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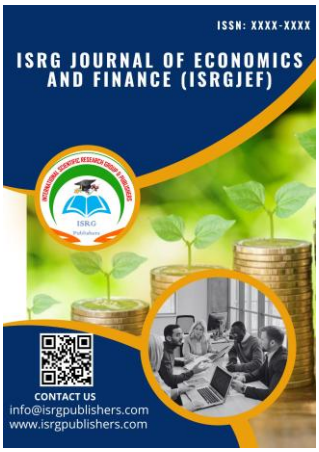

COST IMPLICATION OF GREEN INNOVATION DISCLOSURE ON FIRM VALUE OF SELECTED MANUFACTURING FIRMS IN NIGERIA

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Abstract

The study examined the cost implications of green innovation practices on firm value in the Nigerian manufacturing industry. This study used an ex-post facto research design to investigate the effects of green product and green process disclosures on firm value. Data from ten manufacturing companies listed on the Nigerian Exchange Group between 2017 and 2021 were gathered through secondary sources. A panel regression analysis was used to investigate the relationship between green innovation variables (green product disclosure and green process disclosure) and firm value, while adjusting for firm size. The findings found that green product disclosure had a negative and insignificant effect on firm value. On the other hand, green process disclosure was discovered to have a negative and significant impact on firm value. Furthermore, firm size was discovered to have a negative and non-significant effect on firm value. Based on the findings, it was recommended amongst others that policymakers and regulatory authorities should enforce the compliance requirements and constraints associated with green disclosures as this will aid firms to achieve sustainability goals thus avoid unnecessary costs.

Key Words: Green innovation disclosure, green product disclosure, green process disclosure, firm size and firm value

1. INTRODUCTION

Firm value is significant for a company. It symbolizes the complete stake that the stakeholder has in the organisation. When an organisation takes tangible measures, such as developing green innovation, its value might increase. Green innovation is a relatively recent idea that deals with unconventional approaches to doing various commercial tasks. It is viewed as a means of assessing the extent to which green is being implemented or committed to by the firm as a whole. It is crucial for organisations because it protects the environment from pollution, saves energy, and recycles waste materials.

The manufacturing industry creates employment possibilities while also contributing significantly to Nigeria's GDP. The manufacturing sector should encourage the spread of technical innovation since it promotes long-term economic prosperity and a healthy environment. Consequently, the industry relevance cannot be overstated. Unfortunately, they produce a variety of end products, including liquid and gaseous byproducts that harm the environment. Furthermore, this caused eutrophication of aquatic bodies, contamination of groundwater and soils, and had an influence on urban quality of life (Achi *et al.*, 2018).

Green innovation is difficult for non-green organizations to implement since it usually demands investment in new technologies and abilities that differ considerably from their current competencies, resulting in significant cost increases. In other words, the absence or non-application of green innovation may result in high costs since organisation must engage in corporate social responsibility, particularly to their host community, in order to remain competitive and sustainable in the sector. This intention may also have a negative impact on the firm's value because shareholders may oppose such action, effectively disengaging their investment, as they view corporate social responsibility as secondary to profit or wealth maximization for the owners.

Green innovation is a topical area, with many studies focusing on how it influences significant societal challenges. For example, scholars like Grace (2022) appraised the influence of green product development on environmental reporting practices of listed manufacturing firms in Nigeria; Akinwale *et al.* (2017) examined the impact of R&D expenditure, product and process innovations on small and medium enterprises (SMEs) performance in the manufacturing industry in Nigeria; and Jesuleye *et al.* (2020) examined the degree to which the adoption of green innovation (GI). In all, none of this study had linked this phenomenon to firm values with the controlling effect of firm size in the Nigerian manufacturing sector.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 Concept of green innovation

Green innovation (GIN) is the development of new goods, designs, techniques, suppliers, or management systems to address environmental issues (Saunila et al., 2018). It consists of wholly new or updated techniques, methods, and products that help the environment while also contributing to environmental sustainability (Li et al. 2018). According to Chang (2011), GIN stands for green research. He further categorizes green innovation as green product innovation and green process innovation. As a result, this study sees green innovation from two perspectives: green product innovation and green process innovation.

2.1.1 Green product innovation

Green products are related to product development and design. Green product innovation (GPI) refers to the introduction of new or improved products, such as improvements to complicated materials or even suppliers (Xie *et al.*, 2019), in order to reduce environmental impacts across a product's life cycle and to meet market demands (Cheng *et al.*, 2014). The green product innovation measurement consists of three major components connected to new product development. First, the company must select materials that emit the least amount of pollution. Second, the company must use the fewest number of materials to manufacture products. Third, the company must carefully consider whether the product is easy to recycle, reuse, and decompose (Guoyou et al., 2013).

2.1.2 Green process innovation

Green process innovation benefits resource utilization while lowering input and waste treatment costs (Wei & Sun, 2021). It is related to the company's operational operations, which effectively reduce raw resources and energy sources. Green process innovation is described as the use of new ideas to adapt product processes and management practices that have little or no negative environmental impact (Chen, 2011). Green process innovation measurements are made up of three components. First, the manufacturing process efficiently decreases hazardous substance or waste emissions; second, the manufacturing process reduces water, energy, coal, and oil consumption; and third, the manufacturing process minimizes raw material use (Guoyou et al. 2013).

2.2 Concept of firm value

Firm value, often known as enterprise value (EV), is an economic concept that measures the worth of a company. It is the value that a company is worth on a specific day. In theory, it is the sum required to purchase or acquire a company entity. Firm value can be defined as a market value that is closely tied to stock prices and helps investors understand a company's risks and future possibilities (Brigham et al., 2015). Firm value can be raised by increasing the shareholder wealth. Thus, it can be inferred that a good firm value has an impact on investors, and dividend distribution encourages investors to invest more in a company. Many academics have used Tobin's Q to measure corporate value (Reddy et al., 2010; Vintila et al., 2012). In this aspect, firm value correlates with Tobin's Q.

2.3 The concept of firm size

Firm size is described as the quantity and collection of a firm's production capabilities and potential, as well as the quantity and diversity of services it can provide to its consumers (Shaheen & Malik, 2012). Furthermore, Babalola (2013) stressed that the larger an entity is, the greater its influence over its owners, and so large firms benefit from economies of scale and outperform small firms. In this study, business size is calculated using the natural log of total assets.

2.4 Conceptual model of green innovation and firm's value

The study examined the impact of green innovation on firm value in Nigeria's manufacturing industry. For the aim of this study, green product and green process disclosure were employed as proxies for green innovation, with firm size as a control variable. Tobin's Q was used to measure firm's value. Figure 1 displays the direction of the assumed link between the variables under consideration.

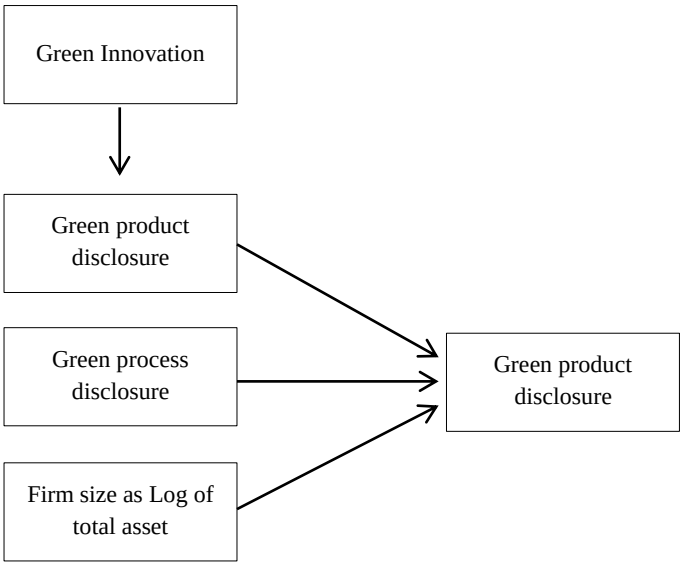

Fig 1: Conceptual model of green innovation and firm's value

Source: Researcher linkage model (2023)

2.5 Literature review

2.5.1 Green product disclosure and firm value

With increasing customer knowledge and demand for environmental protection, businesses must deliver more environmentally friendly products than competitors. Liew and Song (2017) noted that constant development of products or services for customers can reduce unknown environmental consequences and raise the firm's confidence in demonstrating its progress in environmental responsibility. According to prior study, green product innovation minimizes enterprises' negative environmental effect while increasing profitability by lowering waste and costs (Singh et al., 2020). It also helps to develop a positive business image (Weng et al. 2015). Given the benefits of green product innovation, its implementation is expected to have a beneficial impact on firm value performance in competitive markets.

Ho: Green product disclosure has no significant effect on firm's value of manufacturing firm in Nigeria.

2.5.2 Green process disclosure and firm value

According to innovation economics, green process innovation can improve firm economic performance by optimizing factor allocation efficiency, which includes lowering production and operation costs, expanding production, increasing market share, obtaining a green technology patent license, and other benefits. The pressure on businesses to implement green process innovation is increasing. Green process innovation is an important component of green innovation as it reduces pollution in the manufacturing process while also meeting the green needs of the government and customers (Dai & Zhang, 2017). Consumers can applaud environmental protection items that incorporate green process innovation (Liu et al., 2012). With increasing consumer awareness of environmental protection, they not only want to buy energy-saving and environmental protection items, but also want to know whether the products are manufactured using a green process. This has a long-term impact on a firm's market value. Based on the above, this study hypothesized that:

Ho: Green process disclosure has no significant effect on firm value of manufacturing firm in Nigeria.

2.5.3 Firm size and firm value

Asad and Cheema (2017) discovered that firm size has a significant effect on Tobin's Q, but this effect is not common large firms. More crucially, 30 listed businesses on the Indonesian Stock Exchange (IDX) were studied over a five-year period. Rizky et al. (2017) found a positive and significant effect of company size on Tobin's Q. In contrast, Purwohandoko (2017) found a different outcome in his study, which focused on the influence of business size, profitability, and growth on firm value, with capital structure acting as a mediator. Their empirical investigation found no significant effect of firm size on Tobin's Q. Ibrahim (2017) found that firm size has a positive and significant link with firm value in the Nigerian manufacturing industry. In contrast, the study by Lu et al. (2010) found no significant association between firm size and firm value. Based on the above, this study hypothesized that:

Ho: Firm size has no significant effect on firm value of manufacturing firm in Nigeria.

2.6 Legitimacy theory

This study is anchored on the legitimacy idea. According to Sethi's (1975) legitimacy theory, organisation only have the right to exist when they perform within social standards, and other stakeholders outside the firm's financial holders have legitimate rights to the organisation. Based on these assumptions, stakeholders such as customers have a legitimate entitlement to products with green opportunities if the company continues to seek approval and legitimacy for its production operations. When there is a gap between the firms' expectations and performance, their legitimacy is jeopardized. According to Atila and Fisun (2008), in the expectancy-disconfirmation paradigm, consumers' expectations serve as a benchmark against which the product is judged. It indicates that if there is a mismatch between a product's expectations and outcomes, organisations must obtain product certification to demonstrate that their product will provide the intended satisfaction to their customers. Furthermore, for manufacturing companies to meet the pre-purchase expectations of consumers who prefer green products, it is critical that they engage in research and development to improve product quality and devise better manufacturing processes that will save the environment from total destruction. This is achieved by following the company's pollution control policy. As a result, environmental reporting to customers is critical in meeting their informational expectations about the product's recyclable, reusable, and biodegradable nature.

2.7 Empirical review

Grace (2022) assessed the impact of green product development on the environmental reporting of Nigerian listed manufacturing enterprises. The population includes all 67 manufacturing companies in the Nigerian Exchange Group as of December 31, 2018. To ensure optimal representation of various population groups, twenty-three organisation were sampled using the Simple Random Sampling Technique. Data were acquired from selected firms' annual reports and a factbook provided by the Nigerian Exchange Group from 2008 to 2018. The data gathered was examined using descriptive statistics and panel regression. The study's findings demonstrated that product certification and pollution control, as proxies for green product development, had a significant impact on the environmental reporting practices of listed manufacturing firms, although research and development did not.

Akinwale et al. (2017) used a survey of 1,000 SMEs to investigate the impact of research and development (R&D) expenditure,

product and process innovations on small and medium businesses (SMEs) performance in Nigeria's manufacturing industry. The response rate was 52.1%. The results using the least squares method demonstrated that firms' R&D spending, as well as product and process innovation, has significant impacts on the firm's success.

Jesuleye et al. (2020) investigated how the adoption of green innovation (GIN) affects the financial and non-financial performance of food and beverage companies. This study used Partial Least Square Structural Equation Modeling (PLS-SEM) and Mean Item Rating (MIR) to investigate the amount of green innovation uptake in food and beverage companies in Lagos State, Nigeria. This study divided green innovation (also known as eco-friendly innovation) into three categories: green product innovation (GPRD), green process innovation (GPRO), and green managerial innovation (GMIN). A total of 282 firms responded, accounting for approximately 77% of the questionnaires administered. The findings revealed that food and beverage companies are using green innovation. However, green managerial innovation practice was quite high when compared to green process innovation and green product innovation.

Adelegan et al. (2018) use a mediated postulated structural equation model to investigate the relationship between green investment and organizational performance in Nigeria's pulp and paper industry. Data were acquired from 324 Nigerian pulp and paper companies via survey methodology. In AMOS, structural equation modeling was used to investigate hypothesized correlations. The study's findings offered significance of association between green investment and organizational success in Nigerian pulp and paper companies. The study's findings also suggested that profitability drives green investment in developing nations.

Yunlu (2022) used a panel of a-share listed firms from the Shanghai and Shenzhen Stock Exchanges from 2008 to 2020 to perform an empirical study on the association between green innovation and firm value. The findings revealed that green innovation has a considerable beneficial effect on company value, with organizations of strong green innovation capabilities experiencing higher firm value.

Xie et al. (2022) investigated the effects of varying levels of green process innovation on company financial performance, focusing on the moderating roles of green social capital and customers' implicit green needs. They discovered that green process innovation has a U-shaped influence on business financial performance, with the impact initially negative but becoming more positive as the level of green process innovation grows. They also discovered that the U-shaped relationship is moderated by green social capital and green needs' tacitness, with green social capital weakening the negative effect of green process innovation on firm financial performance and also strengthening the negative effect.

The above-mentioned studies by Akinwale et al. (2017), Yunlu (2022), Eneji et al. (2018), Xie et al. (2022), and Jesuleye et al. (2020) investigated the relationship or influence of innovation on sustainability and performance across industries. However, none of these research investigate the moderating influence of firm size in the study of the effect of green innovation practices on firm value in Nigeria's manufacturing sector. This is symptomatic of a knowledge gap, to which this study aimed to contribute to the current body of knowledge.

3. METHODOLOGY

This study used the ex post facto design. The ex-post facto design was utilized to investigate the impact of green innovation on business value, utilizing Nigerian manufacturing enterprises as a case study. The study's population consisted of fifty-four (54) Nigerian manufacturing enterprises listed on the Nigeria Exchange Group (NGX, 2022). This study focused on firms classed as manufacturing on the Nigerian Exchange Group, which span seven (7) industries. These are; conglomerates, industrial goods, healthcare, oil and gas, natural resources, agriculture and consumer goods. Ten (10) manufacturing companies quoted on the Nigeria Exchange Group Market as at 2022. Availability and accessibility of data was used as criteria hence the convenience sampling technique was adopted.

Data for this study was historical thus was gathered via a secondary source from annual reports of selected manufacturing companies ranging from 2017 to 2021. Ordinary least square model was used expressed below as

$FV_{it} = f(GI_{It})$……..……..... equ 1

TQit = f (GPDit, GPRDit, FSit) ……..…….....…… equ 2

The econometric model of the study without the control was further given below as

$TQi_t = a_0 + a_1GPD_{It} + a_2\ GPRD_{It} + e$ ----------equation (i)

With the control is given as

$TQi_t = a_0 + a_1GPD_{It} + a_2\ GPRD_{It} + a_3FSit + e$ ----------equation (i)

Where;

FV = Firm Value (FV) Measurement using Tobin's Q (Chung & Pruitt, 1994): Approximate q MVE PS Debt TA

MVE = Market Value of Equity; PS = Liquidation value of preferred shares; Debt = Total Debt; TA = Book value of total assets

GDP = Green Product Disclosure

GPRD = Green Process Disclosure

FS = Firm size was the control variable measured as log of total asset

a0= The intercept or constant term in the equation, representing the expected value of TQit when all independent variables are zero.

a_1, a_2: and a_3 are coefficient associated with GPit, GPRit, and FSit

e:= the error term, representing the variability or the unobserved factors that influence TQit but are not accounted for by the independent variables in the model.

Green product disclosure and green process disclosure were measured using the content analysis.

4. Result and discussion

Table 1

Descriptive statistic of green innovative firm value

Variables	Mean	Std Deviation	Min	Max
TQ	1.6682	1.844629	.57	8.99
GPD	.58	.4985694	0	1
GPRD	.66	.4785181	0	1

FS	8.0474	.7147764	6.63	9.38

Source: STATA Output version 14

These above data was secondary data and was gathered from the Annual reports of ten (10) selected manufacturing companies in Nigeria for a period of five years ranging from 2017 to 2021. This made up 50 observations in total. The descriptive statistics from table 1 indicates that the firm value proxied by TQ of the sampled manufacturing companies had an average value of 1.6682 with standard deviation of 1.844629, signifying that the data deviated from the mean value from both sides by 1.844629. The minimum value and maximum of firm value (TQ) of the sample sampled manufacturing companies during the period are 0.57 and 8.99 respectively. The table also indicates that the minimum and maximum values of the firm size proxied by log of total assets (FS) are 6.63 and 9.38 respectively, with a mean value of 8.0474 and standard deviation of 0.7147764. This indicated that the firm size of the sampled manufacturing companies deviated from the mean by 0.7147764. The table also showed an average value of 0.58 for green product disclosure with standard deviation of .4985694 and minimum and maximum values of 0 and 1 respectively. The mean value for green process is .66 with standard deviation of .4785181. It also indicates a minimum and maximum of 0 and 1 respectively.

Table 2

Shapiro Test for Normality

Variables	Prob > Z
TOBINSQ	0.00000
GPD	0.99973
GPRD	0.58648
FS	0.02899

Source: STATA Output version 14

The study employed the Shapiro Test for Normality test as shown in table 2 to check the normality of the data. Result indicated that the data from TQ, GPD, GPRD and FS were not normally distributed given their respective p -values (0.00000, 0.99973, 0.58648 and 0.02899). Thus, the null hypothesis (that, the data is normally distributed) was rejected.

Table 3

Correlation matrix of dimension of green innovation and firm value

	TQ	GPD	GPRD	FS
TQ	1.0000			
GPD	0.997	1.0000		
GPRD	0.0102	0.5868	1.0000	
FS	0.4767	0.3876	0.5414	1.0000

Source: STATA Output version 14

The correlation matrix was displayed in table 3. The numeric features indicated a low correlation amongst the variables under study. This indicated there is no possible problem of multi-collinearity. However, there is need for further investigation. This is done with the variance inflation factor as shown in the regression model summary in table 5.

Table 4

Heteroskedascity test

Variables	Coefficient	Prob.
GPD	-.143186	0.595
GPRD	-.5298948	0.044
FS	-2.106113	0.066
Con_	19.04971	0.038
R^2	0.0342	
F Stat. (3.37)	5.66	0.0027

Source: STATA Output version 14

The variance inflation factor (VIF) identifies correlation between the independent variables (GPD, GPRD, and FS) and the strength of that correlation. The average VIF is 1.55 for all the variables thus lies between 1 and 5. This suggested that there is a moderate correlation. The also shows there is no multi-collinearity amongst the independent variables and the coefficients are well estimated. More so, the table shows that there is no presence of heteroskedasticity, problem as evidence by the Breuch Pagan/Cook-Weisberg Chi^2 of 4.67, with p- value of 0.0000 indicated that the variance in the residuals is constant.

Table 5

OLS fixed effect of regression coefficient of green innovation and firm value

Variables	Statistics	Prob.
Mean vif	1.55	
Hettest Chi2	4.67	0.0307

Source: STATA Output version 14

Table 6

OLS random effect of regression coefficient of green innovation and firm value

Variables	Coefficient	Prob.
GPD	-.3538379	0.170
GPRD	-.6116197	0.018
FS	-.1649925	0.817
Con_	3.604855	0.528
R^2	0.0203	
F- Stat. (4.93)	4.87	0.0046
Hausman test		0.1815

Source: STATA Output version 14

There is need to choose between fixed and random effect as shown on table 5 and 6. This choice depends on the outcome of the Hausman test. The result of Hausman test in table 6 show that Prob > chi2 (0.1815) is greater 0.05 hence the random effect is used. **The random effect regression result is** displayed in table 6. The results from indicated that the explanatory variables of the study (GPD, GPRD and FS) accounted for 2.03 percent (%) of the total variations in the firm value of the sampled manufacturing firms in Nigeria. Similarly, the results shows that the model has a good fit

as indicated by the prob. value of 0.0046. This implies it is statistically significant at 5% significance level. The y intercept (bo) from the panel regression result is 3.604855. It indicated while holding all the independent variables (GPD, GPRD and FS) constant, that firm value amount to 3.604855 for manufacturing companies in Nigeria. This showed that there are other factors responsible for the changes of firm value of manufacturing companies in Nigeria aside the GPD, GPRD and FS. The coefficient of GPD is --.3538379 and non-significant at 5 percent level as the p value (0.170) was greater than 0.05. It indicates that green product disclosure has a negative and non-significant effect on firm value of manufacturing firm in Nigeria for the period under review. The implication of this is that the regulatory and compliance burden of disclosing detailed information about green products attract additional regulatory requirements and compliance burdens for companies. Compliance costs, such as obtaining certifications or meeting stringent environmental standards, could increase operational expenses and impact profitability. Investors may anticipate these regulatory challenges and view them as potential risks to the firm's value and disinvest. In other words, green product entails huge cost on the firms and increasing is detrimental to the profit of the firm visa vis the firm value because it reduces operational income of the firm in the short run. This supported the works of Xie et al (2022) who stressed that increasing the proportion of green patent application leads to the devaluation of firm value through in a short term. It however, contradicts with the findings of Husnaini and Tjahjadi (2021) that quality management has a positive effect on green process innovation, but not with green product innovation. That is, the quality of management decreases firm value.

The coefficient of GPRD is -.6116197 and significant at the p value (0.018) was less than 0.05. It indicated that green process disclosure has a negative and significant effect on firm value of manufacturing firm in Nigeria for the period under review. This implies that disclosing detailed information about green process can impose additional regulatory requirements and compliance burdens on companies, leading to increased operational expenses and potential impacts on profitability. The costs associated with obtaining certifications and meeting stringent environmental standards could result in higher compliance expenses. Investors may perceive these regulatory challenges as potential risks to the firm's value, considering the anticipated costs and potential impact on financial performance This is supported with study of works of Akinwale *et al.* (2017) who found that R&D spending by the firms like process innovation has significant impacts on the firm's performance. Also, it is in line with findings of Walsh (2018) who found that green process innovation significantly predicts firm performance.

The coefficient of the control variable (log of firm size) is -0.5532652 and non-significant with p value (.817) greater than 0.05. It indicated that a percentage increase in firm size leads to 0.5532652 decrease in firm value of manufacturing companies in Nigeria. In essence firm size has a negative and non-significant effect on the value of manufacturing firm in Nigeria for the period under review. This implies that larger firms tend to have higher operational costs due to factors such as increased overhead expenses, more complex management structures, and larger workforce. That is, it does not strengthen the validity of the relationship between green innovation practices and the firm value. These higher costs can negatively impact profitability and, consequently, the firm's value. This contradicts with the study of Majid and Benazir, (2015) who found that company's growth has a positive and significant effect on firm value. However, it supports the findings of Rasyid, (2015) who reported that the growth of a firm has a negative influence on firm value.

5. CONCLUSION AND RECOMMENDATIONS

This study examined the cost implication of green product disclosure, green process disclosure, and firm size on firm value of manufacturing companies in Nigeria. The findings revealed interesting insights into the relationship between these variables and firm value. Firstly, the green product disclosure (GPD) was found to be negative and non-significant on firm value, suggesting that disclosing detailed information about green products does not have a significant effect on firm value. This indicates that the costs associated with green product initiatives, such as obtaining certifications and meeting environmental standards, may outweigh the potential benefits in terms of firm value. Additionally, the regulatory and compliance burdens associated with green product disclosure can increase operational expenses and impact profitability, which investors may perceive as risks to the firm's value. Contrary to the findings on green product disclosure, the coefficient of green process disclosure (GPRD) was negative and significant, indicating that disclosing detailed information about green processes can have a significant impact on firm value. The study suggested that the additional regulatory requirements and compliance burdens associated with green process disclosure can lead to increased operational expenses and potential impacts on profitability, thus influencing firm value. This finding aligns with the literature and supports previous studies that emphasized the potential costs and regulatory challenges associated with green process initiatives. Furthermore, the coefficient of the control variable, firm size, was found to be negative and non-significant. This implies that larger firms tend to have higher operational costs, such as increased overhead expenses and more complex management structures, which can negatively impact profitability and firm value. The findings suggest that the lack of flexibility and increased inefficiencies associated with larger firms may outweigh any potential advantages in terms of firm value. Overall, the study conclude that green innovation influences the firm value negatively in the short run. Based on the findings of the study, the following recommendations were proposed. Thus, considering these recommendations, companies can navigate the complexities associated with green disclosures and work towards sustainable practices that positively influence both their environmental impact and firm value.

i. Policymakers and regulatory bodies should carefully evaluate the compliance requirements and burdens associated with green product and process disclosures. Striking a balance between promoting sustainability and minimizing excessive costs and bureaucratic procedures is crucial to encourage firms to adopt green practices without negatively impacting their value.
ii. Companies should conduct thorough cost-effectiveness analyses of their green initiatives to assess the potential impacts on operational expenses and profitability. This analysis can help determine the optimal level of investment in green practices that maximizes both environmental benefits and long-term firm value.
iii. Larger firms should focus on improving operational efficiency to mitigate the negative impact of size on firm value. Streamlining management structures, reducing

bureaucracy, and enhancing flexibility can help larger firms adapt to market changes more effectively and enhance their competitiveness.

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