ISSN 1808-057X
DOI: 10.1590/1808-057x20241985.en

ORIGINAL ARTICLE

Auditor-provided tax services and tax accrual quality in Brazil

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Received on 08/23/2023 – Desk acceptance on 10/20/2023 – 2nd version approved on 02/08/2024
Editor-in-Chief: Andson Braga de Aguiar
Associate Editors: Márcia Martins Mendes De Luca and Eduardo da Silva Flores

ABSTRACT

This research aimed to analyze the temporal association between auditor-provided tax services (APTS) and corporate income tax accrual quality in the Brazilian context. Studies analyzing the influence of APTS on tax accrual quality are scarce and have only been carried out in the United States of America (USA), so that this relationship is not yet clearly understood due to lack of evidence in other institutional contexts. Research results expand international evidence on the theme and enrich empirical literature on auditing and taxation. Also, these results have implications for regulators, companies that contract tax services from their auditors, auditing firms that provide such services, and academic researchers, because they contradict the knowledge spillover argument and reinforce the idea that APTS can compromise auditor independence in the case of institutional configurations such as the Brazilian one. The research adapted the empirical model of Choudhary et al. (2021) and estimated the relationship between the variables of interest using panel data with robust standard errors and a variety of econometric models that address issues related to unobserved heterogeneity between firms, endogeneity, selection bias, outliers, and specification error. We document new evidence of the negative and statistically significant association between APTS and income tax accrual quality, contributing to the ongoing debate about imposing limitations on auditor provision of non-audit services and the role of tax services in accounting information quality.

Keywords: corporate income tax, auditor, tax accrual, knowledge spillover, audit quality.

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This is a bilingual text. This article was originally written in Portuguese and published under the DOI 10.1590/1808-057x20241985.pt
Paper presented at the XVII ANPCONT Congress, São Paulo, SP, Brazil, December 2023.

Os serviços tributários prestados pelo auditor e a qualidade do accrual tributário no Brasil

RESUMO

Esta pesquisa teve por objetivo analisar a associação temporal entre os serviços tributários fornecidos pelo auditor (auditor-provided tax services [APTS]) e a qualidade do accrual do imposto de renda corporativo no contexto brasileiro. Estudos que analisam a influência do APTS na qualidade do accrual tributário são escassos e foram realizados apenas nos Estados Unidos da América (EUA), de modo que essa relação ainda não é bem compreendida em função da ausência de evidências em outros contextos institucionais. Os resultados da pesquisa ampliam as evidências internacionais sobre o tema e a literatura empírica em auditoria e tributação. Além disso, esses resultados têm implicações para reguladores, empresas que contratam serviços tributários de seus auditores, firmas de auditoria que fornecem tais serviços e pesquisadores acadêmicos, porque contrariam o argumento do transbordamento de conhecimento e reforçam a ideia de que a APTS pode comprometer a independência do auditor no caso de configurações institucionais como a brasileira. A pesquisa adaptou o modelo empírico de Choudhary et al. (2021) e estimou a relação entre as variáveis de interesse utilizando dados em painel com erros padrão robustos e uma variedade de modelos econométricos que abordam questões relacionadas a heterogeneidade não observada entre as firmas, endogeneidade, viés de seleção, outliers e erro de especificação. Documentamos novas evidências da associação negativa e estatisticamente significativa entre APTS e a qualidade do accrual do imposto de renda, contribuindo para o debate em andamento sobre a imposição de limitações à prestação de serviços não relacionados à auditoria pelo auditor e do papel dos serviços tributários na qualidade das informações contábeis.

Palavras-chave: *imposto de renda corporativo, auditor, accrual tributário, transbordamento de conhecimento, qualidade da auditoria.*

1. INTRODUCTION

Due to concerns about compromising auditor independence, regulators in several countries have restricted the provision of most non-audit services (NAS) by the firm's main auditor, but allow, in some cases, the provision of tax services (auditor-provided tax services [APTS]). Investors perceive the benefits of APTS, resulting from knowledge spillover (Krishnan et al., 2013). However, empirical studies addressing this issue have documented inconsistent results and provide evidence suggesting both knowledge spillover (Lai, 2022; Watrin et al., 2019) and compromised auditor independence (Carr et al., 2021; Choudhary et al., 2021; Knechel & Payne, 2001).

According to Choudhary et al. (2021), this inconsistency may be explained in part by the fact that prior studies attempt to associate tax services with material violations of generally accepted accounting principles (GAAP), predominantly using specific quality measurements of the financial statements and the audit (e.g., restatement of financial statements, earnings quality, disclosures of material weaknesses in internal control, and change of opinion on operational continuity) with poor ability to produce inferences about the influence of tax services on knowledge spillover or compromised auditor independence. Also, violations of accounting principles considered immaterial are not disclosed by companies and cannot be captured by these research studies.

To advance this issue, Choudhary et al. (2021) propose using income tax accrual quality as a proxy for the quality of company audits and financial reports. As the authors argue, accrual quality is a metric related to financial statements that reflects income tax estimation error, as it captures the mapping between accrual and taxes paid in current and adjacent periods of a company in relation to its peers in the sector, so that higher values indicate greater variance in the mapping and, consequently, greater error in estimating corporate income tax. Hence, it is expected that the effect of APTS will be more discernible using this measure.

Choudhary et al. (2016) explain that income tax accrual can be affected both by estimation errors resulting from managers' inability to adequately assess the taxable implications of company operations and by differences between income tax expenses calculated in accordance with GAAP and income tax-related cash flows that are not captured by deferred tax assets and liabilities. As a consequence, both managerial estimation error and GAAP-induced error affect tax expenditure ability to reflect tax-related cash flows, increasing mapping errors

of tax accruals into cash flows linked to income tax, making it a measure of financial statement quality that captures estimation error and immaterial violations within GAAP. This is possible because, as Choudhary et al. (2016, 2021) explain, the way in which accrual quality is estimated allows capturing less extreme variations (through statistical patterns) in specific tax accounts, in addition to actual or potential violations of accounting principles for a large sample of companies in a broad time series. As an ongoing measure, accrual quality is capable of capturing small amounts of estimation errors that can result in lower financial reporting quality, even in the absence of more egregious material violations of accounting principles.

From this perspective, income tax accrual becomes an interesting and powerful proxy in the context of studies related to the use of APTS, as it involves an economically relevant expense for most listed companies, the calculation of which is complex and regulated by intricate legislation and tax rules that require managers to understand technically how accounting and tax reports are linked (Choudhary et al., 2016; De Simone et al., 2015).

Sun and Habib (2021) argue that, due to the very close relationship between tax services and the calculation of company taxable income, knowledge spillover must manifest itself through the sharing of information between tax consultancy and tax audit teams, which can lead to better income tax estimates. On the other hand, the provision of tax services may induce self-review bias or threats of self-interest if the auditor is in the contingency of having to review the work carried out by members of their own firm related to the provision of tax services, which may lead to worse income tax estimates. This effect of APTS on tax estimates may be more pronounced in more tax-aggressive companies (Carr et al., 2021).

In this research, we analyzed the association between joint provision of audit and tax services by the firm's main auditor and corporate income tax accrual quality in Brazil. Studies in the context of APTS that use this specific measure related to the provision account for corporate income tax are scarce and the few that exist were carried out in the United States of America (USA). However, differences in regulations and other institutional aspects in each country can affect (moderating or mediating) the relationship between APTS and income tax accrual quality, so this relationship is not clear, yet.

Although in Brazil there are standards originating from both the Securities and Exchange Commission (Comissão de Valores Mobiliários [CVM]) (e.g., Resolução CVM No. 23/2021) and the Federal Accounting Council (Conselho Federal de Contabilidade [CFC]) (e.g., NBC PA 400/2019, later amended by NBC No. 017/2022), limiting the provision of NAS by the main auditor, in case of conflict of interests, in practice, the audit firms continue to provide these services, considering that themselves, or the contracting company, make the judgment on whether or not there is a conflict of interests and, even so, the occasional prohibition can be circumvented by applying safeguards that aim to mitigate threats to auditor independence. So, many companies continue to hire their auditors to provide NAS, including tax services.

Furthermore, given that tax aggressiveness can influence the relationship between APTS and the disclosure of accounting information about taxes (Carr et al., 2021), Brazil offers an interesting institutional context to explore this issue because there is observational evidence suggesting that tax aggressiveness affects the quality of accounting information disclosed in the national market (Martinez et al., 2022; Ramos & Martinez, 2018; Santos et al., 2019) and that effective income tax rates (*taxas efetivas de tributos sobre a renda* [ETR]) (a proxy for tax aggressiveness) is influenced by APTS (Santos et al., 2021).

Anticipating the results, we identified in our sample a negative and contemporary association between APTS and income tax accrual quality. The results are robust to a variety of controls and econometric models that formally address issues relating to unobserved and time-invariant heterogeneity among firms and additional tests that take into account concerns of endogeneity, selection bias, outliers, and specification error. These results expand the evidence already existing in Carr et al. (2021) and Choudhary et al. (2021) for the U.S. market and are compatible with the idea of compromising auditor independence and contrary to the knowledge spillover argument.

By documenting evidence suggesting that APTS negatively influences accounting information quality relating to income tax, this study sheds light on the ongoing debate and has implications for regulators, companies that hire their auditors to provide tax services, audit firms that provide such services, and academic researchers because it contradicts the knowledge spillover argument and reinforces the idea that NAS in general and tax services in particular can compromise auditor independence in the case of institutional configurations such as the Brazilian one. Finally, as this is a study outside the U.S. context, carried out in an institutional environment considered to have low investor protection, low litigation risk for the auditor and high tax complexity, the research helps to fill the existing gap, expanding international evidence on the theme and empirical literature on auditing and taxation.

2. RELATED LITERATURE AND HYPOTHESIS

According to Sun and Habib (2021), the literature considers two competing theoretical approaches to analyze the consequences of using tax services provided by the firm's main auditor. The first is the knowledge spillover argument, according to which APTS improves audit quality, in addition to reducing audit costs. The second is the argument that auditor independence is compromised, in which it is argued that APTS harms audit quality because it can strengthen the economic bond between the auditor and the audited firm.

Regarding the knowledge spillover argument, De Simone et al. (2015) rationalize that audit firms providing tax services along with accounting audit services are more likely to obtain knowledge about their clients' operations and businesses. In doing so, they improve their ability to recognize transactions relevant to the financial statements, the internal controls crucial for the adequate recording of transactions that matter for financial disclosure, and the experience to assess the quality of these controls. The knowledge acquired can be shared between various work teams, allowing audit personnel to gain expertise that can be useful in the audit service concerning financial statements and internal controls. McGuire et al. (2012) also consider that knowledge spillover can be generated from the industry-specific knowledge that audit firms acquire when providing companies in the same sector with tax services. Also, as highlighted by Sun and Habib (2021), the provision of tax services provides auditors with a better understanding of the client's tax strategies, facilitating the work of attesting tax-related statements, as well as assessing clients' attitudes towards aggressiveness of financial reports.

However, as Sun and Habib (2021) point out, the concomitant provision of tax and auditing services by the same firm can generate concerns about the emergence of self-interest and self-review threats and compromising auditor independence. According to the International Federation of Accountants (IFAC, 2009), self-interest threat deals with the concern that an interest (financial or otherwise) may negatively influence auditor judgment or professional behavior. In turn, the threat of self-review refers to the risk that the audit fails to adequately assess the judgment or result of a service already performed by the auditor themselves or by a member of the firm where they work.

Just like any non-audit service, APTS can increase the economic link between auditors and clients, becoming a source of self-interest threat. Simunic (1984) designed an analytical model of the joint demand for audit and non-audit services and demonstrated that occasional joint production efficiencies resulting from knowledge spillovers can be partially appropriated as income by the auditor and create a threat to their independence, because the auditor will be economically linked to the client. Therefore, current and future APTS-related income may strengthen economic ties between audit firms and their audit clients, posing a threat to auditor independence (Sun & Habib, 2021). Furthermore, in the context of APTS, auditor independence may also be compromised because of the risk of the audit team not adequately assessing the result of the work involving the client's tax matters carried out by the tax services team, when both belong to the same firm providing both services (Choudhary et al., 2021).

Many of the observational studies investigating the association between APTS and various proxies relating to company financial disclosure quality (directly and not directly related to taxes) documented evidence that supports both the knowledge spillover argument (Gleason & Mills, 2011; Watrin et al., 2019) regarding the argument of compromising auditor independence (Knechel & Payne, 2001).

However, according to Choudhary et al. (2021), these research studies did not analyze the area where there should be an impact on knowledge or a threat to auditor independence due to the APTS because they used specific measures of financial reporting quality, or specific measures related to income tax, which can only identify material errors of breach of accounting principles. For Choudhary (2021), the effect of APTS should be better distinguished when using a measure of financial statement quality that captures estimation errors and immaterial breach of accounting principles in income tax accrual because this metric is directly related to the account provision for corporate income tax. According to Choudhary et al. (2021), as tax professionals are better qualified to assess tax issues, the audited income tax provision account on the balance sheet should increase interaction between the audit team and the tax services team.

However, Carr et al. (2021) argue that the provision of highly aggressive tax services by the auditor to their audit clients, whose compensation is derived from the financial outcome of these services, probably compromises independent judgment and generates a threat of self-review in the audit of the income tax account because

it puts auditors in the position of auditing the work of their own company, in addition to causing them to have an inadequate mutuality of interest with the client due to financial incentives.

When investigating the effects of restrictions imposed by The Public Company Accounting Oversight Board (PCAOB) for aggressive APTS, Carr et al. (2021) documented robust evidence that companies that significantly decreased APTS contracting had experienced an improvement in the income tax accrual quality and that this improvement was more pronounced for companies that were more tax aggressive in the pre-regulation period. Similarly, Choudhary et al. (2021) documented that greater amounts of APTS are associated with greater estimation errors in income tax expense, suggesting a negative relationship between APTS and tax accrual quality.

In the specific case of Brazil, observational evidence has documented that tax aggressiveness: (i) affects qualitative characteristics of company financial reporting (Martinez et al., 2022); and (ii) reduces the quality of accounting information disclosed (Ramos & Martinez, 2018; Santos et al., 2019). Also, Santos et al. (2021) identified a negative relationship between APTS and the effective tax rate. Given that many studies interpret an increased ETR as a proxy for tax aggressiveness, it is expected that, in this context, the APTS will negatively influence the income tax accrual quality in these companies, as suggested by Carr et al. (2021). So, the following hypothesis can be formulated, when analyzing the Brazilian case:

H1: Tax services provided by the main auditor are negatively associated with the firm's corporate income tax accrual quality.

3. METHODOLOGY

3.1 Measuring Income Tax Accrual Quality and Empirical Model

Corporate income tax accrual quality (TaxAQ) is the main variable of interest in the research and, to measure it, we resort to an adaptation of the methodology designed and validated by Choudhary et al. (2016), where income tax accrual (TaxACC) is initially calculated by using this formula:

$$TaxACC_{ij} = \beta_0 + \beta_1 ITP_{it-1} + \beta_2 ITP_{it} + \beta_3 ITP_{it+1} + \beta_4 \Delta LTDTL_{it} + \beta_5 \Delta LTDTA_{it} + \varepsilon_{it} \quad (1)$$

In equation 1, the dependent variable TaxACC is the difference between total income tax expense and income tax paid (ITP) in period *t* (an income statement account minus related cash flows). The ITP variable represents the amount of corporate income tax paid in *t-1*, *t*, and *t+1*. The original model proposed by Choudhary et al. (2016) directly uses the amount of income tax paid, which is mandatorily disclosed by companies in the USA. As in Brazil companies are not required to publicly report how much income tax they actually paid in each tax period, for our research, the income tax paid was calculated by using this formula:

$$ITP = Income\ Tax\ Expense - \Delta\ Income\ tax\ payable \quad (2)$$

The variables ΔLTDTL and ΔLTDTA represent variations in the current period of Deferred Income Tax Liabilities and Deferred Income Tax Assets in the long term and serve to control temporary differences between the GAAP and tax regulations in calculating income tax that do not represent errors in management estimates and which generally reverse outside the window *t-1* to *t+1*. All variables are scaled by total assets. Then, cross-sectional regressions are estimated, based on ordinary least squares (OLS), for each year and sector. After that, the variable TaxAQ is defined as the standard deviation of residuals from company *i* in the annual estimate of Equation (1) over the window from *t-3* to *t*. In this study, we tested the windows from *t-4* to *t*, out of 5 periods, but we did not identify qualitative changes in relation to the 4-period window. So, to work with a larger sample, we kept the 4-period window.

According to Choudhary et al. (2021), TaxAQ reflects the ability of a company's accounting system, in comparison to its sector peers, to generate tax accruals that adequately map cash flows related to income tax. Higher standard deviation values indicate low accrual quality resulting from errors in management estimates (intentional or not) and compliance with accounting principles that lead to differences between expenses and cash flows related to income tax not captured by deferred tax assets and liabilities.

Then, the inference about *APTS* influence on income tax accrual quality was made by using the following regression model based on Carr et al. (2021), Choudhary et al. (2021), and Walton et al. (2021):

$$TaxAQ_{it} = \beta_0 + \beta_1 APTS_{it} + \beta_2 OtherNAS_{it} + \beta_3 AQ_{it} + \beta_4 ESO_{it} + \beta_5 DISC\&EXTRA_{it} + \beta_6 PreTaxVol_{it} + \beta_7 TaxLoss_{it} + \beta_8 SIZE_{it} + \beta_9 INTENSIT_{it} + \beta_{10} INTANG_{it} + \beta_{11} MTB_{it} + \beta_{12} ROA_{it} + \beta_{13} LEV_{it} + \beta_{14} BIG4_{it} + \beta_{15-23} Year_{it} + \beta_{24-31} Industry_{it} + \varepsilon_{it} \quad (3)$$

It is worth highlighting that our calculation of income tax accrual, based on variations in Balance Sheet accounts, may not be as accurate, as there are data limitations relating to components that may reflect tax accrual, such as, for instance, deferred income tax (assets and liabilities) of current assets. Additionally, in some cases, the Taxes Payable account may contain local, state, and federal taxes, including income tax itself.

Another aspect that must be considered is the fact that the accrual calculation model adopted in this research has been designed considering the U.S. context. The tax legislation relating to income tax of U.S. companies has relevant differences in relation to the Brazilian one that may affect tax accrual. For instance, as Soares (2020) explains, in Brazil, tax losses can only be offset against future profits and are limited to reducing the latter by 30%. On the other hand, in the USA, in addition to future profits (with a 80% threshold), it is possible to compensate 'carry-back loss' with the refund of taxes paid in previous years. This characteristic means that the system for calculating payable income tax and tax actually paid by companies has a different dynamic in the two countries.

In another example, in Brazil, national companies pay tax on profits earned by their subsidiaries and affiliates established abroad. In the USA, dividends received by U.S. companies from their affiliates and subsidiaries established abroad have a 100% deduction when calculating corporate income tax. However, some income types (*passive income*) are not entitled to this deduction. Finally, U.S. legislation also has a series of tax rules to prevent abuse in the manipulation of results and displacement of profits to tax havens (Soares, 2020).

3.2 Description of the Main Independent Variable and Controls

In equation 3, APTS is the variable of interest and was measured in two ways. First, we use the ratio between the amount paid for tax services and the total value of all services paid to the audit firm (continuous APTS) to assess whether accrual quality varies directly with the proportion of fees related to tax services. Next, we take an indicator variable (DAPTS) to find out whether the TaxAQ of companies that hire the auditor to provide tax services is different from companies that do not. DAPTS takes a value 1 in the presence of tax services and 0 in other cases. APTS values and the auditor's total contracted services were obtained from the Reference Forms (RF) published by companies. APTS includes any tax services provided by the audit firm (e.g., tax compliance and tax advice and consultancy). We expect $\beta_1>0$ in the case of knowledge spillover and $\beta_1<0$ in the case of compromised auditor independence.

The variable OtherNAS represents the percentage of other services hired from the auditor (in relation to total services) that are not tax services and serves to control other sources of economic dependence on the auditor. *AQ* represents working capital quality and, according to Choudhary et al. (2021), serves to estimate the relationship between APTS and TaxAQ without working capital influence. *AQ* was calculated by having Francis et al. (2005) as a basis and represents the standard deviation of residuals from company *i* in the company-year estimate in Equation (4) over the windows from *t-3* to *t*.

$$\Delta WC_{ij} = \beta_0 + \beta_1 CFO_{it-1} + \beta_2 CFO_{it} + \beta_3 CFO_{it+1} + \beta_4 \Delta REV_{it} + \beta_5 \Delta PPE_{it} + \varepsilon_{it} \quad (4)$$

where ΔWC is the change in the company's working capital, CFO is the operating cash flow, ΔREV is the change in revenue and ΔPPE is the change in fixed assets. All variables are scaled by total assets.

According to Choudhary et al. (2021) other important sources of GAAP-induced mismapping are the presence of stock option-based executive compensation (ESO) and the presence of discretionary and extraordinary

expenses (DISC&EXTRA). In the model, these factors are operationalized by indicator variables where the value 1 indicates the factor's presence and 0 otherwise. Following Choudhary et al. (2021), the value 1 was assigned to DISC&EXTRA when the profit from discontinuous operations was greater than 1% of sales revenue.

The model also controls for factors that capture company characteristics that may be associated with greater judgment and complexity in the application of GAAP related to income tax and that increase the propensity for more sophisticated and complex tax practices to occur, increasing the potential for income tax estimation error (Choudhary et al. 2016), through the following variables: volatility of Profit before Income Tax (*PreTaxVol*) measured by the standard deviation of Pretax book income scaled by lagged total assets, measured from years *t- 3* to *t*; Tax Loss (TaxLoss), which is an indicator variable where 1 signals the presence of tax losses and 0 otherwise; and size (SIZE) measured by the natural logarithm of total assets.

Following Walton et al. (2021), the regression model controls for the following explanatory factors of companies' tax behavior: capital intensity (INTENSIT) measured by having as a basis the value of the company's fixed assets scaled by lagged total assets; intangible asset (INTANG) represented by the value of a company's intangibles scaled by lagged total assets; ratio of the company's current market value to its book value (MTB); return on assets (ROA) calculated by dividing Pretax book income by lagged total assets; leverage (LEV) defined as the company's total debt divided by total assets; and whether the company is audited by a Big Four (BIG4) audit firm operationalized by an indicator variable where 1 signals the presence of one of the four largest international auditing firms and 0 otherwise. Sector fixed effects are included to control for unobservable tax practices of companies that are affected by industry characteristics and that may influence the quality of income tax accrual, and year fixed effects are included to mitigate the effect of unobservable factors that vary over time.

3.3 Sample Selection Criteria

The target population of the research consists of all listed companies operating on the São Paulo Stock Exchange throughout the period from 2010 to 2022. Two main sources were used to obtain research data: (i) Economatica System – to collect accounting data and calculate the variable *TaxAQ*; and (ii) CVM's website – to obtain data on auditor compensation. We limited the sample to companies that were listed on the Brazilian stock exchange (B3) and had all the necessary information, without missing values, to measure the variables of the empirical model between the years 2010 and 2022, so that a balanced panel of companies was defined. We chose to use a balanced panel because controlling heterogeneity between companies and the effects of omitted variables tend to be more efficient in a fixed-effect panel analysis context, in addition to allowing a more convenient analysis of dynamic effects between the variables of the empirical model, greater statistical efficiency, and more accurate parameter estimates (Hsiao, 2007).

The initial date of the sample was defined in this way because 2010 was the year in which companies began to disclose information about auditors' compensation. Following the standard for this type of research, all companies in the financial sector were excluded. The final sample was defined with 102 companies undergoing a cross-sectional approach, observed over 9 annual periods. The length of the time series was defined by having as a basis the calculation of the variable income tax accrual, which takes into account the amount of tax paid in *t-1*, *t*, and *t+1*, and the lag in total assets. In the end, 918 company-year observations resulted for each variable in equation 3. Table 1 displays the sample selection process.

Table 1
Sample selection

Total company-year observations in the Economatica database between 2010 and 2022 (companies with a valid CNPJ)	22,368
(-) Company-year observations from the financial sector	-3,072
(-) Observations of companies with missing data in any year between 2010 and 2022 to define the variable *TaxAQ*	-14,426
(-) Observations of companies without complete data in all years between 2012 and 2022 to define the variable *APTS* and other controls	-3,952
(=) Final sample (company-year observations)	918
Total number of companies in the sample	102

Source: *Prepared by the authors.*

4. RESULTS: ANALYSIS AND DISCUSSION

4.1 Descriptive Statistics and Correlations

Table 2 provides the main statistics that describe the variables used in equation 2. Continuous variables are wisorized at 1% and 99%. Out of the 102 companies, 45 (approximately 44%) hired tax services from their auditor at some point between 2012 and 2021, generating 178 APTS observations or 19.40% of the 918 company-year observations. Furthermore, out of the total service fees paid to the auditor, approximately 7.2% and 9.11% refer to APTS and OtherNAS (non-tabulated data). Table 3 highlights the correlations between variables in the empirical model.

Table 2
Descriptive statistics

	COMPLETE SAMPLE					SUB-SAMPLE WITH APTS					SUB-SAMPLE WITHOUT APTS				
	Mean	**Median**	**Standard deviation**	**95th Percentile**	**5th Percentile**	**Mean**	**Median**	**Standard deviation**	**95th Percentile**	**5th Percentile**	**Mean**	**Median**	**Standard deviation**	**95th Percentile**	**5th Percentile**
TaxAQ	-2.510	-1.669	-2.267	-0.113	-10.452	-2.616	-2.427	1.799	-6.932	-0.438	-2.485	-1.629	2.364	-0.113	-10.452
APTS	0.019	0.000	0.057	0.329	0.000	0.100	0.060	0.095	0.329	0.008	-	-	-	-	-
DAPTS	0.190	0.000	0.392	1.000	0.000	1.000	1.000	0.000	1.000	1.000	-	-	-	-	-
OtherNAS	0.095	0.000	0.183	0.791	0.000	0.131	0.030	0.191	0.717	0.000	0.086	0.000	0.180	0.791	0.000
AQ	0.084	0.061	0.070	0.320	0.008	0.065	0.052	0.046	0.200	0.008	0.088	0.063	0.073	0.320	0.008
ESO	0.419	0.000	0.494	1.000	0.000	0.437	0.000	0.497	1.000	0.000	0.415	0.000	0.493	1.000	0.000
DISC	0.696	1.000	0.460	1.000	0.000	0.810	1.000	0.393	1.000	0.000	0.669	1.000	0.471	1.000	0.000
PreTaxVol	33.226	0.041	271.05	2,586.68	0.006	10.726	0.034	62.31	371.96	0.007	38.488	0.046	299.37	2,586.7	0.006
TaxLoss	0.031	0.000	0.172	1.000	0.000	0.023	0.000	0.150	0.000	0.000	0.032	0.000	0.177	1.000	0.000
SIZE	15.358	15.817	2.653	19.540	3.506	16.589	16.729	1.273	18.403	14.044	15.070	15.655	2.806	19.540	3.506
INTENSIT	0.228	0.172	0.272	1.905	0.000	0.275	0.260	0.227	0.717	0.002	0.216	0.152	0.281	1.905	0.000
INTANG	0.121	0.013	0.225	1.349	0.000	0.117	0.023	0.205	0.709	0.000	0.122	0.010	0.230	1.349	0.000
MTB	2.260	1.772	2.149	11.287	-1.756	2.415	1.756	2.101	9.151	0.238	2.223	1.782	2.160	11.287	-1.756
ROA	-2.733	4.071	37.835	22.178	-271.76	3.712	4.633	11.058	12.480	-8.651	-4.240	3.947	41.548	22.178	-271.76
LEV	0.783	1.625	13.062	44.346	-99.953	2.504	1.701	6.904	24.101	-4.522	0.381	1.604	14.093	44.346	-99.953
BIG4	0.837	1.000	0.370	1.000	0.000	0.994	1.000	0.076	1.000	1.000	0.800	1.000	0.400	1.000	0.000

Source: *Prepared by the authors.*

Table 3
Pearson's correlation for the full sample

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. TaxAQ	1	0.005	-0.023	-0.084*	-0.269**	0.101**	-0.021	-0.055	0.013	-0.028	-0.071*	-0.159**	-0.058	-0.036	0.05	0.042
2. APTS	0.005	1	0.678**	-0.005	-0.143**	-0.007	0.027	-0.032	-0.038	0.097**	0.091**	-0.080*	0.022	0.042	0.034	0.148**
3. DAPTS	-0.023	0.678**	1	0.096**	-0.130**	0.017	0.120**	-0.04	-0.021	0.224**	0.084*	-0.007	0.035	0.082*	0.064	0.206**
4. OthersNAS	-0.084*	-0.005	0.096**	1	0.013	-0.036	0.078*	0.196**	-0.028	0.138**	0.064	0.121**	0.012	0.072*	0.005	0.120**
5. AQ	-0.269**	-0.143**	-0.130**	0.013	1	-0.056	-0.059	0.096**	-0.023	-0.229**	-0.041	0.112**	0.016	-0.308**	-0.055	-0.145**
6. PreTaxVol	0.101**	-0.007	0.017	-0.036	-0.056	1	0.034	0.024	-0.022	0.242**	0.067*	-0.038	0.134**	0.115**	0.001	0.262**
7. SIZE	-0.021	0.027	0.120**	0.078*	-0.059	0.034	1	-0.025	-0.034	0.284**	0.084*	0.042	0.144**	0.377**	0.141**	0.201**
8. MTB	-0.055	-0.032	-0.04	0.196**	0.096**	0.024	-0.025	1	0.039	0.013	0.089**	0.228**	-0.036	-0.002	0.019	-0.018
9. ROA	0.013	-0.038	-0.021	-0.028	-0.023	-0.022	-0.034	0.039	1	0.063	0.06	0.077*	-0.026	0.029	0.01	-0.024
10. LEV	-0.028	0.097**	0.224**	0.138**	-0.229**	0.242**	0.284**	0.013	0.063	1	0.203**	0.138**	0.005	0.642**	0.037	0.575**
11. INTANG	-0.071*	0.091**	0.084*	0.064	-0.041	0.067*	0.084*	0.089**	0.06	0.203**	1	0.031	-0.03	0.123**	0.003	0.071*
12. INTENSIT	-0.159**	-0.080*	-0.007	0.121**	0.112**	-0.038	0.042	0.228**	0.077*	0.138**	0.031	1	0.136**	0.100**	-0.032	0.094**
13. BIG4	-0.058	0.022	0.035	0.012	0.016	0.134**	0.144**	-0.036	-0.026	0.005	-0.03	0.136**	1	0.077*	-0.008	0.075*
14. TaxLoss	-0.036	0.042	0.082*	0.072*	-0.308**	0.115**	0.377**	-0.002	0.029	0.642**	0.123**	0.100**	0.077*	1	0.017	0.322**
15. ESO	0.05	0.034	0.064	0.005	-0.055	0.001	0.141**	0.019	0.01	0.037	0.003	-0.032	-0.008	0.017	1	0.047
16. DISC	0.042	0.148**	0.206**	0.120**	-0.145**	0.262**	0.201**	-0.018	-0.024	0.575**	0.071*	0.094**	0.075*	0.322**	0.047	1

Notes: ** and ** signal a significant correlation at the 5% and 1% level (two-sided).*
Source: *Prepared by the authors.*

The variable TaxAQ has a negative sign because it was multiplied by -1,000 to facilitate interpretation. In the full sample, the value -2.510 represents approximately 20% of the values reported in the studies by Carr et al. (2021), Choudhary et al. (2021), and Walton et al. (2021) for the U.S. market. This suggests that in our sample the error in estimating income tax accrual is smaller in relation to the studies cited. This may be due to differences in legislation and the way in which corporate income tax is calculated between the two countries. Also, the samples used in international studies are much larger in number of company-year observations. Furthermore, 83.7% of company-year observations were audited by BIG4. The values of the variables PreTaxVol, TaxLoss, ESO, and DISC are compatible with the results shown in studies that directly address the determinants of TaxAQ (e.g., Carr et al., 2021; Choudhary et al., 2021; Walton et al., 2021). The values of the other control variables are in line with the results documented in studies that analyze the consequences of APTS on other specific audit quality proxies (e.g., McGuire et al., 2012; Watrin & Weiss, 2019). When we compare the variable TaxAQ between companies with and without APTS, we observe averages of -2.616 and -2.485, respectively. This difference is not statistically significant.

In this preliminary univariate analysis for the entire sample, we can observe that TaxAQ is not significantly correlated with APTS, but has a significant correlation with OtherNAS, AQ, PreTaxVol, INTANG, and INTENSIT. In general, the correlations between control variables are low, previously signaling the absence of multicollinearity in the empirical model.

4.2 Multivariate Analysis

Our study investigates the temporal association between the provision of tax services by the auditor and corporate income tax accrual quality estimates. Table 4 displays the results of the regressions we used in our analysis.

Table 4
Regressions for income tax accrual quality

Variables	Dependent Variable = TaxAQ			
	Fixed Effect (1)	**Fixed Effect (2)**	***Pooled* (3)**	***Pooled* (4)**
APTS	-2.625***	-	-3.016***	-
	(0.555)	-	(0.257)	-
DATPS	-	-0.323***	-	-0.268**
	-	(0.0457)	-	(0.112)
OtherNAS	-0.750***	-0.669***	-0.398***	-0.338**
	(0.122)	(0.143)	(0.123)	(0.132)
AQ	-4.238***	-4.238***	-2.089***	-2.098***
	(0.265)	(0.271)	(0.567)	(0.612)
ESO	0.211***	0.232***	0.248***	0.267***
	(0.0548)	(0.0567)	(0.0451)	(0.0430)
DISC	-0.178***	-0.156**	0.0637	0.0778
	(0.0634)	(0.0691)	(0.0933)	(0.0872)
PreTaxVol	2.57e-05	-2.10e-06	0.000338***	0.000314**
	(5.85e-05)	(5.96e-05)	(0.000113)	(0.000122)
TaxLoss	0.197	0.202*	0.325***	0.349***
	(0.121)	(0.116)	(0.110)	(0.110)
SIZE	-0.474***	-0.476***	-0.0979***	-0.0907***
	(0.0358)	(0.0370)	(0.00791)	(0.0110)
INTENSIT	-0.616**	-0.623**	-0.0922	-0.121
	(0.268)	(0.272)	(0.0807)	(0.0805)
INTANG	0.843***	0.878***	-0.0763	-0.0345
	(0.283)	(0.299)	(0.163)	(0.165)
MTB	-0.00237	-0.00517	-0.00117	-0.00201
	(0.0101)	(0.0100)	(0.00911)	(0.00855)
ROA	0.00218***	0.00233***	-0.00233***	-0.00252***
	(0.000663)	(0.000673)	(0.000436)	(0.000371)
LEV	0.00217	0.00220	0.00279	0.00285
	(0.00374)	(0.00374)	(0.00393)	(0.00398)
BIG4	0.341**	0.343**	0.373**	0.335**
	(0.153)	(0.152)	(0.168)	(0.165)
Constant	5.789***	5.807***	1.348***	1.204***
	(0.591)	(0.627)	(0.126)	(0.148)
Observations	918	918	918	918
Number of Groups	102	102	102	102
R2	-	-	0.367	0.363
Within R2	0.2326	0.2303	-	-
F (*p* value)	535.01 (0.000)	861.55 (0.000)	238.55 (0.000)	410.20 (0.000)

Notes: *Standard errors in parentheses. All regressions were estimated with Driscoll-Kraay robust standard error. Pooled panel regressions have a fixed effect of industry and year and panel regressions with a fixed effect have a fixed effect of year.*
**** p<0.01, ** p<0.05, * p<0.1.*
Source: *Prepared by the authors.*

The estimates were made by using pooled OLS panel data and fixed effects. OLS models do not address unobserved heterogeneity among sample firms. However, fixed-effect models formally deal with these unobserved factors. All models had problems of heteroscedasticity, serial autocorrelation, and cross-sectional dependence. For this reason, standard errors were calculated robustly using the Driscoll-Kraay estimator, as proposed by Driscoll and Kraay (1998). In all regressions, the coefficients of the variables APTS ($p<0.01$) and DAPTS ($p<0.01$; $p<0.05$) are significant and negative, suggesting that income tax accrual quality differs between companies that do and do not hire tax services from their auditor and that greater relative APTS use is associated with lower TaxAQ.

These results are consistent with the idea of compromised auditor independence, do not support the knowledge spillover argument, and are in line with prior studies (e.g., Carr et al., 2021; Choudhary et al., 2021) carried out in the USA, so we did not find evidence that would lead to rejection of our research hypothesis. Despite being countries with different institutional environments, this equality in results can be explained by the large proportion of companies audited by BIG4 firms in the sample used in our research and in U.S. studies. Prior studies suggest that *BIG4* audits are differentially associated with companies' more aggressive tax practices (e.g., Kanagaretnam et al., 2016; McGuire et al., 2012) and this may favor intentional estimation errors related to practices that aim at tax savings.

Our results also reveal that the variable OtherNAS ($p<0.01$; $p<0.05$) is negative and significant, suggesting that other non-audit services, in addition to tax services, negatively affect income tax accrual quality. This finding is interesting because it signals that there may be other mechanisms, linked to various sources of economic dependence, related to the auditor's work, influencing estimation errors (intentional and unintentional) of specific income tax accrual. Another explanation for this result may be the inclusion of tax services in the list of other non-audit services by contracting companies.

In relation to the other TaxAQ determinants, we document that ESO ($p<0.01$), PretaxVol ($p<0.01$), TaxLoss ($p<0.01$), and BIG4 ($p<0.05$) have a positive association, signaling that these characteristics, on average, improve tax accrual quality in Brazil. On the other hand, OtherNAS ($p<0.01$), AQ ($p<0.01$), SIZE ($p<0.01$), and ROA ($p<0.01$) are negatively associated, suggesting that, on average, these variables worsen tax accrual quality. The results for ESO, PreTaxVol, BIG4, and SIZE are contrary to those documented by Choudhary et al. (2021), which may be due to the moderating and/or mediating effect of Brazilian institutional factors. Overall, although we do not make predictions about the expected signs for these variables, our findings are compatible with the literature when we consider other studies that analyze APTS influence on tax outputs (e.g., Krishnan et al., 2013; McGuire et al., 2012; Watrin et al., 2019).

4.3 Sensitivity Testing and Additional Analysis

As Sun and Habib (2021) clarify, the empirical literature takes a wide variety of ways of measuring APTS. To check whether our results are sensitive to how APTS is calculated, we estimated equation 3 using 4 different proxies: (i) tax services divided by operating revenue; (ii) natural logarithm of tax services; (iii) tax services divided by total assets; and (iv) tax services divided by the audit service. Also, we included a measurement of the discretionary income tax accrual adapting the methodology introduced in Calegari (2002), which decomposes the firm's total discretionary accrual into accounting discretionary accrual and tax discretionary accrual (involving only income tax). From this new measurement, we estimated TaxAQ as 4-period (t-3 to t) standard deviation. The results are displayed in Table 5.

Table 5
Regressions for income tax accrual quality using various APTS proxies

Variables	Dependent Variable = TaxAQ				
	***APTS/Operating Revenue* (1)**	***LN (APTS)* (2)**	***APTS/Total Assets* (3)**	***APTS/Audit Fees* (4)**	***APTS/Auditor's Total Compensation***
ATPS	-5.331***	-0.0267***	-5.984***	-1.276***	-
	(1.862)	(0.00717)	(1.667)	(0.337)	-
Observations	918	918	918	918	-
Within R2	0.2302	0.2305	0.2300	0.2308	-
F (*p* value)	697.58 (0.000)	560.52 (0.000)	568.56(0.000)	562.74(0.000)	-
Dependent Variable = *TaxAQ (based on Calegari, 2000)*					
APTS	-	-	-	-	-0.131***
	-	-	-	-	(0.038)

Notes: *Standard errors in parentheses. All regressions were estimated in panel with fixed effect, with robust Driscoll-Kraay standard error and year fixed effect.*
**** p<0.01, ** p<0.05, * p<0.1.*
Source: *Prepared by the authors.*

As observed in Table 5 (which omits the results of the other variables for space reasons), the coefficient of the variable APTS remains negative and significant (p<0.01) in all models, signaling that our estimates are not sensitive to the way of measuring tax services nor the change in the way how tax accrual is measured, nor does its explanatory power change. The same occurs when we change the way in which income tax accrual is measured. These findings are interesting because, as highlighted by Sun and Habib (2021), the various measures capture various aspects of APTS that are related to various research issues. The results of our sample suggest that various aspects of APTS affect income tax accrual quality in a similar way.

Many studies consider that the decision to hire tax services from the incumbent auditor is endogenous because it is not random, so that firms acquiring tax services from their auditors are fundamentally different from those that do not (e.g., Choudhary et al., 2021; Krishnan et al., 2013; Lassila et al., 2010; McGuire et al., 2012; Watrin et al., 2019). If this is true, the coefficients of the variable APTS estimated in our regression models may be biased due to the selection bias problem. Following the strategy adopted in other studies (e.g., Chyz et al., 2021; Krishnan et al., 2013; McGuire et al., 2012; Watrin et al., 2019), we address this issue using the Selection Model designed by Heckman (1979). In a first stage, we estimate the probability of a company hiring *APTS* through the following *probit* regression based on Chyz et al. (2021), Lassila et al. (2010), McGuire et al. (2012), and Watrin et al. (2019):

$$PR(DAPTS) = \beta_0 + INDEPAUDIT_1 + LNAUDIT_2 + CS_3 + DA_4 + SIZE_5 + INTENSIT_6 + MTB_7 + ROA_8 + LEV_9 + BIG4_{10} + Year_{(11-19)} + Industry_{(20-27)} + \varepsilon \quad (5)$$

where:

- INDEPAUDIT represents auditor independence in relation to the client, calculated by compensation for non-audit services minus compensation for tax services divided by the total compensation for audit services.
- LNAUDIT is the natural logarithm of the amounts paid for audit services.
- CS represents the cash and equivalents held by the firm at the end of year *t* divided by total assets at the beginning of the year.
- DA is a discretionary accrual measure taken according to the model proposed in Kothari et al. (2005).

The other variables have already been defined previously. There is a more detailed explanation of the determinants of the likelihood of firms hiring their main auditor as a tax service provider in Lassila et al. (2010) and McGuire et al. (2012).

We then used the coefficients from equation 5 (which were omitted in this paper) to calculate the Inverse Mill Ratio (INVMILL), which was included as a control variable in equation 3, representing the selection bias

correction term that controls the influence of observable and unobservable factors on firms' decisions to hire tax services from their senior auditors.

In addition to the Selection Model adapted from Heckman (1979), we used the panel data approach based on the Generalized Moments Method (GMM) to address potential issues involving omitted variables and measurement error. Along with the instrumental variables method, GMM is the predominant estimation technique for panel data models with unobserved heterogeneity and endogenous variables when working with short panels (T<N) (Kripfganz, 2019). Specifically, from equation 3, we estimate a static panel regression based on systemic GMM (sys-GMM), as discussed in Blundell and Bond (1998), adjusted for a finite sample by calculating robust standard errors based on an estimator proposed by Windmeijer (2005). Our model uses only the original lagged explanatory variables as sequentially exogenous instruments. Additionally, we use a quantile regression model to check whether the result of our variable of interest is sensitive to outliers. Table 6 displays the results of these additional tests.

Finally, the main model assumes that the relationship between TaxAQ and APTS and the other covariates in the model is linear and strongly depends on the premise that the parametric functional form is correctly specified. However, if this assumption is violated, our estimates may be biased. To address this issue, we re-estimated equation 3 using a non-parametric regression based on the Gaussian kernel function with a local linear estimator and the cross-validation method that is not dependent on specifying, *a priori*, the functional form of the relationship between the endogenous variable (TaxAQ) and the explanatory variables of the model.

Table 6
Regressions for income tax accrual quality using endogeneity and specification error approaches

Variables	Dependent variable: TaxAQ			
	Selection Model	**GMM**	**Quantile**	**Non-Parametric**
APTS	-0.646**	-3.586**	-3.135***	-3.0884***
	(0.294)	(1.557)	(0.888)	(1.1885)
INVMILL	-0.410	-	-	
	(0.961)	-	-	
Constant	-37.75***	-0.847	1.159**	-2.488***
	(5.394)	(1.757)	(0.475)	(0.0703)
Observations	174	918	918	918
Number of Groups	44	102	102	102
Sargan-Hansen tests for the validity of overidentification restrictions:				
2-step weighting matrix (*p* value |Chi^2|)	0.6947			
3-step weighting matrix (*p* value |Chi^2|)	0.1147			
Arellano-Bond test for autocorrelation of first difference residuals:				
1st order autocorrelation (*p* value |z|)	0.105			
2nd order autocorrelation (*p* value |z|)	0.734			
3rd order autocorrelation (*p* value |z|)	0.203			

Notes: *Standard errors in parentheses. The selection model was estimated with robust Driscoll-Kraay standard error and year fixed effect. The GMM model was estimated using the xtdpdgmm command proposed by Kripfganz (2019) and robust WC-Robust standard error. In quantile regression, standard errors were calculated robustly. In non-parametric regression, standard errors were estimated using the robust bootstrap method with 100 replications.*
**** p<0.01, ** p<0.05, * p<0.1.*
Source: *Prepared by the authors.*

Table 6 only displays the results for the coefficient of the variable of interest (APTS). In the Selection Model regression, the non-significant coefficient of the INVMILL variable signals that there is not sufficient selection bias to lead to a change in the inference about the coefficient of the variable of interest. This result is consistent with prior studies (Chyz et al., 2021; McGuire et al., 2012; Watrin et al., 2019). The coefficient of the APTS variable remains significant (p<0.05; p<0.01) and negative, even in regression with GMM that formally models potential endogeneity problems related to variable omission and measurement error, in quantile regression, which

estimates the median value of coefficients, and in non-parametric regression which is robust to specification error problems.

Considering that the literature suggests the influence of tax aggressiveness on the financial reporting of companies in Brazil, we conducted an additional test including a measurement of cash ETR (proxy for aggressiveness) in equation 3. The untabulated results did not identify qualitative changes in the tax coefficient TaxAQ variable. Also, the coefficient for the cash ETR variable was negative, but not significant. It is worth highlighting that when calculating the cash ETR variable, we excluded company-year observations whose Pretax income were negative, reducing our sample to 695 observations.

Overall, the results of the additional tests shown in tables 5 and 6 provide robustness to primary findings shown in Table 3 and reinforce our evidence on the negative influence of the joint provision of tax and audit services on income tax accrual quality estimates, suggesting compromised auditor independence.

The quality of tax information reported in accounting reports improves the informativeness of the provision for income tax as a signal of estimated taxable profit, which can help investors in their investment decisions (Choudhary et al., 2016). However, our results suggest that, in Brazil, APTS can negatively affect income tax accrual quality and investor ability to predict future cash flows related to corporate income tax. Based on the literature, we hypothesize that this phenomenon can be explained by compromised auditor independence due to self-review bias or self-interest threats.

Therefore, the results of our research may be of interest to investors and regulatory bodies, as previous studies have suggested that imposing restrictions in APTS can eliminate unwanted mutuality of interests between client and auditor and improve the quality of tax information reported by companies (Carr et al., 2021).

On the other hand, in a context of great tax complexity, such as Brazil, it is possible that companies want to increase their tax management practices, exploiting loopholes in the legislation, in an attempt to reduce the payment of explicit taxes. However, an increase in these practices can increase the level of uncertainty about future cash flows related to income tax and harm the quality of financial information disclosed by companies (Choudhary et al., 2016). As a result, we should not disregard that a negative APTS influence on tax accrual quality can also be explained by the complexity of the Brazilian tax system.

5. CONCLUSION

Auditor independence is a key concern in the ongoing debate about the joint provision of audit services and non-audit services by the firm's main auditor due to its consequences on audit quality and the financial statements disclosed by companies. We analyze this issue by studying the association between the use of APTS and corporate income tax accrual quality in Brazil. To date, empirical evidence available is inconclusive and suggests that APTS can benefit contracting companies, due to the phenomenon known as knowledge spillover, which helps to improve the quality of auditing and accounting information relating to accounts involving taxation on profit, when it undermines auditor independence, as a result of the economic link generated by the magnitude of tax services or the conflict of interest that may arise when auditors need to review in some way the results of tax services provided by the firm of which they are part.

We have documented robust evidence, supported by a variety of econometric models that address concerns regarding specification issues, selection bias, omission of relevant variables, and outliers, suggesting a negative and statistically significant association between APTS and the quality of corporate income tax accrual estimate, supporting the hypothesis of compromised auditor independence. Our results are important and contribute to the ongoing debate because they expand our understanding of the influence of tax services provided by the main auditor on the (intentional and unintentional) error in estimating income tax expense and, consequently, on company ability to convey high/low-quality tax information to external users.

At the same time, our findings need to be considered in light of some limitations, which can serve as suggestions for further studies. For instance, our APTS metric includes any and all fiscal or tax services reported by companies without distinguishing whether they are services related to compliance or tax planning. However, there is evidence suggesting that the relationship between APTS and companies' tax practices depends on the type of service used (e.g., Chyz et al., 2021). Also, it is likely that there will

be inaccuracy in the information disclosed by companies regarding non-audit services provided by the main auditor, including tax services, which may affect our estimates of income tax accrual quality.

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FUNDING

This study was carried out with support from the Coordination for the Improvement of Higher Education Personnel (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior [CAPES]) – Funding Code 001.