JCA JOURNAL OF CONTEMPORARY ACCOUNTING

Journal of Contemporary Accounting, Volume 7, Issue 1, 2025, 14-29

Journal of Contemporary Accounting

Volume 7 | Issue 1

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Joshua Arta Iwan Wijaya
Faculty of Business, Widya Mandala Surabaya Catholic University, Surabaya, Indonesia
account.joshua.a.21@ukwms.ac.id

Jesica Handoko
Faculty of Business, Widya Mandala Surabaya Catholic University, Surabaya, Indonesia
jesica@ukwms.ac.id

Joshua Arta Iwan Wijaya and Jesica Handoko. (2025). Green advantage, integrated reporting, carbon disclosure and state ownership on firm value. *Journal of Contemporary Accounting*, 7(1), 14-29. DOI: 10.20885/jca.vol7.iss1.art2

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Joshua Arta Iwan Wijaya*, Jesica Handoko

Faculty of Business, Widya Mandala Surabaya Catholic University, Surabaya, Indonesia

Article History:
Received : 2025-04-06
Revised : 2025-06-03
Accepted : 2025-06-05
Published : 2025-07-17

JEL Classification:
G32, M41, Q56

Keywords:
Green Competitive Advantage, Integrated Reporting, Carbon Disclosure, Firm Value, State Ownership

***Corresponding Author:**
jesica@ukwms.ac.id

DOI:
10.20885/jca.vol7.iss1.art2

Abstract

This study aims to examine the effect of green competitive advantage, integrated reporting, and carbon disclosure on firm value, with state ownership as a moderating variable. The object of this research is all manufacturing companies listed on the Indonesia Stock Exchange, spanning the period from 2021 to 2023. The population of manufacturing companies listed on the Indonesia Stock Exchange and the samples processed consisted of 438 companies, excluding outlier data from 18 companies. The analysis technique employs legitimacy and agency theory, examining the independent variable and the dependent variable in the presence of moderating variables and control variables, including firm size, leverage, and profitability. The results of this study indicate that a green competitive advantage has a positive but insignificant effect on firm value. In contrast, integrated reporting has a negative but insignificant effect on firm value. In contrast, carbon disclosure has a negative and significant effect on firm value. This study also examines moderation by creating interaction variables and assessing their impact on firm value as the dependent variable. There are three interaction variables: green competitive advantage with state ownership, integrated reporting with state ownership, and carbon disclosure with state ownership. The results of testing the effect of the interaction variables were found to be negatively insignificant, positively insignificant, and negatively significant. The discarded outlier data and measures used may have affected the results of this study.

Introduction

Climate change has been increasingly evident in recent years, as evidenced by the rise in temperature to 1.5 °C, the occurrence of extreme weather events that led to flooding in Dubai in 2024, and the increasing frequency of various natural disasters (Vanderhorst, Pathirage, and Proverbs, 2024). If left unchecked, these environmental phenomena will also impact economic and social sustainability, which in turn has the potential to threaten a company's sustainability (Anindita, 2020). This is because the technology used by the industry often emits a large amount of carbon. For example, the use of technology that uses fossil fuels in the manufacturing industry can contribute to an increase in carbon emissions (Adrian, 2024).

By 2023, Indonesia is expected to be the world's second-largest emitter of greenhouse gases related to land clearing, accounting for 19.9% of global emissions, or approximately 930 million tons (Friedlingstein et al., 2023). With the various phenomena that occur, companies in various industries need to rethink their operational systems and review thoroughly or gradually to determine the company's impact on the environment and what preventive or corrective actions can be taken. This environmental concern is expected to positively impact firm value. Firm value can convince investors to invest their capital or creditors to lend to a company, and with this value, every stakeholder can assess the company's valuation through the market (Suryo & Maulana, 2024). Therefore, market or firm value may be influenced by the sustainability of the three factors.

The first factor is the green competitive advantage (GCA). This factor was chosen because it aligns with the concept of a sustainable business strategy, which is a strategy that companies should adopt to achieve their business goals and increase their firm value by incorporating the three aspects (triple bottom line) into their business strategy. This strategy prioritizes the company's prospects and its potential to become a global entity (Anindita, 2020). To continue growing and achieving a high level of sustainability, a company must utilize its tangible and intangible resources in a manner that aligns with the concept of environmental sustainability. Intangible resources are as important as tangible resources, and both must be utilized effectively and efficiently (Widhiastuti, Murwaningsari, and Mayangsari, 2018). According to Wijayanto, Suhadak, Dzulkirom, and Nuzula (2019), through proper strategy and resource utilization, GCA can positively influence performance, thereby increasing firm value. However, according to Suyati and Murwaningsari (2023), GCA has no significant effect on firm value due to a lack of relevance in the data.

In its development, stakeholders want to obtain financial information and more comprehensive information about what the company has done, including related to the environment. With a comprehensive and accurate report, stakeholders will be interested and can set goals or next steps to achieve company sustainability from the present to future generations (Suyati & Murwaningsari, 2023). Comprehensive reporting in the current era is integrated reporting, which is the second factor affecting firm values. Integrated reporting consists of financial and sustainability reports. Integrated reporting encompasses both financial and non-financial aspects, including environmental and social considerations, within company reports (Lako, 2018). According to Suyati and Murwaningsari (2023), integrated reporting has a negative impact on firm value due to the disclosure of excessive information that is too voluminous, which can cause uncertainty in investment decisions. Meanwhile, according to Suryo and Maulana (2024), integrated reporting has a significant impact on firm value because it provides clearer signals to company stakeholders and can strengthen investment decisions.

After discussing the first and second factors that can affect firm value, a third factor emerges: carbon disclosure. Carbon disclosure is a component of sustainability reporting that provides data on a company's carbon emissions over a specified period, typically a year (Trimuliani & Febrianto, 2023). With complete and comprehensive carbon disclosure, firm value can increase due to the interest of investors or other stakeholders in becoming aware of environmental risks that can arise from excessive carbon use. Carbon disclosure can also prove the superiority of corporate governance compared to those who do not disclose carbon or present it less precisely (Trimuliani & Febrianto, 2023). According to Trimuliani and Febrianto (2023), carbon disclosure has a positive impact on firm value due to increased validation from the capital market; therefore, investors are more likely to be interested in decarbonization efforts, such as carbon disclosure. Meanwhile, according to Suryanata and Sujana (2023), carbon disclosure does not affect firm value under pandemic conditions; therefore, investors do not consider carbon disclosure a significant factor.

Trimuliani and Febrianto (2023) found that state ownership strengthens the effect of carbon disclosure on firm value. This is because the implementation of government policies or rules to reduce the country's carbon emissions will put pressure on and influence various existing companies, including both State-Owned Enterprises (SOEs) and non-SOEs. Pressure is also expected to increase the willingness of companies to immediately implement carbon disclosure and/or integrated reporting, thereby enhancing the valuation or value of the company. This is because, in addition to seeking economic profits, SOEs have greater social responsibility and are obligated to assist the government in implementing carbon emission reduction programs (Trimuliani & Febrianto, 2023).

Given the inconsistency of previous research findings, this study examines the impact of integrated reporting, carbon disclosure, and green competitive advantage on firm value, with state ownership serving as a moderating factor. This study uses legitimacy and agency theories, where the relationship between the two can influence the variables studied. This study also controls for

variables such as firm size, leverage, and profitability. The object of this research is companies in the manufacturing sector that are listed on the Indonesia Stock Exchange (IDX) between 2021 and 2023. The manufacturing industry was chosen as the object of research because it generates the most significant amount of carbon emissions compared to other fuel use processes, as fuel use still relies heavily on fossil fuels, and the industry's carbon emissions continue to increase from year to year (Ministry of Energy and Mineral Resources, 2020).

Literature Review

Literature Review with Theoretical Basis

Legitimacy theory posits a relationship between public trust and company performance, mediated by government regulations (Mujiani, Juardi, and Fauziah, 2019). Legitimacy refers to the confidence that society affords a company as a result of the company fulfilling its social responsibilities to society (Pratama, 2021). Legitimacy theory also encourages companies to gain legitimacy from society, ensuring that their operations align with the norms in their environment (Deegan & Unerman, 2006; Mujiani et al., 2019). Agency theory explains the relationship between company owners (principals) and management (agents) (Jensen & Meckling, 1976). This theory posits a connection between management, company owners, creditors, and the government. This connection is considered a monitoring activity in which one party observes the performance of another. This supervision is based on the party that has the responsibility to provide and the other party that has the responsibility to perform. This relationship refers to the contracts owned and related to management, owners, creditors, and the government (Jensen & Meckling, 1976). The relationship between management and stakeholders can be maintained if management provides various types of voluntary information in addition to that required by regulations (Handoko et al., 2025).

According to Chen (2022), green competitive advantage is a condition in which a company has several strategic positions related to green innovation. This condition will enable the company to continue implementing various green innovations, leveraging its diverse resources. The green innovation in question is a strategy or program that can only be carried out by the company. The International Integrated Reporting Council (IIRC) states that integrated reporting is intended to contain information about management decisions, strategies, management structures, the impact of decisions and projections, or the potential of the company in the future, showing the social, commercial, and environmental aspects of the company (Adams, 2015). Integrated reporting aims to assess a company's present and future. Integrated reporting encompasses both financial and non-financial aspects, resulting from the integration of financial and sustainability reporting.

Carbon disclosure consists of voluntary and mandatory disclosures (Arifah & Haryono, 2021). Voluntary disclosure occurs when companies consciously want to help preserve the environment by paying attention to their operating performance and its actual, potential, positive, and negative impacts on the environment. Mandatory disclosure refers to companies disclosing information according to standards and criteria recognized globally, which aim to report on the company's sustainability program and its social responsibility. According to GRI 305: Emissions 2016, carbon emissions disclosure also consists of three scopes: (1) Scope 1: direct greenhouse gas emissions from sources owned or controlled by the organization; (2) Scope 2: indirect greenhouse gas emissions arising from purchased or obtained electricity, heating, cooling, and steam power consumed by the organization; and (3) Scope 3: other indirect greenhouse gas emissions not covered by Scope 2 greenhouse gas emissions that occur outside the organization, including upstream and downstream emissions (Global Reporting Initiative, 2016).

The concept of firm value suggests that there is a relationship of responsibility between the company's success and its shareholders or stakeholders. Firm value reflects the company's success in executing its strategy to enhance its market valuation, as assessed by its shareholders. The share

price is a fundamental data point that affects shareholders; the higher it is, the more positive its impact on shareholders. The share price reflects the company's performance, efforts, and strategies in achieving profits and building trust within the community. Good trust is obtained through full and fair reporting (Wijaya, Tania and Cahyadi, 2021). This study examines a single factor that is believed to either strengthen or weaken the impact of integrated reporting and carbon disclosure on value. State ownership is a moderating factor. The state can own a share of a company located in the country's territory. The importance of company directors appointed by the government is to ensure that the policies issued by the company align with the goals and interests of the state or government. (Dinda & Darmawati, 2023).

Firm size assesses the feasibility of obtaining financing or capital for corporate purposes. The firm size variable assesses a company's size based on its ability to manage all assets owned by the company (Suryo & Maulana, 2024). Firm size is measured using the natural logarithm of the total assets (Carolin & Susilawati, 2024). Leverage, as the second control variable, refers to a condition in which a company has either obtained or secured a source of financing. Leverage can also be defined as the proportion of all debt or company liabilities, such as pension, long-term, and short-term debt (Suryo & Maulana, 2024). This concept is measured using the debt-to-equity ratio (Carolin & Susilawati, 2024). Profit has two conditions, namely profit and loss. Profit occurs when a company has succeeded in recovering the resources it has processed at a rate of return that exceeds the amount of resources spent. In contrast, a loss is a position where the company experiences the opposite (Tana & Nugraheni, 2021). This concept is measured using the return on assets (ROA) to determine a company's level of profitability accurately.

Hypothesis Development

A green competitive advantage is a condition in which a company has an advantage in competing to implement green programs or strategies that contribute to the sustainability of the company or its goals (Chen et al., 2006). A green competitive advantage can help a company establish a positive image in the community if socialization is carried out effectively. With a good image, the company can continue because it can be recognized more "well" by the community (Suyati & Murwaningsari, 2023). In some previous studies, green competitive advantage was considered to have a positive but insignificant effect. This is because there are many data outliers after testing, and thus, the data cannot be used.

Additionally, there are indications that the eight GCA indicators do not have a direct impact on stock prices. Some companies in Indonesia are still not concerned or focused on creating green production innovations, green creativity, and a green brand image in society, which should enable them to increase their competitive advantage over competitors in sustainable conditions and interaction with nature or the environment (Suyati & Murwaningsari, 2023). With a green competitive advantage, companies can obtain their assessment from the public, making it a trend and increasing firm value (Rachmawati, 2023). The following hypothesis is proposed:
H_1: Green competitive advantage positively affects firm value.

Integrated reporting combines financial and sustainability reporting into an integrated whole (Suryo & Maulana, 2024). Financial reporting performance is linked to sustainability reporting performance and vice versa. In some previous studies, integrated reporting was considered to have a positive influence. The finding of a positive relationship is supported by the study's statement, which states that companies adopting integrated reporting can experience an increase in market valuation (Lee & Yeo, 2016). Higher complexity and the need for external funding (investment) can support a positive relationship between integrated reporting and firm value. This can occur due to reduced information asymmetry between management and investors (Lee & Yeo, 2016). Another study found that higher-quality integrated reporting is associated with higher firm valuation, better stock liquidity, and higher expected future cash flows (Barth et al., 2017). The urgency for integrated reporting stems from environmental, social, and economic issues

that have become a global problem, not just in Indonesia. The public will trust integrated reporting more than reporting that contains only one or two sides but is not integrated (Suryo & Maulana, 2024). The following hypothesis is proposed:

H_2: Integrated reporting has a positive effect on firm value.

Carbon disclosure refers to all information related to greenhouse gas and carbon emissions. Companies are one aspect whose actions can release emissions (Trimuliani & Febrianto, 2023). The waste emissions released by the company are not small. This is particularly true for manufacturing companies with a production system, as machines are required to emit carbon emissions or waste. Therefore, the urgency of carbon disclosure is critical because the world is experiencing global warming, which has an impact on rising temperatures, melting polar ice, resulting in rising water levels, and damaging many ecosystems, leading to the extinction of numerous flora and fauna. Carbon disclosure is an act of concern undertaken by companies to protect the environment (Arifah & Haryono, 2021). Previous research has found that the disclosure of carbon emissions has a positive impact on firm value, especially for companies with good environmental performance (Saka & Oshika, 2014). With carbon disclosure, the public and other stakeholders will have more trust in a company. With the increasing trust that is improving year by year, the company's value will also increase. Therefore, carbon disclosure is a research variable that affects firm value. The following hypothesis is proposed:

H_3: Carbon disclosure has a positive effect on firm value.

When a company has innovated green production, creativity, and brand image, it can be said to have a green competitive advantage (Zameer et al., 2022). By having a green advantage, the company will appear more attractive and can establish a positive image in the community. The government also has the responsibility of protecting and managing relations between communities. Therefore, with the existence of GCA, the government can indirectly achieve its goals while strengthening the value of companies with green advantages that are owned by the state. The following hypothesis is proposed:

H_{4a}: Green competitive advantage has a positive effect on firm value, with state ownership as a moderating variable.

In general, integrated reporting can strengthen a company's position in society by making it aware of its responsibilities as a public company to report its financial and non-financial data in a transparent and accountable manner with clear boundaries (Suyati & Murwaningsari, 2023). These limits are helpful for monitoring and ensuring that the matters disclosed in integrated reporting are indeed the actual, potential, negative, and positive impacts of their business. Integrated reporting aims to foster the long-term sustainability of the company, highlighting its role in society and the state. Therefore, the value of a company can also be strengthened by the public's trust in companies whose shares are partly owned by the state through integrated reporting. The following hypothesis is proposed:

H_{4b}: Integrated reporting has a positive effect on firm value, with state ownership as a moderating variable.

The existence of carbon disclosure makes the community, as well as stakeholders or shareholders, safer and more comfortable in the face of uncertain climate change that is happening in the world. This security and comfort come from the transparent disclosure of the carbon origin and the company's efforts to mitigate the carbon footprint it produces. Clear carbon disclosure stems from the completeness of reporting and disclosure across the three scopes described above, namely direct, indirect, and other indirect emissions (Global Reporting Initiative, 2016). In general, this will further strengthen the company's role in society, making it more aware of its economic, social, and environmental responsibilities. Therefore, a company's value can also be strengthened by the community's trust in companies whose shares are partially owned by the state through carbon disclosure. The following hypothesis is proposed:

H_{4c}: Carbon disclosure has a positive effect on firm value, with state ownership as a moderating variable.

The research model is:

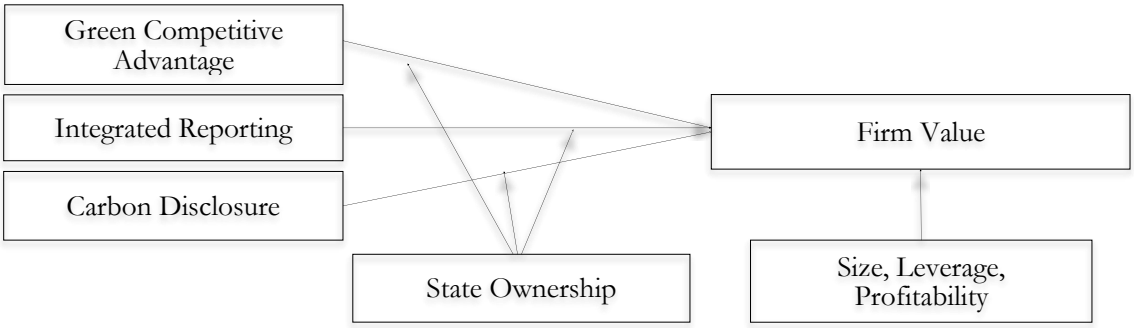

Figure 1. Research Model

Research Method

Research Design, Analysis, Type and Source of Data

This research design employs a causal research design that aims to test hypotheses and analyze the effect of Green Competitive Advantage, integrated reporting, and carbon disclosure on firm value, with state ownership serving as the moderating variable. This study utilizes secondary data and employs a quantitative approach. This quantitative data is obtained from the company's annual report, which contains financial statements and sustainability reports that are then integrated into the integrated reporting of all manufacturing companies listed on the IDX. This information can be accessed through the official website of each company concerned and the IDX website, located at www.idx.co.id. In this study, SPSS 25 was used as a tool to evaluate variables and perform linear regression analysis, as it involves more than one independent variable. Some of the testing techniques performed include descriptive statistics, classical assumption tests, multiple linear regression tests, hypothesis testing, and moderation analysis (Ghozali, 2018, p. 8).

Table 1. Sample Selection Criteria

Information	Amount
Manufacturing companies listed on the IDX	213
Does not meet the criteria:	
a. The company has financial reports listed on the IDX 2021-2023	(12)
b. Manufacturing companies have an annual report and a sustainability report	(21)
c. The company presents the rupiah currency	(34)
Companies that meet the criteria:	146
Observation period	3
Total sample	438
Outlier data	(18)
Amount of data used	420

In this study, the research object is several manufacturing sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021-2023 period. The total population of data that was successfully found based on the manufacturing sector listed on the IDX was 213. The sample, selected from the entire population of companies that met the criteria, consisted of 146 companies. The period covered in this study was three years, resulting in a total sample of 438 pieces. With the presence of outlier data during data processing, which must be removed, the final result of the total sample is reduced to 420 pieces. The sample selection criteria in this study can be seen in Table 1.

Identification, Operational Definition, and Measurement of Variables

A green competitive advantage is a level at which companies actively compete for green excellence by utilizing the resources they own. GCA is measured using eight indicators (Muisyo et al., 2022) and is calculated by:

$$GCA = \frac{Total\ of\ items\ disclosed\ in\ each\ indicator}{Total\ of\ items\ in\ each\ indicator}$$

Integrated reporting is a process of delivering comprehensive information on a company's financial and non-financial performance in the context of long-term value creation. Integrated reporting is measured using the dummy method (Lee & Yeo, 2016).

a. Valuation 0 is used in manufacturing companies that do not or have not used integrated reporting in their annual reports.
b. Valuation 1 is used in manufacturing companies that already utilize integrated reporting in their annual reports.

Carbon Disclosure is a company's obligation to disclose information on its Greenhouse Gas (GHG) emissions to stakeholders. Carbon Disclosure can be measured using the dummy method (Arifah & Haryono, 2021) by disclosing one of the components of GRI 305: Emissions 2016, namely:

a. Valuation 0 is used for manufacturing companies that do not or have not disclosed one of the GRI 305 components, Emissions 2016, in the company's annual report.
b. Valuation 1 is used for manufacturing companies that have disclosed one of the components of GRI 305: Emissions 2016 in the company's annual report.

The dependent variable in this study is firm value measured using Tobin's Q formula (Chung & Pruitt, 1994).

$$Tobin's\ Q = \frac{MVE\ +\ Total\ Liability}{Total\ Asset}$$

The moderating variable in this study is state ownership, which will be measured by the number of shares owned by the state or government to the number of shares outstanding in a company (Trimuliani & Febrianto, 2023). This data is obtained from the company's annual report.

$$\frac{Number\ of\ shares\ owned\ by\ government}{number\ of\ shares\ outstanding}$$

Firm size, also referred to as firm size, is the ability of a company to possess a large number of assets. Firm size can be measured using the logarithm of total assets:

$$Firm\ Size = log.Natural\ of\ total\ assets$$

The level of debt, commonly referred to as leverage, represents a company's ability to meet its obligations or debts using its resources. Leverage can be measured using the ratio of liabilities to equity:

$$DER = \frac{Total\ Liability}{Total\ Equity}$$

Profitability, or profit, is a company's ability to earn a profit or margin in a given accounting period. The measurement of this variable uses ROA:

$$ROA = \frac{Net\ Profit\ After\ Tax}{Total\ Asset}$$

Results and Discussion

Table 2 presents the descriptive statistical results, and Table 2 presents the frequency results. There are three independent variables, namely green competitive advantage (GCA), integrated reporting (PT), and carbon disclosure (PK); then there is one dependent variable, namely firm value (NP); then there is one moderation variable of state ownership (KN); and there are three control variables, namely firm size (U), leverage (L), and profitability (P).

Table 2. Descriptive Statistics Results

Variables	N	Minimum	Maximum	Mean	Std. Deviation
NP	420	0.1145	4.9761	1.3350	0.8565
GCA	420	0.0000	1.0000	0.4518	0.2275
KN	420	0.0000	0.9447	0.0415	0.1666
U	420	24.7943	32.8599	28.2341	1.6654
L	420	-30.1534	7.9989	0.7634	2.4386
P	420	-0.2534	0.6138	0.0454	0.0818
GCA*KN	420	0.0000	0.7300	0.0283	0.1203
PT*KN	420	0.0000	0.5700	0.0059	0.0526
PK*KN	420	0.0000	0.9400	0.0342	0.1507

Table 3. Dummy Frequency Results

Variables	Criteria	Frequency	Percentage
Integrated Reporting	0	186	44.3%
	1	234	55.7%
Total		420	100%
Carbon Disclosure	0	140	33.3%
	1	280	66.7%
Total		420	100%

Based on the processed data shown in Table 2, the lowest GCA value, namely 0 (zero), is owned by PT Sepatu Bata Tbk (BATA) in 2022, PT PT Ekadharma International Tbk (EKAD) in 2022 and 2023, Sinergi Inti Plastindo Tbk (ESIP) in 2021, PT Ladangbaja Murni Tbk (LABA) in 2022, PT Sunsone Textile Manufacture Tbk (SSTM) in 2022 and 2023, and PT Yanaprima Hastapersada Tbk (YPAS) in 2021. The assessment of 0 indicates that these companies did not participate or were not adequately prepared for the Green Excellence competition. Meanwhile, the highest GCA score of 1 (one) was achieved by PT Astra Otoparts Tbk (AUTO) in 2023, PT Diamond Food Indonesia Tbk (DMND) in 2021 and 2022, and PT Ultrajaya Milk Industry and Trading Company Tbk (ULTJ) in 2023. A score of 1 indicates that the company has fulfilled its objectives and has a green competitive advantage in the manufacturing sector, exceeding all samples studied by the company.

Based on the data tabulation and frequency results in Table 3 regarding integrated reporting, there are 234 samples, namely with a frequency of 44.3%, which obtained a value of 1 because they have successfully reported both financial and non-financial aspects in a single integrated report. Meanwhile, there are 186 samples, namely with a frequency of 55.7%, which obtained a value of 0 because they have not fully reported the integration between financial and non-financial aspects. Based on the data tabulation and frequency results in Table 3 regarding carbon disclosure, after removing the outlier data that has been carried out, there are 280 samples or equivalent to 66.7% of the total samples, that obtained a value of 1 because they have successfully disclosed carbon/greenhouse gas emissions and their intensity. Meanwhile, there are 140 samples, equivalent to 33.3% of the total samples, that obtained a value of 0 because they have not disclosed greenhouse gas or carbon emissions.

The measurement of firm value is calculated by dividing total assets by total liabilities, then adding the number of outstanding and paid-up shares, which are multiplied by the market share price. Based on Table 2, the minimum firm value is 0.1145, owned by PT Star Petrochem Tbk (STAR) as of 2023, which indicates the company's financial strength and capability. The maximum value of the firm value was 4.9761, owned by PT Cisarua Mountain Dairy Tbk (CMRY) in 2021, indicating the company's financial strength and capability. Based on Table 2, the minimum value of the state ownership moderation variable is 0.000, while the maximum value is 0.9447, as observed in PT Kimia Farma Tbk (KAEF) for the period of 2021-2022. This amount indicates the extent of state ownership in the company.

Firm size is measured by calculating the natural log of the company's total assets. The minimum value of firm size is 24.7943, owned by PT Ladangbaja Murni Tbk (LABA) as of 2023, which indicates the company's significant size in terms of total assets. The maximum value is 32.8599, held by PT Indofood Sukses Makmur Tbk (INDF) in 2023, which demonstrates the company's significant total assets. Based on Table 2, the minimum value of the leverage variable is -30.1534, which was recorded by PT Asia Pacific Investama Tbk (MYTX) in 2021, indicating the company's unpreparedness in managing its debt relative to its equity. The maximum value of this variable was 7.9989, held by PT Ricky Putra Globalindo Tbk (RICY) in 2023, indicating the company's ability to manage its equity relative to its debt. Based on Table 2, the minimum value of profitability is -0.2534, owned by PT POLU Tbk (POLU) in 2021. The maximum value is 0.3431, held by PT Central Proteina Prima Tbk (CPRO) as of 2021. Based on Table 2, the minimum value of GCA*KN is 0.00, which is almost owned by the entire sample. The maximum value of this variable was 0.73, held by PT Solusi Bangun Indonesia Tbk (SMCB) from 2021 to 2023. Based on Table 2, the minimum value of PT*KN is 0.00, which is almost owned by the entire sample. The maximum value of this variable was 0.57, held by PT Phapros Tbk (PEHA) from 2021 to 2023. Based on Table 2, the minimum value of PK*KN is 0.00, which is almost owned by the entire sample. The maximum value of this variable is 0.94, owned by PT Kimia Farma Tbk Tbk (KAEF) in 2021-2022.

Classical Assumption Test

This study also employs a classical assumption test, which consists of several tests: the normality test, heteroscedasticity test, multicollinearity test, and autocorrelation test. Based on the results of the classical assumption test, the dependent variable in this study, namely firm value (NP), is transformed into a data set so that the variable meets the normality test. Data transformation is carried out in logarithmic form (log10).

Table 4. Normality Test Results

Information	Monte Carlo Sig. (2-tailed)	Results
Unstandardized Residual	0.269	Data is normally distributed

According to the Kolmogorov-Smirnov test, the data will be considered normally distributed and meet the requirements for the normality test if the significance value is 0.05 or greater. Based on Table 4, it can be seen that the significance value is 0.269. This value indicates that the data meet the requirements for the normality test, specifically being normally distributed. The requirement to pass this test and not have heteroscedasticity is that the significance value must be greater than 0.05.

Table 5. Heteroscedasticity Test Results

Information	F	Significance
Regression	5.409	0.000

Based on Table 5 above, it can be seen that the significance value is 0.000. This value indicates that the data have not met the requirements for this test, and heteroscedasticity has occurred. This indicates that it will be challenging to estimate or obtain the actual standard deviation, as it can be too wide or too narrow (Sukoco, 2015).

Table 6. Multicollinearity Test Results

Independent Variables	Tolerance	VIF	Information
GCA	0.598	1.672	There is no multicollinearity
PT	0.827	1.209	There is no multicollinearity
PK	0.802	1.246	There is no multicollinearity
KN	0.061	16.480	There is multicollinearity
U	0.673	1.487	There is no multicollinearity
L	0.942	1.062	There is no multicollinearity
P	0.888	1.126	There is no multicollinearity
GCA*KN	0.046	21.862	There is multicollinearity
PT*KN	0.761	1.313	There is no multicollinearity
PK*KN	0.133	7.491	There is no multicollinearity

Based on Table 6, it can be seen that all independent variables have a tolerance value of more than 0.1 and a VIF value of less than 10. Therefore, the values in the table above show that the majority of all independent variables pass the multicollinearity test. Two variables do not pass, namely the moderation variable KN and the interaction variable GCA*KN.

Tabel 7. Autocorrelation Test Results

k	DU	DW	4-DU
7	1.872	1.725	2.128

Based on the results in Table 7, a DU value of 1,872, a (4-DU) value of 2.128, and a DW value of 1.725 are shown. These values indicate that the DW value has not met the requirements of this test, which lies between the DU and (4-DU) values, resulting in autocorrelation. This autocorrelation test is not viewed in depth because the outlier data that has been removed is not time series data.

Regression Results

This study evaluates the influence of green competitive advantage, integrated reporting, and carbon disclosure on firm value, moderated by state ownership and controlled by firm size, leverage, and profitability. The regression results are presented in Table 8.

Table 8. Regression Test

Variable	Coefficient	Std. Error	t-statistic	Prob.
C (Constant)	0.042	0.243	0.174	0.862
Green Comp. Advantage (GCA)	0.071	0.070	1.021	0.308
Integrated Reporting (PT)	-0.023	0.027	-0.834	0.405
Carbon Disclosure (PK)	-0.058	0.029	-2.004	0.046**
State Ownership (KN)	0.429	0.299	1.433	0.153
Firm Size (U)	0.000	0.009	-0.031	0.975
Leverage (L)	-0.002	0.005	-0.357	0.721
Profitability (P)	0.755	0.159	4.741	0.000***
GCA*KN	-0.526	0.477	-1.102	0.271
PT*KN	0.115	0.268	0.429	0.668
PK*KN	-0.077	0.223	-0.346	0.730

Variable	Coefficient	Std. Error	t-statistic	Prob.
Statistic		**Value**		
R Square		0.076		
Adjusted R Square		0.063		
F-statistic		3.344		
Prob (F-statistic)		0.000		

Notes: Significance levels: ***p < 0.01, **p < 0.05, *$p < 0.1$

Based on Table 8, the regression model equation can be stated as follows:

NP = 0,042 + 0,071GCA – 0,023PT – 0,058PK – 0,526GCA*KN + 0,021PT*KN – 0,077PK*KN + 0,000U – 0,002L + 0,755P + ε

The F-statistic value of 3.344 and its corresponding significance value (p = 0.000) indicate that the regression model is statistically feasible and can be used to explain the variation in firm value. However, the Adjusted R Square value of 0.063 suggests that the model explains only 6.3% of the variance in the dependent variable, indicating that other unobserved factors may have stronger explanatory power.

From the t-test results, profitability (P) shows a strong and significant positive effect on firm value (p = 0.000), suggesting that firms with higher profitability tend to have higher valuation. Carbon disclosure (PK) exhibits a significant negative effect on firm value (p = 0.046), implying that increased carbon disclosure may be perceived as a cost burden or risk factor by the market.

Other variables such as green competitive advantage (GCA), integrated reporting (PT), state ownership (KN), and interaction terms do not exhibit statistically significant effects at the 5% level. This result suggests that while these elements are theoretically important, their measurable influence on firm value is limited in this dataset.

These findings reinforce the role of financial performance in firm valuation, while also highlighting the complex and sometimes counterintuitive effects of environmental and governance disclosures in emerging markets like Indonesia.

Discussion

The Influence of Green Competitive Advantage on Manufacturing Firm Value

The results of the first test (H1) indicate that the green competitive advantage has a positive value but does not have a significant impact on the company's value. This indicates that the value of the green competitive advantage indicator owned by the company does not have a significant impact on the company's overall value. The results of the previous hypothesis test using SPSS did not meet the level of significance, which should be below 0.05, so the H1 hypothesis was rejected. The results of the hypothesis test indicated that the coefficient of the green competitive advantage variable was 0.071, meaning that every time the value of the GCA indicator increases, the company's value will also increase by 0.071; however, this figure is not statistically significant. The insignificant results can be caused by various factors, one of which is the presence of outlier data that cannot be used. Apart from outlier data, another factor is that the company may not thoroughly prioritize a green competitive advantage. This is because the level of stock price fluctuations is not directly influenced by the size of the GCA indicator (Suyati & Murwaningsari, 2023). According to legitimacy theory, the existence of insignificant but positive results from the GCA test is because, although the company has succeeded in gaining good assessment or recognition from the public due to its actions that have GCA, it does not directly affect the frequency of stock transactions within the company. Based on this, GCA can be said to have a positive effect on the company's value but not significantly.

The Effect of Integrated Reporting on Manufacturing Firm Value

The results of the second test (H2) show that integrated reporting has a negative value and does not have a significant effect on the company's value. This indicates that the existence of integrated reporting owned by the company has a negative but not significant impact on the company's value. The results of the previous hypothesis test using SPSS did not meet the level of significance, which should be below 0.05, and had a positive value; therefore, the H2 hypothesis was also rejected. The results of the hypothesis test indicated that the coefficient of the integrated reporting variable was -0.023, which suggests that every time the value of integrated reporting in a company increases, the company's value decreases by 0.023; however, this figure is not statistically significant. The insignificant results can be caused by various factors, one of which is because outlier data cannot be used.

Additionally, another factor is that integrated reporting is often used to fully disclose all components of both financial and non-financial aspects, which requires a more thorough level of consideration from various investors regarding their investment in the company (Suyati & Murwaningsari, 2023). The relationship between the test results and agency theory is evident in every action taken by the company as an agent, which raises many considerations for investors acting as principals. The frequency of considerations that are numerous from investors will affect the stock price formed due to the interaction between sellers and buyers in the stock market, both positively and negatively. With many considerations, integrated reporting can hurt net profit (NP) due to the excessive amount of information conveyed by the company. So, negative and insignificant results can be supported by agency theory. Based on this, PT is stated to have a negative but insignificant effect on the company's value.

The Effect of Carbon Disclosure on Manufacturing Firm Value

The results of the third test (H3) show that carbon disclosure has a negative and significant effect on firm value. This indicates that the company's carbon disclosure will have a negative and significant impact on its value. The results of the previous hypothesis test using SPSS met the level of significance, which is below 0.05, but were not positive; therefore, the H3 hypothesis is also rejected. The results of the hypothesis test indicate that the coefficient of the carbon disclosure variable is -0.058, which suggests that a 1-unit increase in carbon disclosure value results in a significant decrease of 0.058 in the company's value. Several factors can cause the results of the PK variable test to be negative, one of which is that the company's management still does not prioritize its environmental performance. Another factor is that, with the disclosure of carbon disclosure, investors reconsider their investment decisions due to poor disclosure results from year to year. The environmental performance regarding carbon emission disclosure is not considered or is deteriorating from year to year because carbon emissions are a primary factor in the company's business activities (Suryanata & Sujana, 2023). Manufacturing companies that are the focus of this study also comprise several sectors, including the basic and chemical industry sector, the consumer goods industry sector, and various other industry sectors. In the basic and chemical industry sector, as well as various other sectors, some sub-sectors produce processed metals, plastics, ceramics, automotive components, heavy equipment, and tobacco, whose main activities generate carbon emissions. Associated with the legitimacy theory, the company has not succeeded in attracting interest or gaining legitimacy from the community. Associated with agency theory, investors as principals can reconsider their investment decisions due to carbon disclosures that sometimes worsen from year to year. Based on this, PK is stated to have a negative and significant effect on firm value.

The Effect of Green Competitive Advantage, Integrated Reporting, and Carbon Disclosure on Manufacturing Firm Value with State Ownership as a Moderation

The results of the fourth test (H4) show that green competitive advantage still has no significant effect on firm value, integrated reporting remains negative but does not have a significant effect

on firm value, and carbon disclosure still has a negative but significant effect on firm value. This test utilizes interaction variables; specifically, the interaction variables in this study refer to the relationship between independent and moderating variables (Pradinata et al., 2024). The moderating variable, in the form of state ownership, can strengthen the influence of the independent variable on the dependent variable due to several factors. In the GCA variable, the company has tried to follow the positive trend, namely green innovation. The existence of state ownership in the company causes the company to have more responsibility to follow and have GCA, according to the statement of Ayuning & Dewi (2021) in their research, which states that society tends to expect to be good citizens, which means that companies with state ownership can attract more confidence from investors or the public to invest in the company. With increasing investment, the company's value can also increase. In the PT variable, the company has also followed a positive trend, namely integrating financial and non-financial aspects into a single comprehensive report. The existence of state ownership in the company gives it more confidence to provide stakeholders, including the state and its investors, with easy access to company information. In the PK variable, the company has also followed a positive trend, namely reporting carbon emissions released by company activities through carbon disclosures such as GRI 305. The existence of state ownership in the company leads to increased sensitivity to the dangers of carbon emissions and a greater emphasis on reporting these risks to stakeholders through annual reports. With state ownership that strengthens its influence, the company will be in accordance with the legitimacy theory, where it also seeks to attract trust from the community. State ownership also strengthens the agency theory, where the company is responsible to the principal in the form of a country, which must be responsible to all its people. Based on these results, H4A, H4B, and H4C are accepted because they have succeeded in strengthening even though they are not significant.

Conclusion

After testing and analyzing the discussion, the final result indicates that the relationship between the green competitive advantage variable and the firm value variable yields a positive but insignificant influence. The results conclude that H1 is rejected because it does not match the hypothesis, namely positive significance. Other test results in this study have also found and explained the discussion regarding the negative but insignificant influence of the integrated reporting variable on the firm value variable. The results conclude that H2 is rejected because it does not match the hypothesis, namely positive significance. Additionally, other studies have found that the carbon disclosure variable has a negative and significant impact on firm value. The results conclude that H3 is rejected because it does not match the hypothesis, namely positive significance. The conclusion is that, after several tests, state ownership as a moderating variable can strengthen the influence of the other three independent variables—GCA, PT, and PK—on firm value. The results conclude that H4a, H4b, and H4c are accepted because they match the hypothesis, namely strengthening the influence. The reason is that companies with state ownership also bear a significant responsibility, namely maintaining the country's good image.

There are still limitations in this study. First, the objects studied only included manufacturing companies listed on the IDX during the 2021-2023 period, which may affect the research results. Non-financial company objects are suggested for further research to broaden the generalization of research results. Second, the small number of companies using integrated reporting results in limited data that can be used. The measurements used only examine the results of integrating annual and sustainability reports. Many outlier data points are caused by uneven distribution, which may affect the research results. Third, there is a measurement of the independent variable in the form of carbon disclosure using GRI 305, so this may affect the research results. Further research can use other carbon disclosure alternatives. Finally, the small number of state-owned companies in the research sample results in limited data that can be used. The measurement only considers the number of shares owned by the government in the total

number of shares outstanding for the company. Many outlier data are caused by uneven distribution. This is because the majority of companies studied are private companies. Further research can explore other moderating variables to broaden the generalization.

Based on the final results of the research and its findings, the suggestions that can be given are academic and practical. Academic advice on this research suggests that future studies should aim to measure carbon disclosure variables beyond GRI 305 to obtain results that are likely to differ. The second academic suggestion is that future research is expected to utilize other variables that are likely to affect firm value, such as PROPER, ESG, CSV (novelty from CSR), CSR, and other relevant disclosures. The third academic suggestion is that further research is also expected to expand the research object, which is currently only limited to manufacturing companies; other examples can use non-financial or combined sectors. The practical suggestion in this study is that companies should disclose sufficient information to avoid information asymmetry that could harm investors or other stakeholders. In addition, companies are also expected to improve their carbon performance so that the intensity of carbon emissions produced does not increase every year.

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