ORIGINAL ARTICLE

Tax installment plans as a determinant of tax aggressiveness in Brazilian listed companies

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ABSTRACT

The aim of this article was to study the impact of tax installment plans on the tax aggressiveness of Brazilian listed companies. Despite the relevance and timeliness of the topic, there are no studies that examine the use of special tax installment plans as a determinant of the tax aggressiveness of Brazilian listed companies. Tax installment plans have been used repeatedly by Brazilian companies and the number of adherents has grown significantly over time, where this resource can be understood by companies from the perspectives of tax regularization and tax savings. The research contributes to the scientific knowledge on the subject by providing evidence on the determinants of tax aggressiveness, and it is believed that the government can use the results to improve the offer of tax installment plans and the understanding of tax legislation, such as through the development of restrictions on access to installment plans, by allocating them to companies in real financial difficulties, as well as through improvements in its inspection process, considering that companies that pay taxes in installments are more tax aggressive. The data were obtained from explanatory notes, through the Ministry of the Economy's access to information service, and from the Economatica® database. The Special Tax Regularization Program (PERT) 2017 was used as a reference for tax installment plans, and tax aggressiveness was measured using the effective tax rate (ETR), ETR Cash, and book tax difference (BTD). The period analyzed is from 2017 to 2020, and the statistical method applied was multiple linear regression for panel data with random effects. The results show that companies that choose to pay their taxes in installments tend to take a more aggressive tax position. The evidence contributes to extending the theory of the determinants of tax aggressiveness and can help the government in its inspections and in improving tax installment offers and tax benefits.

Keywords: tax installments, tax aggressiveness, tax avoidance, tax planning, PERT.

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1. INTRODUCTION

In the current context, tax aggressiveness (also known as tax avoidance and related to tax planning) represents management aimed at reducing taxable income through tax-saving measures, which may be legal or illegal (Dyreng et al., 2008; Guenther et al., 2017; Hanlon & Heitzman, 2010). For this reason, tax aggressiveness makes it possible to measure an organization's propensity to avoid or minimize different types of tax expenditures (Chen et al., 2010; Hanlon & Heitzman, 2010; Martinez, 2017).

The determinants of tax aggressiveness have been identified in international and national literature. It is already known, for example: that a greater concentration of control in the organization makes it less aggressive (Chen et al., 2010; Martinez & Cerize, 2020); that by using the tax services of their auditors, companies tend to achieve tax savings by presenting a lower effective tax rate (Santos et al., 2021); that the size of the firm is related to its tax aggressiveness (Balakrishke et al., 2019; Lisowsen et al., 2021), 2021); that the structure of the organization, whether family-owned or not, interferes with tax aggressiveness practices (Chen et al., 2010; Martinez & Ramalho, 2014); and that tax enforcement can reduce the tax aggressiveness of organizations (Atwood et al., 2012; Hoopes et al., 2012).

Regarding the payment of taxes, even though it is a legal obligation, organizations can fail to do it for various reasons, such as financial difficulties, resulting in tax debts. These debts are detrimental to the public treasury because they jeopardize the collection of taxes and, consequently, public policies. For this reason, the government uses tax installment plans to increase its revenue and offer companies the opportunity to pay their debts (Receita Federal do Brasil [RFB], 2017).

Installment payment plans are a benefit offered to organizations that allows them to pay in years what should be paid in months, at rates below those practiced in the market (Lima et al., 2017) and, in many cases, with a significant reduction in interest and fines. The Special Tax Regularization Program (PERT), which is the subject of this study, created by Provisional Measure No. 783/2017, converted into Law No. 13,496 of October 24, 2017, fits these characteristics, as it offered discounts totaling almost 12 billion reais on the 1,000 largest installed values alone (Severiano, 2020), covering debts due by April 30, 2017 and those under administrative or judicial discussion, all of which fall under the jurisdiction of the federal government. Castro (2001) argues that paying in installments can be a decisive practice for company

tax savings, since tax aggressiveness aims to reduce the organization's tax burden, whether by reducing, evading, or deferring taxation.

When analyzing the topic, it is already known, for example, that companies that pay their taxes in installments tend to have a greater distribution of dividends and an increase in their market value (Campagnoni & Ruiz, 2020). As for the company insolvency, installment payment plans do not help to improve it and even have a negative impact on the ability of companies to pay their debts (Borges & Rech, 2021).

In the United States, the more tax amnesties the government grants, the more tax aggressive companies are (Shevlin et al., 2017). In Brazil, Gomes (2020) found that companies that pay their taxes in installments are twice as likely to be tax evasive.

Although the option of installments/tax amnesty programs may be directly related to tax aggressiveness, studies have tended to examine the relationship between tax installments and indirect financing (Lima et al., 2017; Plutarco, 2012), capital structure (Segura et al., 2012) and taxpayer behavior (Gomes, 2020; Paes, 2012; RFB, 2017). There is, therefore, a lack of studies that examine the topic in conjunction with tax aggressiveness in the Brazilian scenario.

Installment payment plans can generate positive margins and added value for companies (Rezende, 2014). Therefore, opting for an installment plan can be a crucial measure for company tax savings, as it allows firms the opportunity to defer paying tax.

Based on this context, this study seeks to answer the following research question: What is the influence of tax installment plans on the tax aggressiveness of Brazilian listed companies? In this sense, the research aims to examine the impact of tax installment plans on the tax aggressiveness of Brazilian listed companies.

The justification for this study is based on the need and relevance of understanding tax aggressiveness from different perspectives, as motivated by Hanlon and Heitzman (2010), Martinez (2017), and Wang et al. (2019), and to extend the evidence brought by the studies of Borges and Rech (2021), Campagnoni and Ruiz (2020), Gomes (2020), Rezende (2014), and Shevlin et al. (2017) in the direction of understanding how tax installment plans affect the tax aggressiveness of Brazilian listed companies.

The sample consisted of 257 companies, of which 87 (34%) had opted for the special installment plan and 170 had not. The data needed to determine the dependent

variables [effective tax rate (ETR), ETR Cash, and book tax difference (BTD)], independent variable of interest (PERT 2017), and independent control variables, were collected from explanatory notes, through the Ministry of the Economy's access to information service, and from the Economatica® database. The period analyzed was from 2017 to 2020, and the statistical method applied to test the hypothesis was multiple linear regression for panel data with random effects. The results show that companies that decided to pay their taxes in installments tend to take a more aggressive tax position. The evidence contributes to extending the theory of the determinants of tax aggressiveness and can help the government in its inspections and in improving tax installment offers and tax benefits.

2. LITERATURE REVIEW

2.1 Tax Aggressiveness

For Dyreng et al. (2008), Hanlon and Heitzman (2010), and Lampenius et al. (2021), tax aggressiveness is a form of explicit tax reduction that can be characterized as legal or not. Dyreng et al. (2008) emphasize that it does not necessarily mean that companies are engaged in something illegal. Therefore, tax aggressiveness includes both legal and illegal tax positions that may or may not be challenged by tax authorities and other stakeholders in the company.

At the Brazilian level, the literature (Gomes, 2020; Marinho et al., 2022; Martinez, 2017; Martinez & Cerize, 2020) argues that there is a latent need to examine tax behavior due to the government's growing demand for tax revenue and that there is no concise definition of tax planning in Brazilian legislation, whether abusive or not. For this reason, it is not easy to identify what is valid for the reduction, deferral, or avoidance of tax (tax aggressiveness) (Lietz, 2013). Even empirical tax research in accounting does not have a uniform definition of the constructs often studied as "tax avoidance" or "tax aggressiveness" (Guenther et al., 2021; Hanlon & Heitzman, 2010; Martinez, 2017).

The measurement of tax savings (tax aggressiveness) has been addressed in different ways and by different authors (Hartmann & Martinez, 2020; Martinez & Silva, 2019; Motta & Martinez, 2020). A review carried out by Shackelford and Shevlin (2001) addressed different ways of measuring degrees of tax planning, and over the years other measures have been developed, mostly using explicit taxes, i.e., those easily identified in the financial statements and applied to the company's taxable income (Lampenius et al., 2021).

National and international literature has examined the factors that explain the tax aggressiveness of companies. Table 1 presents a selection of the determinants studied, a summary of the results obtained, and the corresponding references.

Table 1
Determinants of tax aggressiveness

Determinant	Main result	References
Company size	Company size (usually measured by the natural logarithm of assets) is positively related to tax aggressiveness.	Atwood et al. (2012); Martinez (2017); Shevlin et al. (2017); Silva (2016); Wilson (2009).
Leverage	Leverage can both encourage and discourage aggressive tax practices.	Atwood et al. (2012); Mocanu et al. (2020); Rezende et al. (2018); Wilson (2009).
Return on assets	The return on the amount invested can both encourage and discourage tax aggressiveness.	Atwood et al. (2012); Marinho et al. (2022); Martinez & Cerize (2020); Mocanu et al. (2020).
BIG 4 audit	The company appears less aggressive when audited by a BIG 4.	Gaaya et al. (2017); Hartmann & Martinez (2020); Marinho et al. (2022).
Hiring of tax services	The use of the tax services offered by audit firms has a positive impact on the tax aggressiveness of the hiring companies.	Santos et al. (2021).
Organizational life cycle	Whether organizations are in an early or advanced stage of their organizational life cycle positively affects their tax aggressiveness.	Silva (2016).

Table 1
Cont.

Determinant	Main result	References
Inspection activities	More effective enforcement has a negative impact on tax aggressiveness.	Atwood et al. (2012); Hoopes et al. (2012); Kubick et al. (2016).
Tax amnesties	The repeated tax amnesties offered by the government have a positive impact on tax aggressiveness.	Ross & Buckwalter (2013); Shevlin et al. (2017).
Sector, geographic region, and tax assessment	The economic sector, geographic region, and whether the company has already been fined determine its tax aggressiveness.	Mocanu et al. (2020); Rezende et al. (2018); Santos et al. (2021).

Source: *Prepared by the authors.*

The various determinants of tax aggressiveness include those that have been used in virtually all research dedicated to understanding the factors that make companies more tax aggressive, such as size, leverage, and return on assets (ROA). Therefore, it can be said that these factors are already consolidated in the tax aggressiveness literature (Wang et al., 2019).

The size of the company is related to its tax structure for several reasons: larger companies have more resources to hire services specialized in tax savings and can exercise greater lobbying power over regulations; they also have more complex operations and, consequently, due to their higher turnover, they have higher taxation and, therefore, a greater need to engage in tax savings (Atwood et al., 2012; Lisowsky, 2010; Martinez, 2017; Shevlin et al., 2017; Silva, 2016; Wilson, 2009).

With respect to leverage, research has shown that it affects tax aggressiveness in different ways: the company can use the resources saved from taxes to avoid having to raise capital from third parties, or it can be more leveraged when practicing tax aggressiveness, for example, by using financial expenses to reduce the basis for calculating taxes on profits (Atwood et al., 2012; Mocanu et al., 2020; Rezende et al., 2018; Wilson, 2009).

In terms of return on investment, more aggressive companies may have lower returns on their assets, and conversely, higher performing companies may be encouraged to be tax aggressive due to the relevant representation of taxes in the cost structure of their operations, which may even harm the business environment (Atwood et al., 2012; Marinho et al., 2022; Martinez & Cerize, 2020; Mocanu et al., 2020).

Finally, there are several studies that have attempted to understand the determinants of tax aggressiveness, even in a similar vein as this study, such as Mattos (2017), Mocanu et al. (2020) and Shevlin et al. (2017), but with different methodologies, scenarios, and objectives. Therefore, this study aims to broaden the discussion by investigating another determinant of tax aggressiveness. In the following subsection, a new possible predictor variable of tax aggressiveness is presented and proposed, namely tax installment plans.

2.2 Tax Installment Plans and Tax Aggressiveness

Tax installment plans are a practice that allows taxpayers to settle their tax debts. At the same time, it favors the public treasury through the collection of taxes that were previously in arrears; therefore, it aims to stimulate economic activity by increasing collection in the short term and settling tax debts (RFB, 2017).

According to art. 151, item VI, of the National Tax Code (CTN), tax installment plans can only be established by a specific law, as also mentioned in art. 155-A (Law No. 5,172 of October 25, 1966), and apply to all federal entities (the Union, states, municipalities, and the Federal District). It should be noted that, for the purposes of this study, the installment system addressed will be the federal one, in order to be more consistent with the metrics used to measure and study tax aggressiveness.

There are two types of federal tax installment plans: special and conventional. The special installment plan is intended for specific situations and has a deadline for joining, as is the case with PERT. Conventional installment plans, established by Law No. 10,522 of July 19, 2002, are available to taxpayers throughout the year for normal situations.

Lima (2005) reports that tax installment plans represent a significant innovation in the alternatives offered to taxpayers for tax regularization since the emergence of the Brazilian state. The number of adherents has increased significantly and new programs have been launched frequently in Brazil (Paes, 2012).

For example, in the last 18 years, almost 40 special tax installment programs have been created, all of which provide for significant reductions in the fines, interest,

and legal fees that taxpayers must pay when they are registered as tax debtors. They also offer significantly longer payment terms and the possibility of settling the debt with credits from tax losses and negative Social Contribution on Net Profit (CSLL) calculation bases (RFB, 2017). Table 2 shows the programs for installment payment of federal debts that had the highest number of adherents up to the date of this study.

Table 2

Installment plans with the highest number of adherents

Normative act	Benefit	No. of adherents
REFIS – Law No. 9,964 of April 10, 2000	Unlimited period for payment and amortization of fines and interest with credits from tax losses and negative CSLL calculation bases.	129,000
PAES – Law No. 10,684 of May 30, 2003	A 180-month deadline to pay off debts and a 50% reduction in fines.	282,000
Crisis REFIS – Law No. 11,941 of May 27, 2009	14 payment methods with a 60-100% reduction in fines and 45-25% reduction in late payment interest. Tax losses and negative CSLL calculation bases can be used. This program has been reopened four times.	1,012,156 on its launch and four reopenings
PERT – Law No. 13,496 of October 24, 2017	A minimum of 20% discount when paying the debt in cash, in five installments, with the right to use tax losses and negative CSLL bases or other tax credits; or 120 installments, but without reductions/withdrawals on certain dates, with the right to a discount of up to 90% on interest and 70% on fines.	443,000

CSLL = Social Contribution on Net Profit; PAES = Special Installment Plan; PERT = Special Tax Regularization Program; REFIS = Tax Recovery Program.
Source: *Prepared by the authors and adapted from the Brazilian Federal Revenue Service (RFB, 2017).*

As shown in Table 2, the number of adherents to installment plans is significant, and their advantages, such as longer terms, a high percentage reduction in fines, and the use of tax losses to reduce the outstanding balance, make them even more attractive.

Among the installment plans introduced, PERT 2017 offered discounts totaling almost 12 billion reais on the 1,000 largest installed values alone (Severiano, 2020). It covered debts that were due by April 30, 2017, as well as those that were under administrative or judicial discussion, all of which fall under the jurisdiction of the federal government.

The significant number of offers and adherents to these programs has had a negative impact on taxpayer behavior and tax collection (Paes, 2012; RFB, 2017). The RFB has verified a culture and incentive for taxpayers not to pay their taxes due to the expectation of a new tax installment plan. Thus, in an opportunistic way, companies have shown a behavioral culture of defaulting on the installment program itself, waiting for another one to come, deferring their debts, and gaining financial respite (RFB, 2017).

Severiano (2020) argues that although PERT 2017 was designed for companies in financial difficulties, many abuse the benefit. The author comments that the installment plan has a negative impact on the country's tax collection and, therefore, society is harmed by this situation because its social well-being is compromised.

The importance of understanding the causes and consequences of tax installment plans is recognized by scholars, and research on the topic has gained ground in recent years. For example, Campagnoni and Ruiz (2020) examined the characteristics of companies that apply for tax waivers in Brazil and found that those that opted for tax installment plans pay more dividends and have a higher market value than others. On the other hand, Gomes (2020) found that companies that opt for special installment plans are twice as likely to be tax noncompliant as those that do not, i.e. they can be more tax aggressive.

Plutarco (2012) evaluated the possible tactical behavior of Brazilian taxpayers with respect to taxes owed, given the need for financial resources in productive activities. The author found evidence that instead of turning to the banking system to finance their operational activities, companies prefer to take advantage of low interest rates on overdue taxes and the slowness of the tax authorities in resolving tax claims. In this sense, Rezende et al. (2018) explained that tax installment plans have lower costs than those obtained in the private market, in addition to relevant time offers to pay taxes, reduced interest and, in some cases, the waiver of fines.

Borges and Rech (2021), when examining the effectiveness of tax installment plans for the solvency of Brazilian listed companies, concluded that the installment plans fail in terms of their real purpose of "saving companies and offering benefits to society." The study shows that companies in financial difficulties that adhered to PERT did not reduce their risk of insolvency, and that this benefit favors companies that are in a better economic situation and causes less capacity for them to pay their debts.

Regarding tax debts, Marcello Correa (globo.com, 2019) reports an increase of 84% from 2013 to 2019, according to the Attorney General's Office of the National Treasury (PGFN). The main justifications for this statistic are the slowness of justice in adjudicating tax cases, the lack of assets, and the bankruptcy presented by Brazilian companies (UOL Economia, 2019). This context suggests that companies adhere to installment plans because they really need to, and not just out of opportunism or the search for tax savings.

The approaches of Lima et al. (2017), Plutarco (2012), and Rezende et al. (2018) yielded results in a common direction: the use of tax installment plans as a source of fundraising and indirect financing, using tax authority resources instead of equity or third party capital. A possible form of tax aggression is thus adopted: tax deferral. Ross and Buckwalter (2013) revealed that special tax installment plans alter taxpayers' perceptions of the likelihood of being audited, leading to an increase in tax aggressiveness after adhesion. Thus, in addition to deferring taxes and then paying them in installments, the organization is freed from the attention of the tax authorities because, by adhering to the installment plan, it is "up to date" with its obligations and is motivated to aggressively seek tax savings in its transactions.

In this context, Shevlin et al. (2017) examined the amnesties offered by the U.S. government and tax aggressiveness. The authors put tax aggressiveness in the context of the waiving of fines for late tax payments (amnesties) and found evidence that, as tax amnesty programs are repeated, the level of tax aggressiveness of American companies increases.

When applying tax installment plans to the understanding of the Allingham and Sandmo (1972) model, it can be inferred that tax aggressiveness and installment plans have a positive relationship, just like the amnesties and tax aggressiveness cited by Shevlin et al. (2017). This reflects the offer to release resources to the entity and also the possibility of regularization at a considerably low cost, as already shown by Lima et al. (2017), Plutarco (2012), and Rezende et al. (2018). Allingham and Sandmo (1972) and Castro (2001) show that aggressive tax planning is characterized by the pursuit of three basic objectives: (i) to prevent the tax liability from materializing with the occurrence of the taxable event; (ii) to reduce the amount payable by reducing its calculation basis or rate; and (iii) to defer the time of payment of the tax. In summary, it is argued that the decision to use the installment plan is to take advantage of the third feature, the deferral of payment.

Research on the topic has treated tax benefits (for this study, PERT is emphasized) as tax aggressiveness itself, such as that of Rezende et al. (2018). However, the empirical relationship between installment plans and tax aggressiveness remains to be tested, given that companies with different characteristics have resorted to this benefit for different purposes, as pointed out by Téo Takar in UOL Economia (2019) and seen in the studies of Borges and Rech (2021), Lima et al. (2017), and Rezende et al. (2018). Thus, the use of tax benefits has signaled positive (Rezende, 2014) and neutral (Borges & Rech, 2021) results in organizations, explaining the tax behavior of taxpayers (Gomes, 2020; Shevlin et al., 2017) by assuming that tax forgiveness encourages companies to be tax aggressive (Ross & Buckwalter, 2013).

Taxation is something that influences the decisions of organizations (Rezende, 2014), and studies that make this observation try to evaluate how this occurs. Therefore, paying taxes in installments may be an explanatory feature of tax aggressive companies.

Thus, it is believed that companies that opt for special tax installment plans tend to be more aggressive than those that do not. It is expected that the firm's decision to pay its taxes in installments is related to its tax profile, as companies may see the special tax installment plan as a relevant alternative for deferring tax payments. As a result, they may obtain financial leeway and also use the value of the resources that would have gone to the public treasury as indirect financing, as pointed out by Lima et al. (2017).

By considering the literature reviewed in this subtopic, with a focus on Allingham and Sandmo (1972), Gomes (2020), Ross and Buckwalter (2013), and Shevlin et al. (2017), the research hypothesis is established:

H_1: Tax installment plans have a positive impact on the tax aggressiveness of Brazilian listed companies.

3. METHODOLOGICAL PROCEDURES

3.1 Sample and Data Collection

The sample for this research consists of all the non-financial companies listed on the *Brasil, Bolsa, Balcão* (B3), which totaled 329 in July 2021. Financial companies were not considered because they have a specific accounting and tax treatment compared to the others, which makes it impossible to generalize the analyses (Marchesi & Zanoteli, 2020; Martinez & Martins, 2016; Santos et al., 2021).

The financial years from 2017 to 2020 were set as the research period. The first year coincides with the creation of PERT, and the final year (2020) was the last with data available for collection at the time of the research. This installment plan was chosen for its relevance, as it was the largest in terms of number of adherents at the time

of this study, and because it involves federal taxes, which are included in the main proxies for tax aggressiveness established in the literature (Chen et al., 2010; Guenther et al., 2021; Hanlon & Heitzman, 2010; Hoopes et al., 2012; Lee, 2021; Lennox et al., 2013; Rezende et al., 2018; Shevlin et al., 2017; Wang et al., 2019).

It should be noted that 72 companies had to be excluded from the 329 initially planned due to the lack of information on the research variables or because they offered their shares to the market after 2017. The final sample therefore consists of 257 companies. Table 3 shows the distribution of these companies by economic sector (according to Economatica®) in their total number and separated into those that adhered to PERT 2017 and those that did not, at the federal and non-social security levels.

Table 3
Sample companies by economic sector

Sector	Total companies	Adherents to PERT 2017	% of adherents	Non-adherents to PERT 2017	% of non-adherents
Industrial goods	47	18	38	29	62
Communications	4	2	50	2	50
Cyclical consumption	69	17	25	52	75
Non-cyclical consumption	19	12	63	7	37
Basic materials	28	14	50	14	50
Others	16	0	0	16	100
Oil, gas, and biofuels	9	3	33	6	67
Health	13	5	38	8	62
Information technology	6	3	50	3	50
Public utilities	46	13	28	33	72
Total	257	87	34	170	66

PERT = Special Tax Regularization Program.
Source: *Prepared by the authors.*

The data were obtained through the Citizens Information Service (SIC) – Ministry of the Economy – RFB and collected from the websites of the Securities

and Exchange Commission (CVM), B3, Economatica®, and the notes to the financial statements published by the respective companies.

3.2 Econometric Model and Statistical Approach

In order to test the research hypothesis that Brazilian listed companies that adhered to PERT are more tax aggressive than those that did not, the following econometric model was developed, the variables of which are presented in the following subsection:

$$AF_{i,t} = \beta_0 + \beta_1\,PERT_{it} + \beta_2\,LEV_{it} + \beta_3\,ROA_{it} + \beta_4\,SIZE_{it} + \beta_5\,CG_{it} + \beta_6\,BIG4_{it} + \beta_7\,SECTOR_{it} + \varepsilon_{it} \qquad \boxed{1}$$

This model was tested for each dependent variable and the statistical method used was multiple linear regression for panel data, since the data are organized in such a way that the companies have the same information for the same number of years. Given this technique, it is necessary to check which is the best panel for the model. For this purpose, according to Favero (2013), the Chow, Breusch-Pagan Lagrange multiplier (LM), and Hausman statistical tests are applied.

Once the appropriate panel was determined, the next step was to estimate the models using generalized least squares (GLS). The data were processed in Stata® software version 16.0, and after the estimations, the tests were applied to verify that the assumptions of multiple linear regression were met, as described in Table 4.

Table 4
Regression assumptions

Assumption	Test conducted
Normality of residuals	Sfrancia
Homoscedasticity	Wald
Multicollinearity	VIF
No correlation of residuals	Wooldridge

VIF = variance inflation factor.
Source: *Favero and Belfiore (2017).*

3.2.1 Research variables

According to Lin et al. (2014), no single measure is capable of capturing all of a company's aggressive tax behavior. Nevertheless, this study used as dependent variables the measures most commonly used in studies with similar objectives and that stood out in the literature review, namely: ETR Generally Accepted Accounting Principles (GAAP), ETR Cash, and BTD.

Table 5 describes these tax aggressiveness variables in detail, explaining how they were calculated, where the data for their formulation were obtained, and the different literatures (national and international) that used them in their analyses.

Table 5
Dependent variables

Variable	Calculation	How it was obtained	Source
ETR GAAP*	Ratio of total tax on calculated profit to profit before tax: $$ETR = \frac{(IR + CSLL)}{PBT}$$	Economatica® database	Chen et al. (2010); Christensen et al. (2021); Hanlon & Heitzman (2010); Rezende et al. (2018); Shevlin et al. (2017); Wang et al. (2019); Wilson (2009).
ETR Cash*	Ratio of cash outflow to pay tax to profit before income tax: $$Cash\ ETR = \frac{Cash\ outflow\ to\ pay\ IR/CSLL}{PBT}$$	Economatica® database and cash flow statement	Hanlon & Heitzman (2010); Lennox et al. (2013).
BTD	Profit before income tax minus the ratio of the amount of income tax at the nominal rate (IT + CSLL) divided by total assets. $$BTD = \frac{PBT - \frac{(IR + CSLL)}{0.34}}{Total\ Assets}$$	Economatica® database	Fonseca & Costa (2017); Mocanu et al. (2020).

BTD = book tax difference; CSLL = Social Contribution on Net Profit; GAAP = Generally Accepted Accounting Principles; IR = income tax.
* Effective tax rates (ETRs) lower than 0 and higher than 1 were not considered, as they are generally the result of atypical transactions that are not related to the company's true situation, such as non-deductible expenses, the recognition of goodwill, and the reversal of significant amounts of accruals. However, negative ETRs are the result of a negative denominator [profit before income tax (PBT)], so it is unlikely that a company that collects taxes even in a loss situation is in an aggressive tax position. This reasoning follows Christensen et al. (2021), Santos et al. (2021), and Tang (2019).
Source: *Prepared by the authors.*

Dyreng et al. (2017) pointed out that ETR GAAP can capture ways of reducing taxes through loopholes in the tax legislation. In Brazil, the nominal rate for income tax (IR) and CSLL is 34%, but it is difficult for a company to collect this percentage, and it is precisely on this point that ETR offers analytical capacity by observing the effective percentage calculated by the company, and thus arriving at the level of taxation in relation to peers.

The use of ETR Cash is intended to verify the actual rate at which the organization pays its taxes. Thus, ETR Cash captures tax planning activities by incorporating tax deferral strategies, since the use of information on actual taxes paid avoids the impact of companies' permanent and temporary tax reduction strategies by reducing the distorting effect of the deferred tax expense element present in the ETR (Mohanadas et al., 2021). In this way, the use of ETR Cash makes it possible to verify the amounts used for deferral that affect the amount of taxes collected, and provides information that makes it possible to exclude the impact of earnings management (Chen et al., 2014).

Finally, the use of BTD is justified by the fact that tax provisions are used to calculate (not only in Brazil) accounting income and not taxable income (Brazil, 2018), which suggests capturing the difference with this metric.

Regarding the interpretation of these variables, the understanding of the ETRs is that the higher the ratio, the less aggressive the company; however, the understanding of BTD is the opposite: the higher the BTD, the more aggressive the organization (Hanlon & Heitzman, 2010; Martinez, 2017). The purpose of using different metrics is precisely to try to understand the different factors that may determine the tax aggressiveness of the group of companies studied.

The independent variable of interest, PERT 2017, was operationalized according to the information summarized and presented in Table 6.

Table 6
Independent variable of interest

Variable	Calculation	How it was obtained
PERT*	*Dummy to characterize companies that adhered to PERT 2017 (1) and those that did not (0)*	SIC, RFB, and companies' explanatory notes

PERT = Special Tax Regularization Program; RFB = Brazilian Federal Revenue Service; SIC = Citizens Information Service.
* The information on the companies that adhered to the installment plan (PERT 2017) was obtained from the Comptroller General of the Union (CGU), through a consultation via SIC, available on the agency's website, with direct access to the Ministry of the Economy – RFB, and checked in the companies' explanatory notes.
Source: *Prepared by the authors.*

The data show that the PERT variable is qualitative in nature. Therefore, it is characterized by a dummy where the value 1 represents companies that adhered to PERT and 0, the opposite, a procedure similar to the works of Borges and Rech (2021), Gomes (2020), and Mattos (2017).

In order to control for other effects on tax aggressiveness, independent control variables were included in the regression model that stood out in the literature used, as shown in Table 7.

Table 7
Control variables

Variable	Calculation	Where it was obtained	Expected sign	Source
LEV	Long-term debt divided by assets	Economatica® database	+/-	Balakrishnan et al. (2019); Campagnoni & Ruiz (2020); Gaaya et al. (2017); Hoopes et al. (2012); Lin et al. (2014); Martinez & Martins (2016); Rezende et al. (2018); Shevlin et al. (2017); Wilson (2009).
ROA	Company operating profit divided by assets	Economatica® database	+/-	Campagnoni & Ruiz (2020); Chen et al. (2010); Hoopes et al. (2012); Lennox et al. (2013); Marinho et al. (2022); Mocanu et al. (2020); Rezende et al. (2018); Shevlin et al. (2017); Wilson (2009).

Table 7
Cont.

Variable	Calculation	Where it was obtained	Expected sign	Source
SIZE	Natural log of total assets	Economatica® database	+	Balakrishnan et al. (2019); Campagnoni & Ruiz (2020); Hoopes et al. (2012); Kubick et al. (2016); Lennox et al. (2013); Martinez & Sonegheti (2015); Shevlin et al. (2017); Wilson (2009).
CG	Dummy – 1 for companies with some CG segment (new market, levels 1 and 2) and 0 for those without.	Economatica® database	-	Borges & Rech (2021); Carrer & Slavov (2021); Martinez & Cerize (2020); Martinez & Sonegheti (2015).
BIG 4 – Audit quality	Dummy – 1 for companies audited by a BIG 4 and 0 for those not audited by a BIG 4.	Explanatory notes	-	Gaaya et al. (2017); Hartmann & Martinez (2020); Lisowsky (2010); Marinho et al. (2022); Rezende et al. (2018); Santos et al. (2021).
Sector	Dummy – Sector fixed effect based on the Economatica® System classification	Research data	+/-	Mocanu et al. (2020); Rezende et al. (2018); Santos et al. (2021).

LEV = leverage; CG = corporate governance; ROA = return on assets; SIZE = company size.
Source: *Prepared by the authors.*

4. ANALYSIS AND DISCUSSION OF THE RESULTS

4.1 Descriptive Statistics

Table 8 shows the measures of central tendency and dispersion of the continuous variables. It is important to note that the presence of outliers was identified and for this reason all continuous variables were winsorized at the 1st and 99th percentiles (1%).

Table 8
Descriptive statistics

Variable	Companies adhering to PERT		Companies not adhering to PERT	
	Mean	SD	Mean	SD
ETR GAAP	0.19	0.16	0.23	0.18
ETR Cash	0.09	0.16	0.15	0.17
BTD	-0.04	0.17	-0.11	0.61
LEV	0.54	2.92	0.17	0.17
ROA	-0.02	0.17	-0.09	0.60
SIZE	14.82	2.20	14.06	3.01

LEV = leverage; BTD = book tax difference; SD = standard deviation; ETR = effective tax rate; GAAP = Generally Accepted Accounting Principles; PERT = Special Tax Regularization Program; ROA = return on assets; SIZE = company size.
Source: *Prepared by the authors.*

It can be observed that the effective tax rate of companies adhering and those not adhering to PERT differs by up to 4% for GAAP ETR, 6% for Cash ETR, and 7% for BTD. It can be concluded that the differences in the ETRs may indicate that the companies that adhered to PERT have a greater tendency to be tax aggressive, as they assume a lower effective tax rate. On the other hand, the difference between accounting profit and taxable profit (BTD) appears in the opposite way, as the companies that did not adhere to PERT had a lower ratio than the others.

In terms of leverage, companies adhering to PERT are on average 37% more leveraged than non-adherents.

In terms of ROA, this is higher for adherent companies, averaging 7% higher than for non-adherent companies. With regard to size, both adherent and non-adherent companies have similar averages of the natural logarithm of their asset size. Furthermore, when comparing the standard deviation, it can be seen that the greatest dispersion of the data relates to the companies not adhering to PERT.

4.2 Bivariate Analysis

When analyzing the correlation between the dependent variables and the control variables, a correlation significant at 5% was found between ETR Cash and BTD and leverage. The companies in the sample that spend more to pay their taxes (ETR Cash) may have a greater need to raise funds from third parties, unlike the correlation between these variables presented in the study by Marchesi and Zanoteli (2020). In terms of BTD, companies with smaller differences between accounting and taxable profits tend to have higher leverage, a fact that confirms Marchesi and Zanoteli (2020) and Rezende (2014).

There was a negative correlation significant at 5% for GAAP ETR and ROA, suggesting that companies with a higher effective tax rate tend to obtain a lower return on their assets, which is consistent with Martinez and Silva (2017). The negative correlation significant at 5% between ETR Cash and ROA predicts that by having more cash outflow to pay taxes, the company may have a decrease in its potential to generate profits from its assets. Finally, the positive correlation significant at 5% between BTD and ROA shows that companies with a greater difference between accounting and taxable profits tend to have a higher return on their assets, as shown by Chen et al. (2010).

The assumption that larger companies tend to settle their taxes more, have a higher effective tax rate on profits, and a greater difference between accounting and taxable profits is suggested by the positive correlation significant at 5% between ETR Cash and the natural logarithm of assets (SIZE). This result was also observed, for example, in the studies of Marchesi and Zanoteli (2020), Marinho et al. (2022), and Rezende (2014).

4.3 Multiple Linear Regression

It is important to note that before estimating the models, the necessary statistical tests were carried out to determine the most appropriate panel (Chow, Breusch-Pagan LM, and Hausman), which indicated the one with random effects. The normality of the residuals was then checked using the Sfrancia test, which showed that their distribution was normal. The null hypothesis of the Wald test (for results greater than 0.05) indicates the absence of heteroscedasticity and the result obtained was 0.00, which rejects the null hypothesis of the test and therefore the models were estimated with robust errors. The variance inflation factor (VIF) test was less than 5, so it can be concluded that there is no relevant correlation between the regressors. Finally, the Wooldridge test showed autocorrelation of the residuals, but since the models were estimated by GLS – this violation of the assumption is already addressed – there are no problems with their results, since GLS aims to find the best estimate of the original model so that it generates non-autocorrelated error terms, as Favero and Belfiore (2017) note.

Table 9 shows the results of the multiple linear regressions with panel data and random effects that were run to test whether the fact that a company chooses to pay its taxes in installments makes it tax aggressive.

Table 9
Regression result

$$AF_{i,t} = \beta_0 + \beta_1\, PERT_{it} + \beta_2\, LEV_{it} + \beta_3\, ROA_{it} + \beta_4\, SIZE_{it} + \beta_5\, CG_{it} + \beta_6\, BIG4_{it} + \beta_7\, SECTOR_{it} + \varepsilon_{it}$$

| | Dependent | | | | | |
| | ETR GAAP | | ETR Cash | | BTD | |
	Coef.	p value	Coef.	p value	Coef.	p value
Independent of interest						
PERT	-0.04	*	-0.05	*	0.0009	0.83
Control						
LEV	0.18	0.68	0.12	0.22	0.0208	**
ROA	-1.17	*	-0.39	**	0.9377	*
SIZE	0.00	0.19	0.00	0.57	0.0032	**
CG	-0.03	***	0.01	0.56	0.0015	0.75
BIG 4	-0.02	0.17	0.03	0.19	-0.0017	0.73

Table 9
Cont.

$$AF_{i,t} = \beta_0 + \beta_1\,PERT_{it} + \beta_2\,LEV_{it} + \beta_3\,ROA_{it} + \beta_4\,SIZE_{it} + \beta_5\,CG_{it} + \beta_6\,BIG4_{it} + \beta_7\,SECTOR_{it} + \varepsilon_{it}$$

	Dependent					
	ETR GAAP		ETR Cash		BTD	
	Coef.	p value	Coef.	p value	Coef.	p value
Sector Dummy: Yes	Significant		Significant		Significant	
Between	0.23		0.14		0.99	
VIF	1.49		1.45		1.69	
N. Obs.	616		534		950	

LEV = leverage; BTD = book tax difference; ETR = effective tax rate; GAAP = Generally Accepted Accounting Principles; CG = corporate governance; PERT = Special Tax Regularization Program; ROA = return on assets; SIZE = company size; VIF = variance inflation factor.
*, **, *** = significant at 1, 5, and 10%, respectively.
Source: *Elaborated by the authors.*

Table 9 shows negative statistical significance for two measures of tax aggressiveness: ETR GAAP and ETR Cash. This shows that adherence to the installment plan results in a decrease in the effective tax rate, which is 4% for ETR GAAP and 5% for ETR Cash. Since the understanding of the ETR is that the lower the ratio, the more aggressive the company, the result of the empirical test leads to the understanding that companies that adhere to tax installment plans are more tax aggressive.

The empirical evidence that companies that pay their taxes in installments are more tax aggressive is similar to the research of Gomes (2020) in his analysis of the definition of tax aggressiveness as an illegal way of minimizing taxes, since the author found that companies that pay their taxes in installments are more tax disobedient. His way of measuring the installment plan was based on the number of installment payments the companies in the sample had, and not a dummy. Therefore, in addition to the research of Gomes (2020), this study shows that companies that pay their taxes in installments are more tax aggressive.

After adhering to installment plans, companies may believe that their obligations to the tax authorities have been settled, thus reducing their likelihood of being audited. From this perspective, Ross and Buckwalter (2013) studied American companies and found that their behavior was affected in the pre- and post-amnesty periods.

For these authors, delinquent taxpayers become delinquent in a "pre-amnesty" period, with the state acting as a short-term "credit agent." This evidence is close to that of Lima et al. (2017) and Plutarco (2012),

which this study complements by showing that Brazilian companies use installment plans not only as a source of funds, but also for tax savings. The results also confirm the evidence of Shevlin et al. (2017) for the Brazilian scenario. The authors concluded that the more the US government approves tax amnesty programs, the more tax aggressive companies become.

In view of the discussion and the empirical evidence confirmed by the econometric model, it is possible to state that Brazilian companies use tax installments to obtain tax savings, which does not refute the hypothesis of this research. Consequently, tax installment plans are a determinant of the tax aggressiveness of Brazilian listed companies that do not belong to the financial sector. Given that this sector offers lower costs and risks for companies, the practice of tax deferral has incorporated this behavior as a tax planning practice.

The non-significance of BTD is based on the fact that this metric may no longer be one of the most appropriate for measuring tax aggressiveness, but is better applied to earnings management studies, as suggested by Guenther et al. (2021), Magalhães and Ferreira (2018), and Martinez and Leal (2019). Therefore, further research on this metric is encouraged.

When analyzing the relationship between the control variables and the dependent variable, there is a 5% positive statistical significance for LEV and BTD, in which a percentage increase in the level of indebtedness leads to a double (2%) increase in tax aggressiveness, as noted by Gaaya et al. (2017) and Martinez and Martins (2016), when they show that more indebted companies tend to be more aggressive, assuming that the use of resources

saved on taxation does not improve their liquidity. There is no consensus in the literature regarding the behavior of leverage and company tax aggressiveness, as it is something that needs to take into account the scenario studied, the sample, and other factors that may interfere in this relationship.

On the other hand, the profit that the company generates from its assets (ROA) can increase the level of tax aggressiveness of the analyzed companies by up to 93%. This result confirms Cabello et al. (2019), Chen et al. (2010), and Kubick et al. (2016), who show that companies with a higher return on assets tend to be more aggressive; however, it contradicts the finding of Gaaya et al. (2017). Like leverage, the relationship between ROA and tax aggressiveness does not have a consensus in the literature and is something specific to the scenario studied, the time, and the objective of the research.

Size was statistically significant, as in the studies of Lee (2021) and Martinez and Silva (2019), showing that larger companies tend to be more tax aggressive. With regard to corporate governance (CG), it has a negative impact on the tax aggressiveness of the companies analyzed, as it was found that companies belonging to the *Novo Mercado* and CG levels 1 or 2 have a lower effective tax rate, in contrast to the studies by Balakrishnan et al. (2019) and Bayar et al. (2017).

Finally, the sector explains the tax decisions of Brazilian non-financial listed companies, confirming Mocanu et al. (2020) and Santos et al. (2021). Brazilian tax research needs to pay attention to this issue, as companies face different tax burdens depending on their economic sector. In addition, the sectoral tax burden may be a determining factor in firms' behavior, such as the decision to opt for tax installments or not.

5. CONCLUDING REMARKS

When checking the impact of PERT 2017 on the tax aggressiveness of Brazilian non-financial listed companies from 2017 to 2020, the result was statistically significant at 1%. As a result, it seems that companies that pay their taxes in installments behave in a more tax aggressive manner, which translates into the fact that companies that paid their taxes in installments, compared to others that did not, had a 4% reduction in GAAP ETR and a 5% reduction in Cash ETR. This fact does not disprove the research hypothesis that tax installment plans have a positive impact on company tax aggressiveness.

This finding allows us to conclude that tax installment plans may become an independent variable recommended for models that seek to explain tax aggressiveness, thus generating a relevant theoretical contribution. It is also possible to infer that tax authorities, especially the RFB, can use the reported evidence to direct their attention to companies that use special installment plans, since they are more aggressive than others. This inference suggests an important practical contribution of the study. Thus, it is expected from these results that the government can avoid losses in its tax collection by profiling the companies that may or may not take advantage of this benefit, offering a fairer form that is directly related to the real objective of tax installment plans.

Regarding the control variables, many are consistent with the literature and in others, even when these are compared, there is statistical significance in the relationship with tax aggressiveness. Thus, for this study, it can be seen that more leveraged companies, those with a higher return on their assets, those with more CG practices, and those with a larger size were more tax aggressive.

The reflected evidence tends to recognize that BTD should be carefully analyzed in tax planning studies, as it seems more appropriate for studying results management, as pointed out by different studies, some very recent (Guenther et al., 2021; Magalhães & Ferreira, 2018; Martinez & Leal, 2019; Mohanadas et al., 2021). Therefore, this may be a theoretical explanation for the lack of statistical significance of the variable of interest in this research.

The research has limitations, such as the lack of a detailed analysis by economic sector and also the fact that only one special installment plan was used, although it is the most relevant. Therefore, in addition to studies that examine these elements, others are suggested to investigate whether Brazilian companies are more aggressive before, during, or after the special tax installment plan offer period, whether there is a relationship between tax planning and tax provisions and contingent liabilities, and whether the number of tax transactions the organization has influences its tax aggressiveness profile.

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