MARKET CONCENTRATION AND IMPLICIT TAXES: ANALYZING BRAZILIAN FIRMS

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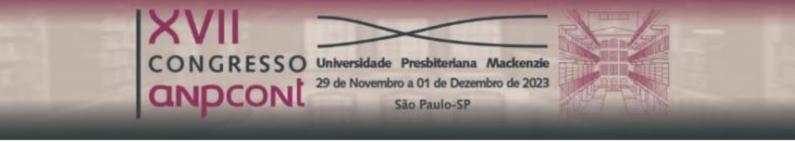
Resumo/Abstract

This study examines the relationship between market concentration and implicit tax burdens in Brazil, challenging the assumption of perfect competition. The results reveal that firms with higher market concentration experience a lower implicit tax burden than those with lower market concentration. Furthermore, companies with higher market concentration can retain and pass the benefits of tax incentives to shareholders. These findings suggest that the market power of firms with higher market concentration allows them to bear a lower implicit tax burden while transferring the burden of implicit taxes to consumers and suppliers through the sale and purchase prices of their products and inputs, respectively. This study provides valuable insights and a better understanding of the real-world implications of tax policies and market structures. The results can inform policymakers, regulators, and businesses in making more informed decisions about taxation and market regulation. Overall, this study contributes to a better understanding of Brazil's complex relationship between market concentration, implicit taxes, and corporate power.

Modalidade/Type

Artigo Científico / Scientific Paper

Área Temática/Research Area

Auditoria e Tributos (AT) / Auditing and Tax

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Abstract: This study examines the relationship between market concentration and implicit tax burdens in Brazil, challenging the assumption of perfect competition. The results reveal that firms with higher market concentration experience a lower implicit tax burden than those with lower market concentration. Furthermore, companies with higher market concentration can retain and pass the benefits of tax incentives to shareholders. These findings suggest that the market power of firms with higher market concentration allows them to bear a lower implicit tax burden while transferring the burden of implicit taxes to consumers and suppliers through the sale and purchase prices of their products and inputs, respectively. This study provides valuable insights and a better understanding of the real-world implications of tax policies and market structures. The results can inform policymakers, regulators, and businesses in making more informed decisions about taxation and market regulation. Overall, this study contributes to a better understanding of Brazil's complex relationship between market concentration, implicit taxes, and corporate power.

Keywords: Market concentration, implicit taxes, explicit taxes, taxation.

1 INTRODUCTION

The Scholes and Wolfson (1992) framework, hereafter referred to as the S&W framework, aims to explain the role of taxes in organizations using a positive approach aligned with a microeconomic perspective. One of the core themes addressed by the S&W framework is the "all taxes" theme, which predicts that effective tax planning requires the consideration of both explicit and implicit taxes when making investment and financing decisions (Scholes & Wolfson, 1992). Explicit taxes are conceptualized as taxes paid directly to the taxing authority, while implicit taxes are conceived as taxes paid indirectly in lower pre-tax rates of return on tax-favored investments.

Scholes, Wolfson, Erickson, Maydew, and Shevlin (2009) exemplify the emergence of implicit taxes by noting that when two equally risky assets generate identical pre-tax cash flows, but one has more favorable tax treatment, investors will show greater interest in the tax-favored asset. Consequently, the tax-favored asset's price will increase relative to the non-tax-favored asset, resulting in lower pre-tax return rates. Scholes et al. (2009) observe that implicit taxes can also occur in corporate activities since various operations with tax incentives, such as tax credits and accelerated depreciation, affect pre-tax rates of return and generate implicit taxes on investments.

The S&W framework has been the basis for empirical tax-accounting research. However, most research has focused on explicit taxes, with little attention given to implicit taxes. Since the S&W framework predicts that the total corporate burden comprises both explicit and implicit taxes, Scholes et al. (2009) argue that future tax-accounting research should estimate and incorporate implicit taxes to avoid biased conclusions.

In Brazil, federal, state, and municipal tax legislations offer various tax incentives that favor corporate investments and may generate implicit taxes. This study aims to contribute to tax-accounting research and provide new insights by investigating whether companies listed on Brasil Bolsa Balcão [B]³ with higher market concentration (low competition) bear lower implicit taxes than those with lower market concentration (higher competition). Additionally, this study examines the benefits obtained from using tax incentives. Tests were conducted using Ordinary Least Squares (OLS) and Quantile Regression (QR).

OLS results suggest that firms listed on [B]³ with higher market concentration have lower implicit taxes and can retain (transfer to shareholders) the benefits of using tax incentives. QR results indicate that, at specific points in the distribution, firms listed on [B]³ with higher market concentration have lower implicit taxes and can retain the benefits obtained from using tax incentives. However, at other points, implicit taxes eliminate the benefits of using tax incentives.

This work is divided into five parts: after the introduction, the second part presents the theoretical framework and research hypotheses; the third part outlines the sample selection and research design; the fourth part discusses the results; the fourth part discusses the implications of the results and concludes the study, and the fifth part lists the references.
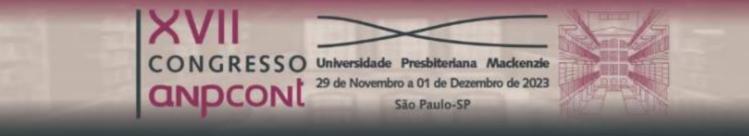
2 THEORETICAL FRAMEWORK AND HYPOTHESES

Studies examining implicit taxes can be observed at the corporate or individual investor level. While numerous studies exist for the latter, research at the corporate level is less developed. Generally, these studies address the effects of implicit taxes resulting from tax reforms or analyze the magnitude of implicit taxes due to tax incentives. Consequently, studies seeking evidence of the impact caused by implicit taxes on corporate activities are even scarcer.

Berger (1993) conducted a regulatory event study to investigate the effects of a U.S. tax incentive that generated a tax credit for companies engaged in research and development (R&D) activities. The findings revealed that the tax incentive (i) stimulated increased R&D investments by firms, (ii) had substantial implicit tax effects, and (iii) allowed firms that utilized the tax incentives to retain a portion of the benefits, passing some of these benefits on to their shareholders.

Guenther (1994) examined the impact of two U.S. tax reforms—the Economic Recovery Tax Act (ERTA) in 1981 and the Tax Reform Act (TRA) in 1986—on implicit tax theory, which posits that a reduction in income tax rates would result in changes in pre-tax rates of return. To do so, the study compared the yields of U.S. Treasury securities maturing in the last week of December with those maturing in the first week of January of the following fiscal year. The empirical evidence indicated a significant decrease in yields for year-ends coinciding with income tax rate reductions brought about by ERTA and TRA, demonstrating that changes in income tax rates result in changes in pre-tax rates of return and providing evidence for the existence of implicit taxes.

Callihan and White (1999) investigated the relationship between implicit taxes, a firm's pre-tax rate of return, and market structure characteristics. The results showed that when implicit taxes increase, there is a reduction in pre-tax rates of return and a decrease in the market structure characteristics of firms. However, when examining the interaction between pre-tax rates of return and market structure characteristics, the findings indicated

that the relationship between implicit taxes and pre-tax rates of return is affected by the firm's market structure features, suggesting that these characteristics may provide opportunities for firms to reduce their potential implicit tax burdens.

Following enacting the Tax Reform Act of 1986 (TRA86), which eliminated a significant portion of tax incentives for defense sector companies, Salbador and Vendrzyk (2006) examined the relationship between implicit taxes and the market power of these companies. The findings suggested that greater market power led to lower implicit taxes and that higher market power enabled companies to retain more benefits generated by using their tax incentives, although this retention was only partial. The evidence also revealed an increase in the implicit tax burden following TRA86, indicating that the act's objectives (reducing benefits provided by tax incentives) were achieved.

Jennings, Weaver, and Mayew (2012) conducted a study to examine the extent of corporate-level implicit taxes before and after the Tax Reform Act of 1986 (TRA86) and the impact of the reform on implicit taxes. The study results indicated that TRA86 had a significant and long-lasting effect on corporate-level implicit taxes. Before the enactment of TRA86, implicit taxes eliminated nearly all cross-sectional differences in explicit tax incentives, but after TRA86, there was a sharp decline in implicit taxes. Moreover, the drop only eliminated about one-third of the cross-sectional differences in explicit tax incentives, suggesting a structural change in the magnitude of implicit taxes after TRA86.

In response to a 2008 tax reform in China, Zhang (2016) conducted a study to gather evidence that (i) implicit tax theory also applies in China, (ii) stronger government intervention in state-owned enterprises would weaken the implicit tax burden, (iii) the tax reform provided firms with a better tax competition environment, and (iv) the negative relationship between the pre-tax rate of return and tax incentives had been strengthened. The results showed (i) the presence of implicit tax in the Chinese market, (ii) a weakened implicit tax burden in state-owned enterprises, meaning they enjoyed more benefits from tax incentives, (iii) an improved tax competition environment after the reform, making the market fairer and more efficient, and (iv) a more robust negative relationship between the pre-tax rate of return and tax incentives.

Using a large sample of US firms, Smith (2017) aimed to document whether variation in market competition (imperfect competition) affects the formation of implicit taxes. To conduct her tests, she estimated market competition based on the market concentration indices of the top four firms (CR4) and the Herfindahl-Hirschman Index (HHI). The tests showed that implicit taxes are lower when more monopolistic or oligopolistic powers are present, and few firms can control the market. As a result, firms can retain more benefits from tax incentives. The author also found that firms in sectors with more competition pass on tax savings to their customers due to higher implicit taxes. In comparison, firms in industries with less competition can retain and pass on tax savings to their shareholders because of lower implicit taxes.

Chyz, Luna, and Smith (2021) aimed to find evidence of whether U.S. multinational firms have a total tax advantage, including explicit and implicit profit taxes, over domestic firms by estimating the extent of implicit taxes for multinationals relative to domestic firms. The results indicated that implicit taxes occur more intensely for U.S. domestic firms than multinationals, suggesting that multinationals enjoy a significantly lower overall tax burden than their domestic competitors.

This research aligns with the study conducted by Smith (2017), where the author found that companies with higher market concentration, meaning less competition, have

lower implicit taxes. Consequently, companies listed on the Brasil Bolsa Balcão [B]3 with higher market concentration (less competition) are expected to bear a lower implicit tax burden than those with lower market concentration (more competition). Therefore, the following research hypothesis is formulated:

H1: Companies listed on the Brazil Bolsa Balcão [B][3] with higher market concentration have lower implicit taxes than those with lower market concentration.

In research focusing on implicit taxes, tests examine the fate of benefits obtained through tax incentives. First, the relationship between the explicit tax rate and the after-tax return is analyzed to determine if these benefits: (i) were retained by the firms (passed on to their shareholders), (ii) were not retained by the firms (passed on to the intended beneficiaries of the tax incentives), or (iii) were eliminated by implicit taxes.

Consistent with Smith's (2017) findings, this study posits that companies in sectors with lower market concentration pass on tax savings to their customers due to higher implicit taxes. In contrast, companies in industries with higher market concentration can retain and pass on tax savings to their shareholders due to lower implicit taxes. Accordingly, the following hypothesis is formulated:

H2: Companies listed on the Brazil Bolsa Balcão [B][3] with higher market concentration can retain benefits from tax incentives, given the lower incidence of implicit taxes.

It should be noted that the hypotheses are directed at analyses performed using Ordinary Least Squares (OLS). However, Armstrong, Blouin, Jagolinzer, and Larcker (2015) explain that OLS only describes the relationship between independent variables and the conditional mean of the dependent variable. Consequently, any connection between independent and dependent variables is measured by changing a central location. If located elsewhere in the sample, OLS will not capture a relationship between independent and dependent variables. In contrast, Quantile Regression (QR) is more versatile and describes the relationship between independent variables and any specified quantile of the conditional distribution of the dependent variable.

Based on Armstrong et al.'s (2015) explanations, more robust analyses will also be conducted using Quantile Regression (QR). QR will determine whether the relationship between market concentration characteristics and ETR varies along the distribution. A positive relationship can exist in one tail of the distribution and a negative association in the other.

3 SAMPLE SELECTION AND RESEARCH DESIGN

The sample selection utilized data from the financial statements of Brazilian companies listed on the Brasil Bolsa Balcão [B][3], spanning from 2011 to 2021. The year 2011 marked the beginning of this period due to Brazilian companies' complete adoption of the International Financial Reporting Standards (IFRS). Therefore, 2021 was chosen as the endpoint since it was the most recent data available in the consulted database.

The COMDINHEIRO Platform was employed to select the companies for the sample, excluding financial companies during the data extraction process. In addition,

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companies with pre-tax losses, negative equity, negative net income, and insufficient data for variable formation were also eliminated from the sample.

Due to a considerable number of observations with missing data and to avoid a sample with limited data, the research was conducted using short and unbalanced panel data, meaning that not all data was available for every company every year. Table 1 illustrates the formation and composition of the observations.

Table 1
Observations Formation Process and Composition

Total Initial Comments	3.675
Exclusion of remarks with pre-tax losses	(756)
Exclusion of observations with negative equity	(64)
Exclusion of observations with negative net income	(44)
Exclusion of observations with missing data	1.305
Total Final Remarks	1.506

Source: COMDINHEIRO Platform
Table prepared by the authors

3.1 Research design

Research that seeks to gain evidence of the presence of implicit taxes analyzes the relationship between the explicit tax rate and firms' pre-tax rate of return. On the other hand, research that seeks to learn about what happens to the benefits obtained from using tax incentives analyzes the relationship between the explicit tax rate and the after-tax rate of return of firms. Thus, adapting the models defined by Smith (2017), the multiple linear regression econometric models to be used will be as follows:

$$ETR_{i,t} = \beta_0 + \beta_1\,PTROE_{i,t} + \beta_2\,CR4_{i,t} + \beta_3\,PTROE_{i,t} \times CR4_{i,t} + \sum\beta_k\,CONTROL_{\,i,t\,+}\,\varepsilon\ (1)$$

$$ETR_{i,t} = \beta_0 + \beta_1\,ROE_{i,t} + \beta_2\,CR4_{i,t} + \beta_3\,ROE_{i,t} \times CR4_{i,t} + \sum\beta_k\,CONTROL_{i,t\,+}\,\varepsilon\ (2)$$

In the models, the dependent variable that measures the effective tax rate (ETR) of the selected companies will be replaced by the Effective Tax Rate on Profit (GAAPETR), which is calculated here as Total Expense with Taxes on Profit / Profit before Taxes, as defined by Hanlon and Heitzman (2010), which is the most widely used metric to indicate the degree of a company's tax aggressiveness. Thus, a low GAAPETR rate means that a company realizes the reduction of its explicit tax burden on profit more intensively than companies with a higher GAAPETR rate.

In Model 1, the pre-tax rate of return (PTROE) is calculated by dividing pre-tax accounting profit by equity. Researchers use the PTROE variable to examine its relationship with the explicit tax rate (ETR). The relationship between these variables reveals the implicit tax burden faced by businesses or individuals:

1. Negative relationship: If ETR and PTROE have a negative relationship, it means when ETR decreases (lower taxes), PTROE increases. This indicates lower taxes lead to higher profitability, suggesting a lower implicit tax burden.
2. Positive relationship: Conversely, if ETR and PTROE have a positive relationship, it means when ETR decreases, PTROE also decreases. In this case, lower taxes result in lower profitability, suggesting a higher implicit tax burden.

In Model 2, the rate of return after taxes (ROE) is calculated by dividing net income by equity. Researchers use the ROE variable to examine its relationship with ETR. This relationship provides insights into whether the benefits of tax incentives are retained by firms (and distributed to shareholders):

1. Negative relationship: If ETR and ROE have a negative relationship, it means when ETR decreases, ROE increases. In this case, lower taxes lead to higher profitability after taxes, suggesting benefits from tax incentives are retained by firms (and distributed to shareholders).

2. Positive relationship: Conversely, if ETR and ROE have a positive relationship, it means when ETR decreases, ROE also decreases. In this case, lower taxes lead to lower profitability after taxes, suggesting benefits from tax incentives are not retained by firms.

In summary, examining the relationship between ETR and PTROE or ROE helps us understand the implicit tax burden and whether benefits from tax incentives are retained by firms (and distributed to shareholders).

The variable CR4 is a dummy variable representing the market concentration index, which measures the extent to which a few dominant players control an industry. A higher market concentration ratio (CR4) suggests that a small number of major players have a significant share of the market, making the market more imperfect and closer to a monopoly-like situation. Conversely, a lower market concentration ratio indicates a more competitive industry, with a larger number of firms having relatively equal market shares.

In essence, the CR4 variable helps gauge the level of competition within an industry by assessing the degree of market power held by the top firms. A high CR4 implies less competition and greater market power for the dominant firms, while a low CR4 suggests a more competitive environment with increased market participation from various firms.

Following the procedures outlined in Smith (2017), the market concentration index (CR4) was calculated by summing the four largest total revenues for each sector each year and dividing the result by the total sales of the respective sector. Subsequently, the average annual CR4 for each sector was computed.

Sectors with a CR4 greater than or equal to the average annual CR4 were classified as having high market concentration (less competition), while sectors with a CR4 lower than the average annual CR4 were considered to have low market concentration (more competition). Consequently, the dummy variable CR4 is assigned a value of 1 for firms in sectors with higher market concentration and a value of 0 for firms in sectors with lower market concentration.The sectors considered in this study are those proposed by Brasil Bolsa Balcão [B][3], as provided in the COMDINHEIRO platform database. Table 2 below shows these sectors and the annual CR4 for each industry.

Table 7
Annual CR4 of each sector

SECTOR/YEAR	2011	2012	2013	2014	2015	2016
Industrial Goods	0,37660	0,38047	0,37557	0,39834	0,44438	0,44801
Cyclic Consumption	0,38244	0,36264	0,34823	0,36318	0,34062	0,35713
Non-Cyclical Consumption	0,90046	0,90104	0,83958	0,84590	0,86548	0,77570
Basic Materials	0,74131	0,72657	0,72992	0,72054	0,70565	0,71108
Oil and Gas	0,99681	0,99584	0,99489	0,99437	0,99506	0,99578
Health	0,62354	0,61725	0,60181	0,60545	0,59103	0,62255
Information Technology	1,00000	0,99536	0,99452	0,98149	0,97237	0,98441
Public Utility	0,34246	0,36479	0,31835	0,30197	0,29298	0,34781
CR4 Medium	0,67045	0,66800	0,65036	0,65141	0,65095	0,65531

SECTOR/YEAR	2017	2018	2019	2020	2021	
Industrial Goods	0,41538	0,39660	0,36108	0,39682	0,37731	
Cyclic Consumption	0,37465	0,36910	0,33427	0,37780	0,37779	
Non-Cyclical Consumption	0,76749	0,75293	0,66241	0,65207	0,64702	
Basic Materials	0,70837	0,70950	0,63720	0,65317	0,65797	
Oil and Gas	0,99503	0,99396	0,99030	0,98768	0,98440	
Health	0,59241	0,59734	0,60951	0,55495	0,56676	
Information Technology	0,98054	0,87078	0,79847	0,71932	0,70643	
Public Utility	0,31216	0,28008	0,27471	0,26726	0,26850	
CR4 Medium	0,64325	0,62129	0,58349	0,57613	0,57327	

Source: Prepared by the authors

The interaction variables between PTROE and CR4 and ROE and CR4 will be the variables of interest in this study. A negative relationship between the dependent variable ETR and the interaction between PTROE and CR4 (PTROE x CR4) suggests that firms with high market concentration have lower implicit taxes than firms with low market concentration. On the other hand, a positive relationship between the dependent variable ETR and the interaction between PTROE and CR4 (PTROE x CR4) suggests that firms with higher market concentration have higher implicit taxes than firms with low market concentration.

A negative relationship between the dependent variable ETR and the interaction between ROE and CR4 (ROExCR4) suggests that firms with high market concentration can retain the benefits of using tax incentives. On the other hand, a positive relationship between the dependent variable ETR and the interaction between ROE and CR4 (ROExCR4) suggests that firms with higher market concentration cannot retain the benefits obtained from using tax incentives.

This paper will use the following control variables: SIZE, LEV, IMOB, and INT. First, the variable SIZE (size of firms) is calculated as the natural logarithm of total assets. Second, the variable LEV (leverage) is calculated by dividing long-term debt by total assets. Third, the variable IMOB (companies' fixed assets ratio) is calculated by dividing total fixed assets by total assets. Finally, the variable INT (intangibles companies' rate) is calculated by dividing total intangible assets by total assets. The summary and form of calculation of all variables used in the developed models are summarized in Table 3 below:

Table 8
Calculations and Meanings of Model Variables

VARIABLES	SIGNIFICANCE	DETERMINATION
GAAPETR	Dependent variable that determines the effective tax rate on profit.	Total Tax Expense on Profit / Profit before Taxes.
PTROE	Independent variable that determines the pre-tax rate of return.	Profit Before Taxes / Shareholders' Equity.
ROE	Independent variable that determines the rate of return after taxes.	Net Income / Shareholders' Equity.
PTROExCR4	Interaction variable.	PTROE multiplied by CR4.
ROExCR4	Interaction variable.	ROE multiplied by CR4.
SIZE	Control variable that determines the size of the company.	Natural Logarithm of Total Assets.
LEV	Control variable that determines the leverage of the company.	Long-Term Debt / Total Assets.
IMOB	Control variable that determines the detention rate of the company.	Fixed Assets / Total Assets.
INT	Control variable that determines the rate of intangibles in the company.	Intangible Assets / Total Assets.
CR4	*Dummy* variable.	Assumes 1 for firms with high market concentration, and zero for firms with low market concentration

Source: Prepared by the authors

4 ANALYSES OF RESULTS AND DISCUSSION

After collecting the data in the COMDINHEIRO platform, they were treated in Excel to generate the variables and the respective short and unbalanced panels. Soon after, the statistical tests were started in the R *software*, version 4.2.2.

4.1 Descriptive Statistics

Table 4 below presents the descriptive statistics for GAAPETR, PTROE, and ROE variables.

Table 4
GAAPETR Descriptive Statistics

Items	High Concentration Comments = 367			Low Concentration Observations = 1,139		
	GAAPETR	PTROE	ROE	GAAPETR	PTROE	ROE
Average	0,26396	0,29713	0,24896	0,27460	0,20723	0,16028
1st Quartile	0,11642	0,07462	0,05836	0,15688	0,09525	0,07705
Median	0,23078	0,14462	0,11620	0,25133	0,17224	0,13663
3rd Quartile	0,32892	0,29051	0,22433	0,32340	0,26622	0,20538
Standard Deviation	0,21755	0,61185	0,57403	0,24184	0,17117	0,13040

Source: *Software* R, version 4.2.2
Table prepared by the authors

Analyzing the results of the descriptive statistics, it is observed that in the taxes levied on profit (GAAPETR), the average explicit tax rate of firms with high market concentration (low competition) is lower than the average explicit tax rate of firms with low market concentration (high competition). We also observe that in the first quartile and at the median, the average explicit tax rates of firms with high market concentration

(low competition) are lower than the average explicit tax rates of firms with low market concentration (high competition), which suggests that at these points in the distribution firms with high market concentration (low competition) are using tax incentives more intensively than firms with low market concentration (high competition). In the third quartile, explicit tax rates are equal across firms of both concentrations. This suggests that firms of both concentration groups use tax incentives with the same intensity at these distribution points.

Implicit taxes are conceptualized as lower pre-tax rates of return on investments in tax-favored assets (Scholes et al., 2009). In the descriptive statistics of GAAPETR, it is observed that at the mean and third quartile, the pre-tax rates of return (PTROE) of firms with high market concentration (low competition) are higher than the pre-tax rates of return (PTROE) of firms with low market concentration (high competition). These results suggest that at these points of the distribution, firms with high market concentration (low competition) bear lower implicit taxes than firms with low market concentration (high competition). On the other hand, we note that in the first quartile and the median, the pre-tax rates of return (PTROE) of firms with high market concentration (low competition) are lower than the pre-tax rates of return (PTROE) of firms with low market concentration (high competition). These results suggest that at these points in the distribution, firms with high market concentration (low competition) bear higher implicit taxes than firms with low market concentration (high competition).

In the case of after-tax returns (ROE), the literature on implicit taxes informs us that the ROE analysis aims to verify whether companies can retain the benefits obtained through tax incentives. Thus, an analysis of ROE within the scope of descriptive statistics is inappropriate.

4.2 Multivariate Ordinary Least Squares (OLS) Analysis

Before the beginning of the tests, all data were *winsorized in* the 1st and 99th percentiles due to the existence of *outliers*. In the correlations, values not tabulated for brevity, the results showed a low correlation between the independent variables, which suggests the absence of multicollinearity. *Variance Inflation Factor* (VIF) tests were also performed to verify collinearity. Favero et al. (2014) clarified that a VIF of less than five suggests the lack of multicollinearity between the independent variables. The results showed that the VIF statistics of the independent variables are much smaller than five. The Breusch-Pagan, Wooldridge, Hausman, and F Test results indicated that the best model to be considered would be the fixed effects model. Table five displays the results obtained by running MQO.

Table 5 presents the results of the Ordinary Least Squares (OLS) relative to the tests performed. The following analysis refers to the variable of interest - interaction between pre-tax rate of return (PTROE) and market concentration (CR4) - which assumes a value equal to 1 for companies with high market concentration (low competition) and zero for companies with low market concentration (high competition).

Table 5
Multivariate MQO Analysis

Variables	Coefficient	T-Value	P-Value
PTROE	-0,10152	-2,6870	0,00730
PTROExCR4	-0,12322	-1,7680	0,07729
CR4	0,03011	1,2881	0,19792
SIZE	-0,00613	-1,2218	0,22199
LEV	0,24369	5,0654	4,663e-07
IMOB	0,05555	1,5118	0,13083
INT	0,10236	2,5926	0,00963

Source: *Software* R, version 4.2.2
Table prepared by the authors

The results show that, on average, there is a negative and statistically significant relationship at the 10% level (p-value = 7.72%) between the explicit tax rate (GAAPETR) and the interaction (PTROE x CR4). This result suggests that, on average, firms with high market concentration have lower implicit taxes than firms with low market concentration, corroborating our first hypothesis's prediction.

A negative relationship between the effective tax rate and the pre-tax rate of return indicates that as the tax rate on profit is reduced, the pre-tax rate increases. From the result presented, for firms with high market concentration, the average one-unit reduction in GAAPETR causes an average 0.12322 unit increase in the pre-tax rate of return.

Table 6 below presents the Ordinary Least Squares (OLS) results for the tests performed concerning the interaction between the after-tax rate of return (ROE) and market concentration (CR4), which takes a value equal to 1 for firms with high market concentration (low competition) and zero for firms with low market concentration (high competition).

Table 6
Multivariate MQO Analysis

Variables	Coefficient	T-Value	P-Value
ROE	-0,12388	-2,8441	0,00452
ROExCR4	-0,19040	-2,1221	0,03401
CR4	0,03756	1,6010	0,10962
SIZE	-0,00631	-1,2595	0,20807
LEV	0,24887	5,1877	2,468e-07
IMOB	0,05663	1,5497	0,12146
INT	0,09831	2,4927	0,01280

Source: *Software* R, version 4.2.2
Table prepared by the authors

The results show that, on average, there is a negative and statistically significant relationship at the 5% level (p-value = 3.40%) between the explicit tax rate (GAAPETR) and the interaction (ROE x CR4). This result suggests that, on average, firms with high market concentration can retain the benefits obtained from using tax incentives, corroborating our second hypothesis's predictions.

A negative relationship between the effective tax rate and the after-tax rate of return indicates that as the tax rate on profit is reduced, the after-tax rate of return increases. From the results presented, it follows that for firms with high market concentration, an average one-unit reduction in GAAPETR causes an average 0.19040

unit increase in the after-tax rate of return. Since this result suggests that these firms can retain the benefits obtained from using tax incentives, these benefits can thus be transferred to the shareholders of these firms.

4.3 Multivariate Quantile Regression (QR) Analysis

Because MQO only describes the relationship between the independent variables and the conditional mean of the dependent variable, any connection between the independent variables and the dependent variable is measured through a change in a central location. Thus, MQO would not capture any existing relationship between the independent and dependent variables if that relationship is located elsewhere in the sample (Blouin, Jagolinzer & Larcker, 2015).

Therefore, tests were also performed using Quantile Regression (QR) to examine other points of the distribution, what happens with the implicit taxes, and to find out the destination of the benefits obtained using the tax incentives at these different points of the distribution.

The following table presents the results of the quantile regression relative to the tests performed concerning the interaction between pre-tax rate of return (PTROE) and market concentration (CR4), which assumes a value equal to 1 for companies with high market concentration (low competition) and zero for companies with low market concentration (high competition).

Table 7
Results of PTROExCR4 interactions

Quantil	Intercept	Coefficient	T-Value	P-Value
0,20	0,09587	-0,01395	-1,72261	0,08517
0,60	0,35483	-0,01489	-1,84978	0,06454
0,70	0,38791	-0,01683	-2,14925	0,03177
0,80	0,41946	-0,01709	-1,87161	0,06145

Source: *Software* R, version 4.2.2
Table prepared by the authors

The displayed table shows that for taxes on profit (GAAPETR), the quantiles 0.10; 0.30; 0.40; 0.50, and 0.90 showed no results with statistical significance, suggesting that at these points in the distribution, the implicit taxes are not statistically different across the market concentration groups under study. However, for the remaining quantiles, the results show a negative and significant relationship between the explicit tax rate and the interactions at the 5% level for the 0.70 quantiles and the 10% level for the 0.20; 0.60; 0.70, and 0.80 quantiles. These results suggest that at these points in the distribution, firms with high market concentration have lower implicit taxes than firms with low market concentration, which corroborates the predictions of our first hypothesis.

A negative relationship between the effective tax rate and the pre-tax rate of return indicates that as the tax rate on profit is reduced, the pre-tax rate of return increases. From the results presented, we have that for firms with high market concentration, a one-unit reduction in GAAPETR causes an increase in the pre-tax rate of return of (i) 0.01395 unit in the 0.20 quantile, (ii) 0.01489 unit in the 0.60 quantiles, (iii) 0.01683 unit in the 0.70 quantiles, and (iv) 0.01709 unit in the 0.80 quantiles.

Table 8
Results of ROExCR4 Interactions

Quantil	Intercept	Coefficient	T-Value	P-Value
0,20	0,10376	-0,02581	-2,74636	0,00610
0,30	0,15674	-0,02277	-1,84295	0,06553
0,50	0,32472	-0,02035	-1,92130	0,05488
0,60	0,35365	-0,02357	-2,60716	0,00922
0,70	0,38760	-0,01516	-1,73974	0,08211

Source: *Software* R, version 4.2.2
Table prepared by the authors

Table 8 presents the quantile regression results related to the tests performed concerning the interaction between the rate of return after taxes (ROE) and the market concentration (CR4), which assumes a value equal to 1 for companies with high market concentration and zero for companies with low market concentration. Therefore, only the results of the quantiles in which the interactions were statistically significant are presented.

The table displayed shows that for taxes on profit (GAAPETR), the quantiles 0.10; 0.40; 0.80, and 0.90 showed no results with statistical significance, suggesting that at these points in the distribution, the implicit taxes are eliminating any benefit obtained from the use of tax incentives. However, at quantiles 0.20; 0.30; 0.50 (median), 0.60, and 0.70, the results show a negative and significant relationship between the explicit tax rate and the interactions at the 1% level for quantiles 0.20 and 0.60 and the 10% level for quantiles 0.30; 0.50 and 0.70. These results suggest that at these points in the distribution, the benefits obtained from using tax incentives by firms with high market concentration are retained by these firms (transferred to their shareholders), corroborating our second hypothesis's predictions.

A negative relationship between the effective tax rate and the after-tax rate of return indicates that as the tax rate on profit is reduced, the after-tax rate of return increases. From the results presented, it can be seen that for firms with high market concentration, reducing GAAPETR by one unit causes an increase in the after-tax rate of return of (i) 0.02581 unit in the 0.20 quantile, (ii) 0.02277 unit in the 0.30 quantile, (iii) 0.02035 unit in the 0.50 quantile, (iv) 0.02357 unit in the 0.60 quantiles, and (v) 0.01516 unit in the 0.70 quantiles.

Taken together, the results of the multivariate analysis suggest that firms with high market concentration (low competition) bear a lower implicit tax burden than firms with high market concentration (high competition), even though they use tax incentives more intensively than their peers. The results also suggest that firms with high market concentration (low competition) can retain (pass on to shareholders) the tax benefits obtained by reducing their explicit tax rates, i.e., the implicit taxes do not eliminate the benefits received by using tax incentives.

The results corroborate the hypotheses proposed in this study. Moreover, they align with what was found by Smith (2017), who received evidence that implicit taxes are lower when markets are less competitive, that is, when more monopolistic or oligopolistic powers are present. As a result, few firms control the market, implicit taxes are lower, and firms can retain the benefits arising from tax incentives.

5 CONCLUSIONS AND IMPLICATIONS

Implicit taxes refer to the reduction in pre-tax rates of return on investments that receive preferential tax treatment. The theory behind implicit taxes suggests that any benefits from preferential tax treatment will be fully offset by the implicit taxes, leading to no net use from lower explicit taxes. However, this theory assumes perfect market competition, which is not always true.

Building on Smith's (2017) work, this study also relaxes the perfectly competitive market assumption. It provides evidence that firms with higher market concentration (lower competition) bear a lower implicit tax burden than firms with lower market concentration (higher competition), even though they utilize tax incentives more intensively than their counterparts. The evidence also indicates that companies with higher market concentration can retain (pass on to shareholders) the benefits of using tax incentives. These results suggest that companies with higher market concentration can bear a lower implicit tax burden and retain the benefits from tax incentives due to their market power. This power allows them to transfer the burden of implicit taxes to their consumers and suppliers through the sale prices of their products and the purchase prices of their inputs.

The results of this study have significant implications for both policymakers and businesses. By understanding the relationship between market concentration and the burden of implicit taxes, policymakers can better evaluate the effectiveness of tax incentives and their impact on market dynamics. In particular, they can consider whether the current tax incentives structure is inadvertently favoring companies with higher market concentration, thus reinforcing existing market power and potentially reducing overall competition.

Based on the presented findings, the study's implications suggest that tax policy changes can significantly affect firms' profitability and market competition, with different impacts on firms with high and low market concentration. Firms with high market concentration (low competition) use tax incentives more intensively than firms with low market concentration (high competition) but bear a lower implicit tax burden than their peers.

The negative relationship between the explicit tax rate and the pre-tax rate of return implies that reducing the tax rate on profit increases the pre-tax rate of return. In contrast, the negative relationship between the explicit tax rate and the after-tax rate of return suggests that reducing the tax rate on profit increases the after-tax rate of return. Moreover, firms with high market concentration (low competition) can retain the benefits obtained from using tax incentives, indicating that these incentives have a more significant impact on their profitability than on firms with low market concentration (high competition).

These findings could be helpful for policymakers and businesses in assessing the impact of tax policy changes on firms and the broader economy. Overall, the implications of your study suggest that tax policy changes can significantly affect firms' profitability and market competition, with different impacts on firms with high and low market concentration. Accordingly, these findings may be helpful for policymakers and businesses in assessing the effects of tax policy changes on firms and the broader economy.

For businesses, the findings suggest that firms operating in industries with higher market concentration may have a strategic advantage in leveraging tax incentives to

reduce their implicit tax burden and increase after-tax returns. This advantage may enable them to maintain or increase their market power, which could have a cascading effect on other aspects of their operations, such as pricing and supply chain management.

However, it is essential to recognize the limitations of this study. The results are based on a specific sample of companies and may not be generalizable to other industries or contexts. Moreover, the reduced number of observations due to data exclusion may have affected the robustness of the findings. As a result, further research is required to validate these results and explore the implications of implicit tax burdens across different sectors and competitive environments.

A potential future topic for research related to the presented findings is investigating the effects of tax policy changes on tax-favorable investments in firms with varying levels of market concentration. This research could examine the impact of tax incentives and disincentives on firms' investment decisions, pricing strategies, and entry and exit patterns. Moreover, the study could explore how tax policy changes affect market competition and industry structure over time. Another potential research topic is analyzing the distributional effects of tax policy changes across firms with varying market concentration levels, including the impact on their size, profitability, and market power. This research could provide insights into the potential trade-offs between promoting firm competitiveness and ensuring a fair and efficient tax system, which could contribute to ongoing policy debates on tax reform and competition policy.

In conclusion, this study sheds light on the varying degrees of implicit tax burdens in imperfectly competitive markets. Moreover, it highlights the importance of understanding the complex relationship between market concentration and tax incentives. Accordingly, policymakers and businesses should consider these findings when evaluating the impact of tax policies on market dynamics and competition. Overall, this study contributes to a better understanding of Brazil's complex relationship between market concentration, implicit taxes, and corporate power.

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