

“Financial structure and current corporate income tax expense: Evidence from Indonesian oil, gas, and coal firms”

AUTHORS	Indra Pahala 
	Tresno Eka Jaya 
	Elmier Immanuel
	Doni Sugianto Sihotang 
	Rismawati 
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Indra Pahala, Ph.D., Associate Professor, Department of Accounting, Faculty of Economics and Business, Universitas Negeri Jakarta [Jakarta State University], Indonesia. (Corresponding author)

Tresno Eka Jaya, Ph.D., Associate Professor, Faculty of Economics and Business, Department of Accounting, Universitas Negeri Jakarta [Jakarta State University], Indonesia.

Elmier Immanuel, Bachelor's Student, Department of Accounting, Faculty of Economics and Business, [Jakarta State University], Indonesia.

Doni Sugianto Sihotang, Ph.D. Student, Department of Management, Faculty of Economics and Business, Universitas Negeri Jakarta [Jakarta State University], Indonesia.

Rismawati, Ph.D., Associate Professor, Department of Accounting, Universitas Muhammadiyah Palopo [Palopo Muhammadiyah University], Indonesia.



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Indra Pahala (Indonesia), Tresno Eka Jaya (Indonesia), Elmier Immanuel (Indonesia), Doni Sugianto Sihotang (Indonesia), Rismawati (Indonesia)

FINANCIAL STRUCTURE AND CURRENT CORPORATE INCOME TAX EXPENSE: EVIDENCE FROM INDONESIAN OIL, GAS, AND COAL FIRMS

Abstract

This study aims to examine the relationship between financial structure and current corporate income tax expense among publicly listed oil, gas, and coal companies in Indonesia. Using a quantitative panel-data approach, the study analyzes 28 companies listed on the Indonesia Stock Exchange during 2021–2023, producing a balanced panel of 84 firm-year observations. The analysis focuses on liquidity, solvency, operating costs, and capital intensity, while controlling for firm size, revenue, and profitability. Current corporate income tax expense is measured from audited financial statements and distinguished from effective tax rates, cash tax paid, and government tax revenue. The results demonstrate that operating costs and capital intensity show negative associations in the random-effects model, but these relationships become statistically insignificant in fixed-effects and Mundlak correlated random-effects models. Liquidity and solvency are not statistically significant. The findings therefore indicate specification-sensitive firm-level accounting associations rather than robust within-firm relationships or causal effects. High correlation among monetary variables and the absence of a consistent production-scale measure further require cautious interpretation. The study contributes to understanding corporate tax-accounting outcomes in Indonesia's extractive sector within a public-finance context.

Keywords

current corporate income tax expense, financial structure, extractive industry, public revenue, panel data regression

JEL Classification

H25, G32, M41

INTRODUCTION

Corporate taxation in extractive industries is an important instrument of public revenue mobilization, while current corporate income tax expense represents a firm-level accounting measure that may differ from cash tax payments and government revenue collection. In resource-rich economies, extractive taxation serves not only to generate fiscal revenues but also to capture a fair share of economic rents from non-renewable natural resources. These revenues support public expenditure, infrastructure, education, healthcare, environmental rehabilitation, and regional development. However, extractive industries are characterized by high capital intensity, long investment horizons, substantial sunk costs, and exposure to commodity-price volatility. Governments therefore face the challenge of designing fiscal systems that secure public revenues while maintaining investment incentives and sustainable resource development (Das et al., 2023; Addison & Roe, 2024). The redevelopment of former mining sites for tourism also provides a context for environmental rehabilitation and regional diversification in Indonesia (Suhud et al., 2026).

Corporate taxation in extractive industries involves multiple fiscal instruments, including corporate income taxes, royalties, depreciation allowances, investment incentives, production-sharing arrangements, and, in some circumstances, windfall profit taxes. These instruments shape the corporate tax base and influence how resource rents are distributed between firms and governments. Nevertheless, current corporate income tax expense recognized in financial statements should be distinguished from actual tax payments and government revenue because differences may occur in both amount and timing. Tax reforms can also influence investment decisions, project feasibility, and the timing of taxable income recognition, thereby affecting the fiscal environment in which extractive firms operate (Abdul-Salam, 2024).

From a public-finance perspective, variation in current corporate income tax expense provides firm-level information relevant to understanding corporate taxation but does not directly measure government revenue collected. Statutory tax rates establish the legal framework, whereas current corporate income tax expense reflects accounting outcomes associated with taxable income and applicable tax provisions. These outcomes may vary according to firms' financing arrangements, asset structures, operating expenditures, production intensity, and investment commitments. Multinational ownership, cross-border financing, regulatory effectiveness, corruption risks, and institutional capacity may further influence corporate tax behavior and fiscal governance (Das et al., 2023; Gichuki, 2022).

Despite the strategic importance of extractive taxation, uncertainty remains regarding the financial characteristics associated with variation in current corporate income tax expense. Existing evidence suggests that liquidity, leverage, operating expenditures, and capital investment may influence corporate tax outcomes, but their direction and magnitude vary across institutional environments, industries, and fiscal systems (Ali et al., 2022). These relationships may be particularly complex in extractive industries because taxation outcomes are also shaped by commodity-price fluctuations, regulatory interventions, depreciation rules, investment incentives, and sector-specific fiscal arrangements (Das et al., 2023; Murray, 2024). Examining financial characteristics can therefore contribute to understanding firm-level accounting outcomes relevant to corporate taxation without implying direct effects on government revenue mobilization.

Indonesia provides a relevant setting because oil, gas, and coal remain important components of the country's extractive economy and fiscal system. At the same time, Indonesia seeks to promote investment-led development while strengthening tax administration and fiscal governance. This creates a continuing policy challenge in balancing investment incentives with the protection of public fiscal interests derived from non-renewable resources. Understanding how firm-level financial characteristics relate to current corporate income tax expense can therefore contribute to broader discussions of corporate taxation and public finance in emerging economies. Trust and collective expectations provide a complementary conceptual perspective on institutional relationships in political economy (Sihotang et al., 2027b).

1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The relationship between financial structure and corporate income tax outcomes has received substantial attention in accounting, finance, and public finance. This relationship is particularly relevant in extractive industries because governments seek to capture economic returns from non-re-

newable resources while maintaining investment incentives (Luo & Tanna, 2014). At the firm level, current corporate income tax expense represents an accounting outcome associated with taxable income and applicable tax provisions. Consequently, financial decisions, operational activities, investment structures, and institutional conditions may shape reported tax outcomes (Song & Yuan, 2024). In capital-intensive sectors such as oil, gas, and coal, financing costs, operating expenditures, depreciation, and investment-related tax provisions

may further influence taxable income and current corporate income tax expense (Landa, 2012; Li et al., 2012).

Capital structure theory provides a foundation for understanding these relationships. The traditional trade-off perspective emphasizes the debt tax shield, whereby deductible interest expenses may reduce taxable income and corporate income tax obligations (Alexander & Menicacci, 2025). However, financial structure also reflects agency considerations, creditor monitoring, financial distress, and governance mechanisms that may influence managerial and tax-related decisions (Amrulloh et al., 2025; Nini & Smith, 2024). Thus, differences in financial structure may be associated with differences in taxable income and current corporate income tax expense, although these accounting outcomes should not be equated with actual tax payments or government revenue.

Liquidity represents an important financial characteristic because firms with greater liquid resources may have greater flexibility in managing tax obligations, operations, and tax-planning activities. However, liquidity may generate competing incentives depending on financial constraints, uncertainty, and governance conditions. Previous evidence is mixed, suggesting that liquidity may either facilitate tax planning or reduce incentives for aggressive tax strategies across different institutional contexts (Benkraiem et al., 2025; Berger et al., 2025; Syarif & Koerniawan, 2025; Seidu et al., 2023; Tanko, 2025). Accordingly, the direction and magnitude of the relationship between liquidity and current corporate income tax expense remain empirically uncertain.

Solvency provides another important dimension of financial structure. Leverage can affect taxation through interest deductibility, financial distress, and creditor monitoring (Lyeonov et al., 2022; Jaworski & Czerwonka, 2021). Although debt financing may reduce taxable income through deductible interest, higher leverage may also strengthen external monitoring and affect tax-related decisions. Evidence indicates that leverage is associated with corporate taxation outcomes, although its direction and magnitude vary across institutional and industry settings (Edwards et al., 2016; Joulfaian, 2011). These effects may be partic-

ularly complex in extractive industries because of substantial investment requirements and sector-specific fiscal arrangements (Cheng et al., 2024; Szüle, 2017).

Operating costs may also be associated with current corporate income tax expense because qualifying business expenditures can affect taxable income. Firms may adjust discretionary and production-related expenditures in ways that influence earnings and tax outcomes (Wibowo, 2024), while operating costs may also relate to tax-planning behavior under conditions of revenue fluctuation and managerial discretion (Tanko, 2025). In extractive industries, however, operational decisions involve trade-offs between tax considerations and business efficiency amid volatile production conditions (Sajedianfard & Shahnazi, 2025). Importantly, operating costs are closely related to firm scale: larger firms may simultaneously report higher costs, revenues, profits, and tax expenses. Therefore, an association between operating costs and tax expense may partly reflect differences in operating scale rather than an independent effect.

Capital intensity is similarly relevant because extractive industries require substantial investment in fixed assets, infrastructure, and production facilities. Depreciation allowances and investment incentives can influence the timing and magnitude of taxable income, potentially producing different tax outcomes for capital-intensive firms (Damayanti et al., 2023; Herianti & Budi, 2024). However, these effects depend on fiscal design, enforcement, and firm-specific characteristics (Zulkifli & Ja'afar, 2025; Konečná & Andrejovská, 2020).

An important distinction is between between-firm and within-firm relationships. Between-firm associations reflect persistent differences across firms, whereas within-firm relationships capture changes occurring within the same firm over time. Persistent business models, ownership structures, fiscal arrangements, asset composition, and production characteristics may generate cross-firm associations that do not persist within firms. Therefore, this study compares random-effects, fixed-effects, and Mundlak correlated random-effects specifications to assess whether the relationships remain after accounting for time-invariant firm heterogeneity.

Overall, prior evidence indicates that liquidity, solvency, operating costs, and capital intensity may be associated with current corporate income tax expense, although findings vary across institutional environments, industries, regulatory systems, and firms (Wang et al., 2018; Wu & Cheng, 2021). Accordingly, this study examines the relationships between liquidity, solvency, operating costs, capital intensity, and current corporate income tax expense among publicly listed oil, gas, and coal companies in Indonesia during 2021–2023. The analysis controls for firm size, revenue, and profitability and compares random-effects, fixed-effects, and Mundlak specifications. The dependent variable is current corporate income tax expense recognized in audited financial statements, rather than cash tax paid or government revenue. The study therefore focuses on firm-level variation in reported tax expense and interprets the estimated relationships as conditional accounting associations rather than direct evidence of government revenue realization. The hypotheses are as follows:

H1: There is a significant relationship between liquidity and current corporate income tax expense.

H2: There is a significant relationship between solvency and current corporate income tax expense.

H3: There is a significant relationship between operating costs and current corporate income tax expense.

H4: There is a significant relationship between capital intensity and current corporate income tax expense.

Figure 1 presents the study framework linking liquidity, solvency, operating costs, and capital intensity with current corporate income tax expense. Logged total assets, logged revenue, and return on assets are included as control variables. Liquidity reflects short-term financial capacity, solvency represents financing position, operating costs capture operational expenditures, and capital intensity reflects fixed-asset investment. These characteristics may be associated with current corporate income tax expense through taxable-income mechanisms, depreciation, and differences in firm scale. The proposed relationships are interpreted as conditional associations rather than causal effects.

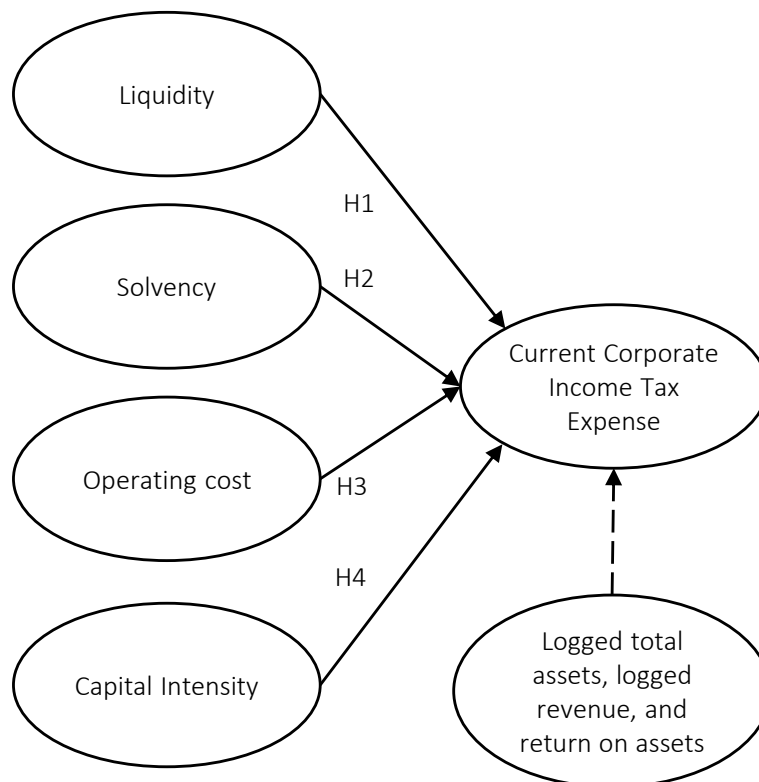


Figure 1. Study framework

2. METHOD

2.1. Data source

Empirical data were obtained from publicly available annual and sustainability reports of companies listed on the Indonesia Stock Exchange (IDX), providing audited and regulator-monitored financial and tax information (De Cristofaro & Gulluscio, 2023). Using purposive sampling, the study selected oil, gas, and coal firms continuously listed during 2021–2023 with complete data, resulting in a balanced panel of 28 firms and 84 firm-year observations (Table 1). The analytical sample was restricted to observations reporting positive current corporate income tax expense because the dependent variable was natural-log transformed. Observations with zero or negative tax expense were excluded. All data were obtained from publicly accessible corporate disclosures and IDX publications.

The available analytical workbook does not retain the complete initial sampling universe or the number of observations excluded because of zero, negative, or unavailable current corporate income tax expense. Consequently, the earlier stages of sample selection cannot be quantitatively reconstructed.

2.2. Measurement

The dependent variable is current corporate income tax expense recognized in firms' audited financial statements and transformed using the natural logarithm (Table 2). It represents an accounting measure rather than an effective tax rate, cash tax paid, or government revenue (Mgammal & Al-Matari, 2023; Schwab et al., 2022). Explanatory variables include liquidity (current assets/current liabilities), solvency (total liabilities/total equity), logged operating costs, and capital intensity (fixed assets/total assets). Controls comprise logged total

Table 1. Data source and sample selection

Sample-selection stage	Firms	Firm-years	Sample-selection stage
Final complete positive-tax balanced panel	28	84	Final complete positive-tax balanced panel
Duplicate firm-year records	0	0	Duplicate firm-year records
Missing values in final estimation variables	0	0	Missing values in final estimation variables
Final estimation sample	28	84	Final estimation sample
Sample-selection stage	Firms	Firm-years	Sample-selection stage

Table 2. Operationalization and measurement of variables

Variable	Definition	Exact Measurement/ Formula	Unit/Transformation	Source
Current Corporate Income Tax Expense	Current corporate income tax expense recognized in the firm's financial statements	$\ln(\text{Current Corporate Income Tax Expense})$	USD; natural logarithm	Audited annual financial statements
Liquidity	Firm's capacity to meet its short-term financial obligations	$\text{Current Ratio} = \text{Current Assets} / \text{Current Liabilities}$	Ratio	Audited annual financial statements
Solvency	Firm's financing position reflecting liabilities relative to its own equity	$\text{Debt-to-Equity Ratio (DER)} = \text{Total Liabilities} / \text{Total Equity}$	Ratio	Audited annual financial statements
Operating Costs	Operating expenditures associated with the firm's principal business activities	$\ln(\text{Selling Expenses} + \text{General and Administrative Expenses})$	USD; natural logarithm	Audited annual financial statements
Capital Intensity	Proportion of the firm's assets committed to fixed assets	$\text{Capital Intensity Ratio} = \text{Fixed Assets} / \text{Total Assets}$	Ratio	Audited annual financial statements
Total assets		$\ln(\text{Total assets})$	USD; natural logarithm	Audited annual financial statements
Revenue		$\ln(\text{Revenue or net sales})$	USD; natural logarithm	Audited annual financial statements
Profitability		$\text{Net income} / \text{total assets}$	ROA ratio	Audited annual financial statements

assets, logged revenue, and ROA (net income/total assets). Detailed operating-cost components were unavailable, limiting independent verification of classification consistency.

2.3. Variable transformation

Due to the substantial differences in monetary scale across the sampled firms, the monetary variables were transformed using the natural logarithm prior to regression estimation. Specifically, current corporate income tax expense was measured as the natural logarithm of the corporate income tax expense reported in the firms' financial statements. In contrast, operating costs were measured as the natural logarithm of selling expenses plus general and administrative expenses or, where reported as an aggregate amount, operating expenses. The logarithmic transformation was applied to reduce excessive variation in monetary values across observations while preserving their proportional differences. This specification is consistent with the measurement approach adopted in previous studies, including Sahrullah and Faizah (2026) and Hapsari and Kuntadi (2023) for corporate income tax expense and Handayani and Edhy (2024) for operating costs. Accordingly, the transformed variables used in the regression model are expressed as:

$$\ln(TAX_{it}) = \ln\left(\frac{\text{Current Corporate Income Tax Expense}_{it}}{\text{Income Tax Expense}_{it}}\right), \quad (1)$$

$$\ln(TA_{it}) = \ln(\text{Total Assets}_{it}), \quad (2)$$

$$\ln(REV_{it}) = \ln(\text{Revenue}_{it}), \quad (3)$$

$$\ln(OC_{it}) = \ln(\text{Operating Costs}_{it}), \quad (4)$$

where operating costs refer to selling expenses plus general and administrative expenses or total operating expenses, depending on the financial statement presentation. Liquidity, solvency, and capital intensity were not logarithmically transformed and were retained in their original ratio forms: the current ratio (current assets/current liabilities), debt-to-equity ratio (total liabilities/total equity), and capital intensity ratio (fixed assets/total assets), respectively. Thus, the descriptive statistics reported in Table 5 present the monetary variables in USD

values to facilitate economic interpretation and comparison across firms, whereas the subsequent panel regression estimation uses their natural-log-transformed values. This distinction explains the scale difference between the descriptive statistics and the regression coefficients and model-error statistics reported in the empirical analysis.

2.4. Regression model specification

The study employs panel-data regression to examine the relationships between firms' financial characteristics and current corporate income tax expense. Panel-data analysis combines cross-sectional and time-series information and allows the model to account for unobserved heterogeneity across firms and over time (Baltagi, 2021; Hsiao, 2022). The dataset comprises 28 publicly listed oil, gas, and coal firms observed over the 2021–2023 period, resulting in a balanced panel of 84 firm-year observations. The source dataset confirms this panel structure and the use of panel regression for the original empirical analysis.

Consistent with the variable operationalization described above, current corporate income tax expense and operating costs enter the regression in natural-logarithmic form. In contrast, liquidity, solvency, and capital intensity are retained as ratios. The regression specification also incorporates year fixed effects to account for common annual variation affecting all sampled firms. With 2021 serving as the reference year, the model is specified as:

$$\begin{aligned} \ln(TAX_{it}) = & \beta_0 + \beta_1 LIQ_{it} + \beta_2 SOLV_{it} \\ & + \beta_3 \ln(OC_{it}) + \beta_4 CI_{it} + \beta_5 \ln(TA_{it}) \\ & + \beta_6 \ln(REV_{it}) + \beta_7 ROA_{it} + \gamma_1 Year2022_t \\ & + \gamma_2 Year2023_t + \mu_i + \varepsilon_{it}, \end{aligned} \quad (5)$$

where $\ln(TAX_{it})$ = natural logarithm of current corporate income tax expense for firm i in year t ; LIQ_{it} = liquidity, measured using the current ratio; $SOLV_{it}$ = solvency, measured using the debt-to-equity ratio; $\ln(OC_{it})$ = natural logarithm of operating costs; CI_{it} = capital intensity ratio; $\ln(TA_{it})$ = natural logarithm of total assets, used as the firm-size control; $\ln(REV_{it})$ = natural logarithm of revenue or net sales, used as the operating-scale control; ROA_{it} = return on assets, used as the profitability control; $Year2022_t$ = dummy variable equal

to 1 for 2022 and 0 otherwise; $Year2023_i$ = dummy variable equal to 1 for 2023 and 0 otherwise; β_0 = intercept; β_1 – β_4 = coefficients of the firm-level explanatory variables; β_5 – β_7 = coefficients of the control variables. γ_1 and γ_2 = coefficients of the 2022 and 2023 year fixed effects relative to the reference year 2021; μ_i = firm-specific effect; and ε_{it} = idiosyncratic error term.

The original dataset measures liquidity using the current ratio, solvency using the debt-to-equity ratio, operating costs in logarithmic form, and capital intensity as fixed assets relative to total assets. Year indicators control common temporal effects. Controls include total assets, revenue, and profitability. Production scale is unavailable. High VIFs indicate multicollinearity.

2.5. Data analysis methods

The empirical analysis proceeds in several stages. First, descriptive statistics are used to summarize the distribution and variation of the study variables. Second, panel-model selection is conducted to determine the appropriate treatment of firm-specific effects. The Chow test compares the pooled/common-effects and fixed-effects specifications, the Hausman test compares fixed and random effects, and the Breusch–Pagan Lagrange Multiplier (LM) test distinguishes between pooled and random-effects specifications. These procedures are consistent with established panel-data estimation approaches (Baltagi, 2021; Hsiao, 2022).

The original analysis identified the random-effects model as the preferred main specification. The source output reports a panel EGLS cross-section random-effects model based on 28 cross-sections and 84 balanced observations. The revised analysis reports random-effects, firm fixed-effects, and Mundlak correlated random-effects specifications as complementary models. The random-effects model combines within-firm and between-firm information, whereas the fixed-effects and Mundlak specifications provide estimates based on within-firm vari-

ation after accounting for persistent firm heterogeneity. A relationship is regarded as robust only when its sign, magnitude, statistical significance, and confidence interval remain substantively consistent across these alternative treatments of firm-specific effects.

2.6. Panel diagnostic tests

Panel diagnostics (Table 3) assess heteroskedasticity, serial correlation, and cross-sectional dependence. The Glejser test indicates no heteroskedasticity (all $p > .05$), while panel-specific serial-correlation and Pesaran CD tests assess temporal and cross-firm dependence. These diagnostics guide the appropriate treatment of regression standard errors and complement model-selection procedures.

2.7. Cluster-robust statistical inference

To address the within-firm serial correlation identified by the Wooldridge test and to reduce sensitivity to heteroskedasticity, all revised panel specifications use standard errors clustered at the firm level. This adjustment permits arbitrary heteroskedasticity and correlation of regression disturbances within the same firm over time. The clustering level corresponds to the 28 firms in the panel. Accordingly, p -values and 95% confidence intervals are calculated using a t distribution with 27 cluster degrees of freedom. The absence of significant cross-sectional dependence supports clustering at the firm level, although the diagnostic results should be interpreted cautiously because the panel contains only three annual observations per firm.

2.8. Robustness analysis

The results show that liquidity and solvency are not significant, while operating costs and capital intensity are significant only in RE and disappear in FE/Mundlak. Revenue and ROA show positive within-firm associations. Thus, H1–H4 lack robust support, indicating that observed tax-accounting

Table 3. Panel diagnostic tests

Diagnostic test	Statistic	p-value	Decision
Heteroskedasticity: Glejser test	Max. t = 1.552	.132–.884	No significant heteroskedasticity detected
Wooldridge first-order serial-correlation test	F(1, 27) = 32.048	< .001	First-order serial correlation detected
Pesaran cross-sectional-dependence test	CD = –0.016	.987	No significant cross-sectional dependence detected

Table 4. Robustness checks across panel specifications

Variable	Random Effects	Fixed Effects	Mundlak CRE
Liquidity	-0.048, p = .407	-0.125, p = .288	-0.125, p = .211
Solvency	-0.057, p = .076	-0.028, p = .774	-0.028, p = .735
ln(Operating Costs)	-0.230, p = .016	-0.219, p = .266	-0.219, p = .191
Capital Intensity	-2.087, p < .001	-3.368, p = .177	-3.368, p = .113
Year 2022	-0.053 (0.705)	0.223 (0.322)	0.223 (0.232)
Year 2023	-0.360 (0.116)	-0.147 (0.600)	-0.147 (0.527)
Year fixed effects	Yes	Yes	Yes
Firm effects	Random	Fixed	Correlated random
Firm-clustered SE	Yes	Yes	Yes

Note: The diagnostic tests are based on the revised controlled specification containing liquidity, solvency, logged operating costs, capital intensity, logged total assets, logged revenue, ROA, and year effects. Because the Wooldridge test identifies within-firm serial correlation, all RE, FE, and Mundlak CRE models use standard errors clustered at the firm level.

relationships largely reflect firm-scale and persistent cross-firm differences rather than causal within-firm effects.

The Mundlak specification is expressed as:

$$\begin{aligned}
 \ln(TAX_{it}) = & \beta_0 + \beta_1 LIQ_{it} + \beta_2 SOLV_{it} \\
 & + \beta_3 \ln(OC_{it}) + \beta_4 CI_{it} + \theta_1 \bar{LIQ}_i \\
 & + \theta_2 \bar{SOLV}_i + \theta_3 \ln(\bar{OC})_i + \theta_4 \bar{CI}_i \\
 & + \gamma_1 Year2022_i + \gamma_2 Year2023_i + u_i + \varepsilon_{it}.
 \end{aligned} \quad (6)$$

The firm-level means are calculated over the three annual observations available for each firm. Year fixed effects and firm-clustered standard errors are retained to maintain consistency with the main regression specification.

3. RESULTS

3.1. Descriptive statistics

Table 5 presents descriptive statistics for the 84 firm-year observations using the same measure-

ment scales employed in the regression analysis. Liquidity has a mean of 2.013, while solvency has a mean of 1.427. Logged operating costs and logged current corporate income tax expense have means of 17.530 and 17.041, respectively. Capital intensity has a mean of 0.282, indicating that fixed assets account for approximately 28.2% of total assets on average. The control variables also display substantial cross-firm variation. Logged total assets range from 17.331 to 23.199, logged revenue ranges from 15.837 to 22.815, and ROA ranges from approximately zero to 0.616. The dispersion of the logged monetary variables reflects substantial differences in firm scale across the sampled extractive firms. This descriptive examination underscores substantial diversity, skewed financial metrics, and notable scaling effects in the data, justifying the adoption of panel methodologies and logarithmic models to derive meaningful, policy-relevant outcomes (Stašek & Lyócsa, 2024; Ghazal et al., 2024).

Table 6 decomposes total variation into between-firm and within-firm components. Most variation in the monetary variables and capital intensity occurs between firms. Specifically, 95.8% of the vari-

Table 5. Descriptive results

Variable	Mean	Median	Minimum	Maximum	SD
Liquidity	2.013	1.664	0.270	7.876	1.330
Solvency	1.427	0.970	0.140	8.453	1.628
ln(Operating costs)	17.530	17.718	13.730	20.573	1.547
Capital intensity	0.282	0.178	0.002	0.844	0.250
ln(Current tax expense)	17.041	17.739	10.879	21.221	2.270
ln(Total assets)	20.725	20.737	17.331	23.199	1.317
ln(Revenue)	20.177	20.356	15.837	22.815	1.567
ROA	0.159	0.083	0.000	0.616	0.170

Note: N = 84 firm-year observations. The prefix ln denotes the natural logarithm of a standardized USD amount. ROA is presented as a ratio.

Table 6. Between-firm and within-firm shares of total variation

Variable	Between-firm	Within-firm
ln(Current corporate income tax expense)	95.2%	4.8%
Liquidity	79.0%	21.0%
Solvency	82.9%	17.1%
ln(Operating costs)	95.8%	4.2%
Capital intensity	98.7%	1.3%
ln(Total assets)	98.2%	1.8%
ln(Revenue)	95.4%	4.6%
ROA	85.8%	14.2%

Note: The shares are calculated from the decomposition of total sums of squares in the balanced panel.

ation in logged operating costs, 95.2% in logged current tax expense, 98.2% in logged total assets, and 95.4% in logged revenue occurs between firms. Capital intensity is particularly stable within firms, with 98.7% of its total variation occurring between firms. Consequently, fixed-effects and Mundlak coefficients are estimated from relatively limited within-firm variation over the three years.

3.2. Model selection and diagnostic tests

Panel specification tests (Table 7) were recalculated using the controlled model containing liquidity, solvency, logged operating costs, capital intensity, logged total assets, logged revenue, ROA, and year effects. The Chow test rejects the pooled OLS specification, $F(27, 47) = 3.554$, $p < .001$, indicating the presence of firm-specific effects. The Breusch–Pagan LM test also rejects pooled OLS in favor of a panel specification, $\chi^2(1) = 18.828$, $p < .001$. The conventional Hausman test does not reject the random-effects consistency assumption, $\chi^2(9) = 2.283$, $p = .986$. The random-effects model combines within-firm and between-firm variation. RE is reported together with firm fixed-effects and Mundlak correlated random-effects estimates. The conventional Hausman result is not treated as evidence that statistically significant RE coefficients necessarily represent robust within-firm relationships.

3.3. Regression results

Table 8 presents the controlled random-effects estimates. The specification includes logged total assets, logged revenue, and ROA as control variables, together with indicators for 2022 and 2023. Statistical inference is based on standard errors clustered at the firm level and a t distribution with 27 cluster degrees of freedom. Because the RE model combines within-firm and between-firm information, its results are subsequently compared with FE and Mundlak CRE estimates.

Liquidity has a negative but statistically insignificant association with current corporate income tax expense ($\beta = -0.048$, $p = .407$). Solvency is also negative but does not reach the 5% significance threshold ($\beta = -0.057$, $p = .076$). Accordingly, $H1$ and $H2$ are not supported at the 5% level. After firm size, revenue, and profitability are controlled, logged operating costs have a negative and statistically significant RE coefficient ($\beta = -0.230$, $p = .016$). The coefficient differs materially from the positive coefficient obtained from the previous uncontrolled specification. Because the dependent variable and operating costs are log transformed, the controlled RE coefficient indicates that a 1% difference in operating costs is conditionally associated with approximately 0.23% lower current corporate income tax expense. However, this coefficient is interpreted cautiously because the mon-

Table 7. Panel model selection tests

Test	Null Hypothesis	Test Statistic	p-value	Decision
Chow test	Pooled OLS is adequate	$F(27, 47) = 3.554$	$< .001$	Firm effects are present
Conventional Hausman test	RE is consistent	$\chi^2(9) = 2.283$	.986	Fail to reject the RE assumption
Breusch–Pagan LM test	No random effects	$\chi^2(1) = 18.828$	$< .001$	Panel RE is preferred to pooled OLS
Mundlak mean joint test	All seven firm means equal zero	$F(7, 27) = 0.932$	.499	Joint null is not rejected

Note: Model-selection tests do not replace the comparison of RE, FE, and Mundlak coefficient estimates. Robustness is evaluated from the consistency of coefficients, clustered standard errors, p-values, and confidence intervals across specifications.

Table 8. Controlled random-effects estimates

Variable	Coefficient	Clustered SE	p-value	95% CI
Liquidity	−0.048	0.057	.407	[−0.165, 0.069]
Solvency	−0.057	0.031	.076	[−0.120, 0.006]
ln(Operating costs)	−0.230	0.090	.016	[−0.414, −0.046]
Capital intensity	−2.087	0.504	< .001	[−3.121, −1.052]
ln(Total assets)	0.588	0.122	< .001	[0.337, 0.838]
ln(Revenue)	0.810	0.125	< .001	[0.553, 1.068]
ROA	2.860	0.567	< .001	[1.696, 4.024]
Year 2022	−0.271	0.111	.021	[−0.498, −0.044]
Year 2023	−0.397	0.169	.027	[−0.745, −0.050]
Constant	−6.919	1.475	< .001	[−9.946, −3.893]

Note: Dependent variable: ln(current corporate income tax expense). N = 84; firms = 28. Year 2021 is the reference category. Statistical inference uses firm-clustered standard errors and 27 cluster degrees of freedom.

etary variables are strongly correlated and the relationship does not remain statistically significant in FE or Mundlak CRE. Capital intensity also has a negative and statistically significant RE coefficient ($\beta = -2.087$, $p < .001$). Nevertheless, the coefficient primarily reflects a specification combining between-firm and within-firm variation. Its robustness must therefore be evaluated against the FE and Mundlak results. Logged total assets, logged revenue, and ROA are positively and statistically significant in RE. The 2022 and 2023 coefficients are negative and significant relative to 2021. These year coefficients, however, do not remain statistically significant in the within-firm specification.

Table 9 reports the fixed-effects (FE) and Mundlak correlated random-effects (CRE) estimates. Both specifications yield identical coefficients for the time-varying regressors, although their clustered standard errors differ.

Table 10 reports the firm-level mean coefficients included in the Mundlak CRE specification and their joint significance test. The coefficients are positive for mean liquidity (0.157), capital intensity (1.402), logged total assets (0.372), and ROA (1.367), and negative for mean solvency (−0.014), logged operating costs (−0.029), and logged revenue (−0.235).

Table 9. Fixed-effects and Mundlak CRE estimates

Variable	FE coefficient (SE)	FE 95% CI	CRE coefficient (SE)	CRE 95% CI
Liquidity	−0.125 (0.115)	[−0.360, 0.111]	−0.125 (0.097)	[−0.324, 0.075]
Solvency	−0.028 (0.097)	[−0.227, 0.171]	−0.028 (0.082)	[−0.196, 0.140]
ln(Operating costs)	−0.219 (0.193)	[−0.615, 0.177]	−0.219 (0.163)	[−0.554, 0.116]
Capital intensity	−3.368 (2.432)	[−8.358, 1.622]	−3.368 (2.058)	[−7.591, 0.855]
ln(Total assets)	0.418 (0.549)	[−0.709, 1.545]	0.418 (0.465)	[−0.536, 1.372]
ln(Revenue)	0.892 (0.208)	[0.466, 1.318]	0.892 (0.176)	[0.531, 1.253]
ROA	2.265 (0.821)	[0.581, 3.948]	2.265 (0.695)	[0.840, 3.690]
Year 2022	−0.221 (0.270)	[−0.774, 0.333]	−0.221 (0.228)	[−0.689, 0.248]
Year 2023	−0.416 (0.296)	[−1.023, 0.191]	−0.416 (0.250)	[−0.930, 0.098]

Note: Firm-clustered standard errors are presented in parentheses. Logged revenue and ROA are significant at the 5% level in both FE and CRE. None of the four hypothesized explanatory variables is significant at the 5% level.

Table 10. Mundlak firm-mean coefficients and joint test

Firm-level mean	Coefficient	Clustered SE	p-value	95% CI
Mean liquidity	0.157	0.133	.246	[-0.115, 0.429]
Mean solvency	-0.014	0.142	.921	[-0.306, 0.277]
Mean ln(operating costs)	-0.029	0.367	.938	[-0.782, 0.725]
Mean capital intensity	1.402	2.033	.496	[-2.769, 5.573]
Mean ln(total assets)	0.372	0.577	.524	[-0.811, 1.555]
Mean ln(revenue)	-0.235	0.493	.637	[-1.246, 0.776]
Mean ROA	1.367	1.164	.250	[-1.021, 3.755]
Joint Wald test	F(7, 27) = 0.932		.499	—

Note: The joint test evaluates whether all seven Mundlak mean coefficients are simultaneously equal to zero.

Table 11 summarizes the controlled random-effects GLS model estimated using a balanced panel of 28 firms over three years, comprising 84 firm-year observations. The GLS-transformed R^2 is 0.869, and the adjusted GLS-transformed R^2 is 0.853, indicating substantial model fit on the transformed estimation scale.

Table 11. Controlled random-effects model information

Indicator	Value
Estimation method	Random-effects GLS
Firms	28
Periods	3
Observations	84
Firm-effect SD, σ_u	0.498
Idiosyncratic-error SD, σ_e	0.455
p	0.545
RE transformation parameter, θ	0.534
GLS-transformed R^2	0.869
Adjusted GLS-transformed R^2	0.853
Root MSE	0.440
Cluster-robust joint Wald test	F(9, 27) = 245.663
Joint p-value	<.001

Table 12 summarizes the hypothesis-testing results based on the controlled random-effects estimates reported in Table 8. H1 and H2 are not supported, whereas H3 and H4 are supported at the 5% significance level, with negative coefficients for operating costs and capital intensity. However, support for H3 and H4 does not persist in the FE

and Mundlak CRE specifications and is therefore sensitive to model specification.

4. DISCUSSION

The findings indicate that associations between financial characteristics and current corporate income tax expense depend on model specification. Liquidity and solvency remain insignificant, whereas operating costs and capital intensity are negatively significant only in random effects (RE), without corresponding significance in fixed effects (FE) or Mundlak correlated random effects (CRE).

For liquidity, the insignificant current-ratio coefficient differs in scope from Di and Hanke (2013), who found a negative relationship between long-run cash effective tax rates and cash holdings. Song and Yuan (2024) showed that tax-rate increases encouraged cash accumulation, illustrating the reverse direction of analysis. Hirth and Uhrig-Homburg (2010) theoretically linked liquidity and financing choices through debt tax benefits and agency costs. Kim et al. (2022) associated greater stock liquidity with increased tax noncompliance, while Chen (2011) demonstrated institutional influences on corporate liquidity. These studies concern cash holdings, trading liquidity, or financing mechanisms rather than the current ratio. Consequently, their findings do not

Table 12. Hypothesis-testing results

Hypothesis	Relationship with current corporate income tax expense	Coefficient (β)	p-value	Decision
H1	Liquidity	-0.048	.407	Not supported
H2	Solvency	-0.057	.076	Not supported
H3	Operating costs	-0.230	.016	Supported
H4	Capital intensity	-2.087	< .001	Supported

directly contradict the present result.

For solvency, the insignificant debt-to-equity coefficient qualifies expectations of an automatic debt tax shield. Shih (1996) linked tax-exhaustion risk to lower leverage, while Trezevant (1992) documented substitution between debt and non-debt tax shields. Carrizosa et al. (2023) found that interest-deductibility restrictions reduced leverage. These studies examine financing responses to taxation rather than financing–tax-expense associations. Omodero et al. (2025) reported negative financing–tax relationships using Nigerian aggregate data, whereas Fatica et al. (2013) explained the institutional debt bias. Differences in aggregation, tax capacity, and deductibility may explain divergent findings; however, these mechanisms were not separately tested here.

For operating costs, the negative RE association is compatible with deductible expenditures reducing taxable income, but its insignificance in FE/CRE limits within-firm evidence. Monterrey Mayoral (2025), conversely, associated operating leverage with higher tax burdens. Operating leverage captures cost composition rather than expenditure levels. Cook et al. (2019) identified operating leases as drivers of cost stickiness and inflexibility. Chen et al. (2023) linked operating leverage to cash holdings, while Harris and Roark (2019) showed that cash-flow positions conditioned risk–leverage relationships. V. Nguyen and J. Nguyen (2020) associated policy uncertainty with lower cash effective tax rates. These studies contextualize operating and financial responses without directly validating the present operating-cost coefficient.

For capital intensity, the negative RE association is directionally compatible with lower effective tax rates reported by Bournakis and Christopoulos (2026) and Vržina et al. (2023). However, their tax-rate outcomes differ from monetary current tax expense. Muhmad et al. (2024) identified financial distress as a mediator of capital-intensity–avoidance relationships. Mukhtaruddin et al. (2025) reported a negative capital-intensity coefficient in an avoidance model, while Mujannah and Narsa (2024) examined capital intensity as a mediator of financial reporting outcomes. These relationships are not interchangeable. Here, 98.7% of capital-intensity variation occurs between firms, limiting within-firm identification.

Differences across studies may reflect sector, institutional setting, measurement, controls, observation period, and estimation method. Indonesia's extractive-sector sample during 2021–2023 provides a specific context, while strong monetary-variable correlations warrant caution. Current corporate income tax expense is an accounting charge; effective tax rates are scaled measures, tax-avoidance proxies capture distinct outcomes, and tax payable is a liability. None automatically equals cash tax payments or government revenue collected. Accordingly, these results represent conditional accounting associations rather than causal effects or demonstrated changes in public revenue.

4.1. Implications

The findings have implications for corporate-tax research and public finance. Controlling for firm size, revenue, and profitability is important because monetary variables may share substantial scale variation. Differences between RE and FE/Mundlak estimates further indicate that RE associations should not be interpreted independently of within-firm evidence. The negative RE association for capital intensity disappears in FE and CRE, while most variation occurs between firms. Revenue and ROA show positive within-firm associations with current corporate income tax expense, but these remain non-causal. The findings therefore support integrating financial statements with taxable-income reconciliations, cash-tax payments, assessments, royalties, and administrative revenue records. Institutional trust and legitimacy also feature in conceptual discussions of empathetic digital leadership in public governance (Sihotang et al., 2027a).

4.2. Limitations

Future research should extend the observation period to improve within-firm variation and the precision of FE and Mundlak estimates. Studies should incorporate comparable production-scale measures, such as production volume, lifting volume, reserves, or output capacity, to distinguish financial from physical scale. Future analyses should retain zero or negative tax-expense observations and consider two-part models to address selection from logarithmic transformation. Researchers should also compare accounting tax

expense with cash taxes, effective tax rates, and actual remittances. Integrating firm-level financial data with tax-administration and government-revenue data could strengthen public-finance analysis. Comparative studies across extractive subsectors and countries should further examine commodity prices, ownership, governance, royalties, incentives, and regulatory arrangements.

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CONCLUSION

This study aimed to examine the relationships between liquidity, solvency, operating costs, capital intensity, and current corporate income tax expense among publicly listed oil, gas, and coal companies in Indonesia during 2021–2023, while controlling for firm size, revenue, and profitability. The findings indicate that financial characteristics do not exhibit uniform associations across alternative panel specifications. Liquidity and solvency show no consistent statistical association with current tax expense, while the negative relationships observed for operating costs and capital intensity in the random-effects model do not persist when the analysis relies on within-firm variation. Revenue and profitability provide the most consistent within-firm associations.

The study contributes to corporate-tax accounting research by demonstrating the importance of distinguishing persistent differences across companies from changes within individual firms. It also shows that interpretations of monetary tax outcomes depend on controls for operating scale and profitability. The findings offer a basis for examining financial-statement patterns in Indonesia's extractive sector, while the short observation period, limited within-firm variation, strong correlations among monetary variables, and restriction to positive-tax observations constrain their interpretation and generalizability.

Current corporate income tax expense should remain distinct from cash tax payments and government revenue collected. Accordingly, the results describe conditional firm-level accounting relationships and do not establish causal effects or changes in realized public revenue.

AUTHOR CONTRIBUTIONS

Conceptualization: Indra Pahala, Tresno Eka Jaya, Doni Sugianto Sihotang, Rismawati.

Data curation: Indra Pahala, Elmier Immanuel.

Formal analysis: Indra Pahala, Tresno Eka Jaya, Elmier Immanuel, Rismawati.

Investigation: Indra Pahala, Elmier Immanuel.

Methodology: Indra Pahala, Tresno Eka Jaya.

Project administration: Indra Pahala, Rismawati.

Software: Indra Pahala, Tresno Eka Jaya, Elmier Immanuel, Doni Sugianto Sihotang, Rismawati.

Supervision: Indra Pahala, Tresno Eka Jaya, Doni Sugianto Sihotang, Rismawati.

Validation: Indra Pahala.

Visualization: Indra Pahala, Doni Sugianto Sihotang.

Writing – original draft: Indra Pahala, Elmier Immanuel.

Writing – review & editing: Indra Pahala, Tresno Eka Jaya, Elmier Immanuel, Doni Sugianto Sihotang, Rismawati.

DATA AVAILABILITY AND REPLICABILITY

The dataset comprises 84 firm-year observations from 28 Indonesian extractive firms during 2021–2023 and includes only observations with positive current corporate income tax expense. The dataset, variable dictionary, processing documentation, and analysis code are available from the corresponding author upon reasonable request. However, incomplete records of the initial sampling universe, excluded observations, detailed operating-cost components, and currency conversions limit full replication.

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