The Effects of Hedging, Leverage, Profitability, Liquidity, and Capital Intensity on Tax Aggressiveness Moderated by Company Size

Amin Wijoyo
Universitas Tarumanagara; Jakarta, Indonesia
E-mail: aminw@fe.untar.ac.id

Steven Imanuel
Universitas Tarumanagara; Jakarta, Indonesia
E-Mail: stevenether2@gmail.com

Bryan Goodwin
Universitas Tarumanagara; Jakarta, Indonesia
E-Mail: bryangoodwins4@gmail.com

Steven Wiryajaya
Universitas Tarumanagara; Jakarta, Indonesia
E-mail: stevenwiryajaya78@gmail.com

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ABSTRACT

Tax aggressiveness in Indonesia's energy sector is a critical issue as companies aim to reduce tax burdens while navigating regulatory constraints. This study examines how hedging, leverage, profitability, liquidity, and capital intensity affect tax aggressiveness, with company size as a moderating factor, in energy firms listed on the Indonesia Stock Exchange. The research analyzes 34 companies from 2021 to 2023, totaling 102 observations, using panel data regression with fixed and random effect models processed via statistical software. Findings show that leverage increases tax aggressiveness, while profitability reduces it, contrary to expectations, possibly due to tax shields and oversight. Hedging, liquidity, and capital intensity have no direct impact, likely due to low derivative use and regulatory limits. Company size strengthens the effects of leverage and capital intensity but not others. The model explains 77.2% of tax aggressiveness variance without moderation and 10.2% with it. These results highlight unique tax planning dynamics in the energy sector, offering insights for firms to balance debt and liquidity and for policymakers to target larger companies for compliance.

Keywords: *Capital Intensity, Company Size, Hedging, Leverage, Liquidity, Profitability, Tax Aggressiveness.*

ABSTRAK

Agresivitas pajak di sektor energi Indonesia merupakan isu krusial karena perusahaan berupaya mengurangi beban pajak sekaligus menghadapi kendala regulasi. Studi ini mengkaji bagaimana lindung nilai, leverage, profitabilitas, likuiditas, dan intensitas modal memengaruhi agresivitas pajak, dengan ukuran perusahaan sebagai faktor moderasi, pada perusahaan energi yang terdaftar di Bursa Efek Indonesia. Penelitian ini menganalisis 34 perusahaan dari tahun 2021 hingga 2023, dengan total 102 observasi, menggunakan regresi data panel dengan model efek tetap dan acak yang diproses melalui perangkat lunak statistik. Temuan menunjukkan bahwa leverage meningkatkan agresivitas pajak, sementara profitabilitas menguranginya, bertentangan dengan ekspektasi, kemungkinan karena adanya perlindungan pajak dan pengawasan. Lindung nilai, likuiditas, dan intensitas modal tidak berdampak langsung, kemungkinan karena rendahnya penggunaan derivatif

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dan batasan regulasi. Ukuran perusahaan memperkuat pengaruh leverage dan intensitas modal, tetapi tidak pada faktor lainnya. Model ini menjelaskan 77,2% varians agresivitas pajak tanpa moderasi dan 10,2% dengan moderasi. Hasil ini menyoroti dinamika perencanaan pajak yang unik di sektor energi, menawarkan wawasan bagi perusahaan untuk menyeimbangkan utang dan likuiditas dan bagi pembuat kebijakan untuk menargetkan perusahaan yang lebih besar agar patuh.

***Keywords**: Intensitas Modal, Ukuran Perusahaan, Lindung Nilai, Leverage, Likuiditas, Profitabilitas, Agresivitas Pajak.*

INTRODUCTION

State revenue in Indonesia relies heavily on taxes, which accounted for 96.1% of total revenues in 2020, compared to 3.9% from non-tax sources (Indonesiabaik, 2021). Income tax, the largest component, imposes obligations on entities based on their taxable earnings. As corporate taxable income rises, so does the tax burden, encouraging companies to engage in aggressive tax strategies to minimize liabilities (Higgins et al., 2015). Tax aggressiveness involves planning to reduce Effective Tax Rates (ETR), often navigating the fine line between avoidance and evasion (Hanlon & Heitzman, 2010). In Indonesia, where taxes fund national development, this creates tension between government revenue goals and corporate tax planning (Ardyansah & Zulaikha, 2014; Andariesta & Suryarini, 2023).

Agency theory highlights conflicts between shareholders, who seek maximum profits, and managers, who may prioritize personal compensation, leading to opportunistic tax behaviors (Jensen & Meckling, 1976; Watts & Zimmerman, 1986). Managers can exploit information asymmetry through aggressive reporting, often using derivatives for non-speculative hedging (Donohoe, 2011; Paesani & Rosselli, 2021). According to Lee (2017), hedging enables tax savings in volatile markets, but its impact on tax aggressiveness in Indonesia's energy sector remains underexplored. In Indonesia, derivative users show higher tax aggressiveness than non-users, with hedging positively linked to tax avoidance (Yosephine & Gunawan, 2023). Recent studies in emerging markets confirm hedging's role in tax planning, yet sector-specific evidence, especially in energy, is limited (Sahoo & Kumar, 2024; Thayyib, 2025).

Debt financing through leverage offers tax-deductible interest, incentivizing higher debt levels (Modigliani & Miller, 1958; Badertscher et al., 2009). Indonesia's debt-to-GDP ratio increased from 2004 to 2014, reflecting a trend where firms with high effective tax rates favor debt from low-tax jurisdictions (Christiana & Martani, 2014). This trend, coupled with creditor monitoring, suggests leverage may reduce tax aggressiveness, but studies like Napitu and Kurniawan (2016) note inconsistent findings in Indonesia's context. Empirical evidence supports leverage's negative effect on aggressiveness due to oversight (Rahayu et al., 2022). However, according to Sudirgo (2024), leverage's moderating effect by company size in energy firms is rarely examined, creating a gap in understanding contextual dynamics.

Profitability increases tax burdens, prompting firms to use income-smoothing tactics to lower political costs (Zimmerman, 1983; Watts & Zimmerman, 1986). High-profit firms often minimize ETR through aggressive planning (Ardyansah & Zulaikha, 2014; Wati & Astuti, 2025). Liquidity enables short-term tax strategies, but highly liquid firms may avoid aggressive tactics to maintain stability (Obeidat, 2021; Gunawan & Ramli, 2023). Capital intensity, through fixed asset depreciation, reduces taxable income (Salim, 2023). According to Yosephine and Gunawan (2023), while profitability and capital intensity influence tax aggressiveness, their interaction with company size as a moderator is understudied in Indonesia's energy sector.

The research gap lies in the limited exploration of how company size moderates the effects of hedging, leverage, profitability, liquidity, and capital intensity on tax aggressiveness in Indonesia's energy sector. According to Monday et al. (2025), most studies focus on manufacturing or broader industries, overlooking energy-specific

dynamics despite their economic significance. This study aims to examine the influence of hedging, leverage, profitability, liquidity, and capital intensity on tax aggressiveness, with company size as a moderating variable, using energy sector firms listed on the Indonesia Stock Exchange (IDX) from 2021-2023. By addressing this gap, the study contributes to agency and political power theories, offering insights for policymakers and corporate strategists in emerging markets.

LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

Direct Effects of Financial Factors on Tax Aggressiveness

Agency theory explains conflicts between shareholders and managers, where managers may prioritize personal gains, leading to opportunistic behaviors like tax aggressiveness. According to Jensen and Meckling (1976), information asymmetry allows managers to manipulate tax strategies, impacting variables like hedging and profitability. This theory connects to tax aggressiveness as managers use tools like derivatives or debt to reduce taxable income, aligning with shareholder interests but raising ethical concerns (Watts & Zimmerman, 1986; Hanlon & Heitzman, 2010). In Indonesia's energy sector, such behaviors are evident due to high regulatory scrutiny (Andariesta & Suryarini, 2023). Political power theory complements this by suggesting that larger firms leverage resources for aggressive tax planning. According to Fernández-Rodríguez and Martínez-Arias (2012), larger energy firms possess greater bargaining power, enabling them to negotiate more favorable tax outcomes and mitigate the effects of other financial factors such as leverage and capital intensity. This relationship highlights how firm size can influence tax strategies and outcomes. Building on this premise, the present study incorporates hedging, leverage, profitability, liquidity, and capital intensity as key determinants of tax aggressiveness, with company size serving as a moderating variable that may strengthen or weaken these effects. Furthermore, this research contributes to the development of agency theory by empirically testing these relationships within Indonesia's energy sector context, which differs significantly from developed markets due to unique institutional, regulatory, and economic conditions (Knezevic et al., 2024; Monday et al., 2025).

Hedging, using derivatives, reduces risk but enables tax planning by shielding income (Chen, 2022). According to Donohoe (2011), non-speculative hedging correlates with lower Effective Tax Rates (ETR), especially in volatile sectors like energy. In Indonesia, hedging positively affects tax avoidance, as firms use derivatives strategically (Oktavia & Martani, 2013; Yosephine & Gunawan, 2023). Leverage, under the debt covenant hypothesis, reduces aggressiveness due to creditor oversight, despite tax-deductible interest (Watts & Zimmerman, 1986; Badertscher et al., 2009). Indonesian studies confirm this negative effect (Napitu & Kurniawan, 2016; Sudirgo, 2024). Profitability plays a crucial role in shaping corporate tax behavior, as higher profits generally increase tax obligations, motivating firms to engage in income-smoothing strategies to minimize their effective tax rate (Zimmerman, 1983). Ardyansah and Zulaikha (2014) further explain that highly profitable energy firms tend to adopt aggressive tax planning practices to reduce political costs associated with large earnings. Liquidity, on the other hand, enables companies to conduct short-term tax maneuvers, although excessive liquidity can indicate financial stability, thereby lowering the incentive for tax aggressiveness (Obeidat, 2021; Gunawan & Ramli, 2023). Capital intensity also significantly affects tax aggressiveness, as high fixed asset ownership allows firms to utilize depreciation expenses to lower taxable income (Dwiyanti & Jati, 2019; Salim, 2023). In Indonesia's energy industry, capital-intensive firms particularly benefit from such tax shields (Novianti & Budiasih, 2022).

H1: Hedging has a positive effect on tax aggressiveness.
H2: Leverage has a negative effect on tax aggressiveness.
H3: Profitability has a positive effect on tax aggressiveness.
H4: Liquidity has a positive effect on tax aggressiveness.
H5: Capital intensity has a negative effect on tax aggressiveness.

Moderating Role of Company Size

Company size moderate financial factors' impact on tax aggressiveness by enhancing firms' resources and bargaining power (Fernández-Rodríguez & Martínez-Arias, 2012). According to Andariesta and Suryarini (2023), larger Indonesian firms amplify hedging's tax benefits through sophisticated strategies. Hedging's positive effect strengthens in larger firms, as they access complex derivatives (Luviani & Pramiudi, 2020). Leverage's negative effect intensifies in larger firms due to stricter creditor monitoring (Indriani & Ramli, 2024). Larger firms, as per Rahayu et al. (2022), negotiate better debt terms, reducing tax aggressiveness. Profitability's positive effect may weaken in larger firms, as they face higher scrutiny but have advanced planning tools (Walidayni & Fidiana, 2022; Azzahra, 2023). Liquidity's effect varies, with larger firms leveraging cash reserves for tax strategies (Nisadiyanti & Yuliandhari, 2021; Rahmadani et al., 2024). Capital intensity's negative effect strengthens in larger firms, as noted by Ramdhania and Kinasih (2021), due to greater depreciation benefits. This moderation is understudied in Indonesia's energy sector, where size-driven dynamics differ from other industries (Apriyadi & Syahputra, 2024; Irawati et al., 2025).

H6: Company size moderates the positive effect of hedging on tax aggressiveness.
H7: Company size moderates the positive effect of leverage on tax aggressiveness.
H8: Company size moderates the positive effect of profitability on tax aggressiveness.
H9: Company size moderates the positive effect of liquidity on tax aggressiveness.
H10: Company size moderates the positive effect of capital intensity on tax aggressiveness.

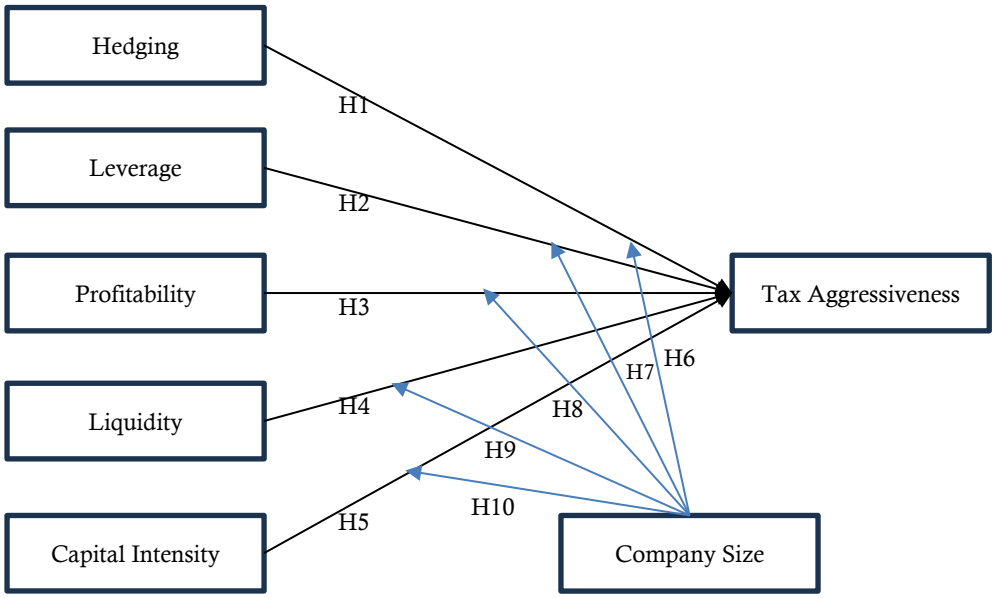

Figure 1. Research Framework

The study's framework links hedging, leverage, profitability, liquidity, and capital intensity to tax aggressiveness, with company size as a moderator, grounded in agency and political power theories. According to Yosephine and Gunawan (2023), energy firms' unique financial structures make them ideal for testing these relationships. Hedging and profitability increase tax aggressiveness, while leverage and capital intensity reduce it; liquidity's effect depends on firm stability (Watts & Zimmerman, 1986; Obeidat, 2021). Company size strengthens or weakens these effects by altering resource access and regulatory scrutiny (Fernández-Rodríguez & Martínez-Arias, 2012; Monday et al., 2025). This framework, as shown in Figure 1, integrates direct and moderated effects to address

gaps in sector-specific tax research in Indonesia. The model uses panel regression to test these relationships in energy firms listed on the IDX from 2021 to 2023, contributing to tax policy and corporate strategy (Knezevic et al., 2024; Briones et al., 2024).

RESEARCH METHODS

This study targets energy sector companies listed on the Indonesia Stock Exchange (IDX) from 2021 to 2023 as its population. Using purposive sampling, 34 firms were selected, yielding 102 observations. The criteria include continuous IDX listing, complete financial statements, positive profits to ensure tax relevance, and availability of hedging and financial data. Secondary data were sourced from IDX annual reports, accessed via the IDX website and company disclosures, ensuring reliable financial information. This selection ensures robust data for analyzing tax aggressiveness in a capital-intensive sector like energy.

The dependent variable, tax aggressiveness, is measured by the Effective Tax Rate (ETR), calculated as (Current Tax Expense + Deferred Tax Expense) / Pretax Income. Independent variables include hedging (HED = Total Notional Value / Lagged Assets), leverage (LEV = Total Liabilities / Lagged Assets), profitability (ROA = Net Income / Total Assets), liquidity (CR = Current Assets / Current Liabilities), and capital intensity (CAP = Fixed Assets / Total Assets). Company size, the moderating variable, is measured as the natural logarithm of total assets. These proxies align with agency and political power theories, capturing financial strategies and firm scale in tax planning.

Data analysis employs panel data regression with fixed and random effect models, processed using E-Views 10. Model selection used Chow and Hausman tests to determine the best fit, with the Lagrange Multiplier test for random effects. Classical assumption tests include multicollinearity (VIF < 10), heteroscedasticity (Glesjer test, $p > 0.05$), normality (Jarque-Bera test, accommodating non-normal distributions common in panel data), and autocorrelation (Durbin-Watson test, values near 2 indicating no issues). Data were collected from IDX's online database and verified for consistency, ensuring accuracy in financial ratios and derivative disclosures. This approach ensures robust findings on tax aggressiveness in Indonesia's energy sector.

RESULTS

The data used for the descriptive analysis is 2021-2023, which includes 34 observational data points. In this study, 2 equations were used, where the first equation tested the effect of hedging (HED), leverage (LEV), profitability (ROA), liquidity (CR), and capital intensity (CAP) on tax aggressiveness (ETR), the second equation tested the influence of green accounting and environmental performance on the company's financial performance (ROA), and the third equation tested hedging (HED), leverage (LEV), profitability (ROA), liquidity (CR), and capital intensity (CAP) to tax aggressiveness (ETR) through company size (SIZE) as the mediating variable. Descriptive statistics describe the character of the variables used in this study. The characteristics tested are descriptive, including minimum values, maximum values, averages, and standard deviations of independent variables.

Table 1, Descriptive Statistics for Equations 1 and 2, summarizes the variables' characteristics for both equations. The Effective Tax Rate (ETR), the dependent variable, has a mean of 0.221, indicating an average tax burden of 22.1% of pretax income. However, ETR ranges from -2.793 to 2.371, suggesting significant variability, with negative values reflecting tax refunds or losses in some firms (Hanlon & Heitzman, 2010). Hedging (HED) in Equation 1 averages 0.0024, with a maximum of 0.085, indicating low derivative use, while HED_SIZE (moderated) in Equation 2 shows a higher mean (0.032) due to size scaling. Leverage (LEV) averages 0.758, reflecting high debt reliance typical in energy firms, with moderated LEV_SIZE at 10.673. Profitability (ROA) averages 0.014, with a maximum of 0.100, while ROA_SIZE is 0.195, showing size amplifies returns. Liquidity (CR) has a high mean (93.069) and maximum (1377.904), indicating potential outliers in highly liquid firms, likely due to large cash reserves in some energy

companies (Obeidat, 2021). Capital intensity (CAP) averages 0.023, with CAP_SIZE at 0.325, reflecting fixed asset scaling. High standard deviations and skewness, especially for CR (155.936) and ETR (0.521), suggest non-normal distributions, common in panel data but not affecting regression validity due to robust tests. The 102 observations from 34 firms over three years are sufficient for panel regression, as they capture diverse financial behaviors in the energy sector, though outliers like CR's maximum warrant caution in interpretation.

Table 1. Descriptive Statistics

Statistics	Equation 1						Equation 2				
	ETR	HED	LEV	ROA	CR	CR	HED_SIZE	LEV_SIZE	ROA_SIZE	CR_SIZE	CAP_SIZE
Mean	0.220879	0.002400	0.758278	0.014160	93.06855	0.023453	0.031582	10.67258	0.194898	1318.610	0.325482
Median	0.209571	1.18E-06	0.826494	0.009322	48.43598	0.018922	1.68E-05	11.31942	0.131448	665.5772	0.278240
Maximum	2.371261	0.085449	0.915330	0.100255	1377.904	0.111583	1.223665	14.34499	1.285015	19856.54	1.351623
Minimum	-2.793214	-0.018035	0.050409	-0.056711	0.094714	0.000256	-0.244253	0.814563	-0.916400	1.161880	0.003429
Std. Dev.	0.520631	0.013026	0.173902	0.019843	155.9355	0.019756	0.172685	2.620025	0.268760	2239.212	0.253460
Skewness	0.004836	5.042771	-2.395886	1.438955	5.733869	2.262411	5.172845	-1.978869	0.860508	5.806013	1.894450
Kurtosis	19.24815	30.15962	8.593373	9.031346	46.51456	9.041052	32.31387	6.832764	8.728645	47.36624	7.235044

The criteria for assessing whether there is multicollinearity or not, if the VIF value is < 10, indicates that there is no multicollinearity. Meanwhile, if the VIF value is > 10, it indicates the existence of multicollinearity.

Table 2. Results of the Multicollinearity Test

Equation	Variable	Coefficient Variance	Uncentered BRIGHT	Centered BRIGHT
Equation 1	HED	3.787532	1.165183	1.126566
	LEV	0.022810	24.43015	1.209351
	ROA	1.617171	1.690416	1.116309
	CR	2.50E-08	1.446266	1.063631
	CR	1.660333	2.753020	1.136067
	C	0.016410	29.05417	ON
Equation 2	HED_SIZE	0.022668	1.128052	1.091192
	LEV_SIZE	0.000105	20.75634	1.168883
	ROA_SIZE	0.009189	1.640464	1.071440
	CR_SIZE	1.32E-10	1.445641	1.070683
	CAP_SIZE	0.010469	2.893746	1.085677
	C	0.015163	24.71897	ON

Table 2, Multicollinearity Test Results, confirms no multicollinearity issues for both equations. All centered variance inflation factors (VIF) are below 10, ranging from 1.064 to 1.209 in Equation 1 and 1.071 to 1.169 in Equation 2, indicating independent variables are not highly correlated. For example, HED and HED_SIZE have VIFs of 1.127 and 1.091, respectively, ensuring reliable regression coefficients. Heteroscedasticity tests, using the Glesjer method, show no issues, with all p-values > 0.05 for both equations, confirming variance stability. Additional tests, including Jarque-Bera for normality ($p < 0.05$, confirming non-normality but acceptable in large samples) and Durbin-Watson for autocorrelation (values near 2, indicating no autocorrelation), support the model's validity. These tests ensure robust regression results for analyzing tax aggressiveness.

The Gleser test was used by regressing independent variables on nominal residues. The criteria for assessing whether there are symptoms of heteroscedasticity are that if the significance value between the independent variable and the residual is greater than 0.05, then there are no symptoms of heteroscedasticity; while if the significance value is less than 0.05, then there are symptoms of heteroscedasticity.

This test was carried out to select a better or appropriate model to estimate the panel data between the pooled least square model (common effect model) and the fixed effect model. If the significance probability value of F > 0.05, then the best model is the common effect model, and vice versa, if F < 0.05, then the best model is to use a fixed effect model. The results of the Chow test for independent variables can be seen in Table 3.

Table 3. Chow Test Results

Equation	Effects Test	Statistic	d.f.	Prob.
Equation 1	Cross-section F	8.822027	(33, 63)	0.0000
	Cross-section Chi-square	176.105102	33	0.0000
Equation 2	Cross-section F	8.777524	(33, 63)	0.0000
	Cross-section Chi-square	175.681215	33	0.0000

In Table 3, for equation 1, it can be seen that the significance probability value of F = 0.0000 < 0.05, so the best model is the fixed effect model. Likewise, for equation 2, it can be seen that the significance probability value of F = 0.0000 < 0.05, then the best model is the fixed effect model.

The Hausman test aims to select the right model to estimate the panel data between a fixed effect model and a random effect model. If the probability value > 0.05, then the best model is a random effect. However, if the probability value < 0.05, then the best model is the fixed effect model. The results of the Hausman test can be seen in Table 4.

Table 4. Hausman Test Results

Equation	Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Equation 1	Cross-section random	14.251133	5	0.0141
Equation 2	Cross-section random	6.262415	5	0.2815

In Table 4, for equation 1, it can be seen that the significance probability value of F = 0.0141 < 0.05, so the best model is the fixed effect model. Otherwise, for equation 2, it can be seen that the significance probability value of F = 0.2815 > 0.05, then the best model is the random effect model.

Table 5. Results of Equation Regression Test

Equation	Variable	Coefficient	Std. Error	t-Statistic	Prob.
Equation 1	HED	-0.221702	0.439031	-0.504979	0.6153
	LEV	0.193290	0.096194	2.009383	0.0488
	ROA	-1.239700	0.587319	-2.110780	0.0388
	CR	-0.000748	0.003722	-0.200844	0.8415
	CR	0.261323	0.653717	0.399749	0.6907
	C	0.045064	0.075775	0.594706	0.5542
Equation 2	HED_SIZE	-0.022050	0.031611	-0.697529	0.4872
	LEV_SIZE	0.012203	0.003929	3.105668	0.0025
	ROA_SIZE	-0.003490	0.028658	-0.121797	0.9033
	CR_SIZE	6.51E-07	2.69E-06	0.241767	0.8095
	CAP_SIZE	0.079121	0.035509	2.228185	0.0282
	C	0.020215	0.045673	0.442613	0.6590

Based on Table 5, the model for the first linear regression equation used in this study can be formulated as follows:

ETR = 0.045064 – 0.221702 HED + 0.193290 LEV – 1.239700 ROA – 0.000748 CR + 0.261323 CAP

Information:
ETR = tax aggressiveness
HED = hedging
LEV = leverage
ROA = profitability
CR = liquidity
CR = capital intensity

Based on Table 5, the model for the second linear regression equation used in this study can be formulated as follows:

ETR = 0.020215 – 0.022050 HED*SIZE + 0.012203 LEV*SIZE – 0.003490 ROA*SIZE + 0.000000651 CR*SIZE + 0.079121 CAP*SIZE

Information:
ETR = aggressive straw
HED*SIZE = hedging with company size as a variable moderation
LEV*SIZE = leverage with company size as a moderation variable
ROA*SIZE = profitability with company size as a moderation variable
CR*SIZE = liquidity with company size as a moderation variable
CAP*SIZE = capital intensity with company size as a moderation variable

The F-test aims to test the feasibility of a research model (the goodness of fit). The significance level used is 0.05. If the significance value (prob) is < 0.05, the regression model meets the goodness of fit.

Table 6. Results of Analysis of F-Test

Equation	Statistics	Value
Equation 1	R-squared	0.857973
	Adjusted R-squared	0.772305
	S.E. of regression	0.042029
	Sum squared resid	0.111283
	Log likelihood	203.1213
	F-statistic	10.01517
	Prob(F-statistic)	0.000000
Equation 2	R-squared	0.146637
	Adjusted R-squared	0.102191
	S.E. of regression	0.043235
	F-statistic	3.299205
	Prob(F-statistic)	0.008582

The results of the first equation F-test can be seen in Table 6. From the results, it can be seen that the probability value of the F-statistic is 0.000000 (P < 0.05), meaning that the regression model used in this study meets the goodness of fit. These results also show that hedging, leverage, profitability, liquidity, capital intensity, and company size together have a significant effect on tax aggressiveness. Then, the results of the second equation F-test show that the probability value of the F-statistic is 0.008582 (P < 0.05), meaning that the regression model used in this study meets the goodness of fit. These results also show that hedging, leverage, profitability, liquidity, and capital intensity together have a significant effect on tax aggressiveness, with company size as a moderator.

DISCUSSION

The regression results reveal varied impacts of hedging, leverage, profitability, liquidity, and capital intensity on tax aggressiveness in Indonesia's energy sector, with company size as a moderator. Equation 1, without moderation, has an Adjusted R-

squared of 0.772, explaining 77.2% of the variance in effective tax rate (ETR), while Equation 2, with moderation, drops to 0.102, indicating a weaker explanatory power. The significant drop suggests that the company size's moderating effect is limited, possibly due to uniform tax regulations in the energy sector constraining firm-specific strategies. The 22.8% unexplained variance in Equation 1 and 89.8% in Equation 2 may reflect untested factors like corporate governance or regulatory changes (Oktaviani et al., 2024). These findings align with agency and political power theories, where firm characteristics influence tax planning (Jensen & Meckling, 1976).

Hedging shows an insignificant effect (p=0.6153) on tax aggressiveness, rejecting H1, and no moderation by company size (p=0.4872, H6 rejected). According to Donohoe (2011), hedging's tax benefits depend on derivative complexity, which may be limited in Indonesia's energy firms due to low derivative use (mean HED=0.0024). This aligns with mixed findings where hedging's impact varies by market volatility (Oktavia & Martani, 2013; Lee, 2017). The insignificance may stem from regulatory restrictions or low hedging adoption in the sector, unlike in developed markets (Luviani & Pramiudi, 2020). Leverage has a significant positive effect (p=0.0488, H2 rejected due to positive coefficient), suggesting higher debt increases ETR, possibly due to stricter creditor oversight limiting aggressive tax strategies, as aligns with the study of Napitu and Kurniawan (2016). This contradicts Sudirgo (2024), who found a negative effect in broader Indonesian firms, highlighting energy sector specifics like high debt reliance (mean LEV=0.758). Size moderates leverage negatively (p=0.0025, H7 accepted), as larger firms face tighter monitoring. This inconsistency may indicate that the energy sector's capital-intensive structure and high regulatory supervision alter traditional leverage–tax dynamics proposed in agency theory.

Profitability negatively affects tax aggressiveness (p=0.0388, H3 rejected due to negative coefficient), indicating that profitable firms lower ETR, likely through tax shields. According to Yudha et al. (2024), energy firms' high profits (mean ROA=0.014) drive tax planning to reduce political costs. No moderation by size (p=0.9033, H8 rejected), as larger firms' advanced planning is offset by scrutiny. Liquidity is insignificant (p=0.8415, H4 rejected), consistent with stability signals reducing aggressive tax moves, as aligns with the study from Obeidat (2021) and Rahmadani et al. (2024). High liquidity (mean CR=93.069) suggests energy firms prioritize cash reserves over tax strategies, unlike findings in less liquid sectors, as align with study from Nisadiyanti and Yuliandhari (2021) and Regina et al. (2024). No moderation by size (p=0.8095, H9 rejected). Capital intensity is insignificant directly (p=0.6907, H5 rejected) but negatively moderated by size (p=0.0282, H10 accepted), as larger firms leverage depreciation, as align with study from Ramdhania and Kinasih (2021) and Wahid (2021). Capital-intensive energy firms (mean CAP=0.023) benefit from tax shields only when scaled by size.

The insignificant results for hedging, liquidity, and direct capital intensity may reflect energy sector characteristics, such as regulatory constraints or uniform tax practices, limiting aggressive strategies. The drop in Adjusted R-squared in Equation 2 suggests that size's moderating role is context-specific, possibly weakened by Indonesia's tax enforcement or sector homogeneity (Lubis et al., 2024). These findings imply that energy firms should balance leverage to optimize tax shields while maintaining liquidity for stability. Policymakers can target larger firms for stricter tax compliance, given their moderated leverage and capital intensity effects. Managers should prioritize profitability-driven tax planning, leveraging depreciation in capital-intensive operations, to align with regulatory expectations. The findings extend agency theory by demonstrating that managerial discretion in tax planning is constrained in heavily regulated sectors, while political power theory is supported through the influence of firm size on leverage and capital intensity.

Practically, these results emphasize the need for fiscal transparency and adaptive tax policies that account for firm-specific characteristics in Indonesia's energy sector. Future research should include more sectors, such as manufacturing or mining, to compare tax

behaviors. Adding variables like corporate governance or thin capitalization and extending the study period could provide deeper insights into tax aggressiveness.

CONCLUSION

This study examines the effects of hedging, leverage, profitability, liquidity, and capital intensity on tax aggressiveness in energy sector companies listed on the Indonesia Stock Exchange from 2021 to 2023, with company size as a moderating variable. The findings show that leverage and profitability significantly influence tax aggressiveness, though in unexpected directions: higher leverage increases the effective tax rate, while higher profitability reduces it, possibly due to tax shields. Hedging, liquidity, and capital intensity have no direct impact, likely because of regulatory constraints or low derivative use in the energy sector. Company size strengthens the effects of leverage and capital intensity, indicating that larger firms face stricter oversight and use depreciation benefits to lower taxes. These results highlight unique tax planning dynamics in Indonesia's energy sector, adding to our understanding of how firm size shapes financial strategies.

The findings suggest that energy firms should balance debt to optimize tax benefits while maintaining liquidity to ensure stability, and larger firms can leverage fixed assets for tax savings. However, the study is limited by its focus on only 34 energy firms and a three-year period, which may not capture broader industry trends or long-term effects. Small sample size and potential outliers, like high liquidity values, could also affect generalizability. Future research should include more sectors, such as manufacturing or mining, to compare tax behaviors. Adding variables like corporate governance or thin capitalization and extending the study period could provide deeper insights into tax aggressiveness.

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