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THE IMPACT OF CORPORATE SUSTAINABILITY DISCLOSURE ON THE FINANCIAL PERFORMANCE OF LISTED CHEMICAL MANUFACTURING COMPANIES IN VIETNAM

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ABSTRACT

This study examines the empirical relationship between sustainability disclosure and corporate financial performance within the chemical manufacturing sector in Vietnam - an environmentally sensitive industry subject to rigorous regulatory oversight. Utilizing a balanced panel dataset of 27 listed chemical manufacturing enterprises over the period 2018–2023 (N = 162 firm-year observations), sustainability disclosure is quantified using a Sustainability Disclosure Index (SDI) evaluated via a binary content analysis framework based on Global Reporting Initiative (GRI) standards. Financial performance is measured through Return on Assets (ROA). To address heteroskedasticity common in panel data, Feasible Generalized Least Squares (FGLS) robust estimation is applied. The empirical findings confirm a statistically significant positive effect of SDI on ROA under the FGLS specification. Among the control variables, Long-term Debt Ratio (LEV) and Liquidity Ratio (LIQ) are negatively associated with ROA, Firm Age (AGE) is positively associated with ROA, while Debt-to-Asset Ratio (DA) is statistically insignificant. The results are consistent with Agency, Stakeholder, Legitimacy, and Signaling Theories, suggesting that transparent sustainability disclosure may help reduce information asymmetry, capital friction, and operational risk in emerging markets.

KEYWORDS: Sustainability disclosure, Sustainability Disclosure Index, Financial performance, Return on Assets, Chemical manufacturing, Vietnam, FGLS.

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1.0 INTRODUCTION

Over the past two decades, corporate sustainability disclosure has evolved from a voluntary corporate communication practice into an increasingly important component of corporate governance and financial strategy. In emerging market economies, rapid industrialization often creates tensions between economic growth objectives and environmental sustainability requirements. Among industrial sectors, chemical manufacturing provides an important case study. Although essential to industrial supply chains, this sector generates substantial negative environmental externalities, consumes significant natural resources, and poses considerable occupational safety risks.

In Vietnam, regulatory frameworks governing corporate disclosure have tightened significantly following Circular 155/2015/TT-BTC and its replacement, Circular 96/2020/TT-BTC, mandating enhanced environmental and social risk disclosures for listed entities. Despite these regulatory advances, empirical consensus regarding the financial payoffs of sustainability disclosure in developing economies remains inconclusive (Aifuwa, 2020; Monteiro et al., 2024). Proponents argue that voluntary disclosure mitigates information asymmetry, enhances stakeholder trust, and lowers capital costs, and several studies report that sustainability disclosure is positively associated with firm performance (Lawati & Hussainey, 2022; Zarefar et al., 2022). Conversely, traditional economic perspectives suggest that the resource allocation required to establish compliance and monitoring mechanisms diverts capital from core operational investments, yielding a neutral or negative net financial return; for example, Monteiro et al. (2024) find no significant difference in financial performance between large Portuguese companies that publish sustainability reports and those that do not.

This paper addresses this empirical debate by focusing on listed chemical manufacturing firms in Vietnam. The primary objective is to evaluate whether corporate sustainability disclosure, measured via a systematic Sustainability Disclosure Index (SDI), is positively associated with firm financial performance (ROA). By employing a Feasible Generalized Least Squares (FGLS) model on panel data spanning 2018 to 2023 across 27 listed firms, this study contributes firm-level empirical evidence to the corporate finance and sustainability literature in emerging Southeast Asian economies.

2.0 LITERATURE REVIEW

Corporate sustainability disclosure refers to the information that firms publicly report about their economic, environmental, and social performance and their governance practices. It is the channel through which corporate sustainable development, namely the strategic integration of economic growth, environmental stewardship, and social responsibility into core business operations, becomes visible to stakeholders. In recent years, sustainability disclosure has evolved from a voluntary corporate public relations effort into a central pillar of corporate governance and strategic risk management. In empirical research, the extent of disclosure is commonly quantified as a Sustainability Disclosure Index (SDI) through content analysis of annual and sustainability reports, often against the Global Reporting Initiative (GRI) framework, while firm performance is typically

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proxied by profitability measures such as ROA and ROE (Aifuwa, 2020). This study follows this approach: the SDI scores whether a firm discloses each information item covering the environmental, social, and governance dimensions, so the study measures the extent of sustainability disclosure rather than ESG performance or ESG ratings. The relationship between sustainability disclosure and financial performance has therefore attracted considerable research attention (Amrigan et al., 2023; Fauzi, 2021). Disclosure levels remain lower in developing countries than in developed ones (Aifuwa, 2020), and this is also the case in Vietnam, where the sustainable development information disclosed by listed firms is still limited and is associated with business efficiency, firm size, Big4 auditing, and board size (Van Linh, 2019). Studies on corporate social responsibility (CSR) disclosure, a closely related construct, show a similar pattern: among listed Vietnamese firms, CSR disclosure is higher for larger and more liquid firms, state-owned firms, and firms in environmentally sensitive industries (Nguyen et al., 2021).

A first stream of the literature finds that sustainability disclosure improves firm performance. Rooted in Stakeholder Theory and Signaling Theory, this stream argues that voluntary sustainability disclosure serves as a strategic signaling mechanism that resolves information asymmetry between corporate insiders and external capital providers, thereby lowering the cost of capital and enhancing operational reputation. Empirical evidence from emerging markets is largely supportive. Lawati and Hussainey (2022) show that Sustainable Development Goals (SDG) reporting, a form of sustainability disclosure has a positive effect on the financial performance of financial companies listed on the Muscat Stock Exchange during 2016–2020. Zarefar et al. (2022), using GLS regression on 850 listed Indonesian firms over 2014–2020, find that sustainability disclosure improves both market-based and accounting-based performance and that family ownership strengthens this relationship. Sulbahri et al. (2022) report a significant positive effect of sustainability reporting on ROA and ROE for 30 Indonesian listed banks over 2016–2019. In Vietnam, Anh and Hoa (2021) find a significant positive relationship between sustainability reporting and the business performance of listed enterprises during 2016–2019. Nguyen and Nguyen (2023) show, for 71 listed mining companies over 2018–2021, that environmental and social disclosure affects firm performance both directly and indirectly through sustainable development. Evidence on the closely related CSR disclosure points in the same direction: Nguyen et al. (2021) find that CSR disclosure significantly affects both ROA and ROE of Vietnamese listed firms, and La Nguyen et al. (2020) conclude that higher CSR disclosure is associated with lower bankruptcy risk among Vietnamese listed firms.

A second stream, grounded in Neoclassical Economic Theory, asserts that sustainability disclosure imposes direct administrative and compliance costs without providing corresponding operational offsets. In highly competitive or under-regulated emerging markets, financial resources dedicated to sustainability reporting infrastructures may be viewed as agency costs that yield negligible market differentiation, so that sustainability expenditures represent a net wealth transfer away from equity holders. This concern is consistent with the inconclusive evidence synthesized by Aifuwa (2020) for developing countries, and with the observation of Monteiro et al. (2024) that the financial

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benefits of sustainability disclosure may take a long time to materialize, so that costs borne in the short run are not immediately offset.

A third body of evidence reports insignificant, partial, or mixed effects. Monteiro et al. (2024), using 297 large Portuguese companies, find that companies publishing sustainability reports do not differ significantly in financial performance from those that do not, and this result holds across both univariate and multivariate analyses and across sector subsamples. Shaban and Barakat (2023), studying 13 Jordanian commercial banks over 2012–2021, find a strong linear relationship between sustainability reporting and both ROA and financial leverage, but no statistically significant relationship with ROE. In Vietnam, Nguyen and Nguyen (2021), using 27 listed firms over 2015–2019, find that CSR disclosure does not explain ROEA, and that only employee-related disclosure is significantly and positively associated with ROAA, whereas environmental, community, and product-related disclosures show no significant relationship with financial performance. These divergent results suggest that the effect of sustainability disclosure depends on the performance measure, the disclosure dimension, firm characteristics, industry sensitivity, and the regulatory context. In environmentally sensitive sectors, such as the Vietnamese mining industry examined by Nguyen and Nguyen (2023), disclosure is often interpreted through Legitimacy Theory as a means of maintaining the firm's legal and social "license to operate", meaning that financial benefits may materialize primarily through risk mitigation rather than direct revenue expansion.

Finally, several research gaps remain. While existing literature extensively covers general manufacturing in developed markets, empirical evidence focusing specifically on environmentally sensitive sectors within Southeast Asian transition economies remains scarce. Most prior Vietnamese studies rely on aggregate cross-sectoral samples of listed firms (Anh & Hoa, 2021; Nguyen et al., 2021; Van Linh, 2019), failing to isolate industry-specific sustainability risks, and the main single sector evidence concerns the mining industry (Nguyen & Nguyen, 2023), while little attention has been paid to chemical manufacturing. Several Vietnamese studies also measure disclosure through CSR items rather than a GRI-based sustainability disclosure index (La Nguyen et al., 2020; Nguyen & Nguyen, 2021; Nguyen et al., 2021), and some treat disclosure as an outcome of business efficiency rather than as a driver of financial performance (Van Linh, 2019). Moreover, prior studies may rely on ordinary least squares (OLS) estimators that fail to address diagnostic panel violations such as cross-sectional heteroskedasticity and autocorrelation. Furthermore, there is a lack of a standardized sustainability disclosure index tailored to Vietnamese reporting environments under unified GRI guidelines. This study addresses these gaps by measuring sustainability disclosure with an SDI for a single high-impact sector - chemical manufacturing - over a continuous six-year period using robust panel estimation methods.

3.0 THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

3.1. Theoretical background

The relationship between sustainability disclosure and firm financial performance can be explained through several theoretical perspectives.

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First, Agency Theory suggests that information asymmetry between managers and shareholders create a demand for external oversight. Sustainability disclosure serves as a governance mechanism to mitigate agency costs. Firms with comprehensive sustainability disclosure signal strong internal control, thereby reducing operational uncertainty and capital costs.

Second, Stakeholder Theory (Freeman, 1984) posits that firms must address the expectations of a broader set of stakeholders beyond shareholders. In environmentally sensitive sectors such as chemical manufacturing in Vietnam, sustainability disclosure enhances corporate reputation, reduces regulatory scrutiny, and builds stakeholder trust, ultimately boosting financial returns.

Third, Legitimacy Theory argues that organizations continuously strive to operate within societal boundaries and norms. Chemical enterprises engage in voluntary sustainability disclosure to maintain their social license to operate, avoiding costly environmental penalties, legal liabilities, and operational disruptions.

Fourth, Signaling Theory (Spence, 1973) indicates that voluntary sustainability disclosure enables high-performing firms to distinguish themselves from low-performing peers, reducing information asymmetry and attracting green investment.

3.2. Research hypothesis

Prior empirical evidence regarding the financial implications of sustainability disclosure remains mixed. On the one hand, studies in emerging markets, including Vietnam, report that sustainability disclosure, including CSR disclosure, is positively associated with firm performance (Anh & Hoa, 2021; Lawati & Hussainey, 2022; Nguyen & Nguyen, 2023; Zarefar et al., 2022). On the other hand, other studies find no significant difference or only partial effects (Monteiro et al., 2024; Nguyen & Nguyen, 2021; Shaban & Barakat, 2023). Because chemical manufacturing is an environmentally sensitive sector exposed to strong regulatory and social scrutiny, the benefits predicted by Agency, Stakeholder, Legitimacy, and Signaling Theories, namely reduced information asymmetry, stronger stakeholder trust, and preserved legitimacy, are expected to outweigh the compliance costs of disclosure. Accordingly, this study proposes:

H1: Corporate sustainability disclosure, measured by the Sustainability Disclosure Index (SDI), positively affects the financial performance of listed chemical manufacturing firms in Vietnam.

4. METHODOLOGY

4.1. Research Design

The study uses a combination of qualitative and quantitative research methods. The research focuses on 27 listed chemical manufacturing enterprises in Vietnam over the period from 2018 to 2023. The dataset consists of 162 observations, based on six years of data for each enterprise.

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The data are mainly collected from annual reports published on the official websites of the enterprises. In addition, the study uses information from CafeF, Vietstock, and Rồng Việt to supplement the data.

The dependent variable is financial performance, measured by Return on Assets (ROA), calculated as net income divided by average total assets (Xuyến & Chi, n.d.), where average total assets is the average value of the assets used by the firm during the period (VIB, 2023). The independent variable is the Sustainability Disclosure Index (SDI), which measures the extent of corporate sustainability disclosure. The SDI is assessed through binary content analysis of annual reports based on Global Reporting Initiative (GRI) standards, covering the environmental, social, and governance dimensions: each information item is scored 1 if it is disclosed and 0 otherwise, and the SDI is the ratio of the number of disclosed items to the total number of items in the index.

The study also includes Debt-to-Asset Ratio (DA), Long-term Debt Ratio (LEV), firm age (AGE), and liquidity (LIQ) as control variables in the research model. DA is measured by total debt divided by total assets, LEV is measured by long-term debt divided by total assets, AGE is based on the number of years since the firm's establishment, and LIQ is measured by current assets divided by current liabilities and reflects the firm’s ability to meet its debt obligations (Bùi, 2023).

4.2. Estimation Strategy and Diagnostic Procedures

The quantitative data are analyzed using panel data regression in STATA. The study considers three estimation methods: Pooled OLS, Fixed Effects Model (FEM), and Random Effects Model (REM). The Breusch–Pagan Lagrange Multiplier (LM) test is used to compare the Pooled OLS model with the Random Effects Model. Statistical significance is assessed at the 1%, 5%, and 10% levels.

The study also conducts diagnostic tests for the regression model. The Wooldridge test is used to examine autocorrelation, while the Variance Inflation Factor (VIF) is used to assess multicollinearity. The results show no first-order autocorrelation and no serious multicollinearity among the explanatory variables.

The Breusch–Pagan test is used to examine heteroskedasticity. The result shows the presence of heteroskedasticity, so the study applies the Feasible Generalized Least Squares (FGLS) method to address this problem. The final FGLS estimation is conducted with 27 groups and 162 observations.

4.3. Model Specification

The research model examines the relationship between sustainability disclosure and financial performance, with ROA as the dependent variable and SDI, DA, LEV, AGE, and LIQ as explanatory variables.

Research model:

$$ROA = \beta_0 + \beta_1 SDI + \beta_2 DA + \beta_3 LEV + \beta_4 AGE + \beta_5 LIQ + \varepsilon$$

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Variable definitions:

- ROA (Return on Assets): Financial performance, measured by net income divided by average total assets.
- SDI (Sustainability Disclosure Index): Extent of corporate sustainability disclosure, assessed through binary content analysis of environmental, social, and governance information items based on GRI standards.
- DA (Debt-to-Asset Ratio): Measured by total debt divided by total assets.
- LEV (Long-term Debt to Total Assets): Measured by long-term debt divided by total assets.
- AGE (Firm Age): Measured by the number of years since the establishment of the enterprise.
- LIQ (Liquidity): Measured by current assets divided by current liabilities.

5.0 RESULTS & DISCUSSION

5.1. Results

5.1.1. Descriptive Statistics of Variables

To identify the basic characteristics of the research variables, such as the maximum value, minimum value, mean value, and standard deviation between the mean values of the variables and their actual values, it is necessary to conduct descriptive statistics of the research sample. The descriptive statistics results are presented in the following table:

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
ROA	162	0.0871516	0.0688245	-0.1703627	0.3155521
SDI	162	0.126061	0.1750018	0	0.9375
DA	162	0.046231	0.1226682	-0.3783353	0.4627433
LEV	162	0.054586	0.0826059	0	0.343025
AGE	162	36.5	18.72529	9	96
LIQ	162	0.5170269	0.3711551	0.0914581	2.802536

(Source: Authors' calculations using Stata based on the model)

The descriptive statistics show that ROA ranges from a minimum of -0.170 to a maximum of 0.316 (about -17.0% to 31.6%), with a mean of 0.087 (about 8.7%) and a standard deviation of 0.069. This indicates that, on average, the sampled firms are profitable, while profitability differs considerably across firm-years, from loss-making to highly profitable observations.

The Sustainability Disclosure Index (SDI) ranges from 0 to 0.94, showing that the amount of sustainability information disclosed by the firms varies from no disclosure at all to a relatively high level of disclosure. The mean SDI is 0.13 with a standard deviation of 0.175, indicating that most firm-years disclose only a small share of the items in the index; in other words, sustainability disclosure among the listed chemical manufacturing firms in the sample is still limited.

The Debt-to-Asset Ratio (DA) ranges from -0.38 to 0.46, with a mean value of 0.05. The relatively low mean suggests that the sampled firms generally maintain a low level of debt relative to their

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total assets, indicating a relatively conservative debt financing structure. However, the considerable variation in DA across firms reflects differences in their capital structures and reliance on debt financing. Firms with higher debt-to-asset ratios may face greater financial obligations and financial risk, whereas firms with lower ratios may rely more heavily on other sources of financing. These differences may influence firms' financial flexibility and their ability to generate returns from their assets.

It is clear that enterprises in the sample mainly maintain a relatively conservative financial position, with the financial leverage index ranging from 0 to 0.34. This indicates that a small number of companies use leverage for growth, while the majority choose to maintain a low debt ratio or do not use debt. With a mean value of 0.05, this result shows that most enterprises in the study prioritize financial stability and avoid taking risks with debt to promote growth.

Firm age (AGE) ranges from 9 to 96 years, with a mean of 36.5 years and a standard deviation of 18.7. This shows that the sample includes both relatively young and long-established firms, which provides a diverse basis for examining the role of firm maturity in financial performance.

Liquidity (LIQ) ranges from 0.09 to 2.80, with a mean of 0.52 and a standard deviation of 0.37. Because a ratio below 1 means that current liabilities exceed current assets, the mean value suggests that the sampled firms generally have limited short-term payment capacity, and only a small number of firm-years (up to 2.80) show a comfortable liquidity position. This indicates considerable differences in short-term financial safety across firms.

5.1.2. Correlation Matrix

The study analyzes the correlation matrix among the variables in the sample to address the limitation of analyzing each variable separately by providing a more detailed perspective through the relationship between the dependent variable and the explanatory variables in the regression model, while also presenting a preliminary picture of the degree of correlation among the explanatory variables.

After running Stata, the results of the correlation analysis among the variables in the research model are presented in the following table:

Table 2: Correlation Matrix

Variable	ROA	SDI	DA	LEV	AGE	LIQ
ROA	1.0000					
SDI	0.2701	1.0000				
p-value	0.0005					
DA	0.3011	0.0448	1.0000			
p-value	0.0001	0.5713				
LEV	-0.1617	-0.1066	0.0471	1.0000		

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p-value	0.0398	0.1770	0.5520			
AGE	-0.0941	0.1112	-0.0239	0.0623	1.0000	
p-value	0.2335	0.1588	0.7627	0.4311		
LIQ	-0.2666	-0.1831	-0.0442	0.1587	-0.3031	1.0000
p-value	0.0006	0.0197	0.5766	0.0437	0.0001	

(Source: Authors' calculations using Stata based on the model)

The above table shows that the results of the pair wise correlation coefficient analysis among the explanatory variables indicate that no pair of variables has a pair wise correlation coefficient r_{ij} > 0.8.

It can be confirmed that there is no strong correlation among the explanatory variables in the model; therefore, the possibility of multicollinearity is very low or nonexistent. Thus, the accuracy of the estimates is not affected, supporting the use of these variables to analyze the linear regression model.

5.1.3. Regression Results

The research group runs the Pool, FEM, and REM models to select the most appropriate model for the study:

Table 3: Pooled OLS Model

c(ROA)	Coefficient	Std. err.	t	P > |t|	[95% Conf.	Interval]
SDI	0.0868596	0.0280175	3.10	0.002	0.0315169	0.1422022
DA	0.1572980	0.0392129	4.01	0.000	0.0798412	0.2347547
LEV	-0.0831911	0.0594656	-1.40	0.164	-0.2006528	0.0342707
AGE	-0.0006709	0.0002712	-2.47	0.014	-0.0012065	-0.0001352
LIQ	-0.0469582	0.0139393	-3.37	0.001	-0.0744924	-0.0194240
_CONS	0.1222361	0.0152432	8.02	0.000	0.0921264	0.1523458

(Source: Authors' calculations using Stata based on the model)

Table 4: REM Model

Variable	Coefficient	Std. err.	z	P > |z|	[95% Conf.	Interval]
SDI	0.0841471	0.0512070	1.64	0.100	-0.0162168	0.1845110
DA	0.1074563	0.0286605	3.75	0.000	0.0512828	0.1636298
LEV	-0.1928525	0.0767147	-2.51	0.012	-0.3432106	-0.0424945
AGE	-0.0005904	0.0005122	-1.15	0.249	-0.0015944	0.0004135
LIQ	-0.0338732	0.0167378	-2.02	0.043	-0.0666788	-0.0010677
_CONS	0.1211672	0.0251120	4.82	0.000	0.0719010	0.1704335

(Source: Authors' calculations using Stata based on the model)

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Table 5: FEM Model

Variable	Coefficient	Std. err.	t	P > |t|	[95% Conf.	Interval]
SDI	0.0940151	0.1238705	0.76	0.449	-0.1510478	0.3390781
DA	0.1003100	0.0290359	3.45	0.001	0.0428659	0.1577541
LEV	-0.2992764	0.1069545	-2.80	0.006	-0.5108749	-0.0876779
AGE	-0.0019347	0.0023154	-0.84	0.405	-0.0065154	0.0026460
LIQ	-0.0287043	0.0199264	-1.44	0.152	-0.0681263	0.0107178
_CONS	0.1724573	0.0842683	2.05	0.043	0.0057426	0.3391721

(Source: Authors' calculations using Stata based on the model)

Across the three specifications, SDI has a positive coefficient (0.0869 in the Pool model, 0.0841 in the REM, and 0.0940 in the FEM), but it is statistically significant only in the Pool model (p = 0.002), while it is marginally significant at the 10% level in the REM (p = 0.100) and insignificant in the FEM (p = 0.449). DA is positive and significant in all three models. LEV is negative and significant in the REM and FEM, AGE is significant only in the Pool model, and LIQ is negative and significant in the Pool model and the REM. These results are used as the basis for the model selection tests below.

a. Model Selection

Using the Breusch and Pagan test to choose between the Pool and REM models, the following table is obtained:

Table 6: Breusch and Pagan Test

Breusch and Pagan Lagrangian multiplier test for random effects

roa [id, t] = Xb + u [id] + e [id, t]

Estimated results:

Variable	Var	SD = sqrt(Var)
roa	0.0047368	0.0688245
e	0.0016557	0.0406906
u	0.0021990	0.0468935

Test: Var(u) = 0

chibar²(01) = 109.12

Prob > chibar² = 0.0000

(Source: Authors' calculations using Stata based on the model)

We observe that p-value = 0.000 < 0.1. Therefore, based on the Breusch and Pagan test, it can be stated that the REM model is more efficient than the Pool model; hence, the research group decides to select the REM model for further analysis.

Next, to choose between the FEM and REM models, the research group uses the Hausman test, with the following results:

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Table 7: Hausman Test

Variable	------ Coefficients ------		(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
	(b) fe	(B) re		
SDI	.0940151	.0841471	.009868	.1131304
DA	.10031	.1074563	-.0071463	.005087
LEV	-.2992764	-.1928525	-.1064239	.0749101
AGE	-.0019347	-.0005904	-.0013443	.0022639
LIQ	-.0287043	-.0338732	.005169	.0109038

b = Consistent under H0 and Ha; obtained from **xtreg.**
B = Inconsistent under Ha, efficient under H0; obtained from **xtreg.**

Test of H0: Difference in coefficients not systematic
chi2(5) = (b-B)'(V_b-V_B)^(-1)
= **5.75**
Prob > chi2 = **0.3312**

(Source: Authors' calculations using Stata based on the model)

From the Hausman test, p-value = 0.3312 > 0.1; therefore, between the FEM and REM models, REM is the more efficient model, and the research group decides to select the REM model for further analysis. Thus, the regression model has the following result:

ROA = 0.0841471SDI + 0.1074563DA – 0.1928525LEV – 0.0005904AGE – 0.0338732LIQ

b. Testing Model Defects

Next, the study conducts three tests for model defects, namely autocorrelation (Wooldridge test), multicollinearity (VIF), and heteroskedasticity (Breusch and Pagan test), with the following results:

**Autocorrelation:*

Table 8: Autocorrelation

Wooldridge test for autocorrelation in panel data
H_0: no first-order autocorrelation
F(1, 26) = **0.100**
Prob > F = **0.7546**

(Source: Authors' calculations using Stata based on the model)

The p-value (Prob > F) = 0.7546 > 0.1; therefore, there is no first-order autocorrelation in the model.

**Multicollinearity:*

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Table 9: Multicollinearity

Variable	VIF	1/VIF
LIQ	1.17	0.856559
AGE	1.12	0.889184
LEV	1.05	0.950164
SDI	1.05	0.953694
DA	1.01	0.990903
Mean VIF	**1.08**	

(Source: Authors' calculations using Stata based on the model)

The VIF coefficient = 1.08 < 2, so it can be accepted and there is no significant concern about multicollinearity.

**Heteroskedasticity:*

Table 10: Heteroskedasticity

Breusch and Pagan Lagrangian multiplier test for random effects

roa [id, t] = Xb + u [id] + e [id, t]

Estimated results:

Variable	Var	SD = sqrt(Var)
roa	0.0047368	0.0688245
e	0.0016557	0.0406906
u	0.002199	0.0468935

Test: Var(u) = 0

chibar²(01) = 109.12

Prob > chibar² = 0.0000

(Source: Authors' calculations using Stata based on the model)

We observe that p-value = 0.0000 < 0.1; therefore, heteroskedasticity exists in the model. Remedy for heteroskedasticity:

Table 11: Remedy for Heteroskedasticity

Cross-sectional time-series FGLS regression

Coefficients: **generalized least squares**

Panels: **heteroskedastic**

Correlation: **no autocorrelation**

Estimated covariances = **27**	Number of obs = **162**
Estimated autocorrelations = **0**	Number of groups = **27**
Estimated coefficients = **6**	Time periods = **6**
	Wald chi2(**5**) = **609.19**
Log likelihood = **300.0129**	Prob > chi2 = **0.0000**

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ROA	Coefficient	Std. err.	z	P > |z|	[95% Conf.	Interval]
SDI	0.0856057	0.005435	15.75	0.000	0.0749534	0.0962581
DA	0.0104385	0.0159502	0.65	0.513	-0.0208234	0.0417003
LEV	-0.2637095	0.0260301	-10.13	0.000	-0.3147276	-0.2126914
AGE	0.000525	0.0001046	5.02	0.000	0.00032	0.00073
LIQ	-0.0180112	0.0042718	-4.22	0.000	-0.0263837	-0.0096387
_CONS	0.0723839	0.0049626	14.59	0.000	0.0626573	0.0821104

(Source: Authors' calculations using Stata based on the model)

The model after remedying heteroskedasticity:

ROA = 0.0856057SDI + 0.0104385DA – 0.2637095LEV + 0.000525AGE – 0.0180112LIQ

In this model, SDI, LEV, AGE, and LIQ are statistically significant at the 1% level, whereas DA is not statistically significant (p = 0.513).

5.2. DISCUSSION

Thus, after testing for heteroscedasticity of the model and remediating it, the research team obtained the following results:

ROA = 0.0856057SDI + 0.0104385DA – 0.2637095LEV + 0.000525AGE – 0.0180112LIQ

From the figures of the above model, we can see:

The estimated coefficient of the Sustainability Disclosure Index (SDI) is positive at 0.0856057, indicating a positive relationship between sustainability disclosure and financial performance among listed chemical manufacturing firms in Vietnam, holding other variables constant. Specifically, a 0.10-unit increase in SDI is associated with an estimated increase in ROA of 0.00856, equivalent to approximately 0.856 percentage points, assuming that ROA is measured as a decimal ratio. This finding suggests that firms with more extensive sustainability disclosure may achieve better financial performance. The coefficient is statistically significant at the 1% level (z = 15.75, p = 0.000; 95% confidence interval from 0.0750 to 0.0963). It should be noted, however, that the SDI coefficient is insignificant in the FEM (p = 0.449) and only marginally significant in the REM (p = 0.100), so this significance is obtained under the FGLS specification. Accordingly, H1 is supported under the FGLS specification, although the evidence should be regarded as moderate given its sensitivity to the estimation method.

Several theoretical perspectives may help explain this positive relationship. First, sustainability disclosure may reduce information asymmetry between firms and external stakeholders. Investors often face difficulties in assessing firms' environmental and social risks when relevant information is incomplete or insufficient. By providing more systematic and transparent sustainability information, firms can reduce uncertainty and enable investors to make more informed decisions.

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An improved information environment may strengthen investor confidence, facilitate access to external financing, and potentially reduce the cost of capital. These benefits may support firms' investment activities and financial performance.

Second, the positive relationship may be explained by legitimacy theory. Chemical manufacturing firms operate in a sector associated with substantial environmental impacts, resource consumption, and occupational safety risks. Transparent sustainability disclosure enables firms to communicate their environmental and social practices and demonstrate accountability to regulators, local communities, and the wider public. Such disclosure may help firms maintain their social legitimacy, protect their corporate reputation, and foster more constructive relationships with regulatory authorities. These outcomes may contribute to a more stable operating environment and support long-term financial performance.

Third, sustainability disclosure may strengthen stakeholder trust. Investors, customers, employees, suppliers, and regulatory authorities increasingly value credible information about corporate responsibility and risk management. By disclosing sustainability-related information, firms can demonstrate greater transparency and responsiveness to stakeholder concerns. Stronger stakeholder relationships may facilitate cooperation with business partners, support customer confidence, improve employee commitment, and reduce potential reputational risks. These benefits may be particularly relevant to chemical manufacturing firms, for which environmental responsibility and operational safety are important concerns. Collectively, these mechanisms provide plausible explanations for the positive association between SDI and ROA, although the present model does not directly test these mechanisms.

Regarding the control variables, the estimated coefficient of DA is positive at 0.0104385 but statistically insignificant ($p = 0.513$), whereas the coefficient of LEV is negative at -0.2637095. The negative coefficient of LEV suggests that higher financial leverage is associated with lower ROA, potentially because debt obligations and interest expenses increase financial pressure and reduce the resources available for productive activities. The coefficient of AGE is positive at 0.000525, suggesting that older firms may benefit from accumulated experience, established business relationships, and organizational capabilities. In contrast, LIQ has a negative coefficient of -0.0180112, indicating a negative estimated relationship between liquidity and ROA. One possible explanation is that holding excess liquid assets may involve an opportunity cost if those resources are not allocated to more productive investments. Nevertheless, these interpretations remain tentative and should be evaluated in conjunction with the statistical significance of each coefficient and the precise definitions of the variables. In particular, DA is not statistically significant and should therefore not be interpreted as having an effect on ROA.

Overall, the findings indicate a positive estimated relationship between sustainability disclosure and financial performance among listed chemical manufacturing firms in Vietnam. The positive coefficient of SDI is consistent with the theoretical arguments that greater transparency may reduce information asymmetry, strengthen corporate legitimacy, and build stakeholder trust. These

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mechanisms may help firms improve their relationships with investors, customers, employees, and regulatory authorities, potentially creating more favorable conditions for financial performance. From a managerial perspective, the findings highlight the potential importance of systematic and transparent sustainability disclosure as part of corporate governance and financial management. However, the conclusions should be interpreted in light of the statistical significance of the estimated coefficients, the characteristics of the sample, and the limitations of observational panel data in establishing causal relationships.

6.0 CONCLUSION

This study examines the relationship between corporate sustainability disclosure and financial performance among listed chemical manufacturing firms in Vietnam. Using a balanced panel dataset of 27 firms over the 2018–2023 period, comprising 162 firm-year observations, the study constructs a Sustainability Disclosure Index (SDI) based on binary content analysis of sustainability-related information aligned with Global Reporting Initiative (GRI) standards. The Feasible Generalized Least Squares (FGLS) method is employed to estimate the relationship between SDI and financial performance, measured by return on assets (ROA), while controlling for debt-to-asset ratio (DA), long-term debt ratio (LEV), firm age (AGE), and liquidity (LIQ).

The empirical results reveal a positive and statistically significant relationship between sustainability disclosure and financial performance under the FGLS specification, so hypothesis H1 is supported. The positive coefficient of SDI suggests that firms with more extensive sustainability disclosure tend to exhibit higher ROA, holding other variables constant. Specifically, a 0.10-unit increase in SDI is associated with an estimated increase of approximately 0.856 percentage points in ROA, assuming that ROA is measured as a decimal ratio. This finding is consistent with the theoretical arguments that transparent sustainability disclosure may reduce information asymmetry, strengthen corporate legitimacy, and enhance stakeholder trust. These mechanisms may support firms' relationships with investors, customers, employees, and regulatory authorities, potentially creating favorable conditions for improved financial performance. Among the control variables, DA does not exhibit a statistically significant relationship with ROA, whereas LEV and LIQ are negatively associated with ROA, and AGE is positively associated with financial performance. These findings highlight the relevance of firms' financial structures, operating characteristics, and disclosure practices when examining financial performance in the chemical manufacturing sector.

From a managerial perspective, the findings suggest that chemical manufacturing firms should consider sustainability disclosure as part of their corporate governance and long-term financial management strategies. Rather than treating disclosure solely as a regulatory compliance exercise, firms may benefit from establishing systematic reporting processes, improving the consistency of disclosed information, and communicating their environmental and social practices more transparently. Such efforts may help strengthen stakeholder confidence and corporate reputation, although the financial benefits depend on firms' circumstances and the credibility of their disclosures. Policymakers and regulatory authorities may also contribute by promoting clear disclosure requirements and improving reporting consistency among listed companies.

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Despite these contributions, this study has several limitations. First, the sample is restricted to 27 listed chemical manufacturing firms in Vietnam over the 2018–2023 period, which limits the generalizability of the findings to other industries, countries, and time periods. Second, the SDI is constructed using a binary content analysis approach, which captures the presence or absence of disclosed information but may not fully reflect its quality, credibility, or actual sustainability performance. Third, the observational panel data and estimation approach identify statistical relationships but do not, by themselves, establish causality or directly test the underlying mechanisms involving information asymmetry, legitimacy, and stakeholder trust. Fourth, the SDI coefficient is insignificant in the FEM and only marginally significant in the REM, and becomes strongly significant only under the FGLS specification, so the statistical significance of the result may be sensitive to the estimation method; future studies should therefore report robust or firm-clustered standard errors.

Future research could extend the analysis to other environmentally sensitive industries and longer observation periods, incorporate alternative measures of sustainability disclosure quality, and examine individual environmental, social, and governance dimensions separately. Further studies could also employ additional robustness checks and research designs to investigate potential endogeneity and provide stronger evidence regarding causal relationships. Overall, this study contributes firm-level empirical evidence on the relationship between sustainability disclosure and financial performance in Vietnam's chemical manufacturing sector, highlighting the potential financial relevance of transparent corporate sustainability disclosure in an emerging market context.

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