

Research Article

Optimization of Effective Tax Rate Through the Interaction of Debt Policy and CSR with Managerial Ownership as a Mediator in the Metal and Mineral Industry Listed on the Indonesian Stock Exchange for the Period 2022-2024

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Abstract: This study aims to analyze the optimization of the Effective Tax Rate (ETR) through the interaction of debt policy (Debt-to-Equity Ratio) and Corporate Social Responsibility (CSR) spending, with managerial ownership as a mediator, focusing on 30 companies in the metal and mineral industry listed on the Indonesia Stock Exchange for the 2022-2024 period. The research employs a quantitative approach using panel data regression with a Fixed Effect Model. In this study, optimal tax management is understood not as achieving the lowest tax rate, but as reaching an equilibrium point between tax efficiency and social responsibility to maintain long-term corporate legitimacy and value. The primary findings indicate that debt policy and CSR simultaneously exert a significant influence on ETR ($p=0.0276$). Likewise, in the mediation model, debt policy, CSR, and managerial ownership collectively show a significant simultaneous influence on ETR ($p=0.0218$). However, partially, each variable does not show a significant individual influence. This phenomenon is explained through the logic of Optimal Tax Rate Theory, where the ETR in the Indonesian mineral industry has reached a deterministic equilibrium heavily influenced by rigid regulations such as PP-96/2021 and PMK-169/2015. Consequently, marginal changes in individual managerial policies are not strong enough to shift the ETR independently, as the corporate tax position is primarily dictated by collective regulatory constraints and technical accounting factors.

Keywords: CSR; Debt Policy; Effective Tax Rate; Legitimacy; Tax Optimization.

1. Introduction

Taxes are the main contributor to Indonesia's state revenue, with the 2024 realization reaching IDR 2,492.70 trillion or 78.07% of total state revenue (Ministry of Finance of the Republic of Indonesia, 2024). However, Indonesia's tax ratio remains low at only 10.31%, far below the ASEAN average of 14.3% (OECD, 2025). The World Bank and OECD estimate Indonesia's tax gap to be 6.4% of GDP or around IDR 1,417 trillion per year, which stems from low taxpayer compliance (3.7%) and suboptimal tax policy design (2.7%). This condition underscores the need for taxation analysis at the company level to understand variations in the tax burden at a more micro level.

At the corporate level, variations in Effective Tax Rate (ETR) occur even though companies are subject to the same regulatory regime. The ETR is influenced by complex tax management strategies, including debt policies, Corporate Social Responsibility (CSR) decisions, and managerial ownership structures. Legitimacy Theory (Dowling & Pfeffer, 1975) and Stakeholder Theory (Freeman, 1984) explain that companies must balance tax efficiency with social legitimacy. Empirical evidence shows that the average ETR of Indonesian companies is lower than the official rate, namely 22.66% compared to the STR of 25% (Mustika &

Received: 11 December 2025
Revised: 17 January 2026
Accepted: 01 February 2026
Online Available: 04 February 2026
Curr. Ver.: 04 February 2026

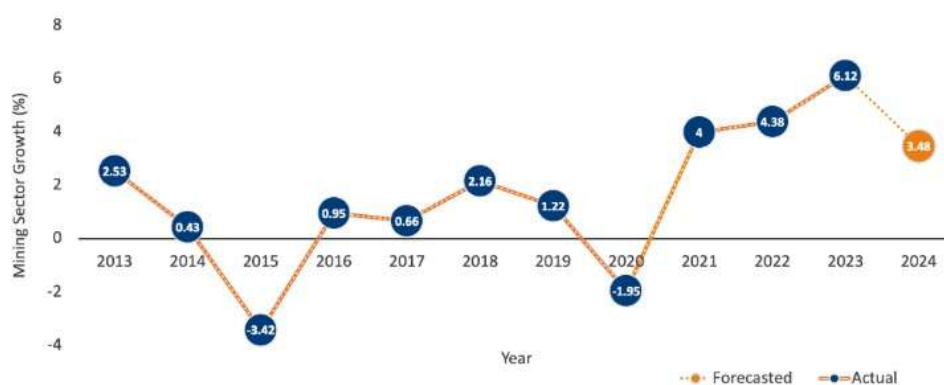


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Ananto, 2018), which indicates the active utilization of tax incentives and financial structure management.

The mineral and metal industry was chosen because of its unique characteristics, such as mandatory CSR obligations through Government Regulation No. 96 of 2021, large financing needs, and high public exposure and reputational risk. The realization of investment in the mineral sector in 2024 reached IDR 245.2 trillion, making it a strategic sector for the national economy (Directorate of Data and Information, 2025). The surge in commodity prices during the 2022–2024 period created windfall profits and increased the ROA of the mining sector, but this was not followed by a proportional increase in ETR, indicating active tax management practices during the initial implementation period of Law No. 7 of 2021 concerning Harmonization of Tax Regulations.

Mining sector year-on-year growth from 2013 to 2024 (%)



Source: Statistics Indonesia (BPS) and reprocessed by CRIF

Figure 1. Increased Profits for Mining Companies in Indonesia.

The literature shows mixed results regarding the impact of debt policy, CSR, and managerial ownership on ETR. Debt policy can reduce ETR through interest tax shields (Agusta, 2025; Sharif & Khan, 2024), although it is limited by thin capitalization regulations PMK 169/PMK.010/2015. CSR can function as a tax-deductible expense under PP 93/2010 as well as a tool for social legitimacy (Suparji & Machmud, 2021). Meanwhile, the effect of managerial ownership on ETR remains inconsistent across countries (Khalifa & Albaz, 2022; Efenana & Egbunike, 2023), opening up a research gap on how governance structures mediate debt and CSR policies on ETR in the mineral and metal industry in Indonesia.

In addition to work motivation, quality of work life (QWL) is also an important determinant in shaping intention to stay. Quality of work life reflects the extent to which an organization is able to provide a work environment that supports competency development, participation, well-being, and fair compensation. When quality of work life aligns with employee expectations, a comfortable work environment is created, encouraging employees to remain with the organization (Hermawati & Mas, 2018). This finding is supported by research by Chaerani et al. (2025) and Trimurni et al. (2021), which found that quality of work life has a positive effect on intention to stay.

2. Literature Review

Debt Policy (X1)

Debt policy is an important instrument in financial management because it affects the tax burden through capital structure and tax shield mechanisms, especially in the context of thin capitalization regulations in Indonesia as stipulated in PMK No. 169/PMK.010/2015. Based on Trade-off Theory, companies balance the tax benefits of debt in the form of interest tax savings with the costs of financial distress (Modigliani & Miller, 1963; Myers, 1984). Interest expenses that are deductible reduce taxable income and effectively lower the Effective Tax Rate (ETR), as long as the risk of bankruptcy remains under control. This mechanism is understood as legal and substantial tax planning, not aggressive tax avoidance (Dewantara, 2025).

Empirically, many studies have found a negative relationship between debt policy and ETR, where an increase in debt is followed by a decrease in ETR due to the effectiveness of the interest tax shield. Dewantara (2025) shows that the application of thin capitalization rules tends to increase ETR, indicating that without such restrictions, debt effectively reduces the tax burden. Agusta (2025) obtained similar findings in mining companies in Indonesia, showing that debt policy has a significant effect on increasing tax avoidance, which implicitly means that ETR is lower in companies with high leverage.

Corporate Social Responsibility [CSR] (X2)

Corporate Social Responsibility (CSR) is rooted in Carroll's CSR Pyramid (1991), which consists of four levels of responsibility: economic, legal, ethical, and philanthropic. In the context of taxation, fair tax payments represent legal responsibility, while ethical tax management practices reflect ethical responsibility, and social contributions through community empowerment reflect philanthropic responsibility. This framework is enriched by Dahlsrud (2008), who identifies five dimensions of CSR environmental, social, economic, stakeholder, and voluntarism emphasizing that CSR must be understood holistically, including how companies manage their tax obligations in a balanced and responsible manner.

It is important to distinguish between CSR spending and CSR disclosure. CSR spending reflects real and verified expenditures for social and environmental activities, while CSR disclosure is more of a strategic communication that can be symbolic in nature (Dahlsrud, 2008). In practice, companies with aggressive tax avoidance practices often increase their CSR disclosure to build a positive image, even though this is not balanced with adequate tax contributions. Therefore, consistency between tax compliance as a legal responsibility and CSR spending as a philanthropic responsibility is a key indicator of authentic CSR commitment in accordance with Carroll's ethical pyramid principle.

From the perspective of Legitimacy Theory, CSR serves as an instrument to maintain the social contract between companies and society, especially when legitimacy is threatened by issues of aggressive tax avoidance (Deegan, 2019). Companies tend to increase CSR disclosure as a reparative legitimacy strategy to reduce public pressure (Hajawiyah et al., 2022). However, the Stakeholder Theory approach emphasizes that stakeholders increasingly demand consistency between CSR claims and actual tax contributions, viewing tax compliance as a key indicator of corporate social responsibility (Zheng et al., 2015; Chen et al., 2023). Therefore, effective tax management should make optimal tax compliance an integral part of CSR strategies to build authentic and sustainable legitimacy.

Managerial Ownership (M)

Managerial ownership is the proportion of shares directly owned by top management involved in strategic decision-making, and is rooted in Agency Theory (Jensen & Meckling, 1976). When managers also act as owners, there is an alignment of interests between agents and principals, so that managers have an incentive to improve the efficiency of the company's expenses, including through tax strategies that maximize after-tax profits (Efenana & Egbunike, 2023). In contrast to managerial ownership, institutional ownership acts as an external oversight mechanism, while public ownership has the weakest influence, and foreign ownership often brings more complex global governance standards and tax strategies (Hassan et al., 2022).

On the one hand, high managerial ownership can encourage aggressive tax strategies to maximize profits and the personal wealth of managers as shareholders (Wongsinhirun et al., 2024). On the other hand, empirical evidence also shows that managerial ownership is negatively correlated with tax avoidance, as managers are more concerned about legal and reputational risks that could damage the long-term value of their investments (Wongsinhirun et al., 2024). These varying findings confirm that the influence of managerial ownership on tax behavior is highly contextual, influenced by external oversight structures and law enforcement, making managerial ownership relevant to test as a mediating variable in the relationship between corporate policy and tax management.

Effective Tax Rate [ETR] (Y)

The Effective Tax Rate (ETR) reflects a company's actual tax burden as a percentage of pre-tax profit and is considered more accurate than the Statutory Tax Rate (STR) because it takes into account tax incentives and deductions (Fullerton, 1984). Research in Indonesia shows that the average ETR of companies is lower than the official rate due to the use of tax incentives, the selection of favorable accounting methods, and tax management strategies (Mustika & Ananto, 2018). This condition raises questions about the effectiveness of corporate tax management and the suitability of tax incentive designs with national economic policy objectives.

Corporate tax is not only a fiscal obligation, but also a strategic factor that influences capital structure and investment decisions. Financial managers need to integrate the impact of taxes into capital cost calculations in order to maximize company value (Myers, 1984). In practice, tax management includes legal tax planning, aggressive tax avoidance that exploits legal loopholes, and illegal tax evasion (Slemrod, 2004). Overly aggressive tax strategies, even if legal, have the potential to trigger negative investor reactions, especially in companies with weak social reputations and performance (Gillette & Stinson, 2022).

In this study, tax optimization is measured through the ETR in mineral and metal sector companies for the period 2022–2024. ETR is calculated as the ratio between total tax expenses and profit before tax, thus becoming an indicator of tax management effectiveness (Mustika & Ananto, 2018). However, a low ETR does not always reflect sustainable practices, as it does not distinguish between legitimate tax planning and aggressive tax avoidance. Therefore, optimal tax management is understood as an effort to achieve a balanced ETR between tax efficiency and social responsibility, in accordance with legitimacy theory and to avoid the risk of regulatory sanctions and negative market reactions (Fullerton, 1984; Gillette & Stinson, 2022).

3. Method

This chapter describes a quantitative research design with an associative causal and comparative approach to test the causal relationship between variables. The main focus is to analyze how debt policies measured by the Debt-to-Equity Ratio (DER) and Corporate Social Responsibility (CSR) affect tax avoidance (Effective Tax Rate), with managerial ownership as a mediating variable. The use of the Fixed Effect Model (FEM) in panel data analysis was chosen to control for the specific characteristics of the mineral and metal industry, which has dynamic capital structures and high downstream financing needs during the 2022–2024 period.

The research focuses on metal and mineral companies listed on the Indonesia Stock Exchange (IDX) due to their unique characteristics related to tax shield policies and thin capitalization rules (PMK-169/2015). In addition, this industry is bound by strict government regulations such as Law No. 3/2020, which requires community development programs, thereby creating a strategic interaction between CSR costs and debt interest expenses as tax reduction instruments. The availability of data is supported by the transparency of financial reports and sustainability reports required by the OJK, enabling researchers to conduct comprehensive fundamental and sustainability analyses.

The sampling technique used purposive sampling, which is a saturated sample (census) due to the limited population size. Of the total 34 metal and mineral industry issuers, 30 companies were selected that met the criteria, such as being listed on the IDX since 2023, having complete financial reports for the 2022–2024 period, and consistently using the calendar year as the fiscal year. With a total of 90 observations (firm-year), this study has sufficient statistical power to provide objective and scientifically accountable analysis results without sample selection bias. The conceptual framework and formulation of research hypotheses are presented as follows:

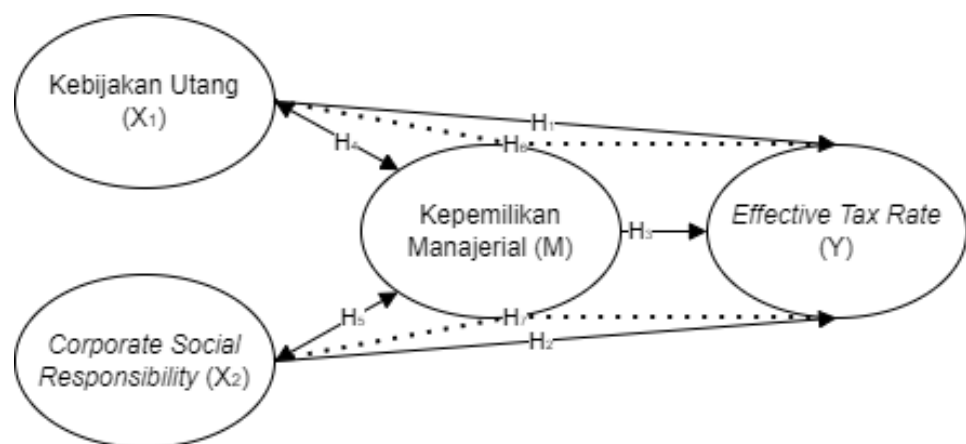


Figure 2. Concetual Framework.

Hypotheses:

- H1:** Kebijakan Utang berpengaruh terhadap Effective Tax Rate (ETR).
- H2:** Corporate Social Responsibility berpengaruh terhadap Effective Tax Rate (ETR).
- H3:** Kepemilikan Manajerial berpengaruh terhadap Effective Tax Rate (ETR).
- H4:** Kebijakan Utang dan Kepemilikan Manajerial dapat saling mempengaruhi.

H5: Corporate Social Responsibility dan Kepemilikan Manajerial saling mempengaruhi.

H6: Kepemilikan Manajerial memediasi Kebijakan Utang terhadap Effective Tax Rate (ETR)

H7: Kepemilikan Manajerial memediasi Corporate Social Responsibility terhadap Effective Tax Rate (ETR).

4. Results and Discussion

4.1. Result

Descriptive Analysis of Research Variables

Descriptive analysis provides a comprehensive overview of the distribution, data centers, and characteristics of each research variable, which forms the basis for further hypothesis testing.

1. Debt-to-Equity Ratio (DER) as a Proxy for Debt Policy The research population is as follows:

Table 1. Debt Policy Value.

Kode	Nama Emiten	2022	2023	2024
CTBN	PT. Citra Tubindo Tbk	0.608	0.671	0.541
ALKA	PT. Alakasa Industrindo Tbk	2.477	0.631	0.058
INCO	PT. Vale Indonesia Tbk	0.129	0.141	0.162
LMSH	PT. Lionmesh Prima Tbk	0.187	0.195	0.216
TBMS	PT. Tembaga Mulia Semanan Tbk	1.191	1.149	1.043
INAI	PT. Indal Aluminium Industry Tbk	4.227	4.392	5.330
TINS	PT. Timah Tbk.	0.856	1.059	0.718
ALMI	PT. Alumindo Light Metal Industry Tbk	1.193	1.505	2.564
ANTM	PT. Aneka Tambang Tbk.	0.419	0.375	0.383
DKFT	PT. Central Omega Resources Tbk	5.164	5.131	1.999
BTON	PT. Betonjaya Manunggal Tbk	0.446	0.406	0.419
CITA	PT. Cita Mineral Investindo Tbk	0.218	0.127	0.042
PSAB	PT. J Resources Asia Pasifik Tbk	1.122	1.242	1.153
GDST	PT. Gunawan Dianjaya Steel Tbk	0.988	0.749	1.032
NIKL	PT. Pelat Timah Nusantara Tbk	2.278	1.436	1.422
BRMS	PT. Bumi Resources Minerals Tbk	0.131	0.140	0.161
KRAS	PT. Krakatau Steel (Persero) Tbk	4.723	4.735	5.651
BAJA	PT. Saranacental Bajatama Tbk	5.637	5.541	11.326
ISSP	PT. Steel Pipe Industry Of Indonesia Tbk	0.787	0.726	0.645
MDKA	PT. Merdeka Copper Gold Tbk.	0.915	0.796	0.796
ZINC	PT. Kapuas Prima Coal Tbk	2.203	2.497	2.936
GGRP	PT. Gunung Raja Paksi Tbk.	0.471	0.329	0.148
IFSH	PT. Ifishdeco Tbk.	0.803	0.365	0.203
OPMS	PT. Optima Prima Metal Sinergi Tbk.	0.026	0.020	0.009
ARCI	PT. Archi Indonesia Tbk	1.897	2.060	2.170
NICL	PT. Pam Mineral Tbk	0.208	0.149	0.196
AMMN	PT. Amman Mineral Internasional Tbk.	0.801	0.962	1.119

Source: Processed primary data (2025)

The debt-to-equity ratio of companies in the sample shows an average value of 1.432088 or around 143.21%, with a standard deviation of 1.831982 that far exceeds the average, indicating a very high level of data dispersion and not concentrated around the average value. The median DER value is 0.7958 or 79.5%, which is lower than the average, indicating a right-skewed distribution with several high extreme values that raise the average. The maximum DER value reached 11.32580 or 1,132.80%, far exceeding the 4:1 thin capitalization threshold stipulated in PMK-169/2015, while the minimum value was only 0.009100 or 0.91%, indicating that the sample included companies with a very diverse funding spectrum.

2. Managerial Ownership as a Mediating Variable

Table 2. Managerial Ownership Value.

Kode	Nama Emiten	2022	2023	2024
CTBN	PT. Citra Tubindo Tbk	0.000	0.000	0.000
ALKA	PT. Alakasa Industrindo Tbk	0.000	0.000	0.000
INCO	PT. Vale Indonesia Tbk	0.000	0.000	0.000
LMSH	PT. Lionmesh Prima Tbk	0.206	0.206	0.206
TBMS	PT. Tembaga Mulia Semanan Tbk	0.000	0.000	0.000
INAI	PT. Indal Aluminium Industry Tbk	0.000	0.000	0.000
TINS	PT. Timah Tbk.	0.000	0.000	0.000
ALMI	PT. Alumindo Light Metal Industry Tbk	0.000	0.000	0.000
ANTM	PT. Aneka Tambang Tbk.	0.000	0.000	0.000
DKFT	PT. Central Omega Resources Tbk	0.028	0.028	0.028
BTON	PT. Betonjaya Manunggal Tbk	0.096	0.096	0.096
CITA	PT. Cita Mineral Investindo Tbk	0.002	0.002	0.002
PSAB	PT. J Resources Asia Pasifik Tbk	0.925	0.925	0.925
GDST	PT. Gunawan Dianjaya Steel Tbk	0.000	0.000	0.000
NIKL	PT. Pelat Timah Nusantara Tbk	0.000	0.000	0.000

Source: Processed primary data (2025)

The average share ownership by the board of directors and key management in the sample companies was only 6.99%, which is relatively low compared to capital markets in the United States and Southeast Asia. The median value of 0.00% indicates a highly skewed distribution of data, where at least half of the sample companies have zero or near-zero managerial ownership. This confirms the phenomenon in the Indonesian mining sector, which is generally managed by hired managers rather than directly by founders or family members.

Statistically, this data has a standard deviation of 0.213 and very high kurtosis (12.65), which indicates extreme concentration of data at low values with a few exceptions of companies that have dominant control of up to 92.5%. This highly skewed distribution pattern concentrated around zero has serious implications for research analysis. The strength of the mediating effect of managerial ownership on the relationship between debt policy or CSR and Effective Tax Rate (ETR) is predicted to be statistically limited due to the lack of variation in ownership in the majority of companies.

3. Effective Tax Rate (ETR) as the Dependent Variable The research population is as follows:

Table 3. ETR value.

Kode	Nama Emiten	2022	2023	2024
CTBN	PT. Citra Tubindo Tbk	0.220	0.124	0.260
ALKA	PT. Alakasa Industrindo Tbk	0.010	0.030	0.220
INCO	PT. Vale Indonesia Tbk	0.273	0.222	0.220
LMSH	PT. Lionmesh Prima Tbk	0.220	0.000	0.000
TBMS	PT. Tembaga Mulia Semanan Tbk	0.224	0.216	0.223
INAI	PT. Indal Aluminium Industry Tbk	0.220	0.220	0.000
TINS	PT. Timah Tbk.	0.333	0.220	0.161
ALMI	PT. Alumindo Light Metal Industry Tbk	0.000	0.000	0.220
ANTM	PT. Aneka Tambang Tbk.	0.267	0.202	0.165
DKFT	PT. Central Omega Resources Tbk	0.605	0.471	0.198
BTON	PT. Betonjaya Manunggal Tbk	0.054	0.077	0.020
CITA	PT. Cita Mineral Investindo Tbk	0.195	0.074	0.045
PSAB	PT. J Resources Asia Pasifik Tbk	0.220	0.954	0.253
GDST	PT. Gunawan Dianjaya Steel Tbk	0.223	0.234	0.176
NIKL	PT. Pelat Timah Nusantara Tbk	0.221	0.000	1.000
BRMS	PT. Bumi Resources Minerals Tbk	0.580	0.187	0.261
KRAS	PT. Krakatau Steel (Persero) Tbk	0.878	0.220	0.220
BAJA	PT. Saranacentral Bajatama Tbk	0.000	0.220	0.000
ISSP	PT. Steel Pipe Industry Of Indonesia Tbk	0.222	0.222	0.215
MDKA	PT. Merdeka Copper Gold Tbk.	0.279	0.541	0.548
ZINC	PT. Kapuas Prima Coal Tbk	0.000	0.220	0.220
GGRP	PT. Gunung Raja Paksi Tbk.	0.215	0.069	0.000
IFSH	PT. Ifishdeco Tbk.	0.220	0.252	0.302
OPMS	PT. Optima Prima Metal Sinergi Tbk.	0.000	0.000	0.220
ARCI	PT. Archi Indonesia Tbk	0.491	0.477	0.493
NICL	PT. Pam Mineral Tbk	0.258	0.419	0.232
AMMN	PT. Amman Mineral Internasional Tbk.	0.220	0.568	0.306
MBMA	PT. Merdeka Battery Materials Tbk	0.000	0.005	0.118
NCKL	PT. Trimegah Bangun Persada Tbk.	0.150	0.135	0.111
NICE	PT. Adhi Kartiko Pratama Tbk	0.219	0.244	0.362

Source: Processed primary data (2025)

The average Effective Tax Rate (ETR) in this sector was recorded at 22.90%, slightly above the official tax rate of 22%, with an identical median value (22.00%) indicating a much more symmetrical and stable distribution compared to other variables. Although there is significant variation with a range of values between 0% and 100% reflecting the heterogeneity of corporate tax strategies from the use of loss compensation to outliers due to tax corrections ETR data tends to be concentrated around the average value. However, with a kurtosis value of 6.78 and positive skewness, and considering the abnormal distribution of independent variables (DER, CSR, and Managerial Ownership) with extreme values, this study requires

data transformation or robust analysis methods to ensure the validity of the inferential test results later.

Panel Data Model Selection Testing

1. Chow Test for Comparing Common Effect Models vs. Fixed Effect Models

Table 4. Redundant Fixed Effects Test.

Redundant Fixed Effects Tests			
Equation: Untitled			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.957176	(29,57)	0.0153
Cross-section Chi-square	62.192072	29	0.0003

Source: Processed primary data (2025)

Statistically, these results indicate that there is significant heterogeneity among mineral and metal companies, reflecting differences in cost structures, market access, resource dependence, and competitive advantages among companies. The conclusion is that the Fixed Effect Model (FEM) is more appropriate than the Common Effect Model (CEM) for estimation in this study, because FEM allows each company to have a different intercept, capturing unobserved company-specific heterogeneity that is stable over time.

2. Hausman Test for Comparing Fixed Effect Models vs. Random Effect Models

Table 5. Hausmant Test.

Correlated Random Effects - Hausman Test Equation:

Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	3.072436	3	0.3806

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
DER_X1	-0.004839	0.006237	0.000654	0.6650
CSR_X2	0.000509	0.076748	0.004813	0.2655
KM_M	-5.506201	0.062592	13.410064	0.1283

Source: Processed primary data (2025)

The Hausman test recommends REM, indicating a trade-off between consistency (FEM) and efficiency (REM). In practice, when there is a conflict between the two tests, the decision must consider the research context and theoretical trade-offs: REM is more efficient but relies on the assumption that there is no correlation between individual effects and regressors; FEM is more robust to assumption violations but less efficient with small samples. In this study, given the relatively small number of firms (30) and short time span (3 years), REM likely provides the best trade-off between efficiency and control for heterogeneity.

3. Lagrange Multiplier Test for Comparing Common Effect Models vs. Random Effect Models

Table 6. Cronbach's Alpha and Composite Reliability.

	Test		
	Cross-section	Hypothesis Time	Both
Breusch-Pagan	3.992500 (0.0457)	1.550077 (0.2131)	5.542576 (0.0186)
Honda	1.998124 (0.0229)	-1.245021 (0.8934)	0.532524 (0.2972)
King-Wu	1.998124 (0.0229)	-1.245021 (0.8934)	-0.696665 (0.7570)
Standardized Honda	2.349852 (0.0094)	-1.022610 (0.8468)	-3.702677 (0.9999)
Standardized King-Wu	2.349852 (0.0094)	-1.022610 (0.8468)	-3.227711 (0.9994)
Gourieroux, et al.	--	--	3.992500 (0.0568)

Source: Processed primary data (2025)

The test results show a Breusch-Pagan probability value of 0.0457, which is just below the 5% significance threshold, indicating rejection of the null hypothesis. By rejecting H_0 , the conclusion is that there is a significant random effect, so REM is more appropriate than CEM. The combination of the three tests (Chow suggests FEM, Hausman suggests REM, and LM suggests REM) indicates that REM is the most appropriate model for this study. REM provides the best balance between addressing inter-firm heterogeneity (recognized by the Chow test) while utilizing estimation efficiency and the assumption of no correlation between unobserved heterogeneity and regressors (validated by the Hausman test).

Panel Data Regression Analysis and Hypothesis Testing

1. Model A: Direct Impact of Debt Policy and CSR on ETR

Table 7. Uji F Model A.

Statistik Uji	Nilai	Probabilitas	Kriteria ($\alpha = 0.05$)
F-statistic	1.791115	0.027662	$0.027662 \leq 0.05$

Source: Processed primary data (2025)

The F-test (Joint Hypothesis Test) shows an F-statistic of 1.791115 with a probability value of 0.027662, which is smaller than the significance level of 5% ($\alpha = 0.05$). This result rejects the null hypothesis that all independent variable coefficients are equal to zero, and accepts the alternative hypothesis that at least one coefficient is significantly different from zero. Statistically, the conclusion is that Debt Ratio (DER) and Corporate Social Responsibility (CSR) jointly and simultaneously have a significant effect on Effective Tax Rate (ETR) at a significance level of 5%.

Table 8. Uji t Model A.

Variabel	Koefisien	t-statistic	Prob.	Hipotesis	Kesimpulan
DER (X1)	-0.005746	-0.195512	0.8457	H1:	Tidak
				DER $\rightarrow$ ETR	Signifikan
CSR (X2)	-0.030628	-0.212113	0.8328	H2:	Tidak
				CSR $\rightarrow$ ETR	Signifikan

Source: Processed primary data (2025)

The results of regression analysis using the Fixed Effect Model show that debt policy (DER) and Corporate Social Responsibility (CSR) partially have no significant effect on the Effective Tax Rate (ETR). This is evidenced by the probability values of each variable (0.8457

for DER and 0.8328 for CSR), which are well above the 5% significance level. This finding indicates that variations in debt levels and the intensity of corporate social activities within the sample do not directly explain the differences in their effective tax burdens after controlling for individual company heterogeneity.

Although partially insignificant, this model has an R-squared value of 48.91%, which means that almost half of the ETR variation can be explained by the combination of DER and CSR variables in the model framework. Meanwhile, the remaining 51.09% is influenced by other factors outside the scope of this study, such as profitability, company size, or asset structure. This coefficient of determination value of nearly 50% indicates that the model still has adequate fit for panel data, and confirms the empirical relevance of the two main variables in the context of industry-related taxation.

2. Model B: The Effect of DER and CSR on Managerial Ownership (Mediator)

Table 8. The Effect of DER and CSR on Managerial Ownership.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
nt				
C	0.069398	0.001674	41.46726	0.0000
DER_X1	0.000165	0.001042	0.158196	0.8749
CSR_X2	0.005655	0.005119	1.104629	0.2739
R-squared	0.999439	Mean dependent var		0.069917
Adjusted R-squared	0.999139	S.D. dependent var		0.213283
S.E. of regression	0.006258	Akaike info criterion		-7.038306
Sum squared resid	0.002271	Schwarz criterion		-6.149485
Log likelihood	348.7238	Hannan-Quinn criter.		-6.679881
F-statistic	3333.377	Durbin-Watson stat		2.307494
Prob(F-statistic)	0.000000			

Source: Processed primary data (2025)

The research results pattern showing simultaneous significance but not partial significance provides several profound implications. From the perspective of Optimal Tax Theory, the ETR in Indonesia's mineral sector appears to have reached a stable equilibrium point, where individual policy variations such as debt or CSR are not strong enough to change the tax burden independently, but must move together in response to economic regulations. Methodologically, the use of the Fixed Effect Model also causes unique company characteristics to absorb most of the data variation (48-51%), leaving very limited space for the DER and CSR variables to show their individual effects.

From the perspective of Legitimacy and Stakeholder Theory, this phenomenon confirms that corporate tax policies in this industry are not influenced by a single factor, but rather are the collective result of various stakeholder pressures and a strict regulatory environment. The highly structured nature of this system indicates that a new policy will have a tangible impact if it interacts with other policies. This reflects that tax compliance and social responsibility have become part of an integrated corporate identity, rather than merely separate tax management strategies.

Table 10. Hypothesis Test.

Hipotesis	Variabel	Koefisien	t-Statistic	Prob.	Conclusion
H1	DER → ETR	-0.005746	-0.195512	0.8457	No effect
H2	CSR → ETR	-0.030628	-0.212113	0.8328	No effect
H3	KM → ETR	-5.506201	-1.502733	0.1384	No effect
H4	DER → KM	0.000165	0.158196	0.8749	No effect
H5	CSR → KM	0.005655	1.104629	0.2739	No effect
H6	DER → KM → ETR (Mediasi)	-0.0009085	Z-Sobel: -0.157477	>0.05	Not Significantly Mediating
H7	CSR → KM → ETR (Mediasi)	-0.031138	Z-Sobel: -0.890078	>0.05	Not Significantly Mediating

Source: Processed primary data (2025)

Discussion

The discussion of the research results will describe how the analysis results from hypothesis testing answer the research objectives and relate them to the underlying theory of the research or to the results of previous studies.

The Effect of Debt Policy on the Effective Tax Rate (ETR)

Based on the results of data processing using EViews, there are interesting findings where independent variables show a significant joint effect, but not a significant individual effect. This phenomenon is explained through three main perspectives. Optimal Tax Rate Theory: The stable ETR value of mineral companies at 22.90% (close to the official rate of 22%) indicates that the tax burden has reached a deterministic equilibrium point. As a result, small changes in the debt-to-equity ratio (DER) are no longer sensitive in partially changing the ETR level because they are already constrained by regulatory restrictions and technical accounting items such as depreciation.

Methodological Constraints: The use of the Fixed Effect Model effectively eliminates unobserved inter-company differences, but on the other hand leaves very limited data variation within a single company subject. This narrow variation is often considered “noise” in statistics, making it difficult to detect the significant influence of DER and CSR independently. Thin Capitalization Regulations: The DER limit of 4:1 in accordance with PMK-169/2015 is much higher than the industry average of only 1.43:1. This means that the debt-based tax planning strategies of the majority of companies in the sample do not violate regulatory limits, so that the variation in DER values within that range does not have a significant enough impact to significantly change the effective tax burden.

The Influence of Corporate Social Responsibility (CSR) on Effective Tax Rate (ETR)

The analysis was conducted using a panel data regression model. Conclusions were drawn by comparing the probability value (p-value) to the significance level $\alpha = 0.05$, where values below this threshold indicate a significant effect. Although Corporate Social Responsibility (CSR) did not have a significant effect on ETR at the individual level (t-statistic = -0.212113, p-value = 0.8328), the significance of the overall model is maintained (Model A F-test p-value = 0.027662 $\leq$ 0.05, Model C F-test p-value = 0.021807 $\leq$ 0.05). This pattern is explained by several empirical and theoretical factors.

First, the very low magnitude of CSR relative to fiscal profit (average 4.99%, median 0.45%) means that changes in CSR, although statistically significant at the individual level, produce numerical effects that are too small to be detected in the context of ETR values

ranging from 0% to 100% with a standard deviation of 19.93%, so that the signal is absorbed in measurement noise and random error (Griliches & Hausman, 1986).

Second, PP-96/2021 changed the nature of CSR from discretionary spending to a mandatory obligation with a certain percentage of investment allocation, thereby reducing CSR variability and weakening the covariance between CSR and tax outcomes (Bhattacharyya & Imam, 2024).

Third, CSR is quasi-fixed in the fixed effects model because the RKAB (Work Plan and Budget) is determined at the beginning of the year, so that temporary variations in CSR objects are limited, and the fixed effects model cannot show information about the effect of CSR on ETR from the two variations formed. From the perspective of Legitimacy Theory, these findings indicate that CSR and taxation are two separate dimensions of corporate governance strategy, rather than a single integrated strategy (Gray et al., 1995; Lanis & Richardson, 2012).

The Effect of Managerial Ownership on Effective Tax Rate (ETR)

The analytical tool used in this model is the Fixed Effect Model. The hypothesis acceptance criterion is if the t-test result shows a p-value smaller than 0.05. The results show that managerial ownership does not have a significant effect on the Effective Tax Rate (ETR). This finding is in line with the research by Khalifa and Albaz (2022) and Beverinotti et al. (2021), which shows that managerial ownership is not always the main determinant of corporate tax behavior. Khalifa and Albaz (2022) emphasize that in an ownership structure dominated by the government or large institutions, the role of managerial ownership in influencing tax policy is limited.

In the context of Indonesia's mineral sector, the low average level of managerial ownership and the dominance of state-owned enterprises and institutional investors mean that the mechanism for aligning interests does not depend on managerial share ownership. This explains why variations in managerial ownership are not strong enough to significantly influence the ETR, so that the predictions of Agency Theory are not fully confirmed in this context.

The Effect of Debt Policy on Managerial Ownership

This relationship was tested using panel data regression through EViews software. The research hypothesis was accepted if the individual t-test results had a p-value < 0.05. The results showed that debt policy did not have a significant effect on managerial ownership. This finding is in line with Risnawati and Jaelani (2025), who state that the structure of managerial ownership in the Indonesian mining sector is relatively fixed and unresponsive to changes in short-term financial policy. Managerial ownership is determined more by the initial ownership structure and corporate control policy than by leverage decisions.

Furthermore, these results indicate that capital structure and management share ownership decisions are independent. In the context of mineral companies, debt policy is more influenced by long-term project financing needs than by managerial ownership incentives, so that the causal relationship between DER and managerial ownership does not function significantly.

The Effect of Corporate Social Responsibility (CSR) on Managerial Ownership

This test uses a panel data regression model to examine the effect of independent variables on mediators. The significance criterion used is a probability value (p-value) < 0.05. The results show that CSR has no significant effect on managerial ownership. This finding is in line with Bhattacharyya and Imam (2024), who show that in times when CSR is mandatory, CSR decisions are driven more by regulatory compliance than by individual managerial preferences. Thus, CSR variations do not reflect managerial ownership incentives.

In the Indonesian context, CSR in the mining sector has been determined top-down through RKAB regulations and PP- 96/2021, so managers have limited discretion. This condition means that CSR is not a strategic instrument that influences or is influenced by managerial ownership, so the relationship between the two is not statistically significant.

The Mediating Relationship of Managerial Ownership on Debt Policy with Effective Tax Rate (ETR)

The mediating effect is measured technically using the Sobel Test. The criterion for drawing conclusions is if the absolute Z-value is greater than 1.96. The test results show that managerial ownership does not mediate the relationship between debt policy and ETR. This finding is consistent with Wongsinhirun et al. (2024), who emphasize that the mediating

effect of managerial ownership is highly dependent on the amount of ownership and the governance context. When managerial ownership is low or insignificant, the mediating path becomes weak or undetectable.

In this study, the insignificance of the DER → Managerial Ownership and Managerial Ownership → ETR paths indicates that internal incentive mechanisms do not function as a transmission channel for debt policy to tax management. Thus, debt policy affects ETR directly through operational and regulatory mechanisms, rather than through changes in managerial ownership incentives.

The Mediating Relationship of Managerial Ownership on Corporate Social Responsibility (CSR) with Effective Tax Rate (ETR)

This indirect effect was tested using Sobel's Test and Bootstrapping. The conclusion of mediation was drawn if the Z value was > 1.96 or if the 95% Confidence Interval did not include zero. The results show that managerial ownership does not mediate the relationship between CSR and ETR. This finding is in line with Abdelfattah and Aboud (2020) and Efenana and Egbunike (2023), who emphasize that CSR and managerial ownership are not always linked through the same incentive mechanisms, especially in a strict regulatory environment.

In the context of Indonesia's mineral sector, mandatory CSR reduces the role of managerial preferences in determining corporate social policies. As a result, managerial ownership does not function as a mechanism that translates CSR into specific tax strategies. Thus, the absence of a mediating effect reinforces the conclusion that the relationship between CSR and ETR is more influenced by regulation and social legitimacy than by managerial incentive structures.

5. Conclusion

This study concludes that although debt policy (DER), corporate social responsibility (CSR), and managerial ownership do not have a significant partial effect, the combination of the three simultaneously has a significant effect on the effective tax rate (ETR) in the mineral and metal sector for the period 2022–2024. This is evidenced by the significance value of the F-test in Model A ($p = 0.0277$) and Model C ($p = 0.0218$). These findings indicate that the effective tax burden in this industry is not the result of a single policy optimization, but rather a multi-dimensional equilibrium that arises from the integration of various corporate policies under strict regulatory constraints.

Specifically, the insignificant effect of individual DER and CSR is due to structural and regulatory factors, such as thin capitalization limits that are too loose (4:1) compared to the industry average, as well as the change in CSR status from voluntary to mandatory through PP-96/2021, which reduces data variation. Meanwhile, managerial ownership is not a major determinant of tax aggression due to the dominance of state-owned (BUMN) and institutional ownership, where the average managerial ownership is only 6.99%. This shows that agency problems in this sector are more centered on the relationship between controlling and minority shareholders, rather than between managers and shareholders.

Although the Sobel test shows that managerial ownership does not formally perform a mediating function, its presence in the model is proven to increase the overall explanatory power (joint explanatory power). This phenomenon of “weak individual influence but strong collective influence” reinforces Stakeholder Theory and Legitimacy Theory, which state that in highly regulated industries, internal governance mechanisms work complementarily to respond to pressure from regulators and stakeholders. These results confirm that the external regulatory power of the Directorate General of Taxes and the Ministry of Energy and Mineral Resources is far more dominant in determining a company's tax burden than individual managerial discretion.

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