

Financial Determinants of Tax Avoidance: Evidence from Borsa Istanbul Listed Firms

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Vergiden Kaçınmanın Finansal Belirleyicileri: Borsa İstanbul'da İşlem Gören Firmalardan Kanıtlar

Abstract

This study examines the impact of transfer pricing, deferred tax expense, profitability, capital intensity, and leverage on tax avoidance for BIST50 firms in Türkiye from 2014 to 2023. Using panel data and the PMG-ARDL model, the findings reveal that deferred tax expense, capital intensity, and profitability negatively affect the effective tax rate (ETR), while transfer pricing has a positive and significant impact. Leverage shows no significant effect. The results indicate that firms use strategic tools like depreciation and R&D to reduce tax burdens, suggesting that tax avoidance is a complex, firm-level issue requiring policy attention.

Keywords : Tax Avoidance, Effective Tax Rate, Deferred Tax Expenses, Transfer Pricing, Profitability, Capital Intensity, Leverage.

JEL Classification Codes : H25, H26, M40, M48.

Öz

Bu çalışma, 2014-2023 yılları arasında Türkiye'de BIST50 endeksindeki şirketlerin transfer fiyatlandırması, ertelenmiş vergi gideri, kârlılık, sermaye yoğunluğu ve kaldıraç gibi finansal değişkenlerin vergiden kaçınma üzerindeki etkisini incelemektedir. Panel veri ve PMG-ARDL modeli kullanılarak yapılan analiz, ertelenmiş vergi giderinin, sermaye yoğunluğunun ve kârlılığın etkin vergi oranını (ETR) negatif yönde etkilediğini; transfer fiyatlandırmasının ise ETR üzerinde pozitif ve anlamlı bir etkiye sahip olduğunu ortaya koymuştur. Kaldıraç ise anlamlı bir etki göstermemiştir. Bulgular, firmaların vergi yükünü azaltmak amacıyla amortisman ve Ar-Ge gibi stratejik araçları kullandığını işaret ederek, vergiden kaçınmanın çok boyutlu ve firma düzeyinde politika odaklı ele alınması gereken bir konu olduğunu vurgulamaktadır.

Anahtar Sözcükler : Vergiden Kaçınma, Etkin Vergi Oranı, Ertelenmiş Vergi Giderleri, Transfer Fiyatlandırması, Kârlılık, Sermaye Yoğunluğu, Kaldıraç.

1. Introduction

Taxes are compulsory financial obligations that the state collects from citizens and institutions to finance public services (Darsani & Sukartha, 2021: 13). Taxes constitute the most comprehensive and most important source of revenue for the state to meet its expenditures sustainably (Alfina et al., 2018; Bellikli, 2024: 502). Therefore, the accurate and complete collection of tax revenues is essential for the orderly provision of public services such as education, health, infrastructure, and social security (Yıldız & Demir, 2019: 330).

On the other hand, since taxes are an expense that reduces firms' profits, taxpayers develop strategies to minimise their liabilities. This conflict of interest between the state and businesses leads to "tax avoidance" activities within legal limits and "tax evasion" activities through illegal means (Suciarti et al., 2020: 76; Karahan-Gökmen & Adıgüzel, 2019: 54). In both cases, the state's tax revenues decrease, difficulties arise in financing public expenditures, and inequities in income distribution increase (Yıldız & Demir, 2019: 330).

Tax avoidance encompasses all arrangements that firms use within the legal framework to reduce, defer or eliminate their tax liability (Oats & Tuck, 2019: 567; Alexander & Pisa, 2023: 3). In other words, tax avoidance refers to any activity aimed at lowering the tax liability relative to a firm's pre-tax earnings. (Kovermann & Velte, 2019: 2; Nguyen, 2020: 1044). In the broadest sense, tax avoidance is a set of methods and techniques to minimise the tax payable by exploiting gaps in existing regulations without contravening current tax legislation (Suciarti et al., 2020: 76; Pandoyo & Bahari, 2022: 24-25).

Tax avoidance strategies include practices such as transfer pricing, accelerated depreciation, taking advantage of R&D incentives, deducting interest expenses from the tax base through borrowing, and transferring income through tax havens (Saeed, 2023: 2; Weisbach, 2003: 9). Transfer pricing, which is the concentration of profits in a country with a low tax rate by determining the prices of goods and services between subsidiaries, is another practice (Kyj & Romeo, 2015: 36; Güney & Bozkurt, 2011: 150; Karahan-Gökmen & Adıgüzel, 2019: 58). Multinational companies may also resort to aggressive tax planning by taking advantage of the differences between different tax regimes (Ubay, 2024: 129; Pangaribuan et al., 2021: 4998; Wang & Wright, 2024: 688).

Theoretical approaches such as agency theory, corporate income tax theory, and information asymmetry constitute a significant foundation for analysing tax avoidance strategies. For example, agency theory emphasizes that conflicts of interest between managers and shareholders play a crucial role in tax planning, leading managers to attempt to reduce tax liabilities to maximize short-term profits (Jensen & Meckling, 1976: 306; Desai & Dharmapala, 2009: 9). Information asymmetry, on the other hand, enables companies to minimize their tax burden by leveraging informational advantages over tax authorities and engaging in complex tax arrangements (Karabacak, 2013: 16).

Another tax avoidance strategy used by multinational corporations involves exploiting mismatches between different national tax systems to reduce their overall tax liability. This approach, referred to as aggressive tax planning, is often considered an improper managerial practice and a legally questionable activity. Moreover, it is regarded as one of the main reasons why governments may fall short of achieving their tax revenue targets (Ubay, 2024: 129; Pangaribuan et al., 2021: 4998).

Transfer pricing is one of the commonly employed methods of tax avoidance. It refers to the pricing of goods and services between related parties, such as a parent company and its subsidiary or two affiliated subsidiaries (Kyj & Romeo, 2015: 36). In other words, transfer pricing involves setting prices for the transfer of finished or semi-finished goods or components between affiliated entities in a way that shifts profits to low-tax jurisdictions (Güney & Bozkurt, 2011: 150). In such arrangements, one entity becomes the seller and the other the buyer, thereby affecting the seller's revenue and the buyer's cost of goods sold. This manipulation reduces taxable income and facilitates tax avoidance (Karahan-Gökmen & Adıgüzel, 2019: 58). In multinational corporations, the pricing of intra-group transactions involving goods, services, intangibles, and capital flows also falls under transfer pricing and directly influences pre-tax profits and the amount of corporate income tax payable in both jurisdictions (Saeed, 2023: 2).

In this context, transfer pricing aligns with corporate income tax theory by allowing firms to optimise their tax liabilities, while information asymmetry facilitates the effective application of such strategies (Hanlon et al., 2005: 408).

Another mechanism provided by governments is the deductibility of interest expenses on corporate loans. While interest payments are considered expenses for the borrower, if both the lending and borrowing entities are subsidiaries of the same multinational corporation located in different countries, this structure can allow the firm to reduce its tax burden in high-tax jurisdictions. By ensuring that subsidiaries in low-tax countries lend to those in high-tax regions, companies can generate favourable tax deductions on interest payments (Contractor, 2016: 33; Hope et al., 2013).

Investment decisions regarding fixed assets also have significant implications for tax payments. The depreciation of fixed assets constitutes a major component of corporate expenses. Firms with substantial fixed assets may reduce their tax liabilities by leveraging depreciation costs. Managers may seek to minimise tax payments by strategically utilising depreciation. As a result, capital-intensive firms tend to benefit more from depreciation deductions. This is especially relevant when an asset's economic life exceeds its depreciation period. The availability of various depreciation methods allows capital-intensive firms to accelerate or defer depreciation charges, thereby managing their tax obligations more effectively (Ribeiro et al., 2015: 8-9).

Another frequently employed tax avoidance strategy involves managers exploiting the flexibilities and gaps arising from differences between accounting standards and tax

legislation to calculate taxable income. As a result, the reported commercial profit may differ from the taxable income. These discrepancies can be either permanent or temporary. When temporary differences exist between commercial and taxable profits, deferred tax items arise (Özer & Sayar, 2024: 89).

Together with balance sheet management strategies, the management of deferred tax items enables firms to defer their tax burden to future periods, thereby improving short-term cash flows (Hanlon et al., 2005: 409; Fajarwati et al., 2020: 960).

In recent years, tax avoidance has become a significant topic of debate not only in academic and political circles but also among the general public, particularly due to increasing media coverage of global corporations' tax strategies (Kovermann & Velte, 2019: 1; Bilicka et al., 2022: 1). Companies employ various methods with different motivations to minimize their tax burden while simultaneously aiming to optimize financial performance. In this context, the present study aims to examine tax avoidance behaviour from a financial perspective, focusing on companies listed on Borsa Istanbul (BIST) in Türkiye. The research empirically analyses the relationships between key financial variables such as transfer pricing, financial leverage, profitability, capital intensity, and deferred tax expense and tax avoidance. This study makes a significant contribution to the tax avoidance literature on both theoretical and empirical levels. Its originality lies in being the first study to integrate and analyse this specific combination of critical variable transfer pricing, leverage, return on assets, deferred tax expense, and capital intensity within a single model. The literature review has revealed no prior study that investigates these five variables together. Previous research (Desai & Dharmapala, 2009; Armstrong et al., 2015; Alfina et al., 2018; Darsani & Sukartha, 2021; Pangaribuan et al., 2021; Suciarti et al., 2020; Amelia et al., 2022; Widyastuti et al., 2022; Terzi, 2024; Bellikli, 2024) has either examined only a subset of these variables or focused on different combinations. Similarly, studies conducted in Türkiye have either been accounting-oriented (Terzi, 2024; Bellikli, 2024) or have been limited in variable selection. Apart from the relationship between return on assets and tax avoidance (Öztürkçü-Akçay, 2020), there appears to be no research that thoroughly investigates the financial dimensions of tax avoidance. Therefore, this study will serve as a valuable guide for tax regulators on revenue optimisation and for firms on tax planning. It will also provide a fundamental reference for academics analysing the interaction among transfer pricing, leverage, profitability, capital intensity, and deferred tax expense in relation to tax avoidance.

This study consists of five chapters. In the introduction, information on tax avoidance and the strategies used to avoid it is provided. In addition, explanations of how the study's variables relate to tax avoidance are provided. In the second section, a literature review of studies on this subject is presented. The third section provides information on data and methodology. The fourth section presents empirical analysis and findings. In the conclusion section, the findings are discussed, and policy recommendations are given.

2. Literature Review

Tax avoidance has evolved into a multidimensional field of inquiry, gaining momentum both theoretically and empirically. The extant literature explores how various factors, such as corporate governance mechanisms, financial structures, managerial characteristics, and accounting policies, influence firms' tax planning behaviours. However, many studies fall short in analytical depth due to a lack of robust theoretical frameworks or a systematic thematic classification of empirical variables. Addressing these limitations requires integrating well-established theoretical lenses, including agency theory, corporate tax theory, and resource dependence theory, while organising variables thematically across managerial factors, financial indicators, governance structures, and accounting practices.

From the perspective of agency theory, principal-agent conflicts between managers and shareholders are fundamental in shaping firms' tax avoidance strategies. Desai and Dharmapala (2009) demonstrated that agency costs affect tax preferences by analysing discrepancies between income reported to capital markets and tax authorities. Armstrong et al. (2015) revealed that board independence and financial expertise have differential impacts on tax avoidance depending on its intensity, whereas Pandoyo and Bahari (2022) found managerial traits to be statistically insignificant in this context. These mixed findings suggest that the effects of governance-related variables may vary with firm-specific conditions.

In the context of corporate tax theory, firms' efforts to minimise tax burdens are often shaped by their financial and operational structures. Alfina et al. (2018) reported positive associations between leverage and firm size with tax avoidance, though profitability appeared irrelevant. These findings were partially supported by Amelia et al. (2022) and Widyastuti et al. (2022), while Riani et al. (2024) reported no significant effects. Additionally, Darsani and Sukartha (2021) observed a negative effect of corporate ownership and a positive effect of capital intensity, whereas Suciarti et al. (2020) found capital intensity to have a negative effect, with other variables showing no significance. Such inconsistencies indicate that financial determinants of tax avoidance may be highly sensitive to contextual factors such as country-specific tax regulations or firm size and industry.

Resource dependence theory emphasises the role of external pressures, including institutional and regulatory forces, in influencing corporate tax behaviour. Çelikay and Yılcı (2019) paradoxically argued that strong corporate governance practices may, under certain conditions, facilitate more aggressive tax avoidance strategies. Stiglingh et al. (2022) found that tax transparency scores were positively correlated with effective tax rates, while Dyreng et al. (2019) observed that firms with lower cash effective tax rates experienced greater tax uncertainty, especially those with subsidiaries in tax havens. These findings underscore how external environmental pressures can shape firms' tax avoidance decisions, either as constraints or strategic opportunities.

When managerial characteristics are evaluated alongside financial indicators, the results remain inconclusive across empirical studies. Pangaribuan et al. (2021) reported that

leverage, profitability, and sales growth positively influence tax avoidance, whereas Suciarti et al. (2020) suggested that their effects are only jointly significant. In contrast, Pandoyo and Bahari (2022) found no significant joint effect, emphasising once again the role of institutional and contextual factors in shaping empirical outcomes.

Within the realm of accounting policies, recent studies have explored the relationship between tax avoidance and financial reporting practices, including conservatism, prudence, and earnings management. Delgado et al. (2023) found a nonlinear but positive association between earnings management and tax avoidance. Terzi (2024) showed that accounting prudence is positively linked to tax avoidance when supported by higher return on assets. Meanwhile, Bellikli (2024) reported that accounting losses contribute to higher tax avoidance, while conservative accounting practices tend to reduce it. These findings suggest that financial reporting discretion may be strategically employed to facilitate or constrain tax minimisation efforts.

Taken together, the literature illustrates that tax avoidance is a complex and context-sensitive phenomenon that cannot be adequately understood through isolated variables or fragmented approaches. Instead, a comprehensive analytical framework that integrates theoretical perspectives and thematically clusters empirical variables is necessary for meaningful insight. This study contributes to the field by synthesising agency theory, corporate tax theory, and resource dependence theory and by systematically organising key financial, managerial, and accounting variables.

Positioned within the underexplored context of Türkiye's emerging market economy, this study focuses on publicly listed firms in BIST to investigate the financial determinants of corporate tax avoidance. By analysing the roles of transfer pricing, leverage, profitability, capital intensity, and deferred tax expenses, it contributes novel empirical evidence to the international literature. The integration of agency theory, corporate tax theory, and resource dependence theory through a thematically structured model offers both theoretical enrichment and practical insights for policymakers, tax authorities, and corporate stakeholders seeking to better understand and regulate tax avoidance behaviour.

3. Data & Methodology

In this study, data from the financial statements of 30 companies listed on the Borsa Istanbul (BIST), specifically those included in the BIST 50 index and with data suitable for analysis, for the period 2014-2023, were used. The data utilised in the study were obtained from the Public Disclosure Platform (PDP), through which disclosures required to be made public under Turkish Capital Markets and Stock Exchange legislation are published. The study's dependent variable is the Effective Tax Rate (ETR), which reflects tax avoidance, while the independent variables are transfer pricing (TP), leverage (LEV), return on assets (ROA), deferred tax expense (DTE), and capital intensity (CI). Table 1 presents the variables used in the study, along with their symbols and descriptions.

Table: 1
Variables and Descriptions

Variables*	Symbol	Variable Description
Effective Tax Rate	ETR	Total Tax Expense / Pre-tax Income
Transfer Pricing	TP	Receivables from Related Parties / Total Receivables
Leverage	LEV	Total Liabilities / Total Equity
Deferred Tax Expense	DTE	Deferred Tax Expense _t - Deferred Tax Expense _{t-1} / Total Assets _{t-1}
Return on Assets	ROA	Net Profit for the Period / Total Assets
Capital Intensity	CI	Total Tangible Fixed Assets / (Total Assets

* Calculated by the author using data obtained from The Public Disclosure Platform (PDP).

The relationship between ETR (used as a tax-avoidance variable) and the DTE, TP, CI, LEV, and ROA variables was examined using the model shown below.

$$\text{Model: } \text{ETR}_{it} = a_1 + a_2\text{DTE}_{it} + a_3\text{TP}_{it} + a_4\text{CI}_{it} + a_5\text{LEV}_{it} + a_6\text{ROA}_{it} + u_{it} \quad (1)$$

ETR serves as a critical indicator of the extent to which companies fulfil their tax obligations (Hanlon & Heitzman, 2010: 139; Wang & Mao, 2021: 368; Baker et al., 2024: 510). TP reflects the pricing policies applied by companies in transactions involving goods and services with related parties. It demonstrates firms' potential to reduce their taxable income through intragroup arrangements (Pargaribuan et al., 2021: 5002). LEV represents the degree to which a firm finances its assets through debt. As an indicator of financial risk, this variable may influence corporate tax avoidance behaviours (Pandoyo & Bahari, 2022: 27). DTE arises from temporary differences between accounting income and taxable income. It reflects the misalignment between accounting standards and tax regulations (Machdar & Nurdiniah, 2021: 108). ROA ratio indicates a firm's ability to generate profit from its total assets and provides insight into operational efficiency (Prabowo, 2020: 98). CI refers to the level of investment in fixed assets. A higher proportion of fixed assets may contribute to lower tax burdens through depreciation, making CI a potential determinant of tax avoidance (Darsani & Sukarta, 2021: 16). Through these variables, this study examines the structural and financial determinants that may influence firms' tax avoidance behaviours.

4. Empirical Findings

In this study, panel data analysis methods were employed to analyse the data of 30 companies listed on the Borsa Istanbul BIST50 index for the period 2014-2023. Initially, cross-sectional dependence among variables was examined, followed by appropriate unit root tests to assess the stationarity of the series. The homogeneity of slope coefficients across all units in the constructed model was tested, and the model was estimated using the Panel ARDL cointegration analysis. The analyses were conducted using Stata and Eviews software.

Tests used to examine cross-sectional dependence vary with the sizes of the time and cross-sectional dimensions. When the time dimension (T) exceeds the cross-sectional dimension (N), the LM test developed by Breusch and Pagan (1980) is preferred (Göçer et al., 2012: 455). However, when N exceeds T, the original LM test becomes biased. It may lead to significant size distortions (Bailey et al., 2021: 2). If both the time and cross-sectional

dimensions approach infinity, the scaled LM test proposed by Pesaran (2004) can be applied. Nevertheless, even this test may exhibit bias when the cross-sectional dimension is large while the time dimension remains small (Güloğlu & İvrendi, 2010: 384), and in cases where $N > T$, Pesaran (2004) recommends the Cross-Section Dependence (CD) test. Furthermore, to account for potential bias in the scaled LM test, Pesaran et al. (2008) suggest the use of the bias-adjusted LM test (Güzel & Akın, 2021: 17). Since the number of cross-sectional units surpasses the number of time periods in this analysis, the study employs the CD test by Pesaran (2004) in Equation (2) and the bias-corrected LM test proposed by Pesaran et al. (2008) in Equation (3).

$$CD_{PES} = \sqrt{\frac{2T}{n(n-1)}} \left(\sum_{i=1}^{n-1} \sum_{j=i+1}^n \hat{\rho}_{ij} \right) \quad (2)$$

$$LM_{BC} = \sqrt{\frac{2}{n(n-1)}} \left(\sum_{i=1}^{n-1} \sum_{j=i+1}^n T \hat{\rho}_{ij} \left[\frac{(T-k) \hat{\rho}_{ij}^2 - \mu_{Tij}}{\sqrt{v_{Tij}^2}} \right] \right) \quad (3)$$

The outcomes of the cross-sectional dependence tests applied to the variables are reported in Table 2.

Table: 2
Cross-Sectional Dependence Test Results

Variables	LMBP	LM _{PES}	LM _{BCadj}	CD _{PES}
ETR	631,59 [0,000]	6,66 [0,000]	4,99 [0,000]	1,99 [0,045]
DTE	760,25 [0,000]	11,02 [0,000]	9,36 [0,000]	9,47 [0,000]
TP	755,21 [0,000]	10,85 [0,000]	9,18 [0,000]	1,91 [0,055]
CI	927,37 [0,000]	16,69 [0,000]	15,02 [0,000]	6,47 [0,000]
LEV	834,11 [0,000]	13,53 [0,000]	11,86 [0,000]	4,69 [0,094]
ROA	763,76 [0,000]	11,14 [0,000]	9,47 [0,000]	9,93 [0,000]

According to the LMB_{Cadj} and CD_{PES} test results presented in Table 2, cross-sectional dependence is present in all variables. Therefore, second-generation unit root tests that account for cross-sectional dependence will be employed to examine the stationarity of the variables.

In the presence of cross-sectional dependence, the Panel CIPS test proposed by Pesaran (2007), as shown in Equation (5), is employed. In this test, the lagged cross-sectional averages of the ADF regression, as specified in Equation (4), are initially calculated. Subsequently, an extended version of these averages is used to estimate the CADF regression. The CIPS statistic is then obtained by averaging the estimated CADF values.

$$\Delta Y_{it} = a_i + b_i Y_{i,t-1} + c_i \bar{Y}_{t-1} + d_i \Delta \bar{Y}_t + \varepsilon_{it} \quad (4)$$

$$CIPS(N, T) = N^{-1} \sum_{i=1}^N CADF_i \quad (5)$$

The outcomes of the unit root tests are shown in Table 3.

Table: 3
Unit Root Test Results

CIPS Unit Root Test				
Variables	Intercept		Intercept and Trend	
	Z st.	Prob.	Z st.	Prob.
ETR	0,34	0,635	-0,97	0,165
DTE	-1,49*	0,068	-0,44	0,328
TP	-2,31***	0,010	-2,16**	0,015
CI	1,19	0,883	0,52	0,701
LEV	2,25	0,988	1,46	0,929
ROA	1,42	0,922	1,83	0,967
DETR	-3,68***	0,000	-1,49*	0,067
DDTE	-6,45***	0,000	-3,40***	0,000
DCI	-6,06***	0,000	-4,52***	0,000
DLEV	-3,61***	0,000	-1,67**	0,047
DROA	-4,12***	0,000	-3,49***	0,000

* 10%, **5%, and ***1% indicate significance at the 10%, 5%, and 1% levels, respectively.

An assessment of the unit root test results in Table 3 reveals that the TP variable is stationary at the level across both the intercept-only and intercept-and-trend specifications, whereas the other variables attain stationarity after first differencing. Whether a change in one cross-section affects the other units at the same level is examined using the slope homogeneity test proposed by Pesaran and Yamagata (2008). The test is presented in Equations (6) and (7) (Pesaran & Yamagata, 2008: 57).

$$\tilde{\Delta} = \sqrt{N} \left(\frac{N^{-1}\tilde{S} - k}{\sqrt{2k}} \right) \quad (6)$$

$$\tilde{\Delta}_{adj} = \sqrt{N} \left(\frac{N^{-1}\tilde{S} - E(Z_{it})}{\sqrt{Var(Z_{it})}} \right) \quad (7)$$

Here, N represents the number of cross-sections, S denotes Swamy's test statistic, and k indicates the number of regressors.

The test results are presented in Table 4.

Table: 4
Homogeneity Test Results

Model	Test Statistic		Prob.
	Delta tilde	-0,46	0,642
	Delta tilde adj	-0,84	0,396

The results shown in Table 4 indicate that the slope coefficients are homogeneous. This suggests that the coefficient estimates for the variables do not differ across units.

Considering that the dependent variable is integrated of order one and the explanatory variables are a mix of I(0) and I(1), the long-run relationship among the variables is investigated using the panel ARDL framework developed by Pesaran et al. (1999). The model parameters are estimated via the Pooled Mean Group (PMG) estimator, which is appropriate under mixed integration orders and assumes that the error terms are

independently and identically distributed with zero mean and constant variance across cross-sectional units (Da Silva et al., 2018: 49)

The long-term relationships indicated by the panel ARDL model are shown in equation (8).

$$Y_{it} = \alpha_i + \sum_{j=1}^p \beta_{ij} Y_{it-j} + \sum_{j=0}^q \gamma_{ij} X_{it-j} + \sum_{j=0}^k \delta_{ij} A_{it-j} + \sum_{j=0}^m \theta_{ij} B_{it-j} + \varepsilon_{it} \quad (8)$$

Here, $i = 1, \dots, N$ represents the number of cross-sectional units, $t = 1, \dots, T$ represents the time dimension, and ε denotes the error term (Nazhoğlu, 2011: 74). The optimal lag lengths for each variable and unit are represented by p , q , k , and m . By including the lag length for both endogenous and exogenous variables, issues arising from endogeneity are corrected, and the estimates become consistent and efficient (Attiaoui et al., 2017: 13039). Then, equation (8) is formulated as an error-correction model to estimate both short- and long-term parameters. The error-correction forms of the panel ARDL models are defined as in equation (9).

$$\Delta Y_{it} = \alpha_i + \lambda_i Y_{it-1} + \gamma'_i X_{it} + \delta'_i A_{it} + \theta'_i B_{it} + \sum_{j=1}^{p-1} \beta_{ij} \Delta Y_{it-j} + \sum_{j=0}^{q-1} \gamma''_{ij} \Delta X_{it-j} + \sum_{j=0}^{k-1} \delta''_{ij} \Delta A_{it-j} + \sum_{j=0}^{m-1} \theta''_{ij} \Delta B_{it-j} + \varepsilon_{it} \quad (9)$$

In the equation specified in Equation (9), the term λ_i represents the error correction coefficient, which is expected to be negative, and is expressed as: $\lambda_i = -(1 - \sum_{j=1}^p \beta_{ij})$, $\gamma'_i = \sum_{j=0}^q \gamma_{ij}$, $\delta'_i = \sum_{j=0}^k \delta_{ij}$, $\theta'_i = \sum_{j=0}^m \theta_{ij}$. Here, Δ represents the first difference operator. γ' , δ' , θ' represent the long-term coefficients, while β'' , γ'' , δ'' , θ'' represent the short-term coefficients (Özgür, 2018: 105).

The optimal lag length is determined using the VAR methodology, with the results provided in Table 5.

Table: 5
Results of Optimal Lag Length

Lag	LogL	AIC	SC	HQ
0	17,58	-0,38	-0,17	-0,30
1	160,44	-3,94	-2,48*	-3,37
2	204,47	-4,21	-1,49	-3,15
3	253,33	-4,64	-0,66	-3,08
4	359,38	-5,21	0,01	-3,17

The results presented in Table 6 show that the optimal lag length is the first lag according to the Schwarz Information Criterion (SC). Using the optimal lag length, the PMG estimator proposed by Pesaran et al. (1999) was used to estimate Equation (9), and the results are displayed in Table 6:

Table: 6
PMG Estimation Results

Model ARDL(1,1,1,1,1)		Coeff.	Test Stat.	Prob.
Long-term	DTE	-0,65	-10,83	0,000
	TP	0,10	22,01	0,000
	CI	-0,03	-9,79	0,000
	LEV	3,56e-05	0,09	0,923
	ROA	-0,78	-34,99	0,000
Short-term	ECM	-0,74	-4,40	0,000
	Δ DTE	-1,18	-0,91	0,362
	Δ TP	-6,50	-1,06	0,287
	Δ CI	1,41	1,69	0,093
	Δ LEV	0,26	1,93	0,055
	Δ ROA	2,01	2,10	0,037

According to the results presented in Table 6, the error correction parameter (ECM) is negative (-0.74), less than 1, and statistically significant at the 1% level. This indicates cointegration among the variables. According to the PMG estimation results, the variables DTE, CI and ROA have a negative and meaningful effect on ETR in the long run. On the other hand, TP has a positive and significant effect on ETR. The LEV variable has no significant effect. In the short run, the variables CI, LEV and ROA have a positive and significant effect on ETR. The value of the error correction parameter (-0.74) indicates the speed at which short-term deviations in the series return to equilibrium in the next period. About 74% of the imbalances in one period are corrected in the next period, and the series returns to its long-run equilibrium after about one period.

The tests for multicollinearity, heteroskedasticity, and normality related to the model analysing tax avoidance are presented in Table 7.

Table: 7
Results of Multicollinearity, Heteroskedasticity, and Normality Tests

Var	VIF	1/VIF
DTE	1,00	1,00
TP	1,09	0,91
CI	1,10	0,90
LEV	1,01	0,99
ROA	1,15	0,86
Cameron & Trivedi's decomposition of the IM-test	Chi2	Prob.
White	19,70	0,476
Skewness	3,57	0,613
Kurtosis	2,86	0,091

The VIF values presented in Table 7 indicate no multicollinearity among the variables. According to the results of the heteroskedasticity, skewness, and kurtosis tests from the information matrix test proposed by Cameron and Trivedi (1990), there are no issues with heteroskedasticity or normality in the model.

To examine the generalizability and stability of the model coefficients, the analysed firms were divided into two groups: the service sector and the manufacturing sector, and the analysis was repeated. The results are presented in Table 8.

Table: 8
Service/Manufacturing Sector PMG Estimation Results [ARDL (1,1,1,1,1)]

	Var.	Service Sector			Manufacturing Sector		
		Coeff.	Test Stat.	Prob.	Coeff.	Test Stat.	Prob.
Long-term	DTE	-1,56	-6,19	0,000	-1,97	-36,87	0,000
	TP	1,27	6,69	0,000	0,06	7,65	0,000
	CI	-0,07	-9,61	0,000	-0,22	-28,76	0,000
	LEV	0,0001	0,38	0,701	0,01	5,07	0,000
	ROA	-1,48	-10,97	0,000	0,10	3,55	0,000
Short-term	ECM	-0,46	-2,20	0,032	-0,60	-3,01	0,003
	ΔDTE	-1,86	-0,78	0,435	-0,31	-0,17	0,864
	ΔTP	-17,07	-1,15	0,253	0,93	0,63	0,525
	ΔCI	3,74	1,47	0,147	0,31	0,63	0,528
	ΔLEV	0,51	1,57	0,123	0,16	1,14	0,255
	ΔROA	0,94	1,07	0,290	1,87	1,15	0,252

According to the results presented in Table 8, the ARDL analysis for the service and manufacturing sectors indicates that DTE and CI significantly reduce the effective tax rate (ETR) in the long term across both sectors, thereby increasing tax avoidance. While TP positively affects ETR in both sectors, the effect is considerably stronger in the service sector. The ROA variable shows a sectorally divergent impact: in the service sector, increased profitability leads to higher tax avoidance, whereas in the manufacturing sector, it leads to greater tax compliance. Additionally, LEV is statistically significant and positively associated with ETR only in the manufacturing sector, suggesting that manufacturing firms more effectively utilise the interest-deduction benefits of debt financing. The short-term effects are statistically insignificant in both sectors, implying that tax planning strategies are shaped primarily by long-term decisions.

Table 9 Panel Granger Causality results examines the causal relationships between ETR as a proxy for tax avoidance and the independent variables in the model (DTE, TP, CI, LEV, and ROA), within the framework of the Granger causality test.

Table: 9
Panel Granger Causality Results

Coeff.	Test Stat.	Prob.
ETR does not Granger-Cause DTE	3,22	0,041
DTE does not Granger-Cause ETR	1,71	0,182
ETR does not Granger-Cause TP	0,64	0,526
TP does not Granger-Cause ETR	0,13	0,876
ETR does not Granger-Cause CI	0,25	0,774
CI does not Granger-Cause ETR	1,25	0,286
ETR does not Granger-Cause LEV	0,33	0,719
LEV does not Granger-Cause ETR	2,20	0,112
ETR does not Granger-Cause ROA	0,47	0,623
ROA does not Granger-Cause ETR	2,85	0,060

According to Table 9, there is a statistically significant causal relationship from ETR to DTE ($p = 0.041$), which is valid at the 5% significance level. This result indicates that changes in the effective tax rate affect deferred tax expenses, suggesting that past values of ETR have predictive power over DTE. However, the reverse relationship, namely, from DTE to ETR, is not statistically significant ($p = 0.182$), implying that changes in deferred tax expenses do not have a determining effect on ETR.

For the other variables, no significant unidirectional or bidirectional causal relationships are observed. The Granger causality tests between ETR and the variables TP, CI, and LEV are statistically insignificant ($p > 0.10$). Although ROA does not have a statistically significant causal effect on ETR, the causality from ROA to ETR is marginally significant ($p = 0.060$), which, while offering only weak evidence at the 10% level, may still suggest that firm profitability could influence the effective tax rate.

This overall picture indicates that most relationships in the model remain correlational and require further testing and analysis to confirm causal linkages. In particular, the significant causality from ETR to DTE suggests that historical tax-burden levels may shape deferred-tax planning strategies.

5. Conclusion

This study analyses the interrelationships among key financial indicators that affect tax avoidance behaviours, utilising financial data from firms listed in the BIST50 index in Türkiye for the period 2014-2023. In the study, ETR is adopted as the dependent variable representing tax avoidance, while the independent variables include TP, DTE, CI, LEV, and ROA. The long- and short-term relationships between the variables were examined using the Panel ARDL method, and directional causality relationships were analysed with Granger causality tests. Tests for multicollinearity, heteroskedasticity, and normality supported the model's statistical validity and the reliability of the findings.

As expected, the analysis results revealed that DTE, CI, and ROA had significant and negative effects on ETR in the long run. These findings indicate that firms, within the framework of agency theory and corporate income tax theory, engage in long-term financial planning to reduce their tax burden through depreciation practices and deferred tax strategies. In particular, the triggering effect of increased profitability on tax avoidance efforts signals a strong connection between financial performance and tax avoidance, driven by managerial motivation to maximise shareholder wealth. These results also suggest that firms' accounting policy choices are closely intertwined with their financial decision-making processes regarding tax obligations.

On the other hand, the positive effect of TP on ETR, consistent with some findings in the international literature, suggests that in the Turkish context, TP practices may enhance tax compliance and reduce avoidance due to strict regulatory oversight and legislative constraints imposed by tax authorities. While LEV was not significant in the general model, it was positively and significantly associated with ETR only in the manufacturing sector, indicating that the tax advantages stemming from interest expenses vary across sectors.

In the short-term analysis, ROA's positive and significant effect on ETR contrasts with the long-term findings, revealing that short-term profitability may increase tax burdens. Granger causality results showed that deferred tax strategies are shaped as proactive responses to past tax liabilities and that profitability is a key factor in tax planning. The

observed differences across the service and manufacturing sectors underline the critical role of sector-specific characteristics (cost structures, regulatory frameworks, managerial motivations) in shaping tax avoidance behaviour.

The most significant contribution of this study lies in its integration of a comprehensive set of financial indicators (TP, DTE, CI, LEV, ROA) to examine their impact on tax avoidance in Türkiye, as well as its sector-based comparative analysis. While these variables have typically been addressed in isolation or in limited combinations in the literature, this study's holistic and comparative approach reveals the financial dynamics and sectoral heterogeneity of tax avoidance behaviours in Türkiye. Additionally, the use of the Panel ARDL methodology and robustness checks enhances the reliability and generalizability of the findings. In this respect, the study contributes to closing an important gap in both theoretical and empirical literature.

This study also offers important implications for policymakers and tax authorities. First, increasing transparency regarding deferred tax assets and liabilities and implementing sector-based benchmarks can help identify potential tax-planning risks more effectively. To prevent profit shifting, it is necessary to enhance disclosure of related-party transactions and pricing methods in transfer pricing practices, and to develop risk-based audit mechanisms, particularly in the service sector. Firms with high capital intensity and profitability should be prioritised within risk-based audit frameworks due to their potential for aggressive tax planning. Moreover, the establishment of regular monitoring systems to assess the interaction between financial incentives and tax behaviour is recommended to evaluate the effectiveness of tax incentives. Lastly, promoting voluntary disclosure of corporate tax strategies in firms' annual reports can enhance corporate transparency and reinforce investor confidence.

Nevertheless, the study has certain limitations. The analysis is limited to large-scale firms within the BIST50 index, which restricts the generalizability of the findings to small and medium-sized enterprises (SMEs) and other non-financial sectors. The inherently complex nature of variables such as transfer pricing and deferred tax expense may limit the study's capacity for in-depth analysis. Furthermore, as the dataset is based on official financial reports, the potential influence of reporting errors and intra-industry differences in accounting practices cannot be entirely ruled out. Finally, the model does not incorporate governance-related variables (e.g., board structure, independent directors), corporate governance mechanisms, or audit quality, which constrains a comprehensive understanding of the multidimensional nature of tax avoidance. Future studies are encouraged to integrate these factors for more holistic analyses.

In conclusion, this study demonstrates that financial-based variables can meaningfully explain tax avoidance behaviours in Türkiye and highlights the necessity of accounting for sectoral differences in these behaviours. The findings not only contribute to the academic literature but also offer guidance for policymakers and practitioners on developing strategies to ensure tax justice and improve tax collection efficiency. In

particular, close monitoring and regulation of the tax-planning strategies of highly profitable, capital-intensive firms are critical to achieving tax equity and supporting sustainable economic growth.

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