Tax aggressiveness in publicly traded companies operating in a regulated market

Agresividad fiscal en empresas que cotizan en bolsa que operan en un mercado regulado

Agressividade tributária nas empresas de capital aberto que atuam em mercado regulado

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Abstract
Purpose: The research aims to identify whether the regulated market through its agencies is a determining factor for a posture of less tax aggressiveness in companies.

Methodology: BTD (Book-Tax Differences), ETRc (Current Effective Tax Rate) and CashETR (Cash Effective Tax Rate) were the indicators used in this study to measure the level of tax aggressiveness. The sample corresponded to all companies that traded their shares in B3, from 2010 to 2018.

Results: The results of this study show that companies that operate in a regulated market are less tax aggressive than companies that operate in the free market. It was thus noted that market regulation acts as a factor that discourages the implementation of more aggressive tax strategies.

Contributions of the Study: The practical contribution of this study was to evaluate the sectorial regulation model in force in the country, from the perspective of tax benefits and the control of tax aggressiveness. This study brings from theoretical contribution the need for a more effective participation of taxpayers for a regulatory model more guided by the mutual contribution between public administration and companies. Still under the theoretical aspect, the work contributes to the evaluation of sectorial regulation as a mechanism to control tax avoidance and reduce tax aggressiveness, in addition to providing initial study material for future research on the behavior of the regulated market in the face of tax aggressiveness.

Keywords: Tax aggressiveness, Regulatory agencies, BTD (Book-Tax Differences), ETRc (Current Effective Tax Rate), CashETR (Cash Effective Tax Rate).

Resumen

Objetivo: La investigación tiene como objetivo identificar si el mercado regulado a través de sus agencias es un factor determinante para una posición de menor agresividad fiscal en las empresas

Metodología: BTD (Book-Tax Differences), ETRc (Tasa de impuestos efectiva actual) y CashETR (Tasa de impuestos efectiva en efectivo) fueron los indicadores utilizados en este estudio para medir el nivel de agresividad fiscal. La muestra correspondió a todas las empresas que negociaron sus acciones en B3, de 2010 a 2018.

Resultados: Los resultados de este estudio muestran que las empresas que operan en un mercado regulado son menos agresivas fiscalmente que las empresas que operan en el mercado libre. Así, se observó que la regulación del mercado actúa como un factor que desalienta la implementación de estrategias fiscales más agresivas.

Contribuciones del Estudio: El aporte práctico de este estudio fue evaluar el modelo de regulación sectorial vigente en el país, desde la perspectiva de los beneficios fiscales y el control de la agresividad fiscal. Este estudio trae de aporte teórico la necesidad de una participación más efectiva de los contribuyentes para un modelo regulatorio más guiado por la contribución mutua entre la administración pública y las empresas. Aún desde un punto de vista teórico, el trabajo contribuye a la valoración de la regulación sectorial como mecanismo de control de la elusión fiscal y reducción de la agresividad fiscal, además de proporcionar material de estudio inicial para futuras investigaciones sobre el comportamiento del mercado regulado frente a agresividad fiscal.

Palabras clave: Agresividad fiscal, Agencias regulatorias, BTD (Diferencias de impuestos contables), ETRc (tasa impositiva efectiva actual), CashETR (Tasa de impuestos efectiva en efectivo).

Resumo

Objetivo: A pesquisa tem como objetivo identificar se o mercado regulado por intermédio de suas agências é fator determinante para uma postura de menor agressividade tributária nas empresas.

Metodologia: A BTD (*Book-Tax Differences*), a ETRc (*Current Effective Tax Rate*) e a CashETR (*Cash Effective Tax Rate*) foram os indicadores usados neste estudo para mensurar

o nível de agressividade tributária. A amostra correspondeu a todas as empresas que negociaram suas ações na B3, no período de 2010 a 2018.

Resultados: Os resultados deste estudo mostram que empresas que atuam em mercado regulado são menos agressivas tributariamente do que empresas que atuam no mercado livre. Notou-se assim que a regulação de mercados atua como fator que desestimula a implementação de estratégias tributárias mais agressivas.

Contribuições do Estudo: A contribuição prática deste estudo foi avaliar o modelo de regulação setorial vigente no país, sob a ótica dos benefícios fiscais e do controle da agressividade tributária. Este estudo traz de contribuição teórica a necessidade de uma participação mais efetiva dos contribuintes para um modelo regulatório mais pautado na contribuição mútua entre a administração pública e as companhias. Ainda sob o aspecto teórico, o trabalho contribui na avaliação da regulação setorial como um mecanismo de controle da elisão fiscal e redução da agressividade tributária, além de fornecer material de estudo inicial para futuras pesquisas sobre o comportamento do mercado regulado frente à agressividade tributária.

Palavras-chave: Agressividade tributária, Agências reguladoras, BTD (*Book-Tax Differences*). ETRc (*Current Effective Tax Rate*), CashETR (*Cash Effective Tax Rate*).

1 Introduction

The companies operating in the regulated market, they need to adjust their accounting to meet 3 (three) aspects: corporate, tax and regulatory accounting. For corporate accounting purposes, as the companies operate in accordance with accounting practices adopted in Brazil ("BR GAAP") included in the legislation, pronouncements, guidelines and technical interpretations issued by Comitê de Pronunciamentos Contábeis – CPC, Accounting Pronouncements Committee - CPC and previously by Conselho Federal de Contabilidade – CFC, the Board Federal of Accounting - CFC.

To comply with tax accounting, companies need to be aware of the laws, rules and guidelines of inspection agents, such as RFB – Receita Federal do Brasil, Federal Revenue of Brazil, the States and the Municipalities.

The companies that operate in the regulated market, because they have one more inspection agent, which are the regulators, to adapt the regulatory accounting, need to follow all the standards and specific manuals to each sector and prepare all their accounting numbers to accomplish the three of them.

Therefore, because there are diverse interests and incentives on accounting and tax information, it is relevant to understand the position of managers responsible for decision-making within an organization to improve tax accounting.

It can be seen in Martinez (2017), that tax aggressiveness has already been related to several types of corporate structures in Brazil, such as: (i) In publicly traded Brazilian companies; (ii) Family businesses; (iii) Control by foreign capital; and (iv) In subsidiaries and their parent companies. However, there are no studies relating tax aggressiveness to regulatory agencies in Brazil, unlike several other international studies, both theoretical (De Simone, Sansing & Seidman, 2013) and empirical studies (Bozanic, Hoopes, Thornock & Williams, 2017).

International research focuses mainly on the power of tax authorities and regulatory bodies to inhibit tax aggressiveness (Hoopes, Mescall & Pittman, 2012). Such themes have not yet been addressed in Brazil, thus verifying a gap in the Brazilian literature. The choice of markets regulated by regulatory agencies was motivated by their representativeness in the Brazilian economy, as they are strategic areas of the Federal Government, and their importance for the development of the country.

De Simone et al. (2013) indicates the regulator influence on business result, demonstrating the greater the regulatory control, the lower the claims for tax benefits. Another study that endorses the relationship among markets regulated by regulatory agencies and tax aggressiveness is Bozanicet al.´s study (2017), which highlights the increase in disclosures of tax statements under the influence of regulatory agencies.

This research aims to answer the following question: **Is market regulation carried out through regulatory agencies a significant factor in influencing the level of tax aggressiveness in companies?** Thus, the objective of this work was to identify whether the market regulated by regulatory agencies is a determining factor for a posture of less tax aggressiveness in companies.

The sample worked on in this study relates to the list of all companies listed in B3. Data collection took place through Economática® database, from 2010, with the adoption of IFRS in Brazil until 2018. The statistical treatment of the data was performed using the STATA13 software. The total sample of this work comprises 1,669 observations, from which 823 are from publicly traded companies that operate in the regulated market and 846 are from publicly traded companies that operate in the unregulated (free) market. The tax aggressiveness will be measured through three *proxies*: the Current Effective Tax Rate (ETRc), the Cash Effective Tax Rate (CashETR), in addition to the Book-Tax Differences (BTD).

The results of this study confirm the hypothesis that companies which operate in the free market have higher tax aggressiveness, while companies that operate in a regulated market are less tax aggressive. From this scenario, market regulation acts as a factor that discourages the implementation of more aggressive tax strategies.

2 Literature Review

2.1 Tax aggressiveness

The concept of tax aggressiveness for Austin and Wilson (2017), as well as for Hanlon (2005) and Hanlon and Heitzman (2010), is any tax planning to avoid, reduce or postpone the payment of taxes in order to increase cash flow (FCX) and the net profit (LL) of the companies. Then, Klassen, Lisowsky and Mescall (2016) conceptualize tax planning as a tool for cost reduction, and therefore a definition of tax avoidance and tax aggressiveness, as reaffirmed by Liets (2013) and Richardson and Lanis (2011).

Castro and Flach (2013) highlight in their study, that tax governance also known as Tax Management, tax administration, tax planning and tax avoidance, had a great importance with the development of corporate governance, becoming a master for companies, entities and organizations in general. Tax governance through the management and control of tax expenses also seeks to reduce the tax burden on companies, and to increase financial performance and mainly to maximize the company's value.

Thus, Chen, Chen, Cheng, and Shevlin (2010) define tax aggressiveness as a tool for reducing taxes through tax planning. Another article that brings a literary review of the main

tax researches is from Halon and Heitzman (2010), which classifies the empirical studies in four main areas: (i) corporate tax avoidance; (ii) disclosure of tax information on profits to serve the capital market; (iii) pricing of assets and taxes; and (iv) the effect of taxes on the capital structure and investment as well as financing decisions.

For Martinez (2017), tax aggressiveness refers to the reduction of explicit tax obligations, without necessarily assessing the adequacy of procedures to current tax rules, which means the higher the level of tax aggressiveness, the greater the risk of transactions disregarded by the competent authority.

It is worth noting that Halon and Heitzman (2010) and Martinez (2017) corroborate the understanding that the studies of tax aggressiveness are based only on the taxes that are linked to the accounting result of the Companies, disregarding any other tax except the IRPJ - Tax of Legal Entity Income and CSLL - Social Contribution on Net Income, therefore, this limitation in the scope restricts the projection of the research conclusions in the line of tax aggressiveness, especially when it is verified that in Brazil there is a tax diversity (direct and indirect) where income taxes are one of the modalities and which over the years have been less relevant.

Many articles use the metric Book-Tax Differences (BTD) to measure tax aggressiveness. This proxy refers to the difference in accounting profit versus tax profit, which causes a controversial measure of aggressiveness, as it can be impacted by earnings management, distorting the degree of tax aggressiveness, as corroborated by Chen et al. (2010). Thus, for this proxy to reflect its effective purpose, earnings management must be among the control variables of the statistical model used.

In general, for Formigoni et. al (2009), the differences between accounting profit and tax profit result from three basic components: the misalignment between accounting and tax rules, which cause non-discretionary differences and therefore, imposed by the state and by regulatory agencies; the management of corporate results and the management of taxes, which generate discretionary differences, requiring control variables to ascertain the appropriate degree of tax aggressiveness.

Hanlon and Heitzman (2010) also show that one of the most common metrics is related to the effective tax rate, the so-called Effective Tax Rate (ETR), which is calculated through the ratio of the total tax expense to Profit before Income Tax. Income (PBIT): the higher the percentage of ETR, the lower the tax aggressiveness. For Chen and Chu (2010), a company that adopts practices of tax aggressiveness has a low percentage of ETR. ETR has the ability to assess the impact of companies' tax burden and can be used as an indicator of strategic business planning, as stated by Giannini and Maggiulli (2002), Robinson, Sikes and Weaver (2010) and Rodrigues, Melo and Paulo (2019).

Liets (2013) indicates in his study variations of this metric, which would be the ETRt - total effective rate and the ETRc - current effective rate, whose differentiation would be to consider deferred taxes or not. Another variation of the metric is the ETR long run (effective long-term tax rate), which allows the dynamic variation of tax aggressiveness to be studied over a longer period. CashETR (effective cash tax rate) is another variation of the metric used in the study by Chen et al. (2010), which is defined by the ratio between taxes actually paid (extracted from the DFC) and profits before income tax (PBIT), indicating more directly the effectiveness of tax planning, possible financial restrictions, in addition to adhesions tax incentive programs.

A genuinely Brazilian proxy, pointed out by Martinez (2017) without any similarity to those adopted internationally, is the DVA Rate (effective tax rate on added profit), obtained through the relationship between the tax burden indicated in the DVA and the amount total

added to distribute. This metric manages to measure tax aggressiveness in several possible dimensions, at the federal, state and municipal levels, thus offering important advantages over the traditional ETR.

For Brunozi Junior (2019) and Shackelford, Slemrod and Sallee (2011), studies should identify metrics for assessing tax aggressiveness through alternative methods more adjusted to the Brazilian reality, highlighting, therefore, BTD, which is measured by using a statistical model, making all necessary adjustments.

Thus, as highlighted by Furtado et al (2018), in the national context, to attend the State, accounting is segregated into financial and tax: the financial meets the corporate standards, providing useful information for corporate management and external agents; and the tax law seeks to use procedures for calculating and generating taxes for the entity, thus meeting the tax authorities and regulatory agencies.

For Medeiros and Costa (2017), the adjusted ETR is the most compatible with the Brazilian reality, as, for example, the PBIT should be added to the JSCP (interest on own capital), which, as a result of CVM resolution No. 207 of 1996 is recorded against Shareholders' Equity and equity in the period.

As advocated by Da Silva and Martinez (2018), the variation of the ETR to CashETR is better suited to the Brazilian reality, as it is possible to capture tax planning strategies in short periods of financial restrictions.

Since the ETR and its variations, according to Chen et. al (2010), a measure that reflects tax planning through the difference between the tax actually paid and the PBIT (Profit before income tax), and the BTD, for Hanlon and Heitzman (2010), is conceptually the difference between the taxable basis of LALUR (Real Profit Calculation Book) and the accounting result before IRPJ and CSLL (PBIT), this work focused its studies on the metrics ETRc, CashETR and BTD in order to adapt to the Brazilian reality.

2.2 Regulatory agencies and tax aggressiveness

As described by Marques, Salviano, Souza and Louzada (2016), it is through the collection that the state carries out its basic activities and generates the maintenance of public policies. However, if the collection is not compatible with the market, it can discourage potential investors, make existing businesses unfeasible, in addition to restricting consumers' purchasing power. Therefore, seeking to neutralize possible economic losses, companies seek tax planning, since, according to Hanlon (2005), the practices of this planning can lead to the reduction of tax obligations and, consequently, their operating costs, making the business viable.

According to Franzoni (2008), the School Law and Economics institution is based on the premise that taxpayer's behavior is directly linked to the rational result of the following equation: the probability of punishment related to the practice of illegal acts versus the cost and benefit factors of tax avoidance. Tax evasion has been the subject of intense investigation by economists and social scientists. A great study was produced, both theoretical and empirical. This literature is of special interest to law and economics scholars interested in the mechanism of compliance with the law, since taxes can represent a high cost for companies and their shareholders, therefore, a position of greater tax aggressiveness is expected.

According to a study presented by Vitalis (2019), in order to increase taxpayers' compliance with tax rules and, consequently, increasing tax collection, the most cooperative tax regulation model emerged, which establishes a relationship between tax administration and taxpayers who are more cooperative contributors.

According to De Simone et al. (2013), Silvestre, Costa and Kronbauer (2018) and Levi-Faur (2005) the influence and the need for the creation of regulatory agencies are clear, demonstrating that, for a greater control by the tax administration there is less claim for tax benefits uncertain to taxpayers. So, there is an increasing need for a relationship of mutual cooperation among the involved agents.

Levi-Faur (2005), through his study of European countries, analyzes the rise and diffusion of the new order of regulatory capitalism, through the creation of regulatory agencies. This author offers a detailed and historical analysis of the relationship between capitalism and regulation. Regulation of sectors, although not necessarily directly by the state, is increasing, despite efforts to redraw the boundaries between state and society.

According to Arigony (2019), companies that operate in regulated markets are exposed to a whole control structure of regulatory agencies, which operate under Federal Government guidelines, which may suggest a less aggressive tax behavior. For De Simone et al. (2013), the greater the interference from the Government / Regulator, the lower the frequency with which taxpayers claim uncertain tax benefits.

According to Bozanic et al.´s study (2017), companies significantly increased the amount of their disclosures related to taxes, according to the influence of the tax regulator.

This research evaluates, in an empirical way, if what is expected under the theoretical aspect in relation to regulation, a possible decrease in tax avoidance, is really occurring in Brazil due to the regulation of certain sectors.

In this context, the research hypothesis emerges:

(H1): Companies that operate in regulated markets are less tax aggressive than companies in the free market.

The hypothesis presented seeks to clarify whether the regulation of markets acts as a factor that discourages the implementation of more aggressive tax strategies.

2.3 Control variables for tax aggressiveness

To define the control variables, this work is based on previous studies on tax aggressiveness in regulated environments.

Armstrong, Blouin, Larcker and David (2012) demonstrate in their studies that for greater economic control, Return on Assets (ROA) should be used to measure the tax aggressiveness of companies. According to Chen et al. (2010), companies with higher profitability generally have higher ETR, which would justify the use of return on assets (ROA) variables.

For Armstrong, Blouin, Larcker and Jagolinzer (2015), Martinez and Ramalho (2014) and Gallemore, Maydew and Thornock (2014) financial leverage (LEV) is defined through the equation (LT / AT) where LT is the debt of long-term and TA are the total assets, and therefore should be used to measure the dimension of the shielding of taxes.

In addition, according to Gompers, Ishii and Metrick (2010), Hanlon and Heitzman (2010) and Martinez and Ramalho (2014), a control variable must be inserted in order to capture the size of the companies (SIZE) and potential tax benefits in course. In addition to it, Motta (2020) and Martinez and Ramalho (2014) suggest that the larger the company, the greater the possibility of investing in fixed assets and intangible assets with accelerated tax depreciation, supporting the fixed assets (PPE) and assets variables intangible assets

(INTANG). Therefore, based on these academic studies, this work uses ROA (Return on Assets), LEV (Financial Leverage), PPE (Fixed Assets), INTANG (Intangible Assets) and SIZE (Companies Size) as control variables.

3 Methodology

This research is descriptive and uses the quantitative method for its accomplishment. The data were organized in a panel and were analyzed using multiple regression to extract the relationship information of the other variables with the tax aggressiveness.

The companies that operate in regulated markets are structured in public and closed capital and correspond to approximately 50% of the number of companies that trade their shares in B3. The sample includes all the companies listed in B3. Data collection took place through the Economática® Database, from 2010 with the adoption of IFRS in Brazil up to 2018 and the statistical treatment of the data was performed using the STATA13 software.

The total sample of this work comprises 1,669 observations, of which 823 are from publicly traded companies that operate in the regulated market and 846 are from publicly traded companies that operate in the unregulated (free) market.

The tax aggressiveness will be measured through three proxies: the Current Effective Tax Rate (ETRc), the Cash Effective Tax Rate (CashETR), in addition to the Book-Tax Differences (BTD).

The premise for identifying the intensity of tax aggressiveness will be measured by the rule that the lower the percentage of taxes in relation to the PBIT, the lower the tax disbursement and, consequently, the greater the tax aggressiveness. In other words, the lower the ETRc and CashETR indices, the lower the tax collection and, with this, the greater the company's tax planning, according to Giannini and Maggiulli (2002), Chen and Chu (2010) and Robinson et al. (2010).

According to Brunozi Junior (2019) and Shackelford et al. (2011), the smaller the difference between accounting profit and tax profit, the lower the BTD and consequently the lower the tax aggressiveness, however this proxy can be impacted by earnings management, distorting the degree of tax aggressiveness, as corroborated by Hanlon and Heitzman (2010). Thus, in order for BTD to reflect its effective purpose, control variables were used in the statistical model in order to mitigate and minimize this possible distortion.

Tax aggressiveness was measured by applying linear regression for three dependent variables:

a) ETRc - Effective Current Tax Rate - this metric indicates the percentage of taxes in relation to PBIT - Profit before income tax. The lower the percentage of the ETRc, the lower the tax burden and, consequently, the greater the predisposition to the company's aggressiveness, becoming an indicator of greater tax aggressiveness;

b) CashETR - Effective Cash Tax Rate - this metric indicates the percentage of taxes actually paid in relation to PBIT. The lower the percentage of CashETR, the lower the tax burden and consequently the greater the predisposition to the company's aggressiveness, generating an indicator of greater tax aggressiveness;

c) BTD - Accounting Profit versus Tax Profit - this metric indicates the variation between accounting profit versus tax profit. The greater this positive variation, the greater the predisposition to tax aggressiveness.

Both ETRc / CashETR and BTD were used in the studies by Chen et al. (2010), Giannini and Maggiulli (2002), Chen and Chu (2010), Robinson et al. (2010), Brunozi Junior

(2019), Shackelford et al. (2011), Gompers et al. (2010), Hanlon and Heitzman (2010) and Martinez and Ramalho (2014).

To test the hypothesis of this research, adaptations were made to the methodology used in the works of Martinez and Ramalho (2014), Chen et al. (2010), and Motta (2020), who carried out similar studies on tax aggressiveness.

The used model was as follows:

$$AgrT_{it} = \varphi_1 + \varphi_2 RG_{it} + \varphi_3 Ctrl_{it} + \varepsilon \tag{1}$$

Where:
a) $AgrT_{it}$ calculated using three measures: ETRc, Cash ETR and BTD.
b) RG_{it} *dummy* represented by the company's classification in a Regulated Market.
   Assumes a value of 1 (one) if the market is regulated and 0 (zero) otherwise.
c) $Ctrl_{it}$ are the control variables represented by:
   - ROA: Return on Assets;
   - LEV: Financial Leverage;
   - PPE: Investments in Fixed Assets;
   - INTANG: Investments in Intangibles;
   - SIZE: Size.
d) ε is the error.

As the central objective of this work is to identify whether the regulated market is a determining factor for a less aggressive tax posture, a lower result of tax aggressiveness in $AgrT_{it}$ and a statistically significant φ_2 index is expected.

To identify this relationship of greater or lesser aggressiveness linked to the regulated market, a binary variable called "RG_{it}" was inserted to interact with free market societies. This variable assumes a coefficient of 1 (one) if the company operates in a regulated market. For companies operating in the free market, the variable assumes 0 (zero).

The other control variables were designed so that the fundamental differences between companies that operate in a regulated market and those that operate in the free market do not negatively influence the results.

Companies with higher profitability tend to have higher ETR, according to Chen et al. (2010), which supports the insertion of the return on assets (ROA) and degree of leverage (LEV) variables. Likewise, according to Martinez and Ramalho (2014), larger companies are more cost-effective in terms of tax aggressiveness and are therefore more motivated to adopt an aggressive stance. They also have a greater capacity to invest in fixed and intangible assets with tax benefits from accelerated depreciation, supporting the active (PPE), intangible (INTANG) and size (SIZE) variables.

4 Analysis of Collected Data

4.1 Descriptive statistics

Table 1 presents the descriptive statistics of the variables that make up the sample, segregated between: companies that operate in regulated markets, companies that operate in the free market and all companies in the sample, respectively.

Some information is important for the interpretation of the sample results:

a) It is possible to verify whether a company is more or less aggressive in taxation by comparing whether the effective tax rates are higher or lower than the average effective rate in the market;

b) For the sample, the effective rate of IRPJ and CSLL of 34% is not considered, for measuring the ETRc and the CashETR, as these segments are influenced by benefits and subsidies for investments, using in this way the average effective rate of the Marketplace;

c) For the sample, the BTD analysis does not consider the positive or negative sign to define tax aggressiveness, because, due to the benefits and subsidies for investments, the entire sample presented accounting profit higher than the tax profit, thus using the market average to define more or less aggressiveness.

Table 1
Descriptive statistics of tax aggressiveness metrics

2010 to 2018	ETRc			BTD			CashETR		
	Regulated Market	Free Market	General Market	Regulated Market	Free Market	General Market	Regulated Market	Free Market	General Market
Average	0,267	0,206	0,238	0,024	0,035	0,030	0,269	0,213	0,241
Medium	0,293	0,225	0,258	0,010	0,021	0,015	0,288	0,227	0,256
Standard Deviation	0,176	0,248	0,213	0,050	0,057	0,053	0,157	0,215	0,186
1st Quartile	0,186	0,102	0,145	0,000	0,006	0,002	0,193	0,119	0,156
3rd Quartile	0,340	0,313	0,333	0,029	0,046	0,040	0,337	0,307	0,327
Minimum	-0,498	-1,170	-0,951	-0,124	-0,310	-0,148	-0,768	-1,486	-0,768
Maximum	1,370	2,044	1,800	0,451	0,280	0,451	1,322	1,694	1,443
Observations	823	846	1.669	823	846	1.669	823	846	1.669

Source: *Research data.*

It is observed that, from 823 observations of the companies that operate in the regulated market, when the effective current tax rate is analyzed, the average is 26.7% (ETRc). Then, on average, companies in the regulated market have an effective tax rate below 34% (IRPJ - 25% plus CSLL - 9%) due to the benefits and subsidies for existing investments in the segment. Likewise, the effective tax rate paid, with an average of 26.9% (CashETR), is below the effective rate of 34%.

As for the difference between accounting profit and tax profit, it presented a positive average of 2.40% (BTD), that is, the accounting profit is higher than the tax profit.

It is also observed that for the 846 observations of companies operating in the free market, the average for the ETRc is 20.6%, an effective tax rate below 34% and below the average of the regulated market of 26.7%, indicating greater aggressiveness in this group.

In the same direction, the effective tax rate paid on average was 21.3% (CashETR), an effective tax rate below the average of the regulated market of 26.9%, indicating greater tax aggressiveness for this group of companies.

The difference between the accounting profit and the tax profit presented a positive average of 3.5% (BTD), indicating an accounting profit higher than the tax profit, however this average was also higher than the average of the regulated market, demonstrating a greater tax aggressiveness.

For the entire sample, in the 1,669 observations, the average effective current tax rate was 23.8% (ETRc). In Table 2, this value is considered as a reference for the definition of tax aggressiveness of the different groups.

Likewise, the tax rate actually paid for the entire sample is 24.1% (CashETR) and for BTD the percentage is 3%. Table 2 shows the results found and the indicative of the level of tax aggressiveness.

Table 2
Tax aggressiveness level

Companies	Indicatives			Level of Aggressiveness
	ETRc	BTD	CashETR	
Regulated Market	26,7% > 23,8% Above average	2,4% < 3% (LC < LT)	26,9% > 24,1% Above average	Less aggressive companies
Free Market	20,6% < 23,8% Below average	3,5% > 3% (LC > LT)	21,3% < 24,1% Below average	More aggressive companies

Source: *Research data.*

As can be seen in Table 2, the average ETRc of the entire sample (23.8%) becomes the average indicator of tax aggressiveness, so, higher effective rates indicate lower tax aggressiveness, whereas lower effective rates indicate greater tax aggressiveness.

The same occurs with BTD, the average difference in accounting profit and tax profit for the entire sample is 3%. Thus, higher percentages indicate greater tax aggressiveness, while lower percentages indicate less tax aggressiveness.

For CashETR, the average of the entire sample (24.1%) becomes the parameter for assessing tax aggressiveness. Higher effective rates indicate lower tax aggressiveness, lower effective rates indicate greater tax aggressiveness.

As can be seen in Table 2, in all the evaluation parameters the group outside the control of regulatory areas presents itself as more tax-aggressive companies than the companies that suffer some type of regulation. The results tend to confirm the research hypothesis, because, comparatively, the companies that operate in the free market are more tax aggressive than the companies that operate in the regulated market.

In order to improve the comparative analysis, a test of difference between means was carried out, which allowed us to assess whether they would be statistically different from each other. Table 3 shows the averages of the variables that make up the research, segregated between the companies that operate in regulated markets from the companies that operate in the free market:

Table 3
Differences test between means

Companies	Observations	ETRc	BTD	CashETR
Regulated Market	823	0,267**	0,024*	0,269**
Free market	846	0,206**	0,035*	0,213**
Difference		6,2%	1,1%	5,6%

Source: *Research data.*
Note: Confidence index of * 1%, ** 5% and *** 10%

Based on the data presented in Table 3, it is possible to state that the averages are statistically different and that this difference is the result of a non-random action, there is something that imposes this difference between the companies analyzed. Thus, it appears that companies that operate in the free market pay 6.2% less taxes on average than companies that operate in the regulated market.

Companies that operate in the regulated market present a difference between tax profit and lower accounting profit, which according to Chen et al. (2010), Giannini and Maggiulli (2002), Chen and Chu (2010) are indicative of less tax aggressiveness. In addition to it, based on the BTD variable, companies that operate in the free market pay 1.1% less taxes than companies that operate in the regulated market.

As described by Brunozi Junior (2019), Shackelford et al. (2011), Gompers et al. (2010), companies that have lower CashETR are more tax aggressive. As it can be seen, in relation to CashETR, a company that operates in the free market pays 5.6% less taxes than companies that operate in the regulated market.

So, the results lead to the confirmation of the hypothesis proposed in this work, then, market regulation is a significant factor to influence the level of tax aggressiveness in companies. However, in order to generate greater robustness to these results, a regression model is used to assess this relationship between fiscal aggressiveness and the regulation of Brazilian markets.

4.2 Correlation matrix

The correlation matrix informs the degree of relationship between the variables, verifying the behavior of the metrics in relation to the increase or decrease in tax aggressiveness (Hanlon & Heitzman, 2010; Martinez & Ramalho, 2014).

Thus, it is necessary to analyze each group of the sample separately: (i) 1,669 observations from the total sample; (ii) 823 observations of the regulated market; and (iii) 846 free market observations.

Table 4
Correlation matrix – all the sample

Variable	ETRc	BTD	CashETR	ROA	LEV	PPE	INTANG	SIZE
ETRc	1,0000							
BTD	-0,5234*	1,0000						
CashETR	0,5217*	-0,4300*	1,0000					
ROA	0,0165	0,4003*	0,0398	1,0000				
LEV	0,0801*	-0,1017*	0,1192*	-0,0112	1,0000			
PPE	-0,0721*	-0,0187	-0,0709*	-0,1149*	0,0432***	1,0000		
INTANG	0,0975*	-0,1162*	0,0912*	0,0472***	0,1913*	-0,3093*	1,0000	
SIZE	-0,0304	-0,0787*	-0,0423***	-0,2625*	0,1370*	0,0755*	0,2314*	1,0000

Source: *Research data.*
Note: ETRc - Effective Current Tax Rate, BTD - Accounting Profit versus Tax Profit, CashETR - Effective Cash Tax Rate, ROA - Return on Assets, LEV - Financial Leverage, PPE - Investments in Fixed Assets, INTANG - Investments in Intangibles and SIZE - Size.
Confidence index of * 1%, ** 5% and *** 10%.

For the 1,669 observations, there is a negative sign between the tax aggressiveness variables ETRc and CashETR versus the BTD variable. This result is expected since the relationship of tax aggressiveness with these variables is inverse, for greater aggressiveness the indicators of the ETRc and CashETR are smaller and the BTD is higher (Chen et al., 2010; Hanlon & Heitzman, 2010).

It is also observed that the relations between the variable ETRc and CashETR with the proposed metric for the size of the company (SIZE) and investments in fixed assets (PPE) have a negative sign.

This fact proves to be an indicator that the more tax-aggressive the companies are, the greater the tendency to have larger business sizes, consequently greater internal controls and compliance, in addition to greater investments in fixed assets.

The relationship between ETRc and CashETR with the control variables is positively related to ROA, LEV and INTANG, indicating that the greater the tax aggressiveness, the lower these metrics will be.

For BTD, the positive relationship was only with ROA, indicating that the greater the tax aggressiveness, the greater the return on its assets. BTD is negatively related to LEV, PPE, INTANG and SIZE, indicating that the lower the tax aggressiveness the greater these metrics will be.

Table 5
Correlation matrix – Regulated market

Variable	ETRc	BTD	CashETR	ROA	LEV	PPE	INTANG	SIZE
ETRc	1,0000							
BTD	-0,5382*	1,0000						
CashETR	0,5008*	-0,4032*	1,0000					
ROA	0,0069	0,4105*	0,0484	1,0000				
LEV	0,1227*	-0,1688*	0,1433*	-0,0759**	1,0000			
PPE	-0,0417	0,0065	-0,0264	-0,0777**	-0,0068	1,0000		
INTANG	0,0951*	-0,1791*	0,0908*	-0,0380	0,1798*	-0,3572*	1,0000	
SIZE	0,0152	-0,1583*	0,0267	-0,3427*	0,1359*	0,1693*	0,2359*	1,0000

Source: *Research data.*
Note: ETRc - Effective Current Tax Rate, BTD - Accounting Profit versus Tax Profit, CashETR - Effective Cash Tax Rate, ROA - Return on Assets, LEV - Financial Leverage, PPE - Investments in Fixed Assets, INTANG - Investments in Intangibles and SIZE - Size. Confidence index of * 1%, ** 5% and *** 10%

For the 823 observations of the regulated market, the behavior between the metrics of tax aggressiveness does not change when compared to the result with the entire sample, so, a negative sign between the variables of tax aggressiveness ETRc and CashETR versus the BTD variable (Martinez & Ramalho, 2014).

The relation of the variables of the regulated market differs from the relation of the whole sample in the following variables: SIZE and PPE, which presented negative results for the whole sample and positive for the regulated market.

This indicates that the more tax aggressive the regulated companies are, the greater the tendency to be smaller in size, consequently lower their internal controls and their level of *compliance*.

The ETRc and CashETR variables are positively related to the control variable SIZE, indicating that the greater the tax aggressiveness the lower the values of these metrics tend to be, indicating smaller business size.

In BTD, the relationship between the metric PPE was positive, indicating that the greater the tax aggressiveness the greater the investment in fixed assets, demonstrating that for the regulated market, any increase in the cash flow generated by the tax aggressiveness the greater the reinvestment in equity.

Table 6
Correlation matrix – Free market

Variable	ETRc	BTD	CashETR	ROA	LEV	PPE	INTANG	SIZE
ETRc	1,0000							
BTD	-0,4759*	1,0000						
CashETR	0,4858*	-0,4604*	1,0000					
ROA	0,0212	0,4150*	0,0283	1,0000				
LEV	0,0010	-0,0918*	0,0907*	0,0246	1,0000			
PPE	-0,0479	-0,0632***	-0,0558	-0,1488*	0,1646*	1,0000		
INTANG	-0,0096	0,0814**	-0,0364	0,1556*	-0,0011	-0,1224*	1,0000	
SIZE	-0,0935*	0,0556	-0,1421*	-0,1663*	0,0488	0,0053	0,1763*	1,0000

Source: *Research data.*
Note: ETRc - Effective Current Tax Rate, BTD - Accounting Profit versus Tax Profit, CashETR - Effective Cash Tax Rate, ROA - Return on Assets, LEV - Financial Leverage, PPE - Investments in Fixed Assets, INTANG - Investments in Intangibles and SIZE - Size.
Confidence index of * 1%, ** 5% and *** 10%

For the 846 observations of the free market, the behavior between the metrics of tax aggressiveness does not change in relation to the regulated market, so, for greater aggressiveness, the ETRc and CashETR indicators are smaller and the BTD is higher (Chen et al., 2010; Hanlon & Heitzman, 2010).

The list of free market variables differs from that of the regulated market in the following variables: SIZE, INTANG and PPE.

For the variables size (SIZE) and investments in intangibles (INTANG), the relationship is exactly the opposite of that of the regulated market, indicating that the greater the tax aggressiveness, the higher the values of these metrics tend to be, the larger the size of the companies and the larger investments in intangibles. This differentiation from the free market to the regulated market indicates that the more tax aggressive, the greater the tendency to be large companies, with greater capacity for management and control of tax planning strategies and adequate legal support, consequently greater their internal controls and compliance level.

To PPE metric, the relationship with the BTD variable was negative, indicating that the greater the tax aggressiveness, the lower the investment in fixed assets, demonstrating that, for the free market, any increase in the cash flow generated by the lower tax aggressiveness can be reinvestment in fixed assets.

It is also observed that although the relationships between the metrics are significant, there is a low degree of relationship.

The profile of the three groups in the sample is similar, indicating that companies with greater tax aggressiveness, regardless of whether they operate in a regulated market or not, have a directly proportional relationship with the return on assets and financial leverage.

4.3 Regression Method

The multiple regression method was used to show the relationship between tax aggressiveness and the regulated market. This statistical method is used to analyze the relationships between the various independent variables and the dependent variable.

The methodology used to test the hypothesis of this study was an adaptation of similar works such as those by Chen et al. (2010), Motta (2020) and Martinez and Ramalho (2014). The analyzes of linear regressions were performed using the panel method with a fixed effect, defined after the execution of the Hausman test. The linear panel model estimates for each aggressiveness proxy are presented, designed to test the research hypothesis: Companies that operate in regulated markets are less tax aggressive than companies in the free market.

The results were constructed from the analysis of linear regression. So, the equation was tested to assess the influence of the tax aggressiveness of the regulated market.

Table 7 below provides the regression result for the aggressiveness indicators, such as: coefficient (Coef.), Standard error of the coefficient (Error) and indicative of the confidence index (p value) for each type of sample. It also presents the estimated coefficients for variables dependent on aggressiveness ETRc, BTD and CashETR for linear regression in a fixed effect panel obtained by the ordinary least square method, as shown below:

Table 7

Results of regressions of the proposed model

2010 to 2018	ETRc				BTD				CashETR			
	Regulated Market		Free Market	General Market			Free Market		Regulated Market		Free Market	
	Coef.	Error	Coef.	Error	Coef.	Error	Coef.	Error	Coef.	Error	Coef.	Error
ROA	0,209*	0,047	0,530*	0,117	0,126*	0,025	0,280*	0,034	0,161*	0,042	0,393*	0,110
LEV	0,010	0,018	-0,054	0,035	-0,007	0,007	-0,014	0,010	0,0367***	0,019	0,045***	0,026
PPE	-0,017	0,024	-0,020	0,030	-0,006	0,005	-0,005	0,006	-0,002	0,017	-0,049***	0,027
INTANG	-0,015	0,017	0,004	0,039	-0,019*	0,004	-0,005	0,010	-0,002	0,018	-0,030	0,032
SIZE	0,000	0,002	0,001	0,003	0,001	0,001	0,002**	0,001	0,002	0,003	-0,007***	0,004
Constante	0,197*	0,044	0,161*	0,057	0,056*	0,012	0,021***	0,012	0,143*	0,043	0,277*	0,062
R²	41,8%		34,9%		50,6%		49%		30,1%		34,1%	
Obs	823		846		823		846		823		846	

Source: *Research data.*

Note: ETRc - Effective Current Tax Rate, BTD - Accounting Profit versus Tax Profit, CashETR - Effective Cash Tax Rate, ROA - Return on Assets, LEV - Financial Leverage, PPE - Investments in Fixed Assets, INTANG - Investments in Intangibles and SIZE - Size. Confidence index of * 1%, ** 5% and *** 10%

As shown in Table 7, the constant statistics indicate that the entire model for the ETRc, BTD and CashETR index was adjusted (p <0.1), which allowed for the continuity of the analyzes, with significant data at 90% confidence.

The R² statistic allowed us to conclude that 41.8% and 34.9% of the ETRc variation are explained by the independent variables described by the model, as well as 50.6% and 49% of the BTD variation and 30.1% and 34.1 % of the variation in CashETR, for the regulated market and free market samples respectively.

In a specific analysis, it can be seen in the constant statistics that the ETRc (0.197) of the regulated market is higher than the ETRc (0.161) of the free market. It can also be observed that the BTD (0.056) of the regulated market is higher than the BTD (0.021) of the free market, both with a confidence level above 90%.

This result converges with that indicated by Chen et al. (2010): a more tax-aggressive company has lower ETRc, BTD and CashETR values, indicating a lower tax burden, confirming the hypothesis with 90% confidence that companies operating in regulated markets are less tax-aggressive than companies in the market free.

The result is similar to that found in Arigony´s work (2019), which prescribes that companies that operate in regulated markets have a less aggressive tax posture. This was also confirmed by Simone, Sansing and Seidman´s work (2013), who proved that the greater the regulatory interference, the lower the frequency with which taxpayers claim tax benefits.

4.4 Regression model by sector

The analyzes of linear regressions by sector follow the same pattern as in the previous item and were performed using the panel method with fixed effect, defined after the execution of the Hausman´s test.

Table 8 presents the estimated coefficients for variables dependent on aggressiveness ETRc, BTD and CashETR for linear regression by sector in a fixed effect panel obtained by the least ordinary square method, as shown below:

Table 8

Regression results of the proposed model by sector

2010 to 2018	Obs	ETRc		BTD		CashETR	
		Coef.	Error	Coef.	Error	Coef.	Error
Free Market	846	-0,043***	0,022	0,009***	0,005	-0,021*	0,032
ANA – Águas	63	0,000	0,000	0,000	0,000	0,000	0,000
ANATEL - Telecomunicações	31	-0,010	0,042	0,016	0,016	-0,003	0,038
ANCINE – Cinema	1	0,086*	0,030	-0,019*	0,006	0,220*	0,037
ANEEL – Energia	339	-0,005	0,023	0,002	0,005	0,018	0,033
ANM – Mineração	6	0,048	0,198	0,025	0,023	0,001	0,082
ANP – Petróleo	46	-0,011	0,029	-0,009	0,006	0,021	0,036
ANS – Saúde	21	0,076**	0,032	-0,014***	0,007	0,100*	0,037
ANTT – Transportes	181	0,036***	0,019	-0,016*	0,004	0,056***	0,031
SUSEP – Seguros	135	0,058***	0,030	-0,014***	0,008	0,079**	0,038
Constante	1.669	0,183*	0,035	0,043*	0,009	0,195*	0,036
R^2	1.669	41,2%		49,0%		33,0%	
Obs		1.669		1.669		1.669	

Source: *Research data.*

Note: Confidence index of * 1%, ** 5% and *** 10%

It can be seen in Table 8 that, among the regulatory agencies, there are different levels of tax aggressiveness, some more aggressive than others, understanding that the lower the coefficient, the greater the tax aggressiveness.

Analyzing the free market, ETRc (-0.043), BTD (0.009) and CashETR (-0.021) are lower than all the other coefficients of regulatory agencies, all with a confidence level above 90%.

As results obtained, it can be seen that companies in the regulated market, when segregated by sector, have a different level of tax aggressiveness.

These differences can be explained because some sectors have their revenues based on regulatory tariffs, so, any tax benefit claimed by companies must be passed on to consumers, with no real interference or benefit for companies to spend time on mechanisms of tax aggressiveness.

These differences can be explained because some sectors have their revenues based on regulatory tariffs, so, any tax benefit claimed by companies must be passed on to consumers, with no real interference or benefit for companies to spend time on mechanisms of tax aggressiveness.

Some sectors, such as water and energy, health and transportation distributors, have specific regulations, in which the regulator supervises, monitors and directly influences the pricing of such companies, which may be the reason for less tax aggressiveness and the divergence that exists between the sectors regulated. In the pursuit of reasonable tariffs, regulatory agencies annually determine the correction of tariffs practiced by companies, directly interfering in corporate revenue.

One of the benefits of tax aggressiveness is the increase in cash flow (FCX) and the net profit (LL) of companies. (Hanlon, 2005; Hanlon & Heitzman, 2010). However, for certain sectors, this benefit does not constitute a result, since any tax gain must be passed on as a reduction in the tariff to the consumer. On the other hand, not all operating costs can be passed on to the tariff, playing a role in discouraging tax aggressiveness.

5 Final Considerations

This research aimed to identify whether the regulated market is a determining factor for a less aggressive tax stance in companies.

To achieve this objective, a comparative analysis of tax aggressiveness was carried out between companies that operate in a regulated market and companies that operate in the free market listed in B3.

The correlation matrix shows that the profile of the three groups in the sample is similar, indicating that companies with greater tax aggressiveness, regardless of whether they operate in a regulated market or not, have a directly proportional relationship with the return on assets and financial leverage.

According to the results found in the difference test between means, it was found that, on average, companies that operate in regulated markets have a more conservative attitude in taxes, due to the less aggressiveness presented in ETRc, BTD and CashETR, being 6.2%, 1.1% and 5.6% lower respectively.

In the regression analysis, it can be seen that the ETRc (0.197) of the regulated market is higher than the ETRc (0.161) of the free market. The same can be seen for the BTD (0.056) of the regulated market, which is higher than the BTD (0.021) of the free market, both with a confidence level greater than 90%. This result converges with that indicated by Chen et. al (2010), that there is a greater probability of presenting lower percentages of ETRc, BTD and CashETR in the most tax-aggressive companies, as it indicates a lower tax burden.

In the analysis of the results of the regressions by sector, it can be seen that companies in the regulated market, when segregated by sector, have different levels of tax aggressiveness. However, when the free market is analyzed, ETRc (-0.043), BTD (0.009) and CashETR (-0.021), it was found that these are lower than all the other coefficients of regulatory agencies, all with a level of confidence above 90%.

According to the results found, it is possible to state that publicly traded companies that operate in the regulated market have less aggressive tax attitudes.

The result is in line with Arigony´s work (2019), in which companies operating in regulated markets are exposed to an entire control structure of regulatory agencies, which operate under Federal Government guidelines, and have a less aggressive tax stance .

This result confirms Bozanic et al.´s study (2017), in which there are influences from the tax regulator on companies, to the point that many significantly increase the amount of their disclosures related to taxes.

This work corroborates Simone et al.'s study (2013), who demonstrated that for greater regulatory control there is less claim for uncertain tax benefits on taxpayers, demonstrating that the greater the regulator's interference the lower the frequency with which taxpayers claim benefits.

An important limitation in this work refers to the sample size, as can be seen, especially with regard to the segregation of companies by sector. This indicates that the results presented can be considered only for the sample in question.

The practical contribution of this study was to evaluate the performance of the union with the sectorial regulation model in force in the country, verifying whether it is capable of bringing benefits under the tax aspect and the tax aggressiveness.

This study brings from the theoretical contribution the need for a more effective participation of taxpayers for a regulatory model more based on trust and mutual contribution between public administration and companies. From the theoretical point of view, the work contributes to the evaluation of sectorial regulation as a mechanism for controlling tax

avoidance and reducing tax aggressiveness, in addition to providing initial study material for future research on the behavior of the regulated market in the face of tax aggressiveness.

As a suggestion for future research, it is recommended: (I) The sample defined in this study was limited to companies that operate in B3, discarding the other companies that are not publicly traded, but that operate in regulated markets. Expanding the sample would be an interesting thing to do (II) extending the sample period; (III) expand the analysis of the relationship between the level of tax aggressiveness among companies by regulatory agencies.

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