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# The influence of green accounting, corporate social disclosure, carbon emission disclosure, and green product innovation on firm value

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ABSTRAK

*Penelitian ini bertujuan untuk menganalisis pengaruh Green Accounting, CSR, CED, dan GPI terhadap Firm Value pada perusahaan manufaktur Indonesia yang terdaftar di Bursa Efek Indonesia tahun 2019-2023. Data diperoleh dari laporan keberlanjutan dan keuangan dengan analisis regresi berganda. Sampel yang digunakan dalam penelitian ini berjumlah 100 dipilih dengan menggunakan metode purposive sampling dengan mempertimbangkan beberapa kriteria yang telah ditetapkan sebelumnya. Data dianalisis menggunakan teknik regresi data panel dengan bantuan software E-views 12. Hasil dari penelitian ini menunjukkan bahwa CSR signifikan meningkatkan Firm Value di semua kategoIri perusahaan. CED dan GPI berpengaruh positif hanya pada perusahaan dengan CSR rendah, sementara Green Accounting tidak berpengaruh. Temuan ini menyoroti pentingnya tanggung jawab sosial dan inovasi hijau, khususnya bagi perusahaan dengan reputasi keberlanjutan yang sedang berkembang. Penelitian ini memberikan wawasan praktis untuk perusahaan dan pembuat kebijakan dalam merancang strategi keberlanjutan.*

ABSTRACT

This study seeks to analyze the effect of green accounting, corporate social responsibility (CSR), carbon emission disclosure (CED), and green product innovation (GPI) on the firm value of Indonesian listed manufacturing firms in 2019-2023. Data were obtained from PROPER and sample firms' sustainability and financial statements and analyzed with the panel data multiple regression analysis run by E-views 12 software. Sample firms were selected using purposive sampling, yielding 100 final sample firms. Our findings reveal that CSR positively affects firm value in the overall sample and both subsamples, while CED and GPI exhibit positive effects on firm value only for the low CSR

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subsample, while green accounting has no significant effect in the overall sample and both subsamples. These findings highlight the importance of social and environmental responsibility and green innovation, especially for firms seeking to promote their sustainable reputation. Besides, this study offers practical insights for firms and policymakers in designing sustainability strategies.

## INTRODUCTION

Indonesian manufacturing firms have been rapidly developing in the post-COVID-19 period, thanks to increased digital technology and automation through the Industry 4.0 initiative (Erlangga et al., 2021). In the business world, firm value formation is critical for making investment decisions and facilitating sustainable business growth (Fina et al., 2024). Firm value indicates investments in developing firms (Dewi & Narayana, 2020). Manufacturing firms' operational performance and efficiency affect their market values due to waste or pollution from their production processes, potentially leading to legal sanctions, damaged reputations, and eroded consumer and investor trust.

The government has attempted to evaluate firms' environmental performance, especially in improving the efficient use of power sources and reducing the negative environmental impacts of their activities (Erlangga et al., 2021). Numerous firms have incurred environmental costs to minimize pollution. These efforts will arguably affect firm value because better-performing firms can manage their financial and nonfinancial activities to preserve their sustainability (Erlangga et al., 2021). In this respect, firms can respond to their nonfinancial (environmental) and environmental problems simultaneously by applying the green accounting concept through environmental disclosure (Sakina et al., 2024).

Various cases potentially affect Indonesian manufacturing firms' firm value, including challenges and opportunities related to energy efficiency, automation, and government policies supporting the downstream industries. The government has targeted the manufacturing sector to grow by 5.8%, mainly thanks to the agricultural, chemical, pharmaceutical, textile, and electronics subsectors. Accordingly, several policies, such as the down-streaming and prioritized use of domestic products (P3DN), aim to boost domestic products. Meanwhile, several incentives, like subsidies for electric vehicles, seek to increase the production of environmentally friendly vehicles. Nevertheless, Indonesian manufacturing firms must face challenges like skilled workforces and increasingly automated production environments. Accordingly, the Indonesian Ministry of Industry supports the development of vocational education, equipment restructuring, and domestic product certification to ensure that this sector adapts to various market and technological changes. This mitigation strategy is critical in maintaining industry competitiveness amidst uncertain global conditions and fluctuating operational costs, especially those related to energy and raw materials (Adnin, 2024)

Several previous studies have investigated the association between green accounting and firm value, including (Apriana, 2024; Astuti et al., 2023; Dewi & Narayana, 2020). They demonstrate that green accounting positively affects firm value. However, Rangkuti et al. (2023) reveal that green accounting negatively affects firm value (as operationalized with MBV and growth revenues). Other studies fail to find a statistically significant association between these two variables (Fina et al., 2024; Gunawan & Berliyanda, 2024; Hadiwibowo et al., 2023; Kumala & Priantilianingtiasari, 2024; Rahmadina et al., 2023; Sakina et al., 2024). Firms also respond to critical social and environmental issues through various outlets, including Corporate Social Responsibility (CSR). CSR potentially helps firms boost investor confidence, improve stakeholders' legitimacy, and even increase sales. However, previous studies document mixed results on this matter. Several studies, such as Astuti et al. (2023) and Dewi & Narayana (2020) observe a positive association, while Afifah et al., (2021); Kumala & Priantilianingtiasari (2024); Sakina et al. (2024) demonstrate a negative or insignificant association. In addition to CSR, carbon emission disclosure (CED) – the disclosure of firms' carbon emissions is critical for environmental sustainability and business legitimacy. Several studies by Putri & Agustin (2023) and Rahmadina et al. (2023) find that CED positively affects firm value, while others, such as Gunawan & Berliyanda (2024) and Hadiwibowo et al. (2023), indicate a negative or insignificant effect. Further, firms can also increase their values through green product innovation (creating or improving environmentally friendly products). This strategy arguably improves market performance and attracts investors. Zaneta et al. (2023) document a positive impact of green product innovation on firm value. However, other studies (Putri & Agustin, 2023; Tonay & Murwaningsari, 2022) reveal conflicting results.

This study aims to analyze the influences of green accounting, corporate social responsibility (CSR), carbon emission disclosure, and green product innovation on Indonesian manufacturing firms' value in 2019–2023. Corporate Social Responsibility (CSR) reflects firms' commitment to balancing profits with stakeholders' welfare. However, this study specifically focuses on CSR disclosure. Increasing global attention to environmental issues has pressed firms to implement sustainable practices in their operating activities and products. These sustainability practices not only affect the environment, but also firm value through better reputation, increased customer loyalty, or operational efficiency. Hence, this study is motivated to analyze the extent of the effects of green accounting, CSR, carbon emission disclosure, and green product innovation on firm value. The manufacturing sector contributes significantly to carbon emissions and environmental pollution. Hence, it is important to analyze this issue in this sector. This study also informs policymakers and firms in designing effective sustainability strategies.

## LITERATURE REVIEW

### Legitimacy Theory

Legitimacy theory refers to an explanatory concept of how power or authority in a public is considered valid by an individual or group. According to Sakina et al. (2024), this theory affects societies, especially in allocating financial and other power sources. In other words, firms seek to demonstrate the justifiability and acceptability of their actions and policies, which in turn affect the distribution and use of power sources in a broader context. Legitimacy theory requires organizations or firms to indicate that they operate by complying with values adopted by their surrounding societies (Rahmadina et al., 2023).

In this respect, firms must actively communicate their environmental activities and social impacts to secure public recognition and legitimacy. Further, they must be responsive in mitigating environmental impacts, disclose their carbon emission transparently, and even implement green accounting practices to improve their social legitimacy. Lastly, firms must develop environmentally friendly products that boost public recognition and trust and demonstrate their commitment to sustainability and commitment to prevailing social values.

### Stakeholder Theory

According to Sakina et al. (2024), stakeholder theory argues that firms do not only serve their shareholders' interests. They must respond to the interests of various parties involved or affected by their activities, like employees, customers, societies, and the environment. In other words, firms should not only focus on profits or financial performance, but also consider the interests of other stakeholders. In this respect, the Kyoto Protocol requires firms to disclose their carbon emission. According to Dewi & Narayana (2020), the disclosure of financial, social, and environmental information represents the dialogue between firms and their interests, providing firm-related information that may affect stakeholders' perception and expectations.

Green accounting is closely associated with stakeholder theory because it provides transparent information about firms' environmental impacts, which is crucial for fulfilling accountability towards stakeholders' interests. Firms' carbon emission disclosure indicates how they respond to environmental impacts, especially to broader stakeholders like customers, investors, and the community. Meanwhile, Corporate Social Responsibility (CSR) disclosure enables firms to respond to stakeholders' interests, arguably improving firm performance and value. Firms' efforts to fulfill their stakeholders' interests may also lead to producing environmentally friendly products, eventually boosting their reputation and sustainability.

### Firm Value

Firm value indicates the amount of a firm's market value, thus representing its past, current, and future performance. Firm value reflects the intrinsic or share value

of its assets or shares (Fina et al., 2024). Hence, firm value is not only affected by the amount of assets, but also by the market's perception of the firm's present and potential performance. In this respect, various other factors, such as green accounting, CSR disclosure, carbon emission disclosure, and environmentally friendly products, may affect firm value.

**The Effect of Green Accounting on Firm Value**

Green accounting appreciates the importance of considering the environmental impacts of reporting firms. Incorporating environmental issues in accounting enables firms to disclose their activities affecting the ecosystem more transparently. According to Gustinya (2022), firms are considered to play a crucial role in protecting the environment if they demonstrate their environmental concerns, including implementing sustainable practices, reducing waste, or introducing environmentally friendly initiatives. Firms reporting environment costs will acquire public legitimacy as reliable firms because they exhibit environmental concerns that will attract more investors and increase their value (Gunawan & Berliyanda, 2024).

Firms can initiate green accounting practices to mitigate their negative environmental impacts (Gunawan & Berliyanda, 2024), reflecting how sustainability-related initiatives likely affect firm value. Firms that implement ethical resource management will arguably preserve their public legitimacy. Hence, focusing on operational aspects will enable firms to create sustainable stakeholder values (Yuliani & Prijanto, 2022).

This research is consistent with Astuti et al. (2023), who document that green accounting positively affects the values of coal mining firms, implying that firms that introduce various environmental and social initiatives will boost their public image, especially among investors, and eventually their market values. In a similar vein, Dewi & Narayana (2020) reveal that green accounting positively affects firm value, implying that green accounting implementation plays a crucial role in the quantitative evaluation of the cost and effectiveness of environmental protection, thus facilitating firms to track their environmental activities to boost their values and achieve sustainable development. Further, Apriana (2024) documents that green accounting contributes positively to firm value. Thus, green accounting improves operational efficiency, reduces environmental risks, and enhances public image. Therefore, the following hypothesis is proposed:

**H1**: Green accounting positively affects firm value.

**The Effect of CSR on Firm Value**

CSR refers to firms' efforts to focus on financial profits and their activities' social, environmental, and ethical impacts. This includes various initiatives, such as environmental sustainability, support for local communities, fair work practices, and

business transparency. According to Kumala & Priantilianingtiasari (2024), CSR implementation is critical to avoid financial and environmental losses from firms' activities. Firms implementing CSR achieve better public and environmental images (Sakina et al., 2024). Therefore, CSR is critical in building firms' stakeholder legitimacy and eventually increasing firm value by establishing public trust and support.

Firms emphasizing sustainability do not only focus on profits, but also respond adequately to social and environmental issues by implementing CSR (Sakina et al., 2024). Hence, CSR implementation enables firms to contribute responsibly to the public and the environment, which will create long-term value for all stakeholders and not only shareholders. For instance, firms can protect employee welfare, boosting their productivity, improving their image, building public trust, and strengthening brand image and competitiveness (Afifah et al., 2021).

This argument is consistent with Astuti et al. (2023) who demonstrate that CSR positively affects coal mining firms' value, implying that firms disclosing more on CSR are more socially accountable and gain more public trust. Further, Dewi & Narayana (2020) observe that CSR positively affects firm value, thus suggesting that firms' social commitment plays a critical role in increasing firm value and creating sustainable economic development. Therefore, the following hypothesis is proposed:

**H2**: CSR positively affects firm value.

### The Effect of Carbon Emission Disclosure (CED) on Firm Value

Carbon emission disclosure (CED) refers to a process where firms disclose information related to carbon emissions from their operating activities. According to Rahmadina et al. (2023), unlike their counterparts in developed countries, firms in developing countries have more limited financial resources to disclose more. Consequently, they are less likely to disclose information more comprehensively, including that related to social or carbon emissions. Nevertheless, disclosing this information is critical to signal firms' compliance with environmental regulations and commitment to sustainability and social responsibility. Carbon emission disclosure is a legitimacy tool to promote stakeholders' interests, eventually increasing firm value by signaling firms' commitment to social issues and sustainable practices.

As current environmental problems have been more widely exposed, the public encourages stakeholders to put more pressure on firms to respond adequately to environmental sustainability, so that the disclosure of more extensive and detailed information can reduce penalty risk and increase firm value (Hadiwibowo et al., 2023). Firms that adopt environmentally friendly practices and disclose environment-related practices more transparently can reduce litigation risks due to environmental violations. Further, lower litigation risks enable firms to protect their reputation and attract more

investors and consumers, leading to greater demand and loyalty. Eventually, these factors will lead to higher firm values, indicating a strong association between CSR-related activities and sound financial performance.

This argument is consistent with Rahmadina et al. (2023) who demonstrate a positive association between CED and firm value. Hence, firms with more detailed and extensive CED exhibit higher firm value. In a similar vein, Putri & Agustin (2023) reveal that CED positively affects firm value because firms with more extensive CED improve their public image, attract investors through better financial performance, and comply with existing environmental regulations, leading to higher stock prices and firm value. Therefore, the following hypothesis is proposed:

**H3**: CED positively affects firm value.

## The Effect of Green Product Innovation on Firm Value

Green product innovation is creating products that reduce the negative environmental impacts through environmentally friendly materials, sustainable production, and efficiency-focused power sources. Innovation not only meets consumers' needs but also contributes to environmental preservation, which will deliver value to firms and societies. According to Zaneta et al. (2023), the concept of green product innovation is similar to conventional innovation, which seeks to boost productivity and cost efficiency and create novel market opportunities. In other words, environmentally friendly innovation benefits sustainability and delivers economic profits and competitiveness. Green product innovation contributes to firm value by improving operational efficiency through investment in environmental friendly technology (Putri & Agustin, 2023). Thus, green product innovation strengthens firms' public legitimacy by demonstrating their commitment to sustainability, thus increasing firm value by securing public and investors' trust and support.

Green product innovation refers to developing environmentally friendly products to reduce the negative environmental impacts through the product life cycle. Consistently applying innovation-driven strategies enables firms to obtain investors' positive evaluation, hence allowing them to achieve superior competitiveness (Tonay & Murwaningsari, 2022). Investors' positive evaluation indicates that firms adapt and innovate to respond to market challenges and demonstrate commitment to sustainability. Additionally, such innovation can function as a strategy to support environmental sustainability and competitive profits, hence eventually boosting firm value. These arguments are consistent with Zaneta et al. (2023) who observe that green product innovation positively affects firm value by reducing pollution and hazardous waste, leading to lower production costs. Therefore, the following hypothesis is proposed:

**H4**: Green product innovation positively affects firm value.

## RESEARCH METHODS

The sample was selected by using the purposive sampling technique, which allows the selected sample to represent the population parameter better (Setiawan et al., 2024). Specifically, we selected 100 observations from Indonesian listed manufacturing firms in 2019-2023. The sample selection process involved multiple exclusion criteria, such as the removal of firms not continuously listed (44), firms lacking complete annual reports (26), firms not publishing sustainability reports (37), or firms with incomplete PROPER data (83). Further exclusions included firms failing to disclose CSR (6) in their sustainability reports and those not meeting the GPI requirements (4). The above exclusions left 20 firms as the final sample analyzed over five years, yielding a balanced panel dataset of 100 firm-year observations (20 firms × 5 years). This methodological approach ensured data consistency and reliability for the research analysis.

**Table 1**
**Sample Criteria**

| Description | Total |
|---|---|
| Population: Indonesian listed manufacturing firms | 220 |
| Sample selection based on criteria (purposive sampling): | |
| 1. Firms non consecutively listed on the IDX from 2019 to 2023 | -44 |
| 2. Firms not publishing financial reports for the 2019–2023 period | -26 |
| 3. Firms not publishing Sustainability Reports from 2019–2023 | -37 |
| 4. Firms not reporting PROPER consecutively from 2019–2023 | -83 |
| 5. Firms not disclosing CSR in the Sustainability Report from 2019–2023 | -6 |
| 6. Firms not disclosing CED in the Sustainability Report from 2019–2023 | 0 |
| 7. Firms not meeting the GPI criteria from 2019–2023 | -4 |
| Final Sample | 20 |
| Total Observations (n x research period) (20 x 5 years) | 100 |

Source: E-Views 12 (data processing).

This study used a quantitative method by using the secondary data to propose and test the predictions. According to Sugiyono (2023), a quantitative approach analyzes quantitative data to test the hypotheses and analyze the association between the research variables with statistical analysis. More specifically, we employed the multiple regression analysis to identify the association between the research variables.

### Firm Value

According to Zaneta et al. (2023), firm value refers to the overall market assessment of a firm based on its net assets. Investors use this perception to evaluate firms' ability to manage their resources. This research utilized Tobin's Q to operationalize this variable.

$$\text{Tobin's Q} = \frac{MVS - TL}{TA} \quad \text{..... 1}$$

where:

MVS = Market value of all outstanding shares
TL = Total Liabilities
TA = Total Assets

## Green Accounting

According to Gustinya (2022), green accounting includes the recognition, measurement, recording, preparation, reporting, and disclosure of economic transactions and events representing firms' economic, social, and environmental impacts to the public, environment, and firms. This system enables users to evaluate firms' economic and non-economic performance and make relevant decisions accordingly. This study operationalized green accounting by using the PROPER rating results issued by the Indonesian Ministry of Environment and Forestry, with the score ranging from one (the lowest score or black) to five (the highest score or gold).

## Corporate Social Responsibility

According to Kumala & Priantilianingtiasari (2024), CSR represents firms' responses to social and environmental issues faced by their consumers, employees, and shareholders. Firms are frequently expected to operate while considering the social, economic, and environmental impacts of their activities, including ensuring their employees' welfare, maintaining sustainable environments, delivering positive public contributions, and ensuring that their produces meet consumers' broad needs responsibly. CSR refers to firms' efforts to strike a balance between profits and long-term sustainability. In this respect, our study measured CSR by employing a variable that sums the dummy indicators that equal one if the firm discloses CSR and zero otherwise. The index indicator refers to the 2021 Global Reporting Initiative (GRI) Standards, consisting of 117 indices with the following disclosure formula:

$$CSRI_j = \frac{\sum X_{ij}}{N_{ij}} \quad \text{..... 2}$$

where:

$\sum$Xij = dummy indicators; 1 = disclosed; 0 = no disclosed
Nij = total number of items

## Carbon Emission Disclosure (CED)

CED refers to a firm's disclosure of information related to carbon emissions due to its operational activities. According to the Global Carbon Project and the International Energy Agency (IEA), the global carbon emissions originating from energy activities increased by 1.1% in 2023, adding around 410 million tons of carbon, hence the total carbon emission reached 37.4 billion tons of $CO_2$. The increase was largely driven by coal use, which contributes more than 65% of the total increase. The declining production of hydropower-originated electricity due to drought also caused additional emissions by around 170 million tons, although the development of clean energy like solar power and electric vehicles decelerated emission growth. Carbon emissions result from manufacturing growth that is accompanied by inadequate environmental management. Although industrial growth offers significant financial profits, environmental issues remain critical (Fina et al., 2024). We measured CED with a variable that sums the dummy indicators that equal one if the item was disclosed

and zero otherwise. We referred to the index from the Carbon Disclosure Project (CDP), which consists of 18 indices with the following disclosure formula:

$$CED = \frac{Total\ Assessment}{Total\ Index\ of\ Disclosure} \times 100\% \quad \text{..... 3}$$

where:

Total Assessment = Total of Disclosure, 1 = disclosed; 0 = not disclosed
Total Index of Disclosure = Total 18 Index CDP

## Green Product Innovation

Green Product Innovation (GPI) is creating or developing environmentally friendly products to reduce the negative environmental impacts. According to Zaneta et al. (2023), similar to conventional innovation, GPI seeks to increase productivity, optimize cost efficiency, and create new market opportunities. Thus, GPI emphasizes environmental sustainability and seeks to achieve business efficiency and market competitiveness. This variable was measured using an indicator scale based on the model developed by Xie et al. (2019), which includes three main indicators: environmental compliance disclosure, green technology adoption disclosure, and sustainable product design disclosure. Environmental compliance disclosure includes adherence to environmental regulations and standards, such as ISO 14001 certification, national environmental laws, or industry-specific policies. A score of one is given for each compliance indicator if the firm explicitly mentioned the matter in its sustainability reports or other disclosures, and zero otherwise.

Green technology adoption disclosure measures whether firms disclose their use of eco-friendly production technologies, including renewable energy integration, energy-efficient machinery, or waste-reduction systems. One score is given for each compliance indicator if the firm explicitly mentioned the matter in its sustainability reports or other disclosures, and zero otherwise. Lastly, sustainable product design disclosure indicates transparency in product sustainability-related activities, such as using recycled materials, biodegradable packaging, or circular economy principles. One score is given for each compliance indicator if the firm explicitly mentioned the matter in its sustainability reports or other disclosures, and zero otherwise. The scores of each three indicators were then summed up and divided by the total index.

# ANALYSIS AND DISCUSSIONS

## Descriptive Statistics

**Table 2**
**Descriptive Statistics**

| | Obs. | Mean | Std. Dev | Min | Max | Skew | Kurt |
|---|---|---|---|---|---|---|---|
| PROPER | 100 | 0.618 | 0.064 | 0.600 | 1.000 | 3.743 | 17.446 |
| CSR | 100 | 0.357 | 0.197 | 0.017 | 0.974 | 0.618 | 3.394 |
| CED | 100 | 0.326 | 0.169 | 0.056 | 0.611 | 0.474 | 2.052 |

| | Obs. | Mean | Std. Dev | Min | Max | Skew | Kurt |
|---|---|---|---|---|---|---|---|
| GPI | 100 | 0.777 | 0.246 | 0.333 | 1.000 | -0.609 | 2.065 |
| TOBINSQ | 100 | 0.905 | 0.275 | 0.063 | 1.442 | -0.767 | 4.458 |

Source: E-Views 12 (data processing).

The above Table demonstrates the descriptive statistics for five variables (PROPER, CSR, CED, GPI, and TOBINSQ) for 100 observations. The means of PROPER and TOBINSQ are 0.618 and 0.905, respectively. Meanwhile, the standard deviation values range from 0.064 (PROPER) to 0.275 (TOBINSQ). In terms of kurtosis, PROPER has a very high kurtosis value of 17.446, indicating a very sharp distribution, whereas other variables, such as CED and GPI, have kurtosis values close to 2, reflecting a flatter distribution.

## Panel Data Regression Model Selection

a. Overall

**Table 3**
**Overall Panel Data Regression Model**

| | Prob | Result | Decision |
|---|---|---|---|
| Chow | 0.0000 | Prob < 0.05 | FEM |
| Hausman | 0.1743 | Prob > 0.05 | REM |
| LM | 0.0000 | Prob < 0.05 | REM |

Source: E-Views 12 (data processing).

We employed three main tests to determine the most appropriate model in our panel data analysis: the Chow test, the Hausman test, and the Lagrange Multiplier (LM) test. The Chow test yields a probability value of 0.000 (prob < 0.05), suggesting that H0, predicting that the best model is the Common Effect Model (CEM), is not supported. Therefore, the Fixed Effect Model (FEM) is more appropriate than CEM. Furthermore, the Hausman test yields a probability value of 0.174 (prob > 0.05), implying that H0 is accepted. Hence, the Random Effect Model (REM) is better than FEM. Finally, the LM Test produces a probability value of 0.000 (prob < 0.05), indicating that H0 is not supported. Accordingly, the REM is more appropriate than CEM. Overall, the Random Effect Model (REM) is the best model for this panel data analysis.

b. Low CSR Group

**Table 4**
**Low CSR Group Panel Data Regression Model**

| | Prob | Result | Decision |
|---|---|---|---|
| Chow | 0.002 | Prob < 0.05 | FEM |
| Hausman | 0.296 | Prob > 0.05 | REM |
| LM | 0.296 | Prob > 0.05 | CEM |

Source: E-Views 12 (data processing).

Our Chow test on the low CSR subsample indicates a probability value of 0.002 (prob < 0.05), suggesting that H0, predicting that the Common Effect Model (CEM) is more appropriate, is not supported. Hence, the FEM is more

appropriate than CEM. Furthermore, the Hausman test demonstrates a probability value of 0.296 (prob > 0.05), implying that H0 is supported. Thus, the Random Effect Model (REM) is better than FEM. Finally, the LM Test produces a probability value of 0.296 (Prob > 0.05). So, H0 is accepted. This indicates that the Common Effect Model (CEM) is better than the Random Effect Model (REM). Due to the LM test indicates that the CEM is superior overall, we then selected the CEM for this panel data analysis.

c. High CSR Group

**Table 5**
**High CSR Group Panel Data Regression Model**

| | Prob | Result | Decision |
|---|---|---|---|
| Chow | 0.000 | Prob < 0.05 | FEM |
| Hausman | 0.483 | Prob > 0.05 | REM |
| LM | 0.000 | Prob < 0.05 | REM |

Source: E-Views 12 (data processing).

In the high CSR subsample, the Chow test yields a probability value of 0.000 (prob < 0.05), implying that $H_0$, which predicts that the CEM is more appropriate, is not supported. In other words, FEM is more appropriate than CEM. Furthermore, the Hausman Test produces a probability value of 0.4831 (prob > 0.05), indicating that $H_0$ is accepted. Thus, the Random Effect Model (REM) is better than FEM. Finally, the LM Test shows a probability value of 0.000 (prob < 0.05), implying that $H_0$ is rejected and the Random Effect Model (REM) is better than the Common Effect Model (CEM). Therefore, the Random Effect Model (REM) is the best model for this panel data analysis.

## Classical Assumption Test

a. Overall

No heteroscedasticity test is required in the overall sample because the selected model is REM. Thus, we only ran the multicollinearity test. The table below presents the results of the multicollinearity tests.

**Table 6**
**Multicollinearity Test**

| Variable | | Coefficient Correlation | < 0.9 | Conclusion |
|---|---|---|---|---|
| PROPER | CSR | -0.050 | ✓ | No multicollinearity |
| PROPER | CED | -0.080 | ✓ | No multicollinearity |
| PROPER | GPI | 0.086 | ✓ | No multicollinearity |
| CSR | CED | 0.337 | ✓ | No multicollinearity |
| CSR | GPI | 0.007 | ✓ | No multicollinearity |
| CED | GPI | -0.181 | ✓ | No multicollinearity |

Source: E-Views 12 (data processing).

b. Low CSR Group

We ran the heteroscedasticity and multicollinearity tests in the low CSR subsample because the selected model is CEM. The results of the

multicollinearity test are presented in the table below.

**Table 7**
**Multicollinearity Test**

| Variable | | Coefficient Correlation | < 0.9 | Conclusion |
|---|---|---|---|---|
| PROPER | CSR | -0.037 | ✓ | No multicollinearity |
| PROPER | CED | -0.340 | ✓ | No multicollinearity |
| PROPER | GPI | 0.266 | ✓ | No multicollinearity |
| CSR | CED | -0.241 | ✓ | No multicollinearity |
| CSR | GPI | -0.137 | ✓ | No multicollinearity |
| CED | GPI | -0.052 | ✓ | No multicollinearity |

Source: E-Views 12 (data processing).

The results of the heteroscedasticity test are presented in the following graph:

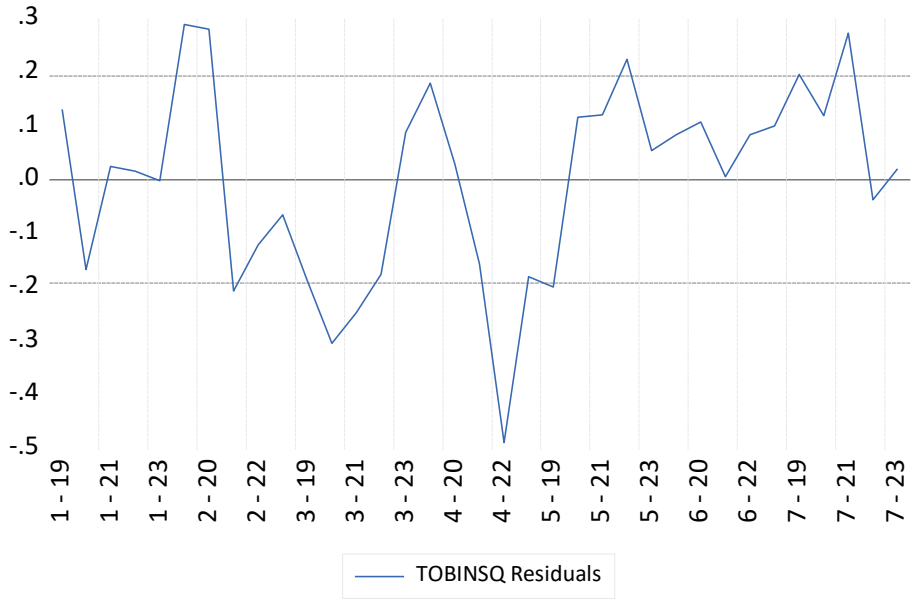


**Figure 1**
**Heteroscedasticity Test Low CSR Group**
Source: E-Views 12 (data processing).

The results of the heteroscedasticity test indicate that the chart does not cross the limits (0.500 and -0.500), implying that the residual variable is constant and the data does not exhibit heteroscedasticity symptoms.

c. High CSR Group

No heteroscedasticity test is required in the high CSR subsample because the selected model is REM. The results of the multicollinearity tests are presented in the table below. Hence, the data is from multicollinearity problems.

**Table 8**
**Multicollinearity Test**

| Variable | | Correlation Coefficient | < 0.9 | Conclusion |
|---|---|---|---|---|
| PROPER | CSR | 0.015 | ✔ | No multicollinearity |
| PROPER | CED | 0.105 | ✔ | No multicollinearity |
| PROPER | GPI | -0.055 | ✔ | No multicollinearity |
| CSR | CED | 0.386 | ✔ | No multicollinearity |
| CSR | GPI | 0.164 | ✔ | No multicollinearity |
| CED | GPI | -0.160 | ✔ | No multicollinearity |

Source: E-Views 12 (data processing).

## Testing Hypothesis

a. T-test (Partial)

The t-test compares means between two or more groups and evaluates the significance. It has several variations based on data types and comparison purposes, such as the independent sample t-test, the paired sample t-test, and the one-tailed t-test (Putri et al., 2023). The results of the t-test on the overall sample, only a variable (CSR) has a probability value below 0.05 (p-value=0.003, t-stat= 3.002>t-table=1.984). hence, CSR significantly affects TOBINSQ (Firm Value). The other three variables, namely PROPER (Green Accounting), CED, and GPI (Green Product Innovation), do not significantly affect TOBINSQ (Firm Value). However, the t-test in the low CSR subsample exhibits different results. The table below presents the results.

**Table 9**
**T-test - Low CSR Subsample**

| Variable | t-Statistic | t-Table | Probability Value | Conclusion |
|---|---|---|---|---|
| CSR | -2.432 | > 2.035 | 0.021 | Significant |
| CED | -3.199 | > 2.035 | 0.003 | Significant |
| GPI | 2.571 | > 2.035 | 0.015 | Significant |
| PROPER | - | - | > 0.05 | Not Significant |

Source: E-Views 12 (data processing).

There are three variables with probability values below 0.05: CSR, CED, and GPI. CSR has a probability value of 0.0212 and a negative t-statistic of 2.432263> t-table of 2.034515, while CED has a probability value of 0.0032 and a negative t-statistic of 3.199334> t-table of 2.034515, and GPI has a probability value of 0.0153 and a t-statistic of 2.570983> t-table of 2.034515. Thus, it can be concluded that CSR, CED, and GPI significantly affect TOBINSQ (firm value). Nevertheless, PROPER (green accounting) does not affect TOBINSQ (firm value).

Meanwhile, the (partial) t-test in the high CSR subsample yields similar results to the test in the overall sample. The table below presents the results.

**Table 10**
**T-test High CSR Group**

| Variable | t-Statistic | t-Table | Probability Value | Conclusion |
|---|---|---|---|---|
| CSR | -2.466 | > 1.998 | 0.017 | Significant |
| CED | - | - | > 0.05 | Not Significant |
| GPI | - | - | > 0.05 | Not Significant |
| PROPER | - | - | > 0.05 | Not Significant |

Source: E-Views 12 (data processing).

Only CSR has a probability value < 0.05 and a negative t-statistic of 2.466 > t-table of 1.998. Hence, CSR significantly affects TOBINSQ (firm value). However, PROPER (green accounting), CED, and GPI (Green Product Innovation) do not affect TOBINSQ (firm value).

b. F-Test (Simultaneous Test)

The F-test evaluates the variance difference between two or more groups. The F-test on the overall sample produces a probability value of 0.001 < 0.05 and an F-statistic of 4.992 > F-table of 2.466. The results imply that the PROPER, CSR, CED, and GPI simultaneously affect firm value (TOBINSQ).

Next, we run the F-test on the low CSR subsample, yielding a probability value of 0.002 > 0.05 and an F-statistic of 5.296 > F-table (2.679). Thus, PROPER, CSR, CED, and GPI simultaneously affect firm value (TOBINSQ).

The F-test on the high CSR subsample also produces similar results. Specifically, the probability value is 0.042 < 0.05, and the F-statistic value is 2.646 > F-table (2.523). Hence, PROPER, CSR, CED, and GPI simultaneously affect firm value (TOBINSQ).

## The Effect of Green Accounting on Firm Value

The results suggest that green accounting does not affect firm value in the overall sample, the low CSR subsample, and the high CSR subsample. Hence, H1 is not empirically supported, implying that implementing green accounting does not affect investors' perceptions or market value. In this respect, investors and other stakeholders likely do not pay more attention to firms' disclosure of environment-related information due to several factors, such as a lack of awareness of the benefits of green accounting or less standardized environmental reports.

Numerous Indonesian manufacturing firms in the textile or food sectors provide sustainability reporting, including green accounting elements. These findings are consistent with Fina et al. (2024); Gunawan & Berliyanda (2024); Kumala & Priantilianingtiasari (2024); Rahmadina et al. (2023); Sakina et al. (2024), who reveal that green accounting does not significantly affect firm value. However, our findings differ from Astuti et al. (2023) and Dewi & Narayana (2020) who document that green accounting positively affects firm value, or Rangkuti et al. (2023), who observe that

green accounting negatively affects firm value.

Our findings can be explained by the legitimacy or stakeholder theory. The legitimacy theory argues that the insignificance of green accounting in explaining firm value indicates that markets or societies do not consider environmental reporting crucial in establishing corporate legitimacy, especially in countries with weaker environmental awareness and regulations (Yuliani & Prijanto, 2022). From the stakeholder theory perspective, the results suggest that investors and key stakeholders have not paid sufficient attention to environmental information disclosed through green accounting, likely due to a lack of consistent reporting standards or low awareness of the importance of environmental issues.

**The Effect of CSR on Firm Value**

Our hypothesis testing results explain that CSR significantly affects firm value, implying that $H_2$ is empirically supported. The analyses on both high and low CSR subsamples also reveal qualitatively similar results. Thus, CSR programs affect firm value, regardless of the level of CSR investments. These findings suggest that CSR is a crucial strategy for (manufacturing) firms to enhance market competitiveness and reputation.

Several large Indonesian manufacturing firms, such as Unilever Indonesia and Astra International, have initiated extensive CSR programs. For instance, Unilever runs a "Waste-Free World" program to reduce plastic waste, strengthening its reputation as an environmentally friendly company. This program boosts Unilever's stock price because it attracts sustainability-aware investors. Likewise, Astra International improves its image among investors and consumers through various CSR programs, such as education and health development, which eventually boost its value. Our results are consistent with Astuti et al. (2023); Dewi & Narayana (2020), who document that CSR positively affects firm value. However, the findings differ from Afifah et al. (2021), who observe the negative impact of CSR on firm value. In addition, by Kumala & Priantilianingtiasari (2024) and Sakina et al. (2024), who fail to demonstrate the significant effect of CSR on firm value.

Our results are consistent with the legitimacy theory and stakeholder theory. Firms use CSR programs to align their activities with social norms with societal values, enabling them to strengthen their positive image and preserve legitimacy. Additionally, the findings are in line with the stakeholder arguing that firms' attention to their stakeholders' interests likely improves their reputation and competitiveness, which ultimately increases their value.

**The Effect of CED on Firm Value**

Our hypothesis testing indicates that CED does not affect the overall sample and the high CSR subsample firm value. Thus, $H_3$ is not empirically supported. However, $H_3$ is supported for the low CSR subsample, implying that CED affects firm

value. A likely explanation of these findings is that firms committing more extensive CSR programs are already reputable among investors, making additional disclosure like CED does not significantly affect market perception. Meanwhile, for low-CSR firms, CED likely increases investor confidence and ultimately affects firm value.

For example, PT Unilever Indonesia Tbk. (as a CSR-intensive firm) has long been recognized for its sustainability programs, like waste management. In this respect, additional disclosure like CED may not significantly affect its value because of its long-standing reputation. On the other hand, PT Indofood CBP Sukses Makmur Tbk., with less extensive CSR disclosure, may attract more investor attention through its CED reporting, providing positive signals that it has begun emphasizing environmental issues in its activities. Our results for the low CSR subsample are consistent with Putri & Agustin (2023) and Rahmadina et al. (2023), who find that CED positively affects firm value. Meanwhile, the findings in the overall sample or the high CSR sample are consistent with Fina et al. (2024); Gunawan & Berliyanda (2024); Rachmawati (2021); Sakina et al. (2024), who demonstrate that CED does not affect firm value.

Based on the legitimacy theory, high-CSR firms already have strong social legitimacy among investors and the public. Therefore, additional disclosure such as CED does not significantly affect firm value because the public has already considered these firms responsible entities. Meanwhile, CED likely increases low-CSR firms' legitimacy by demonstrating their environmental commitment, thereby improving their public image and attracting investor attention. From the stakeholder theory perspective, these results indicate that CED is critical for low-CSR firms to meet stakeholders' sustainability-related expectations.

**Green Product Innovation and Firm Value**

Our hypothesis testing results demonstrate that GPI does not significantly affect firm value for the overall sample and the high CSR subsample. Thus, $H_4$ is not empirically supported. However, the hypothesis is empirically supported for the low-CSR subsample, suggesting that GPI significantly affects firm value. High-CSR firms have already considered GPI a standard expected by the market, leading to its insignificant effect on firm value. However, low-CSR firms can gain significant benefits from GPI. Investors will likely consider GPI a strategic step to repair the firm's image and market competitiveness.

For instance, PT Chandra Asri Petrochemical Tbk., a petrochemical company, exhibits relatively low CSR compared to other large manufacturing firms. Recently, this firm launched innovative, environmentally friendly products in recyclable and reusable packaging. This innovation arguably increases investor confidence and delivers positive impacts on firm value. On the other hand, high-CSR firms such as Danone-AQUA, which have long prioritized environmentally-friendly products, may not exhibit significant increases in their firm value due to their green innovation

because stakeholders have already considered such innovation as their regular business practices. The results for the low-CSR subsample are consistent with Zaneta et al. (2023), who observe a positive impact of GPI on firm value. Meanwhile, the findings for the overall sample and high-CSR subsample are consistent with Tonay & Murwaningsari (2022), who discover that GPI does not affect firm value.

Our results support the legitimacy theory, which argues that firms committing extensive CSR have already had public legitimacy, while GPI enables low-CSR firms to deliver strategic signals for stakeholders, such as investors and consumers, that these firms are currently seeking ways to improve their public image and competitiveness. This argument is also consistent with the stakeholder theory, which emphasizes the importance of meeting influential stakeholders' demands.

## CONCLUSIONS, LIMITATIONS AND SUGGESTIONS

This study analyzes the effects of green accounting, Corporate Social Responsibility (CSR), Carbon Emission Disclosure (CED), and Green Product Innovation (GPI) on the market value of Indonesian manufacturing firms in 2019-2023. The panel data regression analysis indicates that CSR positively affects firm value in the overall sample and high and low CSR subsamples. Meanwhile, green accounting, CED, and GPI do not significantly affect firm value for the overall sample. However, CED and GPI significantly affect firm value for low-CSR firms, suggesting that CED and GPI enable low-CSR firms to boost their value. Hence, this study highlights how CSR programs improve firms' reputations and competitiveness.

This study is subject to several caveats. First, we do not analyze more non-financial indicators in the analysis. Second, our observation period (2019-2023) can limit the generalization of our results, especially in the context of policy changes and market dynamics. Third, we operationalize the green accounting variable with PROPER values, which may not cover the entire environmental or green reporting aspects.

Accordingly, we advise future studies to include other factors affecting the association between sustainability and firm value, such as stricter government regulations or institutional investors. Overall, this study underscores the importance of understanding how environmental policies may affect firms' outcomes, which will inform the existing literature and policies.

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