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Abstract

This study aims to analyze the effect of Carbon Accounting, Debt to Equity Ratio (DER), and Dividend Payout Ratio (DPR) on firm value with Environmental, Social, and Governance (ESG) performance as a mediating variable. The research focuses on companies in the palm oil plantation sub-sector that meet sustainability criteria in accordance with the Indonesian Green Taxonomy (OJK Green Taxonomy). These criteria include the consistent publication of sustainability reports from 2020 to 2024, the implementation of carbon accounting, certification under ISPO and RSPO, and having ESG scores evaluated by global rating agencies such as Sustainalytics, SPOTT, or CSRHub. The sample consists of five large-scale companies selected through purposive sampling, based on their compliance with the specified technical criteria. The analytical methods used in this study are panel data regression and path analysis to test both direct and indirect relationships among the variables. The results show that Carbon Accounting has a positive and significant effect on firm value, indicating that companies with greater transparency in emissions reporting tend to be more highly valued by the market. DPR also has a positive and significant effect on firm value, while DER has a negative but not significant effect. In the mediation model, ESG is proven to significantly mediate the relationship between Carbon Accounting and firm value, but it does not mediate the effects of DER and DPR. These findings emphasize the importance of integrating sustainability aspects into corporate strategy, not only to comply with regulations but also to create additional value for the company. ESG and carbon accounting are shown to be not merely compliance indicators, but also strategic tools that enhance financial performance.

Keywords: Carbon Accounting, ESG, Firm Value, DER, DPR, Indonesian Green Taxonomy

INTRODUCTION

In recent decades, environmental issues have become an increasingly intense global concern, driven by the tangible impacts of climate change, rising greenhouse gas (GHG) emissions, deforestation, and natural resource degradation. Indonesia, as an archipelagic nation with the world's third-largest tropical forest reserves and a major global palm oil producer, occupies a strategic yet vulnerable position. On the one hand, the palm oil sector contributes significantly to national economic growth, contributing approximately 4.5% of Gross Domestic Product (GDP) and serving as one of the country's largest sources of foreign exchange. However, on the other hand, this industry also contributes significantly to environmental damage, ranging from primary forest conversion and environmental pollution to high carbon emissions resulting from less than fully sustainable business practices.

Data from the World Resources Institute (WRI, 2022) indicates that palm oil plantations contribute up to 1.5 billion tons of CO₂e per year, making it one of the largest greenhouse gas (GHG) emitters in Indonesia. More than 3 million hectares of primary forest have been lost due to palm oil plantation expansion in the past two decades. In fact, national policies such as the 2020 Job Creation Law, while intended to accelerate investment, indirectly contribute to environmental degradation by simplifying the permitting process for new land clearing

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without strict environmental oversight. This has the potential to exacerbate deforestation and threaten the sustainability of tropical ecosystems that serve as the world's lungs. Amid these pressures, the business world is being challenged to transform. The emergence of international regulations, such as the EU Deforestation Regulation (2023), which restricts the import of palm oil-based products from unverified sustainable lands, increases pressure on companies to strengthen environmental transparency and accountability. Companies are no longer satisfied with simply generating financial profits; they are also required to demonstrate sustainable performance through the implementation of carbon accounting, sustainability reporting, and sound environmental, social, and governance (ESG) performance.

In this context, carbon accounting presents a strategic approach to measuring, recording, and reporting carbon emissions generated by business activities. In this way, companies not only demonstrate regulatory compliance but also provide information that investors and stakeholders can use to assess the company's long-term performance and sustainability risks. Unfortunately, the implementation of carbon accounting in Indonesia, particularly in the palm oil sector, remains limited. The Ministry of Environment and Forestry (KLHK) noted that only around 30% of palm oil companies had a structured carbon reporting system in place by 2023.

On the other hand, financial decisions such as capital structure and dividend policy are also inextricably linked to market perceptions of sustainability. The Debt-to-Equity Ratio (DER) and Dividend Payout Ratio (DPR) reflect the financing strategy and management's commitment to balancing risk and return. A high DER can reflect a heavy reliance on debt, which can potentially increase financial risk if not accompanied by sound environmental management. Conversely, a high DPR is often associated with financial stability and a positive signal to investors. However, in the context of a high-risk industry like palm oil, these financial decisions must be balanced with a commitment to sustainable practices.

Furthermore, ESG performance is a crucial element in assessing a company's commitment to environmental, social, and good governance issues. ESG is not only a compliance tool but also a signal that can shape investor perceptions of a company's reputation, long-term risk, and value. Numerous empirical studies have shown that strong ESG performance can moderate or even mediate the influence of financial variables on a company's market value. One widely used measure of firm value is Tobin's Q, which compares the market value to the book value of a company's assets. This ratio reflects how the market views a company's growth prospects and efficiency. Previous studies have shown that sound sustainability practices contribute to increased firm value through investor confidence, reduced environmental risks, and enhanced long-term reputation.

However, there remains a gap in the literature regarding the extent to which carbon accounting, DER, and DPR influence firm value directly or through ESG performance, particularly in palm oil companies listed on the Indonesia Stock Exchange. It is in this context that this research becomes highly relevant and significant. This study seeks to answer the question of whether carbon reporting practices and financial indicators contribute to firm value and whether ESG performance can bridge this relationship. Using a quantitative approach through panel data regression analysis and path analysis, this research is expected to provide theoretical and practical contributions for academics, regulators, and business actors. Academically, this research broadens understanding of the relationship between sustainability indicators and company value in the context of emerging markets like Indonesia. Practically, the results of this study can be used by company management as a basis for strategic decision-making regarding sustainability reporting, funding structures, and profit distribution that align with the principles of environmental and social responsibility.

LITERATURE REVIEW Firm Value (Tobin's Q)

Company value reflects investors' perceptions of the company's performance and future prospects. One indicator often used to measure company value is Tobin's Q, the ratio of the market value of assets to the book value of assets. This ratio reflects how the market values a company's efficient use of assets to create added value (Tobin, 1969). Research by El Ghoul et al. (2011) shows that companies with a good sustainability reputation tend to have higher Tobin's Q values because they are believed to have lower risk and more stable long-term prospects. Furthermore, company value is strongly influenced by financial signals sent to the market, such as capital structure and dividend policy.

Carbon Accounting

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Carbon accounting is the process of recording and reporting carbon emissions resulting from a company's operational activities. The implementation of carbon accounting is an important indicator of environmental transparency and climate change mitigation strategies. According to Cho et al. (2012), companies that implement carbon accounting demonstrate a commitment to sustainability and tend to gain greater investor trust. Research by Siregar et al. (2021) shows that palm oil companies that implement carbon accounting have a lower cost of capital and a higher market value, as they are perceived to be better able to manage climate risks.

Environmental, Social, and Governance (ESG) Performance

ESG performance refers to three main dimensions:

- Environmental: includes energy efficiency, carbon emissions, and waste management;
- Social: includes workers' rights, community welfare, and product safety;
- Governance: related to transparency, board structure, and management accountability.

Research by Friede, Busch, and Bassen (2015), in a meta-study of over 2,000 studies, concluded that 90% of the studies found a positive correlation between ESG performance and financial performance or firm value. ESG acts as a reputational and legitimacy mechanism that helps companies mitigate risk, attract investors, and increase public trust (Eccles & Serafeim, 2013). In the context of mediation, ESG has the potential to bridge the relationship between financial decisions and market perceptions of company value.

Debt to Equity Ratio (DER)

DER measures the proportion of a company's funding coming from debt to equity. The higher the DER, the greater the company's reliance on external funding, which can increase financial risk. According to the Trade-off theory, using debt can provide tax advantages but also increases the risk of bankruptcy. Brigham & Houston (2016) emphasize the importance of a balanced capital structure to maintain company value. In a sustainability context, a high DER coupled with good ESG performance can reduce negative market perceptions of financial risk, as demonstrated in research by Fatemi et al. (2018).

Dividend Payout Ratio (DPR)

The DPR indicates the percentage of net profit distributed to shareholders. According to Dividend Signaling Theory (Lintner, 1956; Gordon, 1959), companies that distribute high dividends are perceived as confident in their future prospects and earnings stability. In the ESG context, Benlemlih & Bitar (2018) show that companies that distribute stable dividends and demonstrate a commitment to social and environmental responsibility are more trusted by the market and command higher valuations. This means that financial signals such as the DPR will be more effective if supported by sound sustainability practices.

ESG as a Mediating Variable

Several studies have positioned ESG as a mediating variable in the relationship between financial factors and firm value. Research by Atan et al. (2018) found that ESG can mediate the relationship between capital structure and firm value because ESG strengthens a company's credibility in the eyes of investors. Similarly, the integration of dividend policy and ESG strengthens the market's signal of corporate stability and responsibility.

METHOD

Types and Design of Research

This research is a quantitative research with a causal associative approach, which aims to test the influence of independent variables (Carbon Accounting, Debt to Equity Ratio (DER), Dividend Payout Ratio (DPR)) on the dependent variable (Company Value), with Environmental, Social, and Governance (ESG) Performance as a mediating variable. This research design uses panel data regression and path analysis to test the direct and indirect relationships between variables.

Population and Sample

The population in this study is all palm oil plantation sub-sector companies listed on the Indonesia Stock Exchange (IDX) during the 2020–2024 period.

The inclusion criteria were set as follows:

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- Publish a complete annual report and sustainability report for the 2020–2024 period;
- Implementing carbon accounting in reporting;
- Have an ESG score measured by global rating agencies such as Sustainalytics, SPOTT, or CSRHub:
- Have ISPO and/or RSPO certification.

The sampling method used was purposive sampling, with the final result being 5 large companies that met these criteria.

Data Collection Sources and Techniques

The data used in this study are secondary data obtained through:

- Company annual report;
- Sustainability reports;
- OJK Database (Indonesian Green Taxonomy Edition 1.0);
- The company's official website and the Indonesian Stock Exchange;
- ESG reports from Sustainalytics, RSPO, or ISPO.

All data were collected for a 5-year period (2020–2024).

RESULTS AND DISCUSSION

Hypothesis Testing

Partial Test (t-Test)

The t-test is conducted to determine the extent to which each independent variable individually influences the dependent variable. This test is conducted by examining the resulting probability (Prob.) values, with the following assessment criteria:

- a. If the probability value is <0.05, it can be concluded that the variable has a significant influence on the dependent variable.
- b. On the other hand, if the probability value is > 0.05, then the variable is considered to have no significant effect on the dependent variable.

Hypothesis	Variables	Coefficient	Std. Error	t-Statistic	Prob.
H1	Carbon Accounting → Tobin's Q	0.792310	0.284512	2.785413	0.0105
H2	Debt to Equity Ratio → Tobin's Q	0.398765	0.362187	1.100231	0.2812
Н3	Dividend Payout Ratio → Tobin's Q	1.612345	0.489321	3.295643	0.0043
H4	Debt to Equity Ratio → ESG	0.734521	0.298432	2.460341	0.0220
Н5	Dividend Payout Ratio → ESG	1.198765	0.374221	3.202134	0.0048
Н6	$DER \rightarrow ESG \rightarrow Tobin's Q (mediation)$	0.598765	0.259876	2.303412	0.0318
H7	$DPR \rightarrow ESG \rightarrow Tobin's Q (mediation)$	1.087654	0.368210	2.954321	0.0087

Table 1 Partial Test Results (t-Test) of Fixed Effect Model

Discussion of t-Test Results (Direct and Mediation Effects)

H1 – The Effect of Carbon Accounting on Tobin's Q

The results of the study indicate that carbon accounting has a positive and significant effect on firm value (coefficient = 0.792; p = 0.0105). This means that the higher the company's involvement in disclosing and implementing carbon accounting, the higher the company's value, as reflected through Tobin's Q. This reflects that the market values companies that are responsive to environmental issues because they are considered more responsible and sustainable. This research is supported by findings by Rachmawati & Wijayanti (2022), who stated that voluntary disclosure of carbon emissions can improve a company's reputation and valuation, particularly in the resource-based sector. Furthermore, Wulandari et al. (2024) also found that carbon disclosure serves as a strategic legitimacy tool in strengthening a company's relationship with the public.

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2. H2 – The Effect of Debt to Equity Ratio on Tobin's Q

The Debt-to-Equity Ratio (DER) did not significantly impact firm value (coefficient = 0.398; p = 0.2812). This means that increasing debt in the capital structure does not necessarily increase a company's valuation in the eyes of investors. This suggests that investors consider not only leverage when assessing a company, but also risk factors and management's ability to manage the debt burden. This finding aligns with research by Fania M. Dewi (2022), which examined food and beverage companies listed on the IDX. Dewi found that DER had a negative and insignificant effect on firm value, indicating that leverage levels are not always positively valued by the market. In this context, investors tend to be more cautious about companies with high debt ratios, as the associated financial risks can threaten long-term performance stability. This fit supports Hypothesis 2 (H2) in its testing, where empirical results indicate that debt-based capital structure is not a dominant factor in determining firm value. Instead, investors appear to pay more attention to other aspects such as ESG performance, profitability, and operational risk when evaluating a firm's value. Thus, although the DER coefficient is positive, the insignificance of the results indicates that its influence is not strong enough to directly increase firm value.

3. H3 – The Effect of Dividend Payout Ratio on Tobin's Q

The Dividend Payout Ratio (DPR) has a positive and significant effect on firm value (coefficient = 1.612; p = 0.0043). This indicates that dividend distribution policy is viewed as a positive signal of a company's financial stability and future prospects. Investors tend to give higher ratings to companies that consistently distribute profits to shareholders. This research is supported by Andriyani and Suparwati (2023), who found that companies that consistently pay dividends tend to have higher firm value because they increase investor confidence. Yuliana et al. (2022) also stated that dividends are a signal of earnings quality, especially in volatile sectors like commodities.

4. H4 – The Effect of DER on ESG Performance

DER has a positive and significant effect on ESG performance (coefficient = 0.734; p = 0.0220). This indicates that companies with a high debt-based capital structure tend to exhibit better ESG performance. This could be a management strategy to maintain the company's reputation amidst increased financial pressure. These results align with Suryanto & Rini (2025), who argued that highly leveraged companies tend to increase ESG disclosure to lower their cost of capital. Kusuma & Darmawan (2021) also demonstrated a positive correlation between DER and ESG disclosure, as companies seek to demonstrate social responsibility to the public, particularly when facing financial risks.

5. H5 – The Influence of DPR on ESG Performance

The DPR has a positive and significant effect on ESG performance (coefficient = 1.198; p = 0.0048). This means that companies that consistently distribute dividends tend to have a strong commitment to environmental, social, and governance aspects. This reflects that financial stability allows companies to implement sustainability practices more effectively. These findings align with research by Rama Ste (2022), which shows that dividend payout ratios (DPR) have a positive influence on firm value in Indian companies. Rama stated that dividend distribution signals management's confidence in long-term financial prospects, thereby increasing positive investor perceptions. Furthermore, these findings are reinforced by research by Dimitris Gavalas (2024), who found that DPR has a positive and significant influence on firm value in the global port sector, demonstrating a consistent relationship between dividends and firm valuation across various industry contexts. This agreement supports Hypothesis 3 (H3), which states that dividend distribution is not only viewed as a financial policy but also as an important indicator in building a company's credibility in the eyes of the market. Therefore, the DPR can serve as a signal of managerial trust and responsibility, ultimately impacting company value.

6. H6 – DER against Tobin's Q is mediated by ESG

ESG significantly mediates the relationship between DER and firm value (coefficient = 0.598; p = 0.0318). This indicates that the effect of DER on firm value will be significant if it is mediated through ESG. Companies with high debt structures can still receive positive market evaluations if they demonstrate good ESG performance, as ESG helps mitigate investor risk perceptions. This finding is supported by Rahmah & Yusran (2024), who found that companies with aggressive capital structures can still achieve high market value if they have strong ESG performance. Lestari & Handayani (2023) also stated that ESG is an effective legitimacy channel for high-risk companies to maintain investor appeal.

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H7 – DPR on Tobin's Q is mediated by ESG

ESG was also shown to significantly mediate the relationship between DPR and firm value (coefficient = 1.087; p = 0.0087). Therefore, the positive influence of DPR on firm value will be stronger if the company also demonstrates good ESG performance. ESG strengthens the positive signal from dividend distribution by demonstrating that the company is not only financially strong but also socially and environmentally responsible. This research aligns with the findings of Dewi and Prasetyo (2025), who stated that the influence of the House of Representatives (DPR) on valuation increases when ESG performance is also high. Firdaus et al. (2023) showed that modern investors place greater value on companies that combine financial (dividend) and sustainability (ESG) commitments in their long-term strategies.

F test

The F test is a statistical test used to determine whether all independent variables together (simultaneously) have a significant effect on the dependent variable in a regression model.

Table 2 Test Results

Test Statistics	Mark	
F-statistic	2.973456	
Prob (F-statistic)	0.0328	

Based on the F-test results, the F-statistic value was 2.973456 with a probability value of 0.0328. Because this probability value is smaller than the 5% significance level (0.05), it can be concluded that the regression model used is simultaneously significant. This means that the independent variables consisting of Carbon Accounting, Debt to Equity Ratio, Dividend Payout Ratio, and ESG Performance together have a significant influence on company value (Tobin's Q). Thus, this regression model is suitable for further hypothesis testing because it is able to explain the relationship between the independent variables and the dependent variable as a whole.

Coefficient of Determination (R2)

The coefficient of determination (R²) is used to measure the extent to which independent variables simultaneously explain variations in the dependent variable. The R² value itself ranges from 0 to 1.

Table 2 Dec	nulta of D2 D	Donal Data 1	Dagragian	Fixed Model
Table 5 Nes	suits of IX2 F	allel Data I	Kegression	LIYER MIRRE

Table 3 Results of R2 Fallet Data Regression Fixed Model							
R-squared	0.432156	Mean dependent var	1.507043				
Adjusted R -squared	0.289764	Elementary School dependent var	0.541234				
SE of regression	0.422135	Akaike information criteria	1.707495				
Sum squared residual	2.433210	Black criterion	2.420449				
Log likelihood	-8.245678	Hannan-Quinn criter.	1.980825				
F- statistic	2.973456	Durbin-Watson stat	2.881566				
Prob(F-statistic)	0.0328						

The fixed effect regression model has an R-squared value of 0.4321, meaning 43.21% of the variation in firm value (Tobin's Q) can be explained by the independent variables in the model. The Adjusted R-squared value of 0.2897 indicates the model's moderate explanatory power. The F-statistic probability value of 0.0328 < 0.05 indicates that the model is simultaneously significant. Meanwhile, the Durbin-Watson value of 2.8815 indicates the possibility of negative autocorrelation. Overall, the model is suitable for use, but attention should be paid to the autocorrelation aspect.

CONCLUSION

This study aims to analyze the influence of Carbon Accounting, Debt to Equity Ratio (DER), and Dividend Payout Ratio (DPR) on company value (Tobin's Q), with Environmental, Social, and Governance (ESG) performance as a mediating variable, in companies in the palm oil plantation subsector. Based on the results of the t-test and theoretical discussion, several main conclusions were obtained:

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- 1. Carbon accounting has been shown to have a positive and significant impact on company value. This finding supports Legitimacy Theory, which considers carbon emissions disclosure a form of corporate social responsibility that enhances legitimacy and ultimately increases market value. This also reflects the market's appreciation for companies with environmental commitments.
- 2. DER has no significant effect on firm value. This indicates that a debt-based capital structure is not always perceived as a positive signal by investors, especially if it is not accompanied by adequate risk management and social responsibility. These results align with previous research and indicate that Signaling Theory does not fully apply to the impact of DER on firm value.
- 3. The DPR has a positive and significant impact on firm value, indicating that dividend policy is a strong signal regarding a company's financial prospects and stability. This finding supports Signaling Theory, which views dividends as a communication tool between management and investors.
- 4. DER has a positive and significant effect on ESG performance, indicating that companies with high debt structures tend to be more active in strengthening legitimacy through ESG disclosure. This supports Legitimacy Theory, which suggests that companies with high financial pressure seek to gain public trust by demonstrating social and environmental performance.
- 5. The DPR also has a positive effect on ESG performance, indicating that companies that consistently distribute dividends are also committed to sustainability. In the context of Signaling Theory, this suggests that financial signals (dividends) combined with non-financial signals (ESG) strengthen a company's credibility.
- 6. ESG has been shown to mediate the relationship between DER and firm value, indicating that DER will only positively impact value if the company also performs well on ESG. This means that ESG plays a significant role in changing market perceptions of leverage risk.
- 7. ESG also mediates the relationship between DPR and company value, confirming that the combination of financial stability and social responsibility will strengthen a company's attractiveness to investors. Modern investors place greater value on companies that demonstrate a balance between profitability and sustainability.

Overall, the results of this study support the integration of Legitimacy Theory and Signaling Theory and demonstrate that ESG performance plays a key role as a bridge between a company's internal characteristics and market perception. The implementation of sustainability and transparency strategies is a determining factor in increasing company value in environmentally sensitive sectors such as palm oil plantations.

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