



Tax avoidance, leverage, audit quality, and earnings management: the moderating role of firm size in mining companies listed on the indonesia stock exchange 2020-2024

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Abstract

Background: Earnings are a central component of financial statements, yet managerial discretion may create opportunities for earnings management. Evidence on tax avoidance, leverage, audit quality, and earnings management remains mixed, especially in capital-intensive industries mining companies.

Aims: This study examines their associations and tests whether firm size moderates these relationships in Indonesian mining companies.

Methods: Using 70 firm-year observations from 14 Indonesia Stock Exchange (IDX)-listed mining companies during 2020-2024.

Result: ETR is negatively associated with discretionary accruals ($\beta = -0.115674$, $p = 0.0442$). Because lower ETR indicates greater tax avoidance, the ETR-based result implies that greater tax avoidance is associated with higher earnings management. Leverage and the Big Four audit-quality proxy are not statistically significant. Firm size is positively associated with earnings management in the direct-effects model ($\beta = 0.140549$, $p = 0.0203$), but no interaction term is significant.

Conclusion: The study contributes context-specific mining-sector panel evidence by separating firm size's direct and moderating roles and by clarifying ETR direction. Findings are observational and limited by the purposive sample, proxy choices, and unverified robustness extensions.

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INTRODUCTION

The primary objective of financial statements is to provide relevant, reliable, and useful information to support informed decision-making. Among the various components of financial statements, earnings represent one of the most crucial elements, as they serve as important information for both internal and external stakeholders (Setiowati et al., 2023). According to (Joe & Ginting, 2022) earnings management is defined as a set of accounting actions or strategies undertaken through managerial decisions to influence the earnings reported in financial statements in order to achieve specific objectives. Earnings can be observed in two companies included in the mining-sector context. PT Bukit Asam Tbk (PTBA) reported first-quarter 2025 net profit of approximately IDR 391.48 Billion, while PT Vale Indonesia Tbk (INCO) experienced a significant drop in profit to IDR 935.71 billion amidst weakening global nickel prices and cost pressures. The Indonesian mining sector provides a specific setting for examining these relationships. Mining firms are capital intensive, exposed to commodity-price cycles, and characterized by long-lived assets and accounting estimates. These characteristics do not constitute evidence of earnings manipulation. Instead, they provide a context in which tax-related incentives, financing pressure, and external monitoring may be associated with discretionary accruals differently from other sectors.

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Tax avoidance, uses the effective tax rate (ETR) as its operational proxy. The direction of this proxy is critical a lower ETR conventionally indicates a lower effective tax burden and greater tax avoidance, whereas a higher ETR does not represent greater tax avoidance. Prior findings differ across measurement choices, institutional settings, industries, and periods (Ali et al., 2024; Dinata & Asqolani, 2024; Yuliana et al., 2023). Leverage, or the level of corporate debt, is used to finance a company's operational activities (Kristiana & Rita, 2021). A higher debt ratio increases the company's financial obligations and responsibilities however, it may also provide greater opportunities for generating profits (Astria et al., 2021). Leverage is used to assess a company's ability to meet its total debt obligations using its available capital (Hardiyanti et al., 2022). The level of debt is considered a crucial determinant of earnings management (Setiowati et al., 2023) as debt may create incentives associated with contractual pressures. Quality external auditing may strengthen monitoring and constrain opportunistic reporting. However, evidence is not uniform, and the operational measure used here-Big Four affiliation (Duong Thi, 2023; Indarti & Widiatmoko, 2021). Firm size may operate through competing mechanisms. Larger firms may face greater scrutiny and higher political costs; however, they may also have more complex operations and accounting estimates (Joe & Ginting, 2022). These mechanisms provide the rationale for examining both the direct and moderating effects of firm size. Thus, the theoretical question is not merely whether larger firms engage in higher or lower levels of earnings management, but whether organizational scale alters the relationships between tax avoidance, leverage, audit quality, and earnings management.

This study is designed to address two unresolved quantitative issues. First, the construct of tax avoidance is operationalized using the Effective Tax Rate (ETR). Second, the existence of a significant direct relationship between firm size and earnings management does not necessarily indicate a moderating effect; moderation requires evidence that firm size alters the slope of the relationship between other predictors and earnings management. These issues are particularly relevant in the context of sector-specific panel data, where model selection and variable construction may materially affect the resulting inferences. Accordingly, this study addresses the following questions: (1) how are ETR, leverage, audit quality, and firm size related to discretionary accruals among Indonesian mining companies, and (2) does firm size alter the estimated relationships between ETR, leverage, audit quality, and discretionary accruals? This study contributes by clarifying the interpretation and direction of ETR, distinguishing between direct and interaction effects, and documenting a replicable firm-level panel-data framework. The contributions are quantitative, methodological, and contextual; however, the observed relationships are not interpreted as evidence of causality.

LITERATURE REVIEW

Earnings management is an important issue in financial reporting because reported earnings are frequently used by investors, creditors, and other stakeholders to evaluate corporate performance and support economic decision-making (Setiowati et al., 2023). Managerial discretion in selecting accounting estimates and reporting treatments may influence the amount and timing of earnings recognized in financial statements (Joe & Ginting, 2022). Earnings management can therefore be understood as a set of accounting decisions or strategies undertaken by managers to influence reported earnings in accordance with particular organizational objectives (Joe & Ginting, 2022). Such practices should be examined carefully because managerial discretion may affect the extent to which accounting information reflects the underlying economic performance of a company. In empirical accounting research, earnings management is frequently evaluated through accrual-based approaches that distinguish discretionary accruals from accruals generated by normal

business activities (Bansal, 2023; Christensen et al., 2022; Greusard, 2022; Häkkinen, 2026; Nguyen et al., 2022). The Modified Jones Model provides an established approach for identifying discretionary accruals by considering changes in revenue, receivables, and property, plant, and equipment (Dechow et al., 1995). In this framework, discretionary accruals represent the residual component remaining after estimated non-discretionary accruals have been separated from total accruals (Dechow et al., 1995). Previous studies have also examined company characteristics such as leverage, profitability, and firm size in relation to variations in earnings management (Hardiyanti et al., 2022; Setiowati et al., 2023). These relationships may become particularly relevant in capital-intensive industries where financing structures, long-lived assets, and accounting estimates contribute to the complexity of financial reporting. Accordingly, earnings management provides the central outcome for evaluating the relationships among tax avoidance, leverage, audit quality, and firm size within the financial-reporting environment of Indonesian mining companies.

Tax avoidance represents an important corporate financial consideration because taxation influences the resources retained by a company and may intersect with managerial financial-reporting incentives. In empirical research, tax avoidance can be examined through tax-related indicators that reflect the effective tax burden borne by a company. The present study employs the Effective Tax Rate (ETR) as its operational proxy, calculated by dividing income tax expense by pre-tax income (Flagmeier et al., 2023; Schwab et al., 2022). Interpretation of this indicator requires particular attention because a lower ETR conventionally represents a lower effective tax burden and therefore indicates a greater degree of tax avoidance. Previous research suggests that the relationship between tax avoidance and earnings management is not necessarily uniform across companies and research settings (Ali et al., 2024; Yuliana et al., 2023). Ali et al. (2024) examined tax avoidance and earnings management among Malaysian firms while considering the role of tax incentives. Meanwhile, Yuliana et al. (2023) investigated earnings management in relation to tax planning, deferred tax expense, and tax avoidance, illustrating the relevance of taxation-related factors to financial-reporting behavior. Differences across previous findings may arise from variations in tax-related proxies, institutional environments, industrial characteristics, sample structures, and observation periods (Ali et al., 2024; Yuliana et al., 2023). These differences indicate that the conceptual label of tax avoidance should not override the mathematical direction of the proxy employed in an empirical model, particularly when ETR is directly incorporated into regression analysis. Accordingly, investigating ETR and discretionary accruals among Indonesian mining companies may provide additional sector-specific evidence concerning the relationship between corporate taxation and earnings-management behavior.

Leverage represents the extent to which a company relies on debt to finance its assets and operational activities. Debt financing can provide resources for corporate operations and expansion, but it simultaneously generates financial obligations that companies must satisfy over specified periods (Kristiana & Rita, 2021). Consequently, leverage constitutes an important indicator of financial structure and a potentially relevant determinant of managerial financial-reporting decisions. Previous accounting research has examined leverage as one of the corporate characteristics potentially associated with earnings management (Hardiyanti et al., 2022; Joe & Ginting, 2022; Setiowati et al., 2023). Higher levels of debt may increase managerial attention to reported financial performance because creditors and other providers of capital may rely on accounting information when evaluating corporate financial conditions (Chakraborty et al., 2022; Muttakin et al., 2020; Shakespeare, 2020; Suttipun, 2023; Tanko et al., 2021; Yang et al., 2026). At the same time, the relationship between leverage and earnings management cannot be assumed to operate uniformly across different companies and industrial contexts. Hardiyanti et al. (2022) examined leverage together with profitability and firm size in explaining earnings management, demonstrating the relevance of considering multiple organizational characteristics simultaneously.

Kristiana and Rita (2021) similarly investigated leverage and firm size in relation to earnings management while incorporating the corporate life-cycle perspective. Differences in debt structure, corporate characteristics, and research contexts may therefore contribute to variations in the empirical relationship between leverage and earnings management (Hardiyanti et al., 2022; Kristiana & Rita, 2021). For capital-intensive mining companies, examining leverage is particularly relevant because substantial investment requirements may increase reliance on external financing, making the relationship between debt intensity and discretionary accruals an important empirical question.

Audit quality constitutes an important external monitoring mechanism intended to strengthen the reliability and credibility of corporate financial reporting. External auditors evaluate financial statements and supporting accounting evidence, thereby providing independent oversight of managerial reporting decisions. From a monitoring perspective, higher-quality auditing may restrict opportunities for managers to exercise excessive discretion over reported accounting information. Previous empirical studies have consequently examined audit quality in connection with earnings management and the broader quality of corporate financial reporting (Duong Thi, 2023; Indarti & Widiatmoko, 2021). Duong Thi (2023) investigated audit quality, institutional environments, and earnings management, highlighting the relevance of institutional settings when considering the relationship between auditing and financial reporting. Indarti and Widiatmoko (2021) likewise incorporated audit quality and earnings management when examining the cost of equity capital in the Indonesian context. These studies indicate that audit quality remains relevant when assessing external monitoring mechanisms associated with managerial reporting discretion (Duong Thi, 2023; Indarti & Widiatmoko, 2021). In the present study, audit quality is operationalized through Big Four affiliation, distinguishing companies audited by Big Four-affiliated public accounting firms from those audited by other firms. Nevertheless, Big Four affiliation represents only one observable dimension of audit quality and does not comprehensively capture auditor tenure, industry specialization, partner characteristics, audit fees, or other characteristics of the audit process. Therefore, examining Big Four affiliation among Indonesian mining companies provides a focused approach for assessing whether this external-monitoring proxy is associated with discretionary accruals.

Firm size represents organizational scale and is frequently examined as an important corporate characteristic associated with financial-reporting behavior. Larger companies generally possess broader operations, greater asset bases, and more complex organizational structures, which may influence managerial accounting decisions. At the same time, organizational scale may increase attention from investors, creditors, regulators, and other stakeholders, potentially creating different reporting environments for larger and smaller firms. Previous research has examined firm size as a determinant of earnings management alongside other corporate characteristics such as leverage and profitability (Hardiyanti et al., 2022; Joe & Ginting, 2022; Setiowati et al., 2023). Joe and Ginting (2022), for example, specifically investigated firm size, leverage, and profitability in relation to earnings management. Similarly, Kristiana and Rita (2021) considered firm size and leverage when examining variations in corporate earnings-management practices. The diversity of organizational settings examined in the existing literature suggests that firm size may warrant consideration not only as an independent predictor but also as a potential contextual factor in explaining earnings management (Hardiyanti et al., 2022; Kristiana & Rita, 2021; Setiowati et al., 2023). In the present framework, organizational scale is therefore examined to determine whether the relationships of tax avoidance, leverage, and audit quality with earnings management vary according to firm size. This approach distinguishes the direct association of firm size with earnings management from its potential moderating role, because evidence of a direct association does not itself establish that firm size changes the relationship between another predictor and earnings management. Accordingly,

the study positions firm size as both an organizational characteristic and a potential boundary condition in the relationships between tax avoidance, leverage, audit quality, and earnings management among mining companies listed on the Indonesia Stock Exchange during 2020–2024.

METHOD

Research Design

This study uses an observational quantitative panel-data design. Secondary data were obtained from annual reports and financial statements of mining companies listed on the Indonesia Stock Exchange (IDX) for 2020–2024. The unit of analysis is the firm-year. Because the design is archival and observational, the regression results are interpreted as statistical associations rather than causal effects.

Participant

Table 1. Sample Selection

Selection criterion	Firms
Mining companies identified for the 2020–2024 observation frame	75
Excluded: not listed on the IDX consistently during 2020–2024	(25)
Excluded: inconsistent annual-report availability	(1)
Excluded under the profitability criterion applied in the thesis	(29)
Excluded: outside the research category	(6)
Final sample	14
Observation years	5
Balanced firm-year observations	70

Population and the methods of sampling

The final balanced panel consists of ANTM, BSSR, CITA, ELSA, GEMS, HRUM, IFSH, INCO, ITMG, MBAP, MDKA, MYOH, PTBA, and TOBA. The archived sample-selection procedure yields 14 companies observed for five years, producing 70 firm-year observations. The panel is balanced, so no within-sample firm-year observations are missing after sample selection. The purposive profitability and availability criteria should be understood as design choices that may limit external validity and may reduce statistical power, particularly for interaction tests. Contextual-case boundary. PTBA is included in the 2020–2024 research sample, while the PTBA and INCO news examples discussed in the Introduction concern developments in 2025 and are not additional observations or a separate case-study dataset. INCO is also part of the archived mining-sector sample. The two companies are therefore used illustratively, not as individually estimated case studies.

Variable definitions and operationalization

Table 2. Variable Definitions

Construct	Symbol	Operational measure	Interpretation
Earnings management (Rasio)	DA	Discretionary accruals estimated using the Modified Jones Model of Dechow, Sloan, and Sweeney (1995).	Signed discretionary accruals.
Tax avoidance (Rasio)	ETR	Income tax expense / pre-tax income.	Lower ETR conventionally indicates greater tax avoidance; coefficients must therefore be interpreted using ETR direction.
Leverage (Rasio)	LEV	Total debt / total assets.	Higher values indicate greater debt intensity.

Audit quality (<i>Dummy</i>)	AUDQ	1 if audited by a Big Four-affiliated public accounting firm; 0 otherwise.	Big Four affiliation is the operational proxy, not a comprehensive measure of audit quality.
Firm size (Logarithm	SIZE	Natural logarithm of total assets, as specified in the thesis.	Exact unit of total assets must be verified against the raw dataset before final submission.

Earnings management is estimated using the Modified Jones Model (Dechow, Sloan, & Sweeney, 1995). First, total accruals are scaled by lagged total assets and estimated using: $TA_{it}/A_{i,t-1} = \alpha_1(1/A_{i,t-1}) + \alpha_2[(\Delta REV_{it} - \Delta REC_{it})/A_{i,t-1}] + \alpha_3(PPE_{it}/A_{i,t-1}) + u_{it}$. Estimated non-discretionary accruals are obtained from the fitted coefficients, and discretionary accruals are the residual component: $DA_{it} = (TA_{it}/A_{i,t-1}) - NDA_{it}$. The archived materials support this model description and the reported DA series. However, they do not document the industry-year estimation procedure, minimum cell size, or performance matching; therefore, those procedures are not claimed and should be documented or re-estimated before final submission.

Panel data regression

Panel data regression. According to Sihombing (2020), panel data regression is an analytical method that combines time-series data and cross-sectional data simultaneously. This approach may improve the accuracy of the analysis by controlling for unobserved variables that remain constant within each unit over time. Three main models are commonly used in panel data regression analysis: the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). Model selection was conducted using several statistical tests, namely the *Chow test* to choose between the Common Effect Model (CEM) and the Fixed Effect Model (FEM), the Hausman test to select between the FEM and the Random Effect Model (REM), and the Lagrange Multiplier *test* to determine the appropriate model between the CEM and REM.

The analysis is conducting classical assumption tests to ensure the validity of the estimated model. These tests are particularly relevant for models estimated using the Ordinary Least Squares (OLS) approach, such as the Common Effect Model (CEM) and the Fixed Effect Model (FEM). In this study, the classical assumption tests include a multicollinearity test to ensure the absence of high correlations among the independent variables, with a correlation threshold of 0.85 (Basuki & Prawoto, 2016), and a heteroskedasticity test using the Breusch–Pagan approach to assess the homogeneity of residual variances. A probability value greater than 0.05 indicates the absence of heteroskedasticity (Basuki & Prawoto, 2016). After the classical assumptions are satisfied, the analysis proceeds to hypothesis testing, which consists of three main tests. Subsequently, the hypothesis testing procedure was conducted using the F-statistic test, Adjusted R Square (R^2), and the t-statistic test.

Panel Data Regression Model

The theoretical basis for the moderation analysis in this study refers to the conceptual framework proposed by Baron and Kenny (1986), which suggests that a moderating variable may strengthen, weaken, or even reverse the relationship between an independent variable and a dependent variable. The moderation analysis in this study involves the following stages: (1) Examining the direct effects of each independent variable, namely Tax Avoidance, Leverage, and Audit Quality, on Earnings Management. (2) Assessing the direct effect of the moderating variable, namely Firm Size, on Earnings Management. (3) Evaluating the interaction between each independent variable and Firm Size in explaining Earnings Management. (4) If an interaction coefficient is statistically significant at $p < 0.05$, *Firm Size* is considered to moderate the relationship between the corresponding independent variable and Earnings Management. (5) The direction and magnitude of the interaction coefficient are subsequently interpreted to determine whether *Firm*

Size strengthens or weakens the relationships between Tax Avoidance, Leverage, and Audit Quality and Earnings Management. The empirical model estimated in this study is specified as follows:

$$DA_{it} = \beta_0 + \beta_1 TA_{it} + \beta_2 LEV_{it} + \beta_3 AUDQ_{it} + \beta_4 SIZE_{it} + \beta_5 (TA_{it} \times SIZE_{it}) + \beta_6 (LEV_{it} \times SIZE_{it}) + \beta_7 (AUDQ_{it} \times SIZE_{it}) + \mu_i + \lambda_t + \varepsilon_{it}$$

Where DA_{it} = Earnings management of firm i in year t , measured using discretionary accruals, TA_{it} =Tax avoidance of firm i in year t , LEV_{it} =Leverage of firm i in year t , $AUDQ_{it}$ =Audit quality of firm i in year t , $SIZE_{it}$ =Firm size of firm i in year t , serving as the moderating variable, $TA_{it} \times SIZE_{it}$ =Interaction between tax avoidance and firm size, $LEV_{it} \times SIZE_{it}$ =Interaction between leverage and firm size, $AUDQ_{it} \times SIZE_{it}$ =Interaction between audit quality and firm size, μ_i =Firm-specific fixed effect, λ_t =Year-specific fixed effect and ε_{it} =Error term.

RESULTS AND DISCUSSION

Results

Panel Data Regression Model Selection

Table 3. Panel Model Selection

Test	Statistic	p-value	Decision
Chow: Cross-section F	2.406.517	0.0127	FEM preferred to CEM
Chow: Cross-section Chi-square	32.971.500	0.0017	FEM preferred to CEM
Hausman: Cross-section random	14,172.550	0.0068	FEM preferred to REM
LM Breusch–Pagan: Cross-section	0.359759	0.5486	CEM preferred to REM

The results of the Chow test showed probability values of 0.0127 for the Cross-section F and 0.0017 for the Cross-section chi-square. Both values were below the 0.05 significance level; therefore, the Fixed Effect Model (FEM) was considered more appropriate than the Common Effect Model (CEM). Furthermore, the probability value of the Cross-section random in the Hausman test was 0.0068, which was also below the 0.05 significance level. Therefore, the Fixed Effect Model (FEM) was preferred over the Random Effect Model (REM). Meanwhile, the Lagrange Multiplier test produced a Cross-section Breusch–Pagan probability value of 0.5486. Since this value was greater than the significance level of $\alpha=0.05$, the Common Effect Model (CEM) was considered more appropriate than the *Random Effect Model* (REM). In conclusion, the *Fixed Effect Model* (FEM) was selected as the appropriate panel data regression model for hypothesis testing and regression equation estimation.

Classical Assumption Tests

Eksandy (2018) explains that, in panel data regression analysis, the type of classical assumption tests conducted should be adjusted to the estimation model used. If the analysis employs the Common Effect Model (CEM) or the Fixed Effect Model (FEM), which are based on the Ordinary Least Squares (OLS) method, only two tests need to be conducted, namely the Multicollinearity Test and the Heteroskedasticity Test.

Multicollinearity Test

Table 4. Multicollinearity Test

	DA	TA	LEV	AUDQ	SIZE
DA	1,000000	-0,326467	-0,085069	-0,272698	0,118504
TA	-0,326467	1,000000	0,339137	-0,015915	0,198292
LEV	-0,085069	0,339137	1,000000	0,043611	0,154271
QA	-0,272698	-0,015915	0,043611	1,000000	0,284961
SIZE	0,118504	0,198292	0,154271	0,284961	1,000000

The results of the Multicollinearity Test indicate that none of the correlation coefficients among the variables exceeds 0.8. Therefore, it can be concluded that there is no multicollinearity.

Heteroskedasticity Test

Table 5. Heteroskedasticity Test

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	1,043849	91	0,1596

The results of the Heteroskedasticity Test indicate that H_0 is accepted, as the probability value of the Breusch-Pagan LM test is $0.1596 > 0.05$. Therefore, there is no heteroskedasticity.

Hypothesis Test

F-Statistic and R^2 Test

Table 6. F-Statistic and R^2 Test

Description	Value
F-statistic	3,59014
Prob(F-statistic)	0,00019
R-squared	0,53996
Adjusted R-squared	0,38956

The simultaneous test shows a *Prob*(F-statistic) value of 0.000194, indicating that tax avoidance, leverage, and audit quality jointly have a significant effect on earnings management. Furthermore, the *Adjusted R-squared* value is 0.539955, indicating that 53.99% of the variation in earnings management can be explained by tax avoidance, leverage, and audit quality. The remaining 46.01% is explained by other variables not included in this study.

Direct-effects model

Table 7. Fixed-Effects Direct-Effects Results

Variable	Coefficient	Std. Error	t-statistic	p-value	Decision
Constant	-1,938.992	0,764830	-2,535.194	0,0143	-
ETR	-0,115674	0,056088	-2,062.361	0,0442	H1 supported
LEV	0,091423	0,152822	0,598231	0,5523	H2 not supported
AUDQ	0,033506	0,038152	0,878228	0,3839	H3 not supported
SIZE	0,140549	0,058730	2,393152	0,0203	H4 association observed

Moderation model

Table 8. Moderation Results

Term	Coefficient	t-statistic	p-value	Decision
SIZE	0,28454	1,830774	0,0732	Not statistically significant in interaction model
ETR × SIZE	-0,028874	-0,211851	0,8331	H5 not supported
LEV × SIZE	-0,380795	-1,522936	0,1342	H6 not supported
AUDQ × SIZE	-0,047826	-0,621644	0,5371	H7 not supported

H1-Tax avoidance and earnings management. ETR has a negative and statistically significant coefficient ($\beta = -0.115674$, $p = 0.0442$). The result must be interpreted through the proxy direction. A higher ETR is associated with lower signed discretionary accruals; because lower ETR conventionally indicates greater tax avoidance, the model implies that greater tax avoidance is associated with higher earnings management. The earlier interpretation that greater tax avoidance reduces earnings management is mathematically inconsistent with the direct use of ETR and is therefore not retained. The finding remains an ETR-based association, not definitive evidence about every form of tax avoidance.

H2-Leverage and earnings management. Leverage has a positive but statistically insignificant coefficient ($p = 0.5523$). The evidence is insufficient to establish a detectable association between the debt-to-assets ratio and discretionary accruals in this sample. The result should not be interpreted as proof that leverage is irrelevant, the broad leverage proxy, omitted contractual characteristics, or

sector-specific financing conditions are possible explanations, but these mechanisms were not directly tested.

H3-Audit quality and earnings management. The audit-quality proxy is not statistically significant ($p=0.3839$). Accordingly, the study does not find sufficient evidence that Big Four affiliation is associated with lower discretionary accruals in the observed sample. This does not demonstrate that audit quality is ineffective; the proxy does not capture tenure, industry specialization, partner characteristics, audit fees, or other dimensions of audit quality.

H4-Firm size and earnings management. SIZE is positively associated with discretionary accruals in the direct-effects model ($\beta=0.140549$, $p=0.0203$). This finding is consistent with a complexity-based interpretation in which larger organizations have more extensive operations and accounting estimates. However, it should not be described as supporting prior studies that found no significant size effect. Any contextual explanation should be treated as an interpretation unless tested directly.

H5-H7-Moderating role of firm size. None of the $ETR \times SIZE$, $LEV \times SIZE$, or $AUDQ \times SIZE$ interaction terms is statistically significant. Thus, the available evidence does not support the proposition that firm size changes the relationships between the three focal predictors and earnings management. This does not contradict the direct SIZE result because moderation concerns a change in another predictor's slope, whereas the direct effect concerns the association between SIZE and the outcome.

Discussion

The findings demonstrate that tax avoidance, when interpreted through the direction of the Effective Tax Rate (ETR), is significantly associated with earnings management among Indonesian mining companies. Specifically, ETR has a negative coefficient ($\beta = -0.115674$, $p = 0.0442$), indicating that higher ETR is associated with lower signed discretionary accruals. Because a lower ETR conventionally represents greater tax avoidance, the coefficient implies that greater tax avoidance is associated with higher earnings management. This relationship is broadly consistent with Ali et al. (2024), who documented an empirical connection between tax avoidance and earnings management, although their Malaysian setting and consideration of tax incentives differ from the institutional and sectoral context examined here. The result is also relevant to Yuliana et al. (2023), whose study identified taxation-related factors, including tax avoidance, as important elements in explaining earnings-management behavior. Previous studies conducted in comparable corporate settings have similarly indicated that tax-related strategies may coexist with discretionary financial-reporting decisions (Drake et al., 2024; Floropoulos et al., 2025; Williams & Williams, 2021). Nevertheless, the relationship should not be interpreted as demonstrating that tax avoidance causes earnings management because both financial-reporting and tax-related decisions may arise from common managerial incentives or unobserved firm characteristics. The finding instead suggests that tax-reporting positions and discretionary financial reporting may coexist within a broader set of managerial accounting decisions, particularly in a capital-intensive environment characterized by substantial assets and complex estimates (Lee, 2026; Mutha et al., 2021; Thayyib, 2025). This interpretation also highlights the methodological importance of respecting proxy direction, since treating a positive ETR movement as an increase in tax avoidance would produce an interpretation opposite to the economic meaning of the measure. Overall, the evidence strengthens the argument that tax avoidance and earnings management are empirically interconnected in the mining-sector sample while preserving the distinction between statistical association and causal influence.

The analysis further reveals that leverage does not have a statistically significant association with earnings management, as indicated by its positive coefficient of 0.091423 and p-value of 0.5523. This result suggests that variation in the debt-to-assets ratio alone does not sufficiently explain variation in discretionary accruals among the mining companies included in the sample. The finding

can be interpreted alongside Kristiana and Rita (2021), who examined leverage as a determinant of earnings management together with firm size and the corporate life cycle, as well as Hardiyanti et al. (2022) and Setiowati et al. (2023), who incorporated leverage into multivariate explanations of earnings management. Previous evidence from Indonesian companies has also produced inconsistent findings concerning the association between leverage and earnings management. Some studies have reported that leverage does not significantly explain earnings-management practices, whereas others have identified significant relationships under different industrial and organizational conditions (Alsaadi, 2025; Ghose et al., 2025; Hussain et al., 2022; Muhtaseb et al., 2024). Such divergent findings may reflect differences in debt maturity, covenant intensity, financing arrangements, creditor monitoring, profitability, or the composition of corporate liabilities, none of which is captured fully by an aggregate debt-to-assets ratio. The current finding should therefore not be interpreted as evidence that leverage is irrelevant to managerial financial-reporting decisions. For mining companies in particular, substantial debt may finance long-term productive assets rather than necessarily create short-term reporting incentives, making the economic implications of leverage dependent on the structure and purpose of financing. This sectoral characteristic may partly explain why an aggregate leverage measure does not exhibit a statistically detectable association with discretionary accruals in the present sample. Therefore, the evidence indicates that leverage measured through the debt-to-assets ratio is not a statistically detectable predictor of discretionary accruals in this sample, while differences from previous findings reinforce the context-dependent nature of the relationship.

Audit quality, proxied by Big Four affiliation, is likewise not statistically associated with earnings management in the present study, with a coefficient of 0.033506 and p-value of 0.3839. This finding means that the available sample does not provide sufficient statistical evidence that firms audited by Big Four-affiliated auditors exhibit systematically different discretionary accruals from firms audited by other auditors. The result contributes to the broader literature represented by Duong Thi (2023), who examined audit quality, institutional environments, and earnings management and thereby emphasized that the monitoring implications of auditing can depend on the environment in which companies operate. Indarti and Widiatmoko (2021) also linked audit quality and earnings management to broader capital-market consequences, demonstrating the relevance of external auditing beyond a simple auditor-category distinction. Previous empirical studies have nevertheless produced varying conclusions regarding whether higher audit quality effectively constrains earnings-management behavior (Chowdhury & Eliwa, 2021; Duong Thi, 2023; Sitanggang et al., 2019). These differences indicate that the relationship between audit quality and discretionary reporting may not be stable across institutional settings, industries, observation periods, and audit-quality measurements. One plausible explanation for the present finding is that Big Four affiliation captures audit-firm category but does not directly measure the intensity or effectiveness of the audit engagement itself. Auditor tenure, industry specialization, partner characteristics, audit fees, auditor independence, and the execution of audit procedures may provide additional dimensions through which audit quality influences financial reporting. Consequently, the absence of statistical significance should not be interpreted as evidence that auditing has no monitoring function, but rather that the specific Big Four proxy does not distinguish discretionary accrual behavior sufficiently within these 70 firm-year observations. Future empirical work incorporating multidimensional audit-quality indicators may therefore clarify whether more specific characteristics of external auditing explain earnings-management differences within the Indonesian mining sector.

Firm size presents a different empirical pattern because it is positively and significantly associated with discretionary accruals in the direct-effects model ($\beta = 0.140549$, $p = 0.0203$). This finding indicates that larger firms in the analyzed sample tend to exhibit higher signed discretionary

accruals after accounting for the other variables included in the specification. The result is consistent with a complexity-based interpretation, under which larger organizations may have broader operations, more complex transactions, and more extensive accounting estimates that increase the scope for managerial judgment. Previous research has similarly identified firm size as an important organizational characteristic associated with earnings management (Hardiyanti et al., 2022; Joe & Ginting, 2022; Setiowati et al., 2023). However, the direction and statistical significance of this relationship have not been uniform across empirical studies. Some previous investigations have identified positive relationships, whereas others have documented negative or statistically insignificant associations between organizational scale and earnings-management practices (Abu Afifa et al., 2021; Gerged et al., 2023; Githaiga et al., 2022; Rahman et al., 2024). These contrasting findings are theoretically plausible because firm size may operate through competing mechanisms: larger companies may possess more complex transactions and accounting estimates while simultaneously facing greater scrutiny from regulators, investors, analysts, creditors, and auditors. The positive coefficient in the present study therefore provides support for the complexity-based explanation within this specific sample, but it should not be generalized into a proposition that larger firms inherently engage in more opportunistic financial reporting. Moreover, the natural logarithm of total assets captures organizational scale but does not directly distinguish among operational complexity, political visibility, governance capacity, or stakeholder monitoring. Taken together, the evidence suggests that firm size has a meaningful direct relationship with discretionary accruals in the studied mining companies, while differences from previous findings emphasize the importance of sector, period, proxy construction, and model specification in explaining the size–earnings management relationship.

Despite its significant direct association, firm size does not statistically moderate the relationships between tax avoidance, leverage, audit quality, and earnings management in the estimated interaction model. The $ETR \times SIZE$, $LEV \times SIZE$, and $AUDQ \times SIZE$ interactions produce p-values of 0.8331, 0.1342, and 0.5371, respectively, leaving all three interaction effects statistically unsupported. These results indicate that organizational scale does not provide detectable evidence of changing the slopes linking the three focal predictors to discretionary accruals within the observed sample. Importantly, this conclusion does not conflict with the significant direct $SIZE$ coefficient because direct and moderating effects represent conceptually and statistically distinct relationships. A direct effect captures the association between firm size and earnings management, whereas moderation requires evidence that firm size changes the strength or direction of another predictor's relationship with earnings management. Previous empirical research has shown that theoretically plausible moderating variables do not necessarily produce statistically significant interaction effects across different corporate contexts. In the present study, the absence of significant interactions may partly reflect the limited statistical power associated with only 14 firms and 70 firm-year observations, particularly because interaction effects generally require sufficient variation across constituent variables to be estimated precisely. The result may also indicate that the mechanisms linking taxation, financing, and external auditing with discretionary accruals operate relatively independently of organizational scale within the selected mining firms. Methodologically, these findings reinforce the importance of distinguishing a moderator from an ordinary explanatory variable rather than inferring moderation merely because firm size exhibits a significant direct coefficient. Overall, the study extends previous literature by simultaneously separating the direct and interaction roles of firm size and shows that, within the 2020–2024 Indonesian mining-company sample, firm size is directly associated with earnings management but does not provide statistically significant evidence of altering the relationships between tax avoidance, leverage, audit quality, and discretionary accruals.

Implications

This study provides methodological, managerial, and regulatory implications for understanding earnings management in Indonesian mining companies. Methodologically, the interpretation of tax avoidance must follow the direction of ETR, where a lower ETR represents greater tax avoidance. Researchers should therefore avoid interpreting regression coefficients solely from construct labels without considering the direction of the operational proxy. The findings also emphasize that the direct effect of firm size is statistically distinct from its moderating effect. Future studies should consider alternative tax-avoidance proxies and clearly specify the procedures used to construct interaction terms. From a managerial perspective, tax-related reporting and discretionary accruals should be evaluated jointly to strengthen financial-reporting transparency. Managers should ensure that tax-planning practices remain consistent with reliable and accountable financial reporting. The insignificant audit-quality result also suggests that Big Four affiliation alone may not fully represent the effectiveness of external monitoring. From a regulatory perspective, simultaneous patterns in ETR and discretionary accruals may warrant closer monitoring without being automatically interpreted as evidence of opportunistic reporting. The absence of significant moderation further indicates that firm size alone should not determine the intensity of financial-reporting oversight. Auditors and regulators should therefore consider multiple financial and organizational indicators when assessing earnings-management risks. Overall, the findings encourage careful interpretation of tax, audit, financing, and firm-size information while recognizing that the observed relationships represent statistical associations rather than causal effects.

Limitations and Suggestions for Future Research

This study has several limitations that should be considered when interpreting its findings. The sample was limited to 14 purposively selected mining companies and 70 firm-year observations during 2020–2024, which restricts statistical power and generalizability. The fixed-effects model also cannot fully address reverse causality, simultaneity, omitted variables, or measurement error. Therefore, the findings should be interpreted as statistical associations rather than causal relationships. The use of ETR as a single tax-avoidance proxy may not fully represent corporate tax strategies. Similarly, Big Four affiliation provides only a limited measure of audit quality. The analysis also does not document tests for serial correlation, cross-sectional dependence, robust covariance estimation, or outlier sensitivity. Future studies should expand the sample and observation period to improve external validity. Alternative proxies for tax avoidance, audit quality, and earnings management should also be examined. Researchers should consider centering or standardizing continuous variables before estimating interaction effects. Lagged models, additional control variables, or stronger identification strategies may help address endogeneity concerns. Finally, robustness analyses and marginal-effect estimates are recommended to provide stronger evidence regarding the moderating role of firm size.

CONCLUSION

estimates show a negative association between ETR and discretionary accruals. Because lower ETR conventionally indicates greater tax avoidance, the coefficient implies that greater tax avoidance is associated with higher discretionary accruals under the study's proxy logic. Leverage and the Big Four affiliation proxy for audit quality are not statistically significant. Firm size is positively associated with discretionary accruals in the direct-effects model, but none of the three SIZE interaction terms is statistically significant; therefore, the evidence does not support firm size as a moderator in the archived specification. The study's contribution is to provide sector-specific panel evidence while clarifying ETR direction and separating direct from interaction effects. The

findings remain conditional on the purposive 14-firm sample, the selected proxies, the signed discretionary-accrual measure, and the archived inference procedure, and should be generalized cautiously. The PTBA and INCO examples serve only as contextual illustrations of post-period earnings volatility and should not be interpreted as company-specific findings of earnings management.

AUTHOR CONTRIBUTIONS STATEMENT

Chevri Korat contributed to conceptualization, research design, methodology, data collection, formal analysis, interpretation of the findings, and writing the original draft. Mayang Sari Edastami contributed to supervision, methodological validation, data interpretation, manuscript review and editing, and critical revision of the manuscript for intellectual and academic content. All authors read and approved the final version of the manuscript.

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