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# **Sustainability Reporting and Firm Value of Listed Oil and Gas Firm in Nigeria: The Moderating Role of Board Independence**

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## **Abstract**

The study examined how board independence affected the relationship between listed oil and gas companies in Nigeria's firm value and sustainability reporting from 2013 to 2022. The population of the study consisted of the nine (9) listed oil and gas companies on the Nigeria Exchange Group, from which a sample of seven (7) oil and gas companies was chosen using the purposive sampling technique. The study used secondary data that was taken from the company's annual report and account, and it employed a longitudinal panel research design. The results of the cross-sectional time-series FGLS regression showed that the value of listed oil and gas is positively and significantly impacted by the moderating influence of board independence on economic sustainability disclosure and corporate social responsibility disclosure. However, the study found no significant moderating effect of board independence on the relationship between environmental disclosure and corporate governance disclosure with firm value. The study recommends that the management of the oil and gas companies should actively recruit and appoint board members with diverse expertise and independence from management to ensure objective oversight and enhance the credibility of sustainability reports.

**Keywords:** Sustainability Reporting, Firm Value, Board Independence, Oil and Gas Firm.

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## **1. Introduction**

Businesses around the world are facing growing pressure to add sustainability reporting to their financial statements. This is becoming a key part of their overall strategy and how they compete. In other words, companies that consider the impact of their operations on society and the environment (not just their bottom line) are seen as more sustainable and successful. This approach, called Corporate Sustainability (CS), involves integrating these social and environmental factors into how the company is run. Modern accounting grapples with the new issue of sustainability reporting. This arose because technology's rapid progress has left a big mark on the environment and society around companies' operations. To address this impact, companies are increasingly adopting eco-friendly practices and environmental management systems (Oti, Effiong & Akpan, 2017). These efforts aim to lessen their environmental footprint and contribute to conservation efforts.

Effective corporate governance necessitates board independence. This empowers boards to fulfill their dual role of Safeguarding shareholder interests and Overseeing management of a company. Independent directors are free from personal enrichment motives and act as watchdogs, in ensuring the company adheres to legal and regulatory frameworks (Nguyen & Thanh, 2022). Furthermore, independent directors serve as

effective controllers through adequate scrutiny of CEO actions and company performance (Kesner & Johnson, 1990; Kosnik, 1987). However, De Villiers et al. (2011) opined that boards with high proportions of independent directors may lack specialized knowledge necessary for optimal environmental performance. In addition, Hussain et al. (2018) further related that pressure to maintain reputation could influence independent directors and hinder decisive action on environmental issues (Hussain et al., 2018). Large companies can drive sustainability efforts due to their access to finance, technology, and global influence (Starkey & Welford, 2001). However, the power to decide how much sustainability information a company shares with the public ultimately lies with its board of directors, making them a key player in shaping corporate sustainability practices.

The oil and gas industry has played a pivotal role in the economic, social, and political landscape of Nigeria since the discovery of oil in the late 1950s. Nigeria is often referred to as the "Giant of Africa" due to its large population and economy, and the oil and gas sector has been a major contributor to its economic growth and development. The oil and gas sector is the main source of foreign exchange earnings for Nigeria. It contributes to the stability of the country's currency and facilitates international trade. Oil exports account for a significant portion of Nigeria's government revenue which enables the government to finance its budgetary expenditures, including infrastructure development, public services, and social programs and also the sector provides direct and indirect employment opportunities to millions of Nigerians through exploration, production, refining, distribution, and associated service industries.

Sustainability reporting has become increasingly important in the global oil and gas industry, and Nigeria is no exception. Over the years, there have been efforts to improve transparency, accountability, and sustainability practices in the Nigerian oil and gas sector through regulations, guidelines, and industry initiatives. The National Environmental Standards and Regulations Enforcement Agency (NESREA), which is responsible for enforcing environmental laws, regulations, and standards in Nigeria mandates oil and gas companies to conduct Environmental Impact Assessments (EIAs) and submit periodic environmental reports to ensure compliance with environmental regulations, also the Corporate Governance Codes and sustainability reporting guidelines issued by Securities and Exchange Commission encourage listed companies, including oil and gas companies, to disclose their sustainability practices, environmental risks, and social responsibility initiatives in their annual reports

Oil and gas production often faces challenges in implementing sustainability practices due to the industry's unique characteristics, which leads to unavoidable environmental impacts. Sustainability reporting, which tracks interactions between social, environmental, and economic aspects, can help address this challenges. Sustainability reporting helps the oil and gas firms to communicate how they tackle long-term sustainability challenges through strategies and initiatives. The global energy landscape is shifting towards cleaner alternatives, pressuring oil and gas companies to demonstrate commitment to sustainability (International Energy Agency, 2023). Stakeholders, including investors, consumers, and communities, increasingly demand transparency and accountability regarding environmental and social impacts (Global Reporting Initiative, 2023). Also, regulations promoting sustainability reporting are evolving globally, which present both challenges and opportunities for Nigerian oil and gas companies. Existing studies explore the link between sustainability reporting and firm value in developed markets, with limited research specific to emerging economies like Nigeria and particularly the oil and gas firm (Afegbua & Ogbeifun, 2021).

In Nigeria, inconsistencies exist in reporting practices and adherence to standards like the Global Reporting Initiative (GRI), this has continue to raise concerns about data

reliability and comparability of financial statement (Ikpor, 2020). The unique socio-economic and political context of Nigeria, including corruption and weak governance, may influence the effectiveness of sustainability reporting and its perceived value (Ajilore & Ilesanmi, 2022). Furthermore, investors lack reliable information to assess genuine sustainability practices and may avoid Nigerian oil and gas firms perceived as lagging behind global standards. Against this backdrop, the main aim of the study is to examine the moderating effect of board independence on the relationship between sustainability reporting and firm value of listed oil and gas firm in Nigeria.

The study will employ a quantitative research approach to empirically investigate the relationships between the variables of interest and test the research hypotheses. The direct relationship between sustainability reporting and firm value and moderating effect of board independence on the relationship between sustainability reporting and firm value was analyzed. The adopted research approach and analyses are different from existing studies by offering a more targeted, context-specific, and comprehensive examination of the relationships between sustainability reporting, firm value, and board independence in the Nigerian oil and gas sector. The integration of these dimensions and the technique of analysis adopted by the study contribute to its uniqueness and potential contribution to the existing body of literature on the subject matter

## **2. Literature Review**

### **2.1 Concept of Sustainability Reporting**

Sustainability reporting involves measuring, sharing, and taking responsibility to both internal and external stakeholders for a company's efforts towards sustainable development (GRI, 2019). This aligns with Umoren and Ukpong's (2022) definition, which focuses on recording, analyzing, and reporting the environmental and social impacts of a business, not just financial results. It is aimed at strengthening a company's commitment to sustainability (Akpan & Simeon, 2021). Companies use sustainability reporting to share information about their environmental, social, and ethical practices with both their employees and the wider community (Emeka-Nwokeji & Osioma, 2019). This transparency can be driven by stakeholders, regulations, and a company's own commitment to doing the right thing (Konstantinos & Dimitrios, 2016). According to Whetman (2017), sustainability reporting is the practice that encompasses a company's value, governance model and its approach towards creating a sustainable global economy. In the same vein, Gnanaweera and Kunori (2018) explained that sustainability reporting is the reporting system that enhances transparency, the reputation of the firm and meeting the interests of the stakeholders. Therefore, sustainability reporting refers to the disclosure of non-financial information following four main aspects of economic, environmental, social and governance sustainability in a strategic manner. The globally recognized GRI sustainability framework serves as a blueprint for companies reporting their sustainability efforts. In effect, this study measures of sustainability reporting index is based on GRI economic, social, environmental, and governance performance indicators. Stakeholders view reporting on these dimensions as key to building a company ethical reputation (Okpala & Iredele, 2018).

### **2.2 Concept of Firm Value**

A company's value reflects how well it achieves its financial goals, like earning consistent profits (Emeka-Nwokeji & Osioma, 2019). For a business to survive and thrive, keeping a healthy profit stream is very essential. Investors and other stakeholders rely on financial statements to assess a company's value and decide whether to invest in it or continue doing business with it. According to Brigham and Ehrhardt (2019) sees firm value as the net present value of all future cash flows expected to be generated by the company. It is the

current market capitalization of the company, calculated by multiplying the market price per share by the total number of outstanding shares (Damodaran, 2020). Dixit and Pindyck (1994) defined firm value as the sum of the intrinsic value of the company's current operations and the value of embedded "real options" such as the option to expand, invest in new markets, or delay projects. However, Freeman (2010) sees it as the combined value created for all stakeholders, including not only shareholders but also employees, customers, suppliers, and society as a whole. There are different indices through which the value of a firm can be determined. However, Lambert and Larcker (1987) opined that there is no theory that identifies the precise procedure for measurement. As a result, researchers make their choice based on observed institutional contractual arrangements and ease in the interpretation of empirical findings, therefore, this current study used price to cash flow ratio as a proxy for firm value.

### **2.3 Economic Sustainability Reporting and Firm Value**

The relationship between economic sustainability reporting and firm value is an evolving area of research, with ongoing debate and conflicting findings. Guenster et al. (2018) reported that transparent disclosure of economic sustainability practices may signal responsible management and long-term stability which in turn positively enhance firm value. Winn and Brieger (2019) revealed that implementation of strategies for economic sustainability can lead to cost savings, improved resource management and significantly impact on firm value. Wagner (2017) study on sustainability reporting and firm value revealed that consumers and investors increasingly seek out companies with sustainable practices, and clear economic sustainability disclosure can contribute to positive brand perception and market value. Conversely, Cho and Cho (2018) reported that generating and verifying high-quality economic sustainability reports can be expensive, especially for smaller firms. De Villiers et al. (2014) revealed that companies must be cautious to avoid misleading disclosure and green washing, as reputational damage can severely impact investor confidence and value. From the Nigeria perspective, Onoh, et al, (2022) examined the effect of sustainability reporting practices on the firm value of listed oil and gas firms in Nigeria. The result revealed that economic sustainability reporting has negative significant effect on the value of listed oil and gas firm in Nigeria. Using the Nigeria non-financial firms, Hassan and Musa (2021) reported a positive significant relationship between economic sustainability reporting and firm value.

The existing literature presents conflicting findings on the relationship between economic sustainability reporting and firm value. While Guenster et al. (2018), Winn and Brieger (2019), and Wagner (2017) report a positive relationship, Cho and Cho (2018) and Onoh et al. (2022) present contrasting views, also the study by Onoh et al. (2022) on Nigerian oil and gas firms revealed a negative significant effect of economic sustainability reporting on firm value, contrasting with the findings of Hassan and Musa (2021) on Nigeria non-financial firms. This inconsistency and context-specific divergence in findings underscores the need for more localized and sector-specific studies to understand the unique factors influencing the relationship between economic sustainability reporting and firm value in the Nigerian context. The risks of misleading disclosure and greenwashing, which could severely damage investor confidence and firm value raises concerns about the quality, transparency, and credibility of sustainability reporting practices and calls for further investigation into the integrity and reliability of economic sustainability disclosures. Based on the preceding, the study hypothesized that;

$H_{01}$ : Economic sustainability reporting has no significant effect on the value of listed oil and gas firm in Nigeria.

## **2.4 Governance Sustainability Reporting and Firm Value**

The relationship between governance sustainability reporting, and firm value has garnered significant interest in recent years. However, compared to global trends, research specifically exploring the relationship between this aspect of sustainability reporting and firm value in Nigeria remains less explored. Existing studies often focus on isolated aspects, like governance mechanisms or individual sustainability dimensions. In a study on Indonesian public companies, Siagian and colleagues (2013) discovered that companies with good governance practices, like transparency and accountability, tend to be more valuable. Wu and Wu (2021) examined the effect of corporate governance disclosure on firm value from the Chinese firm perspective. The findings of the study revealed a positive relationship between corporate governance disclosure and firm value. Also, From the UK firm perspective, Ahmed and Hossain (2020) researched on the relationship between governance disclosure quality and financial performance. The result revealed that there is a significant positive relationship between governance disclosure quality and financial performance. More so, Ogbeifun (2020) revealed that lack of standardized reporting frameworks and regulations creates challenges in assessing and comparing ESG (Environmental, Social, and Governance) practices across companies in Nigeria. Adegbite et al. (2021) study suggested that effective governance, particularly transparency and board structures, positively influence the adoption and quality of sustainability reporting. Ngwakwe (2018) study on ESG reporting and firm value of listed firms in Nigeria reported a negative significant relationship between governance reporting and firm values. The existing literature presents conflicting findings on the relationship between governance sustainability reporting and firm value.

While studies by Siagian et al. (2013), Wu and Wu (2021), and Ahmed and Hossain (2020) report a positive relationship, Ngwakwe (2018) presents a contrasting negative relationship. This inconsistency highlights the need for further research to clarify and reconcile these divergent findings. The lack of standardized reporting frameworks and regulations pose a significant challenge in assessing and comparing ESG practices across companies in Nigeria. This issue raises concerns about the consistency, comparability, and reliability of governance sustainability reporting practices and calls for further investigation into the development and implementation of standardized reporting frameworks and regulations. Addressing these gaps and controversies through further research, particularly in the Nigerian context and focusing on the moderating role of board independence, quality of reporting, regulatory framework, consumer and investor perception, and integrated governance and sustainability reporting, can contribute to a more comprehensive understanding of the factors influencing this relationship and guide corporate practices, policies, and strategies towards sustainable value creation. Based on the review of previous studies, the study hypothesized that;

H<sub>02</sub>: Governance Sustainability Reporting has no significant effect on the value of listed oil and gas firm in Nigeria.

## **2.5 Social Sustainability Reporting and Firm Value**

Using the Nigeria non-financial firms, Yusuf and Kighir (2021) investigated the effect of sustainability reporting on the value of listed non-financial firm in Nigeria. The result revealed that social sustainability reporting has positive significant effect on firm value. From the perspective of the listed manufacturing firms in Nigeria, Amedu, *et al.* (2019) examined value relevance of sustainability disclosure among manufacturing firms in Nigeria. The result revealed that social sustainability disclosures have significant effect on market value. Nzekwe *et al.* (2021) assessed the link between sustainability disclosure and the financial performance of listed industrial goods firms in Nigeria, the study reported a

positive significant relationship between social sustainability disclosure and financial performance. In another comparative study, Tyokoso, *et al.* (2020) investigated the effect of Sustainability disclosure and financial performance of Nigerian and Mozambican oil and gas companies. The findings revealed that social disclosure has an insignificant negative effect on the performance of Oil and Gas firms in Nigeria and Mozambique. More so, Fatai, *et al.* (2021) assessed the effect of sustainability disclosure on the value of listed deposit money bank in Nigeria, the study revealed that social sustainability disclosure exert a positive significant effect on firm value. Furthermore, Ibrahim *et al.* (2021) reported that social sustainability has a positive insignificant effect on financial performance of listed oil and gas firm in Nigeria. In the same vein, Fathony *et al.* (2020) used seven companies who are members of the Astra Group for the period from 2014 to 2018 to examine the effect of corporate social reporting and stock return. The result showed that companies cannot rely on corporate social responsibility activities to increase stock returns.

The existing literature presents conflicting findings on the relationship between social sustainability reporting and firm value/performance in Nigeria. While Yusuf and Kighir (2021), Amedu *et al.* (2019), Nzekwe *et al.* (2021), Fatai *et al.* (2021), and Ibrahim *et al.* (2021) report a positive relationship, Tyokoso *et al.* (2020) and Fathony *et al.* (2020) present contrasting negative or insignificant relationships. This inconsistency highlights the need for further research to clarify and reconcile these divergent findings, furthermore studies focusing on different sectors such as manufacturing, oil and gas, and deposit money banks in Nigeria reveal mixed findings regarding the impact of social sustainability reporting on firm value/performance. This sector-specific variation underscores the need for more sector-focused studies to understand the unique factors influencing the relationship between social sustainability reporting and firm value/performance across different industries in Nigeria. There is the need to differentiate between the impacts of CSR activities and comprehensive sustainability reporting on firm value/performance because companies cannot rely solely on CSR activities to increase stock returns. Based on the preceding, the third hypothesis is stated as;

H<sub>03</sub>: Social Sustainability Reporting has no significant effect on the value of listed oil and gas firm in Nigeria.

## **2.6 Environmental Sustainability Reporting and Firm Value**

The relationship between environmental sustainability disclosure (ESD) and firm value has attracted significant research attention in recent years, this has been driven by rising stakeholder demand for corporate transparency and environmental responsibility. Ioannou and Serafeim (2014) show that environmental disclosure index have positive and significant effect on firm value. Nyirenda, *et al.* (2013) revealed that there is no significant relationship existing between firms' environmental management practices and its return on equity. In a study of quoted companies in Bombay Stock Exchange in India, Makori and Jagongo (2013) find a significant negative relationship between Environmental Costs which cover all cost incurred concerning environmental protection, emissions treatment as well as wasted material and Return on Capital Employed (ROCE) and Earnings per Share (EPS) and a significant positive. Also, Plumlee *et al.*, (2015) examined the relationship between environmental disclosure quality and firm value using both cost of equity capital and expected cash flow components. They documented a positive relation between voluntary disclosure quality and firm value through both the cash flow and cost of capital components. Using the listed oil and gas firm Nigeria, Onoh, *et al.* (2022) reported that environmental sustainability reporting has a positive significant effect on the value of listed oil and gas firm in Nigeria. From the Nigeria financial sector perspective, Asuquo,

et al. (2018) found no significant relationship between environmental performance disclosure and firm value.

The existing literature presents mixed findings regarding the relationship between environmental sustainability disclosure and firm value. While Ioannou and Serafeim (2014), Plumlee et al. (2015), and Onoh et al. (2022) report positive relationships, Nyirenda et al. (2013) found no significant relationship, and Makori and Jagongo (2013) even reported a significant negative relationship. These inconsistencies highlight the need for further research to reconcile these divergent findings and understand the underlying factors driving the relationship. There is the need for Standardization and comparability of measurement approaches to help address this issue and facilitate more robust comparisons across studies as variations in the measurement and assessment of environmental sustainability disclosure and firm value across studies may contribute to the inconsistencies in findings. Future studies should adopt comprehensive approaches, consider sector-specific variations, explore moderating factors, and so as to contribute significantly to this evolving field of research. Based on the preceding, the fourth hypothesis is stated as;

H<sub>04</sub>: Environmental sustainability reporting has no significant effect on the value of listed oil and gas firm in Nigeria.

## **2.7 The Moderating Role of Board Independence**

Board independence is essential for companies to successfully monitor and protect shareholders' interests while avoiding personal enrichment (Naciti, 2019). Independent directors also have an obligation to make the company more transparent and assist other stakeholders in making sure their needs are satisfied (Michelon and Parbonetti (2012). The board primary responsibility is to oversee and manage the company's affair in addition to having the ability to affect every decision a firm makes. Sundarasan et al. (2016) argued that independent board members are beneficial in two ways. Firstly, they help reduce the risk of hidden information within the company by providing an independent perspective. Secondly, they motivate companies to improve their sustainability reporting by holding them accountable and encourage transparency. This aligns with agency theory, which suggests that independent boards act as internal watchdogs, protect shareholder interests from manipulation by management and ensure that decisions are made in the best interests of shareholders (Fama & Jensen, 1983). Kim & Cheong (2015) suggested that independent directors hold a unique key to unlocking better corporate governance and sustainability practices. Their unbiased perspective fosters open dialogue and informed decision-making, crucial for transparent sustainability reporting. Research by Shaukat, et al (2016) suggests that companies with boards more focused on Corporate Social Responsibility (CSR), as measured by their independence, tend to develop more proactive and comprehensive CSR strategies. These strategies, in turn, lead to improved environmental and social performance. A recent study by Mok and Bakri (2023) found that independent board members play a crucial role in boosting company performance through sustainability reporting. The study suggests that independent boards encourage transparency and incentivize companies to engage in robust sustainability practices, which in turn attracts investors who value such initiatives and leads to higher firm valuations. Based on the review of previous studies, the study hypothesized that;

H<sub>05</sub>: sustainability reporting when moderated by board independence has no significant effect on the value of listed oil and gas firm in Nigeria

## **2.8 Underpinning Theory**

This study draws support from Freeman's (1984) stakeholder theory, which emphasizes the importance of managing relationships with various groups who can impact or be

impacted by the company. These stakeholders include employees, communities, customers, suppliers, and more. While some agree with Freeman's argument that companies owe responsibility to these broader groups, others like Friedman (2002) disagree. The theory identifies the most relevant stakeholders for a specific company, as their support is crucial for success (Rahman & Rahman, 2020). This theory suggests that growing environmental awareness requires companies to expand their planning beyond traditional stakeholders and include new groups affected by their actions. Stakeholder influence on a company's image and success is growing, leading companies to manage these relationships through transparent communication, often via annual reports or websites. This study finds the theory relevant because it is premised stakeholder expectations of social and environmental responsibility from companies. Companies fulfilling these expectations can gain market advantages through improved economic, environmental, and social performance, ultimately benefiting shareholders.

This study used agency theory, developed by Jensen and Meckling (1976), to explain the link between board independence (moderating variable) and the main study variable. The theory emphasizes a conflict of interest between shareholders (principals) and management (agents). Management may prioritize their own goals over the company's, which leads to information asymmetry. Independent directors can mitigate this by acting as an objective assessment tool. Additionally, companies disclose information (financial and non-financial) to various stakeholders to bridge this information gap (Sulkowski, 2016). This theory is relevant because it highlights the dynamic between managers and stakeholders, particularly regarding information sharing.

### **3. Methodology**

The study adopted the longitudinal panel research design. The population of this study is made up of nine (9) listed oil and gas firm on the floor of the Nigerian Exchange Group for the period 2013 to 2022. The sample size of the study was seven (7) oil and gas companies determined through the purposive sampling technique based on the availability of complete financial statement for the study period and technical suspension within the study period. The study relied on secondary data extracted from the annual report and account of the sample firms for the period under review. The study employed the descriptive statistics, correlation analysis and the multiple regression method of data analysis. The information on how the study variables were measured is presented in table 1 below;

**Table 1: Variable Measurement**

<b>S/N</b>	<b>Dependent Variable</b>	<b>Measurement</b>
1	Price to Cash flow ratio (PCAS)	Share price divided by operating cash flow per share.
	<b>S/N</b>	<b>Independent Variable</b>
1	Economic sustainability Reporting (ECSDI)	Content Analysis based on the Global Reporting Initiative as used by Onoh, et al, (2022).
2	Environmental sustainability Reporting (ENDI)	Content Analysis based on the Global Reporting Initiative(the average value of disclosure of items reported) as used by Onoh, et al, (2022).
3	Corporate social responsibility reporting (CSRDI)	Content Analysis based on the Global Reporting Initiative (the average value of disclosure of items reported) as used by Onoh, et al, (2022).



4	Corporate Governance Disclosure Index (CGDI)	Content Analysis based on the Global Reporting Initiative (the average value of disclosure of items reported) as used by Ngwakwe (2018).
<b>Moderating Variable</b>		
5	Board Independence	The number of independent directors on the board (in percentage) as used by Mok and Bakri (2023).
<b>S/N Control Variable</b>		
1	Firm Age	Number of years from date listed to current year
2	Firm Size	Natural Log of total asset as used by Mok and Bakri (2023).
3	Revenue Growth	Current year revenue minus previous year revenue divided by previous year revenue.

Sources: Developed based on Literature Review

### 3.1 Model Specification

$$PCAS_{it} = \alpha_{it} + \beta_1 ECSDI_{it} + \beta_2 ENDI_{it} + \beta_3 CSRDI_{it} + \beta_4 ECDDI_{it} + \beta_5 BI_{it} + \beta_6 (ECSDI * BI)_{it} + \beta_7 (ENDI * BI)_{it} + \beta_8 (CSRDI * BI)_{it} + \beta_9 (ENDI * BI)_{it} + \beta_{10} FAGE_{it} + \beta_{11} FS_{it} + \beta_{12} REG_{it} + e_{it}$$

Where;

$\alpha_{it}$  = constant

$\beta_1 - \beta_8$  = Coefficient of firm i in year t

$PCAS_{it}$  = Price to Cash flow ratio for firm i in year t,

$ECSDI$  = Economic Sustainability disclosure index for firm i in year t,

$CSRDI$  = Corporate Social Responsibility Disclosure index for firm i in year t,

$CGDI$  = Corporate Governance Disclosure Index for firm i in year t,

$ENDI$  = Environmental Disclosure Index for firm i in year t,

$BI_{it}$  = Board Independence of firm i in year t,

$FAGE_{it}$  = Firm Age for firm i in year t,

$FS_{it}$  = Firm Size for firm i in year t,

$REG_{it}$  = Revenue Growth of firm i in year t,

$e_{it}$  = error term.

### 4. Result and Discussion

This section provides the result of descriptive statistics, diagnostic test, model selection test, and regression result.

**Table 2: Descriptive Statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
PCAS	70	32.031	222.548	24.09	1853.99
ECSDI	70	0.643	0.157	0.25	0.75
CSRDI	70	0.694	0.173	0.20	1
CGDI	70	0.497	0.163	0.125	0.75
ENDI	70	0.018	0.044	0.000	0.125
B1	70	0.582	0.188	0.19	0.88
FS	70	7.911	0.481	7.17	9.03
FAGE	70	28.071	10.38	7	43
REG	70	0.119	1.227	-0.993	7.603

Sources: STATA 13

The table above presents the result of the descriptive statistics of the study. The average value of price to cash flow ratio is 32.031; this indicates that the oil and gas company stock price is 32.031 times higher than its operating cash flow per share. Also, it implies that the stock is overvalued, as investors are paying more for each naira of cash flow. The standard deviation values of 222.548 suggest large variation in the PCAS among the firms with a minimum and maximum value of 24.09 and 1853 respectively. The mean value of Economic Sustainability disclosure index (ESDI), Corporate Social Responsibility Disclosure index (CSRDI), Corporate Governance Disclosure Index (CGDI) and Environmental Disclosure Index (ENDI) are 0.643, 0.694, 0.497, and 0.018 respectively. Notably, the level of Environmental Disclosure among the listed oil and gas firm is very low, however, the level of corporate social responsibility disclosure is moderate (69.4%) as indicated by the mean value. More so, the listed oil and gas firm disclosure about 49.7% of information about their corporate governance. The minimum value of the sustainability reporting index is zero (0) for ENDI and the maximum index 0.75 for ECSDI and CGDI. The minimum level suggest that some firm in the listed oil and gas sector do not disclose any information regarding their environmental sustainability activities, while the level of disclosure of economic and corporate governance practice is high for some firms. Furthermore, the average value of board independence of 0.582 indicates that about 58.2% of the board of the listed oil and gas firm is comprised of independent director, which shows moderate level of independence in the board composition with slight variation across the firms as indicated by the standard deviation value of 0.18.

**Table 3: Pairwise Correlations**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) PCAS	1.000								
(2) ECSDI	-0.125 (0.301)	1.000							
(3) CSRDI	-0.358* (0.002)	0.084 (0.489)	1.000						
(4) CGDI	-0.030 (0.808)	0.001 (0.994)	0.435* (0.000)	1.000					
(5) ENDI	-0.059 (0.626)	0.084 (0.488)	0.204 (0.090)	-0.108 (0.375)	1.000				
(6) B1	-0.103 (0.398)	-0.413* (0.000)	-0.088 (0.468)	0.024 (0.844)	-0.290* (0.015)	1.000			
(7) FS	-0.066 (0.589)	-0.224 (0.062)	0.485* (0.000)	0.528* (0.000)	-0.385* (0.001)	0.263* (0.028)	1.000		
(8) REG	0.030 (0.808)	-0.190 (0.114)	-0.242* (0.043)	-0.209 (0.082)	0.143 (0.238)	0.136 (0.263)	-0.180 (0.135)	1.000	
(9) FAGE	0.099 (0.414)	0.080 (0.508)	0.155 (0.201)	0.679* (0.000)	-0.379* (0.001)	-0.100 (0.409)	0.253* (0.034)	-0.206 (0.087)	1.000

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Sources: STATA 13

The table above present the pairwise correlation result used to examine the relationship between sustainability reporting measures which includes Economic Sustainability disclosure index (ESDI), Corporate Social Responsibility Disclosure index (CSRDI), Corporate Governance Disclosure Index (CGDI) and Environmental Disclosure Index (ENDI), the moderating variable (board independence) and value (PCAS) of the listed oil and gas firm in Nigeria. The result revealed that there is a negative insignificant relationship between Economic Sustainability disclosure index (ESDI), Corporate Governance Disclosure Index (CGDI), Environmental Disclosure Index (ENDI), Board Independence (BI), Firm Size (FS), and value (PCAS) of listed oil and gas firm as indicated by the coefficient of -0.125, -0.030, -0.059, -0.103, and -0.066 respectively. Furthermore, the correlation result indicated that there exist a positive insignificant relationship between Revenue Growth, Firm Age (FAGE) and the value of the firm as shown by the coefficient of 0.030 and 0.099 respectively. Conversely, there is a negative significant relationship between Corporate Social Responsibility Disclosure index (CSRDI) and firm value (coefficient of -0.358 significant at 10%).

#### **4.1 Regression Diagnostic Test**

The models' fitness and the validity of the inferences are verified by the following robustness tests.

**Table 3: Multicollinearity Test**

<b>Variable</b>	<b>VIF</b>	<b>1/VIF</b>
BI	1.45	0.6906
CGDI	3.26	0.3063
CSRDI	1.98	0.5051
ECSDI	1.33	0.7538
ENDI	2.36	0.4239
FS	2.84	0.3517
FAGE	2.90	0.3453
REG	1.18	0.8502
<b>Mean VIF</b>	<b>2.16</b>	

**Sources: STATA 16 output Results based on study data**

The VIF measures how much a coefficient's variance is inflated due to multicollinearity, while tolerance indicates the proportion of variance not explained by multicollinearity. The table above presents VIF scores and tolerances for independent variables. Since the VIF and 1/VIF for all the variables is less than 10 and 1 respectively suggest that there is no presence of multicollinearity problem in model. The mean VIF of 2.16 also attest to this fact.

**Table 4: Heteroscedasticity and Residual Normality Test**

<b>Test</b>	<b>Chi2</b>	<b>Prob&gt;chi2</b>
Breusch-Pagan / Cook-Weisberg test	417.55	0.0000
<b>Test</b>	<b>Z Value</b>	<b>Prob&gt;z</b>
Shapiro-Wilk W test for Residual Normality	4.983	0.00000

**Sources: STATA 16 output Results based on study data**

The table above present the heteroscedasticity and residual normality test. The Breusch-Pagan / Cook-Weisberg test shows a chi-squared value of 417.55, and p-value of 0.0000. This strongly rejects the null hypothesis of homoscedasticity, indicating unequal variance of residuals. This means the variance of the errors is not constant across different predicted values which violate a key assumption of linear regression. Also, Shapiro-Wilk W test has a Z-value of 4.983, p-value of 0.0000. This highly significant result rejects the

null hypothesis of normality, suggested that the residuals are not normally distributed. Normality of residuals is not strictly required for OLS regression, but it can affect the reliability of hypothesis tests and confidence intervals.

**Table 5: Model Selection Test**

Test	Chi2	Probability Value	Choice
F-Test for Fixed Effect	1.28	0.2810	OLS
Hausman Specification Test	4.60	0.9488	RE
Lagrangian multiplier test for random effects	4.35	0.0000	RE

**Sources: STATA 16 output Results based on study data**

The F-test, Hausman specification test and Lagrangian multiplier test for random effect for conducted for best model selection. The result of the F-test suggest the choice of ordinary least square regression over the fixed effect model (p-value of 0.2810), however the Hausman test and the LM test favored the selection of Random effect model with a probability value of 0.9488 and 0.0000 respectively. To correct for heteroscedasticity, serial correlation, cross-sectional dependency, the study adopted the GLS regression with correlated disturbance.

**4.2 Regression Result**

The result of the regression result on the moderating effect of board independence on the relationship between sustainability reporting and firm value is presented in table 6 below;

**Table 6: Cross-sectional time-series FGLS regression**

PCAS	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ECSDI	-1031.299	254.833	-4.05	0.00	-1530.763	-531.835	***
CSRDI	-1187.076	274.782	-4.32	0.00	-1725.638	-648.514	***
CGDI	-278.547	198.472	-1.40	0.160	-667.546	110.451	
ENDI	1717.104	1194.868	1.44	0.151	-624.794	4059.003	
B1	-2189.067	511.77	-4.28	0.000	-3192.117	-1186.017	***
ECSDI*BI	1299.575	325.578	3.99	0.000	661.454	1937.695	***
CSRDI*BI	1389.549	370.518	3.75	0.000	663.348	2115.75	***
CGDI*BI	460.885	346.779	1.33	0.184	-218.79	1140.56	
ENDI*BI	-3036.686	2289.641	-1.33	0.185	-7524.3	1450.927	
FS	-12.216	32.21	-0.38	0.704	-75.346	50.914	
FAGE	1.354	1.392	0.97	0.331	-1.375	4.083	
REG	0.485	4.993	0.10	0.923	-9.301	10.27	
CONSTANT	1821.898	500.476	3.64	0.000	840.984	2802.812	***
Mean dependent var		32.031	SD dependent var		222.548		
Number of obs		70	Chi-square		31.351		

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

**Sources: Sources: STATA 16 output Results based on study data**

The table above present the regression result which examine the moderating effect of board independence on the relationship between sustainability reporting measures as Economic Sustainability disclosure index (ESDI), Corporate Social Responsibility Disclosure index (CSRDI), Corporate Governance Disclosure Index (CGDI) and Environmental Disclosure Index (ENDI) and firm value (price to cash flow ratio) of listed oil and gas firm in Nigeria. The regression result revealed that Economic Sustainability disclosure index (ESDI) and Corporate Social Responsibility Disclosure index (CSRDI) have negative significant effect on the value of listed oil and gas firm in Nigeria. This suggests that higher ESDI and CSRDI disclosure scores are associated with lower price-to-cash flow ratios. This is in

agreement with Ngwakwe (2018) but in disagreement with Wu and Wu (2021), Ahmed and Hossain (2020) and Adegbite et al. (2021). However, the interaction terms with BI (ECS DIBI and CSRDIBI) have positive, significant coefficients of 1299.575 and 1389.549. This suggests that the moderating effect board independence on ESDI and CSRD I has positive significant effect on the value of listed oil and gas firm in Nigeria. This suggests that firms with more independent boards, higher sustainability disclosure in economic and social aspects is more likely to be associated with higher valuations. This is in line with Shaukat, Qiu & Trojanowski (2016) which opined that companies with boards more focused on Corporate Social Responsibility tend to develop more proactive and comprehensive CSR strategies. Also, the findings corroborate the submission by Mok and Bakri (2023) which stated that independent boards encourage transparency and incentivize companies to engage in robust sustainability practices, which in turn attracts investors who value such initiatives and leads to higher firm valuations.

Furthermore, the result shows that Environmental Disclosure Index (ENDI) has a positive insignificant effect on price to cash flow ratio as indicated by the coefficient of 1717.104 and P-value of 0.151. This is not in line with Ioannou and Serafeim (2014); Onoh, Biradawa, and Ndubuisi (2022) but corroborate the study by Nyirenda, Ngwakwe, and Ambe (2013) and Asuquo, et al. (2018). For the moderating effect, the result revealed the moderating effect of board independence on ENDI has negative insignificant effect on the value of listed oil and gas firm in Nigeria with a coefficient of -3036.686 and probability value of 0.185. In addition, Corporate Governance Disclosure Index (CGDI) has negative insignificant effect on the value of listed oil and gas firm in Nigeria as shown by the regression coefficient of -278.547 and P-value of 0.160. Conversely, the result revealed that the moderating effect of board independence on Corporate Governance Disclosure Index (CGDI) has positive insignificant effect on firm value (coefficient of 460.885 and P-value of 0.184). The change in coefficient from -278.547 (negative) to 460.885 (positive) suggested that a partial moderation has taken place.

The result of the Wald chi<sup>2</sup> of 31.35 implies that the joint explanation given by the independent variables is significant at 5% as indicated by Prob > chi<sup>2</sup> statistics figure of 0.0017.

## **5. Conclusion and Recommendation**

The study examined the moderating effect of board independence of the relationship between sustainability reporting and firm value of listed oil and gas firm in Nigeria from 2013 and 2022 using data extracted from the annual report and account of the firms. The result of the study revealed that the moderating effect of board independence on economic sustainability disclosure index and corporate social responsibility disclosure index has positive significant effect on the value of listed oil and gas firm in Nigeria. This suggests that greater independence on the board allows for more objective and comprehensive reporting on economic and social aspects of sustainability, ultimately leading to higher valuations. However, the study found no significant moderating effect of board independence on the relationship between environmental disclosure and corporate governance disclosure with firm value. This could be due the relative complexity of environmental data, lack of standardized reporting metrics, or weaker stakeholder pressure for environmental transparency in the oil and gas industry. Based on the study findings, the following recommendations were made;

The management of the oil and gas companies should actively recruit and appoint board members with diverse expertise and independence from management to ensure objective oversight and enhance the credibility of sustainability reports.

The management should go beyond mere compliance with reporting requirements and provide detailed, transparent, and quantifiable information on economic and social sustainability practices.

The firms should invest in robust data collection systems and adopt standardized reporting frameworks to enhance the transparency and reliability of environmental information.

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