

STAKEHOLDER PRESSURE, CLIMATE FINANCE, AND ESG REPORTING: EMPIRICAL RESEARCH

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DOI: <https://doi.org/10.5281/zenodo.11092609>

Abstract: It is impossible to overstate the role that climate finance plays in establishing a sustainable business climate in emerging nations like Ghana and other African countries. Therefore, the goal of this research is to establish how climate finance and stakeholder pressure affect environmental, social, and governance (ESG) reporting in publicly traded companies in Ghana. The World Bank sourced data from 20 publicly traded businesses listed on the Ghana Stock Exchange between 2014 and 2023. The Panel VAR results showed that although there is a short-term correlation between ESG reporting and climate finance, stakeholder pressure, and green technology innovation, there is no such long-term relationship in this study. At the same time, the Hausman test described a random-effects model that revealed that climate finance and stakeholder pressure have a positive and significant effect on ESG reporting. This means that a high level of these factors leads to better ESG disclosure among traded companies in Ghana. To increase ESG reporting and overall business performance, developing countries like Ghana must gradually strengthen their climate financing systems.

Keywords: Climate finance, Stakeholder pressure, ESG reporting. Panel VAR, Random-effect Model.

1. Introduction

In contemporary times, nearly all of the largest corporations globally regularly provide sustainability reports that delineate their operational strategies and the ramifications they have on the environment, society, and governance (Agyemang et al., 2023a). According to Wiredu et al. (2023), a prominent corporation publishes an annual report that provides an overview of its activities' impact on the economy, society, and environment. The significance of environmental, social, and governance (ESG) reporting has increased in nearly all economies because of the escalating global apprehension regarding ecological issues and the consequent imperative to safeguard ecological systems.

Consequently, numerous firms are striving to be more environmentally aware and responsible. Organizations such as the Global Reporting Initiative (GRI) are sought after by businesses and governments worldwide to aid them in understanding and effectively communicating their influence on environmental, social, and governance (ESG) matters. Companies may face pressure from stakeholders to increase their ESG data while simultaneously planning strategies to enhance their ESG reporting to remain competitive in the global market. Furthermore, a conducive climate foster enhanced ESG reporting, underscoring the imperative of strengthening climate finance

to bolster sustainable development in less developed nations. Climate financing, which encompasses local, national, or worldwide funding, is provided by public, private, and alternative financial sources to support projects aimed at adapting to and mitigating climate change (UNFCCC, 2023).

Despite the critical role played by Ghana's National Determined Contributions (NDCs) in establishing a framework for climate action, concerns persist regarding the adequacy of resources required to effectively implement these ambitious goals. Ghana encounters the further obstacle of maneuvering through a complex domestic financial landscape marked by susceptibility to debt in its endeavors to secure climate financing (World Bank, 2020). The acquisition of additional climate funding is of utmost importance for Ghana to achieve its climate objectives, in addition to meeting its development needs and establishing a foundation for a sustainable future (World Bank, 2022). Ghana's climate finance flows were examined, revealing an average yearly monitoring of USD 830 million in 2019 and 2020. This accounts for a meager 5-9% of the projected USD 9.3–15.5 billion required investment, highlighting the pressing necessity to augment climate spending to achieve Ghana's Nationally Determined Contributions (UNFCCC, 2021).

Countries often underestimate their budgetary needs because of a lack of knowledge and expertise in making accurate estimates, especially regarding adaptation. Additionally, there is a lack of data from subnational governments and vulnerable groups. Consequently, this gap is likely to widen (CPI, 2022c). Through the publication of Environmental, Social, and Governance (ESG) reports, a corporation may effectively showcase to the public its commitment to upholding its responsibilities toward its clients, employees, the environment, and society rather than solely pursuing profit. The enhancement of sustainability reporting and the incorporation of sustainability into business strategy and practices yield numerous advantages, including enhanced legitimacy and reputation, increased employee and customer loyalty, decreased expenses, improved business practices, enhanced firm performance and valuation, and the cultivation of competitive advantage (Sanchez-Planelles et al., 2020; Menassa & Dagher, 2020).

There is an increasing focus among owners and other stakeholders on firms operating in developing economies, with the aim of gaining a deeper understanding of the value they provide and the environmental and societal impacts resulting from their activities. The authors, Mensah et al. (2017), have advocated for the implementation of a standardized and transparent reporting framework to improve business performance and attract potential investors. Companies are adopting more robust self-regulation and demonstrating greater transparency in their sustainable practices due to the active participation of stakeholders (Maama & Mkhize, 2020). Hence, it is imperative for firms to advance their ESG (environmental, social, and governance) reporting, as an increasing number of individuals recognize that the potential risks and challenges impacting a company's long-term value are significantly more complex and diverse than what can be conveyed solely through financial statements.

Prior research has mostly concentrated on the requirements of stakeholders, as they are the primary drivers of sustainability (Higgins et al., 2020; Lulu, 2021). However, none of this research considered the mediating role of technological innovation, which is an essential element of sustainability reporting. The research by Ramadini et al. (2020) and Krasodomska and Zarzycka (2021) also looked at developed economies using secondary data sources and the Environmental Kuznets Curve (EKC) theory. As far as we know, past research has not specifically examined developing economies, especially those in Sub-Saharan Africa (SSA). There is a lack of studies in industrialized economies that have investigated the relationship between stakeholder pressure and ecological reporting. This is surprising considering the belief that a corporation can impact its various stakeholder groups in both beneficial and harmful ways. Stakeholder pressures typically influence sustainability reporting, according to prior studies.

However, the effects of certain stakeholder demands have produced inconclusive findings (Rudyanto & Veronica Siregar, 2018). To gain a deeper understanding of the relationship between climate finance, stakeholders' pressures (SP), and sustainability disclosure (SD), additional studies using secondary data from the World Bank are necessary. The existing body of research lacks clarity regarding the influence of SP on SD, thus rendering the findings of this study susceptible to varying interpretations. The existing body of research mostly centers on the significance and transparency of sustainability reports (Higgins et al., 2020; Lulu, 2021). Hence, this paper seeks to fill a gap in research by examining the influence of stakeholder pressure and climate finance on Ghana's ESG reporting. This study investigates the impact of stakeholder pressure and climate funding on environmental, social, and governance (ESG) reporting inside publicly traded enterprises in Ghana. The primary aims of this study are to determine the impact of climate funding and stakeholder pressure on sustainability reporting, considering the role of green technology innovation in a developing country such as Ghana.

2. Literature review

2.1 Theoretical literature review

This study is built on stakeholder theory and institutional theory, which are presented in this section.

2.1.1 Stakeholder theory

The notion of stakeholder theory is commonly employed to explain the motivations behind firms' inclination to report on environmental, social, and governance (ESG) matters. According to stakeholder theory, firms are obligated to consider the interests of all stakeholders, in addition to the owners, who primarily want to maximize profit (Freeman, 1984). According to stakeholder theory, attainment of this purpose is unachievable if the needs of other stakeholders are disregarded. Dissanayake et al. (2019) claim that companies bear a twofold obligation toward their investors or stakeholders, as well as diverse stakeholders whose actions can exert influence on or be influenced by the organizations' conduct. Corporations proactively participate in and communicate on environmental, social, and governance (ESG) issues to demonstrate to stakeholders that their demands are acknowledged. A potential strategy for attaining this goal involves integrating it into annual reports or creating separate sustainability reports (Abeysekera, 2022). Companies strive to address the issue of information asymmetry by properly disseminating environmental, social, and governance (ESG) information. This involves reporting non-financial factors like social and environmental initiatives, along with their corresponding outcomes (Alsahali & Malagueño, 2022). The use of ESG reporting serves as a means to actively include several stakeholder groups that are considered crucial for the ongoing operation of the organization. The use of stakeholder theory necessitates that the organizational manager swiftly attends to the external demands of the global context. Stakeholder theory asserts that businesses should conduct themselves in an ethical and fair manner toward the expectations of stakeholders, guided by their understanding of what is morally right. This research builds upon the theoretical framework of legitimacy theory, which also highlights the ethical behavior of businesses (Osei et al., 2023). Stakeholders are of paramount importance in offering assistance to organizational management regarding the manifestation of the firm's ideals, as stated by Wen et al. (2023). This mindset empowers individuals to distinguish between ethically right and perilous. According to Zhou et al. (2022), stakeholders play a vital role in directing enterprises toward the preservation and improvement of quality of life. Consequently, it is imperative for businesses to incorporate environmental considerations into their operations and effectively communicate sustainability-related information. According to stakeholder theory, it is advisable for organizations to prioritize the cultivation of positive relationships with all stakeholders (Osei et al., 2019). Consequently, corporations may feel obligated to adopt and disseminate sustainability reports because of the impact exerted by stakeholders. The sustainability reports of the company function as comprehensive collections of data on the effects of the

company's operations on the local community and the natural environment. Companies express their efforts toward global goals as a strategic approach to efficiently execute their responsibilities and obtain the support and approval of stakeholders.

The use of ST is commonly observed as a prominent theoretical framework in research related to ESG. According to Agyemang et al. (2023b), ensuring the sustained existence of a firm necessitates the organization's capacity to meet the expectations of its employees. The participation of numerous stakeholders is necessary to address the complexity of environmental, social, and governance (ESG) concerns and generate effective and sustainable solutions (Freudenreich et al., 2020). Leaders often encounter the challenge of deciding which interests to prioritize, ignore, support, or please due to conflicting interests. The equilibrium of stakeholder interests is a pivotal factor for organizations.

2.1.2 Institutional Theory

Institutional theory offers a comprehensive framework for understanding the rationale behind a firm's selection of a certain structure or reporting technique. Simoni et al. (2020) assert that businesses primarily engaged in activities with significant ecological impacts, like the mining sector, are under more pressure to conduct their operations ethically than businesses with less ecological implications.

Institutional theory posits that entities in a particular field tend to become more similar to one another because of the forces they encounter. These pressures include the adoption of institutional and social norms and standards to establish legitimacy and maintain access to resources. The concept of isomorphism refers to a form of standardization that encompasses several types, including coercive (regulatory), mimetic (competitive), and normative (market) styles (Kılıç et al., 2021).

The phenomenon of coercive isomorphism occurs when a corporation experiences external pressures, such as those exerted by shareholders or employees or by national decisions and legislation, that compel the firm to modify its established institutional standards (Herold, 2018). A company may adopt mimetic isomorphism if its executives perceive it as a strategic advantage in the market (Kılıç et al., 2021). An illustration of this phenomenon can be observed in the implementation of corporate social responsibility reporting. Organizations globally are progressively adopting the GRI standards for sustainable development (SD) as a manifestation of normative isomorphism. This phenomenon pertains to the compulsion of firms to adopt organizational practices that align with shared beliefs, often driven by clients or vendors who demand adherence to ecological and social standards (Tran & Beddewela, 2020).

According to institutional theory, a company's corporate strategies are greatly affected by its institutional environment, which includes its rules and societal values (Posadas et al., 2023). However, this concept bears a resemblance to the approach advocated by legitimacy theory. Simoni et al. (2020) posited that to thrive, firms must conform to the social norms, values, and beliefs prevalent in their respective regions. Expanding upon this concept, institutional theory posits that the actions, endeavors, and communications of a company might result in stakeholders developing specific expectations. Hence, the adoption of sustainable strategies entails adherence to legal regulations, societal norms, and ethical principles to bolster or safeguard a company's standing among its various stakeholders (Alatawi et al., 2023).

2.2 Empirical review and hypothesis development

2.2.1 Stakeholder pressure and ESG reporting

The examination of the determinants that impact sustainability reports from enterprises could derive advantages from the theoretical framework established by stakeholder theory. In accordance with stakeholder theory, managers can utilize stakeholders' expectations, or limitations on output, as a standard for evaluating

environmental performance, particularly when there is a broad agreement regarding the significance of environmental issues (Sarkis et al., 2010). In response to increasing issues, efforts have been made to integrate environmental concerns and practices into strategic, tactical, and operational measures. The legitimacy idea posits that enterprises should prioritize their social actions to align with community expectations. Hence, a company may be required to elucidate the congruence between its activities and social values, as the community or stakeholders may respond unfavorably, particularly in cases where there are disparities between the company's values and those of society (Alatawi et al., 2023). Hence, it is imperative for firms to adjust their strategies in response to societal expectations to maintain their social reputation and foster a relationship founded on trust with stakeholders. According to Alatawi et al. (2023), firms can enhance their ability to anticipate social concerns by effectively communicating and sharing information regarding their sustainability challenges through publicly accessible reports.

Sarkis et al. (2010) examined the application of stakeholder theory in their analysis of the adoption of sustainable measures within the Spanish automobile sector. Their findings indicated that stakeholders can have diverse impacts depending on the specific scenario being examined. Hence, a notable correlation exists between the environmental requirements of different stakeholders and the pressures exerted by distinct groups of stakeholders on sustainable practices.

The firm's decisions are a direct manifestation of the preferences of the dominant shareholder (Raub & Martin-Rios, 2019). Hence, it is imperative for shareholders to exert efficient supervision over the management of the company to mitigate the occurrences of information concealment and foster a culture of more thorough and transparent reporting. Shareholder pressure on sustainability is compelling firms to consider their wider social and environmental effects, which is a positive development.

Investors are increasingly recognizing the promise of sustainability as a means to foster a more just and fair society, while also enhancing safety and prosperity. Consequently, stakeholders are employing their voting power and other types of influence to exert pressure on firms to enhance their environmental, social, and governance (ESG) efficacy (Cadez et al., 2019; Lee et al., 2018). The findings of Chithambo et al. (2022) indicate that the environmental performance of manufacturing companies listed on the Indonesia Stock Exchange (ISE) is considerably influenced by stakeholder pressure, encompassing environmental, consumer, employee, and shareholder pressures.

Ramadhini et al. (2020) found that external stakeholders, including creditors and the media, influence social and environmental transparency. Furthermore, Fernandez-Feijoo et al. (2014) revealed that the presence of particular stakeholder groups, such as customers, clients, employees, and the environment, exerts a significant influence on the level of transparency in reporting.

The aforementioned literature leads to the formulation of the hypothesis as follows:

H1: Stakeholder pressure has a positive significant impact on ESG reporting

2.2.2 Climatic finance and ESG reporting

The achievement of the Paris climate objectives presents a notable and persistent challenge in terms of investment, requiring careful and prompt allocation of resources toward low-carbon and energy-efficient technologies. Additionally, it is crucial to align the financial sector with climate objectives (Boissinot et al., 2016; Jachnik et al., 2019).

To meet the existing NDC obligations, it will be imperative to allocate an average of around US\$130 billion per year toward the development of low-carbon technology and energy efficiency measures (hence referred to as "low-carbon") from 2016 to 2030. The potential for this quantity to increase twofold or even threefold exists if

the selected trajectories agree with the overarching goal of the Paris Agreement, which aims to restrict global warming to a level below 2°C (McCollum et al., 2018). It is improbable that the mobilization of these investments will be accomplished exclusively through state finances, thereby requiring the significant participation of private finance (UNFCCC, 2018). The substantial assets under management of institutional investors, amounting to \$84 trillion in OECD countries in 2017 (OECD, 2018), as well as their long-term liabilities, which may correspond to the temporal dimensions of climate change, have garnered commendation from scholars such as Gründl et al. (2016), Nelson and Pierpont (2013), Kaminker and Stewart (2012), and Della et al. (2011).

According to the 2016 G20 report, the current representation of low-carbon assets in the portfolios of global institutional investors stands at less than 1%. Furthermore, it is worth noting that in 2016, these assets accounted for a mere 0.2% of the overall climate finance flows, as reported by Buchner et al. (2017) and Oliver et al. (2018). Considering Carney's address, the Financial Stability Board argued that a notable aspect of the problem can be attributed to the lack of transparency surrounding asset holdings, drawing a comparison to the believed circumstances that contributed to the 2008 financial crisis. As a result, the board of directors formed the Task Force on Climate-Related Financial Disclosure (TCFD), which seeks to incorporate industry perspectives and recommendations. The main goal of industry and policy initiatives in the domains of climate finance and sustainability reporting is to effectively execute the suggestions put forth by the TCFD on the establishment of transparency throughout the financial system. The proposition of this objective is substantiated by the chronology put forth by Chenet (2019b) and recent scholarly works examining the essence and attributes of financial risks associated with climate change, including the UNFCCC (2018), Chenet et al. (2017), and Gros et al. (2016). There is a growing recognition among investors of the potential of sustainability in promoting a more equitable and morally upright society, as well as in bolstering safety and prosperity. According to Chenet (2019b), the effective utilization of climate finance can foster a conducive atmosphere for firms to enhance their environmental, social, and governance (ESG) reporting. Therefore, the current study developed the following hypothesis:

H2: Climate finance has a positive significant impact on ESG reporting

2.2.3 Green technological innovation and ESG reporting

Institutional theory examines the impact of external factors on green technology. We can use analytical logic to view green innovation as a response to customer expectations and regulatory pressure. According to Berrone et al. (2013), the objective is to ensure that firms conform to societal norms, regulatory obligations, and public perception.

In accordance with stakeholder theory, it is imperative for businesses to prioritize addressing the needs and anticipations of all stakeholders rather than solely catering to the interests of shareholders who possess financial interests (Freeman, 1984). Considering this, the company has integrated green innovation strategies into its policy. Shareholder pressure on sustainability refers to the increasing trend among shareholders, particularly institutional shareholders, to demand that corporations reveal their environmental, social, and governance (ESG) performance and prioritize efforts promoting green technical advancements. According to Kılıç et al. (2021), shareholders are employing their voting power and other types of influence to exert pressure on enterprises, urging them to enhance their green technological innovation. Consequently, the influence of shareholders on the adoption of green technology innovation is compelling companies to consider their wider social and environmental consequences, which is a positive development. Esposito De Falco et al. (2021) conducted an empirical investigation and found that contractual stakeholders significantly influence environmental innovation. Jayaraman et al. (2023) found that stakeholders, including employees, suppliers, government regulations, and customers, have a significant influence on an organization's

sustainability performance, especially in relation to green technological innovation initiatives. This suggests that stakeholders play a crucial role in implementing green innovation and believe that doing so can help reduce environmental impact. Further investigation has corroborated the notion that stakeholders have a significant impact on enterprises' adoption of green innovation (Thomas et al., 2022). Thus, the study described the following hypothesis:

H3: Green technological innovation has a positive significant impact on ESG reporting

3. Methodology

The study used panel data obtained from the World Bank, namely from 20 publicly traded companies listed on the Ghana stock exchange market. The data covered the time frame from 2014 to 2023 and were collected through the Ghana-CClimatology | Climate Change Knowledge Portal (worldbank.org). Consequently, the study yielded a sample size of 200. The firms were chosen on the basis of their stock market performance. The selected time frame was deliberately chosen depending on the accessibility of the data. The analysis of this study employed panel data methods, specifically the summary statistics, panel unit root test, panel VAR, and Hausman test. The Hausman test is a robust test that was used to assess endogeneity among the regressors and determine whether to employ a fixed-effects model or a random-effects model for the analysis.

Panel Unit Root Test

It is important to highlight that the estimator may not be adequate in cases where the variables inside a panel exhibit a unit root, which might result in inaccurate conclusions. In this study, the panel unit tests employed were Breitung & Das (2005) and Im-Pesaran-Shin (2003). These tests were used to test the null hypothesis for all panels that exhibited a unit root. The formulation of the hypothesis for performing the unit test can be expressed as follows:

H_0 : Panels contain unit roots vs. H_a : Panels are stationary. The Panel unit root test can be presented mathematically as follows:

$$\Delta Y_{i,t} = \theta + \gamma \alpha_{i,t-1} + \sum \beta_i \Delta Y_{i,t-1} + \omega_{i,t} \dots \dots \dots (1)$$

Where, θ is a constant, γ is the coefficient of the process root, β_i coefficient in time tendency, n is the lag order and $\omega_{i,t}$ is the disturbance (error) term.

Panel VAR

The proposed panel VAR model helps to examine the short-run connection between the variables of interest and it is given by

$$Y_{it} = \mu_i + B(L)Y_{it} + \alpha_i + \delta_t + \varepsilon_{it} \quad (2)$$

Where Y_{it} represents the vector of the endogenous stationary series Environmental, social, and governance (ESG) reporting, Stakeholder Pressure (Stakeholder), Climate Finance (Climate), and Green Innovation (Green) while μ_i represents the matrix of firm-specific fixed effects. The subscripts i and t refer to firm and time, respectively. $B(L)$ denotes the matrix polynomial in the lag operator with $B(L) = B^1L_1 + B^2L_2 + \dots + B_pL_p$, α_i indicates the vector that determines the specific effects of the firm found in this regression, δ_t represents the dummy variables for the firm's specific time and ε_{it} denotes the residual vector.

The matrix form of the proposed VAR in equation 2 treated as endogenous can be expressed as follows:

$$\begin{aligned} \Delta(ESG_{it}) = & \mu_{1i} + \sum_{j=1}^p \alpha_{1j} \Delta(ESG_{it-j}) + \sum_{j=1}^p b_{1j} \Delta(Stakeholder_{it-j}) + \sum_{j=1}^p c_{1j} \Delta(Climate_{it-j}) \\ & + \sum_{j=1}^p d_{1j} \Delta(Green_{it-j}) + \alpha_{1i} + \delta_{1t} + \varepsilon_{1it} \end{aligned} \quad (3)$$

$$\begin{aligned} \Delta(Stakeholder_{it}) &= \mu_{2i} + \sum_{j=1}^p \alpha_{2j} \Delta(ESG_{it-j}) + \sum_{j=1}^p b_{2j} \Delta(Stakeholder_{it-j}) + \sum_{j=1}^p c_{2j} \Delta(Climate_{it-j}) \\ &+ \sum_{j=1}^p d_{2j} \Delta(Green_{it-j}) + \alpha_{2i} + \delta_{2t} + \varepsilon_{2it} \end{aligned} \quad (4)$$

$$\begin{aligned} \Delta(Climate_{it}) &= \mu_{3i} + \sum_{j=1}^p \alpha_{3j} \Delta(ESG_{it-j}) + \sum_{j=1}^p b_{3j} \Delta(Stakeholder_{it-j}) + \sum_{j=1}^p c_{3j} \Delta(Climate_{it-j}) \\ &+ \sum_{j=1}^p d_{3j} \Delta(Green_{it-j}) + \alpha_{3i} + \delta_{3t} + \varepsilon_{3it} \end{aligned} \quad (5)$$

$$\begin{aligned} \Delta(Green_{it}) &= \mu_{4i} + \sum_{j=1}^p \alpha_{4j} \Delta(ESG_{it-j}) + \sum_{j=1}^p b_{4j} \Delta(Stakeholder_{it-j}) + \sum_{j=1}^p c_{4j} \Delta(Climate_{it-j}) \\ &+ \sum_{j=1}^p d_{4j} \Delta(Green_{it-j}) + \alpha_{4i} + \delta_{4t} + \varepsilon_{4it} \end{aligned} \quad (6)$$

Hausman Test

The Hausman Test, alternatively referred to as the Hausman specification test, is employed to detect endogenous regressors within a regression model. These regressors were identified as predictor variables that correlated with the error term. Endogenous variables are influenced by other variables present in the system to which they belong. The applicability of ordinary least squares estimators is limited in models with endogenous regressors because of their assumption of uncorrelated error terms and predictor variables. Instrumental variable estimators can be a valuable option in this situation. It is imperative to discover the endogeneity of the predictor variables prior to choosing the most suitable regression approach. To determine the more appropriate estimator for a certain regression model, it is necessary to evaluate the statistical significance of the difference between two estimators using the Hausman test (Zulfikar and STp, 2018). This diagnostic method, known as the Hausman test, is frequently employed to detect potential problems in model definition. In panel data analysis, the Hausman test is employed to determine the appropriate model choice between fixed effects (FE) and random effects (RE) models. According to Adebajo and Morufu (2022), the alternative hypothesis posits that the preferred model incorporates fixed effects, in contrast to the null hypothesis, which posits the presence of random effects. The primary objective of the tests was to determine the correlation between the predictors included in the model and the particular mistakes observed. It is postulated by the null hypothesis that there exists no correlation between the predictor variables and the error term, suggesting that the model remains unaffected by endogeneity.

The Hausman statistic can be computed as follows:

$$H = (\hat{\beta}^{RE} - \hat{\beta}^{FE})' [Var(\hat{\beta}^{RE}) - Var(\hat{\beta}^{FE})]^{-1} (\hat{\beta}^{RE} - \hat{\beta}^{FE}) \quad (7)$$

The hypothesis is therefore stated as follows:

H₀: Select RE (p > 0.05)

H₁: Select FE (p < 0.05)

In panel data analysis, the generalized model involves assessing the relationship between variables while considering individual intercepts. This equation clarifies the complex connections between variables within and between companies, enabling a more comprehensive understanding of the elements that influence ESG reporting. The equation may be represented in the following manner:

$$y_{it} = \alpha_i + \beta' X_{it} + \varepsilon_{it} ; \quad i = 1, 2, \dots, N \text{ and } t = 1, 2, \dots, T. \quad (8)$$

Where N = number of individuals or cross-section and T = the number of periods.

According to Chenet (2019b) and Chithambo et al. (2022), the panel model can take the following form:

$$ESG_{it} = \alpha + \beta_1(Stakeholder)_{it} + \beta_2(Climate)_{it} + \beta_3(Green)_{it} + \varepsilon_{it} \quad (9)$$

The dependent variable in this study is the ESG reporting of traded firms in Ghana. The main independent variables are stakeholder pressure and climate finance, whereas the control variable is green technological innovation. The random error term, denoted as ε_{it} , represents firms, while the i th unit represents time in years, denoted as t .

According to Chu et al. (2019), green technological innovation (GTI) involves the development and application of novel technologies and processes aimed at enhancing environmental sustainability. These technologies conserve resources, mitigate pollution, and foster a more sustainable and ecologically conscious society. The measurement is expressed as a percentage. Similarly, ESG reporting, stakeholder pressure, and climate finance are quantified as percentages.

4. Empirical results and discussion

Table 1: Descriptive Statistics

	N	Mean	Std. Deviation
Climate Finance	200	33.88	19.335
Stakeholder Pressure	200	63.45	16.768
Green Innovation	200	23.07	10.331
ESG	200	39.89	14.724
Valid N (listwise)	200		

Source: Author's computation using the EViews software

According to the data presented in Table 1, the selected firms exhibited an average climate finance of approximately 34% during the review period, with a variability of approximately 19%. Additionally, the average stakeholder pressure was found to be approximately 63%, with a variability of approximately 17%. Furthermore, the average green technological innovation was observed to be around 23%, with a variability of approximately 10%. Finally, the average ESG reporting was estimated to be around 40%, with a variability of approximately 15%.

Table 2: Panel Unit root test

First difference (Breitung)			Im-Pesaran-Shin		
Differenced Variables	Test statistic	P-value	Test statistic	P-value	No. of panels
ESG	-4.42	0.0010	-4.28	0.0000	20
Stakeholder pressure	-5.99	0.0008	-7.06	0.0000	20
Climate Finance	-6.30	0.0000	-8.51	0.0000	20
Green Innovation	-2.29	0.0041	-1.99	0.0235	20

Source: Author's computation using the EViews software

Table 2 presents the results of the panel unit root using the Breitung and Im-Pesaran-Shin approaches, indicating that the panel data became stationary after the second difference at the 5% significance level, suggesting that the unit root that might lead to an erroneous conclusion has been eliminated and further panel data analysis can be conducted.

Table 3: Panel VAR

	Coefficient	Std. Error	t-Statistic	Prob.
ESG C (1)	0.714209	0.088707	8.051289	0.0000
C (2)	-0.075036	0.046827	-1.602395	0.1095
C (3)	-0.012495	0.069924	-0.178697	0.8582
C (4)	0.043396	0.073535	0.590142	0.5553
C (5)	16.65817	4.482543	3.716232	0.0002
Stakeholder C (6)	0.073976	0.138386	0.534565	0.5931
C (7)	0.251267	0.073052	3.439570	0.0006
C (8)	-0.220099	0.109084	-2.017708	0.0440
C (9)	-0.312700	0.114717	-2.725846	0.0066
C (10)	59.26484	6.992878	8.475030	0.0000
Climate C (11)	-0.031438	0.112999	-0.278212	0.7809
C (12)	-0.101958	0.059650	-1.709270	0.0878
C (13)	0.766171	0.089072	8.601684	0.0000
C (14)	0.103759	0.093672	1.107687	0.2684
C (15)	14.86281	5.710019	2.602936	0.0094
Green C (16)	-0.037657	0.078374	-0.480474	0.6310
C (17)	-0.047861	0.041373	-1.156841	0.2477
C (18)	-0.015481	0.061779	-0.250586	0.8022
C (19)	0.546963	0.064969	8.418797	0.0000
C (20)	15.84158	3.960385	4.000009	0.0001

Source: Author's computation using the EViews software

Table 3 shows the result of the estimated panel vector autoregressive (VAR) model, and the outcome reveals that five lags were estimated for each of the five endogenous variables in the model, with ESG reporting having the first and fifth lags statistically significant at the 1% level, stakeholder pressure having the second, third, fourth, and fifth lags statistically significant at the 1% and 5% significant levels, respectively, climate finance having the third and fifth lags statistically significant at the 1% level, and green technological innovation having the fourth and fifth lags statistically significant at the 1% level, suggesting that ESG reporting has a short-run relationship with climate finance, stakeholder pressure, and green technological innovation. co-integration does not exist among the panel data; hence, the Panel VAR is well suited for the dataset.

Table 4: Correlated Random Effects: Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d. f.	Prob.
Cross-section random	0.379695	3	0.9444

Cross-sectional random effect test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
STAKEHOLDER PRESSURE	0.052952	0.053500	0.000023	0.9098
CLIMATE FINANCE	0.648026	0.646618	0.000019	0.7437
GREEN INNOVATION	0.031045	0.026269	0.000066	0.5551

Source: Author's computation using the EViews software

Table 4 shows that the P-value of the Hausman test exceeds the 0.05 significance level, indicating that the panel random-effects model is appropriate for the analysis of panel data. In addition, the Hausman test also indicates that the P-values of all the predictor variables, such as stakeholder pressure, climate finance, and green technological innovation, exceed the 0.05 significance level, implying that the model does not suffer from the problem of endogeneity. Hence, panel random regression estimators will be adopted for the analysis of this work on the basis of the specification of the Hausman test, which aligns with Adebajo et al. (2022).

Table 5: Method: Panel EGLS (Cross-section random effects)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.98612	3.079837	4.541187	0.0000
CLIMATE FINANCE	0.646618	0.026129	24.74736	0.0000
STAKEHOLDER PRESSURE	0.053500	0.030300	1.765678	0.0490
GREEN INNOVATION	0.026269	0.047978	0.547524	0.5846
Effects Specification				
			S.D.	Rho
Cross-section random			6.675625	0.5565
Idiosyncratic random			5.959484	0.4435
Weighted Statistics				
R-squared	0.765377			
Adjusted R-squared	0.761786			
S.E. of regression	5.919514			
F-statistic	213.1281			
Prob(F-statistic)	0.000000			

Source: Author's computation using the EViews software

According to Table 5, the fitted panel random-effect regression model ($P < 0.01$) indicates that the model is statistically significant at the 1% level. This suggests that, while considering green technological innovation, there is a significant relationship between stakeholder pressure, climate finance, and ESG reporting. Additionally, the random-effect regression model demonstrates that the coefficient estimates of climate finance and stakeholder pressure have a significant positive impact on ESG reporting ($P < 0.05$). This suggests that higher levels of stakeholder pressure and climate finance in traded firms lead to greater ESG reporting, thereby supporting the first and second hypotheses (H1 and H2). This agrees with the findings of Ramadhini et al. (2020), who showed that external stakeholders, such as creditors and the media, have an impact on social and environmental transparency, as well as the work of Chenet (2019b), which demonstrates that the efficient use of climate finance can foster an atmosphere conducive for firms to enhance their environmental, social, and governance (ESG) reporting. Moreover, it corroborated the research of Fernandez-Feijoo et al. (2014), which demonstrated that the existence of specific stakeholder groups, such as clients, consumers, workers, and the environment, has a major impact on the degree of reporting transparency.

Figure 1 shows the pattern of the coefficient estimates of the fitted random-effects model.

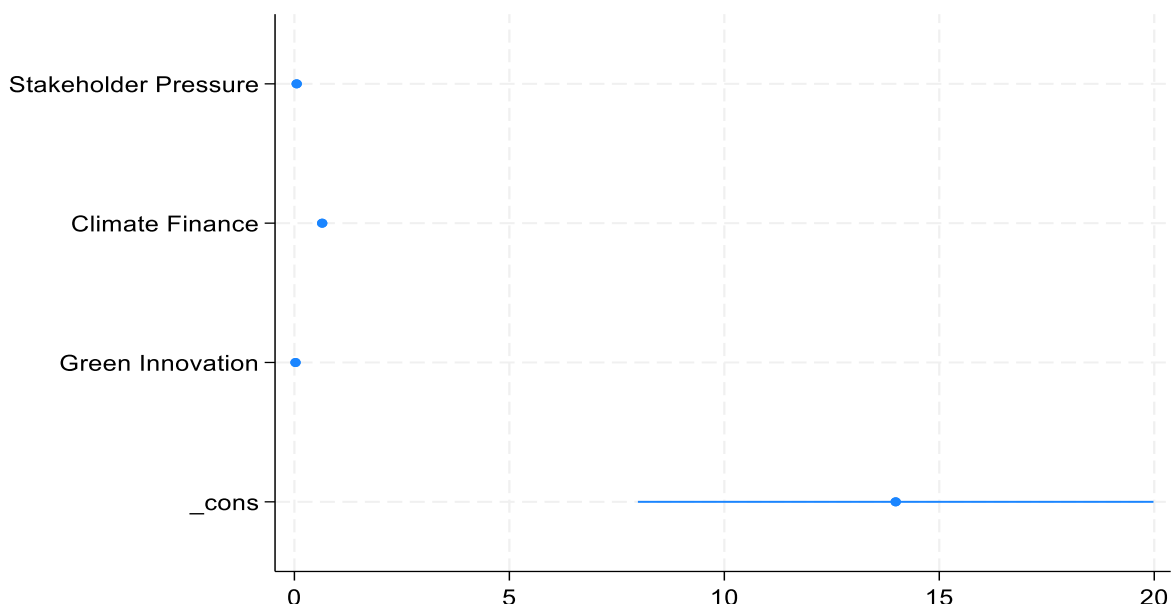


Figure 1: Coefficient plot

5. Conclusion and policy implications

It is crucial to underscore the significance of climate financing in fostering a sustainable business environment in developing economies such as Ghana and other African nations. The primary aim of this research is to examine the influence of stakeholder pressure and climate finance on the practice of environmental, social, and governance (ESG) reporting within publicly traded companies in Ghana. The findings from the Panel VAR analysis indicate a short-term relationship between ESG reporting and climate finance, stakeholder pressure, and green technical innovation. The Hausman test revealed that the random-effects model indicates a positive and significant influence of climate finance and stakeholder pressure on ESG reporting. This suggests that a high level of climate finance and stakeholder pressure improves ESG reporting among traded firms in Ghana. Therefore, it is

imperative to implement sustainable measures to promote climate finance in poor countries such as Ghana, with the aim of improving environmental, social, and governance (ESG) reporting and overall company performance.

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