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Article

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Analyzing the causal relationship between tax avoidance and earnings management: Evidence from the STOXX Europe 600 Index

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Abstract

Research Question: Can a bidirectional link be established between earnings management and tax avoidance?

Motivation: The relationship between tax avoidance and earnings management has been a subject of significant scholarly interest, yet it remains inconclusive and context-dependent.

Idea: This study seeks to examine the bidirectional causality between tax avoidance and earnings management.

Data: The author selected companies listed on the European STOXX 600 index for the period from 2010 to 2022.

Tools: To test the research hypothesis, the author employs the Granger causality procedure on panel data and applies a dynamic panel using the Generalized Method of Moments (GMM) approach.

Findings: The results of our study indicate a bidirectional causal relationship between tax avoidance and earnings management in the European context.

Contribution: Our research contributes to the existing literature by shedding light on the nuanced relationship between tax avoidance and earnings management in the European context, offering insights that can inform corporate financial strategies and regulatory frameworks.

Keywords: Earnings management, Tax avoidance, Bidirectional causality, Granger-causality.

JEL codes: H26, M41

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1. Introduction

Tax avoidance and earnings management are two practices that have garnered significant interest in both academic and professional circles due to their implications for the financial and ethical aspects of companies (Francis *et al.*, 2022; Delgado *et al.*, 2023).

Corporate tax avoidance is a critical issue in both academic tax research and real-world accounting practice (Francis *et al.*, 2022). Recently, it has been estimated that corporate tax avoidance practices have resulted in an estimated loss of tax revenue for the European Union ranging from 55 billion euros to 65 billion euros (Gebhart, 2017; Wenwu *et al.*, 2023; Lou *et al.*, 2023).

Company executives have the opportunity to manage earnings using various strategies such as selecting accounting methods and structuring transactions (Kothari *et al.*, 2012). However, it's important to note that earnings management can lead to a situation where the company's financial position does not reflect its true situation (Yang *et al.*, 2008). This raises questions about the transparency and integrity of the financial information provided by companies.

Tax avoidance and earnings management are two distinct but interrelated practices that can significantly impact a company's performance (Guenther *et al.*, 2017; Amidu *et al.*, 2019; Kałdoński & Jewartowski, 2020; Delgado *et al.*, 2023). Tax avoidance refers to the legal strategies employed by companies to reduce their tax burden by exploiting gaps or advantages in the tax system (Dyreng *et al.*, 2019). On the other hand, earnings management refers to the practices used by companies to manipulate their results to present more favorable performance or meet specific goals (Healy & Wahlen, 1999). This practice is not considered fraud as long as it adheres to accounting principles (Dechow & Skinner, 2000).

There is a complex relationship between tax avoidance and earnings management. On one hand, some forms of tax avoidance can be used as a means of earnings management. For example, by deferring tax liabilities to future periods or using specific tax provisions, a company can artificially reduce its current earnings, which can be advantageous for tax or management reasons. This can be considered a form of earnings manipulation. On the other hand, earnings management can also impact tax avoidance choices. By seeking to maximize reported earnings, companies may be incentivized to avoid certain activities or transactions that could have a negative impact on their earnings. This may include avoiding certain forms of income or expenses that could result in an increased tax burden.

It is worth noting that several empirical studies have been conducted to test the relationship between earnings management and tax avoidance. An examination of

these various works allows us to conclude that the empirical tests conducted did not focus on the reciprocal causality between the two variables. Furthermore, even when empirically evaluating the impact of one variable on the other, the research conducted did not yield consistent empirical results (Dhaliwal *et al.*, 2004; Wang & Chen, 2012; Desai & Dharmapala, 2009; Guenther *et al.*, 2017; Delgado *et al.*, 2023). Indeed, the results obtained by researchers lack homogeneity. In other words, there is uncertainty about the nature of the relationship between earnings management and tax avoidance. The question that arises is whether these two phenomena are reciprocally related, meaning whether earnings management can influence tax avoidance and vice versa. This uncertainty in the literature underscores the complexity of this relationship and the need for further research to better understand how these two variables interact.

Therefore, the study seeks to examine the bidirectional causality between tax avoidance and earnings. It will be analyzed within companies listed on the European STOXX 600 index for the period from 2010 to 2022.

Our research contributes to the existing literature in accounting and taxation in several ways. Firstly, to our knowledge, there is limited research that has examined the relationship between tax avoidance and earnings management. Previous studies investigating the determinants of tax avoidance and earnings management have yielded varied and inconclusive results (Fonseca-Díaz *et al.*, 2019; Delgado *et al.*, 2023). Several traditional business variables have been considered as determinants of tax avoidance, including size, leverage, asset composition, and profitability (Fernández-Rodríguez *et al.*, 2021; Delgado *et al.*, 2023). In this study, earnings management was chosen as an explanatory variable for tax avoidance, and vice versa, based on the hypothesis that the two concepts, "tax avoidance" and "earnings management," are closely interconnected. Consequently, two empirical models were constructed, with the dependent variable of each model being explained by the other model's variable, and vice versa. Our primary conclusion is that earnings management serves as a determining factor in tax avoidance. Additionally, tax avoidance positively influences earnings management. Indeed, the empirical results confirm bidirectional causality between tax avoidance and earnings management. These findings lead us to conclude that an interaction exists between these two concepts. Therefore, our results, based on Panel Granger Causality, are significant as they provide additional evidence to the existing literature. Our research aims to address this gap by employing a robust methodology and a comprehensive dataset. We investigate whether tax avoidance practices have an impact on earnings management and, conversely, whether earnings management strategies affect decisions related to tax avoidance. By analyzing financial data from a diverse set of European companies spanning over a decade, we seek to offer insights into the dynamics of these two financial practices and their interrelationship. The findings from our study reveal a bidirectional causal relationship between tax avoidance and

earnings management within the European context. In light of these results, as the study demonstrates a positive and statistically significant association between earnings management and the effective tax rate (ETR), it suggests that higher levels of earnings management are linked to increased tax liabilities. Furthermore, it indicates that as earnings management becomes more pronounced, the tax burden escalates, resulting in reduced tax avoidance.

Secondly, this study illuminates the intricate connection between tax avoidance and earnings management in the European context, providing valuable insights that can guide corporate financial strategies and regulatory frameworks. To our knowledge, the primary references available are the studies conducted by Kałdoński and Jewartowski in 2020 and Delgado *et al.* in 2023. This research underscores the importance of further exploration in this field to gain a deeper understanding of the subtleties within the relationship between tax avoidance and earnings management in the European STOXX 600 index. While prior research has investigated this relationship in various geographical regions, there is limited empirical evidence specific to the European context, particularly utilizing a large and diverse sample of STOXX 600 companies.

The rest of the paper is organized as follows. First, the literature review (Section 2) presents a theoretical and empirical examination of the causal relationship between Tax Avoidance and Earnings Management. The methodology section (Section 3) subsequently covers sample selection and variable measurement. Following that, (Section 4) contains the empirical results, and the concluding remarks are provided in the final section.

2. Literature review

This section reviews the literature related to the paper's topic. We begin with the theoretical principles underlying the relationship between earnings management and tax avoidance. We then discuss the empirical review and hypothesis development.

2.1. Theoretical overview

The agency theory, stakeholder theory, and signaling theory constitute an essential conceptual framework for understanding the relationship between earnings management and tax avoidance within companies.

2.1.1 Agency Theory

The agency theory is essential for understanding how conflicts between shareholders and executives within companies influence earnings management and tax avoidance (Jensen & Meckling, 1976). This theory highlights the diverging interests and

knowledge disparities among these stakeholders, leading to agency costs resulting from information asymmetry and differing objectives.

In this context, executives may adjust financial results to serve their personal interests, using questionable accounting practices or opportunistic decisions. They seek to optimize their compensation or maintain a positive image of the company, employing strategies that may not align with the interests of primary shareholders. Furthermore, the separation of ownership and management can lead to advantageous tax decisions for executives. They may engage in tax avoidance by complying with prevailing legislation to reduce the company's tax burden, even if it goes against the interests of primary shareholders. Thus, tax avoidance can be interpreted as a mechanism for transferring resources from the government to the company's shareholders, to the detriment of other stakeholders.

2.1.2 Stakeholder Theory

The stakeholder theory represents a fundamental pillar in our analysis of earnings management and tax avoidance. According to Freeman (1984), this theory defines stakeholders as "any group or individual who can affect or be affected by the achievement of the company's objectives," thus encompassing all the actors for whom the success and sustainability of the company are crucial.

This theory sheds light on how different stakeholders, such as shareholders, executives, employees, customers, suppliers, unions, government, creditors, and society as a whole, influence earnings management and tax avoidance behaviors within the company. It reveals that the interests and expectations of stakeholders shape the company's strategic choices regarding taxation, determine the approaches taken for tax avoidance, and have an impact on earnings management.

2.1.3 Signaling Theory

The signaling theory, developed by Spence (1973), plays a crucial role in our study of earnings management and tax avoidance. This theory explores how companies communicate with their stakeholders through their financial statements. Managers adjust earnings to project the company's future prospects.

The paramount importance of this theory lies in its examination of the methods by which companies can influence their stakeholders through signals. Indeed, to project positive prospects, executives may adopt tax optimization strategies to reduce expenses. Conversely, if their goal is not to attract new investors, they may opt for a different approach without resorting to such strategies.

It is relevant to emphasize that these practices of earnings management and tax avoidance function as signals that impact the investment decisions of financial actors. Thus, earnings management becomes a means of communication toward external stakeholders, including creditors, investors, and tax authorities. The manipulation of financial results aims to convey signals regarding the financial health of the company, influencing its overall perception as well as its tax burden.

2.2 Empirical review and hypothesis development

The debate regarding the connection between tax avoidance and earnings management remains inconclusive. In reality, prior literature demonstrates that empirical investigations have yielded varying conclusions and have not explored the reciprocal causal link between the two variables. Furthermore, even when empirically assessing the impact of one variable on the other, empirical tests have not yielded consistent results. The question that arises at this stage is as follows: Can a bidirectional relationship between earnings management and tax avoidance be established?

The literature on earnings management and tax avoidance, with only a few empirical studies available, has primarily documented a positive relationship between earnings management and tax avoidance and other evidence of an inverse relationship.

Delgado *et al.* (2023) stated that the primary reason for earnings management is income taxation. Furthermore, Frank *et al.* (2009) found that managers who simultaneously engage in the manipulation of taxable and financial earnings also increase their reported accounting earnings while decreasing their taxable earnings in the same fiscal year.

To assess the extent to which the special payment account tax policy encourages private firms in Portugal to engage in earnings management, Marques *et al.* (2011) used a sample of 6,652 companies from 2001 to 2002. Their findings suggest that the desire to minimize taxes motivates managers to manipulate earnings.

The study conducted by Goh *et al.* (2013) focused on U.S. data from 2000 to 2010, with a sample size ranging from 2,539 to 4,513 firm-year observations. Data were collected from databases such as Audit Analytics, Compustat, I/B/E/S, and Thomson Reuters. The study aimed to analyze the relationship between earnings management (EM), measured using several proxies, and tax aggressiveness, rather than the effective tax rate (ETR). The study's results revealed a positive relationship between earnings management (EM) and tax aggressiveness, suggesting that companies employing earnings management practices are more inclined to adopt a tax-aggressive stance.

The study conducted by Frank *et al.* (2009) was conducted in the United States over a period from 1991 to 2005. The sample included 49,886 observations for 8,100 firms, and the data were extracted from the Compustat database. The aim of this study was to analyze the relationship between aggressive financial reporting, measured in the form of discretionary accruals (using the Jones model with lagged return on assets, following Kothari *et al.* (2005), and tax reporting aggressiveness. The study's results demonstrated a positive relationship between aggressive financial reporting and tax reporting aggressiveness, suggesting that firms that adopt more aggressive financial reporting practices are also inclined to adopt more aggressive tax practices.

The study conducted by Blaylock *et al.* (2012) focused on the United States over a period from 1993 to 2005, with a sample of 12,585 observations. The data used for this study were extracted from the Compustat and the Center for Research in Security Prices (CRSP) databases. The objective of this study was to analyze the most tax-aggressive companies, namely those with the highest pre-tax income (BTI) with a positive sign and those with low effective tax rates (ETR), using long-term taxes paid over a 5-year period as a criterion. Additionally, the study measured earnings management (EM) using discretionary accruals, which were calculated using the Jones model with lagged return on assets, as defined by Kothari *et al.* (2005). The study's results showed that the most tax-aggressive companies were also the ones that engaged more in earnings management (EM) and tax avoidance practices. In other words, there was a positive correlation between tax aggressiveness and earnings management and tax avoidance practices in these firms.

The study conducted by Guenther *et al.* (2017) was carried out in the United States over a period from 1987 to 2011, with a sample size ranging from 4,456 to 32,023 observations across different company years. The data used in this study were extracted from the merged CRSP/Compustat database covering the period from 1987 to 2011. The objective of the study was to examine the relationship between earnings management (EM), measured in the form of discretionary accruals using the modified Jones model (Dechow *et al.*, 1995), and tax avoidance, measured using several indicators. The results of the study showed that earnings management had a negative effect on total tax expenses (GAAP_ETR) and cash taxes paid (CASH_ETR), implying that companies employing earnings management practices tended to have lower effective tax rates and pay less cash taxes.

Research in this area related to Europe is still in its early stages. Currently, to our knowledge, only two references are available. The main references available are the study conducted by Kałdoński and Jewartowski in 2020 and that of Delgado *et al.* (2023).

Kałdoński and Jewartowski (2020) analyzed a sample of publicly traded companies in Poland over a period from 2005 to 2017. Their findings suggested an inverse

relationship between tax avoidance and earnings management in this specific context. In other words, when companies engaged more in earnings management, their inclination towards tax avoidance appeared to decrease. This research highlights the importance of further work in this field to better understand the nuances of the relationship between tax avoidance and earnings management in Europe.

Delgado *et al.* (2023) have examined the relationship between tax avoidance and earnings management in the five largest economies of the European Union using regressions with artificial neural networks. This methodology allowed them to account for the non-linearities detected in the data, which is the primary contribution compared to previous research. The study's data were extracted from Compustat for Germany, the United Kingdom, France, Italy, and Spain over the period from 2006 to 2015, focusing on discretionary accruals. Three measures of tax avoidance were considered, two based on the effective tax rate (ETR) and one based on the differences between accounting and tax income (BTD). The results of the study indicate the presence of non-linear patterns and a positive, statistically significant relationship between discretionary accruals and both ETR indicators. This suggests that when companies engage in earnings management, they generate higher taxable income, resulting in a higher ETR and a reduction in tax avoidance. Furthermore, the fact that discretionary accruals do not affect BTD suggests that companies do not exploit tax manipulation to reduce their tax payments. Thus, the gap between accounting and taxation appears to be largely influenced by earnings management. In conclusion, a review of the literature highlights a wide range of results regarding the potential relationship between tax avoidance and earnings management. Therefore, we formulate the following hypothesis to assess the relationship between tax avoidance and earnings management.

H1. *There is a causal effect between tax avoidance and earnings management.*

3. Research methodology

3.1 Research sample

Our initial sample comprised 600 companies listed on the European STOXX 600 index for the period from 2010 to 2022. The index represented companies with varying levels of market capitalization across 17 European countries, encompassing approximately 90% of the free-float market capitalization in Europe (Mardawi *et al.*, 2023). The countries included in this index were Spain, Norway, Austria, Germany, Denmark, Sweden, Luxembourg, France, Ireland, Belgium, Finland, Italy, The Netherlands, Poland, Switzerland, Portugal, and the UK. Consistent with previous research (Halaoua *et al.*, 2017; Mardawi *et al.*, 2023), we excluded financial institutions due to their unique accounting regulations and financial statement formats, resulting in the exclusion of 128 firms. Additionally, firms with incomplete

data were excluded, resulting in the removal of 122 firms. After eliminating observations with missing values, our final sample consists of 4,550 firm-year observations spanning from 2010 to 2022.

Table 1: Sample selection

	No. of firms
French firms listed on the CAC All Tradable index	600
Financial firms	128
Firms with missing data	122
Total	350

3.2 Variables

3.2.1 Measurement of earnings management

The model utilized to assess earnings management in this study is the modified Jones model (Dechow *et al.*, 1995). Indeed, this model has been widely regarded as the most commonly used model by researchers for detecting earnings management (Collins *et al.*, 2017). The Kothari *et al.* (2005) model will be employed in the robustness test.

The Dechow *et al.* (1995) model is formulated as follows:

$$TA_{it}/A_{it-1} = \alpha_0 (1/A_{it-1}) + \alpha_1 \left(\frac{\Delta SALES_{it} - \Delta REC_{it}}{A_{it-1}} \right) + \alpha_2 \left(\frac{PPE_{it}}{A_{it-1}} \right) + \varepsilon_{it} \quad (1)$$

where TA is total accruals. A is total assets at the beginning of year. $\Delta SALES$ is changes in sales. ΔREC is the change in net receivables. PPE represents the amount of property, plant and equipment. The residual ε_{it} from the regression is the measure of discretionary accruals.

3.2.2 Measurement of tax avoidance

The Effective Tax Rate (ETR) of a company is a common indicator of its tax burden. According to Hanlon & Heitzman (2010), it is defined as the total income tax expense divided by the pre-tax accounting income.

Similarly, as described by Taylor and Richardson (2012), the ETR is calculated as the total tax expenses divided by the pre-tax profit. It's important to note that an increase in the effective tax rate signifies a lower level of tax avoidance. Conversely, a decrease in the effective tax rate indicates a higher degree of tax avoidance.

$$ETR = \frac{\text{total tax expenses}}{\text{pre-tax profit}}$$

3.2.3 Control variables

Consistent with prior research, this study incorporated several control variables such as firm size (SIZE), the firm's level of indebtedness (DEBT), and return on assets (ROA) that could potentially influence earnings management and tax avoidance.

* Company size (SIZE), as defined by Liu and Lee (2019), is measured as the natural logarithm of total assets. In alignment with the findings of Belz *et al.* (2019), we anticipate a negative relationship between company size and tax avoidance. The researchers suggest that larger companies have the capacity to allocate more resources to tax planning, leading to an inverse correlation between SIZE and the tax avoidance strategies outlined in the literature. Additionally, it's worth noting that large companies with high political visibility may engage in downward earnings management to mitigate the political costs associated with them, as proposed by Jones (1991).

* The level of debt (DEBT) as defined by Delgado *et al.* (2023), is calculated as the ratio of total debt to total assets. Building on the research conducted by Molina Llopis and Barberá Martí (2017), Vintilă *et al.* (2018), and the findings of Delgado *et al.* (2023) in their studies focused on the European Union, they have identified a positive correlation. This positive relationship may be attributed to recent restrictions on the deductibility of interest expenses. Therefore, we propose that, within the context of the major European economies during the analyzed period, the connection between DEBT and our tax avoidance measures could exhibit a positive trend. Additionally, it's worth noting that managers of heavily indebted companies may be incentivized to engage in upward earnings management in order to secure more favorable terms during a bank financing operation and to maintain positive relations with creditors, as suggested by Mard (2004).

* ROA, as measured by Delgado *et al.* (2023), represents the ratio of earnings before income tax to total assets. In line with the research conducted by Tomsen and Watrin (2018), and the findings of Delgado *et al.* (2023), we expect an inverse relationship between ROA and ETR. This anticipation is grounded in the idea that highly profitable companies have the capacity to allocate more resources to tax planning in order to minimize their tax liabilities. Kothari *et al.* (2005) emphasized the significance of incorporating the ROA variable as a control for profitability in models that seek to explain earnings management.

3.2.4 Regression models

In the subsequent analysis, we estimate the following regression models, following the approach of Makni *et al.* (2009) and Hirigoyen and Poulain-Rehm (2014), where we include the same set of control variables in our empirical models.

To determine the minimum required duration for each lag length, we applied the formula outlined by Dumitrescu and Hurlin (2012), which is expressed as follows: $T > 5 + 2X$ Where: T: Represents the number of periods. X: Denotes the number of lags. In our case, T equals 13, so the maximum value for X is 3. Hence, in the context of our present study, we restrict the number of lags to two in order to retain the most extensive dataset, aligning with the recommendation advocated by Menard and Weill (2016).

$$ETR_{it} = \beta_0 + \beta_1 ETR_{it-1} + \beta_2 ETR_{it-2} + \beta_3 DA_{it-1} + \beta_4 DA_{it-2} + \beta_5 SIZE_{it} + \beta_6 DEBT_{it} + \beta_7 ROA_{it} + \varepsilon_{it} \quad (2)$$

$$DA_{it} = \beta_0 + \beta_1 DA_{it-1} + \beta_2 DA_{it-2} + \beta_3 ETR_{it-1} + \beta_4 ETR_{it-2} + \beta_5 SIZE_{it} + \beta_6 DEBT_{it} + \beta_7 ROA_{it} + \varepsilon_{it} \quad (3)$$

Where :

ETR = effective tax rate;

DA = earnings management, measured using discretionary accruals;

SIZE = firm size, measured as the natural logarithm of total assets;

DEBT = debt ratio, measured as long-term debt divided by total assets;

ROA = return assets, the ratio of earnings before income tax to total asset.;

3.2.5 Statistical Methods

The paper's objective is to investigate the relationship between earnings management and tax avoidance, aiming to establish a statistically significant cause-and-effect link between the two variables. To accomplish this, a causal study using panel data and a dynamic panel model based on the generalized method of moments (GMM) is conducted for estimating models (2) and (3).

Several challenges in econometric estimation are considered, including potential issues related to the correlation between explanatory variables and the error term, as well as the presence of lagged variables in empirical models, which can introduce bias when using standard techniques like OLS (Sevestre, 2002). To enhance the robustness of empirical results, the GMM method proposed by Arellano and Bond (1991), suitable for dynamic panel data models, is employed. This approach has been previously used by Blundell and Bond (1998).

The advantages of the GMM estimator include addressing problems associated with reverse causation and omitted variables, estimating models with lagged dependent variables, handling endogeneity by employing instrumental variables derived from lagged variables, leveraging orthogonality conditions between endogenous lagged variables and error terms, and accounting for specific individual and time effects.

Researchers frequently utilize two GMM estimators in dynamic panels: the first difference GMM estimator (Arellano and Bond, 1991) and the GMM system estimator (Blundell & Bond, 1998). The first difference GMM estimator instruments explanatory variables in the first difference equation with lagged values, while the GMM system estimator combines the first difference equation with the level equation. Notably, Monte Carlo simulations have demonstrated the superior efficiency of the system GMM estimator, particularly when dealing with highly persistent series (Blundell & Bond, 1998).

4. Empirical results

4.1 Descriptive statistics and Correlation

Table 2 presents an overview of the descriptive statistics for all the variables used in the study's analysis.

Table 2. Descriptive statistics

Variable	Min	Max	Mean	Median	Std. dev.
ETR	-1.188	1.746	0.197	0.211	1.791
DA	-0.274	0.210	0.0009	0.005	0.081
SIZE	12.252	19.645	16.123	16.098	1.676
DEBT	0.000	0.673	0.259	0.246	0.162
ROA	-9.22	38.95	7.763	6.37	8.555

The average Effective Tax Rate (ETR) stands at 0.197, suggesting that, on average, the surveyed firms maintain a relatively low effective tax rate. However, the substantial standard deviation of 1.791 implies notable variability, with certain firms exhibiting significantly lower or higher effective tax rates.

Discretionary Accruals (DA) serve as a proxy for earnings management. The mean DA is exceedingly close to zero (0.0009), indicating that, on average, firms within the sample engage in minimal discretionary accruals. Nevertheless, there exists some degree of variability, as evident from the standard deviation of 0.081, signifying that some firms employ more pronounced earnings management practices than others.

The average SIZE is approximately 16.123, indicating that, on average, the firms in the sample are relatively large. The mean DEBT is 0.259, suggesting that, on average, the sampled firms maintain a moderate level of indebtedness. Lastly, the average ROA stands at 7.763, signifying that, on average, firms exhibit a positive return on assets.

To evaluate multicollinearity among the study variables, we calculated Pearson's correlations for all the variables and displayed them in Table 3. The findings reveal that the highest correlation observed is 0.262, specifically between DA and ROA. In accordance with Kennedy (2003), there are no notable concerns regarding multicollinearity impacting the results, given that the correlations are below the threshold of 0.75.

Furthermore, as presented in Table 4, the variance inflation factors (VIF) are below 5, and the tolerance values exceed 0.20, in accordance with Hair *et al.* (2014). Consequently, there are no significant issues of multicollinearity among the variables incorporated in the models.

Table 3. Pearson correlations

Variables	ETR	DA	SIZE	DEBT	ROA
ETR	1				
DA	-0.027*	1			
SIZE	0.000	-0.168***	1		
DEBT	-0.019	-0.049***	0.181***	1	
ROA	-0.008	0.262***	-0.263***	-0.152***	1

Notes: *Significance at 10% level; ** Significance at 1% level

Table 4. Tolerance values and VIF

Variable	Tolerance	VIF
ETR	0.999	1.00
DA	0.910	1.07
SIZE	0.935	1.10
DEBT	0.954	1.05
ROA	0.919	1.09

4.2 Testing for stationarity

The conventional Granger method is only applicable to stationary time series data, meaning that the distribution of these variables does not exhibit any trends or changes over time. Therefore, it is crucial to examine the stationarity of our variables' time series data. If the series are non-stationary, their variances can vary over time, potentially altering the existence of a causal relationship.

It's worth noting that our empirical models are estimated using panel data. Consequently, we employ stationarity tests following the Phillips-Perron procedure.

Specifically, we conduct unit root tests using a Fisher-type test statistic (referred to as the Phillips-Perron test).

As indicated in Table 5, the calculated p-value is below the 5% significance level. Consequently, we can conclude that all the variables in our study are stationary.

Table 5: Phillips – Perron unit root tests

Variables	ETR	DA	SIZE	DEBT	ROA
	Statistic	Statistic	Statistic	Statistic	Statistic
PP – Fisher	2456.11***	2440.05***	976.063***	1137.24***	1564.9***
Chi-square					
Notes : ***Significance at 1% level ; H0 : The series contains a unit root					

4.3 Tests Associated with the System GMM Estimator

It's noteworthy that two tests are linked to the system GMM estimator:

4.3.1 Sargan and Hansen's Over-Identification Test

This test is used to assess the validity of lagged variables as instruments. Table 6 presents the results of the Sargan and Hansen Over-Identification Test.

Table 6: Results of Sargan and Hansen's Over-Identification Test

Model	(2)	(3)
Hansen j-test	70.051	57.583
P-value	0.175	0.416

Based on these results, the Hansen test does not provide enough evidence to reject the hypothesis of the validity of lagged variables as instruments (P-value of 0.175 for the first model (2) and 0.416 for the second model (3)). Therefore, the instruments used in the models are deemed valid.

4.3.2 Arellano and Bond's Autocorrelation Test (1991)

This test is used to examine the presence of second-order autocorrelation between the variables and the error term.

Table 7 presents the results of Arellano and Bond's Autocorrelation Test (1991).

Table 7: Results of Arellano and Bond's Autocorrelation Test (1991)

Model	(2)	(3)
AR(2) test	-0.423	-0.396
P-value	0.672	0.691

According to these results, Arellano and Bond's second-order autocorrelation test does not provide enough evidence to reject the hypothesis of the absence of second-order autocorrelation (P-value of 0.672 for the first model (2) and 0.691 for the second model (3)). Therefore, we conclude that there is no second-order autocorrelation in the errors of the differenced equation (AR2).

4.4 Results of the causal study

We are presenting the results pertaining to the estimation of empirical models (2) and (3). Our primary objective is to emphasize the sign and direction of causality between tax avoidance and earnings management. In our initial conclusion, we observe that tax avoidance is influenced by its past values. Specifically, the coefficients linked to the variables ETR (-1) and ETR (-2) are negative and statistically significant at the 1% level.

Table 8 displays the results obtained from estimating models 2 and 3 through the Generalized Method of Moments (GMM) on our dataset. Consistent with hypothesis H1, we identify a bidirectional causal relationship between tax avoidance and earnings management. More specifically, the coefficients for the ETR (-1), ETR (-2), DA (-1), and DA (-2) variables exhibit positive values and statistical significance. These outcomes suggest that tax avoidance, as measured by ETR, positively Granger-causes earnings management, and conversely, earnings management positively Granger-causes the measurement of tax avoidance.

Let's recall that, in line with Taylor and Richardson (2012), the ETR is computed by dividing total tax expenses by pre-tax profit. It's crucial to emphasize that an increase in the effective tax rate indicates reduced tax avoidance, while a decline in the effective tax rate signifies an elevated level of tax avoidance. Therefore, given that the study's results reveal a positive and statistically significant relationship between earnings management and the effective tax rate (ETR), it suggests that higher levels of earnings management are associated with a higher tax burden. Furthermore, it appears that as earnings management becomes more pronounced, the tax burden increases, leading to reduced tax avoidance.

In conclusion, our findings suggest that large European companies listed on the European STOXX 600 index do not employ tax manipulation to reduce their tax payments, as evidenced by the fact that accruals have no impact on pre-tax earnings. Our results align with the findings of Delgado *et al.* (2023), suggesting that companies aim to avoid unwanted attention from tax authorities and regulators. Consequently, earnings management appears to have limitations in terms of reducing the tax burden. These findings contradict the research by Guenther *et al.* (2021), which emphasizes that earnings management (EM) influences tax avoidance since pre-tax accounting income serves as the basis for calculating tax payments. If a company manages its earnings upwards without incurring additional taxes on those earnings, it could be viewed as tax avoidance.

Table 8: Results of the causal study in the sense of Granger

Variable	ETR		DA	
	Coefficient	t-Statistic	Coefficient	t-Statistic
ETR (-1)	-0.097***	-61.558	0.001***	8.695
ETR (-2)	-0.057***	-43.998	0.001***	5.903
DA (-1)	3.449***	17.307	0.046**	2.518
DA (-2)	4.155***	14.130	-0.161***	-6.067
SIZE	0.135***	4.628	-0.038***	-3.395
DEBT	0.069	0.417	0.141***	3.812
ROA	0.000	0.183	0.000	0.672
Hansen j-test (p-value)	78.174 (0.080)		61.29 (0.402)	
AR(2) test (p-value)	-0.423 (0.672)		-0.396 (0.691)	

Notes: ** Significance at 5% level; *** Significance at 1% level

To ensure the robustness of our results, we introduce an alternative measure for earnings management. Specifically, we adopt a measure of earnings management based on Kothari *et al.*'s (2005) model. The model is expressed as follows:

$$TA_{it}/A_{it-1} = \alpha_0 (1/A_{it-1}) + \alpha_1 \left(\frac{\Delta SALES_{it} - \Delta REC_{it}}{A_{it-1}} \right) + \alpha_2 \left(\frac{PPE_{it}}{A_{it-1}} \right) + \alpha_3 (ROA_{it}) + \varepsilon_{it} \quad (4)$$

where A represents total assets, $\Delta SALES$ is the change in revenues, ΔREC is the change in net receivables, PPE represents the amount of property, plant and equipment, ROA is defined as the net income before extraordinary items scaled by lagged total assets.

The results, as presented in Table 9, corroborate our main findings.

Table 9: Results of the causal study in the sense of Granger
Alternative measure : Kothari *et al.* (2005) model

Variable	ETR		DA khotari	
	Coefficient	t-Statistic	Coefficient	t-Statistic
ETR (-1)	-0.098***	-46.028	0.001***	7.556
ETR (-2)	-0.057***	-30.746	0.001***	7.993
DA (-1)	3.776***	10.489	0.334***	13.888
DA (-2)	5.280***	9.847	-0.034	-1.483
SIZE	0.133***	3.268	0.012***	3.015
DEBT	0.015	0.086	-0.033***	-2.591
ROA	0.003**	2.533	0.003***	10.569
Hansen j-test (p-value)	75.314 (0.119)		55.880 (0.694)	
AR(2) test (p-value)	0.735 (0.462)		1.507 (0.131)	

5. Conclusion

This study investigates the bidirectional causality between tax avoidance and earnings within the companies listed on the European STOXX 600 index during the period from 2010 to 2022. The relationship between tax avoidance and earnings management has been a subject of significant scholarly interest, yet it remains inconclusive and context-dependent.

The results of our study indicate a bidirectional causal relationship between tax avoidance and earnings management in the European context. In light of these findings, as the study reveals a positive and statistically significant correlation between earnings management and the effective tax rate (ETR), it implies that heightened levels of earnings management are linked to an increased tax burden. Furthermore, it suggests that as earnings management becomes more prominent, the tax burden escalates, resulting in a decrease in tax avoidance.

These findings carry significant implications for various stakeholders, including policymakers, investors, and corporate governance practices. They underscore the importance of gaining a deeper insight into the intricate financial dynamics at play within the European business environment.

For policymakers, this research suggests the need for a nuanced approach to tax regulation and enforcement. Recognizing the bidirectional relationship between tax avoidance and earnings management, policymakers may consider implementing measures that address both aspects comprehensively, ensuring a fair and transparent tax system.

Investors, on the other hand, can benefit from a better understanding of how tax avoidance and earnings management practices influence a company's financial health. This insight can inform investment decisions and risk assessments, enabling investors to make more informed choices.

In terms of corporate governance practices, these findings emphasize the importance of transparency and ethical financial reporting. Companies should be vigilant in disclosing their tax practices and earnings management strategies, promoting trust among stakeholders and minimizing potential regulatory and reputational risks.

Overall, the study highlights the complexity of financial interactions in the European corporate landscape and suggests that a holistic approach to understanding these dynamics is crucial for informed decision-making and effective governance.

While this study indeed contributes significantly to our comprehension of tax avoidance and earnings management, it's crucial to acknowledge its inherent

limitations. These limitations can offer valuable insights for future research and help guide the interpretation of the study's results.

Firstly, it's worth noting that the findings are contingent on a specific dataset and a sample comprising European companies. Consequently, these outcomes may not be universally applicable across diverse business types or regions. Researchers should exercise prudence when attempting to extrapolate these findings to other contexts.

Moreover, the study leans on specific metrics to gauge tax avoidance and earnings management, each of which has its own set of constraints. Employing alternative measurement methodologies could potentially yield divergent outcomes. Future investigations should explore different approaches and metrics to corroborate and broaden the scope of these findings.

Additionally, the study focuses on a defined time frame, and the relationships observed could be influenced by regulatory modifications or economic fluctuations during that period. A more extensive examination that spans multiple time periods or accounts for regulatory shifts might offer a more comprehensive grasp of these intricate dynamics.

Lastly, the study does not distinguish between various industries, yet it is plausible that the correlation between tax avoidance and earnings management could differ among sectors. Future research endeavors could delve into the subtleties specific to each industry and assess how they impact these financial practices.

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