International Symposium on Green Innovation, Governance, and Sustainability
Vol. 4 No. 1 | 2026
E-ISSN 3047 - 1877

The Dynamics of Leverage on Tax Avoidance in Indonesia: The Moderating Roles of Investment Opportunity Set and Dividend Policy

Elsa Nur Khabibah[1], and *Dian* Anita Nuswantara[2]

[1]Department of Accounting, Faculty of Economics and Business, Universitas Negeri Surabaya, Indonesia
[2]Department of Accounting, Faculty of Economics and Business, Universitas Negeri Surabaya, Indonesia
[3]Department of Accounting, Faculty of Economics and Business, Universitas Negeri Surabaya, Indonesia

Abstract. This study examines the relationship between leverage and tax avoidance and investigates the moderating roles of investment opportunity set (IOS) and dividend policy. The sample consists of 38 non-financial companies included in the LQ45 index of the Indonesia Stock Exchange during 2022–2025, resulting in 152 firm-year observations selected through purposive sampling. Tax avoidance is measured using the Cash Effective Tax Rate (CETR), leverage is proxied by the Debt-to-Equity Ratio (DER), IOS is measured using Market-to-Book Value of Equity (MVEBVE), and dividend policy is represented by the Dividend Payout Ratio (DPR), with Return on Assets (ROA) included as a control variable. This study employs pooled fractional probit quasi-maximum likelihood estimation (QMLE) with a Correlated Random Effects (CRE) specification based on the Mundlak approach. Standard errors are clustered at the firm level. The results indicate that leverage has a negative and statistically significant coefficient on CETR ($\beta = -0.2669$; $p = 0.012$), consistent with a positive association between leverage and tax avoidance. IOS does not significantly moderate this relationship ($\beta = -0.0021$; $p = 0.860$). In contrast, the interaction between leverage and dividend policy is positive and statistically significant ($\beta = 0.4337$; $p < 0.001$), supporting the moderating role of dividend policy in the hypothesized direction. Furthermore, the joint Wald test confirms the significance of the firm-specific mean terms ($\chi^2 = 17.08$; $p = 0.009$), supporting the relevance of the CRE specification. These findings highlight the importance of dividend policy in understanding the relationship between corporate financing decisions and tax avoidance.

Keywords: Tax avoidance; Leverage; Investment opportunity set; Dividend policy; Fractional probit.

[11]Corresponding author: elsa.23441@mhs.unesa.ac.id

1 Introduction

Tax revenue is essential for government financing and national development. However, Indonesia's tax ratio declined from 10.39% in 2022 to 9.31% in 2025 despite increasing nominal tax receipts [1]. This highlights the importance of corporate tax avoidance, which can reduce tax contributions through tax planning strategies [2].

Leverage may encourage tax avoidance because interest expenses reduce taxable income through tax-shield benefits. However, previous findings on this relationship remain inconsistent [3–5]. This suggests that other firm characteristics may influence the relationship.

This study examines the moderating roles of investment opportunity set (IOS) and dividend policy. IOS reflects future growth opportunities and potential financing needs[6], while dividend policy concerns earnings distribution and may constrain managerial discretion over available funds [7].

Despite previous research on leverage and tax avoidance, evidence regarding the moderating roles of IOS and dividend policy remains limited, particularly among LQ45 companies. Therefore, this study investigates the effect of leverage on tax avoidance and the moderating roles of IOS and dividend policy in non-financial LQ45 companies listed on the Indonesia Stock Exchange during 2022–2025.

2 Literature review and hypothesis development

2.1 Agency theory and signaling theory

Agency theory describes the contractual relationship between principals, such as shareholders, and agents, such as managers. Because managers may have objectives and risk preferences that differ from those of shareholders, information asymmetry and conflicts of interest can arise [8]. Financing choices, investment decisions, dividend distributions, and tax strategies are among the managerial decisions that may be shaped by these agency considerations. In this study, leverage and tax avoidance are considered decisions that may reflect management's effort to preserve company resources, while dividend policy may function as a monitoring mechanism that limits discretionary cash available to managers.

Signaling theory explains how management actions communicate information about a firm's condition and prospects to external parties [9]. Dividend payments can serve as a positive signal of earnings quality and managerial confidence in the company's future performance [10]. Maintaining dividend payments may also strengthen investor confidence in the company.

2.2 Leverage and tax avoidance

Leverage represents the extent to which a company uses debt to finance its assets and operations. Interest expenses arising from debt may reduce taxable income and create a tax shield, which can encourage companies to use debt as part of their tax planning. In Indonesia, the deductibility of borrowing costs is also subject to applicable thin-capitalization provisions, including the debt-to-equity limitation under Minister of Finance Regulation No. 169/PMK.010/2015 for taxpayers covered by the regulation [11]. Consequently, the tax benefit of debt financing is not unlimited. Prior empirical studies have produced inconsistent findings, leaving the expected relationship open to further testing. Based on the tax-shield argument, this study proposes:

H1: Leverage has a positive effect on tax avoidance.

2.3 The moderating role of investment opportunity set

IOS represents the value of a firm's future investment and growth opportunities beyond its existing assets [6]. Firms with high IOS may face greater funding requirements as they seek to pursue new projects and expand operations. When such firms also have high leverage, managers may have incentives to preserve internal funds by managing cash tax payments. Investment opportunities may therefore strengthen the relationship between leverage and tax avoidance. This argument is consistent with the view that investment opportunities and corporate characteristics can shape tax-related decisions [12]. The second hypothesis is:

H2: IOS strengthens the positive effect of leverage on tax avoidance.

2.4 The moderating role of dividend policy

Dividend policy determines the proportion of earnings distributed to shareholders rather than retained in the company. Dividend payments can reduce free cash flow under managerial control and provide a signal regarding earnings quality and the company's prospects [7]. A firm that seeks to maintain investor confidence through dividend distributions may be more cautious about aggressive tax strategies that could damage its reputation. Thus, dividend policy is expected to weaken the relationship between leverage and tax avoidance. The third hypothesis is:

H3: Dividend policy weakens the positive effect of leverage on tax avoidance.

2 Research method

3.1 Research design, population, and sample

This study uses a quantitative approach with a causal research design. The population comprises companies included in the LQ45 index of the Indonesia Stock Exchange during 2022–2025. The sample is selected using non-probability purposive sampling based on the availability and comparability of financial and market data. Financial and banking companies are excluded because their capital structures and applicable debt regulations differ from those of non-financial companies. Firms must also have been listed before 2022, publish complete audited annual financial statements, report positive earnings before tax, provide complete data for all research variables, and have CETR values between zero and one.

The screening process began with 68 company entries appearing in the LQ45 during the observation period. After applying the criteria, 38 companies remained. With four annual observations for each company, the final dataset consists of 152 firm-year observations.

Table 1. Sample selection criteria

No	Sample selection criteria	Number
1.	Companies included in LQ45 during the observation period	68
2.	Financial and banking companies excluded	-8
3.	Companies conducting an IPO during 2022–2025	-9
4.	Companies without complete audited annual reports	0

No	Sample selection criteria	Number
5.	Companies with non-positive earnings before tax	-7
6.	Companies with incomplete research-variable data	0
7.	Companies with CETR outside the 0–1 range	-6
	Final sample	38
	Observation period (years)	4
	Total firm-year observations	152

3.2 Data sources and variable measurement

The study uses secondary data obtained from audited annual financial statements, company annual reports, Indonesia Stock Exchange fact sheets, general meeting of shareholders information, and other official company disclosures. IOS is measured using MVEBVE, a market-to-book proxy consistent with the market-based approach to assessing investment opportunities in prior IOS research [6]. Leverage is the independent variable, tax avoidance is the dependent variable, IOS and dividend policy are the moderating variables, and profitability is included as a control variable. The operational definitions and measurements are presented in Table 2.

Table 2. Variable and proxy

Variable	Role	Proxy and measurement
Leverage	Independent	$DER = \frac{Total\ Liabilities}{Total\ Equity}$
Tax Avoidance	Dependent	$CETR = \frac{Cash\ Tax\ Paid}{Earnings\ Before\ Tax}$
Investment Opportunity Set	Moderator 1	$MVEBVE = \frac{(Number\ of\ Outstanding\ Shares\ x\ Closing\ Price)}{Total\ Equity}$
Dividend policy	Moderator 2	$Dividend\ Payout\ Ratio = \frac{Dividends\ Per\ Share}{Earning\ Per\ Share}$
Profitability	Control	$Return\ on\ Total\ Assets\ (ROA) = \frac{Net\ income}{Total\ assets}$

A lower CETR indicates a higher level of tax avoidance because it represents a smaller cash tax payment relative to pre-tax earnings. This inverse interpretation is important when interpreting the signs of the estimated coefficients.

3.3 Data analysis and empirical models

This study employs a fractional probit quasi-maximum likelihood estimation (QMLE) using Stata 17 to account for the bounded nature of the dependent variable, Cash Effective Tax Rate (CETR 0 - 1), following Papke and Wooldridge (2008). To address unobserved firm-specific heterogeneity, a Correlated Random Effects (CRE) specification is applied via the Mundlak–Chamberlain approach by incorporating firm-specific time averages of all time-varying explanatory variables and interaction terms [13, 14]. The baseline model (1) and the extended moderation model (2) are specified as follows:

$$E(CETR_i \square \mid X_i, \bar{X}_i) = \Phi(\alpha + \beta_1 LEV_i \square + \beta_2 IOS_i \square + \beta_3 DPR_i \square + \beta_4 ROA_i \square + \theta_1 \underline{LEV}_i \quad (1)$$

$$+ \theta_2 \underline{IOS}_i + \theta_3 \underline{DPR}_i + \theta_4 \underline{ROA}_i$$

$$E(CETR_i \square \mid X_i, \bar{X}_i) = \Phi(\alpha + \beta_1 LEV_i \square + \beta_2 IOS_i \square + \beta_3 DPR_i \square + \beta_4 (LEV \times IOS)_i \square + \beta_5 (LEV \times DPR)_i \square + \beta_6 ROA_i \square + \theta_1 \underline{LEV}_i + + \theta_2 \underline{IOS}_i + \theta_3 \underline{DPR}_i + \theta_4 \underline{ROA}_i + \theta_5 \underline{(LEV \times IOS)}_i + \theta_6 \underline{(LEV \times DPR)}_i) \quad (2)$$

where i denotes the company and t denotes the year; Φ represents the cumulative distribution function of the standard normal distribution; X_i represents the set of explanatory variables across the observed periods; and $\bar{X}_i$ represents their respective firm-specific time averages. The β coefficients represent the coefficients of the contemporaneous explanatory variables in the fractional probit index, whereas the θ coefficients capture the association between the firm-specific time averages and the conditional mean index.

The models are estimated using the pooled Bernoulli quasi-maximum likelihood procedure, commonly referred to as the pooled fractional probit estimator (PFP). Standard errors are clustered at the firm level to account for potential heteroskedasticity and arbitrary serial correlation within firms over time. The joint significance of the firm-specific time-average terms is examined using a Wald test to assess the relevance of the correlated random effects specification.

Hypotheses are evaluated at a 5% significance level based on robust z-statistics and their associated p-values. A coefficient is considered statistically significant when its p-value is below 0.05.

4. Results and discussion

4.1 Descriptive statistics

Table 3. Descriptive Statistics

Variable	N	Min	Max	Mean	Std. Dev.
TA	152	0.0036	0.8685	0.3077	0.1858
LEV	152	0.0882	3.9284	0.9788	0.8855
IOS	152	0.1696	39.8285	2.8789	5.5050
DPR	152	0.0000	1.7284	0.5078	0.3675
ROA	152	0.0100	0.3817	0.0970	0.0739

Table 4.1 presents the descriptive statistics for 152 firm-year observations. The mean CETR of 0.3077 indicates that the sample firms paid approximately 30.77% of their pretax income in cash taxes. Meanwhile, the mean LEV of 0.9788 suggests that the firms' debt levels were nearly equivalent to their equity levels. The mean IOS of 2.8789, DPR of 0.5078, and ROA of 0.0970 provide an overview of the sample firms' investment opportunities, dividend distribution, and profitability. The minimum and maximum values, together with the standard deviations, further indicate variation in these characteristics across firms and periods. All CETR observations fall within the 0–1 range, supporting the use of a fractional response estimation approach.

4.2 Fractional probit estimation results with correlated random effects

Table 1.4 Fractional Probit Estimation Results with Correlated Random Effects

Variable	Coefficient	Std. Error	z-statistic	p-value
Explanatory variables				

LEV	-0.2669	0.1066	-2.50	0.012
IOS	-0.0158	0.0473	-0.33	0.739
DPR	-0.2146	0.2100	-1.02	0.307
LEV × IOS	-0.0021	0.0120	-0.18	0.860
LEV × DPR	0.4337	0.0769	5.64	<0.001
ROA	-3.5240	1.1233	-3.14	0.002
Mundlak terms (firm-specific means)				
Mean LEV	0.3162	0.1902	1.66	0.096
Mean IOS	-0.0243	0.0487	-0.50	0.618
Mean DPR	0.6896	0.3546	1.95	0.052
Mean ROA	3.2151	1.5225	2.11	0.035
Mean LEV × IOS	0.0006	0.0138	0.04	0.965
Mean LEV × DPR	-0.1485	0.3618	-0.41	0.682
Constant	-0.7971	0.2169	-3.68	<0.001
Model statistics				
Observations	152			
Number of firms (clusters)	38			
Wald chi-square	117.22			
Prob > chi-square	<0.001			
Pseudo R-squared	0.0329			
Log pseudolikelihood	-90.743			

The fractional probit estimation results indicate that the explanatory variables are jointly significant (Wald $\chi^2 = 117.22$; $p < 0.001$). Leverage (LEV) has a negative and statistically significant coefficient (-0.2669; $p = 0.012$), suggesting a negative relationship with the conditional probit index of CETR. Given the inverse relationship between CETR and tax avoidance, this result is consistent with a higher indication of tax avoidance as leverage increases. However, the effect of leverage on the expected CETR depends on the levels of IOS and DPR due to the interaction terms. IOS (-0.0158; $p = 0.739$) and DPR (-0.2146; $p = 0.307$) show no statistically significant direct associations with the conditional probit index. Similarly, the LEV × IOS interaction is insignificant (-0.0021; $p = 0.860$), providing insufficient evidence of a moderating effect. In contrast, the LEV × DPR interaction is positive and significant (0.4337; $p < 0.001$), indicating that the conditional probit index slope of leverage becomes more positive as DPR increases.

Regarding the control and correlated random effects components, ROA has a negative and significant coefficient (-3.5240; $p = 0.002$), while Mean ROA is positive and significant (3.2151; $p = 0.035$). Among the firm-specific mean terms, only Mean ROA is individually significant, while the other firm-specific mean coefficients are insignificant. Their joint significance is further examined through the Mundlak test.

4.3 Correlated random effects (Mundlak) test

Table 1.5 Joint Wald Test of Mundlak Terms

Test	Null hypothesis	Chi-square	df	p-value	Decision (5%)

Joint Wald test of firm-specific means	All six Mundlak mean coefficients = 0	17.08	6	0.0090	Reject H_0

The joint Wald test of the firm-specific time-average variables produces a chi-square statistic of 17.08 with six degrees of freedom and a p-value of 0.0090. Since the p-value is below the 5% significance level, the null hypothesis that all firm-specific mean coefficients are jointly equal to zero is rejected.

This finding indicates that the firm-specific time averages of the explanatory variables are jointly statistically significant in the fractional probit specification. It provides evidence that unobserved firm-specific heterogeneity may be correlated with the explanatory variables. Therefore, incorporating the firm-specific time averages through the Mundlak approach is empirically relevant to the correlated random effects specification.

The result supports the use of a correlated random effects framework rather than relying solely on the conventional assumption of independence between unobserved firm-specific effects and the explanatory variables. Nevertheless, the joint Wald test does not establish all distributional and exogeneity assumptions of the fractional response model, which remain necessary for the validity of the estimation procedure.

4.4 Hypothesis testing

4.4.1 The effect of leverage on tax avoidance (H1)

The fractional probit estimation reveals that leverage (LEV) has a negative and statistically significant coefficient of -0.2669 (p = 0.012). Since tax avoidance is proxied by the Cash Effective Tax Rate (CETR), a lower CETR indicates a higher level of tax avoidance. Therefore, the negative coefficient indicates that higher leverage is associated with a higher indication of tax avoidance. This finding is consistent with the proposed hypothesis that leverage positively affects tax avoidance. Accordingly, H1 is supported. This finding is consistent with Paramita et al. (2023), who found that leverage negatively affects CETR, indicating that higher leverage is associated with lower cash effective tax rates and a higher level of tax avoidance.

4.4.2 The moderating role of investment opportunity set (H2)

The interaction between leverage and investment opportunity set (LEV × IOS) produces a negative coefficient of -0.0021, with a p-value of 0.860. Although the coefficient indicates a negative direction, the interaction is not statistically significant at the 5% significance level. Therefore, there is insufficient empirical evidence to conclude that investment opportunity set strengthens the relationship between leverage and tax avoidance. Accordingly, H2 is not supported.

This finding can be compared with Firmansyah et al. [12], who examined the relationship between investment opportunity sets and tax avoidance among Indonesian manufacturing companies. Their findings indicate that investment opportunity sets positively affect tax avoidance. However, their study examined the moderating role of corporate social responsibility disclosure in the relationship between investment opportunity sets and tax avoidance, rather than the moderating role of IOS in the leverage-tax avoidance relationship.

The difference in the moderation structure suggests that the direct relevance of investment opportunity sets to tax avoidance does not necessarily translate into a significant

moderating effect on the relationship between leverage and tax avoidance. Thus, the current findings do not provide sufficient evidence to support the proposed moderating role of IOS.

4.4.3 The moderating role of dividend policy (H3)

The interaction between leverage and dividend payout ratio (LEV × DPR) produces a positive and statistically significant coefficient of 0.4337 ($p < 0.001$). This finding indicates that dividend policy significantly interacts with leverage in explaining the fractional probit index of CETR. Considering that lower CETR values indicate higher tax avoidance, the positive interaction coefficient suggests that dividend policy offsets the negative relationship between leverage and CETR. Thus, higher dividend payout ratios are associated with a weaker negative relationship between leverage and CETR, which is consistent with the proposed hypothesis that dividend policy weakens the relationship between leverage and tax avoidance. Accordingly, H3 is supported based on the estimated interaction coefficient.

This finding is consistent with Rizky and Zahroh [15], who examined the moderating role of dividend policy in the relationship between leverage and tax avoidance among Indonesian state-owned enterprises. Their study found that dividend policy negatively moderates the relationship between leverage and tax avoidance, with a significance level of 0.033. The authors concluded that dividend policy weakens the effect of leverage on tax avoidance.

The consistency between these findings highlights the relevance of dividend policy in understanding the relationship between corporate financing decisions and tax avoidance. In particular, dividend distribution may serve as a mechanism through which companies maintain shareholder confidence and influence managerial financial decisions.

5 Conclusion

This study examines the relationship between leverage and tax avoidance, with investment opportunity set and dividend policy as moderating variables. Using the pooled fractional probit model with a Correlated Random Effects (Mundlak) specification, the findings indicate that leverage is negatively associated with CETR, supporting its positive relationship with tax avoidance. However, IOS does not significantly moderate this relationship, while dividend policy exhibits a positive and significant moderating effect, indicating that it weakens the negative relationship between leverage and CETR. These findings highlight the importance of considering dividend policy when examining the relationship between corporate financing decisions and tax avoidance.

The author gratefully acknowledges the academic guidance and constructive feedback provided by Prof. Dr. Dian Anita Nuswantara, S.E., M.Si., Ak., CA. during the research process. Appreciation is also extended to the Department of Accounting and the Faculty of Economics and Business, Universitas Negeri Surabaya, for their academic support.

References

1. M. Wildan, Tax Ratio 2025 Hanya Sebesar 9,31% dari PDB. DDTCNews. (2026). https://news.ddtc.co.id/berita/nasional/1817160/tax-ratio-2025-hanya-sebesar-931-dari-pdb
2. M. Hanlon, S. Heitzman, A review of tax research. J. Account. Econ. **50**, 127–178 (2010). https://doi.org/10.1016/j.jacceco.2010.09.002
3. S. L. Dewi, R. M. Oktaviani, Pengaruh Leverage, Capital Intensity, Komisaris

Independen Dan Kepemilikan Institusional Terhadap Tax Avoidance. Akurasi J. Stud. Akunt. dan Keuang. **4**, 179–194 (2021). https://doi.org/10.29303/akurasi.v4i2.122

4. Y. Hendayana, M. Arief Ramdhany, A. S. Pranowo, R. Abdul Halim Rachmat, E. Herdiana, Exploring impact of profitability, leverage and capital intensity on avoidance of tax, moderated by size of firm in LQ45 companies. Cogent Bus. Manag. **11** (2024). https://doi.org/10.1080/23311975.2024.2371062
5. A. S. Paramita, M. N. Ardiansah, R. A. Delyuzar, A. Dzulfikar, The Analysis of Leverage, Return on Assets, and Firm Size on Tax Avoidance. Account. Anal. J. **11**, 186–195 (2023). https://doi.org/10.15294/aaj.v11i3.61617
6. J. J. Gaver, K. M. Gaver, Additional evidence on the association between the investment opportunity set and corporate financing, dividend, and compensation policies. J. Account. Econ. **16**, 125–160 (1993). https://doi.org/10.1016/0165-4101(93)90007-3
7. J. Lintner, Distribution of Incomes of Corporations Among Dividends, Retained Earnings, and Taxes. Source: The American Economic Review. (1956). http://www.jstor.org/stable/1910664
8. M. C. Jensen, W. H. Meckling, Theory of the firm: Managerial behavior, agency costs and ownership structure. J. financ. econ. **3**, 305–360 (1976). https://doi.org/10.1016/0304-405X(76)90026-X
9. Spence. A. M., *Market signaling informational transfer in hiring and related screening processes*. Harvard University Press (1974)
10. M. Siladjaja, Y. Anwar, I. Djan, The Relationship between Dividend Policy and Earnings Quality: The Role of Accounting Information in Indonesia's Capital Market. **10**, 140 (2022). https://doi.org/10.3390/economies10060140
11. Menteri Keuangan Republik Indonesia, *Peraturan Menteri Keuangan Republik Indonesia*. (2015). www.jdih.kemenkeu.go.id
12. A. Firmansyah, A. Arham, R. A. Qadri, P. Wibowo, F. Irawan, N. A. Kustiani, S. Wijaya, A. F. Andriani, Z. Arfiansyah, L. Kurniawati, A. Mabrur, A. Dinarjito, R. Kusumawati, M. L. Mahrus, Political connections, investment opportunity sets, tax avoidance: does corporate social responsibility disclosure in Indonesia have a role? Heliyon. (2022). https://doi.org/10.1016/j.heliyon.2022.e10155
13. L. E. Papke, J. M. Wooldridge, Panel data methods for fractional response variables with an application to test pass rates. J. Econom. **145**, 121–133 (2008). https://doi.org/10.1016/j.jeconom.2008.05.009
14. J. M. Wooldridge, *Econometric Analysis of cross section and panel data*. The MIT Press, London, England (2010)
15. T. A. Rizky, F. Zahroh, Tax avoidance determinants: the role of dividend policy as moderating variable. J. Akad. Akunt. **7**, 593–608 (2024). https://doi.org/10.22219/jaa.v7i4.37305