to the results of Araújo and Leite Filho (2019) and Santos and Oliveira (2020) and differs from the results of Martinez and Reinders (2018), who did not find a significant relationship between fiscal aggressiveness and profitability.

Among the practical implications, since the companies carry out tax planning to make investments and meet the stakeholders' expectations, this research contributes to the managerial decision making related to the aggressive tax planning of B3 companies, specifically with a view to achieving greater profitability, by increasing resources, investment possibilities and return to the shareholders. On the other hand, as a theoretical implication, the study advances in the accounting and financial literature when addressing elements of the financial statements, as well as for the literature on tax planning in the context of tax aggressiveness, focused on the ability of companies to reduce their tax burden.

Since tax planning aims to maximize the return to shareholders with the use of legal practices (Frank, Lynch & Rego, 2009), the present study also contributes to the Owner Theory, because it has the owner in the main position, claims that decisions must meet the owners' interests.

However, some limitations stand out. The use of the same database can conclude different statements biased by different *proxies*. This occurs because, even if they refer to the same study object, the forms of measurement among the *proxies* are unequal. Another limitation is the choice of the aggressiveness variables BTD and ETR, which may interfere with the findings in comparison to related studies. Moreover, regarding the database, only companies with ordinary shares (ON) participated in the research. Companies in the "Finance" and "Insurance" sector were excluded because they have their own regulations. It is also necessary to point out that the initial sample is balanced and excludes *outliers*, in a way that the results would be several cases included.

As future studies it is suggested to observe the impact of tax aggressiveness on different financial indices, or even to evaluate the differences among tax aggressiveness *proxies*, in order to understand which best applies to the Brazilian context, because it is necessary to reflect on the particularities of each country. For example, while companies in Brazil adopt the legal code law regime, the Americans adopt the common law, which ends up resulting in a higher demand from shareholders and tax authorities, regarding the credibility of the information disclosed in these reports compared to those (Araújo & Leite Filho, 2018).

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