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THE REPULSIVE EFFECTS OF THE TAX BURDEN ON THE GENERATION OF WEALTH IN BRAZIL

O EFEITO REPULSIVO DA CARGA TRIBUTÁRIA NA GERAÇÃO DE RIQUEZA NO BRASIL

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Lauro Vinício de Almeida Lima[1]
Márcia Reis Machado[2]

1 Federal University of Paraiba/Paraiba State Finance Secreatariat, 2 Federal University of Paraiba

ABSTRACT

Purpose – This research was aimed at verifying the influence of the tax burden on the value added produced by publicly traded companies listed in Brazil Bolsa Balcão (B^3).
Design/methodology/approach – The study had a quantitative approach and the sample period was from 2010 to 2016. Given the complexity of the Brazilian tax burden – characterized by high tax rates and confusing legislation – and the importance of value added as an accounting metric with economic impact, this research relied on the public choice theory and the elasticity of taxable income to analyze the relationship between the level of tax burden and the process of wealth generation in Brazilian companies.
Findings – The empirical evidence found in this study corroborates the theoretical understanding that the tax burden in Brazil exerts a negative influence on the value added produced by companies.
Practical and Social implications – This conclusion is a relevant assessment for society as a whole, as it is necessary to protect and maximize companies' wealth-adding process, since it is the resources produced by companies that will be shared in the economy with society, whose development depends on the wealth creation process.
Originality – The use of the added value produced as a metric of efficiency or saturation of the tax burden borne by companies in the Brazilian market.
Keywords - Tax burden; Public choice; Elasticity; Value Added.

RESUMO

Objetivo - Esta pesquisa teve como objetivo verificar a influência da carga tributária sobre o valor adicionado produzido pelas empresas de capital aberto listadas no Brasil Bolsa Balcão (B^3).
Desenho/metodologia/abordagem – O estudo teve uma abordagem quantitativa e o período da amostra foi de 2010 a 2016 Diante da complexidade da carga tributária brasileira - caracterizada por altas alíquotas e uma legislação complexa – e a importância do valor adicionado como métrica contábil com impacto econômico da tributação, esta pesquisa apoiou-se na teoria da escolha pública e da elasticidade da receita tributária para analisar a relação entre o nível de carga tributária e o processo de geração de riqueza nas empresas brasileiras.
Resultados - As evidências empíricas encontradas corroboram o entendimento teórico de que a carga tributária no Brasil exerce influência negativa sobre o valor adicionado produzido pelas empresas.
Implicações Práticas - A análise do estudo traz contribuições relevantes para a sociedade como um todo, observando a necessidade de proteger e maximizar o processo de geração de riqueza das empresas, uma vez que são os recursos produzidos pelas empresas que serão partilhados na economia com a sociedade, cujo desenvolvimento depende do processo de criação de riqueza..
Originalidade – A utilização do valor adicionado produzido como métrica de eficiência ou saturação da carga tributária suportada pelas empresas no mercado brasileiro.

Palavras-chave: Carga Tributária; Escolha Publica; Elasticidade; Valor Adicionado.

1 INTRODUCTION

The Brazilian tax system is complex; however, despite this scenario, fiscal imbalance, economic recession, need for investments, or any circumstance that demands the balance of Brazilian public accounts triggers the concern of public managers with seeking ways to further raise taxes rather than choosing to reduce public spending. Nonetheless, reducing public expenses starts a fierce political strife between managers and their associates, especially when it comes to reducing staff numbers; cutting down spending on public policies with low social impact; reducing subsidies to public and private companies; among other initiatives that contradict the interests of those who generally help public managers in their rise to power. Therefore, increasing tax collection appears to be a quick and easy alternative for public managers.

Tax collection is fundamental to sustain the state because it collects resources derived from taxpayers, citizens, and companies to meet public needs. However, to a certain extent, the tax burden influences the decision of company managers to produce. It is worth remembering that taxpayers naturally abhor taxation because it is a compulsory pecuniary payment whose counterpart taxpayers do not directly see since taxes are indirectly reverted to taxpayers when the government provides public goods and services. At this point, people have the feeling that taxes are like any other expense, which is associated with loss. Then, tax exaction can be a discouraging factor for the whole process of companies adding wealth to the economy (Meyvis, Bennett & Oppenaheimer, 2010; Sussman & Olivola, 2011).

Tax burden is related to profitability because one of the counterparts of the allocation of a shared wealth produced by a company, in the form of tax payment, is the decrease in the shared wealth that could be distributed among the other elements that contribute to that company's production. In this sense, taxes would have the power of expropriating part of the wealth that could be earmarked for remunerating a firm's own capital. This discourages production, since, by assuming all the risk of the activity undertaken, firm owners will receive a smaller part of the wealth they produce because receipt is conditioned to satisfying the other factors used to generate wealth: employees, third-party resources, and taxes levied on business activities (Dos Santos & Hashimoto, 2003).

Thus, the weight of the high taxes cannot always be passed on to the selling price of the product or service. It may discourage companies from producing because there is not enough wealth

left to meet the expected returns on investment. Thus, reflectively, the tax burden can possibly have a negative impact on the value added produced by companies (Laffer, 2004).

Therefore, it is worth observing the implications that the tax burden may have on the value added produced by companies in Brazil, so much so that our research problem comes down to: **what is the influence exerted by the tax burden on the value added produced by Brazilian publicly traded companies?**

The study fell on Brazil, due to its legal confidentiality, by requiring publicly traded companies to disclose an accounting statement entitled value added statement. Because of this characteristic, this study cannot be compared with those covering other countries due to the lack of data to measure companies' value added because of the tax burden.

The importance of this analysis stems from companies being unable to absorb the tax burden in Brazil, given the elevated number of taxes and their high complexity, which generate a repulsive effect on the process of wealth generation. In these terms, this research contributes scientifically to open up new perspectives for society and the Government to analyze the efficiency of its fiscal policy, from the standpoint of sustainable economic development – by examining the wealth produced by companies in the country and taxation. Measuring the relationship between value added produced and the tax burden serves as a parameter to obtain an effective tax collection, providing society and the government with monitoring tools that protect the public interest and social demands (Ferreira, 1998)

2 THEORETICAL FRAMEWORK

2.1 Public Choice Theory and Taxation

The possibility of market failures due to imperfect competition, externalities, information asymmetry, and incomplete contracts leads to an understanding that the marginal social cost may be different from its marginal benefit, depending on the individual desires of market participants that can potentially harm the whole society. In this perspective, the use of government intervention, through public policies, regulation, and taxation is used to rectify and mitigate the effects of market failures (Smith, 1963; Nepal & Jamasb, 2015).

Despite the importance of the State's economic intervention as an equalizer of the forces between participants, it is worth noting that their performance depends on the decisions made by public managers, and, like any human agent, they can prioritize meeting their own interests. Thus, the public choice theory arises and goes beyond the limits of the innocent view of the prevalence of public interest, to propose that not only are there market failures but also there are government failures (Fike & Gwartney, 2015).

Then, it is in the public managers' best interest to maximize government revenues in their administration, so that they have all the favorable financial conditions to implement their political ambitions, make investments and expenditures that favor their electoral prestige (Brender & Drazen, 2013).

Thus, to avoid cutting down on spending, rulers may prefer to raise public revenue. However, as a public choice of rapid effect on the inflow of resources, especially in developing countries, as is the case of Brazil, managers opt for tax increases, given that taxes have the power to leverage their own revenues and provide financial comfort for the implementation of the desired public policies (Brennan & Buchanan, 1980).

Taxes are defined as a pecuniary benefit, expressed in monetary or monetarily measurable

amounts, which do not come from passing an unlawful act, established by law and charged through a fully bound administrative activity. As a result, companies are obliged to contribute to the public coffers amounts levied on their activities, under the name of taxes. In Brazil, tributes encompass taxes, fees, benefit charges, special contributions and compulsory loans, and its tax jurisdiction is authorized to the Federated Institutions by the Brazilian Constitutional Charter.

Taxes are a kind of tribute whose proceeds have no specific destination, and are used to finance government activities that comprise its administrative structure and public services in general. Meanwhile, fees are tributes for a service provided by the public power.

Contributions are of two types: benefit charges, charged as a result of a real estate valuation resulting from a public work, where a taxpayer pays the tax based on the profit obtained from such work, being limited to the incremental valorization or value of the work prorated by the affected taxpayers; and, special contributions, which are collected from a particular group for a specific destination or for social purposes. Finally, compulsory loans are forced loans, created by a complementary law, which are collected due to an emergency or other specific purposes, repayable to the taxpayer (Godoi & Mello, 2017).

Therefore, each of the tributes is accounted for throughout financial statements, depending on its relationship with the economic activities performed by the companies. Taxes that are directly associated with sales are considered in net revenue. Fees, which are amounts paid for a service provided, are generally classified as expenses. Taxes on profits, as they are levied on the result obtained at the end of the year, are accounted for in order to obtain the Net Income calculated. However, it is in the Value Added Statement that the taxes are segmented by federative entity (Federal, State or Municipal), fully evidencing all the wealth destined by the company to the tributary charge (Da Silva & Marques, 2015).

In such context, it is worth noticing the effect of the level of tax burden borne by companies in their predisposition to generate wealth.

2.2 Tax Burden and Value Added

In economic analysis the Gross Domestic Product (GDP) is used as the standard measure of success of a nation (Leonard, 2011). This way, it can be concluded that the value added produced by companies is the metric of success of their activity. It is therefore important, for an analysis of the efficiency of a fair tax policy, to verify, through the tax burden, whether or not it negatively interferes with the value added produced by companies (Castro, 2006; De Luca, 2009).

Thus, in the accounting treatment of the value added produced by companies according to Pronouncement 09 by the Brazilian Accounting Pronouncements Committee, the elements that interfere with value added calculation are the revenues, third-party purchased inputs and depreciation, amortization, or depletion. Revenues include: sales of goods, products, and services; other income; revenues related to the construction of a firm's own assets; and the constitution or reversal of allowance for doubtful accounts. Inputs purchased from third parties (including all taxes levied on the acquisition) include: costs of products, goods, and services sold; materials, energy, third-party services and other related expenses for revenue generation; and, loss or recovery of assets. Finally, depreciation, amortization, or depletion of the assets used to obtain the revenues are amounts that are deducted from the gross value added to calculate the net value added produced by the company.

As a result, the increase in the value added produced by the companies occurs when there is an increase in the elements that make up the revenues or when there is a decrease in the values of the items that are accounted for in the inputs purchased from third parties or in the values related to depreciation, amortization, or exhaustion. This way, revenues have a positive relation while inputs

and depreciation have a negative relation with the value added produced.

In view of this, companies' value added are expected to increase as the tax burden is reduced, since it directly or indirectly influences the increase in revenues or the reduction of the prices of supplies purchased from third parties. Companies seek to maximize their production level to the point where marginal cost equals marginal revenue, that is, the maximum profit point, at which time the company has no interest in increasing its production. At this point, there is direct tax interference because taxation reduces profit and unbalances the relationship between production and profit, thus reducing the maximum point of production that maximizes profit. Therefore, this study on value added is an analysis of companies' efficiency and productivity by measuring their total generated and distributed wealth, including the increase in tax collection, compensation with personnel (jobs), and retention of profits for investments (Drake & Peterson, 1996; Reahi-Belkaoui & Picur, 1999).

In many situations there will be an influence of the tax burden on the value added. As an example, one can take the operations related to exports, where exemptions of various taxes are generally granted. The company benefiting from the exemption on its exports may reduce its revenue from the value of the product sold so that, added to the cost of transportation, it reaches the destination on a competitive price. In this case, reducing revenue will cause a reduction in the value added produced by the company, however, it may lead to an increase in profitability, since the reduction of the tax burden may be greater than the reduction of the value received for the product sold.

All of this analysis in Brazil is only possible because publicly-traded companies must publish their Value Added Statements (VAS), since this accounting statement shows the wealth created by the company and indicates its distribution to those who contributed to its creation (Conseza, 2003).

The importance of value added as a performance metric was investigated by Machado, Macedo and Machado (2011); who analyzed whether the information content of the VAS – as a mandatory publication – can explain the stock price variations of the surveyed companies in the Brazilian capital market. The authors realized that the relationship between the wealth generated by stocks and their price was significant, even after including control variables (stockholders' equity per share and net earnings per share). They concluded that in the Brazilian capital market, the wealth created per share would be a better parameter for the company's result than net earnings per share.

There is an association between the value added produced and the tax burden, while the government's concern to establish limits to expenditures in the budget legislation, due to the behavior of the aggregate wealth, is relevant since the collection is fully associated with the GDP (Musgrave & Musgrave, 1983; Rezende, 1995; González, 2001; Assunção, Ortiz & Pereira, 2012). On such subject, the literature points to a negative interference of the tax burden in the GDP, so that this sensitivity can interfere with the formation of value added produced by companies (Dos Santos & Hashimoto, 2003).

2.3 The Elasticity of Taxable Income

From the economic theory, derived from the Law of Supply and Demand, in which the market will always seek a balance point on the elasticity of such two variables, the theoretical construct derives from the elasticity of taxable income, which is a relation between the incentives for generating income or adding economic value produced by companies at different levels of tax burden (Keynes, 1936; Paes, 2010).

The tax burden or tax rate supported by the economic base of the Federative Entity boosts its public revenue which, in turn, can be understood as the external resources that guarantee the fulfillment of the obligations of the Government for the attainment of its ends, thus contributing to the improvement of their financial condition (Musgrave & Musgrave, 1983; Assunção, Ortiz & Pereira,

2012). Tax revenues differ from other sources of public revenue because of their importance to support the entire financial framework of the public sector; their main characteristic is the derivation of tax collection (Almeida, 2000).

Then, when contemplating tax collection, it should be noted that it is closely linked to its economic base and the ability to exploit it. To do so, the economic base should be understood as the ability of individuals and companies, established in the taxing district, to provide revenue to the government, being relevant to their characterization to observe the economic variables that affect tax collection, such as income, GDP, level of employment etc. (Lima & Diniz, 2016).

In such context, it is necessary to elucidate that tax aspects are linked to the economic capacity of taxpayers, since, whenever possible, taxes should be personal and be graded according to taxpayers' economic capacity. As a result, the tax burden should measure economic capacity, otherwise, it will encourage tax evasion and will trigger a fall in tax collection, due to the absolute impossibility of individuals or legal entities to comply with their tax obligations (Scaff, 2003; Catarino & Teixeira, 2016).

To that extent, the balance between tax burden and the economic capacity of the companies is of fundamental importance for the maintenance of tax collection. Without taxes, the Public Government is unable to offer the goods and services necessary to achieve its objectives, nor can taxation be unlimited so as not to discourage economic growth, job creation, investment and consumption, which are used as a basis for taxation (Musgrave & Musgrave, 1983; Almeida, 2000).

The effect of taxation on the economy is highlighted by Harberger's triangle, in relation to the study of the deadweight loss caused by taxes in the markets due to government intervention, thus generating losses in tax collection due to economic inefficiency (Harberger, 1995). From this point of view, American economists have made the Laffer Curve popular in the academic world, analyzing the supply (economic base) as a preponderant factor for economic policy (Paes, 2010). The Laffer curve is designed to represent the theory of value collected from taxes at different rates, graphically presenting the concept of elasticity of taxable income. To do so, the author explains that at a rate of 0%, obviously, there will be no tax revenue, while, according to the parable of the curve, at a rate of 100% it will not be possible to obtain any revenue either because of the taxpayers' lack of incentive to receive or get any value (Laffer, 2004).

The origin of the idea of the Laffer curve dates back to the 14th century, as reported by Islamic historian, economist and jurist Ibn Khaldun (1332-1406), who explains that "when the tax rate on people is low, they have the energy and the will to produce". He adds that "economic activity grows, because low rates bring satisfaction", concluding that "when economic activity increases, the number of contributors grows. As a result, revenue increases". At the time of the construction of this thought, Ibn Khaldun lived in a social culture where the Bedouin leaders, who were in power, abandoned the simple habits and became more sophisticated, accustomed to a sedentary culture surrounded by luxury. Then, in order to maintain this standard of living, the dynasty in power gradually increased taxes, resulting in people's lack of interest in doing business and producing, thus leading to a fall in tax collection. In order to counter the reduction, the rulers raised taxes even more, entering into a vicious circle that would lead to the destruction of that civilization and the fall of the dynasty (Khaldun, 1377).

In this systematics, the idea is to understand that after reaching the optimum point, in which the result of the collection is maximized, the more the tax rate increases, the more revenue will decrease. With this, it is worth remembering the doctrinal explanation that the State acts on the basis of Haavelmo's theorem, where the level of investment equals the level of collection, that is, the constant need for budget balance (Roncaglia, 2013). Therefore, the Government operates at the maximum point in which taxpayers would be able to afford it; in such case, the increase in tax

rates would not achieve the desired effect since taxpayers would be unable to bear any higher taxes (Rodrigues, Souza, Oliveira, Carneiro & Macedo, 2015).

Given the fact that the government operates at the maximum tax rate to collect, the value added produced by companies would be inversely sensitive to the tax burden, since there is no incentive for the company to produce more (adding economic value) to higher levels of taxes than those already being charged (Fullerton, 1982).

In practice, the use of the theoretical construct drawn by the Laffer curve was observed in the United States. During the Great Depression, when the US Congress passed the Hawley-Smoot tax law in 1930, even though the law raised taxes on imported goods from 13.5% to 19.8%, tax revenue fell from $ 602 million to $ 251 million. Then, during the Reagan administration in the 1980s, taxes on the rich were reduced from 70% to 50%, raising tax revenues from $ 22 billion to $ 49 billion (Laffer & Moore, 2010).

So, based on the evidence that the tax burden interferes with production (or wealth generation) producing direct and indirect effects for tax collection, the academy has channeled efforts to find out the saturation point of the tax rate to maximize tax collection, to verify if the vertex of the parabola of the Laffer curve is facing right or left (Fullerton, 1982).

Economist Paul Pecorino (1995) presented a mathematical model explaining that the apex of the Laffer curve would occur when the tax burden reached 65% of the GDP. Accordingly, Fullerton (2008) considered in The New Palgrave Dictionary of Economics that the average range of the tax burden for maximizing tax revenue would be around 70% of the GDP. Therefore, the Romer and Romer (2010) research provided evidence of the possibility of quantifying the relationship between tax burden and the wealth generated in a country, reporting that the effects are enormous. The results found lead to the conclusion that the top of the Laffer curve, that is, the apex of the tax collection, would be around 33% of the GDP. In turn, Piketty, Saez and Stantcheva (2014) conclude that the margin of the total tax burden would be around 84% of the GDP.

In Brazil, studies have occasionally verified each tax, noting that taxation would still be in the ascending phase of the curve. Nonetheless, there is evidence that reducing the IPI – an indirect tax related to consumption – for automobiles, which occurred between 2009 and 2013, boosted sales and favored an increase in the collection of that tax (Araujo, 2016).

However, the complexity of the Brazilian tax burden, with the collection of five kinds of tributes (taxes, fees, benefit charges, social contributions and compulsory loans) in the three federative spheres, having either a cumulative or non-cumulative nature, whose interrelation sometimes have a cascade effect, not counting the numerous accessory obligations that in case of non-compliance generate fines and high costs for companies, may have led to the maximum point of tax saturation (Noble, Souza & Almeida, 2006).

According to studies conducted by Brazil's Internal Revenue Service (Receita Federal, original name in Portuguese), the tax burden in Brazil increased from 32.42% of the GDP in 2014 to 32.66% in 2015. Although it is not the highest in the world, compared to the proportion found for the year of 2014 in countries such as Italy (43.6%), Germany (36.1%), Austria (43%), Norway (39.1%), Hungary (35.5%) and Iceland (38.7%), the weight of the Brazilian tax burden was higher than in countries such as the United States (26%); Switzerland (26.6%), South Korea (24.6%), Canada (30.8%), Israel (31.1%), Ireland (29.9%), Chile (19.8%), among others (Receita Federal, 2016).

Nevertheless, in light of the discussion of the saturation point between the tax burden (or effective tax rate) and tax collection, this research assumes that the maximum point of the Laffer curve in the Brazilian economy has already been exceeded, in such a way that the level of production (value added produced) of companies may be inversely associated with the tax burden.

3 METHODOLOGY

3.1 Sample Selection and Data Collection

The sample consisted of companies listed in Brazil Bolsa Balcão (B3), excluding financial and insurance companies, and those that did not present positive revenues during the analyzed period. Financial and insurance companies were excluded because of the special regulations to which they are subject and the peculiar capital structure of such companies. Companies that did not have a positive income in the surveyed period were also left out of the sample, due to the impossibility of analyzing the effect of the tax burden on the value added they produced. Because companies had no revenue, it would be impossible to produce any value added.

The quantitative data of the survey were taken from the financial statements published on the website of the Brazilian Securities and Exchange Commission (CVM), especially the explanatory notes, regarding information on government incentives or subsidies received by companies, and Value Added Statements (VAS) from year 2010 to 2016. Although the mandatory disclosure of VAS by publicly traded companies in Brazil began in 2008, 2010 was chosen because that was the year when the alignment of international accounting practices began in Brazil, influencing the control variables employed in the proposed econometric model.

3.2 Variables of Interest and Control

In this research, the net value added produced by a company on its gross revenues of the period is used as proxy to measure the wealth directly generated by companies. We chose the net value added to the detriment of the distributed value added because the former is a company's own revenues minus the inputs needed to generate that revenue and depreciation, amortization, or depletion of the period. The latter adds to the former the amounts received on third-party transfers, which are not related to the company's own activity.

As a proxy for tax burden, the survey considers the part of the distribution of value added by companies destined to the government divided by company revenues during the financial year, since this is the effective tax rate (Dos Santos & Hashimoto, 2003).

As the survey uses data from 2014 to 2016, it was necessary to control the effect of the economic recession that hit Brazil during that period on the value added produced by Brazilian publicly traded companies. At the end of 2014, there was a decline in Brazilian economic indicators, with GDP declining 0.2% in the last quarter of that year. The confirmation of the Brazilian economic recession, however, was only widely announced in the year 2015, when GDP closed the last quarter, compared with the same period of 2014, down by 5.9%, closing the year on a 3.8% decline compared to 2014. As a result of these indicators, there were profound negative oscillations in the economic activity of the country, leading to a period of recession from 2014 to 2017 (Barbosa Filho, 2017).

Then, based on the research carried out by Riahia-Belkaoui and Picuir (1999); and, Machado, Macedo and Machado (2015), value added can be used as a metric – just as profit can – to evaluate companies. This way, it is possible to explain the value added produced on the same control variables used in the literature to explain profit.

At this point, firm size, represented by the natural logarithm of total assets, is consecrated by the literature as a determinant for cost reduction and, consequently, it increases the value added produced, because the bigger a company is, the lower is the cost of access to credit, capital goods and inputs (Ganguli, 2013; Serrasqueiro & Caetano, 2015; Machado, Macedo & Machado, 2015).

In the same way, both national and international literature clarify that the capital structure impacts profit and productivity, and it is possible to associate this aspect with the value added produced. With this, in the econometric model, leverage is an important variable to control the analysis of the value added produced. Leverage, usually used in empirical research in the area of finance as indebtedness, is the participation of third-party capital in financing the activities of a company (Bastos & Nakamura, 2009). In this sense, it is also possible to highlight the influence of indebtedness on tax burden, since the flow of capital destined to remunerate third-party capital allows reducing the tax burden on the profit, which affects the total tax burden of the company, and can possibly exert a positive influence on the value added produced (Modigliani & Miller, 1959; Myers, 1984; Titman; Wessels, 1988).

3.3 Econometric model

Considering the elements presented in the sections above, the econometric model used to verify the influence of tax burden on the net value added produced was estimated according to Equation 1.

$$VA_{it} = \alpha_0 - \alpha_1 TxB_{it} - \alpha_2 RECESSION_{it} + \alpha_3 LEV_{it} + \alpha_4 SIZE_{it} + \varepsilon \quad (1)$$

Where the variables to be used were:

- VA_{it}: variable that represents the value added obtained by dividing the net value added a company produced by its gross revenue in the year;
- TxB_{it}: variable that represents tax burden, obtained by dividing the total of taxes, fees, and contributions a company supports by its gross revenue in the year;
- $RECESSION_{it}$ variable that represents the economic recession facing Brazil, obtained by a dummy, where 1 was used for years 2014 to 2016 and 0 was used for the other periods;
- LEV_{it}: Variable that represents leverage, obtained by dividing the total liabilities by the total assets of a company in period t;
- $SIZE_{it}$: variable that represents the size of the company, obtained by calculating the natural logarithm of the total assets of companies in period t;
- $\alpha_{0...n}$: estimated parameters;
- ε: regression error.

The data used in this research were run on an unbalanced panel data set, aiming to maximize the number of observations, and are presented in two dimensions: cross section and time series for the years 2010 to 2016.

Using the main panel data techniques, we sought to adequate the model to be applied for data treatment through the unrestricted pool model, the restricted model of fixed effects, and the restricted model of random effects (Fávero, 2013). Therefore, in accordance with the three models, the procedures were adopted in the course of the research to determine the most appropriate model, using the Chow, Hausman and Breusch-Pagan tests. In addition, the modified Wooldridge and Wald tests for panel data were used to observe autocorrelation and heteroscedasticity, respectively (Marques, 2000).

4 PRESENTATION AND ANALYSIS OF RESULTS

After the exclusion of companies from the financial sector, the sample initially had 336 companies, which were listed in B3 from 2010 to 2016. We had to leave out of the sample companies that did not present enough information to calculate the variables used in the econometric model, including the cases of companies that showed no revenues in their VAS during the surveyed period, because lacking such information is a factor that hampers adding the value produced by companies themselves. Therefore, 276 companies remained, those that presented enough information to carry out the assumptions tests necessary to estimate the regressive model presented.

We eventually had an unbalanced panel consisting of 276 companies and 1,871 observations for financial years 2010 to 2016.

4.1 Descriptive Statistics

Table 1 depicts the quantitative composition of the sample and the descriptive statistics of the variables of interest for the research, considering the 276 companies in the sample, with 1,871 observations.

Table 1 – Descriptive statistics of the sample

	All sample companies				
Variables	**Average**	**Medium**	**Standard deviation**	**Minimum**	**Maximum**
VA	0.2754	0.3745	0.2829	-73.6098	1.06911
TxB	0.1660	0.1267	0.1110	-3.2328	12.5673
LEV	14.4831	14.6892	1.5090	0.6065	20.6181
SIZE	0.2754	0.3745	0.2829	-73.6098	1.06911
Companies	**276**				
Observations	**1871**				

Note: VA = value added produced by companies; **TX** = tax burden by companies on their net revenues; **LEV =** total liabilities on total corporate assets**; SIZE =** natural logarithm of total assets.

According to Table 1, all the tax burden (**TxB**) per companies average is 16.60% of the earned revenue. With regard to the value added produced (**VA**) against their revenues, companies produce an average percentage of 27.54%. However, due to the greater standard deviation of the value added produced (1.8819) found in the sample of firms and the distance between the mean and the median, 0.2754 and 0.3745, respectively, there is a negative asymmetry and heterogeneity in the percentage of value added in relation to revenues across the companies in the sample.

Table 2 shows the average of the variables used in the survey by economic sector.

Table 2 – Average of the variables calculated from the sample by economic sector

Variables Economic sector	VA %	TAX %	LEV %	SIZE ln(x)
Industrial Goods	22.80	16.41	81.61	13.6820
Cyclic Consumption	40.19	15.48	73.52	13.7633
Non-Cyclical Consumption	28.17	9.04	68.07	15.0519
Construction and Transportation	24.15	11.70	64.30	14.8189
Health	30.62	10.94	47.88	13.8166
Basic Materials	29.83	11.28	75.39	14.4086
Oil, Gas and Biofuels	-3.14	11.62	94.16	15.7555
Information Technology	38.19	28.47	62.65	13.0741
Telecommunications	-22.90	41.09	66.64	16.4643
Public utility	21.92	28.96	62.96	15.5802

Note: VA = value added produced by companies; **TX** = tax burden by companies on their net revenues; **LEV =** total liabilities on total corporate assets**; SIZE =** natural logarithm of total assets.

The analysis of Table 2 shows that, on average, the highest percentage of value added produced in relation to the sample's gross revenue is found in the sectors of cyclical consumption (40.19%) and information technology (38.19%). The lowest percentages, including negative signs, were in the sectors of telecommunications (-22.90%) and oil, gas, and biofuels (-3.14%). These sectors, which had an average negative percentage of value added produced over gross revenues, are heavily regulated, including their own regulatory agencies to inspect their operations – the telecommunications sector is supervised by the National Telecommunications Agency (ANATEL) while that of oil, gas, and biofuels is supervised by the National Petroleum Agency (ANP). This special regulatory system entails additional charges that may be one of the determining reasons to negatively impact those companies' wealth generation, as they need to comply with several additional accessory obligations that make their operation more expensive, among other factors.

The period with the lowest percentage of value added produced over gross revenues by the telecommunications sector occurred in 2012 when it reached -229.38%, a time when the percentage of the tax burden on gross revenues reached an average of 130.77%, the largest in the entire period analyzed for that sector. The oil, gas, and biofuels sector had the lowest percentage in 2014, when it reached -40.20%, probably due to the beginning of political instability and economic recession in Brazil, mainly due to the strong devaluation of the Brazilian currency against the US dollar.

Thus, when analyzing the value added produced over time, the lowest level was found in 2014, when the average percentage reached -0.01%, corroborating the economic indicator from that period that pointed out that a period of economic recession began in 2014, which lasted in Brazil until 2016, the last year observed by the survey. The economic sectors that contributed most to the drop in the average percentage of value added produced by companies on their revenues were those of public utility (-134.44%), oil, gas, and biofuels (-40.20%) and goods (-20.49%).

In addition, the period in which the value added produced on gross revenue reached the highest level occurred in 2011, when the average reached 38.72%; that year, the sectors of information technology (59.45%), public utility (50.68%), and cyclical consumption (42.46%) had the highest averages.

Therefore, from the information regarding the tax burden proxy presented in Table 2, the most taxed sectors, on average, were telecommunications (41.09%), and public utility (28.96 %).

These sectors are considered essential services, and their tax burden may reverberate through the others, as the other economic sectors often use those essential services to operationalize their own activities, thus increasing their costs and modifying their wealth generation results. The year with the highest percentage of tax burden in relation to companies' gross revenue was 2016, when it reached the average percentage of 18.96%; the highest tax burdens were on the sectors of information technology (74.08%), telecommunications (35.79%), and public utility (27.98%). A probable hypothesis for this increase in the tax burden verified in 2016 in the companies that compose the sample may have been the generalized increase in the ICMS (Brazil's VAT), since 20 of the 26 Brazilian states, plus the Federal District, increased their ICMS rates in 2016. As this tax is levied on almost everything consumed within the Brazilian territory, it probably increased the costs of inputs in all sectors, which may have caused a decrease in companies' value added.

As for the sectors that have the lowest tax burdens, Table 2 shows that they are the sectors of non-cyclical consumption (9.47%), and health (10.94%). The year with the lowest average incidence of tax burden on gross revenue was 2013, when the sectors that benefited the most from the lowest percentage of the tax burden were non-cyclical consumption (10.10%), and health (10.35%).

The sectors that presented, on average, the highest degree of leverage (**LEV**) were oil, gas, and biofuel (94.16%), and industrial goods (81.61%), which is justified by the need for high investments for achieving their purposes, recurrently imposing the search for third-party capital to contribute investments. The sectors with the lowest average degree of leverage were health (47.88%), and information technology (62.65%). As for size (**SIZE**), the sectors with the highest average were telecommunications (16.4643), and oil, gas, and biofuels (15.7555), and those with the smallest average were information technology (13.0741), and industrial goods (13.6820).

4.2 Analysis of the regressive model results

In order to verify the influence of the tax burden on the net value added produced by the companies listed in B3, we used the econometric model proposed in Equation 1, while the Chow test was used to compare the restricted model (pool) and the model fixed effects. In the test, we assume as null hypothesis the restricted model, and the alternative hypothesis to the unrestricted model of fixed effects. Then, the Hausman test was used to verify the best model between random effects and fixed effects. Finally, we compared the suitability of the restricted model and the unrestricted model of random effects, by applying the Breusch-Pagan LM test (Clark & Linzer, 2015).

After relaxing the hypothesis of normal distribution of data, due to the central limit theorem, the autocorrelation and homoscedasticity tests of the data were applied. When analyzing the correlations between the variables of the panel data, the Wooldridge test was applied, which found no autocorrelation. For the homoscedasticity analysis of the data, the modified Wald test for panel data was applied, noting it was non-existent, according to Table 2. As a consequence of the problem of the observed heteroscedasticity, it was necessary to estimate the regression in the robust form for its correction in all estimated regressions (Wooldridge, 2002).

After all assumption tests were run to estimate the regressions, the regressions were estimated using the balanced and unbalanced panel data, in which the results were not altered and there was no decrease in the efficiency of the estimator. This way, the unbalanced panel was chosen, aiming to maximize the amount of observations. Thus, the results obtained by the estimation of the econometric model proposed by Equation 1 are shown in Table 3.

Table 3 – Estimation of the regression of equation 1 with all firms.

Variables	Fixed Effects Model		Random Effects Model		
VA	**Coefficients**	**p-value**	**Coefficients**	**p-value**	**VIF**
TxB	-4.0419	0.001	-3.8741	0.003	1.01
RECESSION	-0.1711	0.016	-0.1085	0.017	1.01
LEV	0.2026	0.156	0.0488	0.557	1.11
SIZE	0.2432	0.136	-0.0152	0.524	1.10
Intercept	-2.6457	0.267	1.1567	0.008	

	Within	Between	Overall	Within	Between	Overall	Groups 276
R^2	0.6437	0.1035	0.4927	0.6190	0.1988	0.5355	Obs. 1,871
	F (4,275) = 3.39 Prob > F = 0.0099			Wald chip2(4) = 14.56 Prob > F = 0.0057			
Tests	*Chow (F)*	*Breusch-Pagan*		Hausman	Wooldridge		Wald
	0.0000	0.0000		0.0000	0.7832		0.0000
	Test result: Fixed effects model						

Note: VA = value added produced by companies**; TxB =** tax burden by companies on their net revenues; **RECESSION** = period of Brazilian economic recession from 2014 to 2016; **LEV** = total liabilities on total corporate assets; **SIZE** = natural logarithm of total assets.

According to Table 3, taking into account that the Chow (0.000) and Hausman (0.000) tests indicate that the most suitable model for analysis is the fixed effects model, the results obtained show that the tax load has an inverse relation with the value added produced by Brazilian publicly traded companies. For the average of the companies studied, the tax burden (-4.0419) at a significance level of 1%, reduces the value added produced on revenues, denoting that the process of wealth generation in Brazil is highly sensitive to changes of the tax burden. The result obtained is consistent with the theory, in the sense that the tax burden is negatively related to the value added produced by companies (Fullerton, 1982; Harberger, 1995; Laffer, 2004; Araujo, 2016).

The variable **RECESSION** (-0.1711) showed a significant relationship, at the level of 5%, in the estimated model, explaining the negative effect of the economic recession facing Brazil since 2014 on the value added produced by companies in the period covered by the research (Barbosa Filho, 2017).

The variables LEV and SIZE were not significant for the estimated econometric model to explain the variation of the value added produced by the Brazilian publicly traded companies that comprise the sample. However, in the estimated regression, LEV and SIZE were relevant to control the effects on the dependent variable, allowing a more accurate estimation of the coefficients obtained by the other independent variables of interest of the research (Ganguli, 2013; Serrasqueiro & caetano, 2015; Machado *et al*, 2015).

5 CONCLUSIONS

The purpose of this research was to verify the influence exerted by the tax burden on the value added produced by Brazilian publicly traded companies, taking into account that Brazilian economy's level of absorptive capacity of the tax burden exceeded its peak. Thus, the survey used a sample consisting of companies listed in B3 from 2010 to 2016. The study contemplated the public choice theory, the analysis of the Brazilian tax burden, the calculation of the value added produced

by the companies, and the theory of elasticity of taxable income, considering that the tax burden can discourage companies from producing wealth.

The results obtained in this research indicate that, in Brazil, the value added produced by companies was highly sensitive to the changes in the tax burden, since it was economically impossible to absorb them because the tax rates practiced by the Public Power are at the maximum level of the economic capacity of the population. Thus, we found evidence that the tax increase on the operations of the Brazilian companies generates a negative impact on the wealth produced by them, so that the collection may have reduced relative to its potential, because it also depends on the wealth produced by companies. Thus, the results found rekindle the discussion about the efficiency of the fiscal policies practiced in Brazil and the need to reformulate the tax system to make it capable of favoring sustainable economic development.

In view of this, in Brazil, public policies geared to economic development must be reconsidered, making it imperative to use conscious and prudent taxation as an instrument for collection and an element of balance in the economy. At this point, to follow up the tax effects in the wealth generation process, one could use the information in the accounting reports disclosed by companies, especially the VAS, since it shows all the wealth generated and distributed by companies.

As a limitation of this research, it is necessary to point out that the results hereby obtained are restricted to the companies in the sample, raising evidence that this behavior is common among publicly traded companies in Brazil. However, the Brazilian market is mostly formed by small and medium companies that are not publicly traded and they were left out of the analysis of this research.

For future research it is necessary to verify the levels of tax saturation for each tax or tax type used in Brazil and its relation to the period of economic recession.

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AUTHORS

1. Lauro Vinício de Almeida Lima
Doctoral student of Accounting from Federal University of Paraiba. João Pessoa, Paraiba, Brazil.
E-mail: lvinicio2@gmail.com
ORCID: https://orcid.org/0000-0001-5474-5655

2. Márcia Reis Machado
Doctor of Controllership and Accounting from University of São Paulo. João Pessoa, Paraiba, Brazil.
E-mail: marciareism@hotmail.com
ORCID: https://orcid.org/0000-0003-4081-6058

Contribution of authors.

Contribution	[Author 1]	[Author 2]
1. Definition of research problem	√	
2. Development of hypotheses or research questions (empirical studies)	√	
3. Development of theoretical propositions (theoretical work)	√	
4. Theoretical foundation / Literature review	√	√
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11. Other (please specify)		