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Sustainability Report Disclosure Moderates the Relationship between Credit Growth and Bank Profitability in Vietnamese Commercial Banks

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Research Article

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Abstract

Today, banks no longer pursue profitability as their sole objective; they are also expected to achieve the broader goal of sustainable development. The preparation and disclosure of sustainability reports represent tangible evidence of banks' commitment to this objective. Using panel data from 26 listed commercial banks in Vietnam over the period 2011–2025, this study not only examines whether the disclosure of sustainability reports enhances bank profitability but also demonstrates that it alters the mechanism through which credit growth is translated into profits. The findings indicate that, in the context of banks pursuing sustainable development, credit expansion no longer translates into profitability as efficiently as before, reflecting the trade-off between growth objectives and sustainability goals. Furthermore, the study reveals that the moderating effect of sustainability reporting is heterogeneous across banks and depends on bank size. This perspective has received limited attention in the existing literature, which has predominantly focused on the direct impact of sustainability practices or sustainability disclosure on bank profitability.

JEL Classification: G21, M41, Q56

Introduction

Credit growth is one of the key drivers of bank profitability, as it expands the stock of interest-earning assets and increases income generated from lending activities [39]. However, excessively rapid credit growth may also increase credit risk, deteriorate asset quality, and adversely affect long-term profitability if the associated risks are not effectively managed [4, 29]. Therefore, the effect of credit growth on bank profitability is not necessarily positive across all banks.

Sustainability report disclosure may serve as an important moderating variable in the relationship between bank size or credit growth and bank profitability. According to Stakeholder Theory, the disclosure of sustainability-related information enhances transparency, reduces information asymmetry, and strengthens the confidence of investors, customers, and regulators [18, 20, 44]. Furthermore, pursuing sustainable development and publicly disclosing sustainability reports reflect a bank's commitment to environmental, social, and governance (ESG) risk management, thereby improving the quality of lending activities and mitigating the risks associated with credit expansion [9, 25, 50]. Banks with higher levels of sustainability disclosure generally exhibit stronger governance systems, enabling them to allocate capital more efficiently and maintain credit quality during periods of credit expansion [26, 33]. Consequently, sustainability report disclosure may strengthen the positive effect of credit growth on bank profitability or mitigate the adverse consequences of excessive credit expansion. Therefore, examining the moderating role of sustainability report disclosure in the relationship between credit growth and bank profitability is warranted from both theoretical and practical perspectives.

To the best of the author's knowledge, based on a comprehensive review of the empirical literature using the keywords "sustainability report disclosure," "ESG report disclosure," "sustainability disclosure," and "ESG disclosure," no prior study has examined sustainability report disclosure or ESG report disclosure as a moderating variable in the relationship between credit growth (or credit scale) and bank profitability.

Vietnam is one of the fastest growing emerging economies in Southeast Asia. A distinctive feature of its financial system is the pivotal role of the banking sector in mobilizing and allocating financial resources across the economy. The country's credit-to-GDP ratio has consistently remained at a very high level. By the end of 2025, outstanding credit to the economy was estimated at VND 18.4 quadrillion, raising the credit-to-GDP ratio to approximately 147% [3]. Bank credit typically accounts for 50–60% of the total funding provided to the economy, substantially exceeding the contributions of the corporate bond market (3–6%) and the equity market (10–18%), with the remainder financed through public investment, foreign direct investment (FDI), and firms' internal funds. Given that bank credit remains the primary source of financing for businesses and households, credit growth is widely regarded as a key driver of economic growth while also exerting a direct influence on the operating performance and profitability of commercial banks. Moreover, given the central role of the banking sector in the economy, banks' commitment to preparing and publicly disclosing sustainability reports can contribute to mitigating adverse environmental impacts, addressing poverty and inequality, and promoting sustainable economic development, thereby supporting the achievement of national Sustainable Development Goals (SDGs).

Despite this important role, Vietnamese regulations have not yet required commercial banks to disclose sustainability reports, although the legal framework governing environmental, social, and governance (ESG) issues has been introduced by the State Bank of Vietnam at an early stage. The first regulatory document was issued in 2015 to promote green credit growth and strengthen the management of environmental and social risks in lending activities. However, no regulation currently requires banks to disclose reports on their ESG-related performance or implementation outcomes. Instead, sustainability disclosure requirements are imposed by the Ministry of Finance on listed companies. Specifically, listed companies are required to disclose sustainability-related information in accordance with Circular No. 155/2015/TT-BTC, issued by the Minister of Finance on 6 October 2015. Under this Circular, a listed company may either prepare a standalone sustainability report or integrate sustainability information into its annual report. When incorporated into the annual report, sustainability-related information is presented in Section 6 named Environmental and Social Impact Report. Circular No. 155/2015/TT-BTC requires listed companies to disclose information on six environmental and social dimensions: (i) raw material management; (ii) energy and water consumption; (iii) compliance with environmental protection regulations; (iv) employee related policies; (v) responsibilities toward local communities; and (vi) green capital market activities. The first three disclosure requirements are exempted for firms operating in the financial, banking, securities, and insurance sectors.

Building upon the above arguments, this study seeks to address the existing research gap concerning sustainability report disclosure in the Vietnamese context. To achieve this objective, the remainder of the article is structured as follows. Section 2 reviews the literature on bank profitability, credit growth, and sustainability report disclosure. Section 3 describes the data and research methodology. Section 4 presents and discusses the empirical findings. Finally, Section 5 concludes the study.

Literature review

Bank Profitability

Bank profitability refers to a bank's ability to generate profits from the resources employed in its business operations. According to Rose & Hudgins, profitability reflects the effectiveness of a bank's management in utilizing its assets and capital while maintaining cost efficiency [39]. Similarly, Athanasoglou et al. argue that profitability is a comprehensive indicator of a bank's operating performance and financial strength, serving as a foundation for the stability and sustainable development of the banking system [4].

Bank profitability is influenced by a wide range of bank-specific and external factors. Among these, bank-specific characteristics have been the primary focus of empirical research, including bank size, credit scale or credit growth, the loan-to-deposit ratio, the cost-to-income ratio, the capital adequacy ratio, the non-performing loan ratio, and, in particular, the net interest margin [4, 11, 12, 14, 39, 40, 43].

Previous studies have employed a variety of econometric techniques to examine the determinants of bank profitability. Early studies, such as Bourke [7] and Molyneux & Thornton [32], primarily relied on conventional linear regression models, in which profitability indicators including return on assets (ROA), return on equity (ROE), and net interest margin (NIM) were specified as dependent variables, while bank-specific and macroeconomic factors were incorporated as explanatory variables. More recent studies have increasingly adopted the Generalized Method of Moments (GMM), arguing that this approach is better suited to addressing common econometric issues associated with banking panel data, particularly endogeneity and the dynamic nature of bank profitability, compared with alternative estimation techniques such as the Fixed Effects Model [13, 31, 36].

Credit and Bank Profitability

Lending activities generate higher returns than most other asset classes and securities; however, they are also associated with greater risk [12, 22]. All else being equal, a higher proportion of deposits converted into loans enables banks to generate greater interest income and achieve a higher net interest margin ([39, 48].

In the banking literature, credit related variables are commonly measured by the ratio of loans to total assets [6, 42] or by loan growth [13, 40]). Most empirical studies report a positive relationship between lending activities and bank profitability [6, 29, 40, 42]. Similar evidence has been documented for Vietnamese commercial banks, where lending activities are generally characterized by relatively low risk, stable returns, and strong income-generating capacity [30, 35].

Nevertheless, Demirgüç-Kunt and Huizinga [12] document a negative association between bank lending and pretax profits. However, when lending is interacted with GDP, the estimated effect becomes positive. This finding suggests that bank lending tends to be more profitable in countries with higher income levels, indicating that the profitability of lending activities depends, at least in part, on the broader macroeconomic environment.

Sustainability Report Disclosure and Bank Profitability

The concept of sustainable development was initially framed through the Triple Bottom Line (TBL) model proposed by John Elkington, which defines sustainability as the principle of ensuring that today's actions do not diminish the economic, social, and environmental opportunities available to future generations. Under this framework, an organization's sustainability performance is evaluated based on three pillars: economic, social, and environmental performance [17]. From this perspective, the economic dimension encompasses not only financial performance but also the economic value created for stakeholders and the economy as a whole.

With the growing importance of responsible investment and sustainable finance, however, the Environmental, Social, and Governance framework has gradually become the dominant approach, particularly in the banking and financial sectors. The ESG framework gained widespread recognition following the publication of the *Who Cares Wins* report by the United Nations Global Compact in 2004, which identifies environmental (E), social (S), and governance (G) factors as its three core dimensions [49]. Unlike the Triple Bottom Line framework, ESG does not regard the economic dimension as a separate pillar. Instead, corporate financial performance is viewed as an outcome reflecting the effectiveness of an organization's environmental, social, and governance practices. Consequently, contemporary studies commonly employ indicators such as ROA, ROE, NIM, and Tobin's Q to evaluate the effects of ESG practices or sustainability reporting on organizational performance [16, 28].

The existing literature, however, has not reached a consensus regarding the effect of sustainability report disclosure on bank profitability. A substantial body of research suggests that preparing sustainability reports and transparently disclosing environmental, social, and governance information to stakeholders can enhance banks' financial performance. Using a sample of 235 European banks over the period 2007–2016, Buallay finds that ESG disclosure has a positive effect on bank performance, particularly on return on assets and market value [9]. Banks with higher levels of ESG transparency generally achieve superior financial performance by enhancing their reputation, strengthening investor confidence, reducing information asymmetry, and improving corporate governance. Using a sample of Asian banks, Almunadiya and Widyawati [2] report findings consistent with those of Buallay [9]. Specifically, they show that sustainability report disclosure has a positive and statistically significant effect on both return on assets (ROA) and return on equity (ROE). Similar evidence has also been reported in country-specific studies. For example, Nandika and Abidin, using a sample of Indonesia's largest commercial banks during the 2022–2024 period [34], and Al-Dhaimesh and Al Zobi [1], examining banks in Jordan over the 2013–2017 period, both document a positive association between sustainability report disclosure and bank profitability.

In contrast to the studies reporting a positive relationship between sustainability report disclosure and bank profitability, a growing body of research has documented opposite findings. Using a sample of 882 banks from both developed and developing countries over the 11-year period following the 2008 global financial crisis, Buallay et al. find that ESG transparency has a negative effect on bank performance across both groups of countries [10]. Similarly, Buallay et al. examine the impact of sustainability disclosure on the performance of banks and financial services firms worldwide using a sample of 4,458 observations from 60 countries across seven regions (Asia, Europe, the Middle East and North Africa, Africa, North America, and South America) during the 2008–2017 period [11]. Their findings indicate that ESG disclosure has a negative impact on both bank profitability and market value. Furthermore, the effect of sustainability disclosure on firm performance is not homogeneous across regions. Specifically, the relationship between sustainability disclosure and bank performance is significantly negative in Australia, Europe, North America, and Africa, significantly positive in the Middle East and North Africa (MENA), and statistically insignificant in South America. Gupta using a sample of 400 listed banks from 19 countries over the period 2009–2022, also finds that sustainability report disclosure has a negative effect on bank performance [23]. Moreover, the study shows that country-specific characteristics shape this relationship: financial system development strengthens the negative effect of sustainability report disclosure on bank performance, whereas economic development exerts a positive moderating effect.

Overall, the literature on bank profitability and the effect of lending growth on bank profitability is extensive, covering a wide range of research contexts, sample sizes, and empirical methodologies. Nevertheless, the empirical evidence remains inconclusive. Likewise, although the relationship between sustainability report disclosure and bank profitability has been examined across different institutional settings and research designs, existing studies have produced mixed findings rather than a consistent conclusion.

Drawing upon the foregoing literature review and the Vietnamese context, this study examines the moderating role of sustainability report disclosure in the relationship between credit growth and the profitability of Vietnamese commercial banks. To the best of the author's knowledge, no prior study has investigated whether sustainability report disclosure moderates the relationship between credit growth and bank profitability. Accordingly, this study aims not only to address this research gap but also to provide empirical evidence on whether sustainability report disclosure moderates this relationship in the context of Vietnamese commercial banks.

Methodology

Data

Data for all variables were collected and calculated from the financial statements and annual reports of the 26 banks available on their official websites. Under the current regulatory framework in Vietnam, commercial banks are required to disclose their audited financial statements and annual reports on their official websites by the end of the first quarter of the subsequent year. These reports are generally available in the "Investor Relations" or "Shareholder Information" sections and are freely accessible to the public. Appendix A presents the list of sample banks, together with the links to the corresponding reports available on each bank's official website.

In particular, data for the sustainability report disclosure variable were manually collected from the official websites of individual banks. The variable is coded as a binary indicator, taking the value of 1 if a bank publicly disclosed a sustainability report in a given year and 0 otherwise. Vietnamese commercial banks that disclose sustainability reports present them either as standalone reports or as an audited section incorporated into their annual reports. During the study period, Vietnamese commercial banks were not required to adopt a uniform standard for preparing sustainability reports. In practice, however, most banks prepared their sustainability reports or ESG-related sections in annual reports primarily in accordance with the Global Reporting Initiative (GRI) Standards, while also referring to the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), the United Nations Sustainable Development Goals (SDGs), and, more recently, IFRS S1 (General Requirements for Disclosure of Sustainability-related Financial Information) and IFRS S2 (Climate-related Disclosures). Under these reporting frameworks, some banks disclosed comprehensive information covering environmental, social, and governance (ESG) issues, whereas others reported only selected aspects of these topics.

Research Procedure

Prior to model estimation, the data were screened to reduce the influence of outliers on the estimation results. Descriptive statistics and distribution plots were first examined to identify extreme observations. Based on this assessment, continuous variables exhibiting substantial skewness were winsorized at the 1st and 99th percentiles following the approach of Brownen-Trinh [8]. This procedure is consistent with common practice in finance research, where extreme observations may substantially distort regression estimates and descriptive statistics. Specifically, only continuous variables with highly skewed distributions or evident extreme values were winsorized. In contrast, the dummy variable sustainability report disclosure (SRD) was not winsorized, and the interaction term CGR_SRD was constructed directly from the original variables to preserve the economic interpretation of the empirical model. Descriptive statistics and the correlation matrix were then computed.

The empirical analysis began with estimating pooled ordinary least squares (Pooled OLS, POLS), the fixed effects model (FEM), and the random effects model (REM) to provide an initial comparison across alternative panel data specifications. The Breusch-Pagan Lagrange Multiplier (LM) test was subsequently conducted to choose between POLS and REM. The LM test results indicated that the random effects model was preferred to POLS. Next, the Hausman specification test was employed to determine the appropriate model between FEM and REM, with the results supporting the use of the fixed effects model.

The fixed effects model was initially estimated using cluster-robust standard errors to obtain estimates robust to heteroskedasticity within individual banks. Diagnostic tests were then performed to evaluate the underlying model assumptions. Specifically, the Modified Wald test indicated the presence of heteroskedasticity, the Wooldridge test detected serial correlation, and the Pesaran cross-sectional dependence test revealed the existence of cross-

sectional dependence across banks. In addition, multicollinearity among the explanatory variables was assessed using the Variance Inflation Factor (VIF), while the Durbin-Wu-Hausman test was employed to examine the potential presence of endogeneity, thereby enhancing the reliability of the estimation results.

Given the simultaneous presence of heteroskedasticity, serial correlation, and cross-sectional dependence, the fixed effects model with Driscoll-Kraay standard errors was adopted as the primary estimation approach. This estimator provides standard errors that are robust to heteroskedasticity, serial correlation, and cross-sectional dependence in panel data without requiring a specific covariance structure to be specified [15]. To further assess the robustness of the empirical findings, two additional robustness checks were performed. First, the fixed effects model with cluster-robust standard errors at the bank level was estimated to control for heteroskedasticity and serial correlation within individual banks. Second, the Fixed effects Generalized Least Squares (FEGLS) estimator was employed to compare the sign, magnitude, and statistical significance of the estimated coefficients across estimation methods. Comparing the results obtained from these alternative estimators provides additional evidence regarding the robustness and reliability of the empirical findings.

Finally, to examine the heterogeneity of the estimated effects, a heterogeneity analysis was conducted based on bank size. The sample was divided into two subsamples according to the median value of total assets to investigate whether the moderating effect of sustainability report disclosure on the relationship between credit growth and bank profitability differs between small and large commercial banks.

Empirical model

To examine the moderating role of sustainability report disclosure in the relationship between credit growth and the profitability of commercial banks, this study develops a panel data regression model. In the model, return on equity (ROE) is employed as the proxy for bank profitability. Credit growth (CGR) serves as the primary explanatory variable, while sustainability report disclosure (SRD) is incorporated as the moderating variable to examine whether the effect of credit growth on bank profitability varies when a bank publicly discloses a sustainability report. To capture this moderating effect, the model includes an interaction term between credit growth and sustainability report disclosure (CGR_SRD). In addition, the analysis controls for key bank-specific financial characteristics, including the net interest margin (NIM), non-performing loan ratio (NPLR), loan-to-deposit ratio (LDR), capital adequacy ratio (CAR), cost-to-income ratio (CIR), and bank size (LN_TA).

Accordingly, the empirical model is specified as follows:

$$ROE_{it} = \beta_0 + \beta_1 CGR_{it} + \beta_2 SRD_{it} + \beta_3 (CGR_{it} \times SRD_{it}) + \beta_4 NIM_{it} + \beta_5 LDR_{it} + \beta_6 NPLR_{it} + \beta_7 CAR_{it} + \beta_8 LN_TA_{it} + \beta_9 CI$$

where β_3 is the coefficient of primary interest, capturing the moderating effect of sustainability report disclosure on the relationship between credit growth and bank profitability. μ_i denotes the bank-specific effect, accounting for unobserved time invariant characteristics of individual banks, such as managerial capability, risk appetite, and business model. ϵ_{it}represents the idiosyncratic error term, capturing unobserved factors that vary over time and may influence bank profitability.

The definitions and measurements of all variables used in the empirical analysis are presented in Table 1.

Table 1
Definitions and measurement of variables

Variable	Measurement	Source
Return on equity (ROE)	$\frac{NetIncome}{AverageEquityCapital}$	[4, 39]
Net interest margin (NIM)	$\frac{(InterestIncome-InterestExpense)}{EarningAssets}$	[12, 14, 43]
Credit growth rate (CGR)	$\frac{OustandingLoans_t-OustandingLoans_{t-1}}{OustandingLoans_{t-1}}$	[13, 40]
Non performing loan ratio (NPLR)	$\frac{Nonperformingloans}{Oustandingloans}$	[24, 38, 41]
Loan to deposit ratio (LDR)	$\frac{Totalloans}{Totaldeposits}$	[39, 46]
Capital adequacy ration (CAR)	$\frac{Regulatorycapital}{Riskweightedassets}$	[24]
Sustainability report Disclosure (SRD)	A dummy variable, taking the value of 1 if the bank publishes a sustainability report in year *t*, and 0 otherwise	[2, 9, 34]
CGR*SRD	An interaction term measuring the moderating effect of sustainability report disclosure on the relationship between credit growth and net interest margin	
Natural logarithm of total assets (Ln_TA)	used as a proxy for bank size	[12, 19, 45]
Cost to income ratio (CIR)	$\frac{Totalcost}{TotalIncome}$	[40]
Research Hypotheses as follows:		

H1. Credit growth (CGR) has a significant effect on bank profitability, as measured by return on equity (ROE).

H2. Sustainability report disclosure (SRD) has a significant effect on bank profitability, as measured by return on equity (ROE).

H3. Sustainability report disclosure (SRD) moderates the relationship between credit growth (CGR) and bank profitability (ROE).

H4. The control variables, namely the net interest margin (NIM), non-performing loan ratio (NPLR), loan-to-deposit ratio (LDR), capital adequacy ratio (CAR), cost-to-income ratio (CIR), and bank size (LN_TA), have significant effects on bank profitability (ROE).

Data Preparation

Prior to model estimation, the continuous variables were examined for the presence of outliers using detailed descriptive statistics and boxplots in Stata. The results indicate that ROE, NIM, and CGR contain extreme observations. Specifically, ROE exhibits a highly left skewed distribution (skewness = − 3.499) with substantial kurtosis (36.620), whereas NIM and CGR are positively skewed, with skewness values of 1.142 and 1.789 and kurtosis values of 7.326 and 11.487, respectively. In addition, the minimum and maximum values of these three variables deviate considerably from the majority of observations in the sample, a pattern that is further confirmed by the boxplots. To mitigate the influence of extreme observations while preserving the sample size, the study applies winsorization at the 1st and 99th percentiles to ROE, NIM, and CGR prior to the regression analysis. Following winsorization, the transformed variables (ROE_W, NIM_W, and CGR_W) are used in all subsequent empirical analyses.

Empirical results

Descriptive statistics

Table 2
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROE	390	11.552	7.612	0	28.79
NIM	390	3.225	1.273	0.59	8.69
NPLR	390	2.264	2.002	0.46	23
LDR	390	89.977	18.648	36.33	178.93
CAR	390	12.968	4.098	7.98	40.15
CIR	390	49.109	21.497	-230.36	172.25
LN_TA	390	11.992	1.23	9.592	15.019
SRD	390	0.277	0.448	0	1
CGR	390	18.604	13.655	-15.96	78.71
CGR_SRD	390	4.815	8.506	0	45.02

Table 2 reports the descriptive statistics for the variables used in the study after winsorization. The average return on equity (ROE) is 11.55%, ranging from 0% to 28.79%. The net interest margin (NIM) has a mean value of 3.22%, with values ranging from 0.59% to 8.69%. Credit growth (CGR) averages 18.60%, varying between − 15.96% and 78.71%, indicating substantial variation in credit expansion across banks and over time.

Regarding the control variables, the average non-performing loan ratio (NPLR) is 2.26%, the average loan-to-deposit ratio (LDR) is 89.98%, and the average capital adequacy ratio (CAR) is 12.97%. These statistics suggest that although the sampled banks were exposed to credit and liquidity risks, they generally maintained capital adequacy ratios above the regulatory minimum. The cost-to-income ratio (CIR) averages 49.11%, while bank size, measured as the natural logarithm of total assets (LN_TA), has a mean value of 11.99.

With respect to the moderating variable, the mean value of the dummy variable sustainability report disclosure (SRD) is 0.277, indicating that sustainability reports were publicly disclosed in approximately 27.7% of all bank-year observations during the sample period. The interaction term between credit growth and sustainability report disclosure (CGR_SRD) has a mean value of 4.81, capturing the combined effect of credit growth among banks that publicly disclosed sustainability reports.

Correlation analysis

Table 3
Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) ROE	1.000									
(2) NIM	0.513***	1.000								
	(0.000)									
(3) NPLR	-0.318***	-0.080	1.000							
	(0.000)	(0.115)								
(4) LDR	0.371***	0.386***	-0.096*	1.000						
	(0.000)	(0.000)	(0.058)							
(5) CAR	-0.236***	0.211***	0.083*	-0.058	1.000					
	(0.000)	(0.000)	(0.103)	(0.250)						
(6) CIR	-0.482***	-0.284***	-0.021	-0.297***	0.107**	1.000				
	(0.000)	(0.000)	(0.681)	(0.000)	(0.035)					
(7) LN_TA	0.636***	0.118**	-0.181***	0.270***	-0.480***	-0.410***	1.000			
	(0.000)	(0.019)	(0.000)	(0.000)	(0.000)	(0.000)				
(8) SRD	0.451***	0.206***	-0.067	0.324***	-0.184***	-0.316***	0.606***	1.000		
	(0.000)	(0.000)	(0.190)	(0.000)	(0.000)	(0.000)	(0.000)			
(9) CGR	0.114**	0.050	0.013	-0.048	0.070	-0.053	0.003	-0.055	1.000	
	(0.025)	(0.322)	(0.795)	(0.343)	(0.170)	(0.294)	(0.950)	(0.276)		
(10) CGR_SRD	0.451***	0.281***	-0.047	0.324***	-0.133***	-0.311***	0.553***	0.916***	0.050	1.000
	(0.000)	(0.000)	(0.351)	(0.000)	(0.009)	(0.000)	(0.000)	(0.000)	(0.327)	
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$										

Table 3 presents the Pearson correlation matrix for the variables included in the empirical model. The results show that ROE is positively and significantly correlated with NIM, LDR, LN_TA, SRD, CGR, and the interaction term (CGR_SRD). In contrast, ROE is negatively correlated with NPLR, CIR, and CAR.

With respect to the relationships among the explanatory variables, most pairwise correlation coefficients have absolute values below 0.70 (Gujarati & Porter, 2009), suggesting that the linear associations among the explanatory variables are not sufficiently strong to raise concerns about multicollinearity. Although the interaction term (CGR_SRD) is highly correlated with SRD ($r = 0.9159$), this is a common feature of regression models that include interaction terms because the interaction variable is constructed directly from SRD and CGR. Therefore, this correlation should not be interpreted as evidence of severe multicollinearity. To formally assess this issue, the Variance Inflation Factor (VIF) is examined in the subsequent analysis.

Model selection

Following the estimation of POLS, FEM, and REM, the next step is to identify the most appropriate model specification. The selection process begins with the Breusch and Pagan Lagrange Multiplier test to compare POLS and REM. The Breusch and Pagan Lagrange Multiplier test for random effects yields a chibar²(01) statistic of 49.17 with a p-value of 0.0000, indicating that the presence of significant unobserved heterogeneity across banks at the 1% significance level. This result suggests that the pooled OLS model is inappropriate and that a panel data model accounting for individual specific effects should be employed.

The Hausman specification test is then conducted to choose between FEM and REM. The test produces a chi-square statistic of 26.81 with a p-value of 0.0015, indicating that the unobserved individual-specific effects are correlated with the explanatory variables. Consequently, the REM estimator is inconsistent, and the fixed effects model is preferred. Accordingly, FEM is selected as the appropriate specification for examining the relationships among the variables in this study.

Post estimation tests

To ensure the reliability of the estimation results, a series of post-estimation diagnostic tests was conducted.

Regarding heteroskedasticity, the test results indicate that both test statistics are statistically significant, with $\sigma^2_it = 38.779$) ($p < 0.01$) and $\sigma^2_i = 24.854$) ($p < 0.01$), confirming the presence of heteroskedasticity in the model. This finding implies that the error variance is not constant across observations or across banks. Consequently, conventional standard errors may produce unreliable statistical inference.

The Wooldridge test was then employed to detect first-order serial correlation in the panel data. The test yields an F statistic of 107.341 with degrees of freedom (1, 25) and a p-value of 0.000, indicating the presence of first-order serial correlation in the model residuals. This result suggests that estimation based on conventional standard errors may no longer be efficient, highlighting the need for an estimation approach that simultaneously accounts for both heteroskedasticity and serial correlation in panel data.

To assess multicollinearity, VIF was calculated for all explanatory variables. As reported in Appendix B, the VIF values range from 1.07 to 6.57, with the highest values observed for sustainability report disclosure (SRD) (VIF = 6.57) and the interaction term CGR_SRD (VIF = 6.43). The mean VIF is 2.63, which is well below the commonly accepted threshold of 10 [21]. Although SRD and the interaction term exhibit relatively high VIF values, this pattern is expected in regression models that include interaction terms because the interaction variable is constructed directly from its constituent variables. Overall, the VIF results indicate that multicollinearity is not a serious concern, and all explanatory variables are therefore retained for the subsequent regression analyses.

Regarding cross-sectional dependence, the Pesaran cross-sectional dependence test (Pesaran, 2021) was employed. The test yields a statistic of 7.173 with a p-value of 0.000, indicating the presence of cross-sectional dependence in the panel data. This finding suggests that the error terms across banks are correlated rather than independent. Such a result is consistent with the characteristics of the banking industry, where banks are simultaneously exposed to common macroeconomic shocks, monetary policy changes, and developments in financial market conditions. Furthermore, the average absolute value of the off-diagonal elements of the residual correlation matrix is 0.291, indicating a moderate degree of cross-sectional dependence among the banks in the sample.

Finally, to assess the potential presence of endogeneity, the study employed the Davidson-MacKinnon test for each explanatory variable. As reported in Appendix C, the variables NIM, NPLR, CAR, CIR, SRD, and CGR all have p-values greater than 0.05. Accordingly, there is insufficient evidence to reject the null hypothesis that these variables are exogenous. For LDR and bank size (LN_TA), the corresponding p-values are 0.0647 and 0.0668, respectively. Although these values are relatively close to the 5% significance threshold, they remain above the conventional significance level, indicating that there is no sufficient statistical evidence to conclude that either variable is endogenous.

Overall, at the 5% significance level, the explanatory variables can be regarded as exogenous. Accordingly, a static panel data framework is considered appropriate for the subsequent empirical analyses. Furthermore, to ensure the robustness of the coefficient estimates and statistical inference, the fixed effects model with Driscoll-Kraay standard errors is adopted as the primary estimation approach, as it provides standard errors that are robust to heteroskedasticity, serial correlation, and cross-sectional dependence simultaneously.

As discussed in the methodology section, two additional robustness checks are performed to evaluate the stability of the estimation results. First, the fixed effects model with cluster-robust standard errors at the bank level is estimated to account for heteroskedasticity and serial correlation within individual banks. Second, FEGLS estimator is employed to compare the sign, magnitude, and statistical significance of the estimated coefficients across alternative estimation methods. The results obtained from these three estimators are then compared to verify the robustness of the empirical findings and to confirm that the fixed effects model with Driscoll-Kraay standard errors provides the most appropriate specification for the data.

Regression results and discussion

Table 4
Regression results

	ROE	ROE	ROE
	Driscoll-Kraay FE	**Cluster-robust FE**	**FEGLS**
NIM	2.711***	2.711***	2.390***
	(0.612)	(0.389)	(0.201)
NPLR	-0.443*	-0.443	-0.526***
	(0.237)	(0.329)	(0.156)
LDR	0.012	0.012	0.014
	(0.022)	(0.020)	(0.011)
CAR	-0.156	-0.156	-0.000128
	(0.111)	(0.119)	(0.037)
CIR	-0.045	-0.045	-0.029*
	(0.031)	(0.039)	(0.016)
LN_TA	3.762***	3.762***	3.887***
	(0.605)	(0.779)	(0.582)
SRD	2.232	2.232	1.776**
	(1.694)	(1.364)	(0.708)
CGR	0.032	0.032	0.013**
	(0.023)	(0.023)	(0.006)
CGR_SRD	-0.130**	-0.130*	-0.089***
	(0.049)	(0.071)	(0.030)
Constant	-38.723***	-38.723***	
	(7.427)	(12.664)	
Observations	390	390	390
Within R-squared	0.547	0.547	0.536
Standard errors in parentheses			
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$			

To assess the robustness of the empirical findings, the study compares the estimation results obtained from three alternative estimators: the fixed effects model with Driscoll-Kraay standard errors (Driscoll–Kraay FE), the fixed effects model with cluster-robust standard errors at the bank level (Cluster-robust FE), and the Fixed-effects Generalized Least Squares (FEGLS) estimator. As reported in Table 4, the estimated coefficients exhibit consistent signs across all three models, indicating that the direction of the relationships among the variables remains stable regardless of the estimation method employed. Nevertheless, some differences emerge in the statistical significance of the estimated coefficients. For the main variables of interest, the results from the Driscoll-Kraay FE and Cluster-robust FE models are highly comparable. Specifically, the coefficients of CGR and SRD are positive but statistically insignificant in both models. In contrast, the interaction term (CGR_SRD) consistently exhibits a negative and statistically significant coefficient, although its significance level declines from the 5% level in the Driscoll-Kraay FE model to the 10% level in the Cluster-robust FE model. The FEGLS estimator yields statistically significant coefficients for all three main variables. However, FEGLS is designed to address heteroskedasticity and serial correlation but does not adequately account for cross-sectional dependence among banks. As demonstrated by the diagnostic tests, the sample simultaneously exhibits heteroskedasticity, serial correlation, and cross-sectional dependence. Consequently, although FEGLS produces a greater number of statistically significant coefficients, it does not fully accommodate the error structure of the panel data.

Overall, the robustness analysis confirms that the moderating effect of sustainability report disclosure on the relationship between credit growth and bank profitability is robust across alternative estimation methods, as evidenced by the consistently negative and statistically significant coefficient of the interaction term in all three models. By contrast, the direct effects of credit growth and sustainability report disclosure vary across estimation methods, suggesting that the empirical evidence regarding these direct effects is less robust. Accordingly, the fixed effects model with Driscoll-Kraay standard errors is adopted as the benchmark specification for interpreting and discussing the empirical findings in the following sections, as it provides standard errors that are simultaneously robust to heteroskedasticity, serial correlation, and cross-sectional dependence, making it the most appropriate estimator for the characteristics of the panel dataset.

The estimation results obtained from the fixed effects model with Driscoll-Kraay standard errors indicate that the model is jointly statistically significant ($F = 371.80$; $p < 0.01$). The model also achieves a within R^2 of 54.74%, indicating that the explanatory variables account for approximately 54.74% of the within-

bank variation in ROE over time.

With respect to the main variables of interest, CGR has a positive coefficient (β = 0.032) but is not statistically significant (p = 0.197), indicating that there is no empirical evidence to support a direct effect of credit growth on bank profitability. Similarly, SRD exhibits a positive coefficient (β = 2.232) but is also statistically insignificant (p = 0.209), suggesting that, when considered independently, the public disclosure of sustainability reports does not lead to a statistically significant difference in ROE across banks.

In contrast, the interaction term between credit growth and sustainability report disclosure (CGR_SRD) is negative and statistically significant at the 5% level (β = −0.130; p = 0.018), indicating that sustainability report disclosure moderates the effect of credit growth on bank profitability. Specifically, for banks that do not disclose sustainability reports (SRD = 0), the marginal effect of credit growth on ROE is 0.032, although this effect is not statistically significant. By contrast, for banks that publicly disclose sustainability reports (SRD = 1), the Wald test for the linear combination of coefficients reported in Table 5 indicates that the marginal effect of credit growth is − 0.098439, which is statistically significant at the 10% level (p = 0.068). These findings suggest that, among banks that publicly disclose sustainability reports, higher credit growth is associated with lower ROE.

These findings are consistent with the trade-off perspective, which suggests that pursuing sustainability objectives may come at the expense of financial performance, particularly in the short run. This perspective has been supported by several empirical studies, including Jeucken, Buallay et al., and Gupta [11, 23, 27]. According to Jeucken, the banking and financial services industry has responded relatively slowly to sustainability challenges [27]. Many banks have been reluctant to disclose sustainability-related information because doing so requires additional investments in human capital, including recruiting and training accounting and reporting professionals capable of preparing sustainability reports. As a result, the associated implementation costs may outweigh the expected benefits in the short term. Furthermore, pursuing sustainable development objectives requires banks to incur higher ESG compliance costs and more comprehensive risk management costs when expanding their lending activities. In addition to managing traditional banking risks, banks that publicly disclose sustainability reports are expected to incorporate environmental and climate-related risk management into their governance frameworks, lending policies, and credit approval processes. Integrating environmental and climate-related risks into lending decisions may also increase provisioning requirements and other risk management costs. Moreover, sustainable banking practices require banks to move beyond maximizing profits through aggressive credit expansion and instead allocate more credit to green projects and projects that promote broader social and community development objectives. Such projects are generally expected to generate lower financial returns than conventional commercial investments. Consequently, net interest margins and overall profitability are likely to come under downward pressure, particularly during the early stages of the sustainability transition, when banks have not yet secured sufficient low-cost funding sources, such as proceeds from green bond issuances, to finance sustainable investment projects.

Table 5
Marginal effect of credit growth when sustainability reporting is disclosed

ROE	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]
Marginal effect of CGR when SRD = 1	-0.098439	0.0498011	-1.98	0.068	-0.2052517; 0.0083736

With respect to the control variables, NIM has a positive and statistically significant effect at the 1% level (β = 2.711; p = 0.001), indicating that a wider spread between interest income and interest expense is an important driver of bank profitability. Bank size (LN_TA) also has a positive and statistically significant effect at the 1% level (β = 3.762; p < 0.01), suggesting that larger banks tend to achieve higher ROE, likely owing to economies of scale and greater opportunities for business diversification. In contrast, NPLR has a negative coefficient that is statistically significant at the 10% level (β = −0.443; p = 0.082), implying that deteriorating loan quality reduces bank profitability by increasing loan loss provisioning and lowering interest income from lending activities. Meanwhile, the coefficients of LDR, CAR, and CIR all exhibit the expected theoretical signs but are not statistically significant at conventional significance levels. Therefore, there is insufficient empirical evidence to conclude that these variables have a significant effect on ROE during the sample period.

Heterogeneity analysis by bank size

To examine whether the moderating effect of sustainability report disclosure varies with bank size, the study conducts a heterogeneity analysis by dividing the sample into two subsamples based on total asset size. Specifically, bank size is measured as the natural logarithm of total assets (LN_TA), with the sample median equal to 11.98. Accordingly, observations with LN_TA < 11.98 are classified as small banks, whereas those with LN_TA ≥ 11.98 are classified as large banks. Splitting the sample at the median ensures a relatively balanced number of observations in each subsample, thereby facilitating a meaningful comparison of the estimated effects across banks of different sizes.

Table 6
Regression results of heterogeneity analysis by bank size

	ROE	ROE
	Small banks	**Large banks**
NIM	1.541***	2.752***
	(0.348)	(0.597)
NPLR	0.161	-1.241***
	(0.122)	(0.339)
LDR	0.046***	-0.026
	(0.009)	(0.025)
CAR	0.086	-0.550*
	(0.060)	(0.259)
CIR	-0.073**	-0.321***
	(0.031)	(0.047)
LN_TA	5.412***	1.050
	(0.975)	(0.883)
SRD	3.674	1.563
	(3.512)	(1.368)
CGR	-0.005	0.140**
	(0.016)	(0.053)
CGR_SRD	-0.074	-0.163***
	(0.184)	(0.055)
Constant	-58.251***	15.454
	(12.756)	(13.524)
Observations	195.000	195.000
Within R-squared	0.534	0.644
Standard errors in parentheses		
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$		

The subsample analysis is subsequently estimated using the fixed effects model with Driscoll-Kraay standard errors, and the results are reported in Table 6. For the small-bank subsample, the estimation results indicate that CGR has no statistically significant effect on bank profitability (β = −0.005; p > 0.10). Likewise, the interaction term between credit growth and sustainability report disclosure (CGR_SRD) is not statistically significant (β = −0.074; p > 0.10). These findings suggest that, among small banks, the public disclosure of sustainability reports does not alter the relationship between credit growth and profitability. In other words, the analysis provides no empirical evidence of a moderating effect of SRD for this group of banks. In contrast, the results for the large-bank subsample reveal that credit growth has a positive and statistically significant effect on ROE among banks that do not publicly disclose sustainability reports (β = 0.140; p < 0.05). However, the coefficient of the interaction term (CGR_SRD) is negative and statistically significant at the 1% level (β = −0.163; p < 0.01), indicating that sustainability report disclosure substantially weakens the positive effect of credit growth on bank profitability.

To further evaluate the marginal effect of credit growth for large banks that publicly disclose sustainability reports, a Wald test of the linear combination of coefficients was performed. As reported in Table 7, the combined marginal effect of credit growth is no longer statistically significant (β = −0.023; p = 0.752). This finding implies that although credit growth generally enhances profitability among large banks, this benefit is almost entirely offset once these banks publicly disclose sustainability reports.

Table 7
Marginal effect of credit growth when sustainability reporting is disclosed for large banks

ROE	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]
Marginal effect of CGR when SRD = 1	-0.0230229	0.0713063	-0.32	0.752	-0.1759596; 0.1299139

With respect to the control variables, the results also reveal notable differences between the two subsamples. Among small banks, NIM and LDR have positive effects on ROE, whereas CIR exerts a negative effect. Bank size (LN_TA) continues to have a positive association with profitability within this subsample. In contrast, for large banks, NIM remains positively associated with ROE, while NPLR, CAR, and CIR all exhibit negative effects on profitability. These findings suggest that greater credit risk, higher capital requirements, and less efficient cost management contribute to lower profitability among large

banks. In particular, improving cost efficiency remains a major challenge for Vietnamese commercial banks. Overall, the heterogeneity analysis indicates that the moderating effect of sustainability report disclosure is evident only among large banks, whereas no comparable evidence is found for small banks. This finding suggests that bank size is an important condition determining the extent to which sustainability report disclosure moderates the relationship between credit growth and bank profitability.

From the perspective of Stakeholder Theory, large banks are subject to greater pressure from investors, customers, regulators, and other stakeholders to balance profitability with sustainable development objectives [18]. Likewise, Legitimacy Theory suggests that publicly disclosing sustainability reports enables large banks to maintain organizational legitimacy and meet the increasing expectations of society regarding the environmental and social responsibilities of financial institutions [47]. Consequently, these banks are likely to adopt a more prudent approach to credit expansion by prioritizing credit quality and ESG considerations rather than focusing solely on loan growth. Moreover, large banks generally possess stronger financial resources, more advanced technological capabilities, and superior managerial capacity, enabling them to integrate sustainable development objectives into their business strategies more effectively. As a result, the public disclosure of sustainability reports is more likely to exert a substantive influence on both their credit growth strategies and profitability. By contrast, smaller banks face relatively weaker stakeholder pressure and often lack the financial and organizational resources required to implement ESG practices comprehensively. Consequently, sustainability report disclosure does not appear to materially alter the relationship between credit growth and profitability within this group of banks.

Conclusion

According to the estimation results, credit growth does not have a statistically significant direct effect on bank profitability, while sustainability report disclosure also shows no significant direct effect on ROE. However, the interaction term between credit growth (CGR) and sustainability report disclosure (SRD) is negative and statistically significant at the 5% level, indicating that sustainability report disclosure weakens the effect of credit growth on bank profitability. These findings confirm the moderating role of sustainability report disclosure in the relationship between credit growth and bank performance.

From a policy perspective, sustainability report disclosure should not be viewed as a compliance cost that constrains credit expansion. Rather, it should be regarded as a governance mechanism that encourages banks to pursue higher quality and more prudent credit growth. Furthermore, adopting sustainable development practices is expected to generate long-term benefits, including improved financial performance, suggesting that sustainability initiatives should be considered not as short-term costs but as strategic investments that create long-term value and sustainable competitive advantages [5, 26, 50].

Accordingly, the primary objective of public policy should not be to relax sustainability reporting requirements but to facilitate banks' adaptation to these requirements so that they can simultaneously expand credit while preserving profitability. In this regard, regulators should continue to promote the public disclosure of sustainability reports, while providing clear, consistent, and practical reporting guidelines to reduce compliance costs and implementation uncertainty. At the same time, credit policies should encourage selective credit expansion rather than growth based solely on lending volume by promoting the allocation of credit to lower risk, more efficient, and sustainability oriented sectors.

From the banks' perspective, sustainability reporting should be regarded as a strategic management tool rather than merely a disclosure obligation. This requires banks to integrate sustainability considerations into their lending policies, credit appraisal procedures, and risk management frameworks in order to mitigate future environmental, social, and governance related risks. Banks should also improve the composition of their loan portfolios by shifting toward higher quality loans with more appropriate maturities and risk-adjusted profit margins, instead of pursuing credit expansion at any cost. Viewed from this perspective, publicly disclosing sustainability reports should not be seen as a factor that undermines profitability, but rather as a governance mechanism that promotes higher quality and more sustainable credit growth.

Declarations

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Ethics Approval: Ethical approval was not required for this study because it used only publicly available secondary data obtained from audited financial statements and annual reports of commercial banks. No human participants, animals, or identifiable personal data were involved in this research.

Originality Statement: The dataset and the findings reported in this manuscript have not been previously published and are not currently under consideration for publication elsewhere.

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Data Availability Statement: The data used in this study are secondary data collected from the audited financial statements and annual reports of 26 listed commercial banks in Vietnam for the period 2011-2025. In accordance with the current regulations of Vietnam on corporate information disclosure, these documents are publicly available and can be accessed free of charge through the official websites of the respective banks. The dataset was compiled, cleaned, and standardized by the authors for quantitative analysis. To preserve the integrity of the double-blind peer-review process, information regarding the data repository and its Digital Object Identifier (DOI) has been withheld from this manuscript. The dataset will be made available to the Editor or reviewers upon reasonable request during the review process and will be fully disclosed in the final published version of the article upon acceptance.

Author Contributions: The author conceived and designed the study; collected, compiled, cleaned, and analyzed the data; interpreted the findings; wrote the original manuscript; revised the manuscript critically for important intellectual content; and approved the final version for publication.

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