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The impact of debt on tax avoidance: Evidence from companies listed on the Korean stock market

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Abstract: This study investigates the impact of corporate debt levels on tax avoidance among companies listed on the Korean stock market from 2001 to 2023. Using eight empirical models, the analysis examines the relationship between corporate debt and firm value (Models 1–4) and the effects of debt level fluctuations on corporate value (Models 5–8). The findings indicate that corporate debt serves as a mitigating factor for tax avoidance, as evidenced by a negative correlation between debt levels and tax avoidance measures (DDBTD, BTD). This supports the primary hypothesis that higher corporate debt levels are associated with lower tax avoidance activities. Additionally, changes in debt levels, whether increases or decreases, consistently exhibit a negative relationship with tax avoidance. This result reinforces the secondary hypothesis that fluctuations in corporate debt further reduce tax avoidance behavior. These findings suggest that Korean listed firms utilizing external debt financing to enhance internal cash flow and benefit from interest expense deductions tend to engage less in tax avoidance. This study contributes to the literature on corporate financial behavior by highlighting the role of debt financing in shaping tax planning strategies. The results provide practical implications for policymakers and corporate decision-makers concerned with tax compliance and financial management.

Keywords: *Debt, Korean stock market, Liability, Tax avoidance, Value relevance.*

1. Introduction

Corporate debt refers to the funds borrowed by a company from external sources, such as financial institutions or other creditors. This financial instrument plays a pivotal role in shaping a company's capital structure, offering a means to mobilize essential financial resources [1]. Companies can obtain debt in the form of loans, which may be allocated for various purposes, including business expansion, research and development, and investment in infrastructure. For firms with limited access to internal capital, debt serves as a vital source of external financing, facilitating the prompt achievement of strategic objectives [2]. However, it is crucial to recognize that an increase in debt levels simultaneously elevates the financial risk associated with the company [3].

The financial liability associated with debt requires the repayment of both the principal and the interest accrued. As a result, if a company's profits fall short of expectations, it may face challenges in meeting its obligations for both interest and principal repayments. An increase in the debt ratio to unsustainable levels can, therefore, jeopardize the company's financial stability [4]. However, when employed prudently, debt can serve as a crucial tool for firms seeking external financing to expand operations. It is essential, though, to manage debt carefully, as excessive debt can significantly heighten a company's financial risk. From a tax perspective, debt can offer advantages by providing tax deductions on interest expenses [5]. Specifically, when a company uses debt to finance its operations, the interest expenses incurred are deductible from taxable income, thereby reducing the company's overall tax liability [6].

The necessity of analyzing the impact of debt on tax avoidance is imperative in the context of

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corporate tax strategy. The funds procured through debt instruments can be deducted from the taxable income of a corporation, thereby reducing the overall tax liability. This tax-saving effect can, in turn, motivate companies to adopt tax avoidance strategies that utilize debt [7]. Consequently, strategies that employ debt for tax avoidance purposes can serve as a means to optimize a company's overall after-tax profits [8]. However, it is imperative to note that excessive reliance on debt for tax avoidance purposes can lead to increased financial instability and bankruptcy risk. In the event of an economic crisis, such companies are susceptible to bankruptcy, which poses a significant risk to the national economic system. Consequently, it is imperative for companies to carefully assess the impact of debt on tax avoidance strategies, and to prioritize long-term financial stability and growth potential over short-term tax savings [9].

Therefore, the objective of this study is to examine the impact of corporate debt levels on tax avoidance for companies listed on the Korean stock market from 2001 to 2023. Specifically, this study tests how corporate tax avoidance strategies are influenced by changes in the degree of debt increase, in addition to the overall debt level of companies.

In order to achieve the aforementioned objective, the study is structured as follows. Chapter 1 introduces the necessity and purpose of the study. Chapter 2 reviews studies on the relationship between debt and tax avoidance to establish the theoretical background. Chapter 3 establishes hypotheses and presents an empirical analysis model to test these hypotheses. Chapter 4 conducts empirical analysis using the research model and interprets the results. Chapter 5 offers a comprehensive summary of the study, followed by in-depth discussions on its implications and potential directions for future research.

2. Theoretical Background

The existing literature on the relationship between debt and tax avoidance has predominantly focused on examining the interaction between these two variables within the context of corporate financial structures and tax strategies. This section provides a comprehensive review of the current body of research exploring the link between debt and tax avoidance.

Jensen and Meckling [10] argue that the presence of debt serves as a mechanism to constrain managerial discretion, while simultaneously providing tax benefits. They suggest that tax avoidance becomes more pronounced in situations characterized by significant agency problems, and that the use of debt can either mitigate or replace such tax avoidance behaviors.

Bradley, et al. [5] assert that tax benefits are a critical factor in shaping a firm's capital structure. They argue that reducing tax burdens through debt financing represents a key strategy for optimizing the cost of capital. Additionally, the authors suggest that debt and tax avoidance function as substitutes, with effective tax avoidance reducing the need for debt financing.

Hines Jr and Rice [11] examine the strategies employed by multinational corporations to minimize their tax liabilities through the use of tax havens. They argue that multinational corporations adopt a strategy of maintaining high debt ratios in high-tax jurisdictions while shifting income to low-tax countries to reduce their overall tax burden. According to the authors, this approach illustrates that debt and tax avoidance function as complementary mechanisms.

Fama and French [1] investigate whether the tax shield from interest payments plays a dominant role in corporate financing decisions. They analyze empirical data to determine whether firms adjust their capital structure to maximize tax benefits while balancing bankruptcy costs. Their findings report that the impact of tax advantages on firm value is more complex than traditional theories suggest, as firms do not appear to exploit tax shields to the maximum extent.

Claessens and Djankov [12] analyze how debt and tax avoidance strategies are utilized in the tax environment of the Czech Republic. Their findings suggest that in emerging economies with low tax rates, the tax-saving benefits of debt may be less significant. This indicates that while debt can be an important strategy for tax savings in countries with higher tax rates, its effect is more limited in countries with lower tax rates. This study highlights that the effectiveness of tax benefits derived from

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debt may vary depending on the tax environment and economic conditions of each country.

Graham [6] emphasizes that interest expense deductions from debt serve as a crucial tax-saving mechanism. He argues that tax avoidance and debt usage function as substitutes, with firms that actively engage in tax avoidance being less likely to rely on additional debt.

Bond and Devereux [8] investigate cross-country variations in tax laws and conclude that the tax benefits of debt financing are more pronounced in high-tax countries. Rego [13] finds that large multinational corporations are more proactive in employing tax avoidance strategies compared to small and medium-sized enterprises. He suggests that large firms exhibit a lower reliance on debt due to their access to a wider array of tax avoidance methods.

Desai, et al. [14] argue that multinational corporations strategically minimize their tax burdens by employing a combination of debt financing and tax avoidance strategies. They contend that these corporations maximize tax savings by utilizing debt in high-tax jurisdictions while shifting income to low-tax jurisdictions. The complementary nature of debt and tax avoidance arises from the tax advantages of interest expense deductions in high-tax countries, which effectively reduce overall tax liabilities.

Similarly, Mintz and Smart [15] provide empirical evidence showing that multinational corporations strategically use debt to maximize interest expense deductions in high-tax countries, while simultaneously lowering tax burdens by reallocating income to low-tax jurisdictions. Their findings suggest that the intensity of debt financing and tax avoidance strategies increases as the tax rate differentials between countries grow.

Desai and Dharmapala [16] examine the relationship between executive compensation structures and tax avoidance, arguing that debt serves as a mechanism to influence executives' incentives for tax avoidance. Furthermore, Graham and Tucker [17] assert that corporations using tax shelters for tax avoidance tend to exhibit a reduced reliance on debt financing, leading to lower debt ratios. In contrast, firms that do not engage in or fail to utilize tax avoidance mechanisms are more likely to depend on debt financing.

Foley, et al. [7] argue that firms sometimes address tax-related issues by holding cash rather than utilizing debt to obtain tax benefits. Their findings suggest that tax avoidance and debt usage are not necessarily complementary.

Weichenrieder and Klautke [18] examine the impact of tax law changes that limit interest expense deductions on corporate debt financing and tax avoidance strategies. Their study indicates that when interest deductions are restricted, firms tend to reduce their reliance on debt, instead enhancing transfer pricing adjustments and utilizing non-cash tax deductions.

Kweon, et al. [19] report that tax avoidance has a significant positive effect on debt ratios. Additionally, they find that firms with higher profitability tend to have lower debt ratios, consistent with the pecking order theory, which suggests that firms with greater capacity to finance through internally retained earnings exhibit a lower reliance on debt.

In a subsequent study, Kweon, et al. [20] find that firms engaging in higher levels of tax avoidance exhibit lower debt ratios. This suggests that companies use tax avoidance as an alternative to debt-based tax benefits.

Blouin, et al. [4] investigate whether firms increase their use of tax avoidance strategies in response to government-imposed restrictions on interest deductions. Their findings show that, following such tax law changes, firms reduce their debt usage while strengthening alternative tax strategies, such as income shifting to foreign subsidiaries and increasing depreciation deductions.

Graham and Tucker [17] introduce the "Gap-Filling Theory" of corporate debt maturity, suggesting that firms adjust their debt maturity based on the maturity structure of government debt. This theory challenges traditional views by showing that corporate debt decisions are influenced not only by firm-specific factors but also by broader market conditions, particularly government debt issuance. The authors highlight the role of firms as "gap-fillers" in the debt market.

González [3] explores the link between leverage and corporate performance across various

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countries. The study finds that the effect of leverage on performance differs depending on the institutional environment. Stronger governance and regulations can moderate this relationship, suggesting that while leverage may enhance performance in some contexts, excessive debt can be harmful, with its impact shaped by market conditions and country-specific factors.

Lee [21] argues that in the absence of financial flexibility considerations, there is a negative relationship between tax avoidance and debt. However, when financial flexibility is considered, the impact of tax avoidance on debt financing becomes insignificant, emphasizing the importance of financial flexibility as a key determinant in corporate debt decisions.

Richardson, et al. [22] report that financially distressed firms tend to increase debt financing to capitalize on interest deductions, while simultaneously enhancing non-debt tax avoidance measures, such as non-cash expense deductions.

Ko and Park [23] find that cash generated through tax avoidance is allocated for various corporate purposes, including investment, dividend payments, and debt repayment. This tendency is particularly pronounced among firms experiencing greater financial constraints.

Kim and Im [24] report that firms with high levels of cash holdings exhibit a reduced need for tax avoidance through debt financing, leading to a decline in their debt ratios. Conversely, firms with lower cash reserves tend to rely more heavily on debt to achieve tax savings.

Medhioub and Boujelbene [25] explore how corporate tax avoidance affects the cost of debt (COD), focusing on the role of integrated report (IR) assurance. Their study of South African firms finds that tax-avoiding firms face higher COD due to information asymmetry. However, they show that IR assurance helps reduce these costs and highlight its importance in decision-making and policy development.

Sánchez-Ballesta and Yagüe [26] investigate the relationship between tax avoidance and debt maturity in SMEs, using data of Spanish SMEs. They find that tax-avoiding SMEs tend to have longer debt maturities, especially when they are more profitable and have reliable financial reporting. Tax avoidance also reduces leverage and short-term debt, improving the financial structure of SMEs.

Guedrib and Hamdi [9] examine how tax avoidance and tax risk impact the cost of debt using data from non-financial French firms. They find that tax avoidance lowers the cost of debt, while higher tax risk increases it. Their study stresses the need to manage tax risks for both creditors and managers.

These studies provide critical insights into corporate financial strategies and tax planning, demonstrating how the relationship between debt and tax avoidance evolves in response to changing regulatory environments and firm-specific financial conditions.

3. Hypothesis and Research Model

3.1. Hypothesis

Debt financing enables firms to acquire external capital while incurring interest expenses, which can be deducted from corporate taxable income, thereby reducing the overall corporate tax burden. This tax-saving effect may incentivize firms to employ debt as a strategic tool for tax avoidance, ultimately enhancing overall profitability. However, excessive reliance on debt financing can increase financial instability, potentially leading to a decline in corporate value.

Since the seminal work of Jensen and Meckling [10] numerous studies have documented the reciprocal relationship between debt financing and tax avoidance [5, 6, 17]. Nevertheless, some scholars argue that tax avoidance and debt utilization are not necessarily substitutes, as firms may address tax-related concerns by accumulating cash reserves rather than seeking tax benefits through increased debt [7].

In the context of Korea, empirical research suggests that an optimal balance between tax avoidance and debt ratios enhances corporate financial performance. However, when firms exhibit excessively high debt ratios or engage in aggressive tax avoidance strategies, financial risk escalates, ultimately impairing performance [19]. Furthermore, cash secured through tax avoidance is often allocated for various corporate purposes, including investments, dividend distributions, and debt repayment. This tendency is

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particularly pronounced in firms facing greater financial constraints [23]. These findings underscore the complex interplay between tax strategies and corporate financial management, emphasizing the importance of prudent financial planning to mitigate the risks associated with excessive debt financing and tax avoidance.

As such, research results on the relationship between debt and tax avoidance often differ depending on the target country or the financial status of the company. Therefore, this study analyzes how the degree of tax avoidance of a company changes according to the level of debt and the level of increase or decrease in debt for companies listed on the Korean stock market over the period from 2001 to 2023.

To this end, this study sets the following as research hypotheses.

Hypothesis 1: The level of debt of a company has a negative (-) relationship with tax avoidance.

Hypothesis 2: The level of increase or decrease in debt of a company has a negative (-) relationship with tax avoidance.

3.2. Research Model

This study aims to analyze how the debt level and debt increase/decrease level of companies listed on the Korean stock market affect tax avoidance. To this end, this study designs a research model in which tax avoidance (DDBTD, BTD) is set as a dependent variable, while debt level (LEV1, LEV2) and debt increase/decrease level (LEV3, LEV4) are set as major independent variables.

The primary dependent variables of this study are the residual of the regression on the difference between accounting income and tax income (BTD) and the difference between accounting income and tax income (BTD) of total accruals (DDBTD), which serve as proxy variables for tax avoidance [14, 27, 28].

Control variables include donations (DON), which indicate the level of corporate social responsibility activities; the ratio of market value to book value (MTB), which reflects the company's growth potential; firm size (SIZE); return on assets (ROA); sales growth rate (GRW); the intangible asset ratio to total assets (INT); capital intensity (PPE); and the company's lifespan since establishment (AGE). Industry and year dummies are also included in the research model to control for industry and year effects.

<Research Model 1> and <Research Model 2> analyze how the debt ratio to total assets (LEV1) affects DDBTD and BTD, which serve as proxies for tax avoidance. <Research Model 3> and <Research Model 4> examine the effect of the debt ratio to total capital (LEV2) on tax avoidance (DDBTD, BTD). <Research Model 5> and <Research Model 6> investigate the impact of the year-on-year debt increase/decrease rate (LEV3) on tax avoidance (DDBTD, BTD), while <Research Model 7> and <Research Model 8> assess the influence of the year-on-year debt increase/decrease rate (LEV4) on tax avoidance (DDBTD, BTD).

<Research model 1>: $DDBTD_{it} = \beta_0 + \beta_1 LEV1_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

<Research Model 2>: $BTD_{it} = \beta_0 + \beta_1 LEV1_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

<Research model 3>: $DDBTD_{it} = \beta_0 + \beta_1 LEV2_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

<Research Model 4>: $BTD_{it} = \beta_0 + \beta_1 LEV2_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

<Research model 5>: $DDBTD_{it} = \beta_0 + \beta_1 LEV3_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

<Research Model 6>: $BTD_{it} = \beta_0 + \beta_1 LEV3_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

<Research model 7>: $DDBTD_{it} = \beta_0 + \beta_1 LEV4_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

<Research Model 8>: $BTD_{it} = \beta_0 + \beta_1 LEV4_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it}$

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$$+ \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$$

Here,

$DDBTD_{i,t}$: Residuals after regressing total accrual on BTD (Difference between accounting earnings in period t and taxable income in period t),

$BTD_{i,t}$: Difference between accounting earnings in period t and taxable income in period t,

$LEV1_{i,t}$: Liabilities at the end of the year t ÷ Total assets at the end of the year t,

$LEV2_{i,t}$: Liabilities at the end of the year t ÷ Total equity at the end of the year t,

$LEV3_{i,t}$: (Liabilities at the end of the year t - Liabilities at the end of the year t-1) ÷ Liabilities at the end of the year t-1

$LEV4_{i,t}$: (Liabilities at the end of the year t - Liabilities at the end of the year t-1) ÷ Total equity at the end of the year t,

$DON_{i,t}$: Total donations expenditure in period t ÷ total sales in period t,

$MTB_{i,t}$: Market value of equity at the end of year t ÷ book value of equity at the end of year t,

$SIZE_{i,t}$: Natural log of total assets at the end of the year t,

$ROA_{i,t}$: Net income in period t ÷ Total assets at the beginning of the year t,

$GRW_{i,t}$: (Total sales in period t – total sales in period t-1) ÷ total sales in period t-1,

$INT_{i,t}$: Intangible assets at the end of year t ÷ Total assets at the beginning of year t,

$PPE_{i,t}$: (Tangible assets at the end of year t – Lands at the end of year t - Construction in progress at the end of year t) ÷ Total assets at the beginning of year t,

$AGE_{i,t}$: Natural logarithm of the Survival period after establishment,

$\varepsilon_{i,t}$: Error term

4. Empirical Analysis

4.1. Sample Selection

Table 1 presents the selection process of the analytical data used in this study. The data for this study is extracted from the VALUESearch DATABASE of Korea Credit Information Co., Ltd. Among the extracted sample data, companies that meet the following criteria are excluded from the empirical analysis:

(1) Companies belonging to the financial and insurance industry

(2) Companies other than those with December-end settlement

(3) Stocks subject to management

(4) Companies with eroded capital

(5) Companies with an estimated taxable income of less than 0

(6) Companies with missing data on any of the variables used in this study

This study conducts regression analysis in two stages to minimize the influence of extreme values. Specifically, after excluding samples in which the absolute value of the standardized residuals in the first regression analysis exceeds 3 or the Cook's distance exceeds 1, a second regression analysis is performed. The results of this second analysis are used as the primary findings of this study.

Table 1.
Sample selection.

Sample selection procedure		Number of samples (Firm-year)
Number of samples extracted from VALUESearch DB (2001-2023)		78,798
Excluded Samples (-)	(1) Companies in the financial and insurance industries	64,094
	(2) Companies other than those with December-end closing	
	(3) Companies involved in issues for administration	
	(4) Capital impaired company	
	(5) Companies with estimated taxable income less than 0	
	(6) Companies with missing data on any of the variables used in this study	
The final number of samples used in the analysis		14,704

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4.2. Descriptive Statistics

Table 2 shows the descriptive statistics for the variables used in this study. The mean values of LEV1, LEV2, LEV3, and LEV4, which represent the main independent variables substituting for debt, are 0.41772, 0.77168, 0.27923, and 0.10221, respectively. Their standard deviations are 0.75866, 1.27982, 8.22231, and 4.80817, with maximum values of 84.56274, 68.16425, 968.5053, and 566.9717, respectively.

Among the control variables, the mean donation (DON) is 0.00119, with a standard deviation of 0.00493, a median of 0.00019, and a maximum of 0.33748. The mean market-to-book value ratio (MTB) is 1.65128, with a standard deviation of 2.78085, a median of 1.12636, a minimum of 0.02836, and a maximum of 254.2212. The mean company size (SIZE) is 25.93735, with a standard deviation of 1.43567 and a minimum of 20.01123.

The mean return on assets (ROA) is 0.08296, with a standard deviation of 0.15232 and a median of 0.06327. The mean sales growth rate (GRW) is 0.21327, with a standard deviation of 3.76507 and a maximum of 333.6399. The maximum intangible asset intensity (INT) is 10.32102, with a mean of 0.02992 and a standard deviation of 0.13116. The mean capital intensity (PPE) is 0.19153, with a standard deviation of 0.20069 and a median of 0.15806. The mean firm age (AGE) is 12.2686, with a standard deviation of 0.79297, a minimum of 5.35186, and a median of 12.3905.

Table 2.
Descriptive statistics.

Variable	N	Mean	Standard Deviation	Median	Minimum	Maximum
DDBTD	14,704	0.08787	0.11527	0.06278	1.87E-05	5.64721
BTD	14,704	0.1052	0.11731	0.08162	1.88E-05	6.66517
LEV1	14,704	0.41772	0.75866	0.37988	0.000661	84.56274
LEV2	14,704	0.77168	1.27982	0.51766	0.000618	68.16425
LEV3	14,704	0.27923	8.22231	0.03652	-0.98334	968.5053
LEV4	14,704	0.10221	4.80817	0.01633	-34.0616	566.9717
DON	14,704	0.00119	0.00493	0.00019	0	0.33748
MTB	14,704	1.65128	2.78085	1.12636	0.02836	254.2212
SIZE	14,704	25.93735	1.43567	25.68974	20.01123	33.19202
ROA	14,704	0.08296	0.15232	0.06327	-3.27181	11.94322
GRW	14,704	0.21327	3.76507	0.07487	-0.9968	333.6399
INT	14,704	0.02992	0.13116	0.00928	0	10.32102
PPE	14,704	0.19153	0.20069	0.15806	0	13.49112
AGE	14,704	12.2686	0.79297	12.3905	5.35186	16.82224

1) Variable description:

$DDBTD_{i,t}$: Residuals after regressing total accrual on BTD (Difference between accounting earnings in period t and taxable income in period t),

$BTD_{i,t}$: Difference between accounting earnings in period t and taxable income in period t,

$LEV1_{i,t}$: Liabilities at the end of the year t ÷ Total assets at the end of the year t,

$LEV2_{i,t}$: Liabilities at the end of the year t ÷ Total equity at the end of the year t,

$LEV3_{i,t}$: (Liabilities at the end of the year t - Liabilities at the end of the year t-1) ÷ Liabilities at the end of the year t-1,

$LEV4_{i,t}$: (Liabilities at the end of the year t - Liabilities at the end of the year t-1) ÷ Total equity at the end of the year t,

$DON_{i,t}$: Total donations expenditure in period t ÷ total sales in period t,

$MTB_{i,t}$: Market value of equity at the end of year t ÷ book value of equity at the end of year t,

$SIZE_{i,t}$: Natural log of total assets at the end of the year t,

$ROA_{i,t}$: Net income in period t ÷ Total assets at the beginning of the year t,

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$GRW_{i,t}$: (Total sales in period t – total sales in period t-1) ÷ total sales in period t-1,

$INT_{i,t}$: Intangible assets at the end of year t ÷ Total assets at the beginning of year t,

$PPE_{i,t}$: (Tangible assets at the end of year t – Lands at the end of year t - Construction in progress at the end of year t) ÷ Total assets at the beginning of year t,

$AGE_{i,t}$: Natural logarithm of the Survival period after establishment,

4.3. Correlation Analysis

Table 3 presents the results of the correlation analysis conducted between the main independent variables and dependent variables prior to regression analysis. The table shows the Pearson correlation coefficients above the diagonal and the Spearman correlation coefficients below the diagonal.

According to the results of the Spearman correlation analysis, the dependent variables, DDBTD and BTD, serve as proxies for tax avoidance. DDBTD demonstrates a statistically significant negative correlation with the main independent variables LEV1 and LEV2 at the 1% significance level, while showing a statistically significant positive correlation with LEV3 and LEV4 at the 1% significance level. Additionally, DDBTD is positively correlated with the control variables MTB, ROA, GRW, INT, and PPE at the 1% level, while it exhibits a negative correlation with SIZE and AGE at the 1% significance level.

Similarly, BTD shows a statistically significant negative correlation with LEV1 and LEV2 at the 1% level, but a statistically significant positive correlation with LEV3 and LEV4 at the 1% level. Regarding the control variables, BTD is positively correlated with DON, MTB, ROA, and GRW at the 1% level, while it shows a negative correlation with SIZE, INT, PPE, and AGE, also at the 1% level.

Turning to the Pearson correlation analysis results, DDBTD reveals a statistically significant positive correlation with the major independent variable LEV1 at the 10% significance level, although it does not show a statistically significant correlation with LEV2, LEV3, or LEV4. Furthermore, DDBTD is positively correlated with the control variables MTB, ROA, GRW, INT, and PPE at the 1% level, while it exhibits a negative correlation with SIZE and AGE at the 1% level. In contrast, BTD shows no statistically significant correlation with any of the major independent variables (LEV1, LEV2, LEV3, and LEV4). However, BTD is positively correlated with DON, MTB, ROA, and GRW at the 1% or 5% significance level, while it shows a negative correlation with SIZE, INT, PPE, and AGE at the 1% level.

The results from both the Pearson and Spearman correlation analyses provide insights into the direction of relationships between the main dependent and independent variables. These findings establish a foundation for the subsequent regression analysis.

4.4. Regression Results

Table 4 presents the results of analyzing the impact of Debt Level 1 (LEV1: Liabilities at the end of the year t ÷ Total assets at the end of the year t) on tax avoidance, as measured by DDBTD and BTD, using Research Models 1 and 2. Research Model 1 examines the effect of Debt Level 1 (LEV1) on the first proxy for tax avoidance, DDBTD, while Research Model 2 investigates the effect of Debt Level 1 (LEV1) on the second proxy, BTD.

The statistical significance of the empirical models is indicated by the F-values, which are 102.65 and 631.28 for Research Models 1 and 2, respectively. Both F-values are statistically significant at the 1% level. The adjusted R-squared (Adj-R^2) values, which reflect the explanatory power of the independent variables on the dependent variables, are 0.1997 for Model 1 and 0.6080 for Model 2. In both models, the maximum variance inflation factor (VIF) is 1.42044, suggesting a very low likelihood of multicollinearity.

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Table 3.
Correlation analysis.

	DDBTD	BTD	LEV1	LEV2	LEV3	LEV4	DON	MTB	SIZE	ROA	GRW	INT	PPE	AGE
DDBTD	1	0.81539	0.0152	0.01206	0.00086	0.0011	0.00012	0.40813	-0.0537	0.07281	0.03769	0.00852	0.01817	-0.09142
		<.0001	0.0653	0.1437	0.9165	0.8936	0.9888	<.0001	<.0001	<.0001	<.0001	0.3018	0.0276	<.0001
BTD	0.61128	1	0.0011	-0.01295	0.0131	0.00933	0.01785	0.44179	-0.05575	0.26364	0.04479	-0.00021	-0.04755	-0.07258
	<.0001		0.8936	0.1163	0.1121	0.258	0.0805	<.0001	<.0001	<.0001	<.0001	0.7985	<.0001	<.0001
LEV1	-0.02291	-0.13243	1	0.17032	0.12253	0.93137	-0.01858	0.01482	0.03947	0.62825	0.68029	0.62883	0.22757	-0.02527
	0.0055	<.0001		<.0001	<.0001	<.0001	0.0243	0.0723	<.0001	<.0001	<.0001	<.0001	<.0001	0.0022
LEV2	-0.07556	-0.24481	0.94403	1	0.00023	0.04107	-0.03582	0.05824	0.1084	-0.08214	0.00961	-0.01364	0.12985	0.0413
	<.0001	<.0001	<.0001		0.978	<.0001	<.0001	<.0001	<.0001	<.0001	0.2437	0.0982	<.0001	<.0001
LEV3	0.04854	0.09557	0.31844	0.14123	1	0.10599	-0.00189	0.0091	-0.00556	0.11166	0.07895	0.0735	0.0644	-0.04964
	<.0001	<.0001	<.0001	<.0001		<.0001	0.8189	0.2698	0.4999	<.0001	<.0001	<.0001	<.0001	<.0001
LEV4	0.03345	0.07816	0.40565	0.22549	0.90868	1	-0.00328	0.0009	-0.00405	0.65502	0.71298	0.64396	0.09422	-0.0136
	<.0001	<.0001	<.0001	<.0001	<.0001		0.6909	0.913	0.6237	<.0001	<.0001	<.0001	<.0001	0.0992
DON	0.00039	0.02098	-0.06818	-0.06459	0.00836	-0.0005	1	0.01216	0.0615	0.01277	-0.00331	0.01102	-0.00917	0.00201
	0.9625	0.0109	<.0001	<.0001	0.311	0.5442		0.1403	<.0001	0.1217	0.6877	0.1816	0.2661	0.807
MTB	0.19816	0.2539	0.02672	-0.04421	0.11133	0.09466	0.01828	1	-0.05626	0.05047	0.0163	0.04638	-0.01316	-0.11051
	<.0001	<.0001	0.0012	<.0001	<.0001	<.0001	0.0267		<.0001	<.0001	0.0481	<.0001	0.1106	<.0001
SIZE	-0.06394	-0.07005	0.18592	0.21962	0.0311	0.05061	0.20684	-0.07826	1	-0.05889	0.00083	-0.01024	0.09934	0.22878
	<.0001	<.0001	<.0001	<.0001	0.0002	<.0001	<.0001	<.0001		<.0001	0.9198	0.2145	<.0001	<.0001
ROA	0.38293	0.74661	-0.19399	-0.32949	0.1164	0.08291	0.0605	0.33532	-0.13207	1	0.50183	0.4684	0.11415	-0.15014
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001
GRW	0.14013	0.22547	0.1864	0.08142	0.30682	0.28403	-0.02699	0.20267	-0.0477	0.30383	1	0.47918	0.03686	-0.03089
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0011	<.0001	<.0001	<.0001		<.0001	<.0001	0.0002
INT	0.0439	-0.00097	0.01229	-0.02722	0.1025	0.08743	0.06971	0.32534	-0.02901	0.05416	0.08664	1	0.10127	-0.07264
	<.0001	0.906	0.1363	0.001	<.0001	<.0001	<.0001	<.0001	0.0004	<.0001	<.0001		<.0001	<.0001
PPE	0.04319	-0.07647	0.26055	0.25196	0.04282	0.06975	0.06743	-0.02878	0.11998	-0.04013	0.07259	-0.05937	1	-0.02906
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0005	<.0001	<.0001	<.0001	<.0001		0.0004
AGE	-0.15771	-0.14947	0.03083	0.09694	-0.06789	-0.04793	0.05745	-0.29738	0.32781	-0.24549	-0.13997	-0.21976	0.03809	1
	<.0001	<.0001	0.0002	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

Source: 1) Pearson correlation analysis above, Spearman correlation analysis below. 2) Description of variables: See <Table 2>.

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In the analysis of Research Model 1, the coefficient for the key independent variable, Debt Level 1 (LEV1), is -0.01817, which is statistically significant at the 1% level, indicating a negative relationship. Among the control variables, MTB, SIZE, ROA, and PPE exhibit statistically significant positive coefficients at the 1% level, while INT and AGE show statistically significant negative coefficients at the 5% and 1% levels, respectively.

For Research Model 2, the coefficient for Debt Level 1 (LEV1) is -0.02717, which is statistically significant at the 1% level, indicating a negative effect. Among the control variables, DON, MTB, SIZE, and ROA show statistically significant positive coefficients at the 1% level, while INT and PPE exhibit statistically significant negative coefficients at the 1% level.

The results presented in Table 4 suggest that debt serves as a factor that reduces tax avoidance (DDBTD, BTD) in firms. These findings support Hypothesis 1(The level of debt of a company has a negative (-) relationship with tax avoidance.) of this study, which posits that a firm's debt level is negatively correlated with tax avoidance. Specifically, this implies that, for listed firms in Korea, an increase in debt level is associated with a reduction in tax avoidance behaviors.

Table 4.
Analysis of the relationship between debt level 1 (LEV1) and tax avoidance (DDBTD, BTD).

Variable	<Research Model 1: DDBTD>				<Research Model 2: BTD>			
	coefficient	t-Value	Pr > |t|	Variance Inflation Factor (VIF)	coefficient	t-Value	Pr > |t|	Variance Inflation Factor (VIF)
Intercept	0.06664	5.94	<.0001	0	-0.00825	-0.99	0.3246	0
LEV1	-0.01817	-9.93	<.0001	1.38494	-0.02717	-17.02	<.0001	1.42044
DON	0.02321	0.24	0.8086	1.02193	0.31091	4.35	<.0001	1.02315
MTB	0.01018	30.19	<.0001	1.21069	0.00753	27.79	<.0001	1.2306
SIZE	0.00139	3.94	<.0001	1.14166	0.00227	8.6	<.0001	1.14849
ROA	0.17061	34.34	<.0001	1.15916	0.4936	123.2	<.0001	1.16688
GRW	-0.00025	-0.33	0.7386	1.07737	-0.00053	-1.61	0.1082	1.03354
INT	-0.01517	-2.4	0.0162	1.06667	-0.09047	-14.71	<.0001	1.09636
PPE	0.01378	5.05	<.0001	1.34247	-0.03855	-18.1	<.0001	1.38324
AGE	-0.00464	-7.12	<.0001	1.1729	0.000239	0.49	0.623	1.18236
Year Dummy	Included				Included			
Industry Dummy	Included				Included			
F-Value	102.65***				631.28***			
Adj-R^2	0.1997				0.6080			
Number of samples after removal of outliers	14,255				14,222			

Source: 1) Description of variables: See <Table 2>.
2) <Research model 1>: $DDBTD_{it} = \beta_0 + \beta_1 LEV1_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$
3) <Research Model 2>: $BTD_{it} = \beta_0 + \beta_1 LEV1_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

Table 5 presents the results of analyzing the impact of Debt Level 2 (LEV2: Liabilities at the end of the year t ÷ Total equity at the end of the year t) on tax avoidance (measured by DDBTD and BTD) using Research Models 3 and 4. Research Model 3 examines the effect of Debt Level 2 (LEV2) on the first proxy for tax avoidance, DDBTD, while Research Model 4 investigates the effect of Debt Level 2 (LEV2) on the second proxy, BTD.

The statistical significance of the empirical models is indicated by the F-values, which are 98.69 and 540.11 for Research Models 3 and 4, respectively. Both F-values are statistically significant at the 1% level.

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The adjusted R-squared (Adj-R^2) values, reflecting the explanatory power of the independent variables on the dependent variables, are 0.1935 for Model 3 and 0.5701 for Model 4. In both models, the maximum variance inflation factor (VIF) is 1.21486, indicating a very low likelihood of multicollinearity.

In the analysis of Research Model 3, the coefficient for the key independent variable, Debt Level 2 (LEV2), is -0.00113, which is statistically significant at the 1% level, indicating a negative relationship. Among the control variables, MTB, SIZE, and ROA show statistically significant positive coefficients at the 1% level, while INT and AGE exhibit statistically significant negative coefficients at the 1% level.

In Research Model 4, the coefficient for Debt Level 2 (LEV2) is -0.00129, which is statistically significant at the 1% level, again reflecting a negative effect. Among the control variables, DON, MTB, SIZE, and ROA demonstrate statistically significant positive coefficients at the 1% level, while GRW, INT, and PPE show statistically significant negative coefficients at the 1% level.

The results presented in Table 5 suggest that debt serves as a factor that reduces tax avoidance (DDBTD, BTD) in firms. These findings support Hypothesis 1 of this study, which posits that a firm's debt level is negatively correlated with tax avoidance. Specifically, this implies that for listed firms in Korea, as debt levels increase, tax avoidance behaviors decrease.

Table 4.
Analysis of the relationship between debt level 2 (LEV2) and tax avoidance (DDBTD, BTD).

Variable	<Research Model 3: DDBTD>				<Research Model 4: BTD>			
	coefficient	**t-Value**	**Pr > |t|**	**Variance Inflation Factor (VIF)**	**coefficient**	**t-Value**	**Pr > |t|**	**Variance Inflation Factor (VIF)**
Intercept	0.0676	6	<.0001	0	0.00465	0.53	0.5932	0
LEV2	-0.00113	-2.82	0.0048	1.08405	-0.00129	-4.06	<.0001	1.09889
DON	0.05779	0.6	0.5472	1.02127	0.36692	4.95	<.0001	1.02163
MTB	0.01002	29.67	<.0001	1.20586	0.00733	26.11	<.0001	1.23335
SIZE	0.00117	3.31	0.0009	1.1445	0.00175	6.39	<.0001	1.14601
ROA	0.16303	32.68	<.0001	1.16009	0.46411	110.96	<.0001	1.21486
GRW	-0.00077	-1.76	0.0778	1.02827	-0.0016	-4.75	<.0001	1.03481
INT	-0.02074	-3.29	0.001	1.05942	-0.10006	-15.82	<.0001	1.07996
PPE	0.00268	1.08	0.2786	1.09451	-0.05172	-27.05	<.0001	1.10228
AGE	-0.00456	-6.98	<.0001	1.17379	-6.6E-05	-0.13	0.8961	1.18268
Year Dummy	Included				Included			
Industry Dummy	Included				Included			
F-Value	98.69***				540.11***			
Adj-R^2	0.1935				0.5701			
Number of samples after removal of outliers	14,253				14,232			

Source: 1) Description of variables: See <Table 2>.
2) <Research model 3>: $DDBTD_{it} = \beta_0 + \beta_1 LEV2_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$
3) <Research Model 4>: $BTD_{it} = \beta_0 + \beta_1 LEV2_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

Table 6 presents the results of analyzing the effect of the debt increase/decrease level (LEV3: (Liabilities at the end of the year t - Liabilities at the end of the year t-1) ÷ Liabilities at the end of the year t-1) on tax

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avoidance, measured by DDBTD and BTD, using Research Models 5 and 6. Research Model 5 assesses the impact of the debt increase/decrease level (LEV3) on DDBTD, a proxy for tax avoidance, while Research Model 6 examines the effect of LEV3 on BTD, a second proxy for tax avoidance.

The F-values, which indicate the statistical significance of the empirical models, are 98.63 and 538.96 for Research Models 5 and 6, respectively, both of which are statistically significant at the 1% level. The adjusted R-squared (Adj-R^2) values, reflecting the explanatory power of the independent variables on the dependent variables, are 0.1934 for Model 5 and 0.5695 for Model 6. The maximum variance inflation factor (VIF) in both models is 1.18961, suggesting a very low possibility of multicollinearity.

In the analysis of Research Model 5, the coefficient for the primary independent variable, the debt increase/decrease level (LEV3), is -0.00019, which is statistically significant at the 1% level, indicating a negative relationship. Among the control variables, MTB, SIZE, and ROA exhibit statistically significant positive coefficients at the 1% level, while INT and AGE show statistically significant negative coefficients at the 1% level.

For Research Model 6, the coefficient for the debt increase/decrease level (LEV3) is -0.00024, which is statistically insignificant. However, among the control variables, DON, MTB, SIZE, and ROA show statistically significant positive coefficients at the 1% level, whereas GRW, INT, and PPE exhibit statistically significant negative coefficients at the 1% level.

The results presented in Table 6 indicate that changes in a firm's debt level, whether an increase or decrease, serve as a factor that reduces tax avoidance (DDBTD, BTD). These findings support Hypothesis 2(The level of increase or decrease in debt of a company has a negative (-) relationship with tax avoidance.) of this study, which posits that the level of debt increase or decrease in a firm is negatively related to tax avoidance. In other words, for listed firms in Korea, tax avoidance behaviors decrease as the level of debt change increases.

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Table 6.
Analysis of the relationship between debt increase/decrease level (LEV3) and tax avoidance (DDBTD, BTD).

Variable	<Research Model 5: DDBTD>				<Research Model 6: BTD>			
	coefficient	t-Value	Pr > |t|	Variance Inflation Factor (VIF)	coefficient	t-Value	Pr > |t|	Variance Inflation Factor (VIF)
Intercept	0.07133	6.35	<.0001	0	0.00879	1.01	0.312	0
LEV3	-0.00019	-3.27	0.0011	1.01225	-0.00024	-1.07	0.2863	1.14536
DON	0.06868	0.72	0.474	1.01968	0.37868	5.1	<.0001	1.02017
MTB	0.00987	29.43	<.0001	1.19199	0.0072	25.8	<.0001	1.2163
SIZE	0.00106	3.01	0.0026	1.13028	0.00162	5.92	<.0001	1.13556
ROA	0.166	33.54	<.0001	1.14172	0.46759	113.28	<.0001	1.18062
GRW	-0.00078	-1.79	0.0741	1.02778	-0.00167	-4.92	<.0001	1.04063
INT	-0.02024	-3.21	0.0013	1.05864	-0.0995	-15.72	<.0001	1.0793
PPE	0.00211	0.86	0.3886	1.07657	-0.0524	-26.33	<.0001	1.18961
AGE	-0.00468	-7.16	<.0001	1.17482	-0.00019	-0.37	0.7134	1.18396
Year Dummy	Included				Included			
Industry Dummy	Included				Included			
F-Value	98.63***				538.96***			
Adj-R^2	0.1934				0.5695			
Number of samples after removal of outliers	14,254				14,232			

Source: 1) Description of variables: See <Table 2>.
2) <Research model 5>: $DDBTD_{it} = \beta_0 + \beta_1 LEV3_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$
3) <Research Model 6>: $BTD_{it} = \beta_0 + \beta_1 LEV3_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

Table 7 presents the results of analyzing the impact of the debt increase/decrease level (LEV4: Liabilities at the end of the year t - Liabilities at the end of the year t-1) ÷ Total equity at the end of the year t) on tax avoidance (DDBTD, BTD) using Research Models 7 and 8. Research Model 7 examines the effect of the debt increase/decrease level (LEV4) on DDBTD, a proxy for tax avoidance, while Research Model 8 analyzes the effect of LEV4 on BTD, a second proxy for tax avoidance.

The F-values, which indicate the statistical significance of the empirical models, are 101.44 and 632.37 for Research Models 7 and 8, respectively, both of which show statistical significance at the 1% level. The adjusted R-squared (Adj-R^2) values, reflecting the explanatory power of the independent variables on the dependent variables, are 0.1979 for Model 7 and 0.6085 for Model 8. The maximum variance inflation factor (VIF) in both models is 1.24218, indicating a very low likelihood of multicollinearity.

In the analysis of Research Model 7, the coefficient for the primary independent variable, the debt increase/decrease level (LEV4), is -0.00311, which is statistically significant at the 1% level, indicating a negative relationship. Among the control variables, MTB, SIZE, ROA, and PPE exhibit statistically significant positive coefficients at the 1% level, while INT and AGE show statistically significant negative coefficients at the 1% level.

For Research Model 8, the coefficient for LEV4 is -0.0072, which is statistically significant at the 1% level, also indicating a negative relationship. Among the control variables, DON, MTB, SIZE, and ROA show statistically significant positive coefficients at the 1% level, while GRW, INT, and PPE exhibit statistically significant negative coefficients at the 5% and 1% levels.

The results presented in Table 7 suggest that changes in a firm's debt level (increase or decrease) act as a factor that reduces tax avoidance (DDBTD, BTD). These findings support Hypothesis 2 of this study, which posits that the level of debt increase or decrease in a firm is negatively related to tax avoidance. In other

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words, for listed firms in Korea, tax avoidance behavior decreases as the level of debt change increases.

Table 7.
Analysis of the relationship between debt increase/decrease level (LEV4) and tax avoidance (DDBTD, BTD).

Variable	<Research Model 7: DDBTD>				<Research Model 8: BTD>			
	Coefficient	t-Value	Pr > |t|	Variance Inflation Factor (VIF)	coefficient	t-Value	Pr > |t|	Variance Inflation Factor (VIF)
Intercept	0.06898	6.15	<.0001	0	-0.00651	-0.78	0.4367	0
LEV4	-0.00311	-7.03	<.0001	1.10124	-0.0072	-12.46	<.0001	1.24082
DON	0.06343	0.66	0.5079	1.01975	0.3684	5.15	<.0001	1.02016
MTB	0.00992	29.36	<.0001	1.20561	0.00695	25.73	<.0001	1.21581
SIZE	0.00103	2.94	0.0033	1.13033	0.00176	6.69	<.0001	1.1335
ROA	0.17224	34.23	<.0001	1.19187	0.50979	125.37	<.0001	1.18243
GRW	-0.00039	-0.45	0.6533	1.09482	-0.00074	-2.24	0.0249	1.02615
INT	-0.01753	-2.78	0.0054	1.0629	-0.09381	-15.21	<.0001	1.10019
PPE	0.00505	2.02	0.0434	1.12383	-0.04686	-23.91	<.0001	1.24218
AGE	-0.00449	-6.87	<.0001	1.17603	0.000479	0.99	0.3246	1.1833
Year Dummy	Included				Included			
Industry Dummy	Included				Included			
F-Value	101.44***				632.37***			
Adj-R^2	0.1979				0.6085			
Number of samples after removal of outliers	14,253				14,221			

Source: 1) Description of variables: See <Table 2>.
2) <Research model 7>: $DDBTD_{it} = \beta_0 + \beta_1 LEV4_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$
3) <Research Model 8>: $BTD_{it} = \beta_0 + \beta_1 LEV4_{it} + \beta_2 DON_{it} + \beta_3 MTB_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 GRW_{it} + \beta_7 INT_{it} + \beta_8 PPE_{it} + \beta_9 AGE_{it} + \beta_{10} \sum ID + \beta_{11} \sum YD + \varepsilon_{it}$

5. Conclusions

This study analyzes the impact of corporate debt levels on tax avoidance among firms listed on the Korean stock market from 2001 to 2023. In particular, this research examines how tax avoidance varies not only with the level of debt but also with the degree of changes in debt levels.

To achieve this, the study employs a total of eight research models for empirical analysis. Models 1, 2, 3, and 4 are used to examine the relationship between debt levels and corporate value, while Models 5, 6, 7, and 8 focus on evaluating the impact of changes in debt levels on corporate value.

The results of analyzing Models 1 through 4 reveal that, in all empirical analyses, debt serves as a factor that reduces tax avoidance (DDBTD, BTD). These findings support Hypothesis 1 of this study (that corporate debt levels have a negative (-) relationship with tax avoidance), suggesting that, for listed firms in Korea, tax avoidance behaviors decrease as the debt level increases.

The analysis of Models 5 through 8 shows that in all empirical results, changes in debt levels act as a factor that reduces tax avoidance (DDBTD, BTD). These results support Hypothesis 2 (that the level of increase or decrease in corporate debt has a negative (-) relationship with tax avoidance), meaning that tax avoidance decreases as the level of change in debt increases for firms listed on the Korean stock market.

These empirical findings are consistent with previous research that suggests a substitutive relationship between debt and tax avoidance [5, 6, 11, 17]. Furthermore, the results indicate that in firms listed on the Korean stock market, external debt financing increases internal cash flow and reduces tax liabilities through

interest payments, leading to a reduction in tax avoidance. This suggests that, similar to prior studies, firms generally use debt-based tax reduction policies in conjunction with other methods of tax avoidance.

This study contributes to the existing research by providing new insights into the use of debt as a tax avoidance strategy among firms listed on the Korean stock market. However, its primary limitation is that the analysis focuses solely on companies in the Korean capital market. To improve the generalizability of these findings, future studies should examine and compare firms from other capital markets, such as those in the United States, Japan, Europe, and China. Such comparative analyses would offer a broader perspective on the relationship between debt and tax avoidance across different economic and regulatory environments.

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The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

References

[1] E. F. Fama and K. R. French, "Taxes, financing decisions, and firm value," *The Journal of Finance*, vol. 53, no. 3, pp. 819-843, 1998. https://doi.org/10.1111/0022-1082.10029

[2] R. Greenwood, S. Hanson, and J. C. Stein, "A gap-filling theory of corporate debt maturity choice," *The Journal of Finance*, vol. 65, no. 3, pp. 993-1028, 2010. https://doi.org/10.1111/j.1540-6261.2010.01566.x

[3] V. M. González, "Leverage and corporate performance: International evidence," *International Review of Economics & Finance*, vol. 25, pp. 169-184, 2013. https://doi.org/10.1016/j.iref.2012.05.003

[4] J. Blouin, J. E. Core, and W. Guay, "Have the tax benefits of debt been overestimated?," *Journal of Financial Economics*, vol. 98, no. 2, pp. 195-213, 2010. https://doi.org/10.1016/j.jfineco.2010.03.001

[5] M. Bradley, G. A. Jarrell, and E. H. Kim, "On the existence of an optimal capital structure: Theory and evidence," *The Journal of Finance*, vol. 39, no. 3, pp. 857-878, 1984. https://doi.org/10.1111/j.1540-6261.1984.tb03680.x

[6] J. R. Graham, "How big are the tax benefits of debt?," *The Journal of Finance*, vol. 55, no. 5, pp. 1901-1941, 2000. https://doi.org/10.1111/0022-1082.00277

[7] C. F. Foley, J. C. Hartzell, S. Titman, and G. Twite, "Why do firms hold so much cash? A tax-based explanation," *Journal of Financial Economics*, vol. 86, no. 3, pp. 579-607, 2007. https://doi.org/10.1016/j.jfineco.2007.06.004

[8] S. R. Bond and M. P. Devereux, "Generalised R-based and S-based taxes under uncertainty," *Journal of Public Economics*, vol. 87, no. 5-6, pp. 1291-1311, 2003. https://doi.org/10.1016/S0047-2727(02)00084-1

[9] M. Guedrib and Z. Hamdi, "Investigating tax risk's influence on tax avoidance and debt costs: Evidence from France," *Journal of Financial Crime*, vol. 32, no. 2, pp. 321-336, 2024. https://doi.org/10.1108/JFC-03-2024-0111

[10] M. C. Jensen and W. H. Meckling, *Theory of the firm: Managerial behavior, agency costs and ownership structure* (Corporate governance). Gower. https://doi.org/10.1016/0304-405X(76)90026-X, 2019, pp. 77-132.

[11] J. R. Hines Jr and E. M. Rice, "Fiscal paradise: Foreign tax havens and American business," *The Quarterly Journal of Economics*, vol. 109, no. 1, pp. 149-182, 1994. https://doi.org/10.2307/2118443

[12] S. Claessens and S. Djankov, "Ownership concentration and corporate performance in the Czech Republic," *Journal of Comparative Economics*, vol. 27, no. 3, pp. 498-513, 1999. https://doi.org/10.1006/jcec.1999.1583

[13] S. O. Rego, "Tax-avoidance activities of US multinational corporations," *Contemporary Accounting Research*, vol. 20, no. 4, pp. 805-833, 2003. https://doi.org/10.1506/VANN-B7UB-GMFA-9E6W

[14] M. A. Desai, C. F. Foley, and J. R. Hines Jr, "A multinational perspective on capital structure choice and internal capital markets," *The Journal of Finance*, vol. 59, no. 6, pp. 2451-2487, 2004. https://doi.org/10.1111/j.1540-6261.2004.00706.x

[15] J. Mintz and M. Smart, "Income shifting, investment, and tax competition: theory and evidence from provincial taxation in Canada," *Journal of public Economics*, vol. 88, no. 6, pp. 1149-1168, 2004. https://doi.org/10.1016/j.jpubeco.2003.12.005

[16] M. A. Desai and D. Dharmapala, "Corporate tax avoidance and high-powered incentives," *Journal of Financial Economics*, vol. 79, no. 1, pp. 145-179, 2006. https://doi.org/10.1016/j.jfineco.2005.03.003

[17] J. R. Graham and A. L. Tucker, "Tax shelters and corporate debt policy," *Journal of Financial Economics*, vol. 81, no. 3, pp. 563-594, 2006. https://doi.org/10.1111/0022-1082.00277

[18] A. J. Weichenrieder and T. Klautke, "Taxes and the efficiency costs of capital distortions," CESifo Working Paper No. 2431, 2008.

[19] S. C. Kweon, Y. O. Kang, and K. H. Kim, "A study on the effects of tax shelters to corporate debt policy," *Korean Business Education Review*, vol. 53, pp. 129-152, 2009.

[20] S. C. Kweon, Y. O. Kang, and T. J. Lee, "A study on the effects of corporate debt policy to tax shelters," *Journal of Business Research* vol. 25, no. 2, pp. 115-133, 2010.

[21] Y. K. Lee, "Tax avoidance, financial flexibility, and debt financing," Doctoral Dissertation, Hanyang University, 2014.

[22] G. Richardson, G. Taylor, and R. Lanis, "The impact of financial distress on corporate tax avoidance spanning the global financial crisis: Evidence from Australia," *Economic Modelling*, vol. 44, pp. 44-53, 2015. https://doi.org/10.1016/j.econmod.2014.10.030

[23] J. K. Ko and H. J. Park, "Financial constraint, tax avoidance, and firms' use of operating cash flow," *Korean Accounting Journal*, vol. 26, no. 4, pp. 229-262, 2017.

[24] B. G. Kim and Y. J. Im, "The effect of cash on the relationship between cost of debt capital and tax avoidance," *Korea International Accounting Review*, vol. 97, pp. 81-102, 2021. https://doi.org/10.21073/kiar.2021..97.004

[25] N. Medhioub and S. Boujelbene, "Tax avoidance and cost of debt: does integrated report assurance matter?," *Journal of Accounting in Emerging Economies*, vol. 14, no. 1, pp. 75-98, 2024. https://doi.org/10.1108/JAEE-04-2022-0114

[26] J. P. Sánchez-Ballesta and J. Yagüe, "Tax avoidance and debt maturity in SMEs," *Journal of International Financial Management & Accounting*, vol. 35, no. 2, pp. 429-464, 2024. https://doi.org/10.1111/jifm.12201

[27] S. S. Park, "The influence of corporate governance on book-tax earnings difference," Doctoral Dissertation, Chung-Ang University, 2004.

[28] S. T. Kim, P. S. Kim, and D. M. Shin, "Discretionary R&D expenditure and tax avoidance – focus on R&D tax relief," *Journal of Tax Studies*, vol. 19, no. 4, pp. 101-130, 2019.

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