


Multinationality, intangible assets and tax aggressiveness


Multinacionalidade, ativos intangíveis e agressividade fiscal

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Abstract

Currently, tax aggressiveness and multinationality have been recurring themes in international accounting research. This study aims to analyze how tax aggressiveness (BTD or VATR) is affected by multinationality, considering the level of intangible assets of companies listed on B3 (Brazil stock exchange). For this, a quantitative research was carried out from the regression analysis, where two proxies of tax aggressiveness were tested (BTD and TTVA). The results allow us to infer that, on average, the presence of multinationality is related to lower levels of tax aggressiveness. However, the presence of multinationality, related to higher levels of intangible assets generates higher levels of tax aggressiveness.

Keywords: Tax aggressiveness; Multinationality; Intangible assets

Resumo

Atualmente, a agressividade fiscal e a multinacionalidade tem sido temas recorrentes em pesquisas internacionais na área contábil. O objetivo deste estudo é analisar como a agressividade tributária (BTD ou TTVA) é afetada pela multinacionalidade, considerando o nível de ativos intangíveis das empresas listadas na B3. Para isso, foi realizada uma pesquisa quantitativa a partir da análise de regressão, em que se testaram duas *proxies* de agressividade fiscal (BTD e TTVA). Os resultados permitem inferir que a presença de multinacionalidade está relacionada a menores níveis de agressividade fiscal, em média. No entanto, a presença de multinacionalidade relacionada a maiores níveis de ativos intangíveis gera maiores níveis de agressividade fiscal.

Palavras-chave: Agressividade fiscal; Multinacionalidade; Ativos intangíveis

Resumen

La agresividad fiscal y la multinacionalidad han sido temas recurrentes en la investigación internacional en el ámbito contable. Este Estudio tiene como objetivo analizar cómo la agresividad fiscal (BTD o TTVA) se ve afectada por la multinacionalidad considerando el nivel de activos intangibles de las empresas que cotizan en B3. Para ello, se realizó una investigación cuantitativa con el análisis de regresión, utilizando dos *proxies* de agresividad (BTD y TTVA). Los resultados permiten inferir que la presencia de multinacionalidad se relaciona con menores niveles de agresividad fiscal, en promedio. Sin embargo, la presencia de multinacionalidad relacionada con mayores niveles de activos intangibles genera mayores niveles de agresividad fiscal.

Palabras clave: Agresividad fiscal; Multinacionalidad; Activos intangibles

1 Introduction

Two of the topics discussed in the international accounting literature are tax aggressiveness, and the multinationality of companies, because there are indications that taxation effectively influences business, especially when there is a change in the location of companies with an aim to reduce taxes (Blouin, 2012; Silva & Martinez, 2016; Schanz, Dinkel & Keller, 2017; Lawless, McCoy, Morgenroth & O "Toole, 2018; Ramos & Martinez, 2018; Pieretti & Pulina, 2020; Johannesen, Torslov, & Wier 2020; Oguttu & Kayis-Kumar, 2020; Choi, Furusawa & Ishikawa, 2020; Goyvaerts & Roggeman, 2020; Mardan & Stimmelmayer, 2020; Merlo, Riedel & Wamser, 2020; Nerudova, Solilova, Litzman & Janský, 2020; Akhtar, Akhtar, John & Wong, 2019).

The results of research carried out in different countries show that companies can move from one environment to another in search of lower tax costs, and companies can even transfer from country-to-country (Schanz et al., 2017; Lawless et al., 2018; Pieretti & Pulina, 2020; Johannesen et al., 2020).

When exploring the ways taken by businessmen to mitigate tax costs, Nerudova et al. (2020) set out to identify income transfer channels. They concluded that the income of the companies analyzed are generally offset by the movement of revenue, operating costs, and the use of debt channels. Investments made in tax havens require less operating income to achieve higher results. Barrios and D'Andria (2020) concluded, after analyzing data worldwide, that those sectors that carry out the most income transfers reduced their average cost of capital, and thereby attracted more investments, when compared to the other sectors less capable of dodging taxes. They also concluded that intangible assets are shown to be related to income transfer (Barrios & D'Andria, 2020). The level of intangible assets is an economically relevant factor due to its high measurement subjectivity and its ability to generate tax benefits arising from the use of amortizations, which brings competitive advantage to organizations and can be directly related to the degree of tax aggressiveness of companies (Oliveira & Beuren, 2003; Perez & Famá, 2006; Kaplan & Norton, 2009; Taylor & Richardson, 2015; Silva, 2016; Barrios & D'Andria, 2020).

In the international scenario, preliminary studies bring evidence of the relation between multinationality and the degree of tax aggressiveness of companies. In these studies, they analyze companies from different countries that explore the gaps in legislation and the absence of clear rules for regulating international trade. Companies exploit these gaps for the purpose of tax planning, the increase in results associated with the multinationality of companies is significant (Blouin, 2012; Zucman, 2014; Taylor & Richardson, 2015; Picciotto, 2018; Barrios & D'Andria, 2020; Oguttu & Kayis-Kumar 2020, Goyvaerts & Roggeman, 2020; Mardan & Stimmelmayer, 2020; Merlo et al., 2020).

In recent years, intangible assets have also been recognized as mechanisms that managers can use towards tax aggressiveness. The use of intangible assets occurs due to tax planning opportunities brought by the deductibility of amortization and the difficulty of verifying these tax benefits by tax authorities (Markusen, 1995; Markham, 2005; Perez & Famá, 2006; Blouin, 2012; Ocean, 2017; Hamamura, 2018; Silva, 2016; Maluf & Asano, 2019; Barrios & D'Andria, 2020).

In a national context, there are empirical evidence that tax aggressiveness is determined by the parent companies in business groups, which seek intragroup income transfer strategies to reduce taxation (Ferreira, Martinez, & Costa, Passamani, 2012; Martinez & Dalfior, 2015).

In this study, we intend to look at a gap not yet observed in the literature, which is to verify how tax aggressiveness is affected by multinationality, considering the level of intangible assets of each company. With regard to tax aggressiveness, in this study the novelty is working with the Book Tax Differences (BTD) and the Value Added Tax Rate (VATR). BTD looks at the difference between book and tax values to measure tax aggressiveness. The multinationality in this study is measured in 3 ways: 1) when there is substantial control of the Brazilian company by a foreign company; 2) when there is a subsidiary in a foreign country; and 3) when there are foreign direct investments. The proposal is to verify if the culture of transferring from one market to another, in search of lower costs, is also maintained when the investor is a foreign company.

The justification for conducting this research is due to its results, in the sense that there are opportunities for tax planning generated by taking advantage of tax benefits, operations between multinationals, as well as by taking advantage of amortizations of intangible assets. Another justification is based on the results of the study by Johannesen et al. (2020), where they analyzed data from 210,000 corporations in 142 different countries and found that tax evasion by multinational companies is more likely in less developed countries. It should be noted that there is an absence of previous works investigating this theme. In the international scenario, there are no studies that investigate the context explored in this research, but there are studies that relate multinationality to transfer prices (Blouin, 2012; Silva & Martinez, 2016; Schanz et al., 2017, Lawless et al., 2018; Ramos & Martinez, 2018; Pieretti & Pulina, 2020; Johannesen et al., 2020; Oguttu & Kayis-Kumar, 2020; Choi et al., 2020; Goyvaerts & Roggeman, 2020; Mardan & Stimmelmayer, 2020; Merlo et al., 2020; Nerudova, et al. 2020; Akhtar et al., 2019). In addition, there are also studies that relate multinationality and intangible assets to transfer prices (Taylor & Richardson, 2015, Barrios & D'Andria, 2020). Given the above, this research fills a gap not yet empirically observed, since the Brazilian market is a developing market about which there is still no record of research being done on this topic.

Therefore, the idea for carrying out this study came from the work developed by Taylor and Richardson (2015), in the American market, on transfer pricing, which is considered a type of tax aggressiveness. The

particularities found in the Brazilian scenario, such as the high tax burden, complex legislation with constant changes, and tax war between states are mechanisms that can influence tax aggressiveness, motivated this study to analyze whether multinationality and intangible assets can be factors that encourage the implementation of tax-aggressive practices in the national market (Silva, 2016).

In order to carry out this study, an empirical, quantitative research was developed, using regression analysis to test hypotheses. The financial data studied were obtained through the Economatica® database and collected in the reference forms available on the B3 website, while some data were collected from the Value Added Statements (VAS) on the companies' website. Data were collected for companies in the Brazilian market listed on B3 from 2010 to 2017.

In this study, tax aggressiveness is the explained variable measured by BTD and VATR, which follow the studies by Frank, Lynch and Rego (2009) and Silva (2016), respectively. Multinationality is measured by means of three dummy variables, created from the definition brought by Markusen (1995): 1) dummy variable indicates the presence of substantial control by a foreign company; 2) dummy variable indicates the existence of a subsidiary in a foreign country; 3) dummy variable indicates the existence of foreign direct investments. The level of intangible assets was measured by the total value of intangible assets divided by the total asset, as used by Chen, Chen, Cheng and Shevlin (2010).

This research contributes to the national literature and provides empirical evidence on the relationship of tax aggressiveness and the tax strategies of income shifting (income transfer) adopted by Brazilian companies, used as a tax planning tool. Another contribution of this research is to verify how the presence of multinationality, considering the level of intangible assets, can affect the tax aggressiveness of companies, both in the difference between the book and tax value, as well as the tax paid in relation to the added value. These results bring evidence that has not yet been observed nationally, or internationally, and can assist stakeholders in making decisions related to the topic. This study also provides evidence that corroborates the identification of other profiles and characteristics of tax-aggressive Brazilian companies, as suggested by Martinez and Dalfior (2016), and can help public entities with empirical information that allows them to mitigate the impacts of tax evasion to the coffer's public.

The results found in this study are that the presence of multinationality reduces, on average, the level of tax aggressiveness in companies, but, in the presence of multinationality, as the levels of intangible assets increase, there is an increase in the levels of tax aggressiveness.

2 Literature Review

2.1 Tax aggressiveness

Tax aggressiveness is a characteristic present in large companies whom seek strategies to reduce the tax burden. It occurs through the allocation of taxation among the members of an economic group, located in different jurisdictions, where they intentionally manipulate or control the prices charged intragroup to reduce taxable income (Chen et al., 2010; Blouin, 2012; Taylor & Richardson, 2015; Silva & Martinez, 2016; Schanz, Dinkel & Keller, 2017; Lawless et al., 2018; Ramos & Martinez, 2018; Pieretti & Pulina, 2020; Johannesen et al., 2020; Oguttu & Kayis-Kumar, 2020; Choi et al., 2020; Goyvaerts & Roggeman, 2020; Mardan & Stimmelmayer, 2020; Merlo et al., 2020; Nerudova, et al., 2020; Akhtar et al., 2019).

Tax aggressiveness is also inferred from the lack of control mechanisms for monitoring intra-group transactions, practices related to income manipulation that aim only at reducing the tax burden, which can have direct impacts on tax evasion to public coffers (Eccles, 1985; Emmanuel & Mehafdi, 1994; Colbert & Spicer, 1995; Taylor & Richardson, 2015; Ramos & Martinez, 2018; Rodrigues, Melo, & Paulo, 2019). Nerudova et al. (2020) set out to identify income transfer channels based on data from European Union Member States. They concluded that the income of the companies analyzed are generally offset by the movement of revenues, operating costs, and the use of debt channels. They also concluded that groups linked to tax havens pay less taxes. In addition, they noted that investments made in tax havens require less operating income to achieve higher results. Barrios and D'Andria (2020) concluded, after analyzing data worldwide, that those sectors that carry out the most income transfers reduced their average cost of capital, and thereby attracted more investments when compared to other sectors less able to dodge taxes. They also concluded that intangible assets are related to the transfer of income due to the difficulty of controlling and inspecting the accounting for these assets.

In order to mitigate tax evasion, tax authorities apply the arm's length principle, which consists of comparing prices used in transactions between parties related to market prices, thus verifying the adequacy of commercial income and royalties' values. In this way, multinationals and abusive practices of tax aggressiveness is detected (Keuschnigg & Devereux, 2013). In Australia, due to the increase in aggressive tax planning schemes by multinationals, a new demand from society has emerged, which has increased pressure on governments and public policy makers to curb such practices (Oguttu & Kayis-Kumar, 2020). Still with the purpose of mitigating the evasion of resources, several countries have proposed subcapitalization rules. These rules limit the deductibility of interest on domestic loans and aim to avoid the excessive transference of income by multinational companies (Goyvaerts & Roggeman, 2020). Mardan & Stimmelmayer (2020) analyzed tax competition between countries and concluded that countries that are able to receive

transfers tend not to lower taxes, while countries that offer little infrastructure, for example, can lower taxes. The opposite is also true, so that if the costs of transferring income are low, the country involved does not lower the tax. Merlo et al. (2020) studied data from companies in 172 countries to see how restrictions on the tax deductibility of interest costs affect the location choices of multinational companies. Small cap rules have been implemented in some countries to prevent multinationals from changing their tax base in countries with lower tax rates, and the result of this study was that business location choices are considered negative in countries with stricter restrictions, that is, companies take into account the transfer cost.

With regards to the measurement of tax aggressiveness in relation to the difference between book income and tax income, the previous literature suggests that there are differences between these types of incomes (Hanlon & Heitzman, 2010), because each income criterion follows rules for measurement. Book income complies with Generally Accepted Accounting Principles (GAAP), while tax income obeys legal or tax determinations (Ferreira et al., 2012; Chen & Dhaliwal, Trombley, 2012; Noga & Schnader, 2013). With regard to the measurement of tax aggressiveness, the tax paid in relation to the added value is taken into account, this proxy of aggressiveness brings a perspective regarding the company's contribution to society (Silva, 2016).

In this study, two proxies of tax aggressiveness were used. BTM, which is the difference between book income and tax income divided by total assets, was chosen because it is a robust proxy associated with tax planning, and can also be used to identify signs of tax illegalities and risks either known or not by the company, but unknown to external users (Nossa & Teixeira, 2018; Noga & Schnader, 2013; Silva 2016). And comparatively, VATR was used to measure the impact of the tax paid in relation to the value added by the company (Silva, 2016).

As organizational factors, the preliminary literature relates tax aggressiveness to the size of companies, leverage, spending on research, and development, level of profitability and level of operation abroad. They even bring evidence that the largest companies have, on average, lower costs with tax planning, which would leverage their degree of tax aggressiveness, as companies would be more susceptible to participate in aggressive price agreements (Benvignati, 1985; Slemrod, 2001; Bernard, Jensen, & Schott, 2006; Conover & Nichols, 2000; Silva, 2016). Rezende, Dalmácio & Rathke (2018, p. 31) present arguments that "an environment with a high tax burden, complexity of tax laws and tax competition, created between administrative units, becomes a fertile ground for companies to develop practices of tax planning".

There is also evidence that corporate profitability is related to tax aggressiveness, as large companies can take advantage of differences in profitability between local entities and other non-local entities, which further reduces costs with tax planning, since there are indications that the higher the profits, the less the tax aggressiveness. (Benvignati, 1985; Jacob, 1996; Conover & Nichols, 2000; Gupta & Newberry, 1997).

Lawless et al. (2018) studied the effect of the tax rate charged on the location decisions of multinational subsidiaries. For the development of the study, they analyzed companies established in 26 European countries for 8 years. They concluded that there are wide variations in the sensitivity of companies to the tax rates charged. They call attention to companies in the financial sector, which are doubly more sensitive to changes in tax rates when compared to companies in other sectors. Pieretti and Pulina (2020) who analyzed initiatives aimed at eliminating the income transfer, concluded that companies seek environments with lower taxes and can even transfer in search of reduced taxes.

The capital structure, in turn, is another organizational factor that can impact the effective tax burden of companies, because the more leveraged companies are, the greater the opportunities for taking advantage of the deductibilities brought by interest and loan rates, which also makes companies more tax-aggressive (Gupta & Newberry, 1997; Hines, 1996; Newberry & Dhaliwal, 2001; Bernard et al., 2006; Dyreng, Hanlon, Maydew, 2008; Pohlmann & Iudícibus, 2010; Santos, Cavalcante, & Rodrigues, 2013; Blouin, Huizinga, Laeven & Nicodè, 2014). Goyvaerts and Roggeman (2020) concluded that several countries have proposed subcapitalization rules that limit the deductibility of interest on domestic loans, in order to avoid the excessive transfer of income by multinational companies.

2.2 Multinationality and tax aggressiveness

The international literature on multinationality reports that corporate taxation becomes more complex when companies operate in different countries, due to the absence of specific international treaties to regulate corporate taxes and the different tax rules that companies are subject to, and, with that, gaps are created for tax aggressiveness (Zucman, 2014; Markusen, 1995; Oguttu & Kayis-Kumar 2020; Choi et al., 2020; Goyvaerts & Roggeman, 2020; Mardan & Stimmelmayer, 2020; Merlo et al., 2020). These authors also discuss points about the advantages, costs, markets for business expansion, advantages and disadvantages for setting up companies in other countries.

Multinationals are companies that need to strive to manage their various channels and find opportunities to make their operations more profitable, which, on the other hand, puts them under the radar of the tax authorities, since a substantial part of international trade corresponds to sales or transactions between units of the same company, within or outside the national borders of the parent company (Grewal, Saini, Kumar, Dwyer, & Dahlstrom, 2018; Mehafdi, 2000; Choi et al., 2020).

Blouin (2012) suggests that when multinationals reach maturity (a condition in which companies have

adequate accumulated earnings to finance their investments), they shift their marginal investment focus and analyze whether or not to repatriate the accumulated earnings. Multinational companies transfer income from countries with higher taxes to countries with low taxes or with more tax incentives, in an attempt to reduce their tax liabilities (Keuschnigg & Devereux, 2013).

In Australia, due to the increase in aggressive tax planning schemes by multinationals, a new demand from society arose, which increased pressure on governments and public policy makers, in order to curb tax aggressiveness (Oguttu & Kayis- Kumar, 2020).

Mardan & Stimmelmayer (2020) analyzed tax competition between countries and concluded that countries that are able to receive transfers tend not to lower taxes, but countries that offer, for example, little infrastructure, can lower taxes. In other words, countries with the highest risk offer lower tax rates when compared to the countries with the lowest risk. The opposite is also true, so that if the costs of transferring income are low, the country involved does not decrease the tax. Merlo et al. (2020) studied data from companies in 172 countries to see how restrictions on the tax deductibility of interest costs affect the choice of location for multinational companies. Small cap rules have been implemented in some countries to prevent multinationals from shifting their tax base to countries with lower tax rates, and the result of this study shows that business location choices are negatively affected in countries with stricter restrictions, that is, companies take into account the cost of transfer.

Johannesen et al. (2020) analyzed data from 210,000 corporations in 142 different countries to analyze whether tax evasion by multinational companies is more likely in less developed countries. They conclude that the transference of income is negatively related to the level of economic and institutional development, that is, in developing countries the transfer of income is more likely. There is also evidence that multinationality is directly related to tax aggressiveness, because the effective collection of companies in their countries of origin may decrease as a result of the increased transfer of income to jurisdictions with low taxation or that have tax attractions (Zucman, 2014; Taylor & Richardson, 2015; Harvey, 2014; Blouin, 2012; Harvey, 2014, Keuschnigg & Devereux, 2013). It is also noted that, when re-investing income in foreign countries, companies avoid taxing gains in the country of origin of the parent company or controller, they become more tax aggressive (Zucman, 2014; Taylor & Richardson, 2015, Harvey, 2014; Blouin, 2012; Keuschnigg & Devereux, 2013). This aggressiveness is used as a strategic tool in tax planning, which depends on the legal environment and managers of companies convinced that the benefits generated by these strategies (tax planning) are greater than the costs of assuming such practices (Zucman, 2014; Taylor & Richardson, 2015, Harvey, 2014; Blouin, 2012; Keuschnigg & Devereux, 2013).

For this reason, tax aggressiveness in multinationals can be associated with a greater availability of resources for application in tax planning, since by obtaining higher earnings than domestic units in countries with low taxes or with tax incentives, foreign companies pay lower taxes in comparison to those paid by domestic companies in countries with high taxation or without incentives (Mehafdi, 2000; Slemrod, 2001; Smith, 2002; Bartelsman & Beetsma, 2003; Baldenius, Melumad and Reichelstein, 2004; Hyde & Choe, 2005; Egger, Eggert, & Winner, 2010; Shunko, Debo & Gavirneni, 2014; Barrios & D'Andria, 2020).

Regarding the form of identification of multinationality, Allayannis and Weston (2001) consider only the geographical diversification of companies for their characterization. As in this research, multinationality was studied in a context related to international trade, which is a more current approach introduced by Markusen (1995), who considers multinationality represented by the substantial control exercised by a foreign company, or the existence of a subsidiary in a foreign country. The terms "multinational company" and "foreign direct investment" were also used interchangeably in this research, as suggested by Markusen (1995).

As Brazil is treated as a developing country and, in view of the literature presented, the hypothesis to be tested is presented:

H1: Tax aggressiveness increases under the presence of multinationality in the Brazilian market companies listed in B3.

2.3 Intangible assets and tax aggressiveness

Entities' intangible assets are an economically relevant factor, due to their high measurement subjectivity and their ability to generate tax benefits arising from the use of amortizations (Oliveira & Beuren, 2003; Perez & Famá, 2006; Kaplan & Norton, 2009; Taylor & Richardson, 2015; Silva, 2016; Barrios and D'Andria, 2020). Intangible assets bring competitive advantage to organizations and can be directly related to the tax aggressiveness of companies (Oliveira & Beuren, 2003, Perez & Famá, 2006, Kaplan & Norton, 2009, Taylor & Richardson, 2015, Silva, 2016, Barrios and D'Andria, 2020).

Due to the growth in transactions involving intangible assets transfer between affiliates of the same business group, and the tax planning opportunities brought by the deductibility of amortizations, local authorities began to observe more closely the compliance with the arm's length principle, (respect tax rules) by companies (Markham, 2005, & Taylor & Richardson, 2015). Barrios and D'Andria (2020) concluded, after analyzing data worldwide, that sectors which carry out the most profitable transfers reduce their average cost of capital, thereby attracting more investments when compared to the other sectors, which are less capable of dodging taxes. They also concluded that intangible assets are related to income transfer.

Intangible assets are organizational items with their own market value that contribute to the generation of value for companies over a long period. In this way, its amortization can occur in a very flexible way, and, with that, it can create opportunities for tax aggressiveness. This occurs, given that companies can choose among the various alternative ways of recognizing the amortization of intangible assets, and can even reduce earnings, which is the basis for taxation (Ferreira et al., 2012; Taylor & Richardson, 2015; Silva, 2016; Barrios & D'Andria, 2020).

Tax planning practices can determine how aggressive companies can be, how much of the planning strategies will influence organizational performance and the risk of de-characterization of legitimacy in recognition, and consequently, in the taxation of these items, which can occur due to difficulties in proving the deductibility of high amortizations (Silva, 2016; Perez & Famá, 2006). Intangible assets can assist managers in managing an entity's more competitive position due to the absence of well-established markets, in addition to the subjectivity of these items from the exploitation of tax benefits among affiliates to take advantage of the deductibility of amortizations, which would leverage the results with direct impact on income taxes (Perez & Famá, 2006; Kaplan & Norton, 2009; Shackelford; Slemrod, Sallee, 2011; Dyreng et al., 2008; Silva, 2016). Given the above, the second research hypothesis is presented:

H2: The higher the intangible asset, the higher the tax aggressiveness of companies listed in B3.

Taylor and Richardson (2015) studied companies in the American market, and there they concluded that when the company is multinational, as intangible assets increase, tax aggressiveness (transfer pricing aggressiveness) increases. For Silva (2016), transfer prices reflect some degree of tax aggressiveness. Given the above, the third hypothesis is presented:

H3: In the context of multinationality, as intangible assets increase, the tax aggressiveness of companies increases compared to the Brazilian companies listed in B3, which do not have multinationality.

3 Methodology

3.1 Proposed model

This research is characterized as empirical with the use of secondary data, using the financial statements released by the companies, and it is also a documentary, quantitative, descriptive research that used the content analysis technique to infer about the multinationality of the companies (Beuren et al., 2010; & Bardin, 2004).

The objective of this study is to verify how tax aggressiveness (BTD or VATR) is affected by multinationality considering the level of intangible assets of companies listed on B3.

To test the hypotheses established in this research, the econometric model presented by equation (1) was used:

$$AGRESS_{it} = \beta_0 + \beta_1(DMULT_{it}) + \beta_2(INTANG_{it}) + \beta_3(DMULT_{it} * INTANG_{it}) + \beta_4 CONTROLES_{it} \quad (1)$$

Where $AGRESS_{it}$ represents one of the proxies used to measure tax aggressiveness for company i in year t . $DMULT_{it}$ represents the measure of multinationality. $INTANG_{it}$ represents the intangible assets of company i in year t . Using the coefficients β_1, β_2 and β_3 the research hypotheses H1, H2 and H3 will be tested, respectively.

3.2 Tax aggressiveness

To measure tax aggressiveness, two proxies were used: Book Tax Differences (BTD) (Frank et al., 2009) and the Value Added Tax Rate (VATR) (Silva, 2016). BTD is measured by the difference between Book Income and Tax Income, where the calculation of Tax Income is explained in Table 1, the higher the BTD, the greater the tax aggressiveness. VATR is measured by the ratio between the tax burden using data from the Value Added Statements (VAS) and the Total Added Value to be distributed, thus, the lower the VATR the greater the tax aggressiveness.

TABLE 1:
Book Income and Tax Income

	Data	Description and Source of Data Collection
(1)	Book Income	Income Before Taxes
(2)	Corporate income tax rates and social contribution on income rates	Amount referring to the corporate income tax rates (25% considering the normal and additional rates) plus 9% referring to social contribution on profit). In total 34% will be considered
(3)	Current corporate income tax rates and social contribution on profit rates	Current expenses with income tax (corporate income tax and social contribution on profit), available in the Consolidated Income Statements (CIS)
(4)	Deferred income tax and social contribution	Deferred income tax expense amount (corporate income tax rates and social contribution on profit) available in the Consolidated Income Statement (CIS)
(5)	Tax Income	Value obtained with the sum of items (3) and (4) divided by item (2). This calculation is an approximation of the Tax Income, as this information is not found in the accounting reports

Source: Table prepared by the authors.

3.3 Multinationality and intangible assets

Multinationality (DMULT) was measured from the definition provided by Markusen (1995), it is captured using 3 dummy variables: 1) $DMULT_CONTR_{it}$ assumes the value 1 if a substantial control of a foreign company over company i is identified in year t , 0 otherwise; 2) $DMULT_SUBS_{it}$ is set to 1 if company i has a subsidiary in a foreign country in year t , 0 otherwise; and 3) $DMULT_INVEST_{it}$ assumes the value 1 if company i has foreign direct investments in year t , 0 otherwise, this being a new metric for the identification of multinationality, which may be replicated in other research on this topic. According to hypothesis H1, the coefficients of these three dummy variables are expected to be positive when using the BTM proxy, and negative when using the VATR proxy. Indicating that tax aggressiveness is greater, on average, in the presence of multinationality.

The level of intangible assets was measured by the value of intangible assets divided by the total asset, as used by Chen et al. (2010). According to hypothesis H2, the coefficient of the variable INTANG is expected to be positive when using the BTM proxy, and negative when using the VATR proxy. Indicating that the higher the level of intangible assets, the greater the tax aggressiveness, on average.

The additional effect of multinationality on the relationship between intangibles and tax aggressiveness was also verified, through the interaction between the multinationality dummy variables (DMULT_CONTR, DMULT_SUBS and DMULT_INVEST) and the INTANG variable. According to hypothesis H3, the coefficient of the interaction's variable is expected to be positive when using the BTM proxy, and negative when using the VATR proxy. Indicating that in the presence of multinationality, the use of intangible assets to reduce the tax burden is even more pronounced.

3.4 Controls

The control variables of the model are: company size (SIZE), profitability (ROA) and leverage (LEV). The variable (SIZE) was measured as the natural logarithm of total assets, following Stickney and McGee (1982), for which it is expected that larger companies will be more tax aggressive, as the costs for tax planning could be apportioned and distributed among members of the business group. The control variable (ROA) was measured, according to Ramalho and Martinez (2014), as operating earnings divided by the total assets of the previous year, companies with higher profitability are expected to have higher levels of tax aggressiveness, as companies would tend to exploit the differences in the profitability of local and non-local members (Benvignati, 1985; Jacob, 1996; Conover & Nichols, 2000). Leverage (LEV) was measured by the ratio of long-term debt to total assets, according to Gupta and Newberry (1997). Leverage is also expected to have a positive relationship with the company's tax aggressiveness.

Table 2 presents the description of all variables in the model, including the source of the data and references in the literature.

TABLE 2:
Regression Model Variables

Variables	Measurement and Source of Collection	Authors
<i>Variables Explained</i>		
BTD	Measured by the ratio between the difference between Book Income and Tax Income, and the Total Assets. The data to generate the variable were collected from Economática@.	(Frank et al., 2009)
VATR	Measured by the ratio between the tax burden of the VAS and the Total Added Value to be Distributed. The data were collected from the Securities Commission - CVM website.	Silva (2016)

Variables	Measurement and Source of Collection	Authors
<i>Explanatory Variables</i>		
MULTI	Dummy variable that takes the value of 1 when there is substantial control by a foreign company, subsidiary in a foreign country or foreign direct investments and 0 otherwise for company <i>i</i> in year <i>t</i> . The data to generate this variable were collected from the Reference Forms available at B3 and on the companies' websites.	Markusen (1995)
INTANG	Measured by the total of intangible assets divided by the total assets of company <i>i</i> for year <i>t</i> . Data to generate this variable were collected from Economática®.	S.Chen et al. (2010)
MULT* INTANG	Measured by the interaction of the MULT and INTANG variables.	Taylor et al. (2015)
<i>Control Variables</i>		
SIZE	Measured by the natural logarithm of total assets. Data to generate this variable were collected from Economática®.	Stickney e McGee (1982)
ROA	Measured by the ratio between operating earnings and total assets of the previous year. Data to generate this variable were collected from Economática®.	Ramalho e Martinez (1997)
LEV	Measured by the ratio between long-term debt and total assets. Data to generate this variable were collected from Economática®.	Gupta e Newberry (1997)

Source: Table prepared by the authors.

3.4 Construction of the database

The Brazilian stock market is the target population of this research, from which the data referring to the period 2010 to 2017 of the companies listed in B3 were analyzed, the choice of this period being due to the mandatory sending of the reference forms (Instruction of the Commission of Monetary Values - CVM No. 480/2009) as of 2010 for the companies listed in B3 and the year 2017 the last period that contains the financial information disclosed by the companies. Financial institutions and companies in the insurance sector, companies with negative equity and companies / year were excluded from the sample, where all the necessary information for calculating the variables of the proposed model was not available. This resulted in 888 company / year observations from 2010 to 2017. Finally, all variables were winsorized at 1%. Table 3 shows the number of initial observations and the loss of observations at each stage.

TABLE 3:
Sample Composition

Description	Amount
Number of Initial Observations	5,904
(-) Exclusion of companies from the financial and insurance sector	(540)
(=) Total after exclusion	5,364
(-) Exclusion of companies with negative equity	(427)
(-) Exclusion of companies without information	(4,049)
(=) Number of Observations Final Sample	888

Source: Table prepared by the authors.

4 Results

4.1 Descriptive statistics

Table 4 presents the descriptive statistics of the continuous variables of the proposed model, and Table 5 shows the frequency of the model's dummy variables.

TABLE 4:
Descriptive statistics

Variables ^a	N	MIN	P25	MEAN	MEDIAN	SD	P75	MAX
BTD	888	-3.0692	-0.0095	-0.0880	0.0084	0.5014	0.0284	0.3278
VATR	888	0.0043	0.1776	0.2856	0.2614	0.1901	0.3529	1.3625
INTANG	888	0.0000	0.0014	0.1194	0.0311	0.1942	0.1427	0.8011
SIZE	888	3.7743	12.6428	13.7606	14.2430	2.7508	15.3436	18.7120
LEV	888	0.0000	0.0063	0.1634	0.1382	0.1516	0.2714	0.5702
ROA	888	-0.0249	0.0859	0.2373	0.1831	0.2055	0.3432	0.8399

^a BTD is the difference between the Book Income and Tax Income divided by the total assets. VATR is the ratio between the VAS and the total added value to be distributed. INTANG is the ratio between intangible assets and total assets. SIZE is the natural logarithm of the total asset. LEVERAGE is the ratio between long-term debt and total assets. ROA is the ratio between the operating profit and the total assets of the previous year.

Source: Table prepared by the authors.

The negative BTM average indicates that, on average, the Brazilian companies in this sample are not tax-aggressive. Regarding the VATR variable, the average of 0.2856 indicates that the sample companies are supporting, on average, a tax burden of 28.56% on the added value to distribute generated by the companies' operations. The INTANG variable presents an average of 0.1194, indicating the intangible assets represent 11.94% of the total assets of the sample companies, on average (Table 4).

Table 5 shows the percentage frequency of the companies in each group by quartiles of proxies of tax aggressiveness, the quartiles were calculated by year. The quartiles of the BTM variable vary from the lowest level of tax aggressiveness (quartile 1) to the highest level of tax aggressiveness (quartile 4). While the quartiles of the VATR variable vary from the highest level of tax aggressiveness (quartile 1) to the lowest level of tax aggressiveness (quartile 4).

TABLE 5:
Frequency Table by Quartiles

	GROUP	QUARTIS BTM				QUARTIS TTVA			
		1	2	3	4	1	2	3	4
DMULT_CONTR	1	13.76%	20.18%	35.78%	30.28%	23.85%	27.52%	22.02%	26.61%
	0	26.96%	25.55%	23.49%	24.01%	25.55%	24.52%	25.42%	24.52%
DMULT_SUBS	1	21.11%	20.56%	30.00%	28.33%	21.67%	30.00%	32.78%	15.56%
	0	26.41%	25.99%	23.73%	23.87%	26.27%	23.59%	23.02%	27.12%
DMULT_INVEST	1	20.70%	22.58%	27.96%	28.76%	25.54%	27.69%	22.31%	24.46%
	0	28.68%	26.55%	22.87%	21.90%	25.19%	22.87%	26.94%	25.00%

Legend: BTM: Quartile 1 (lowest level of tax aggressiveness) - Quartile 4 (highest level of tax aggressiveness). TTVA: Quartile 1 (highest level of tax aggressiveness) - Quartile 4 (lowest level of tax aggressiveness).

Note: Quartiles were calculated by year.

Source: Table prepared by the authors.

According to the data presented in Table 5, companies that are in the context of no form of multinationality (DMULT_CONTR = 0, DMULT_SUBS = 0, DMULT_INVEST = 0), are distributed evenly over the different levels of tax aggressiveness. Companies that have substantial foreign control (DMULT_SUBS = 1) have a higher concentration in the 3rd and 4th quartiles of the BTM variable (66.06%), which are the levels of greatest tax aggressiveness. Companies with subsidiaries abroad also have a higher concentration in the 3rd and 4th quartiles of the BTM variable (58.33%), which are the levels of greatest tax aggressiveness.

Table 6 shows Pearson's correlation between the model's continuous variables. None of the independent variables showed a high correlation with each other, discarding evidence of perfect collinearity in the model.

TABLE 6:
Pearson's correlation

Variables ^a	BTM	VATR	INTANG	SIZE	LEV	ROA
BTM	1					
VATR	0.0340	1				
INTANG	0.1042***	-0.0350	1			
SIZE	0.6988***	-0.1151***	0.2377***	1		
LEV	0.1980***	-0.2233***	0.1244***	0.4691***	1	
ROA	0.2556***	0.1168***	0.1204***	0.1524***	-0.0920***	1

^a BTM is the difference between Book Income and Tax Income divided by the total assets. VATR is the ratio between the VAS and the total added value to be distributed. INTANG is the ratio between intangible assets and total assets. SIZE is the natural logarithm of the total asset. lev is the ratio between long-term debt and total assets. ROA is the ratio between the operating profit and the total assets of the previous year.

*, **, *** Indicate the significance level of 10%, 5% and 1%, respectively.

Source: Table prepared by the authors.

The variables INTANG, SIZE, LEV and ROA have a positive correlation and significantly different from zero, which indicates that companies with more intangible assets, larger, more leveraged and with better profitability are more tax aggressive (Table 6).

4.2 Results

Table 7 shows the results of the model estimation shown in Eq. (1). Column (1) provides the results using BTD as a proxy for tax aggressiveness, and column (2) provides the results using VATR as a proxy for tax aggressiveness. The P-Value of the Hausman test for both models was less than 10%, rejecting the null hypothesis that the most appropriate method for estimating the model would be the Random Effects method. Therefore, both models were estimated using the Fixed Effects method with correction for heteroscedasticity.

The DMULT_CONTR variable showed a statistically insignificant coefficient (t Stat. = -0.56) when using the BTD variable as a proxy for tax aggressiveness. However, when using the VATR proxy, this variable had a positive estimated coefficient of 0.0737 and was statistically significant at 10% (t Stat. = 1.79). This indicates that companies listed on B3 that have substantial foreign control are, on average, less tax-aggressive than the others. Which goes against the H1 hypothesis, that companies with tax aggressiveness increase in the presence of multinationality.

The DMULT_SUBS variable showed a statistically insignificant coefficient when using the VATR proxy. On the other hand, the estimated coefficient was statistically significant at 5% and negative, when using the BTD proxy for tax aggressiveness. Indicating that companies listed on B3 that have subsidiaries abroad are less aggressive than companies listed on B3 that do not have subsidiaries abroad, on average. Which, too, goes against the H1 hypothesis.

For the estimated coefficient of the DMULT_INVEST variable, no statistical significance was found in either model. Therefore, there is no statistical evidence that companies listed on B3 with foreign direct investment are, on average, more aggressive than the others. Not confirming the H1 hypothesis. In general, the evidence indicates that the presence of multinationality reduces tax aggressiveness.

With respect to intangible assets, the variable INTANG was not statistically significant when using the VATR proxy and presented statistical significance of 5% when using the BTD proxy. As the estimated coefficient was negative and statistically different from zero, when using BTD, this means that, for Brazilian companies where there is no presence of multinationality, higher levels of intangible assets are related to less levels of tax aggressiveness. Which goes against the H2 hypothesis that companies with more intangibles are, on average, more aggressive in tax terms.

The DMULT_CONTR*INTANG interaction showed a statistically significant coefficient in both models. The coefficient appears positive when the dependent variable is BTD and negative when the dependent variable is VATR. For the model in column (1) where the variables INTANG and DMULT_CONTR*INTANG presented statistical significance, we performed a test on the sum of the coefficients of the variables INTANG and DMULT_CONTR*INTANG. The F statistic, for the null hypothesis $H_0: \beta_2 + \beta_3 = 0$, was 0.09 with a P-value of 0.7699. Therefore, we cannot reject the hypothesis that the sum of these coefficients is zero. Therefore, for companies that do not have substantial foreign control, the presence of more intangible assets generates lower levels of tax aggressiveness. However, in the presence of foreign control, the relationship between intangible assets and tax aggressiveness is nullified (Table 7).

TABLE 7:
Results

Variables ^c	(1) BTD ^a		(2) VATR ^b	
	Coef.	t Stat.	Coef.	t Stat.
DMULT_CONTR	-0.0215	(-0.56)	0.0734	(1.79)*
DMULT_SUBS	-0.0949	(-2.37)**	0.2108	(1.89)*
DMULT_INVEST	-0.0234	(-1.41)	-0.0181	(-0.95)
INTANG	-0.2924	(-2.58)**	0.0616	(0.44)
DMULT_CONTR*INTANG	0,3575	(1.67)*	-0.2758	(-2.20)**
DMULT_SUBS*INTANG	0,2639	(0.92)	-0.2958	(-1.55)
DMULT_INVEST*INTANG	0,0262	(0.54)	0.0255	(0.43)
SIZE	0.1842	(3.54)***	-0.0205	(-1.20)
LEV	-0.1841	(-1.94)*	-0.0504	(-0.75)
ROA	0.3185	(4.44)***	-0.1251	(-1.39)
N ^o of Obs.	888		888	
Hausman test (χ^2)	16.87		23.73	
Hausman test (P-Value)	0.0773		0.0083	

^a BTB is the difference between Book Income and Tax Income divided by the total assets. ^b VATR is the ratio between the VAS and the total added value to be distributed. ^c DMULT_CONTR is a dummy variable that takes the value 1 when there is substantial control by a foreign company and 0 c.c. DMULT_SUBS is a dummy variable that takes the value 1 when there is a subsidiary in a foreign country and 0 c. ç. DMULT_INVEST is a dummy variable that takes the value 1 when there are foreign direct investments and 0 c. ç. INTANG is the ratio between intangible assets and total assets. SIZE is the natural logarithm of the total asset. LEV is the ratio between long-term debt and total assets. ROA is the ratio between the operating profit and the total assets of the previous year. *, **, *** Indicate the significance level of 10%, 5% and 1%, respectively. Source: Table prepared by the authors.

For the column (2) model, using VATR as a proxy for tax aggressiveness, the coefficient of the INTANG variable was statistically insignificant, indicating that intangibles do not affect the levels of tax aggressiveness, on average. However, the DMULT_CONTR*INTANG interaction coefficient is negative and statistically

significant at 5% (Coef. = -0.2758 t Stat. = -2.20), indicating that in the presence of substantial foreign control, the higher the level of intangible assets greater is the tax aggressiveness, on average.

In general, the evidence found indicates that the presence of multinationality reduces, on average, the company's levels of tax aggressiveness. However, the higher the level of intangible assets, the greater the tax aggressiveness of companies.

5 Final considerations

This work aimed to analyze how tax aggressiveness (BTD or VATR) is affected by multinationality considering the level of intangible assets of companies listed on B3. In order to achieve the objective of this research, an empirical research was developed in which secondary data from the financial statements published by the companies were used. The research is also of a documentary, quantitative, and descriptive nature that used the content analysis technique to infer about the multinationality companies (Beuren et al., 2010; Bardin, 2004).

With regard to the characteristics of the sample analyzed, 12.27% of the sample's observations are from companies that have substantial foreign control, 20.27% are from companies that have a foreign subsidiary and 41.89% of the sample is composed of companies that have foreign direct investment. The results found in this research are that companies that are in the context of no form of multinationality are homogeneously organized when we look at the levels of tax aggressiveness. Companies with substantial foreign control are at the highest levels of tax aggressiveness (BTD). Companies with subsidiaries abroad also have a higher concentration in the levels of greater tax aggressiveness (BTD).

When looking at the context in which the company is under multinational control and as the intangible asset increases (DMULT_CONTR*INTANG), there was a statistically significant result in both models (BTD and VATR). The coefficient appears positive when the dependent variable is BTD and negative when the dependent variable is VATR, remembering that as BTD increases this means tax aggressiveness and as it reduces VATR this means tax aggressiveness. However, the test developed from the F statistic, for the null hypothesis $H_0: \beta_2 + \beta_3 = 0$, was that we cannot reject the hypothesis that the sum of these coefficients is zero. Given the above, for companies that do not have substantial foreign control, the presence of more intangible assets generates lower levels of tax aggressiveness. However, in the presence of foreign control, the relationship between intangible assets and tax aggressiveness is nullified.

When we look at VATR as a proxy for tax aggressiveness, intangibles do not affect levels of tax aggressiveness, on average. However, DMULT_CONTR*INTANG shows a negative coefficient, indicating that in the presence of substantial foreign control, the higher the level of intangible assets, the greater the tax aggressiveness. These results corroborate those found by Taylor and Richardson (2015). Thus, the results found in this study are that the presence of multinationality reduces, on average, the company's levels of tax aggressiveness. However, the higher the level of intangible assets, the greater the tax aggressiveness of companies.

For future research it is recommended to include other variables, such as the use of tax loss, local tax benefits, in order to compare the results found, identifying only the effect of tax aggressiveness on local companies. It is also recommended to compare the effects of tax aggressiveness in the local scenario with the aggressiveness found in other markets to create profiles of fiscally aggressive companies in a more global way. It is also recommended to analyze the market's perception of tax aggressiveness (Akhtar et al., 2019).

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