

Capitalis: Journal of Economic Stability, Banking, and Investment
Vol 1 No 3 September 2026, Hal 132-148
ISSN: 3163-6047 (Print) ISSN: 3163-6039 (Electronic)
Open Access: https://sovereignresearch.org/capitalis

The Effects of Firm Size, Leverage, and Transfer Pricing on Tax Avoidance (An Empirical Study: Companies in the Industrial Sector Listed on the Indonesia Stock Exchange, 2021–2025)

Selviana Bengan[1*], Juaniva Sidharta[2], Arya Gina Tarigan[3]
[1-3] Universitas Kristen Indonesia, Jakarta, Indonesia
Email: Selvianabengan93@gmail.com[1]

Article Info :
Received:
01-09-2026
Revised:
12-09-2026
Accepted:
24-09-2026

Abstract

This study examined the individual and simultaneous associations of firm size, leverage, and transfer pricing with tax avoidance among industrials sector companies listed on the Indonesia Stock Exchange during 2021–2025. A quantitative explanatory design was employed using purposive sampling, yielding 21 companies and 105 firm-year observations. Tax avoidance was measured using the cash effective tax rate (CETR), with lower values indicating greater tax avoidance. Panel regression analysis was conducted using STATA 15. Specification tests supported a random effects model, while firm-clustered robust standard errors addressed heteroskedasticity and serial correlation. Firm size ($\beta = -0.0058$; $p = 0.588$) and transfer pricing ($\beta = 0.0187$; $p = 0.580$) showed statistically insignificant associations with CETR. Leverage exhibited a positive and significant association ($\beta = 0.0129$; $p = 0.013$), suggesting lower tax avoidance, contrary to the expected tax-shield effect. However, this association became insignificant after excluding an extreme-leverage company ($p = 0.137$) or winsorizing leverage ($p = 0.132$). The variables were jointly significant only at the 10% level (Wald $\chi^2(3) = 7.05$; $p = 0.0704$), with an overall R^2 of 10.85%. The findings demonstrate limited explanatory power and sensitivity to extreme observations, emphasizing cautious interpretation of corporate tax avoidance determinants.

Keywords: *cash effective tax rate, firm size, leverage, tax avoidance, transfer pricing.*

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INTRODUCTION

Tax revenue mobilization remains a fundamental determinant of fiscal sustainability, particularly in emerging economies where public expenditure requirements increasingly depend on the effectiveness of domestic resource collection. Indonesia has experienced growing pressure to maintain corporate tax revenue amid economic adjustments, changes in commodity markets, and the expansion of increasingly complex business transactions. Official fiscal data indicate that tax revenue realization exceeded government targets during 2021–2023 but declined to 97.2% of the target in 2024 and 87.6% in 2025, when actual collections reached IDR 1,917.6 trillion against a target of IDR 2,189.3 trillion (Kementerian Keuangan Republik Indonesia, 2026). The annual differences between revenue targets and actual collections are presented in Table 1, illustrating the changing fiscal conditions over the observation period.

Table 1. Tax Revenue Targets and Realization, 2021–2025

Year	State Budget Target (IDR trillion)	Realization (IDR trillion)	Achievement (%)
2021	1,229.58	1,278.63	104.0
2022	1,485.00	1,716.77	115.6
2023	1,818.20	1,869.23	102.8
2024	1,988.90	1,932.40	97.2
2025	2,189.31	1,917.60	87.6

Although these developments cannot be attributed exclusively to corporate tax avoidance, they reinforce the need to understand organizational characteristics associated with variations in corporate tax payments. Tax avoidance represents a complex managerial decision involving the interaction of financial incentives, regulatory opportunities, and corporate governance arrangements, rather than merely a mechanical response to statutory tax rates (Ferawati & Bimantoro, 2022; Moeljono, 2020). International evidence further indicates that differences in multinational structures and cross-border profit allocation can expose developing economies to substantial challenges in protecting their corporate tax bases (Johannesen et al., 2020). Indonesia's industrials sector presents a particularly relevant empirical setting because its companies operate through capital-intensive production systems, substantial financing arrangements, diversified corporate structures, and transactions involving affiliated entities. These characteristics create potentially competing incentives for corporate tax planning, including interest-related tax deductions, asset-based tax benefits, and related-party pricing arrangements. The relationship between corporate financial decisions and tax compliance is further complicated by legal requirements governing acceptable tax planning and the application of the arm's length principle to transactions between related parties (Burhanudin Yusuf et al., 2025; Winarta & Basani, 2026). Understanding whether firm size, leverage, and transfer pricing are systematically associated with cash-based tax avoidance during 2021–2025 is consequently relevant to the assessment of corporate fiscal behavior and the development of more evidence-based tax compliance monitoring.

Existing research on corporate tax avoidance has developed around three interrelated analytical perspectives: organizational capacity, financing incentives, and opportunities arising from related-party transactions. Research examining organizational capacity suggests that larger firms may possess greater administrative resources and specialized expertise to undertake sophisticated tax planning, although their greater public visibility and regulatory exposure may simultaneously constrain aggressive tax decisions. Empirical evidence reflects these competing mechanisms, with significant relationships between firm size and tax avoidance reported in manufacturing and corporate governance settings, while other investigations identify statistically insignificant associations (Ainniyya et al., 2021; Malik et al., 2022; Wedatara & Yasa, 2024; Widodo, 2024; Oktavia et al., 2025; Nasution et al., 2026). The financing literature similarly presents competing interpretations of leverage, as interest deductibility may encourage tax-saving debt structures, whereas financial distress, creditor monitoring, and financing constraints may influence managerial tax decisions in different directions (Arianandini & Ramantha, 2018; Apriliyani & Kartika, 2021; Solehah et al., 2024; Miracle et al., 2025; Wangsa & Tanno, 2024). Studies incorporating profitability, financial distress, sales growth, and fixed-asset intensity further suggest that leverage should not be interpreted independently of broader corporate financial conditions (Darma & Al Imadah, 2023; Rahmawati & Nani, 2021). A separate but related body of research considers transfer pricing and related-party transactions as potential channels for reallocating taxable income, particularly where multinational structures facilitate transactions across different tax jurisdictions (Jafri & Mustikasari, 2018; Ananta, 2024; Sugiharti & Machdar, 2023). Evidence from manufacturing, energy, coal production, and multinational companies nevertheless remains heterogeneous, with some studies identifying significant relationships and others reporting limited statistical support (Santoso et al., 2021; Barokah & Nindya Sari, 2024; Buntu et al., 2025; Jumliana et al., 2025; Ramadhan & Purnamasari, 2025; Zahri et al., 2025). These findings suggest that corporate tax avoidance is shaped by sectoral characteristics, financing structures, transaction composition, and the operational definitions used to capture tax behavior.

The principal research gap concerns the limited integration of organizational scale, financial leverage, and related-party transaction intensity within a sector-specific framework that consistently distinguishes corporate tax avoidance from the observable measurement of cash tax payments. Previous studies have established that these characteristics may be associated with corporate tax outcomes, but the direction and statistical significance of their relationships remain inconsistent across sectors, observation periods, and model specifications. Findings from manufacturing, mining, energy, consumer goods, and multinational enterprises cannot automatically be generalized to IDX-listed industrials companies because differences in asset composition, financing requirements, transaction structures, and regulatory exposure may influence corporate tax behavior (Wedatara & Yasa, 2024; Barokah & Nindya Sari, 2024; Oktavia et al., 2025; Ramadhan & Purnamasari, 2025). A further

conceptual limitation arises from the distinction between opportunities for income shifting and the actual tax consequences of related-party transactions. The existence of substantial affiliated receivables does not necessarily establish cross-border profit shifting, since related-party transactions may reflect ordinary commercial arrangements and may occur between entities subject to similar tax regimes (Nindita et al., 2021; Suryana & Gouw, 2021). Measurement also presents a substantive methodological concern. Cash effective tax rates capture actual tax payments relative to pretax income and therefore provide a cash-based indicator whose direction is inversely related to tax avoidance, requiring careful interpretation of regression coefficients (Dyreng et al., 2008). Moreover, the presence of financial outliers, persistent firm-level heterogeneity, and potential violations of conventional regression assumptions can complicate statistical inference in corporate panel datasets. Although panel regression techniques have been extensively applied to financial research, their relevance depends on appropriate model specification and the treatment of data characteristics affecting estimation reliability (Baltagi, 2021; Madany & Rais, 2022; Filgrima & Achmad, 2022). The unresolved empirical question is consequently whether these three corporate characteristics demonstrate statistically reliable individual and joint associations with cash-based tax avoidance among Indonesian industrials companies when sectoral specificity, panel structure, and sensitivity to extreme leverage observations are explicitly considered.

The persistence of these empirical and methodological uncertainties has important implications for the development of corporate taxation research and the practical assessment of tax compliance risks. From a theoretical standpoint, the coexistence of competing findings indicates that tax-planning incentives cannot be assumed to operate uniformly across firms with different organizational and financing characteristics. Agency theory suggests that managerial discretion and information asymmetry may influence tax-related decisions, while signaling theory emphasizes how financial reporting and corporate policy choices communicate information about risk and organizational quality to external stakeholders (Jensen & Meckling, 1976; Spence, 1973; Ross, 1977; Payne & Petrenko, 2019). Positive accounting theory introduces an additional tension between managerial reporting incentives, debt covenant considerations, and political costs, implying that organizational size and indebtedness may generate conflicting predictions for corporate tax outcomes (Watts & Zimmerman, 1978). These theoretical tensions become particularly relevant when leverage is examined because debt financing may produce interest-related tax benefits while simultaneously increasing exposure to creditor supervision and financial reporting pressures (Nissim & Penman, 2003). For corporate managers, insufficiently differentiated evidence may encourage an excessive reliance on conventional assumptions that larger asset bases, higher indebtedness, or more intensive related-party transactions necessarily produce greater tax savings. Such interpretations overlook the potential influence of regulatory scrutiny, transaction documentation, and financial risk. For tax authorities, the absence of reliable sector-specific evidence may similarly reduce the effectiveness of risk-based monitoring by encouraging dependence on isolated financial indicators rather than their combined informational value. Research on the readability of corporate tax disclosures further highlights the importance of considering the informational consequences of tax-related decisions when interpreting financial reporting behavior (Inger et al., 2021). Empirically examining these relationships within an appropriately specified analytical framework is necessary to clarify the explanatory boundaries of commonly employed corporate characteristics and support a more proportionate interpretation of tax compliance indicators.

This study is positioned at the intersection of corporate financial characteristics, tax avoidance measurement, and sector-specific panel econometrics, with its proposed contribution arising from the integration of elements that previous research has frequently examined across different organizational settings. Rather than treating firm size, leverage, and transfer pricing as independently established predictors of aggressive taxation, the study evaluates their associations within a unified empirical specification using industrials sector companies listed on the Indonesia Stock Exchange during 2021–2025. This setting differs from investigations centered on manufacturing, extractive industries, food and beverage production, and multinational enterprises, whose distinctive operating structures may limit the applicability of their findings to the broader industrials classification (Solehah et al., 2024; Buntu et al., 2025; Jumliana et al., 2025; Zahri et al., 2025). The proposed empirical contribution consists of three complementary analytical features. First, tax avoidance is operationalized through the cash effective tax rate, allowing corporate financial characteristics to be evaluated against actual

income tax payments while explicitly preserving the inverse interpretation between the dependent variable and the underlying avoidance construct (Dyreng et al., 2008). Second, related-party transaction intensity is represented by the proportion of receivables attributable to related parties, providing an observable financial statement indicator while recognizing that this measure cannot independently establish non-arm's-length pricing or international profit shifting (Nindita et al., 2021; Barokah & Nindya Sari, 2024). Third, the analysis combines panel-model selection, firm-clustered robust inference, and sensitivity assessment of extreme leverage observations to distinguish estimated relationships from associations potentially influenced by influential financial observations (Baltagi, 2021; Savitri et al., 2021). The study's novelty is consequently framed as a sector-specific and measurement-conscious empirical assessment supported by explicit robustness evaluation, rather than as a claim to introduce previously unknown financial determinants or establish causal mechanisms that cannot be identified from observational data. This analytical positioning addresses both the contextual limitations and interpretative inconsistencies identified in the preceding literature.

This study aims to examine the individual and simultaneous associations of firm size, leverage, and transfer pricing with corporate tax avoidance among industrials sector companies listed on the Indonesia Stock Exchange during 2021–2025. Specifically, it evaluates whether organizational scale, debt-to-equity ratios, and related-party receivables intensity are statistically associated with cash effective tax rates, while maintaining a consistent distinction between changes in observed cash tax payments and their inverse implications for tax avoidance. The investigation employs a quantitative explanatory design using secondary financial statement data from 21 companies, comprising 105 firm-year observations, and estimates panel regression models selected through specification testing. Statistical inference incorporates firm-clustered robust standard errors to address heteroskedasticity and within-firm serial correlation, while additional sensitivity analyses examine the extent to which extreme leverage observations influence the stability of estimated associations. The study is intended to contribute to the corporate taxation literature by providing sector-specific evidence concerning the explanatory relevance of three frequently investigated corporate characteristics, clarifying the interpretation of cash-based tax avoidance indicators, and assessing whether conventional theoretical expectations remain empirically defensible under alternative analytical specifications. Its methodological contribution lies in combining explicit measurement interpretation with robustness-oriented panel estimation, thereby supporting a more cautious assessment of statistical significance and explanatory power. Its practical contribution is directed toward improving the interpretation of corporate financial indicators used by managers, investors, and tax administrators when evaluating tax-related behavior and potential compliance risks. The analysis ultimately seeks to establish the extent to which firm size, leverage, and transfer pricing offer reliable information about variation in corporate cash tax payments without attributing causal effects or specific tax-planning mechanisms beyond those supported by the available observational evidence.

RESEARCH METHODS

This study employed a quantitative explanatory research design using secondary financial data to examine the individual and simultaneous associations of firm size, leverage, and transfer pricing with tax avoidance among industrials sector companies listed on the Indonesia Stock Exchange (IDX) during 2021–2025. The population comprised 65 industrials sector companies listed on the IDX as of December 2025. Purposive sampling was applied using four exclusion criteria: companies conducting an initial public offering during the observation period, companies with incomplete financial statements, companies reporting pretax losses, and companies that were not continuously listed throughout 2021–2025. These criteria excluded 9, 4, 27, and 4 companies, respectively, producing a final sample of 21 companies and a balanced panel of 105 firm-year observations. The population screening and sample selection procedures are summarized in Table 2.

Table 2. Sample Selection

Description	Number
Industrials sector companies listed on the IDX	65
(–) Companies that conducted an IPO during the study period	(9)

(–) Companies with incomplete financial reports	(4)
(–) Companies reporting pretax losses during the study period	(27)
(–) Companies not continuously listed during 2021–2025	(4)
Final sample	21
Total observations (21 firms × 5 years)	105

Companies reporting pretax losses were excluded because negative pretax income complicates the economic interpretation of cash effective tax rates. The sample comprised AMFG, APII, ARNA, ASGR, ASII, BNBR, HEXA, IMPC, JTPE, KBLI, KONI, MFMI, SCCO, TOTO, UNTR, MARK, SPTO, KUAS, HYGN, BLUE, and NTBK. Data were obtained from audited annual financial statements and annual reports published through the IDX and the respective companies' official websites. The research instrument consisted of a structured financial data extraction process using Microsoft Excel to organize company-level observations before statistical analysis in STATA 15. Tax avoidance was operationalized using the cash effective tax rate (CETR), calculated as cash income taxes paid divided by pretax income, where lower CETR values indicated greater tax avoidance. Firm size (SIZE) was measured as the natural logarithm of total assets, leverage (DER) as total liabilities divided by total equity, and transfer pricing (RPT) as related-party receivables divided by total receivables. Related-party receivables were extracted from the accompanying notes to the financial statements. The operational definitions, measurement formulas, and expected coefficient directions are presented in Table 3.

Table 3. Operational Definitions of Variables

Variable	Symbol	Measurement	Scale	Expected sign for CETR
Tax avoidance (dependent)	CETR	Cash income taxes paid ÷ pretax income	Ratio	—
Firm size (X1)	SIZE	Natural logarithm of total assets	Ratio	(−)
Leverage (X2)	DER	Total liabilities ÷ total equity	Ratio	(−)
Transfer pricing (X3)	RPT	Related-party receivables ÷ total receivables	Ratio	(−)

The RPT measure represented the intensity of related-party receivables rather than direct evidence of non-arm's-length pricing or international profit shifting. These operational definitions established a consistent measurement framework for examining the relationships between corporate financial characteristics and cash-based tax avoidance.

Data analysis employed descriptive statistics and panel data regression to estimate the relationships between the three explanatory variables and CETR. Descriptive analysis summarized the minimum, maximum, mean, and standard deviation of each variable. The regression specification was expressed as $CETR_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 DER_{it} + \beta_3 RPT_{it} + \varepsilon_{it}$, where i represented the 21 sampled companies, t denoted the observation years from 2021 to 2025, α represented the intercept, β_1–β_3 represented the regression coefficients, and ε_{it} represented the error term. Three panel estimation approaches were evaluated: the common effects model (CEM), fixed effects model (FEM), and random effects model (REM). Model selection was conducted using 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 5% significance threshold. Diagnostic procedures included the Shapiro–Wilk and skewness–kurtosis tests for residual normality, variance inflation factors for multicollinearity using a threshold of 10, the Breusch–Pagan/Cook–Weisberg test for

heteroskedasticity, and the Wooldridge test for first-order serial correlation. Firm-clustered robust standard errors were employed in the selected panel regression model to account for heteroskedasticity and within-firm serial correlation. Individual regression coefficients were evaluated using z statistics at the 5% significance level, while the simultaneous association of the explanatory variables was assessed using the Wald chi-square test, with findings at the 10% level separately identified as marginal evidence. Explanatory power was evaluated using the overall coefficient of determination (R^2), and coefficient directions were interpreted according to the inverse relationship between CETR and tax avoidance. Two sensitivity analyses were conducted to assess the influence of extreme leverage observations: re-estimation after excluding the company exhibiting exceptionally high leverage and re-estimation after winsorizing DER at the 95th percentile. Both alternative specifications employed random effects estimation with firm-clustered robust standard errors. The combined procedures provided a basis for evaluating model specification, statistical inference, and the sensitivity of estimated associations to influential observations. The analysis was interpreted as observational evidence of statistical associations rather than causal identification, consistent with the secondary-data research design.

RESULTS AND DISCUSSION

Financial Characteristics and Cash-Based Tax Avoidance among Indonesian Industrials Companies

The analysis covered 21 industrials sector companies listed on the Indonesia Stock Exchange during 2021–2025, producing 105 balanced firm-year observations. The dataset captured corporate tax behavior through the cash effective tax rate (CETR), while firm size, leverage, and related-party receivables represented organizational capacity, financial structure, and affiliated transaction intensity, respectively. These dimensions reflect distinct mechanisms through which corporate financial decisions may influence tax-related outcomes, although their associations cannot be presumed to operate uniformly across firms. Agency theory provides an analytical foundation for examining how managerial discretion and organizational characteristics may shape tax planning decisions under conditions of information asymmetry (Jensen & Meckling, 1976; Payne & Petrenko, 2019).

The descriptive statistics revealed substantial differences in corporate financial conditions, particularly between indicators of organizational scale and financial leverage. Firm size displayed relatively limited dispersion, whereas leverage and related-party receivables showed considerably greater variation across the sampled observations. Such differences are analytically relevant because the distribution of explanatory variables can influence estimated relationships and the sensitivity of regression coefficients to influential observations. Previous research has similarly emphasized the importance of considering corporate financial heterogeneity when examining the relationships among leverage, profitability, and tax-related behavior (Arianandini & Ramantha, 2018; Rahmawati & Nani, 2021).

The mean CETR was 0.2409, equivalent to 24.09% of pretax income, with observed values ranging from 0.0234 to 0.6940. This distribution indicated considerable variation in cash income tax payments, although differences in CETR should not automatically be interpreted as evidence of deliberate or unlawful tax avoidance. Cash-based tax measurements capture the relationship between taxes paid and pretax accounting income, which may also reflect timing differences and company-specific financial circumstances (Dyreng et al., 2008). The complete descriptive statistics are presented in Table 4 to establish the empirical distribution of the variables before interpreting their estimated relationships.

Table 4. Descriptive Statistics of Research Variables (N = 105)

Variable	Minimum	Maximum	Mean	Standard Deviation
CETR	0.0234	0.6940	0.2409	0.1216
SIZE	24.8426	33.8603	28.3813	2.1348
DER	0.0460	10.5212	0.8475	1.4800
RPT	0.0000	0.9967	0.2330	0.3062

Source: Authors' calculations using STATA 15.

Table 4 indicates that the average CETR exceeded Indonesia's 22% statutory corporate income tax rate, suggesting that the sampled companies did not exhibit exceptionally low cash tax payments at the aggregate descriptive level. This comparison nevertheless requires caution because cash tax payments and pretax accounting income do not necessarily correspond to taxable income and current-period tax liabilities. The standard deviation of CETR, at 0.1216, also indicates that the sample mean conceals substantial differences in company-level tax payment patterns. These considerations reinforce the distinction between descriptive indicators of corporate taxation and the underlying managerial strategies associated with tax avoidance (Dyreng et al., 2008; Ferawati & Bimantoro, 2022).

Firm size ranged from 24.8426 to 33.8603, with a mean of 28.3813 and a standard deviation of 2.1348. Its coefficient of variation was approximately 0.08, substantially below the corresponding dispersion of the financial structure and affiliated transaction indicators. This suggests that differences in organizational scale were relatively moderate when evaluated against the distribution of leverage and related-party receivables in the sample. Theoretical interpretations remain ambiguous because larger organizations may possess greater tax-planning capabilities while also facing higher political costs and external scrutiny (Watts & Zimmerman, 1978; Wedatara & Yasa, 2024; Widodo, 2024).

Leverage exhibited pronounced dispersion, with an average debt-to-equity ratio of 0.8475, a standard deviation of 1.4800, and a maximum value of 10.5212. The maximum corresponded to BNBR in 2021, while approximately 84% of firm-year observations reported debt-to-equity ratios below 1. This distribution suggests that a relatively small number of highly leveraged observations accounted for a substantial share of the variation in corporate financing structures. Financing-related tax incentives may consequently differ across firms, particularly because debt-related tax benefits coexist with creditor monitoring, debt covenant constraints, and financial risk considerations (Nissim & Penman, 2003; Miracle et al., 2025; Solehah et al., 2024).

The related-party receivables ratio averaged 0.2330, with values extending from zero to 0.9967 and a standard deviation of 0.3062. The upper bound was observed for TOTO in 2025, indicating that nearly all reported receivables in that firm-year originated from related parties. This degree of variation illustrates differences in affiliated transaction structures but does not independently establish inappropriate transfer pricing or cross-border income shifting. Research on transfer pricing distinguishes the existence of related-party transactions from their potential tax consequences, particularly where transaction jurisdictions, pricing arrangements, and regulatory compliance are not directly observed (Nindita et al., 2021; Barokah & Nindya Sari, 2024; Sugiharti & Machdar, 2023).

The contrasting distributions of SIZE, DER, and RPT indicate that corporate scale, indebtedness, and affiliated transaction intensity represented empirically distinct financial characteristics in the observed sample. Limited relative dispersion in SIZE did not necessarily imply weak explanatory relevance, just as substantial dispersion in DER and RPT did not establish stronger relationships with tax avoidance. Such relationships require multivariate estimation because descriptive statistics cannot isolate the conditional association of one financial characteristic while accounting for the others. Research employing financial panel datasets similarly demonstrates the analytical value of examining variation across companies and observation periods rather than drawing substantive conclusions from aggregate averages alone (Baltagi, 2021; Madany & Rais, 2022).

The descriptive evidence establishes a foundation for evaluating whether conventional assumptions regarding corporate tax planning are supported by the observed industrials sector data. Firm size may capture access to specialized financial resources, leverage may reflect both tax-shield incentives and financing constraints, and related-party receivables may indicate transaction structures through which tax-planning opportunities could arise. However, the presence of these characteristics does not imply that firms necessarily undertake aggressive tax strategies, particularly when tax compliance incentives and organizational monitoring may produce competing behavioral responses. The empirical interpretation must consequently distinguish observable financial characteristics from unmeasured managerial motivations, consistent with the competing predictions of agency theory, signaling theory, and positive accounting theory (Jensen & Meckling, 1976; Ross, 1977; Watts & Zimmerman, 1978).

Panel Regression Estimation, Model Specification, and the Effects of Corporate Financial Characteristics on Tax Avoidance

The examination of corporate financial characteristics and tax avoidance employed panel regression analysis to distinguish the associations of firm size, leverage, and related-party receivables with cash effective tax rates across 21 industrials sector companies during 2021–2025. Panel estimation was particularly relevant because the observations incorporated both cross-sectional differences among companies and temporal variation within individual firms. The common effects model (CEM), fixed effects model (FEM), and random effects model (REM) were evaluated to determine an appropriate specification for the available data structure. Baltagi (2021) emphasized that panel model selection requires consideration of unobserved individual heterogeneity and the assumptions governing relationships between firm-specific effects and explanatory variables.

Model specification testing produced different indications concerning the treatment of individual company effects. The Chow test rejected the pooled specification in favor of fixed effects, while the Hausman test did not reject the random effects specification relative to fixed effects at the conventional significance threshold. The Breusch–Pagan Lagrange multiplier test also indicated that a pooled model was less appropriate than one incorporating random individual effects. These procedures reflect established principles of panel econometrics, where model selection depends on the statistical properties of individual effects rather than the unrestricted preference for a particular estimation technique (Baltagi, 2021; Madany & Rais, 2022).

The Hausman statistic was 4.03, with a probability of 0.2579, indicating insufficient evidence to reject the null hypothesis underlying the consistency of the random effects estimator. The Lagrange multiplier statistic reached 41.18 with a probability below 0.001, supporting the inclusion of individual effects relative to pooled estimation. Table 5 presents the specification test results and the corresponding model selection decisions used in the analysis. Although these tests provide a formal basis for selecting REM, failure to reject the Hausman null hypothesis does not independently establish that unobserved corporate characteristics are uncorrelated with the explanatory variables (Baltagi, 2021).

Table 5. Panel Regression Model Selection Results

Specification Test	Test Statistic	Probability	Statistical Decision
Chow test	Not reported	0.0000	FEM preferred to CEM
Hausman test	$\chi^2 = 4.03$	0.2579	REM not rejected relative to FEM
Breusch–Pagan Lagrange multiplier test	$\chi^2 = 41.18$	<0.001	REM preferred to CEM

Source: Authors' calculations using STATA 15.

The results in Table 5 provided the statistical justification for adopting REM as the principal estimation framework. The selected specification accommodated unobserved company-level variation while estimating the associations of financial characteristics with CETR using the available panel observations. This distinction is important because industrials companies may differ in organizational arrangements, financing policies, and transaction structures that are not fully captured by the three explanatory variables. Panel regression can account for a component of firm-level heterogeneity, although the validity of random effects estimates continues to depend on assumptions concerning the relationship between unobserved effects and observed regressors (Baltagi, 2021; Gujarati, 2004).

Diagnostic testing identified several characteristics requiring attention before substantive interpretation of the estimated coefficients. The random effects estimates revealed different directional relationships between corporate financial characteristics and CETR.

Table 6. Diagnostic Tests for the Random Effects Model

Test	Statistic	Probability	Conclusion
Shapiro–Wilk	z = 2.886	0.002	Residuals were not normally distributed
Skewness/kurtosis	adj. $\chi^2(2) = 6.39$	0.041	Residuals were not normally distributed
VIF (SIZE; DER; RPT)	1.03; 1.05; 1.03 (mean 1.04)	—	No multicollinearity
Breusch–Pagan/Cook–Weisberg	$\chi^2(1) = 5.69$	0.017	Heteroskedasticity detected
Wooldridge	F(1, 20) = 31.740	0.000	First-order serial correlation detected

The Shapiro–Wilk test rejected residual normality at a probability of 0.002, while the skewness–kurtosis test produced a probability of 0.041, supporting the same conclusion. The Breusch–Pagan/Cook–Weisberg test indicated heteroskedasticity ($p = 0.017$), and the Wooldridge test identified first-order serial correlation ($p < 0.001$), whereas the mean variance inflation factor of 1.04 indicated no material multicollinearity among the explanatory variables. Firm-clustered robust standard errors were subsequently used to address heteroskedasticity and within-company error correlation, although the limited number of 21 firm clusters warrants caution when interpreting conventional asymptotic significance tests (Wooldridge, 2002; Drukker, 2003; Baltagi, 2021).

The random effects estimates revealed different directional relationships between corporate financial characteristics and CETR. Firm size had a negative coefficient of −0.0058, leverage had a positive coefficient of 0.0129, and related-party receivables had a positive coefficient of 0.0187. Since CETR is inversely related to the operational measure of tax avoidance, positive regression coefficients imply higher observed cash tax payments relative to pretax income rather than greater tax avoidance. Table 7 reports the coefficient estimates, firm-clustered robust standard errors, and statistical significance levels used to evaluate the individual hypotheses, following the cash-based measurement interpretation established by Dyreng et al. (2008).

Table 7. Random Effects Regression Estimates with Firm-Clustered Robust Standard Errors

Variable	Coefficient	Robust Standard Error	z Statistic	p-value
Constant	0.3913	0.3156	1.24	0.215
Firm size (SIZE)	−0.0058	0.0108	−0.54	0.588
Leverage (DER)	0.0129	0.0052	2.48	0.013
Related-party receivables (RPT)	0.0187	0.0337	0.55	0.580

Model information: N = 105; firms = 21; Wald $\chi^2(3) = 7.05$; $p = 0.0704$; overall $R^2 = 0.1085$; rho = 0.5070.

Source: Authors' calculations using STATA 15.

The negative coefficient of firm size indicated that larger companies tended to report lower CETR values when leverage and related-party receivables were held constant, although this association was statistically insignificant ($p = 0.588$). The estimated direction was consistent with the expectation that larger organizations possess greater resources for managing tax obligations, but the evidence did not support a reliable relationship between organizational scale and tax avoidance. This finding was consistent with Ainniyya et al. (2021), Malik et al. (2022), and Oktavia et al. (2025), while contrasting with the significant associations reported by Wedatara and Yasa (2024) and Widodo (2024). The opposing predictions of managerial tax-planning capacity and political cost exposure offer a plausible interpretation of the insignificant estimate, although the analysis did not directly measure these mechanisms (Watts & Zimmerman, 1978).

Leverage produced a positive and statistically significant coefficient on CETR in the baseline model ($\beta = 0.0129$; $p = 0.013$), implying that greater indebtedness was associated with higher cash tax

payments rather than stronger tax avoidance. The positive direction contradicted the anticipated tax-shield mechanism, under which interest deductions would ordinarily be expected to reduce taxable income and potentially lower corporate tax burdens. This result differed from the positive tax avoidance relationships reported by Wedatara and Yasa (2024) and Miracle et al. (2025), while also differing from the statistically insignificant findings of Solehah et al. (2024) and Ramadhan and Purnamasari (2025). Debt covenant pressures, creditor monitoring, and restrictions on interest deductibility represent possible competing mechanisms, but their influence cannot be established without direct measures of covenant conditions, financing arrangements, and deductible interest expenses (Nissim & Penman, 2003; Watts & Zimmerman, 1978).

The coefficient of related-party receivables was positive but statistically insignificant ($\beta = 0.0187$; $p = 0.580$), providing no reliable evidence that greater affiliated receivables intensity was associated with lower CETR in the sampled industrials companies. This result was consistent with the absence of significant associations reported by Santoso et al. (2021) and Buntu et al. (2025), but differed from evidence linking certain related-party transactions and transfer pricing characteristics to tax avoidance (Barokah & Nindya Sari, 2024; Zahri et al., 2025). The interpretation requires recognition that receivables from related parties are an incomplete proxy for transfer pricing because they do not identify transaction jurisdictions, contractual prices, or departures from arm's length conditions. The distinction between affiliated transaction intensity and actual profit shifting is particularly relevant when evaluating whether observed financial relationships support claims concerning aggressive corporate tax practices (Ananta, 2024; Sugiharti & Machdar, 2023). The results of individual and simultaneous hypothesis testing are summarized in Table 8, highlighting the differences between the expected and observed relationships.

Table 8. Summary of Hypothesis Testing

Hypothesis	Expected sign on CETR	Observed sign	p	Decision
H1: SIZE positively affects tax avoidance	(−)	(−)	0.588	Not supported; expected direction but nonsignificant
H2: DER positively affects tax avoidance	(−)	(+)	0.013	Not supported; significant but opposite direction
H3: RPT positively affects tax avoidance	(−)	(+)	0.580	Not supported; opposite direction and nonsignificant
H4: Joint effect	—	—	0.0704	Supported only at the 10% level

The simultaneous Wald test produced $\chi^2(3) = 7.05$ with a probability of 0.0704, indicating marginal joint significance at the 10% threshold but insufficient evidence of a joint association at the conventional 5% level. The overall R^2 of 0.1085 indicated that the regression explained approximately 10.85% of the observed variation in CETR, leaving a substantial proportion outside the explanatory scope of the three-variable specification. The estimated rho of 0.5070 further indicated that company-specific effects represented a substantial component of the modeled error variance, underscoring the relevance of unobserved organizational heterogeneity. This limited explanatory capacity is consistent with the broader observation that corporate tax avoidance is influenced by interacting financial, governance, and institutional characteristics that cannot be fully represented by firm size, leverage, and affiliated transaction intensity alone (Ainniyya et al., 2021; Moeljono, 2020; Kartika et al., 2023).

Robustness of Corporate Tax Avoidance Determinants, Theoretical Implications, and Fiscal Governance Considerations

The reliability of estimated relationships between corporate financial characteristics and tax avoidance depends not only on statistical significance but also on the stability of coefficient estimates under alternative model specifications. The baseline random effects regression identified a statistically significant positive association between leverage and the cash effective tax rate (CETR), whereas firm size and related-party receivables exhibited insignificant relationships. However, the pronounced dispersion of debt-to-equity ratios raised concerns that the leverage coefficient might be disproportionately influenced by observations with exceptionally high indebtedness. Financial research recognizes that extreme capital structure observations can affect regression estimates and their interpretation, particularly when financial ratios exhibit substantial distributional asymmetry (Nissim & Penman, 2003; Baltagi, 2021).

The leverage distribution provided a substantive basis for examining the sensitivity of the estimated association to influential observations. BNBR reported debt-to-equity ratios of 10.52 in 2021 and 10.44 in 2022, substantially exceeding the sample mean of approximately 0.85 and the 95th percentile of 1.98. Such observations represented an unusually concentrated degree of financial leverage relative to the majority of sampled industrials companies, potentially affecting coefficient precision and statistical inference. The importance of differentiating conventional debt financing from extreme indebtedness is consistent with research emphasizing the heterogeneous implications of leverage for financial performance, managerial incentives, and tax-related decisions (Arianandini & Ramantha, 2018; Miracle et al., 2025; Nasution et al., 2026).

Two sensitivity procedures were employed to evaluate whether the baseline leverage association remained statistically reliable under alternative treatments of extreme observations. The first specification excluded BNBR from the dataset, reducing the sample from 105 to 100 firm-year observations, while the second retained the complete sample but winsorized leverage at the 95th percentile. Both specifications employed random effects estimation with firm-clustered robust standard errors, preserving the principal estimation framework while modifying the treatment of unusually high debt-to-equity ratios. Table 9 presents the resulting leverage coefficients, robust standard errors, and joint Wald statistics, allowing the stability of the baseline relationship to be assessed against the alternative specifications (Baltagi, 2021; Savitri et al., 2021).

Table 9. Robustness Checks of the Relationship between Leverage and Cash Effective Tax Rates

Model Specification	N	DER Coefficient	Robust SE	p-value (DER)	Wald $\chi^2(3)$	p-value (Wald)
Baseline random effects model	105	0.0129	0.0052	0.013	7.05	0.0704
Excluding BNBR	100	0.0589	0.0392	0.137	2.74	0.433
DER winsorized at 95th percentile	105	0.0538	0.0354	0.132	2.32	0.508

Note: The dependent variable is CETR. All specifications employ random effects regression with firm-clustered robust standard errors.
Source: Authors' calculations using STATA 15.

Table 9 demonstrates that the positive association between leverage and CETR was not statistically robust to either sensitivity specification. Excluding BNBR increased the estimated leverage coefficient from 0.0129 to 0.0589, but the corresponding robust standard error rose from 0.0052 to 0.0392, resulting in a probability of 0.137. Winsorizing leverage produced a comparable positive coefficient of 0.0538 with a probability of 0.132, indicating that the estimated direction persisted while conventional statistical significance disappeared. These findings suggest that the baseline leverage association should be interpreted cautiously rather than regarded as conclusive evidence that more highly indebted companies systematically exhibit lower tax avoidance (Ramadhan & Purnamasari, 2025; Solehah et al., 2024).

The sensitivity results also qualify the evidence concerning the simultaneous explanatory relevance of firm size, leverage, and related-party receivables. Although the baseline Wald test

indicated marginal joint significance at the 10% level, the corresponding probabilities increased to 0.433 after excluding BNBR and 0.508 following leverage winsorization. Firm size and related-party receivables remained statistically insignificant under both alternative specifications, with reported probability values ranging from approximately 0.33 to 0.57. The instability of joint significance indicates that conclusions regarding the combined explanatory contribution of the three financial characteristics are sensitive to the treatment of extreme leverage observations, reinforcing the need for cautious interpretation of corporate financial models with heterogeneous debt structures (Baltagi, 2021; Gujarati, 2004).

The absence of a robust leverage relationship presents an important qualification to conventional theoretical expectations concerning debt-related tax advantages. Interest deductibility provides a potential incentive for debt financing, but agency theory indicates that managerial financial decisions may also reflect monitoring arrangements, conflicts of interest, and contractual constraints that influence corporate behavior beyond immediate tax savings (Jensen & Meckling, 1976; Payne & Petrenko, 2019). Positive accounting theory offers a complementary explanation through the debt covenant hypothesis, under which highly indebted firms may face incentives to maintain favorable reported financial performance, potentially producing tax-related consequences that differ from those predicted by the tax-shield argument (Watts & Zimmerman, 1978). The regression results cannot establish whether creditor monitoring or debt covenant incentives directly influenced the sampled companies, particularly because contractual conditions and deductible interest expenses were not separately measured.

The insignificant relationships involving firm size and related-party receivables also have implications for interpretations of corporate tax planning based on organizational visibility and transaction complexity. Signaling theory suggests that corporate financing and reporting decisions may communicate information concerning organizational quality and risk, while larger firms may face reputational incentives that constrain potentially aggressive tax positions (Spence, 1973; Ross, 1977). Research on firm size has reported divergent associations with tax avoidance, supporting the interpretation that organizational scale may represent competing tax-planning opportunities and monitoring pressures rather than a uniformly directional determinant (Malik et al., 2022; Wedatara & Yasa, 2024; Oktavia et al., 2025). The absence of a significant relationship between related-party receivables and CETR similarly indicates that affiliated transaction intensity should not be equated with tax-motivated income shifting without information concerning transaction pricing, counterparties, and jurisdictional differences (Barokah & Nindya Sari, 2024; Buntu et al., 2025; Zahri et al., 2025).

These findings carry practical implications for corporate financial management and tax compliance monitoring, particularly regarding the limitations of using individual accounting ratios as indicators of potentially aggressive taxation. Managers should evaluate financing decisions according to their combined implications for liquidity, contractual obligations, financial sustainability, and tax compliance rather than assuming that higher leverage necessarily reduces cash tax burdens. Tax administrators should likewise avoid treating company size or the proportion of related-party receivables as sufficient standalone evidence of tax avoidance, since the observed relationships were statistically insignificant and the receivables-based proxy did not establish inappropriate transfer pricing. Research addressing related-party transactions and the arm's length principle supports differentiated examination of transaction characteristics and compliance documentation rather than reliance on affiliated transaction volume alone (Sugiharti & Machdar, 2023; Jumliana et al., 2025; Winarta & Basani, 2026).

The interpretation of these results remains subject to limitations arising from the research design, sample composition, variable measurement, and statistical specification. The analysis covered 21 purposively selected companies over five years, excluded observations associated with loss-making firms, and relied on a single operational measure for each construct, thereby restricting generalizability and potentially introducing selection bias. The overall explanatory power of 10.85% and the considerable firm-specific variance component suggest that additional characteristics, including profitability, capital intensity, corporate governance, and tax incentives, may warrant investigation, although their influence was not directly estimated in the present model (Darma & Al Imadah, 2023; Kartika et al., 2023; Moeljono, 2020). Future research could evaluate alternative tax avoidance measures, distinguish domestic from cross-border related-party transactions, incorporate

additional financial and governance controls, and employ broader datasets with sensitivity analyses capable of separating stable empirical relationships from associations dependent on influential observations.

CONCLUSION

This study examined the individual and simultaneous associations of firm size, leverage, and transfer pricing with tax avoidance among 21 industrials sector companies listed on the Indonesia Stock Exchange during 2021–2025, using 105 firm-year observations. The random effects regression indicated that firm size had a negative but statistically insignificant association with the cash effective tax rate ($\beta = -0.0058$; $p = 0.588$), providing insufficient evidence that organizational scale was systematically related to tax avoidance. Transfer pricing, measured through the proportion of related-party receivables, also exhibited an insignificant association with CETR ($\beta = 0.0187$; $p = 0.580$), indicating that affiliated receivables intensity did not reliably explain differences in corporate cash tax payments. Leverage demonstrated a positive and statistically significant association with CETR in the baseline specification ($\beta = 0.0129$; $p = 0.013$), suggesting lower tax avoidance among more highly leveraged companies, contrary to the anticipated debt-related tax-saving effect. However, this association lost statistical significance when the company with extreme leverage was excluded ($p = 0.137$) and when leverage was winsorized at the 95th percentile ($p = 0.132$), indicating that the baseline finding was sensitive to influential observations. The three explanatory variables were jointly significant only at the 10% level (Wald $\chi^2(3) = 7.05$; $p = 0.0704$), with an overall R^2 of 10.85%, while their joint significance disappeared under both robustness specifications. These findings demonstrate that firm size, leverage, and related-party receivables provide limited and statistically unstable explanatory information concerning cash-based tax avoidance in the sampled industrials companies.

The study contributes to corporate taxation research by providing sector-specific empirical evidence that qualifies conventional assumptions regarding the relationships between organizational scale, corporate indebtedness, affiliated transactions, and tax avoidance. Its methodological contribution lies in combining panel regression estimation, firm-clustered robust inference, and sensitivity analysis to distinguish baseline statistical significance from relationships that remain stable under alternative treatments of extreme observations. The findings also emphasize the importance of interpreting CETR coefficients according to their inverse relationship with tax avoidance and recognizing that related-party receivables do not independently establish inappropriate transfer pricing practices. For corporate management, the results suggest that financing structures and affiliated transactions should be assessed alongside broader financial and compliance considerations rather than treated as automatic instruments for reducing corporate tax burdens. For tax authorities, the limited explanatory power of the model indicates that firm size, leverage, and related-party receivables should not serve as standalone indicators of aggressive tax behavior. The conclusions remain constrained by the relatively small purposively selected sample, the exclusion of loss-making companies, the five-year observation period, and reliance on individual proxies without additional financial or governance controls. Future research should incorporate broader sectoral coverage, alternative tax avoidance and related-party transaction measures, additional corporate characteristics, and sensitivity analyses to establish more reliable evidence regarding the determinants of corporate tax behavior.

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