THE EFFECT OF SUSTAINABILITY REPORTING ON BANK RISK-TAKING AND SUSTAINABLE GROWTH RATE

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Abstract

This study examines the effects of sustainability reporting, using environmental, social, and governance (ESG) disclosure practices, on banks' risk-taking and sustainable growth rates (SGR). The study was motivated by the need to provide empirical evidence on the relevance of sustainability reporting in a developing country with a weak institutional framework and limited enforcement. Using ESG disclosure scores data from Bloomberg for banks listed on the Nigerian Stock Exchange (NGX) from 2014 to 2023, we model ESG aggregate and disaggregate dimensions as explanatory variables, with the non-performing loans (NPL) ratio and SGR as dependent variables, based on stakeholder theory. The panel corrected standard error (PCSE) and two-stage least squares (2SLS) models addressed endogeneity issues. Our findings reveal that ESG disclosures have a negative and significant impact on bank risk-taking, with the environmental disclosure dimension having the most substantial effect on improving banks' asset quality. Also, ESG had a negative and insignificant relationship with the SGR and net interest margin, financial leverage, and net income per employee are positive and significant determinants of sustainable growth. The research contributes to the existing literature on sustainability reporting, providing both theoretical and practical implications amid the growing trend of ESG rollbacks worldwide.

Keywords: Sustainability Reporting, Environmental, Social, Governance, Disclosures, Banks Risk-Taking, Sustainable Growth Rate, Non-Performing Loans, Banking Sector

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1. INTRODUCTION

The relationship between environmental, social, and governance (ESG) disclosure scores, environmental (E) scores, social (S) scores, and governance (G) scores, and their impact on bank risk and sustainable growth rate (SGR), has been underexplored. However, banks are essential stakeholders in the economic system, primarily because of their unique role in creating and allocating funds to promote sustainable investment, economic growth, and social well-being (Scholtens & van't Klooster, 2019). Existing studies often exclude banks from ESG research, focusing instead on industries that heavily pollute the environment. However, as shown in this study, ESG evolved from banks due to their intermediation roles as enablers of the economic and financial activities of both financial and non-financial firms. Despite the extensive research on sustainability disclosure

and performance in the banking sector, the existing studies in the Nigeria context have avoided the voluntary disclosure of sustainable banking principles within the banking industry, often covering other areas sectors such as manufacturing (Omole et al., 2024; Eneh & Amakor, 2019; Anazonwu et al., 2018), governance (Erin et al., 2022; Olayinka, 2022; Moses, 2021), brewery (Asuquo et al., 2018), listed manufacturing firms and market value (Anazonwu et al., 2018), industrial goods (Nzekwe et al., 2021), oil, gas and petroleum marketing (Bala & Ibrahim, 2022). And when the study involves banks in their sample, the period is inadequate to capture the real impact of sustainability reporting based on the Nigerian sustainable banking principles (NSBP), which required Nigerian banks to start making public their voluntary sustainability reporting effective by December 2014 (Central Bank of Nigeria [CBN], 2012). It's this gap in the existing literature that motivated us to pursue this research.

This research aims to analyse the impact of NSBP or sustainability reporting through the lens of ESG disclosures' impact on banks' risk-taking and SGR, including the effects of the three dimensions of ESG on banks' risk-taking or asset quality, as well as their impact on SGR. Deteriorating asset quality, primarily attributed to an inadequate risk management framework, has been identified as the major challenge facing the Nigerian banking industry (Sanusi, 2012). Although the concept of ESG itself is not new, especially from the ethical and sustainability dimension, the use of the exact nomenclature of ESG gained traction in 2004 following the outcome of the report 'Who cares wins' which was commissioned by the then United Nations (UN) Secretary-General Kofi Annan, the UN Global Compact, International Finance Corporation with support from the Swiss Government and involving some 23 chief executive officer of major financial institutions with the task of integrating ESG factors into the economic and financial market ecosystem (World Bank, 2004). As the title suggests, the report posits that organisations adopting a strategic ESG framework will likely experience sustainable financial and societal outcomes that benefit all stakeholders.

Sustainability reporting serves as a means for banks to publicly communicate their management of risks and opportunities, as well as their impacts on economic, environmental, and social issues (Sharma et al., 2020). In addressing the enormous responsibilities and challenges posed by the institutions' governance (G), social (S), and environmental (E) issues, organisations adopt corporate sustainability reporting as a competitive strategy. Fifka (2013) asserts that internal (company size, industry) and external (stakeholders, culture) characteristics unique to the firms are determinants of sustainability reports. In contrast, Dienes et al. (2016) asserted that ownership structure, public visibility, and firm size are among the key drivers of sustainability reports. Lozano et al. (2016) categorised sustainability reports into three distinct theories: corporate entity theories, corporate nature theories, and corporate obligations theories. Therefore, it is not surprising that sustainability reporting research has attracted the attention of academics and practitioners over the last decade, from just under 50 published research articles worldwide in 2004 to over 500 publications recorded in 2021 in peer-reviewed articles indexed in the social science citation index (Kapil & Rawal, 2023).

Some empirical literature has confirmed these positive outcomes of increasing research output, affirming that ESG has a positive impact on firms' performance, strategy, and sustainability (Bofinger et al., 2022; Liu et al., 2018). Other studies also attribute sustainability reporting to firm value (Cheng et al., 2024; Bang et al., 2023). Some other studies have reported that sustainability reporting can reduce risks (Yang et al, 2024; Albuquerque et al., 2019). A similar positive relationship between corporate social responsibility (CSR) disclosure and bank performance was reported in a study by Oyewumi et al. (2018). Existing studies have also shown that sustainability reporting can serve as a signal of future performance, particularly in the long run, thereby enhancing the sustainability of the firm (Lys et al., 2015), confirming the signalling role of ESG for sustainable growth.

This study makes several contributions to the literature. First, it contributes to the literature on sustainable banking principles and banking risk. Banks' ability to play a crucial role in the economy and society depends on the quality of their assets, risk-taking capabilities, and management. Therefore, reviewing and ascertaining the impacts of voluntarily disclosed ESG on bank risk-taking is a significant contribution, as the few existing studies that have explored this area primarily come from enforced ESG reporting channels in developed countries. Secondly, this study aims to determine whether banks in a developing country like Nigeria, with higher ESG scores, tend to have better asset quality and which E, S, and G scores impact or mitigate deteriorating asset quality, which has been a significant contributor to bank failures in Nigeria.

Thirdly, this study contributes to the SGR literature by examining the impact of each ESG disclosure on the SGR of banks. The study aims to determine whether higher ESG discourse scores are associated with a higher SGR. This area is underexplored, as existing literature concentrates on economic sustainability through macro-level studies (Sun & Tang, 2022), whilst a majority of the existing studies use other performance indicators as sustainability proxies, which can mask the fact that these financial performance metrics can disguise the ESG activities of these companies, or 'greenwashing' with ESG performance to attract benefits such as external financing (Bai et al., 2022). Using the SGR, independent of ESG-related performance measures, this study provides more valuable insights into measuring the sustainability of banks that disclose their ESG information. Using the SGR, we can determine whether banks can sustain growth through revenues from their operations without relying on external financing. For context, the SGR indicates the bank's potential for endogenous growth without relying on signalling or greenwashing to attract external funding.

The remainder of this paper proceeds as follows. Section 2 reviews the relevant literature, focusing on banks and the research hypothesis. Section 3 details the research data and methods. Section 4 presents the research results and findings, and Section 5 discusses the findings, outlines the practical and managerial policy implications of

the study, and Section 6 summarises the study's conclusions, stating its limitations and suggesting areas for future research.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Theoretical review

Based on the stakeholder theory as espoused by Freeman (1984), firms do have an ethical obligation to ensure that while maximising the value of shareholders (owners of capital), the other parties (stakeholders, customers, employees, suppliers, and regulatory authorities) who are essential participants can indeed create values that are beneficiary for all parties (shareholders and stakeholders). It involves balancing the corporate goals of the organisation and the stakeholders' interests (Adams, 2002).

Therefore, banks that engage in sustainability reporting signal their willingness to meet stakeholders' expectations of the firm and reduce or avoid costs, such as regulatory compliance costs. Under the NSBP, bank sustainability disclosures are voluntary, enabling banks to enhance their reputations, transparency, and legitimacy. Disclosures are critical, as no matter the level of investments in CSR activities involving ESG, as rightly noted by Oyewumi et al. (2018), without due disclosure, there would be little or no contribution to corporate financial performance. This disclosure stance creates a competitive advantage, fosters innovation, and informs corporate strategy that enhances the banks' sustainability rather than their costs (Porter & Kramer, 2006). Additionally, the bank's enhanced relationship with its stakeholders through its CSR strategy fosters trust among customers and society (Luo & Du, 2015). A trusted bank can then attract talented employees who value its positive impact on the environment and society and who make valuable contributions to its growth (Mao & Weathers, 2019).

2.2. Environmental, social, and governance disclosure and bank risk-taking

Nigeria's sustainable banking principles and the Nigerian Stock Exchange (NGX) reporting framework for ESG disclosure are voluntary, requiring banks and listed companies to disclose sustainability reports and ESG disclosures. We postulate that banks involved in ESG activities would consider sustainability reporting as a predictor. As such, banks with positive ESG performance would gladly disclose/report their ESG activities. By revealing their ESG activities, firms signal their superior performance compared to non-disclosing firms. The empirical literature on ESG practices and bank performance (Tobin's Q and return on assets (ROA)) also reports mixed results. For instance, Lamanda et al. (2024) found no significant relationship between ESG disclosure and bank performance in a study of 26 banks in the Visegrad countries (the Czech Republic, Hungary, Poland, and Slovakia). In contrast, Nollet et al. (2016) investigated the effects of this relationship on both linear and non-linear bases, reporting a significant negative impact of ESG disclosures on banks' performance. Other studies, such as Gutiérrez-Ponce and Wibowo (2023) and Menicucci and Paolucci (2023), report similar negative associations.

Buallay (2019), who studied ESG and bank performance using ROA, return on equity (ROE), and Tobin's Q as measures, also found a positive relationship and significant correlation between ESG disclosures and bank performance. Other recent studies reporting a positive association between banks' ESG disclosures and performance include Aras and Kazak (2022), Ersoy et al. (2022), and Shakil et al. (2019). In a related study, Buallay et al. (2021) reported that, based on a survey of 232 listed banks in developing and developed countries, banks' ESG disclosure was found to be insignificantly related to bank performance in developing countries. In contrast, in developed countries, a positive relationship was observed.

On ESG disclosure and bank risk, Galletta et al. (2023) found that higher ESG disclosure scores reduce bank operations risk, and Liu et al. (2023) established a negative relationship between ESG disclosure and banks' non-performing assets, which can serve as a proxy for bank risk. Also, the study by Di Tommaso and Thornton (2020), based on a sample of European banks, found that higher ESG scores lead to a 'modest' reduction in bank risk-taking, irrespective of whether the banks are high- or low-risk-taking. Di Tommaso and Thornton (2020) also assert that although higher ESG disclosure scores for banks led to reduced risk, they negatively impacted bank value, a finding the study attributed to the 'overinvestment' view. Additionally, a study by Cerqueti et al. (2021) found that higher ESG scores are associated with lower systematic risk, even in times of crisis, thereby attracting long-term investors.

A study by Bolton (2013) found a negative relationship between US banks' ESG disclosures and their risk-taking. Regarding specific ESG disclosure, Gangi et al. (2019) report that banks with high environmental awareness had lower insolvency risk, based on a sample of 142 banks across multiple countries. Additionally, a study by Zahid et al. (2023) found that during the COVID-19 pandemic, banks neglected environmental sustainability practices, leading to a negative relationship between environmental disclosure and financial performance. A study by He (2022) based on 50 Asian commercial banks found that higher ESG disclosure scores are significantly associated with lower bank risk. Additionally, the study posits that ESG and risk are significantly associated with increases in bank value, aligning with stakeholder theory. Meanwhile, a study by Manta et al. (2025) of 50 listed banks across 28 European countries from 2012 to 2018 reports a positive relationship between banks' risk-taking and ESG disclosure scores. As banks aim to improve their reputation by increasing their disclosure, this mitigates the impact of risk-taking.

A penal data study by Aevoae et al. (2023) on a sample of 367 listed banks across 47 countries from 2007–2020, reports that ESG combined scores and governance (G) score had a beneficial impact on systemic risks faced by banks, and attributed these findings to stakeholders' theory expectations of

corporate social responsibilities being a mitigating factor for bank-specific risk. Similarly, leveraging stakeholder analysis, Liu and Xie's (2024) study on ESG score disclosure and liquidity risk among 41 commercial listed banks in China from 2009 to 2022 found that an enhanced ESG score mitigates liquidity risk, thereby lowering the ratio of non-performing loans (NPL) and improving bank profitability. Another recent study by Gangwani and Kashiramka (2024) examined the impact of ESG disclosure scores on bank risk-taking, using a sample of 178 listed banks from 20 emerging countries over six years (2015–2021). Using the system's generalised method of moments (GMM) estimation methods, Gangwani and Kashiramka (2024) report that higher ESG disclosure scores are associated with lower liquidity, leverage, and insolvency risks for banks. Using a similar methodological approach, Yang et al. (2023) employed two-stage least squares (2SLS) and GMM to confirm that ESG governance disclosure does not correlate with idiosyncratic risk. In contrast, environmental and social disclosures have a significant negative effect on idiosyncratic volatility.

2.3. Environmental, social, and governance disclosure and sustainable growth rate

The goal of sustainability reporting as a corporate strategy is to enhance a firm's economic sustainability. The results on how ESG disclosure or activities impact a company's profitability dominate the literature, with varying outcomes. Some studies, such as those by Gillan et al. (2021) and Sila and Cek (2017), have found that ESG activities can harm firm performance. Profitability and ESG activities often focus on the macro level, where economic sustainability is examined superficially, and questions are typically left unanswered about whether the 'profits' are genuinely sustainable. In other words, can the absence of external financing keep the firm as a going concern (sustainable) entity? For this reason, this study explores bank sustainability by measuring a bank's SGR. SGR is a more robust, easy, and straightforward way to measure a bank's sustainability at the micro-level. It was initially postulated by Higgins (1977) as the 'maximum rate at which a company's sales can increase without depleting financial resources'. The SGR defines a company's ability to achieve sustainable growth without relying on external financing. To be sustainable, banks must achieve their revenue projections based solely on their current business model, operations, and existing financial constraints within the environment (Patel et al., 2020; Babcock, 1970). In today's highly competitive environment, investors and managers are concerned with the firm's survival and long-term growth, and SGR provides stakeholders with insights to address these concerns and promote growth and long-term sustainability (Mamilla, 2019). From the stakeholders' theory perspectives, companies that have a strong and effective relationship with their stakeholders, such as shareholders, employees, customers, the community and the government, have strong CSR performance, which they proudly disclosure in their sustainability reporting (Rahman et al., 2024; Paolone et al., 2022; Luo & Du, 2015; Godfrey et al., 2010).

Lin (2024), using data from a sample of listed companies in China, excluding the financial services industry (banks) from 2009 to 2021, examined the impact of ESG activities on SGR. Lin (2024) reported that ESG disclosures have a positive impact on SGR; according to the study, aside from ESG activities enhancing SGR, higher ESG scores also drive higher SGR. ESG also promotes innovation, mitigates risks, and reduces agency costs. On the separate components of ESG, Lin (2024) asserts that social dimension (SDS) and governance dimension (GDS) have a positive impact on SGR, whereas environmental dimension (EDS) has a negative effect on SGR. The negative relationship between EDS and sustainable growth was corroborated by Hassel et al. (2005) and Wagner (2005), who found that environmental investments could lead to increased costs that do not directly impact a company's economic benefits. Another study by Teng et al. (2021) evaluated ESG risks. They reported that ESG had a significantly negative impact on SGR, as determined by the ordinary least squares (OLS). In contrast, ESG risk had a negative and significant effect on SGR at the upper quantiles of SGR but not at the median and lower quantiles when using quantile regression. This indicates that the negative relationship was more pronounced for firms in environmentally sensitive sectors. A study by Do et al. (2024), based on commercial banks in Association of Southeast Asian Nations (ASEAN) countries from 2015 to 2022, in which the Z-score was used as a proxy for bank stability, found that ESG had a significant negative impact on bank stability, as banks adopting ESG incur significant costs (drain the bank's resources) that have an inverse effect on bank stability.

Norocel and Vierescu (2024) examined the relationship between ESG (country level) and economic growth at the macro level. Their study used the gross domestic product (GDP) per capita growth rate (%) to measure economic growth in 27 European Union countries from 2000 to 2021. Their primary research question was to determine whether banks' ESG performance led to banks stability. They found and reported a negative relationship between ESG scores and economic growth, which holds in both the short and long term, and that banks' involvement in sustainable investing, such as green bonds, does not consistently improve economic growth. Several other studies (Ersoy et al., 2022; Aras & Kazak, 2022; Azmi et al., 2021; Shakil et al., 2019) involving banks did not use the SGR performance indicator of sustainable growth, as the literature often relies on accounting measures such as Tobin's Q and ROA.

2.4. Hypotheses development

Theoretical and empirical literature asserts that when banks are committed to sustainable development, as is expected of Nigerian banks through the NSBP, particularly in Principles 1,2 and 6, considering social and environmental issues when availing credit facilities, banks can mitigate adverse selection and moral hazard issues (Gangi

et al., 2019), thereby reducing to the barest minimum the bank risk-taking through reduced NPL ratio, thus better asset quality, used as a measurement for banking risk in this study.

Additionally, a closely related study involving banks, conducted by Firmansyah and Kartiko (2024), examined the relationship between green banking disclosure (related to the e-environment dimension of ESG) and the SGR, utilising data from 45 listed banks on the Indonesian Stock Exchange from 2004 to 2021. According to findings by Firmansyah and Kartiko (2024), green banking disclosure has a negative association with the SGR. However, neither significantly impacted the relationship when firm size and firm age were introduced as moderating variables. Still, when regressed with firm age, the relationship between green banking disclosure and SGR was enhanced, but only for state-owned banks. Consequently, it is reasonable to expect that ESG disclosure scores would affect banks' SGRs. Building on both the theoretical foundation, as viewed through the lens of stakeholder theory, and the empirical literature, we hypothesise as follows.

H1: Environmental, social, and governance disclosure has no significant effect on banks' risk-taking.

H1a: Environmental disclosure has no significant effect on banks' risk-taking.

H1b: Social disclosure has no significant effect on banks' risk-taking.

H1c: Governance disclosure has no significant impact on banks' risk-taking.

H2: Environmental, social, and governance disclosure has no significant effect on the sustainable growth of banks.

H2a: Environmental disclosure has no significant effect on banks' sustainable growth.

H2b: Social disclosure has no significant effect on the sustainable growth of banks.

H2c: Governance has no significant effect on the sustainable growth of banks.

3. RESEARCH METHODOLOGY

This study investigated the impact of sustainability reporting (ESG disclosure) on asset quality and SGR of banks in Nigeria. According to the CBN (2024), as of April 26, 2024, there were 44 banks in Nigeria. The analysis employs a sample of 16 quoted banks on the NGX, comprising 14 deposit money banks, one microfinance bank, and one mortgage bank, for the period of ten years (2014–2023). These 16 listed banks account for 17.68% of the all-share index, the 3rd-largest after telecommunications services (30.61%) and materials (23.14%) as of December 2023. The start period is relevant to the study as the CBN (2012) require banks to start reporting their ESG activities, effective from 2014. The availability of ESG disclosure data determined the final selection of sampled banks. We removed four deposit money banks due to the unavailability of ESG disclosure score data between 2014 and 2023. bringing the final sample size to 10 banks. All 10 banks are privately owned commercial banks with a combined asset base of 104,18 trillion Nigerian nairas, representing 85.53% of the total assets of all deposit money banks, which stood at 121,80 trillion Nigerian nairas as of December 2023, translating to a 52% share of Nigeria's nominal GDP (EntepriseNGR, 2024).

3.1. Measurement of variables

In this study, we measure sustainability reporting using ESG disclosure scores, which serve as the explanatory variables. The Bloomberg terminal is the primary source of our ESG data, and all other data used in this study. ESG scores are based on the extent of a company's ESG disclosure. The score ranges from zero for companies that do not disclose any ESG data to 100 for those that disclose every data point. The environmental (E), social (S), and governance (G) pillars are equally weighted within the overall ESG disclosure score. Each topic within a pillar is equally weighted, and topic weights are allocated across fields related to the issue, with quantitative fields weighted more heavily than binary fields. Owing to its reliability, transparency, and objectivity, the Bloomberg ESG disclosure score has been widely used in ESG and finance-related research (Anifowose, 2025; Manta et al., 2025; Gurol & Lagasio, 2022; Bermejo et al., 2021; D'Amato et al., 2021; Wong et al., 2021; Baldini et al., 2018).

Dependent variables: This study employs two dependent variables: the non-performing loans to total loans (*NPL*) ratio, which serves as a measure of bank risk. *NPL* has been used in existing literature as an ideal measure of bank risk and, by extension, asset quality (Liu & Xie, 2024; Gangwani & Kashiramka, 2024; Izcan & Bektas, 2022). CBN's prudential guidelines mandate that banks in Nigeria maintain an *NPL* ratio of not more than 5.00%.

Corporate sustainability is measured by the *SGR*. *SGR* measures how much a bank can grow without borrowing additional funds and is used as a proxy for banks' sustainability, as guided by Lin (2024), Ramadhan et al. (2024), Zhang (2024), Chai et al. (2023), and Teng et al. (2021).

Control variables: This study uses eight control variables of bank attributes that are likely to impact bank risk and *SGR*, as follows: total assets (*TA*), number of employees (*NOE*), capital adequacy ratio (*CAR*), net interest margin (*NIM*), and financial leverage (*FL*), efficiency ratio (*ER*), women on board (*WOB*), net income per employee (*NIPE*). Table 1 summarises the definitions of all variables.

Table 1. Definitions of variables used

Variables	*Acronym*	*Description*
Explanatory variables		
ESG disclosure score	*ESGD*	The measurement of the bank's sustainability reporting/disclosures on ESG
Environmental disclosure score	*EDS*	Measurement of banks' environmental disclosures
Social disclosure score	*SDS*	Measurement of the bank's social disclosures
Governance disclosure score	*GDS*	Measurement of the bank's governance disclosures
Dependent variables		
Non-performing loans to total loans	*NPL*	This is a measure of a bank's risk-taking, a ratio comparing the amount of non-performing loans to total loans as a percentage
Sustainable growth rate	*SGR*	A measure of how much a bank can grow without borrowing more money. Return on common equity * (1 – (dividend payout ratio / 100))
Control variables		
Total assets	*TA*	The natural logarithm of total assets (bank's size)
Financial leverage	*FL*	This is a measure of the average assets to average equity
Efficiency ratio	*ER*	Efficiency measure is also known as the cost-to-income ratio
Capital adequacy ratio	*CAR*	Measures the ratio of tier 1 capital to risk-weighted assets at a given year, or the capital adequacy ratio f total risk-based capital to risk-weighted assets
Annualised net interest margin	*NIM*	A measure of the net return on the bank's earning assets
Percentage of women on board	*WOB*	A measure of the percentage of board members who are women
Number of employees	*NOE*	The total number of full-time employees
Actual net income per employee	*NIPE*	Measurement of employees' productivity

3.2. Model estimations

We used the panel corrected standard error (PCSE) estimation method as our baseline model to estimate the impact of sustainability reporting (ESG) on the two dependent variables (*NPL* and *SGR*). We supplemented this with a robustness check using 2SLS to address endogeneity. Our data, covering 10 banks, spans the period from 2014 to 2023. Although *N* (denotes the number of cross-sectional units) is small, *T* (represents the number of time periods observed for each unit) is moderate, and the time-series cross-section aligns with the research questions. We also deployed tests, including the Breusch-Pagan, Pesaran CD (cross-sectional dependence), and Wooldridge tests, which reveal three major features of the data, as shown in the summary statistics. Heteroscedasticity is evident, with larger banks exhibiting greater variance in *NIPE* and *TA* than smaller banks. Additionally, all banks in the sample exhibit contemporaneous correlation, as existing banking policy — specifically, NSBP — as well as other policy changes and economic conditions affect all banks in any given year.

Therefore, we deploy the PCSE model proposed by Beck and Katz (1995) because it can estimate a very reliable small-sample standard error, as seen in our current data, and provides easy-to-interpret results from the estimation, surpassing pooled OLS. It captures serial and contemporaneous correlations, as well as heteroscedasticity. In addition, we use the 2SLS to address endogeneity concerns, especially by instrumenting some regressors with variables that may be strongly correlated or uncorrelated with the current error term. The primary 2SLS tests of endogeneity used in this study are the Durbin (score) chi^2 and the Wu-Hausman test for the F-statistic weak instrument test, and the Sargan (score) and Basmann chi^2 for the instrument validity test.

The following equations are, therefore, used to provide a regression analysis that addresses the eight hypotheses of this study.

Bank risk model

$$NPL_{it} = \varphi_i + \beta_1 ESGD_{it} + \gamma_1 CAR_{it} + \gamma_2 ER_{it} + \gamma_3 FL_{it} + \gamma_4 NIM_{it} + \gamma_5 NIPE_{it} + \gamma_6 NOE_{it} + \gamma_7 TA_{it} + \gamma_8 WOB_{it} + \varepsilon_{it} \quad (1)$$

$$NPL_{it} = \varphi_i + \beta_1 EDS_{it} + \beta_2 SDS_{it} + \beta_3 GDS_{it} + \gamma_1 CAR_{it} + \gamma_2 ER_{it} + \gamma_3 FL_{it} + \gamma_4 NIM_{it} + \gamma_5 NIPE_{it} + \gamma_6 NOE_{it} + \gamma_7 TA_{it} + \gamma_8 WOB_{it} + \varepsilon_{it} \quad (1a)$$

SGR model

$$SGR_{it} = \varphi_i + \beta_1 ESGD_{it} + \gamma_1 CAR_{it} + \gamma_2 ER_{it} + \gamma_3 FL_{it} + \gamma_4 NIM_{it} + \gamma_5 NIPE_{it} + \gamma_6 NOE_{it} + \gamma_7 TA_{it} + \gamma_8 WOB_{it} + \varepsilon_{it} \quad (2)$$

$$SGR_{it} = \varphi_i + \beta_1 EDS_{it} + \beta_2 SDS_{it} + \beta_3 GDS_{it} + \gamma_1 CAR_{it} + \gamma_2 ER_{it} + \gamma_3 FL_{it} + \gamma_4 NIM_{it} + \gamma_5 NIPE_{it} + \gamma_6 NOE_{it} + \gamma_7 TA_{it} + \gamma_8 WOB_{it} + \varepsilon_{it} \quad (2a)$$

where, *it* is a cross-sectional time series, φ_i, β_i, γ_i are the parameters to be estimated, and ε_{it} is the error term.

4. RESEARCH RESULTS

4.1. Descriptive statistics

Table 2 and Figure 1 present the descriptive statistics for all variables used in this study.

The overall *ESGD* mean is 33.71 on a scale of 0 to 100. This is below the average of 50. However, *GDS* is well above the average score of 50, at 70.52, compared to *SDS* and *EDS*, which are at lows of 22.03 and 8.45, respectively. This aligns with the fact that a governance framework has existed well before sustainability reporting, including the social and environmental dimensions of corporate governance.

Table 2. Descriptive statistics

Variable	Obs.	Mean	Std. dev.	Min	Max
SGR	99	11.764	6.986	0.282	37.315
NPL	100	5.138	3.764	0	19.783
ESGD	93	33.713	8.830	10.462	51.293
EDS	93	8.449	11.885	0	40.079
GDS	93	70.520	12.860	27.423	83.594
SDS	93	22.037	11.451	0	45.738
CAR	100	18.446	4.014	11.070	28.800
ER	100	62.024	14.049	26.013	88.956
FL	100	9.193	3.282	4.487	21.654
NIM	100	7.111	1.835	2.443	12.626
NIPE	100	16,728,247	21,818,739	-5,112,452	160,923,010
NOE	100	4,868	4,066	275	20,331
TA	100	4,178,156.823	4,748,185.417	382,562.312	26,457,042.000
WOB	93	24.055	10.333	0	45.454

Figure 1. Trends in ESG disclosure: Average disclosure scores per year (2014–2023)

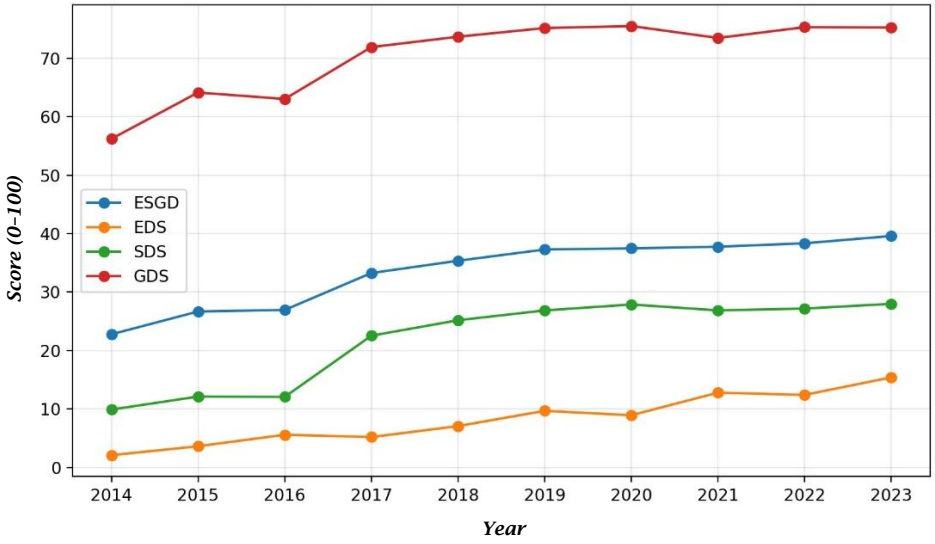

Table 3. Pairwise correlation

	ESGD	EDS	GDS	SDS	CAR	ER	FL	NIM	NIPE	NOE	TA	WOB
ESGD	1.000											
EDS	0.607	1.000										
GDS	0.855	0.179	1.000									
SDS	0.852	0.525	0.569	1.000								
CAR	-0.074	0.058	-0.146	-0.013	1.000							
ER	-0.105	-0.224	0.036	-0.163	-0.601	1.000						
FL	0.322	0.097	0.366	0.206	-0.428	0.215	1.000					
NIM	-0.376	-0.204	-0.317	-0.352	0.205	-0.281	-0.526	1.000				
NIPE	0.204	0.180	0.131	0.197	0.376	-0.694	-0.116	0.187	1.000			
NOE	0.249	0.121	0.272	0.136	0.217	-0.237	0.371	-0.243	-0.028	1.000		
TA	0.426	0.305	0.369	0.309	0.200	-0.463	0.430	-0.323	0.491	0.577	1.000	
WOB	0.417	-0.041	0.591	0.214	-0.201	0.078	0.245	-0.153	0.195	-0.087	0.182	1.000

The correlation matrix did not indicate multicollinearity, as none of the independent variables showed collinearity exceeding 0.80, either positive or negative. The highest negative correlation of 0.694 was observed between *ER* and *NIPE*, while the highest positive correlation of 0.577 was observed between *NOE* and *TA*. Thus, the variables in the study do not suffer from multicollinearity.

4.2. Estimation results

Table 4 presents the results from estimating Eq. (1), which represents the bank risk (*NPL*) equation, based on the aggregate of sustainability reporting *ESGD* and utilising the PCSE as our primary model of analysis to correct for heteroscedasticity and possible contemporaneous correlation. To ensure robust baseline estimation, we employed the instrumental variables method via 2SLS to address endogeneity concerns.

Table 4. Effect of ESGD on NPL

Variables	*PCSE, main analysis*	*2SLS, robustness*
ESGD	-0.0581*	-0.0737*
	(0.0326)	(0.0383)
LnTA	3.3466**	4.4698***
	(1.3457)	(1.6300)
LnNOE	-1.8586	-0.7956
	(1.3431)	(0.9770)
NIM	0.8832***	1.4359***
	(0.2705)	(0.3754)
FL	-0.1828*	-0.2189
	(0.0986)	(0.1563)
ER	-0.0523	0.1887**
	(0.0550)	(0.0874)
CAR	-0.0196	
	(0.1104)	
WOB	0.0263	-0.0031
	(0.0310)	(0.0387)
LnNIPE	-1.7177**	
	(0.7547)	
Constant	-1.2143	-71.9264***
	(15.58489)	(24.5019)
Endogeneity test Durbin chi²		5.63 (p = 0.02 < 0.05)
Weak instrument test F-stat: 22.62		5% (19.933)
Over identification test (Sargan) chi² p-value		0.01 (p = 0.91 > 0.05)

*Note: The standard errors are in parentheses; ***, **, * represent 1%, 5% and 10% levels of significance, respectively; LnNIPE: natural log of NIPE.*

The coefficient estimates indicate that ESG disclosure scores, number of employees, financial leverage, efficiency ratio, capital adequacy ratio, and net income per employee have a negative relationship with NPL as a percentage of total loans. Hence, there would be a decrease of 0.0581, 1.8586, 0.1828, 0.0523, 0.0196, and 1.7177 units in NPL because of a 1-unit increase in environment, social and governance disclosure scores, number of employees, financial leverage, efficiency ratio, capital adequacy ratio, and net income per employee respectively. Conversely, bank size, net income margin, and the proportion of women on the board have a positive relationship with NPL. Thus, a 1-unit increase in firm size, net income margin, and the number of women on the board would cause an increase of 3.3466, 0.8832, and 0.0263 units, respectively, in NPL.

Since ESG is weakly significant at 10%, then *H1* that ESG disclosure has no significant effect on banks' risk-taking is rejected in favour of the alternative hypothesis that ESG disclosure has a significant effect on banks' risk-taking.

Table 5 presents the disaggregated E, S, and D dimensions of disclosures to test Eq. (1a) and to conduct a further 2SLS test of endogeneity. For the EDS, the parameter estimates indicate that the EDS, number of employees, financial leverage, efficiency ratio, capital adequacy ratio, and net income per employee are negatively associated with NPL. EDS and net income per employee, as well as financial leverage, are significant at 1%, 5%, and 10%, respectively. In contrast, bank size (*LnTA*), net income margin, and the percentage of women on the board have a positive relationship with NPL. Hence, the NPL ratio would increase by 2.8812, 0.8358, and 0.0017 units, respectively, due to increases in bank size, net income margin, and the number of women on the board. Both bank size and net income margin are significant at the 1% and 5% levels, respectively, whereas the presence of women on the board is not statistically significant.

Since EDS is strongly significant at 1%, then *H1a* that EDS disclosure has no significant effect on banks' risk-taking is rejected in favour of alternative hypothesis that EDS disclosure has a significant effect on banks' risk-taking.

Table 5. NPL equation (1a): E, S, and G dimensions disclosures

Variable	*NPL (1)*		*NPL (2)*		*NPL (3)*	
	PCSE	*2SLS*	*PCSE*	*2SLS*	*PCSE*	*2SLS*
EDS	-0.0667***	-0.0686**				
	(0.0191)	(0.0316)				
SDS			-0.0198	-0.0364		
			(0.0210)	(0.0343)		
GDS					-0.0224	-0.0325
					(0.0268)	(0.0945)
LnTA	2.8812**	3.7372**	3.0033**	4.0901**	3.2137**	4.4618***
	(1.2883)	(1.4999)	(1.3279)	(1.6153)	(1.4117)	(1.7141)
LnNOE	-1.5703	-0.6248	-1.8157	-0.7796	-1.8984	-0.6998
	(1.2797)	(0.9366)	(1.3369)	(0.9952)	(1.3718)	(0.9924)
NIM	0.8358***	1.3196***	0.8945***	1.4143***	0.9264***	1.5450***
	(0.2713)	(0.3709)	(0.2851)	(0.3748)	(0.2656)	(0.3957)
FL	-0.1678*	-0.1945	-0.1732***	-0.2211	-0.1677*	-0.2196
	(0.0914)	(0.1514)	(0.0999)	(0.1578)	(0.1003)	(0.1599)
ER	-0.0600	0.1463*	-0.0581	0.1731**	-0.05662	0.2063**
	(0.0544)	(0.0838)	(0.0550)	(0.0861)	(0.0548)	(0.0945)
CAR	-0.0233		0.0011		0.0058	
	(0.1033)		(0.1087)		(0.1124)	
WOB	0.0017	-0.0274	0.0118	-0.0206	0.0318	0.0032
	(0.0323)	(0.0370)	(0.0351)	(0.0280)	(0.0324)	(0.0424)
LnNIPE	-1.4858**		-1.7027**		-1.8685**	
	(0.7013)		-0.7637		(0.8029)	
Constant	-0.4295	-60.4954***	1.988	-66.4794**	2.3811	-74.78105***
	(15.0791)	(23.0212)	(15.7585)	(24.0761)	(15.2373)	(26.2865)
Endogeneity test Durbin chi²		4.36		5.21		6.08
		p = 0.04		p = 0.02		p = 0.01
Weak instrument test-F-stat: 22.92		5%		5%		5%
		19.93		19.93		19.93
Over identification test (Sargan) chi²		0.07 (p = 0.98)		0.00 (p = 0.89)		0.02 (p = 0.89)

*Note: The standard errors are in parenthesis; ***, **, * represents 1%, 5% and 10% levels of significance respectively.*

Regarding the SDS, estimated coefficients indicate that the SDS, number of employees, financial leverage, efficiency ratio, and net income per employee are negatively associated with NPL.

Thus, an increase in the SDS, number of employees, financial leverage, efficiency ratio, and net income per employee would cause a decrease of 0.0198, 1.8157, 0.1732, 0.0581, and 1.7027 units, respectively, in NPL. Meanwhile, net income per employee and financial leverage are significant at 5% and 10%, respectively, whereas the SDS, number of employees, and efficiency ratio are not significant. Conversely, firm size, net income margin, capital adequacy, and the presence of women on the board are positively associated with NPL. So, NPL would increase by 3.0033, 0.8946, 0.0011, and 0.0118 units, respectively, due to a 1-unit increase in firm size, net income margin, capital adequacy, and women on the board. Both firm size and net income margin are significant at 5% and 1% respectively.

However, SDS is insignificant, hence *H1b* that SDS disclosure has no significant effect on banks' risk-taking cannot be rejected in favour of alternative hypothesis that SDS disclosure has a significant effect on banks' risk-taking.

For the GDS, the PCSE results indicate a negative relationship among bank size, the efficiency ratio, and the SGR. Meanwhile, the GDS is statistically significant at the 5% level, whereas bank size and financial leverage are not. In contrast, the number of employees, net income margin, financial leverage, capital adequacy, proportion of women on the board, and net income per employee have a positive association with the SGR. However, net income margin, financial leverage, and net income per employee are statistically significant at 1% each.

Since GDS is insignificant, *H1c* that GDS disclosure has no significant effect on banks' risk-taking cannot be rejected in favour of alternative hypothesis that GDS disclosure has a significant effect on banks' risk-taking.

Table 6 below presents the results from estimating Eq. (2), the SGR of banks equation (dependent variable), starting with the aggregate sustainability disclosure score (*ESGD*). Table 6 presents the results for estimating Eq. (2a), disaggregated by the E, S, and D dimensions of disclosures, using the PCSE as our main analytical model. To ensure the robustness of the baseline estimation, we employed the 2SLS as a robustness test for endogeneity, thereby addressing endogeneity concerns.

Table 6. Effect of ESGD on SGR

Variable	*PCSE, main analysis*	*2SLS, robustness*
ESGD	-0.0950*	-0.1844***
	(0.0498)	(0.0588)
LnTA	-0.8845	11.4872***
	(1.6181)	(1.4428)
LnNOE	1.9761	-8.4674***
	(1.6790)	(1.3701)
NIM	0.8333**	1.8452***
	(0.3257)	(0.3456)
FL	1.0307***	0.3329
	(0.1645)	(0.2384)
ER	-0.0444	
	(0.0625)	
CAR	0.0074	-0.0563)
	(0.1565)	(0.2072)
WOB	-0.0074	-0.0895
	(0.0368)	(0.0544)
LnNIPE	4.8080***	
	(0.7529)	
Constant	-79.3693***	-95.7061***
	(18.6739)	(11.6838)
Endogeneity test Durbin chi²	30.38 (p = 0.00)	
Weak instrument test F-stat: 82.20	5% (19.93)	
Over ID test (Sargan) chi² p-value	0.95 (p = 0.33)	

*Note: The standard errors are in parenthesis; ***, **, * represents 1%, 5% and 10% levels of significance respectively.*

The estimated parameter under PCSE reveals that ESG disclosure, bank size, efficiency ratio, and percentage of women on the board have a negative association with the SGR. However, environmental sustainability and governance disclosure are statistically significant at the 10% level, whereas firm size, efficiency ratio, and percentage of women on the board are statistically insignificant. In contrast, the regression result shows that the number of employees, net income margin, financial leverage, capital adequacy, and net income per employee all have a positive relationship with the SGR.

H2 that ESG disclosure has no significant effect on the sustainable growth of banks has been rejected because ESG is significant at 10%.

Table 7 presents the output from the ESG and SGR of Eq. (2a). The coefficients under PCSE suggest that the environment disclosure score, bank size, efficiency ratio, and percentage of women on the board have a negative relationship with the SGR. However, only the EDS is significant at the 10% level, while bank size, efficiency ratio, and the presence of women on the board are not significant. The results also indicate a positive relationship between the number of employees, net income margin, financial leverage, and capital adequacy, and the SGR. Meanwhile, net income margin, financial leverage, and net income per employee are statistically significant at 5%, 1%, and 1%, respectively, whereas the number of employees and capital adequacy ratio are not statistically significant.

Since EDS is weakly significant at 10%, *H2a* that EDS disclosure has no significant effect on the sustainable growth of banks has been rejected in favour of alternative hypothesis that EDS disclosure has a significant effect on the sustainable growth of banks.

Additionally, the SDS, bank size, efficiency ratio, and the proportion of women on the board are negatively correlated with sustainability growth under PCSE. However, the values are statistically

insignificant. In contrast, net income margin, financial leverage, and net income per employee have a positive and significant effect on SGR. Meanwhile, capital adequacy has a positive but insignificant effect on the SGR.

Meanwhile, SDS is insignificant, hence *H2b* that SDS disclosure has no significant effect on the sustainable growth of banks cannot be rejected in favour of the alternative hypothesis that SDS disclosure has a significant effect on the sustainable growth of banks.

Table 7. Effect of E, S, and D dimensions disclosures on SGR

Variable	*SGR (1)*		*SGR (2)*		*SGR (3)*	
	PCSE	*2SLS*	*PCSE*	*2SLS*	*PCSE*	*2SLS*
EDS	-0.0526*	-0.0569				
	(0.0302)	(0.0510)				
SDS			-0.0284	-0.1021***		
			(0.0407)	(0.0556)		
GDS					-0.0659**	-0.1224***
					(0.0498)	(0.0318)
LnTA	-1.6895	10.8232***	-1.4816	11.3161***	-0.602	10.3310***
	(1.6491)	(1.4416)	(1.6530)	(1.5570)	(1.6668)	(1.2512)
LnNOE	2.2717	-8.6181***	2.0538	-8.8478***	1.7546	-7.3947***
	(1.7246)	(1.4226)	(1.7171)	(1.4667)	(1.6727)	(1.2707)
NIM	0.8219**	2.0173***	0.8558**	1.9119***	0.9202***	1.8713***
	(0.3264)	(0.3619)	(0.3369)	(0.3661)	(0.3137)	(0.3328)
FL	1.0626***	0.3482	1.0492***	0.303	1.0443***	0.4535**
	(0.1626)	(0.2448)	(0.1654)	(0.2504)	(0.1808)	(0.2226)
ER	-0.0593		-0.0549		-0.0437	
	(0.0633)		(0.0626)		(0.0638)	
CAR	0.0353	0.0195	0.0445	-0.0223	0.0347	-0.0009
	(0.1558)	(0.2083)	(0.1608)	(0.2144)	(0.1510)	(0.1916)
WOB	-0.0391	-0.1564***	-0.0311	-0.1415**	0.0278	-0.0121
	(0.0368)	(0.0557)	(0.0378)	(0.0546)	(0.0418)	(0.0579)
LnNIPE	4.9546***		4.8207***		4.4211***	
	(0.7840)		(0.7843)		(0.7907)	
Constant	72.9084***	-91.2449***	-72.6181***	-93.3948***	-75.2440***	-89.2545***
	(19.4409)	(11.8076)	(19.016)	(12.1712)	(19.7076)	(10.5106)

*Note: That standard errors are in parentheses; ***, **, * represent 1%, 5% and 10% levels of significance, respectively.*

For the GDS, the PCSE results indicate a negative relationship among bank size, the efficiency ratio, and the SGR. Meanwhile, the GDS is statistically significant at the 5% level, whereas bank size and financial leverage are not. In contrast, the number of employees, net income margin, financial leverage, capital adequacy, proportion of women on the board, and net income per employee have a positive association with the SGR. However, net income margin, financial leverage, and net income per employee are statistically significant at 1% each.

GDS is statistically significant at 5%; therefore, *H2c* that GDS has no significant effect on the sustainable growth of banks was rejected in favour of the alternative hypothesis that GDS has a significant effect on the sustainable growth of banks.

4.3. Robustness check

We conducted sensitivity checks on the 2SLS estimation. In using 2SLS, it must be ascertained that the instruments are valid, namely, 1) the instruments must be uncorrelated with the error term, and 2) the instruments are strongly correlated with the endogenous regressor (Eicher & Leukert, 2009).

The 2SLS test of the endogeneity tests based on the weak instrument test, using the 2SLS size of a nominal 5% Wald test, and the limited-information maximum likelihood (LIML) as an instrumental-variables estimator. The results show that the F-statistic from the first-stage regression was 22.6165, which exceeds the minimum eigenvalue statistic and the critical value shown above, indicating no weak-instrument problem. The further test of overidentification restriction shows that, since the p-values of Sagan and Basmann ($p > 0.91$) are both statistically insignificant, the *H1* of an invalid instrument is rejected, thereby confirming that the instruments used are valid (Appendix, Table A.1).

In the case of aggregate *ESGD* and banks' risk-taking, the parameter estimates for environment, social and governance disclosure score, number of employees, financial leverage, and women on the board show a negative relationship with NPL. Thus, increases in estimates of environmental sustainability and governance disclosure score, the number of employees, financial leverage, and the proportion of women on the board would, respectively, cause decreases of 0.0737, 0.7956, 0.2189, and 0.0031 units in NPL. Only the environmental sustainability and governance disclosure score is significant at a 10% confidence level. Conversely, firm size, net income margin, and efficiency ratio established a positive relationship with NPL. So, NPL would increase by 4.4698, 1.4359, and 0.1887 units due to a 1-unit increase in firm size, net income margin, and efficiency ratio. Firm size and net income margin are significant at 1% and 5%, respectively. The estimated elasticities, except for the efficiency ratio and women on board, are the same as those obtained under the PCSE method (see Appendix, Table A.1, which reports details of the 2SLS diagnostic tests).

Regarding the aggregate *ESGD* and sustainable growth of banks, the result showed that ESG disclosure (with a coefficient of -0.1844) and number of employees (with a coefficient of -8.4674) have a negative significant impact on SGR while firm size (with a coefficient of 11.4872) and net income margin (with a coefficient of 1.842) equally have positive and statistically significant influence on SGR

under the 2SLS output. Thus, the 2SLS elasticities confirm the PCSE output. Table A.3, Panels 2A–2C in the Appendix provide the diagnostic tests for sustainability.

5. DISCUSSION

We empirically examine the connection between sustainability reporting through the lens of the NSBP on banks' risk-taking (measured by NPL ratio) and SGR, The results show that ESG disclosure has a statistically significant negative effect on banks' risk-taking, under the PCSE and 2SLS, the coefficient of ESG is -0.0581, $p < 0.10$, and -0.0737, $p < 0.10$, confirming the robustness of the results. These findings imply that banks with higher ESG disclosure have lower NPL ratios and better asset quality.

This result differs from the results of previous researchers, such as Bruno et al. (2024), based on a study of European listed banks, which reports that banks with higher ESG disclosure levels have higher levels of NPLs, other studies by Manta et al. (2025), Aras and Kazak (2022), Ersoy et al. (2022). Azmi et al. (2021) also report a positive relationship. In contrast, Buallay et al. (2021) found no significant relationship between ESG and bank performance in developing countries. Our results align with the findings from previous related studies (Gangwani & Kashiramka, 2024; Galletta et al., 2023; Di Tommaso & Thornton, 2020; He, 2022; Cerqueti et al., 2021; Bolton, 2013), theoretically, the study results align with the stakeholder theory as postulated initially by Freeman (1984) that indeed banks respond to the interests of all stakeholders (customers, regulators, investors, staff, civil society, etc.), and by diligently deploying ESG disclosures through sustainability reporting, reduce information asymmetry, which in turn translates to building trust, providing the necessary environment for transparency and accountability and solves the agency problems, which are vital signals of the banks reputations and legitimacy that translate to lower bank risk (NPL).

Among the disaggregated ESG dimensions, environmental disclosure (*EDS*) shows the strongest negative impact on banks' risk-taking, with both PCSE and 2SLS estimates indicating that higher EDS scores may reduce risk-taking, leading to lower NPLs and better asset quality. Therefore, we fail to accept the hypothesis *H1a* on EDS and NPL. This result affirms that banks that have higher EDS reduce their NPL through the transparency and stakeholders' positive contributions to board oversight effectiveness, which potentially leads to better asset quality, as concerns for the environments compels the banks to ask tough questions in their credit/loan approval procedures that ensures that stakeholders painstakingly consider all the risk posed by the environment to banks loans book. Additionally, *H1b* hypotheses are partially accepted, as the SDS and GDS show a negative, insignificant relationship with banks' risk-taking. Thus, the results confirm that indeed SDS and GDS are not determining factors for lower NPL. The control variable outcomes also indicate that bank size and net interest margin are consistently positive and significant across all model in the relationship with NPL, suggesting that larger banks face greater challenges with NPL risks, possibly due to their extensive and complex balance sheets and loan portfolios and the higher margins that come with higher NPL. Also, the financial leverage and net income per employee contribute to the reduction in NPL in PCSE. In contrast, under 2SLS, the efficiency ratio is positive, suggesting that banks engaged in aggressive lending may inadvertently increase their NPL risk.

Regarding the relationship between ESG and SGR, the PCSE model indicates a negative correlation (*ESGD*: -0.0950, $p < 0.10$), suggesting that higher ESG disclosure scores are associated with lower SGRs. Additionally, the 2SLS model confirms the negative relationship more strongly, with a coefficient of -0.1844 ($p < 0.01$). The control variables, such as *NIM* (0.333, $p < 0.05$), *FL* (1.0307, $p < 0.01$), and *LnNIPE* (4.8080, $p < 0.01$), are positive and significant determinants of SGR. In contrast, bank size, number of employees, efficiency ratio, capital adequacy ratio, and percentage of women on the board are insignificant determinants of SGR. However, after correcting for endogeneity using the 2SLS model, bank size and the number of employees become significant.

Regarding the individual disclosure scores, the GDS has a consistent negative and significant effect on SGR across all models (PCSE: $\beta = -0.0659$, $p < 0.05$; 2SLS: $\beta = -0.1224$, $p < 0.01$); thus, we reject the hypothesis *H2c*. This result confirms that high monitoring costs are associated with GDS implementation, hindering sustainable growth in the short term. Similar high costs of environmental and social disclosures also seem to impact SGR, as the social and environmental disclosures are negative and statistically insignificant, and negative and significant, respectively. This negative relationship between ESG and SGR aligns with Lin's (2024) findings, which indicate that the environmental dimension negatively affects SGR. The negative relationship between environmental dimension and sustainable growth was corroborated by Hassel et al. (2005) and Wagner (2005), who found that environmental investments could lead to increased costs that do not directly impact a company's economic benefits. This finding contradicts the positive impact of ESG on SGR reported by Lin (2024) for firms in China, Chiaramonte et al. (2022) for European banks, and Choi et al. (2024) for Korean financial firms. Other studies, such as those by Teng et al. (2021) and Norocel and Vierescu (2024), also confirm the negative relationship identified in our research. In contrast, some studies, such as Prasad and Mondal (2025), established a positive relationship between ESG and SGR, as well as financial stability, in the context of banks in India, and Lin (2024), based on a study of Chinese listed companies, also reports a positive and significant relationship.

Therefore, this result suggests that there are short-term trade-offs between the resources available to stakeholders for implementing ESG strategies and pursuing sustainable growth. Enhancing factors, such as bank size, net interest margin, financial leverage, and net income per employee, are all positive and significant determinants of SGR. And this is further corroborated by Ullah et al. (2024), who found that there is a difference between developed and developing countries in terms of the moderating effects of regulatory quality and economic growth,

such that the study failed to detect any significant impact of regulatory quality and economic development and stability in developing countries. In contrast, in developed countries, regulatory quality had a significant positive effect on economic growth.

6. CONCLUSION

The importance of sustainability reporting as a CSR strategy enables banks, especially in developing countries like Nigeria, to continually assess the progress of their ESG practices and ensure they meet the Global Reporting Initiative standards, which can be independently verified by standards-setting organisations for effectiveness. To achieve this, there must be a culture that recognises the importance of not only the future of the banking system but also its impact on the broader society and the environment. Adhering to the sustainable banking principles should never be a 'tick-the-box' compliance checklist or 'greenwashing' to gain reputational advantages. This study demonstrates that ESG disclosures can mitigate banking risk, and environmental disclosures significantly reduce non-performing loans. However, it is not enough to guarantee a sustainable banking system. Therefore, additional macroprudential policies that strengthen the key factors for sustainable banking system growth are required. The low adoption rate of just 10 banks that meet the Global Reporting Initiative standards and have their ESG data available for scrutiny is abysmal, given the over 30 existing banks. Perhaps a compulsory timeframe for all banks to meet these requirements can drive greater adoption of sustainability reporting.

The results from this study, therefore, could prompt the regulator (Central Bank), policy makers and stakeholders to review and broaden the scope of the NSBP to be more adaptable, sanctionable, but avoid ESG over-tokenism with 'tick box' complainace, rather emphasis need to focus on improving regulatory quality and ensure processes that supports other factors such as bank recapilisation to boast bank size (total assets), net interest margin, net income from employees (generally profitability and productiveity) along with ESG activities contributes to SGR of banks. The regulator and stakeholders need to move more swiftly with the implementation of the International Sustainability Standards Board framework and conduct a climate-risk disclosure stress test to assess the level of risk exposure and develop viable strategies to mitigate these risks. Having a robust board risk management committee that prioritises environmental issues as they affect customers, suppliers, society, and the bank's business is a holistic management approach. For investors, this research indicates that despite the increasing number of countries implementing ESG policy rollbacks, sustainability issues remain significant in emerging markets. With proper regulations, banks in these jurisdictions can indeed be pro-ESG, providing investors with the right investment opportunities for a sustainable future.

This research shows that banks in Nigeria, which by the way, are expanding globally than any other banks on the continent of Africa, prioritise the stakeholder theory by taking deliberate strategies to address all stakeholders' interests and reduce to the barest minimum the agency problem through the adoption of sustainable banking principles reporting through ESG disclosures.

This study has some limitations, such as the small sample size, which limits the generalisability of the results, and the possibility of omitted variables, such as macroeconomic factors or other bank-specific variables, that may have different impacts on SGRs and banking risk. Secondly, the research is based on data from listed banks' disclosed ESG scores, which are self-reported and may be biased by each bank's unique practices. Thirdly, the study used NPL as a proxy for banking risk. Although NPLs are well established in the literature as an indicator of credit risk, they do not capture other risks, such as operational, reputational, and market risks.

Future studies need to consider the impact of multidimensional risk metrics on ESG to capture other possible spectra of bank risk vulnerabilities that may have influenced ESG practices. Also, as part of future studies in this field, researchers need to go beyond the quantitative methods used in our study and explore qualitative analysis to provide a better understanding of the impact of sustainability reporting on bank risk and SGRs.

Finally, future research can enrich the existing studies by undertaking a cross-country comparative analysis, as this would provide a better understanding of the impact of sustainability reporting across multiple jurisdictions and how each country's institutional and regulatory ecosystem impacts ESG practices, thus complementing our research, which is based on one developing country in Africa.

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APPENDIX

Table A.1. Endogeneity, instrument strength, and validity tests for the NPL model

2SLS test of endogeneity				
Durbin (score) chi²(1)	5.6298 (p = 0.0177)			
Wu-Hausman F(1, 90)	5.42659 (p = 0.0221)			
Weak instrument test				
The F-statistics of the first-stage regression	22.62			
2SLS relative bias	5%	10%	20%	30%
2SLS size of the normal 5% Wald test	19.93	11.59	8.75	7.25
LIML size of the normal 5% Wald test	8.68	5.33	4.42	3.92
Instrument validity test: Overidentification restriction				
Sargan (score) chi²(1)	0.011761 (p = 0.9136)			
Basmann chi²(1)	0.010693 (p = 0.9176)			

Table A.2. 2SLS tests of endogeneity on NPL

Endogeneity tests	***EDS***				***SDS***				***GDS***			
2SLS test of endogeneity												
Durbin (score) chi²(1)	4.36314 (p = 0.0367)				5.20794 (p = 0.0225)				6.08003 (p = 0.0137)			
Wu-Hausman F(1, 90)	4.14936 (p = 0.0446)				4.99738 (p = 0.0279)				5.88897 (p = 0.0172)			
Weak instrument test												
2SLS relative bias	5%	10%	20%	30%	5%	10%	20%	30%	5%	10%	20%	30%
2SLS S of N 5% Wald test	19.93	11.59	8.75	7.25	19.93	11.59	8.75	7.25	19.93	11.59	8.75	7.25
LIML S of N 5% Wald test	8.68	5.33	4.42	3.92	8.68	5.33	4.42	3.92	8.68	5.33	4.42	3.92
F-statistics: 1st stage	22.9248				23.5758				20.1498			
Decision rule	No weak instrument											
Instrument validity test: Overidentification restriction												
Sargan (score) chi²(1)	0.007774 (p = 0.9297)				0.000367 (p = 0.9847)							
Basmann chi²(1)	0.007607 (p = 0.9330)				0.000334 (p = 0.9854)							
Confirmation	Valid instruments used											

Note: S of N: size of nominal.

Table A.3. SGR model: Post estimation diagnostic tests for the 2SLS specification

2SLS test of endogeneity				
Durbin (score) chi²(1)	30.3808 (p = 0.0000)			
Wu-Hausman F(1, 90)	39.8470 (p = 0.0000)			
Weak instrument test				
F-statistics of first-stage regression	82.1975			
2SLS relative bias	5%	10%	20%	30%
2SLS size of normal 5% Wald test	19.93	11.59	8.75	7.25
LIML size of normal 5% Wald test	8.68	5.33	4.42	3.92
Instrument validity test: Overidentification restriction				
Sargan (score) chi²(1)	0.95445 (p = 0.3286)			
Basmann chi²(1)	0.87613 (p = 0.3493)			
Panel 2A: Environmental disclosure score				
2SLS test of endogeneity				
Durbin (score) chi²(1)	31.7905 (p = 0.0000)			
Wu-Hausman F(1, 90)	42.5706 (p = 0.0000)			
Weak instrument test				
F-statistics of first-stage regression	80.7314			
2SLS relative bias	5%	10%	20%	30%
2SLS size of normal 5% Wald test	19.93	11.59	8.75	7.25
LIML size of normal 5% Wald test	8.68	5.33	4.42	3.92
Instrument validity test: Overidentification restriction				
Sargan (score) chi²(1)	0.50844 (p = 0.4758)			
Basmann chi²(1)	0.46460 (p = 0.4955)			
Panel 2B: Social disclosure score				
2SLS test of endogeneity				
Durbin (score) chi²(1)	30.4170 (p = 0.0000)			
Wu-Hausman F(1, 90)	39.9156 (p = 0.0000)			
Weak instrument test				
F-statistics of first-stage regression	73.6974			
2SLS relative bias	5%	10%	20%	30%
2SLS size of normal 5% Wald test	19.93	11.59	8.75	7.25
LIML size of normal 5% Wald test	8.68	5.33	4.42	3.92
Instrument validity test: Overidentification restriction				
Sargan (score) chi²(1)	0.832987 (p = 0.3614)			
Basmann chi²(1)	0.763687 (p = 0.3822)			
Panel 2C: Governance disclosure score				
2SLS test of endogeneity				
Durbin (score) chi²(1)	26.6091 (p = 0.0000)			
Wu-Hausman F(1, 90)	33.0818 (p = 0.0000)			
Weak instrument test				
F-statistics of first-stage regression	99.7800			
2SLS relative bias	5%	10%	20%	30%
2SLS size of normal 5% Wald test	19.93	11.59	8.75	7.25
LIML size of normal 5% Wald test	8.68	5.33	4.42	3.92
Instrument validity test: Overidentification restriction				
Sargan (score) chi²(1)	0.70052 (p = 0.4026)			
Basmann chi²(1)	0.64138 (p = 0.4232)			