

Prosperia: Journal of Economic Development, Accounting, and Global Markets
Vol 1 No 4 November 2026, Hal 120-132
ISSN: 3125-117x (Print) ISSN: 3125-1181 (Electronic)
Open Access: https://sovereignresearch.org/prosperia

The Effect of Profitability, Leverage, and Institutional Ownership on Tax Avoidance (An Empirical Study: Energy Sector Companies on the Indonesia Stock Exchange, 2021-2025)

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Article Info :
Received:
29-08-2026
Revised:
28-10-2026
Accepted:
06-11-2026

Abstract

This study examines the effect of profitability, leverage, and institutional ownership on tax avoidance in energy sector companies listed on the Indonesia Stock Exchange (IDX) during 2021–2025. Motivated by fluctuating energy-sector revenue and inconsistent empirical findings, the study evaluates financial and ownership determinants of corporate tax behavior. Annual financial statements from 40 companies selected through purposive sampling yielded 184 firm-year observations in an unbalanced panel. Tax avoidance was measured as one minus the Cash Effective Tax Rate (CETR), profitability using Return on Assets, leverage using the Debt to Equity Ratio, and institutional ownership as the proportion of shares held by institutions. Chow, Hausman, and Lagrange Multiplier tests supported Random Effect Model estimation. Profitability showed a positive significant association with tax avoidance ($\beta = 0.2822$; $p = 0.0080$), supporting H1. Leverage exhibited a negative significant association ($\beta = -0.0376$; $p = 0.0072$), contrary to H2. Institutional ownership was not significant ($\beta = 0.0677$; $p = 0.3553$), leaving H3 unsupported. The predictors were jointly significant ($F = 6.8712$; $p = 0.0002$), supporting H4, but explained only 8.78% of variation. These findings inform sector-specific tax oversight and investor assessments, while limited explanatory power, non-normal residuals, and the exclusion of loss-making companies warrant cautious interpretation and restrict generalizability.

Keywords: *Energy Sector, Institutional Ownership, Leverage, Profitability, Tax Avoidance.*

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INTRODUCTION

Corporate tax avoidance remains a significant concern in contemporary economic development because the ability of governments to finance public expenditure depends partly on the effectiveness of corporate tax collection. The increasing complexity of business operations, financial arrangements, and cross-border transactions has created opportunities for corporations to manage their tax obligations through strategies that may comply with formal regulations while reducing effective tax payments (Duhoon & Singh, 2023). Research on emerging economies emphasizes that corporate tax avoidance is influenced by financial incentives, regulatory environments, and organizational characteristics that shape corporate tax behavior (Hossain et al., 2024). Indonesia faces particular challenges in maintaining corporate tax compliance because companies operate across industries with substantially different financial structures and exposure to economic fluctuations. The energy sector deserves specific attention because its capital-intensive operations, international transactions, and dependence on commodity prices create complex conditions for financial management and tax planning. Concerns regarding corporate tax practices in this sector have been illustrated by research examining alleged tax avoidance arrangements involving PT Adaro Energy Tbk, particularly those associated with transactions between affiliated companies (Wahyuningtias et al., 2025). These conditions establish the relevance of examining whether profitability, leverage, and institutional ownership explain variations in tax avoidance among energy-sector companies listed on the Indonesia Stock Exchange during 2021–2025.

Existing research has progressively examined corporate tax avoidance through financial characteristics and governance mechanisms, particularly the relationships between corporate profitability, financing decisions, and managerial incentives. The empirical literature indicates that

profitability and leverage represent fundamental financial determinants because corporate earnings and debt structures influence taxable income and the incentives associated with tax planning (Prasetya & Muid, 2022). Investigations incorporating financial distress further demonstrate that the relationship between profitability and tax avoidance cannot be separated entirely from companies' financial conditions and financing obligations (Fadhila & Andayani, 2022). Research integrating capital intensity with profitability and leverage has extended this discussion by considering how investment characteristics and financing structures contribute to corporate tax behavior (Setyaningsih et al., 2023). Corporate governance research introduces another dimension by demonstrating that ownership structures and governance reforms are relevant to understanding differences in managerial tax decisions (Kerr et al., 2024). These research streams collectively suggest that corporate tax avoidance should be examined through an integrated framework incorporating financial performance, capital structure, and ownership-based monitoring rather than through isolated financial indicators.

Despite these developments, empirical findings regarding the determinants of corporate tax avoidance remain inconsistent, particularly concerning the direction and significance of financial and ownership-related relationships. Research investigating profitability and leverage has identified positive relationships with tax avoidance, suggesting that higher earnings and greater reliance on debt financing may strengthen incentives to reduce corporate tax obligations (Prasetya & Muid, 2022). Contrasting evidence indicates that profitability may exhibit a negative relationship with tax avoidance while leverage demonstrates a positive association, revealing that the two financial characteristics do not necessarily operate through identical mechanisms (Fadhila & Andayani, 2022). Investigations incorporating sales growth and company size further indicate that the explanatory relevance of financial characteristics may differ across empirical specifications and corporate samples (Tanjaya & Nazir, 2021). The simultaneous examination of profitability, leverage, and institutional ownership has previously been undertaken, demonstrating that the proposed combination of explanatory variables is not itself an unexplored research model (Sari & Kinasih, 2021). Nevertheless, the extent to which these relationships remain applicable to energy-sector companies during 2021–2025, particularly when tax avoidance is assessed using actual cash tax payments, remains insufficiently established by the studies considered. The resulting research gap is therefore primarily contextual and measurement-oriented, concerning the applicability of established financial and governance relationships to a specific industry, observation period, and tax avoidance indicator.

Addressing this research gap has both scientific and practical significance because differences in corporate financial structures may produce variations in tax avoidance that cannot be explained adequately through general cross-industry findings. Institutional ownership constitutes a particularly relevant governance mechanism because institutional investors may exercise monitoring functions and influence managerial incentives associated with corporate tax decisions (Pujiningsih & Salsabyla, 2022). Evidence linking corporate governance reforms with tax avoidance further supports the need to examine whether ownership-related monitoring contributes to explaining corporate tax behavior alongside financial characteristics (Kerr et al., 2024). The relevance of this investigation increases in the Indonesian energy sector, where research on corporate tax avoidance practices has raised questions concerning the transparency and accountability of tax-related business arrangements (Wahyuningtias et al., 2025). Without sector-specific empirical evidence, interpretations of the relationship between corporate financial performance and tax avoidance may overlook differences in operating risks, financing requirements, and governance arrangements. The broader literature on corporate tax avoidance in emerging economies reinforces the scientific importance of examining financial and institutional factors within their particular economic settings rather than assuming that findings can be transferred uniformly across industries (Hossain et al., 2024).

The present study positions itself within the empirical literature on corporate tax avoidance by integrating profitability, leverage, and institutional ownership into a single analytical model applied specifically to energy-sector companies listed on the Indonesia Stock Exchange during 2021–2025. Previous research has examined these three determinants simultaneously, providing an established empirical foundation while leaving opportunities to evaluate their relationships in different industrial settings and observation periods (Sari & Kinasih, 2021). The selection of energy-sector companies is supported by earlier investigations highlighting corporate tax avoidance concerns within Indonesia's energy industry, making the sector a substantively relevant setting rather than an arbitrary extension of existing research (Wahyuningtias et al., 2025). A further methodological distinction involves the

application of the Cash Effective Tax Rate (CETR), calculated as cash taxes paid relative to pretax income, to represent the cash-based dimension of corporate tax avoidance. This measurement approach emphasizes actual tax payments rather than relying exclusively on income tax expenses reported under accrual accounting, although the interpretation of CETR must account for differences in profitability and the timing of tax payments. The inclusion of institutional ownership strengthens the analytical model by incorporating a monitoring mechanism previously examined in relation to foreign institutional investors and managerial incentives (Pujiningsih & Salsabyla, 2022). The proposed contribution consequently lies in evaluating established financial and governance determinants within a sector-specific, five-year, cash-based empirical framework, consistent with the continuing emphasis on governance mechanisms in corporate tax research (Kerr et al., 2024).

This study aims to empirically examine the effects of profitability, leverage, and institutional ownership on tax avoidance among energy-sector companies listed on the Indonesia Stock Exchange during the 2021–2025 period. The investigation evaluates the individual effects of these three independent variables and their simultaneous explanatory relationship with corporate tax avoidance measured through CETR. The examination of profitability is justified by existing evidence indicating that corporate earnings constitute a relevant determinant of tax avoidance, although the direction of the relationship has not been consistently established (Fadhila & Andayani, 2022). The analysis of leverage focuses on the relationship between debt financing and corporate tax behavior, building upon previous empirical research incorporating capital structure into explanations of tax avoidance (Setyaningsih et al., 2023). Institutional ownership is examined to determine whether ownership-based monitoring contributes to explaining corporate tax avoidance, considering previous evidence connecting institutional investors with managerial tax-related incentives (Pujiningsih & Salsabyla, 2022). The findings are expected to contribute sector-specific empirical evidence to accounting and taxation research while providing an analytical basis for corporate stakeholders, investors, and policymakers to evaluate the relationships between financial characteristics, ownership structures, and corporate tax behavior.

RESEARCH METHODS

This study employed a quantitative causal research design to examine the effects of profitability, leverage, and institutional ownership on corporate tax avoidance, adopting the explanatory variables previously investigated by Sari and Kinasih (2021). Secondary data were collected through documentary analysis of annual financial statements of energy-sector companies listed on the Indonesia Stock Exchange (IDX) during 2021–2025, including statements of financial position, profit or loss, cash flows, and related tax disclosures. The population comprised 91 companies, with purposive sampling excluding 18 companies that were not continuously listed or entered through initial public offerings during the observation period, 27 companies reporting losses in at least one year, and six companies with incomplete financial data, resulting in 40 sampled companies. The initial 200 firm-year observations were reduced by excluding 16 observations with Cash Effective Tax Rate (CETR) values below zero or above one, producing an unbalanced panel of 184 observations, while observations with CETR equal to one were retained. Tax avoidance was measured as $TA = 1 - CETR$, with CETR calculated by dividing cash income tax payments by pretax income, whereas profitability was measured using Return on Assets (ROA), calculated as net income after tax divided by total assets (Kasmir, 2019). Leverage was measured using the Debt to Equity Ratio (DER), calculated as total liabilities divided by total equity, while institutional ownership (IO) represented the proportion of outstanding shares held by institutional investors, reflecting the ownership dimension examined by Pujiningsih and Salsabyla (2022).

Table 1. Sample Selection Criteria

No.	Selection Criteria	Number of Firms/Observations
1	Energy-sector companies listed on the IDX during 2021–2025	91
2	Companies not continuously listed or newly listed through IPO	(18)
3	Companies reporting losses in at least one study year	(27)
4	Companies with incomplete ROA, DER, IO, or CETR data	(6)

Final sample	**40**
Initial observations (40 firms × 5 years)	200
Observations excluded due to CETR below 0 or above 1	(16)
Final observations	**184**

Source: Indonesia Stock Exchange (www.idx.co.id), processed by the authors (2026).

Data processing was conducted using Microsoft Excel for variable calculation and dataset preparation, while EViews 12 was employed for panel-data regression analysis incorporating the financial determinants examined in previous tax avoidance research (Prasetya & Muid, 2022). Descriptive statistics summarized the minimum, maximum, mean, and standard deviation of each variable, followed by estimation of the regression equation $TA_{it} = \alpha + \beta_1 ROA_{it} + \beta_2 DER_{it} + \beta_3 IO_{it} + \varepsilon_{it}$, where i denotes companies and t represents observation years. Model specification considered the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM), following established principles of panel-data estimation (Wooldridge, 2016). Model selection employed the Chow test to compare CEM and FEM, the Hausman test to compare FEM and REM, and the Breusch–Pagan Lagrange Multiplier test to compare CEM and REM, applying a significance threshold of 0.05. Diagnostic procedures included the Jarque–Bera test for residual normality, with p-values above 0.05 indicating no rejection of normality, and an independent-variable correlation matrix using an absolute correlation threshold of 0.80, while separate heteroskedasticity and autocorrelation tests were not conducted and the REM was estimated using Generalized Least Squares (GLS). Hypothesis testing applied partial t-tests, an overall F-test, and the adjusted coefficient of determination (Adjusted R^2) at a 5% significance level to evaluate the individual and simultaneous effects of profitability, leverage, and institutional ownership on tax avoidance, consistent with the explanatory relationships investigated by Fadhila and Andayani (2022).

Hypothesis Development

H1: Profitability has a positive effect on tax avoidance among energy-sector companies listed on the Indonesia Stock Exchange during 2021–2025.

H2: Leverage has a positive effect on tax avoidance among energy-sector companies listed on the Indonesia Stock Exchange during 2021–2025.

H3: Institutional ownership has a significant effect on tax avoidance among energy-sector companies listed on the Indonesia Stock Exchange during 2021–2025.

H4: Profitability, leverage, and institutional ownership simultaneously have a significant effect on tax avoidance among energy-sector companies listed on the Indonesia Stock Exchange during 2021–2025.

RESULTS AND DISCUSSION

Descriptive Statistics and Characteristics of Energy Sector Companies

The descriptive analysis covers 184 firm-year observations from 40 energy-sector companies listed on the Indonesia Stock Exchange during the 2021–2025 period. The initial dataset consisted of 200 observations, of which 16 were excluded because their Cash Effective Tax Rate (CETR) values were below zero or exceeded one. These exclusions resulted in an unbalanced panel structure, reflecting differences in the availability of valid observations across companies and years. The sampled companies met the established selection criteria concerning listing continuity, positive earnings, and completeness of financial information. These characteristics indicate that the descriptive findings represent companies satisfying the research criteria rather than the entire population of listed energy-sector firms. Corporate tax avoidance was measured using the transformation TA = 1 − CETR, where higher TA values indicate lower cash tax payments relative to pretax income. The use of cash-based tax measures provides information about corporate tax payment patterns, although such indicators cannot independently establish whether particular tax arrangements constitute unlawful practices (Hossain et al., 2024).

The descriptive results indicate that corporate tax avoidance has a mean value of 0.7180, corresponding to an average CETR of 0.2820 or 28.20%. This average CETR exceeds Indonesia's statutory corporate income tax rate of 22%, although direct comparison requires caution because cash tax payments and accounting pretax income are not necessarily determined using identical tax bases or reporting periods. The minimum TA value of 0.0479 and maximum value of 0.9981 demonstrate

substantial differences in measured tax avoidance across the observations. These differences indicate that energy-sector companies exhibit varying relationships between reported pretax earnings and actual cash tax payments. The standard deviation of 0.2054 further demonstrates considerable dispersion in tax avoidance relative to its average value. Such variation is consistent with the broader literature identifying corporate financial characteristics, organizational arrangements, and institutional conditions as relevant dimensions of corporate tax avoidance (Duhoon & Singh, 2023).

Differences in tax avoidance values warrant further investigation because companies operating within the same industrial classification may demonstrate substantially different tax payment patterns. A TA value approaching one indicates a relatively low CETR, whereas a value approaching zero indicates relatively high cash tax payments compared with pretax income. The observed maximum of 0.9981 suggests that at least one firm-year observation recorded an exceptionally low cash-based effective tax rate. This condition cannot independently establish aggressive or unlawful tax avoidance because the indicator does not identify the underlying transactions or accounting circumstances. Research examining corporate taxation in emerging economies emphasizes the need to distinguish patterns of tax avoidance from illegal tax evasion when interpreting corporate tax behavior (Hossain et al., 2024). The descriptive distribution provides an empirical basis for evaluating whether differences in profitability, leverage, and institutional ownership are associated with variations in measured tax avoidance. The statistical characteristics of these variables are presented in Table 2 to establish the distributional properties of the dataset before panel regression analysis.

Table 2. Descriptive Statistics (N = 184)

Variable	N	Minimum	Maximum	Mean	Std. deviation
Tax avoidance (TA)	184	0.0479	0.9981	0.7180	0.2054
Profitability (ROA)	184	0.0007	0.9277	0.1377	0.1426
Leverage (DER)	184	0.0505	8.4534	1.0207	1.2266
Institutional ownership (IO)	184	0.0017	0.9811	0.6101	0.2329

Source: EViews 12 output, processed by the authors (2026).

Profitability, measured through Return on Assets (ROA), records a mean value of 0.1377, indicating that the sampled observations generated average net income equivalent to approximately 13.77% of total assets. The minimum profitability value of 0.0007 and maximum value of 0.9277 demonstrate considerable differences in the ability of energy-sector companies to generate earnings from their asset bases. The standard deviation of 0.1426 exceeds the mean, suggesting substantial variability in corporate profitability, although the direction of distributional skewness cannot be established from these statistics alone. Such differences may reflect variations in operational efficiency, asset utilization, business characteristics, and exposure to commodity market conditions, although these mechanisms were not separately measured in the descriptive analysis. Previous research has examined profitability as a determinant of tax avoidance because differences in corporate earnings may influence tax liabilities and managerial incentives associated with tax planning (Prasetya & Muid, 2022). The observed dispersion in ROA consequently provides a relevant empirical foundation for testing whether profitability explains variations in tax avoidance within the sampled energy-sector companies.

Leverage, represented by the Debt to Equity Ratio (DER), has a mean value of 1.0207, indicating that total liabilities were approximately equivalent to shareholders' equity on average. The minimum DER of 0.0505 indicates observations with relatively limited liabilities compared with equity, whereas the maximum value of 8.4534 reflects substantially greater financial leverage. The standard deviation of 1.2266 exceeds the mean, indicating considerable dispersion in capital structures across the sampled observations. This variability suggests that energy-sector companies differ substantially in their reliance on liabilities relative to shareholder financing. Differences in leverage may influence corporate tax behavior because financing structures affect financial obligations and the potential tax treatment of borrowing costs. Previous empirical research has examined leverage alongside profitability and capital intensity, identifying financial structure as an important consideration in the analysis of corporate tax avoidance (Setyaningsih et al., 2023). The wide DER range provides sufficient observed variation to investigate the relationship between corporate financing decisions and tax avoidance,

although the descriptive statistics do not establish the direction or statistical significance of that relationship.

Institutional ownership (IO) has an average value of 0.6101, indicating that institutional investors held approximately 61.01% of outstanding shares across the sampled observations. The minimum institutional ownership proportion of 0.0017 indicates extremely limited institutional participation in certain observations, whereas the maximum value of 0.9811 reflects highly concentrated institutional shareholding. The standard deviation of 0.2329 demonstrates notable differences in institutional ownership structures among the sampled energy-sector companies. These differences indicate that the proportion of shares controlled by institutional investors varies substantially, despite institutional ownership representing a majority shareholding on average. Institutional investors may influence corporate decision-making through ownership rights and monitoring activities, although the effectiveness of such mechanisms depends on governance arrangements and investor characteristics (Pujiningsih & Salsabyla, 2022). The substantial variation in institutional ownership provides an empirical basis for examining whether differences in ownership concentration are associated with tax avoidance behavior.

The descriptive findings reveal distinct distributional characteristics across profitability, leverage, institutional ownership, and corporate tax avoidance. Profitability and leverage exhibit standard deviations exceeding their respective means, indicating substantial relative variation in financial performance and financing structures. Institutional ownership demonstrates a comparatively concentrated distribution around a mean exceeding 60%, although its observed range remains considerable. These differences suggest that the sampled energy-sector companies are heterogeneous in their financial and ownership characteristics despite operating within the same broad industrial sector. Research integrating profitability, leverage, and institutional ownership into tax avoidance models provides a relevant foundation for investigating the relationships among these corporate characteristics (Sari & Kinasih, 2021). Nevertheless, the descriptive statistics cannot establish whether companies with higher profitability or leverage systematically report higher tax avoidance, since such conclusions require analysis of relationships between variables. The observed variation supports the relevance of subsequent panel-data regression while emphasizing the need to distinguish descriptive heterogeneity from statistically established explanatory relationships.

The descriptive characteristics of the sampled companies indicate that corporate tax avoidance during 2021–2025 occurred alongside substantial differences in profitability, leverage, and institutional ownership. The mean TA value of 0.7180 provides an initial representation of cash-based tax avoidance, while the wide observed range indicates heterogeneous tax payment patterns. Differences in profitability and leverage demonstrate that financial performance and financing structures were not uniform across the sampled energy-sector companies. Institutional ownership also varied substantially, indicating that the potential influence of ownership-based monitoring cannot be assumed to be identical across firms. Previous research has documented the relevance of financial characteristics and governance-related factors in explaining corporate tax avoidance, supporting their inclusion in an integrated empirical specification (Fadhila & Andayani, 2022). These descriptive findings establish the statistical background for subsequent model selection, regression diagnostics, and hypothesis testing, through which the associations between the independent variables and corporate tax avoidance are evaluated.

Panel Data Model Selection and Regression Diagnostics

Panel-data model selection was conducted to determine an appropriate estimation specification for the 184 firm-year observations obtained from 40 energy-sector companies listed on the Indonesia Stock Exchange during 2021–2025. The dataset was structured as an unbalanced panel because 16 observations were excluded following the Cash Effective Tax Rate (CETR) screening procedure. The dependent variable was tax avoidance (TA), while profitability (ROA), leverage (DER), and institutional ownership (IO) served as the independent variables. Three alternative specifications were considered, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). These models differ in their treatment of unobserved company-specific characteristics and the relationships between individual effects and explanatory variables. Appropriate model selection is essential because incorrectly specifying unobserved heterogeneity may affect coefficient consistency, estimation efficiency, and the reliability of statistical inference (Wooldridge, 2016).

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The Chow test was conducted to determine whether the Fixed Effect Model provided a statistically preferable specification compared with the Common Effect Model. The cross-section F-statistic was 3.0572 with degrees of freedom of 39 and 141, accompanied by a probability value of 0.0000. The corresponding cross-section Chi-square statistic reached 112.7574 with 39 degrees of freedom and an identical probability value of 0.0000. Both probability values were below the predetermined significance threshold of 0.05, indicating that the null hypothesis favoring the pooled model should be rejected. This result demonstrates that allowing company-specific intercepts provides a statistically significant improvement over the common-intercept specification. Differences among energy-sector companies may therefore be relevant to the regression structure, although the test does not identify the particular firm characteristics responsible for those differences. The rejection of the pooled specification does not automatically establish FEM as the final model because further evaluation against REM is required under established panel-data estimation procedures (Wooldridge, 2016).

The Hausman test was subsequently employed to evaluate the appropriateness of the Fixed Effect Model relative to the Random Effect Model. The test produced a cross-section random statistic of 6.8153 with three degrees of freedom and a probability value of 0.0780. Since this probability exceeded the 0.05 significance threshold, the null hypothesis underlying the Random Effect Model was not rejected. The Breusch–Pagan Lagrange Multiplier test generated a statistic of 135.9018 with a probability value of 0.0000, indicating that REM was statistically preferable to the pooled CEM specification. These results supported the selection of REM as the working estimation model, although the Hausman outcome does not independently prove that unobserved company effects are uncorrelated with the regressors. The numerical results and corresponding model selection decisions are presented in Table 3, following the comparative approach to panel estimators described by Wooldridge (2016).

Table 3. Panel Data Model Selection Tests

Test	Statistic	Probability	Decision
Chow (cross-section F)	3.0572 (df 39; 141)	0.0000	FEM preferred over CEM
Chow (cross-section Chi-square)	112.7574 (df 39)	0.0000	FEM preferred over CEM
Hausman (cross-section random)	6.8153 (df 3)	0.0780	REM preferred over FEM
Lagrange Multiplier (Breusch-Pagan)	135.9018	0.0000	REM preferred over CEM

Source: EViews 12 output, processed by the authors (2026).

The Random Effect Model was selected because the combined specification tests favored an estimation framework incorporating random company-specific effects. Unlike pooled regression, REM explicitly represents unobserved heterogeneity through an additional error component associated with individual companies. The Hausman probability of 0.0780 indicates that the test did not identify a statistically significant difference between the FEM and REM coefficient estimates at the 5% significance level. This outcome supports the conventional selection of REM under the applied decision rule, although it does not establish the absence of relationships between unobserved firm characteristics and the explanatory variables. The significant Lagrange Multiplier result further indicates that company-level variation should not be disregarded through a pooled estimation framework. The selected specification consequently accommodates differences among energy-sector companies while estimating the relationships between profitability, leverage, institutional ownership, and tax avoidance. The reliability of this approach nevertheless depends on the random-effects assumptions, particularly the requirement that unobserved individual effects are uncorrelated with the included explanatory variables (Wooldridge, 2016).

The unbalanced structure of the dataset represents another methodological consideration in interpreting the selected panel regression model. The initial dataset comprised 200 firm-year observations, corresponding to 40 companies observed across the five-year research period. The exclusion of 16 observations with CETR values below zero or above one reduced the final dataset to 184 observations without changing the number of sampled companies. This procedure excluded observations considered economically atypical under the established measurement criteria, although such exclusion may also affect the representation of unusual corporate tax payment patterns. The available results do not identify the companies or observation years associated with these exclusions, limiting further assessment of their distribution across the panel. Although REM accommodates

unbalanced panel structures, the statistical implications of missing or excluded observations depend on their relationship with the variables and underlying data-generating process (Wooldridge, 2016).

Residual normality was evaluated using the Jarque–Bera test to assess whether the regression residuals followed a normal distribution. The test generated a Jarque–Bera statistic of 14.2723 with a probability value of 0.0008. The probability was below the 0.05 significance threshold, indicating rejection of the null hypothesis that the residuals were normally distributed. This result demonstrates that the residual distribution deviated significantly from normality and therefore requires consideration when evaluating the reliability of subsequent statistical inference. The dataset contains 184 observations, making large-sample asymptotic inference potentially relevant, although sample size alone does not guarantee that conventional significance tests remain valid under every form of model misspecification. The applicability of asymptotic inference also depends on assumptions concerning the regression error structure, coefficient estimation, and the covariance matrix used in hypothesis testing. Econometric principles recognize that departures from normality do not automatically invalidate large-sample regression inference, but the adequacy of the remaining assumptions must still be considered (Wooldridge, 2016).

Multicollinearity was assessed using a correlation matrix to examine pairwise relationships among profitability, leverage, and institutional ownership. The correlation coefficient between ROA and DER was −0.2324, indicating a negative linear relationship between profitability and leverage in the observed dataset. The correlation between ROA and IO was 0.1300, while the relationship between DER and IO produced a coefficient of −0.1826. All absolute correlation coefficients were below the predetermined threshold of 0.80, suggesting that severe pairwise multicollinearity was not evident among the explanatory variables. These results indicate that the three independent variables capture distinguishable financial and ownership characteristics, although pairwise correlations alone cannot eliminate every possible form of multicollinearity. The distinction is consistent with multiple regression principles emphasizing that relationships among explanatory variables influence coefficient precision and the interpretation of estimated effects (Aiken et al., 1991).

The initial regression analysis did not include separate statistical tests for heteroskedasticity or serial correlation because the Random Effect Model was estimated using Generalized Least Squares (GLS). GLS estimation accounts for the error-component covariance structure specified by the random-effects model, potentially improving estimation efficiency when the underlying assumptions are satisfied. Its application does not automatically demonstrate that all forms of heteroskedasticity or autocorrelation have been eliminated, particularly when separate diagnostic results are unavailable. The absence of these tests limits the extent to which the reported covariance structure and conventional significance tests can be independently evaluated. The Chow, Hausman, and Lagrange Multiplier tests nevertheless provide a consistent basis for selecting REM under the established 5% significance criterion. The significant Jarque–Bera result and the absence of separate disturbance diagnostics remain methodological limitations that should be considered when interpreting coefficient estimates and hypothesis testing outcomes. These considerations reinforce the distinction between selecting an appropriate panel-data specification and establishing the statistical reliability of regression inference, as emphasized in econometric methodology (Wooldridge, 2016).

Effects of Profitability, Leverage, and Institutional Ownership on Tax Avoidance

The Random Effect Model (REM) regression results provide empirical evidence regarding the relationships between profitability, leverage, institutional ownership, and corporate tax avoidance among energy-sector companies listed on the Indonesia Stock Exchange during 2021–2025. The estimated regression intercept is 0.6758, representing the predicted tax avoidance value when all independent variables equal zero, although this condition does not necessarily correspond to an economically representative company. Profitability, measured through Return on Assets (ROA), produces a positive regression coefficient of 0.2822, indicating a positive association with the transformed tax avoidance indicator. Leverage, represented by the Debt to Equity Ratio (DER), records a negative coefficient of −0.0376, suggesting an inverse relationship between corporate indebtedness and measured tax avoidance. Institutional ownership exhibits a positive coefficient of 0.0677, although its statistical significance requires evaluation through the corresponding partial hypothesis test. The estimated model produces an F-statistic of 6.8712 with a probability value of 0.0002, indicating that the explanatory variables are jointly statistically significant. These estimates represent conditional

relationships within the specified panel regression model, and their interpretation must consider the assumptions underlying random-effects estimation (Wooldridge, 2016).

Table 4. Random Effect Model Regression Results

Variable	Coefficient	t-statistic	Prob.	Interpretation
Constant	0.6758			
Profitability (ROA)	0.2822	2.6806	0.0080	Significant
Leverage (DER)	−0.0376	−2.7187	0.0072	Significant
Institutional ownership (IO)	0.0677	0.9266	0.3553	Not significant
F-statistic	6.8712		0.0002	Significant
Adjusted R^2	0.0878			

Source: EViews 12 output, processed by the authors (2026).

The estimated regression equation is:

$$TA_{it} = 0.6758 + 0.2822\ ROA_{it} - 0.0376\ DER_{it} + 0.0677\ IO_{it} + \varepsilon_{it}$$

Profitability demonstrates a positive and statistically significant relationship with corporate tax avoidance, as indicated by the regression coefficient of 0.2822 and t-statistic of 2.6806. The probability value of 0.0080 is below the predetermined significance threshold of 0.05, providing sufficient statistical evidence to support the first hypothesis (H1). A 0.01 increase in ROA, equivalent to one percentage point, is associated with an approximately 0.0028 increase in the tax avoidance indicator, holding leverage and institutional ownership constant. Since tax avoidance is measured using TA = 1 − CETR, the positive coefficient indicates that more profitable companies tend to report lower cash effective tax rates. Higher profitability may increase incentives for corporate management to manage tax obligations because greater earnings can generate larger taxable income and associated tax liabilities. This interpretation is consistent with the positive relationship between profitability and tax avoidance examined by Prasetya and Muid (2022), although the present regression does not directly identify the particular tax planning strategies employed by the sampled companies.

The positive profitability coefficient contributes to the empirical understanding of how corporate financial performance relates to tax avoidance within Indonesia's energy sector. Previous research involving profitability, sales growth, leverage, and company size has examined the relevance of financial characteristics in explaining differences in corporate tax avoidance (Tanjaya & Nazir, 2021). Empirical evidence from manufacturing companies also identifies profitability as a relevant explanatory variable, suggesting that earnings-related tax incentives extend beyond a single industrial classification (Prang et al., 2024). The present finding nevertheless contrasts with the negative profitability relationship reported by Fadhila and Andayani (2022), indicating that the direction of the relationship may differ across research settings and company characteristics. From an agency-based interpretation, managers may have incentives to preserve after-tax earnings through tax planning, although these incentives cannot be verified without direct information concerning managerial compensation and decision-making. Research connecting tax avoidance with agency-related investment inefficiency demonstrates the broader relevance of managerial incentives to corporate taxation, but it does not establish the specific behavioral mechanism operating in the present sample (Ajmal et al., 2025).

Leverage exhibits a negative and statistically significant association with corporate tax avoidance, as demonstrated by the regression coefficient of −0.0376 and t-statistic of −2.7187. The probability value of 0.0072 is below the 0.05 significance threshold, indicating that leverage contributes significantly to explaining variation in the dependent variable. A one-unit increase in DER is associated with a decrease of approximately 0.0376 in the tax avoidance indicator, holding profitability and institutional ownership constant. This negative relationship contradicts the initial directional prediction that higher leverage increases tax avoidance, resulting in rejection of the second hypothesis (H2) as originally formulated. The finding differs from evidence identifying a positive relationship between leverage and tax avoidance, suggesting that greater corporate indebtedness does not necessarily correspond to more intensive tax avoidance practices (Setyaningsih et al., 2023). Earlier research

involving institutional ownership, leverage, and company size provides a relevant comparative basis for examining the possibility of negative leverage relationships in Indonesian companies (Alya, 2021). The observed coefficient indicates that financial leverage may be associated with lower measured tax avoidance, although the regression does not independently establish whether creditor monitoring, financing restrictions, or differences in tax shields explain this association.

The negative relationship between leverage and tax avoidance requires consideration of the financial characteristics of energy-sector companies, particularly their reliance on debt financing and substantial capital requirements. Debt financing may create opportunities for reducing taxable income through deductible interest expenses, but DER measures total liabilities relative to equity rather than the amount of interest actually deducted for tax purposes. Highly leveraged companies may also face financial obligations and contractual restrictions that influence managerial decisions concerning taxation, although these mechanisms were not directly measured in the present investigation. The descriptive statistics indicate that DER ranges from 0.0505 to 8.4534, demonstrating substantial differences in financing structures among the sampled observations. Research incorporating capital intensity, inventory turnover, leverage, and company size highlights the relevance of additional corporate characteristics when evaluating financial determinants of tax avoidance (Hermanto & Puspita, 2022). The negative coefficient therefore supports a statistically established inverse association between leverage and tax avoidance without demonstrating that debt financing itself necessarily reduces aggressive tax planning.

Institutional ownership produces a positive regression coefficient of 0.0677 with a t-statistic of 0.9266, indicating a positive estimated association that is not statistically significant. The probability value of 0.3553 exceeds the predetermined significance threshold of 0.05, providing insufficient evidence to reject the null hypothesis of no institutional ownership effect. A 0.10 increase in institutional ownership, equivalent to ten percentage points, corresponds to an estimated increase of approximately 0.0068 in the tax avoidance indicator, although this estimate cannot be distinguished statistically from zero at the specified significance level. The third hypothesis (H3) is consequently not supported because institutional ownership does not demonstrate a statistically significant relationship with corporate tax avoidance in the sampled observations. The finding is consistent with the possibility that a relatively high proportion of institutional shareholding does not automatically translate into effective monitoring of corporate tax policies. Research examining foreign institutional ownership and managerial incentives indicates that the relationship between institutional investors and tax avoidance warrants attention to ownership characteristics rather than ownership proportions alone (Pujiningsih & Salsabyla, 2022). Corporate governance research further suggests that institutional arrangements may influence tax-related managerial decisions, although the effectiveness of governance mechanisms cannot be inferred solely from the concentration of institutional ownership (Kerr et al., 2024).

The simultaneous hypothesis test produces an F-statistic of 6.8712 with a probability value of 0.0002, which is below the 0.05 significance threshold. This result indicates that profitability, leverage, and institutional ownership jointly have a statistically significant relationship with corporate tax avoidance, supporting the fourth hypothesis (H4). The significant overall regression test does not imply that all three explanatory variables possess statistically significant individual effects, because only profitability and leverage satisfy the specified partial significance criterion. The adjusted coefficient of determination is 0.0878, indicating that the model accounts for approximately 8.78% of variation in measured tax avoidance after adjustment for the number of explanatory variables. The relatively limited explanatory power suggests that substantial variation remains outside the estimated model, potentially involving financial, organizational, regulatory, and operational characteristics not included in the regression specification. Systematic reviews of corporate tax avoidance identify numerous possible determinants, supporting the interpretation that a model containing three explanatory variables provides only a partial representation of the factors associated with corporate tax behavior (Duhoon & Singh, 2023).

The regression findings contribute to corporate taxation research by demonstrating that profitability and leverage have statistically significant but opposite relationships with tax avoidance among Indonesian energy-sector companies. The positive profitability coefficient is consistent with the possibility that greater earnings create incentives for tax planning, while the negative leverage coefficient challenges the assumption that additional debt financing invariably increases tax avoidance. The insignificant institutional ownership coefficient indicates that ownership concentration alone

provides insufficient evidence of effective monitoring over corporate tax decisions, consistent with research emphasizing the relevance of ownership-related agency conflicts (Wongsinhirun et al., 2024). For tax administrators, profitability may provide a useful consideration when examining corporate cash tax outcomes, although a high tax avoidance indicator cannot independently establish regulatory noncompliance. Corporate managers and institutional investors may use these findings to evaluate how financial performance, financing decisions, and ownership structures relate to corporate tax payment patterns. The interpretation remains subject to limitations associated with the 184 firm-year observations, sample selection criteria, residual non-normality, the absence of separate heteroskedasticity and serial correlation diagnostics, and the relatively low adjusted explanatory power. Further empirical investigation incorporating additional financial and governance characteristics may clarify the mechanisms underlying these relationships and strengthen the explanatory capacity of tax avoidance models within capital-intensive industries, consistent with directions identified in recent literature reviews (Prasetyawati & Fuadah, 2025).

CONCLUSION

Based on Random Effect Model panel regression of 184 firm-year observations from 40 energy-sector companies listed on the IDX between 2021 and 2025, the study reaches the following conclusions. Profitability (ROA) exhibits a positive and statistically significant association with tax avoidance ($\beta = 0.2822$; $p = 0.0080$), indicating that companies with higher profitability tend to demonstrate greater measured tax avoidance, thereby supporting H1. Leverage (DER) demonstrates a negative and statistically significant association ($\beta = -0.0376$; $p = 0.0072$), contradicting the predicted positive relationship and resulting in the rejection of H2. Institutional ownership shows no statistically significant relationship with tax avoidance ($\beta = 0.0677$; $p = 0.3553$), indicating insufficient empirical evidence to support H3. The three independent variables jointly exhibit a statistically significant relationship with tax avoidance ($F = 6.8712$; $p = 0.0002$), supporting H4, although the adjusted coefficient of determination indicates that the model explains only 8.78% of the variation in tax avoidance. These findings demonstrate that corporate financial characteristics exhibit different relationships with tax avoidance, while institutional ownership concentration does not necessarily correspond to significant differences in corporate tax behavior. The study contributes sector-specific empirical evidence to accounting and taxation research by identifying the contrasting associations of profitability and leverage with cash-based tax avoidance among Indonesian energy-sector companies.

The findings should be interpreted considering several methodological limitations, including the relatively low explanatory power, non-normal residual distribution (Jarque–Bera $p = 0.0008$), and unbalanced panel resulting from the exclusion of 16 observations with CETR values outside the 0–1 interval. The exclusion of companies reporting losses during the observation period also restricts the generalizability of the findings to energy-sector firms satisfying the established profitability and data completeness criteria. The use of cash-based CETR may be influenced by differences in tax payment timing, while aggregate institutional ownership measurements do not distinguish among investor categories or monitoring characteristics. The proposed explanations concerning creditor monitoring, financing structures, and institutional governance remain theoretical interpretations because these mechanisms were not directly examined in the regression model. Energy-sector companies should strengthen tax transparency, maintain compliance with applicable regulations, and prioritize legitimate tax planning arrangements that minimize financial, legal, and reputational risks. Future research should incorporate additional determinants, including company size, capital intensity, liquidity, audit committee characteristics, and auditor reputation, while considering alternative tax avoidance measures and governance-related moderating variables. Comparative investigations across industrial sectors, ownership categories, and periods surrounding the 2022 commodity-price increase may provide further evidence regarding the stability of these relationships and improve the explanatory capacity of corporate tax avoidance models.

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