



DOI: 10.22144/ctu.jen.2023.027

## The effect of environmental accounting information disclosure on financial performance of Vietnamese listed industrial firms: The moderating role of Leverage and Big4

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### Article info.

Received 08 Mar 2023

Revised 09 Apr 2023

Accepted 17 Apr 2023

### Keywords

*Environmental accounting, financial performance, information disclosure, legitimacy theory, stakeholder theory, voluntary disclosure theory*

### ABSTRACT

*Environmental Accounting Information Disclosure (EAID) is the most recent novelty in corporate non-financial information reporting practice. This study aims to evaluate the effects of EAID on the financial performance of Vietnamese enterprises. The population of this study comprises listed companies in the industrial sector on the Ho Chi Minh Stock Exchange for the period of five years (2017–2021). The research employed a purposive sampling technique and some analysis techniques, such as content analysis and regression analysis, including Ordinary Least Squares, Fixed Effects Model, Random Effects Model, and Feasible General Least Squares. The final regression results show a positive effect of EAID on profitability. Specifically, as a moderating variable, leverage weakens the relationship when financial performance is measured by ROA and ROE, whereas the quality of financial statements is assured by the Big 4, which strengthens the nexus between EAID and ROE. The study cannot confirm the negative moderating variable of the duality of the CEO position in the relationship. The research gives implications for improving financial performance with increased EAID and some future research directions.*

## 1. INTRODUCTION

Environmental issues such as climate change, pollution, waste management, and biodiversity loss, are becoming increasingly important to governments and businesses because of globalization and other trends in social and economic progress. As a result, environmental accounting information disclosure is the most recent novelty in corporate reporting practice. Environmental information of a corporation contributes to the environment, community, and society, both monetary and non-monetary information (Khuong et al., 2022). Corporate environmental accounting information disclosure (EAID) is reporting data from firms' environmental activities, resource utilization, and

environmental protection actions (Zeng et al. 2012). The Global Reporting Initiative (GRI) reports that by 2022, there will be a rising trend in the involvement of Asian corporations in climate reporting, based on data from a survey of six countries. Seventy per cent (70%) of the largest listed firms in Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam already provide climate-related statistics. Additionally, sixty-five per cent (65%) of the sampled Vietnamese companies have implemented GRI Standards (GRI, 2022).

Since the 1900s, scholars worldwide, particularly those concerned with environmental and social issues, have taken an interest in the growing body of research on CSR reports (Chand et al., 2022). Most

studies have found a relationship between environmental and social disclosure and profitability. Stockholder wealth rises when companies voluntarily report more financial and non-financial information (Alipour *et al.*, 2019; Ezeagba *et al.*, 2017; Yuen *et al.*, 2009). Due to requirements put in place by the Vietnamese government since 2013, Environmental Accounting Information Disclosure (EAID) has become more common practice among publicly traded Vietnamese companies followed by Circular 155/2015/TT-BTC and the adjusted Circular 96/2020/TT-BTC (Vietnamese Ministry of Finance, 2020). Businesses in Vietnam must show how they have helped promote environmental responsibility in accordance with government rules. However, these publicly traded companies have voluntarily disclosed their environmental information.

Recently, Vietnamese scholars have been getting increasingly interested in researching EAID. Specifically, there has been a rise in the number of Vietnamese academics that investigate the relationship between voluntary EAID and the profitability of businesses (Nguyen & Tran, 2019; Nguyen & To, 2020; Nguyen *et al.*, 2020; Nguyen & Nguyen, 2020). However, there remain empirical research and industry gaps in these recent studies. *As regards the empirical research gap*, primarily, previous papers have found a positive relationship between EAID and financial performance (Nguyen & Tran, 2019; Nguyen *et al.*, 2020; Nguyen & Nguyen, 2020). However, other findings revealed a negative relationship or no relationship when using different financial performance indicators (Nguyen & Tran, 2019; Nguyen, 2020; Nguyen *et al.*, 2022). *In terms of the industry gap*, most studies focus on the disclosure of environmental information in heavily polluting industries and various industries in the research sample. For instance, Nguyen & Tran (2019), and Nguyen *et al.* (2019) examined various industries; Nguyen (2017) and Nguyen (2020) examined construction firms; and Nguyen (2018) studied the credit institution context. However, there is a shortage of research on this topic in the key and developing sectors of Vietnam, such as agriculture, manufacturing, and transportation. As a result, this study focuses on the scope of the industrial sector in Vietnam. It is not complicated to figure out that Vietnam's industrial sector is one of the fastest-growing areas of the economy; it contributes almost 30% to Vietnam's Gross Domestic Product (GDP) between 2011 and 2020 (Hoang & Nguyen, 2021). In addition, by 2035, Viet Nam aims to have

developed industrial sectors where most targeted sectors efficiently use innovative technological developments and energy resources that towards environmental sustainability (Hoang & Nguyen, 2021). As a result, increasing the prevalence of EAID in industrial companies is crucial for environmental information disclosure. Therefore, this study aims to examine the effect of EAID on the profitability of Vietnam-listed industrial firms over a five-year period, from 2017 to 2021. This study attempts to answer the main research question: "What is the relationship between the level of environmental accounting information disclosure and financial performance in the industrial listed firms?"

This paper is divided into five sections. The remaining parts include a literature review and hypotheses, methodology, results and discussion, conclusions, and recommendations.

## 2. LITERATURE REVIEW, HYPOTHESES AND METHODOLOGY

### 2.1. Environmental accounting information disclosure

Environmental Accounting Information is based on recommendations for environmental accounting (EA) issued in 2001 and 2005, by the United Nations Commission on Sustainable Development (UNSD) and the International Federation of Accountants (IFAC), respectively (Nguyen & Tran, 2019). Governments, academia, and the general public have all been more concerned about environmental law and practice since the 1970s. Yet, since the 1990s, corporations in developed economies have investigated and implemented environmental accounting. Environmental accounting analyses and quantifies environmental expenses to assist management in deciding on environmental activities.

EAID is a gateway for reporting environmental accounting information from enterprises, concerning the way they use resources and protect the environment (Gray *et al.*, 1995). Environmental information is provided on topics such as resources, energy and water use, biodiversity, emissions, environmental complaint processes, and so on. Environmental information is one of the non-financial components of an annual report, sustainability report, or corporate social responsibility (CSR) report. Numerous international organizations have issued guidance for financial and non-financial information disclosure. The

International Accounting Standards Board (IASB), the Global Reporting Initiative (GRI), Directive 95/2014/EU, and the Financial Accounting Standards Board (FASB) all provide guidance to help publicly traded corporations prepare for information disclosure in annual reports. GRI establishes international standards for non-financial performance (Ismail et al., 2021). Based on the GRI's guidelines, the information publicly released comprises economics, environment, human rights, and social issues (GRI, 2021).

## 2.2. The nexus of EAI disclosure and financial performance

Scholars are now interested in how environmental information reporting initiatives affect the success of companies. Most studies have examined a variety of nations' backgrounds, including developed and developing countries, such as the USA, the UK, China, Australia, New Zealand. However, the research findings are still mixed. Several studies suggest that there is no connection between Environmental Information Disclosure (EID) and Financial Performance (FP) (Alikhani & Maranjory, 2013; Dragomir, 2010; Malarvizhi & Matta, 2016; Qiu et al., 2016). These studies suppose a tenuous link between sustainability and financial performance, which would not encourage businesses to disclose more non-financial information. Because of stakeholder demand, the corporation released its environmental accounting information, which is thought to have had a negative impact on financial performance (Aragon-Correa et al., 2016). However, Widiatami et al. (2021) discovered the detrimental impact of EID on FP as evaluated by the expansion of sales in the Indonesian food and beverage sector. The reason EI reporting has no impact on sales growth is that customers in this market are more interested in the green innovation strategies that businesses use than in the environmental information that businesses disclose on the annual reports (Widiatami et al., 2021). Although Khelif et al. (2015) also discovered that EI disclosure had a negative impact on FP measured by Tobin's Q in Morocco for the 5 - year period, the results also point that Morocco's environmental reporting rules have little effect on businesses, and as result, they do not incorporate environmental disclosure into their operations. On the other hand, EI reporting has a positive effect on enterprises' financial performance in South Africa (Khelif et al., 2015). They suppose that the nation's sectors are significantly impacted by the regulations controlling the reporting of non-financial

information. Other authors also confirm the positive relationship between EAID and financial performance (Abdullah et al., 2020; Chouabi et al., 2022; Constantinescu et al., 2021; Ezeagba et al., 2017; Yin et al., 2019; Wang et al., 2020). Because of mixed findings, the nexus between EAID and financial performance is needed to be examined in different countries.

## 2.3. Underpinning theories

The voluntary disclosure theory states that disclosing environmental information will boost a company's financial performance (Khelif et al., 2015). Companies that want to stand out from the crowd usually give out more information voluntarily so that investors can learn more about the company and judge it better. However, low-performance corporations will implement accounting practices that conceal low-quality information, whereas efficient financial-performance organizations will embrace accounting procedures that permit the disclosure of good environmental information (Morris, 1987). As a result, the level of information disclosure is influenced by the state of the company's development, including its size and rate of growth.

Dowling and Pfeffer (1975) developed the legitimacy theory in organizations. This theory points out that an organization needs to abide by societal values or standards to win the community's support. The needs of society are ever-changing, and businesses must change regularly to maintain the legality of their operations. Businesses must publish their data through corporate social responsibility reporting to show how their operations have changed to satisfy societal demands. Business operations are progressively impacting the environment. As a result, the public expects that firms will behave responsibly in terms of social responsibility and environmental protection. Businesses are thought to benefit greatly from business planning to satisfy their environmental protection duties and disseminate information on social responsibility. Businesses are under pressure to uphold their environmental responsibilities through environmental management and alter their accounting practices because of legal requirements and environmental advocacy groups' standards. Thus, the legitimacy theory clarifies why businesses must perform social responsibility reports that reveal information to support the organization's legality (Deegan, 2002). This theory also explains how managers' cognitive variables

would impact the reporting of environmental information, since favorable management responses would help the company establish legitimacy.

Stakeholder theory shows that shareholders and other diverse groups may impact how businesses behave (Freeman, 1999). A company's performance and ability to stick with things depends a lot on how it deals with these different groups (Freeman & Philips, 2002). Stakeholder theory places a lot of emphasis on the firm's stakeholders and suggests that a corporation should pay close attention to addressing the needs and interests of its stakeholders (Maignan & Ferrell, 2004). Stakeholder theory may also be a conceptual synthesis of various disciplines that provide strong sociological and organisational insights into corporate behaviour (Solomon, 2010).

#### 2.4. Conceptual Research and Hypotheses

Most existing studies confirm that disclosing EAI positively influences financial performance. When EAID is encouraged and society's awareness of the environment is enhanced, more businesses will help their financial situation improve (Abdullah et al., 2020). In addition, examining the relationship between environmental information disclosure and financial performance depends on several moderating variables in corporate governance and the quality of the annual report.

As mentioned in the previous part, there are mixed findings for determining the relationship between EID and FP in an international and national context. While Khelif et al. (2015), and Widiatami et al. (2021) found that EID had a negative effect on FP in the Indonesian food and beverage industry. Earlier studies in other nations' contexts found the previously noted positive relationship between EID and Return on Assets (ROA). While Yin et al. (2019) prove the evidence for the positive relationship between EID and Return on Equity (ROE) and the finding supports the voluntary disclosure theory. In the Vietnam context, Nguyen et al. (2022) noted that corporate environmental disclosure has a negative impact on ROA in Vietnam. Few listed firms disregards for EI transparency disclosure are cited as the reason they cannot attract investment or even acquire profitability (Nguyen et al., 2020). Another possibility is that the lack of an industry-specific focus causes a negative relationship between EI and FP. However, Nguyen and Tran (2019) contend that there is a connection between EI and FP, with the FP of listed firms measured by ROA, while the nexus between EID and Tobin's Q is not

authenticated. Tobin's Q is usually used as an indicator of firm value rather than FP. Moreover, Nguyen & Nguyen (2020) also confirm the relationship between EAID and ROE profitability proxies ROE.

These past studies also examine a wide range of industries, which makes it hard to understand what makes one's own industry unique. This study attempts to identify the relationship between EAID and FP in industrial firms in which FP is proxied by ROA and ROE. Therefore, the following hypothesis is formed:

*H<sub>1</sub>: The disclosure of Environmental Accounting Information positively influences the listed firms' financial performance in the industrial sector.*

Although Khelif et al. (2015) found no evidence of EAID influence on FP, previous studies also show that the financial leverage of enterprises has a favorable association with the disclosure of sustainability information (Liu & Zhang, 2017; Nguyen & Nguyen, 2020; Yuan et al., 2022). However, Chouaibi et al. (2022) discovered that organizations with high levels of financial leverage typically restrict the level of information disclosure. The reason is that disclosing information about sustainable development is an expensive procedure. Nguyen & Tran (2019) also found that leverage negatively affects the relationship between EAID and FP when examining firms in different industries. In this study, the following hypothesis is formed:

*H<sub>2</sub>: Leverage negatively moderates the relationship between the disclosure of Environmental Accounting Information and the financial performance of the Vietnamese-listed industrial firms.*

As regards the moderating role, Che-Ahmad et al. (2015) show that the Big Four auditing firms positively moderate the relationship between EAID and financial performance in Malaysia-based on stakeholder theory and legitimacy theory. The Big Four auditing firms have a role in ensuring the quality of financial reports. Nguyen & Tran (2019) also reach the same conclusion when confirming that the role of the Big Four firms influences the positive relationship between EAID and FP. So, this hypothesis is created:

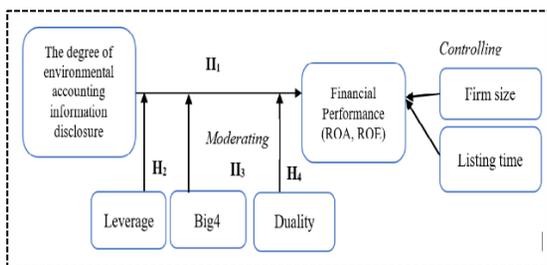
*H<sub>3</sub>: the financial report quality positively moderates the relationship between Environmental Accounting Information disclosure and the financial*

performance of the Vietnamese-listed industrial firms.

Khelif et al. (2015) discovered that it is helpful to put more pressure on management to take social and environmental measures to guarantee both short- and long-term financial performance. Liao et al. (2015) show that board characteristics can help a company balance its financial and non-financial goals with its limited resources and moderate the expectations of stakeholders with different interests who may have different goals. Besides providing evidence to support this argument, Chouaibi et al. (2022) describe how corporate governance affects environmental disclosure favorably. Stakeholder theory is important because it explains why companies report to their stakeholders about things other than their financial information and what plans can be made to keep the relationship going. However, Rossi et al. (2021) discovered that CEO duality, where the chairperson of the board and CEO are the same person, negatively moderates the association between Corporate Social Responsibility (CSR) activities and financial performance. This finding suggests that CEO duality limits CSR practice. Hence, role separation may assist boards in performing their oversight duties more effectively. Therefore, the hypothesis below is formed:

*H4: CEO Duality negatively moderates the relationship between Environmental Accounting Information disclosure and the financial performance of the Vietnamese-listed industrial firms.*

The conceptual research model is indicated in Figure 1, which shows the relationship between the dependent and independent variables of the study.



**Figure 1. The conceptual research model.**

**2.5. Methodology**

*2.5.1. Data Collection and sample selection*

The study’s population comprises Vietnamese-listed firms on the Ho Chi Minh Stock Exchange.

Since the Stock Exchange's various industry classifications make probability sampling impractical, this research instead concentrates on publicly traded companies from the industrial sector. Particularly, this study adopts non-probability sampling, namely the purposive sampling technique. To gather information about the environmental disclosure of the sample companies from 2017 to 2021, the study relied on secondary data gleaned from their annual reports. As a result, the data comprises 85 industrial listed firms over a period of five years, and there are 425 observations in this research sample. In this investigation, the study relies on annual reports because they are a reliable and easily accessible data source (Nor et al., 2016). The annual reports and sustainability reports were collected from the company websites, and the Ho Chi Minh Stock Exchange's website features annual and sustainability reports.

*2.5.2. Measurement of Variables*

The Environmental Accounting Information Index in this study uses the criteria set by the Vietnamese Stock Exchange for grading the annual reports and sustainability reports award which has been organised annually. The criteria are based on Circular 155/2015/TT-BTC and Circular 96/2020/TT-BTC issued by the Ministry of Finance of Vietnam (Vietnamese Stock Exchange, 2021). The EAI disclosure index comprises 15 items, and it is followed by the environmental accounting information index, which gives grades to the annual reports of the listed companies every year. The set of environmental accounting information indexes includes (1) environmental policy; (2) the highest position implementing environmental policies in the company; (3) The total amount of raw materials used by businesses during the year to manufacture and package critical products and services (4) Percentage of recycled materials used to produce the firm's principal products and services (5) Energy consumption, both direct and indirect; (6) Energy savings from energy efficiency initiatives; (7) energy-saving initiative reports (providing energy-efficient or renewable energy-efficient products and services); reporting on the results; (8) water supply and water sources; (9) Recycled and reusable water percentage or total amount (in relation to total water consumption); (10) assessment of the risk/impact between the company's core operations and the environment; (11). The percentage of recyclable products or recycled materials collected in the most recent year

(12) a wastewater treatment system prior to the discharge system; (13) an internal waste disposal system that meets solid waste disposal standards or has a contract with a local authority or public waste disposal company; (14) The number of sanctions for

violations of environmental laws and regulations; (15) The total amount of the fine because of environmental law and regulation violations (Vietnamese Stock Exchanges, 2021).

**Table 1. Measurements and definitions of variables**

Variables	Symbols	Measurement	Definition	Previous studies
1 Financial Performance	ROA	Return on Assets	Profit after tax/ Total Assets (%)	Alikhani & Maranjory, 2013; Nguyen & Tran, 2019; Dewi et al. 2021
	ROE	Return on Equity	Profit after tax/Total Equity (%)	Nguyen & Nguyen, 2020; Yin et al. 2019
2 Environmental Accounting Information disclosure	EAID	Environmental Information Index	$EAID_{it} = \frac{\sum_{j=1}^n X_{ijt}}{n_j} \times 100 (\%)$ <i>X<sub>ijt</sub>: the score of the component j of EAID for firm i in year t,</i> <i>EAID<sub>it</sub>: the sum of the score of firms i in year t, in which j=1, 2,..., and t = specific year</i>	Charumathi & Ramesh, 2020; Nguyen & Tran, 2019
3 The quality of financial report is assured by big4	BIG4	Audit by Big4	The dummy variable equals 1 if the financial report is audited by one of the big four auditing firms and 0 otherwise.	Che-Ahmad et al., 2015; Nguyen & Tran, 2019
4 Leverage	LEV	the ratio of the firm's year-end asset liability	Liability/Total Assets (%)	Chouaibi et al. 2022; Nguyen & Tran, 2019
5 Duality	DUAL	CEO duality	Dummy variable: 1 if for companies that the chairperson of the board and CEO are the same individual and 0 otherwise	Rossi et al., 2021
6 Firm Size	SIZE	Total Assets	Natural logarithm of the total assets	Chouaibi et al. 2022; Nguyen & Tran, 2019
7 Listing year	LSY	Listing year	The number of years the firm listed (years)	Nguyen & Tran, 2019; Wang et al., 2020

This study calculates an unweighted disclosure index as a measurement for EAID by using manual content analysis. The score for each item is dichotomous, which means it will be 1 for disclosed information and 0 otherwise, and it is unweighted because all the criteria have the same weight. This method is also adopted from previous studies (Charumathi & Ramesh, 2020; Nguyen & Nguyen, 2020). Each listed firm's EAI disclosure index is calculated using the formula (1) below. Table 1 below also presents the measurement of the

dependent variable and independent variables of the research framework.

$$Y = \frac{\sum_{j=1}^n X_{ij}}{n} \times 100 (\%) \tag{1}$$

Where,

*Y<sub>it</sub>* = EAID index of the company *i* at year *t*

*X<sub>ij</sub>*: the score of the information item *j* disclosed by company *i*

*n*: number of items (*n* = 15)

The study uses some methodologies to test the hypotheses in the research framework. First, the study employs descriptive statistics to summarize the data in the research sample. Second, testing for correlation is done to determine any association among independent variables. In addition, the variables in the regression model should be tested for the collinearity phenomenon. In addition, this research adopts the Ordinary Least Squares (OLS) method to test the hypotheses. The panel data regression strategy was used because of the mix of time series and cross-sectional data (Elsayed and Paton, 2005). This would correct for any unobserved heterogeneity. There are two most prevalent procedures that are adequate in panel data regression, including the fixed effects estimation in the fixed effects model (FEM) and the study of the random effects in the random-effects model (REM). After performing preliminary Breusch-Pagan, Lagrange multiplier, and Hausman tests, the fixed-effects panel data model was employed to correct for pooled and/or random effects. The FEM is used to examine the impact of variables that change over time, but the REM was also used to estimate the impacts of time-invariant variables (Alsayegh et al., 2020). Then, some tests are also adopted to test heteroscedasticity and autocorrelation phenomenon, such as the Modified Wald test and the Wooldridge Test. The final model is made with the Feasible Generalized Least Squares (FGLS), which is used to fix heteroscedasticity and autocorrelation.

This study uses four regression models to test the hypotheses. Particularly, model 1 shows financial performance measured by ROA in which moderating variable while Model 2 is without moderating variable. Model 3 shows financial performance proxied by ROE with moderating variables while model 4 is without moderating variables.

$$\text{Model 1: } ROA_{it} = \beta_0 + \beta_1 * EAID + \beta_2 * LEV + \beta_3 * BIG4 + \beta_4 * DUAL + \beta_5 * SIZE + \beta_6 * LSY + \epsilon_{it}$$

$$\text{Model 2: } ROA_{it} = \beta_0 + \beta_1 * EAID + \beta_2 * BIG4 + \beta_3 * DUAL + \beta_4 * SIZE + \beta_5 * LSY + \epsilon_{it}$$

$$\text{Model 3: } ROE_{it} = \beta_0 + \beta_1 * EAID + \beta_2 * LEV + \beta_3 * BIG4 + \beta_4 * DUAL + \beta_5 * SIZE + \beta_6 * LSY + \epsilon_{it}$$

$$\text{Model 4: } ROE_{it} = \beta_0 + \beta_1 * EAID + \beta_2 * DUAL + \beta_3 * SIZE + \beta_4 * LSY + \epsilon_{it}$$

### 3. RESULTS AND DISCUSSION

#### 3.1. Analysis and results

**Table 2. Summaries statistics for continuous variables for the period of 2017-2021**

Variable	n	Min	Max	Mean	S.D
ROA	425	-15.05	54.65	5.72	7.17
ROE	425	-30.8	66.2	10.5	11.5
EAID	425	0	93.3	32.6	25.8
LSY	425	0	21	9.28	4.3
SIZE	425	26.03	31.75	28.2	1.24
LEV	425	1.3	94.39	48.2	22.6

Note. Source from Financial statements from Ho Chi Minh Stock Exchange, 2017-2021

**Table 3. Frequency for binary variables of sample companies for the period of 2017-2021**

Variables	Frequent	%
Audit by Big4	425	100.0
No	307	72.2
Yes	118	27.8
CEO Duality	425	100.0
No	366	86.1
Yes	59	3.9

Table 2 shows an overview of descriptive statistics for variables. The table reveals that environmental accounting information has an average score of 32.61 per cent. The average score of ROA is 5.72 per cent, varying from -15.0 per cent to 54.65 per cent, while the mean score of ROE is 10.55%. The average listing time is 9.28 years and spans from 0 to 21 years, which shows that the firms in the sample are young for listing time on the stock market. Firm size has an average score of 28.2 and varies from 26.03 to 31.75. The mean of the leverage ratio is relatively high at 48.2 per cent. Table 3 shows that 27.8% of the listed companies in this sample use audit services from the "big 4" auditing firms, and 3.9% of the listed companies have CEO duality.

Table 4 displays the results of the correlation analysis among variables. Notably, there is a correlation between the independent and dependent variables of the model: the degree of EAID is positively correlated with ROA and BIG4, while there is a negative correlation between the degree of EAID and size, leverage, listing time, and duality. Also, there is no multicollinearity phenomenon because the correlation between each pair of variables is less than 0.8 and the independent variables' variance magnification coefficient (VIF) is less than 10.

**Table 4. Correlation matrix**

Variables	ROA	ROE	EAID	SIZE	LEV	BIG4	LSY	DUAL	VIF
ROA	<b>1.000</b>								
ROE	0.818*	<b>1.000</b>							
EAID	0.134*	0.116**	<b>1.000</b>						0.72
SIZE	-0.113**	0.091***	-0.092***	<b>1.000</b>					0.79
LEV	-0.444*	-0.119**	0.052	0.335*	<b>1.000</b>				0.85
BIG4	0.006	0.112**	0.033	0.383*	0.077	<b>1.000</b>			0.92
LSY	-0.147*	-0.159*	-0.024	0.069	0.055	0.160*	<b>1.000</b>		0.95
DUAL	0.040	0.050	-0.031	0.048	-0.050	-0.036	-0.126*	<b>1.000</b>	0.97

Note: \*, \*\*, \*\*\* significant level at 1%, 5% and 10% respectively

**Table 5. Regression results with profitability measured by ROA**

Variables	Y = ROA (Model 1)				Y=ROA (Model 2)			
	OLS	FEM	REM	FGLS	OLS	FEM	REM	FGLS
EAID	0.044* (3.68)	-0.015 (-0.89)	0.008 (0.56)	0.018* (3.56)	0.033** (2.46)	-0.005 (-0.26)	0.005 (0.37)	0.008 (1.15)
LEV	-0.147* (-10.19)	-0.211* (-5.84)	-0.156* (-7.20)	-0.135* (-18.98)				
BIG4	0.601 (0.80)	-0.998 (-0.83)	0.059 (0.06)	0.308 (1.55)	1.173 (1.41)	-1.144 (-0.90)	0.075 (0.07)	0.252 (0.70)
DUAL	0.105 (0.12)	0.651 (0.76)	0.789 (0.99)	0.461 (1.42)	0.710 (0.71)	1.034 (1.16)	1.144 (1.38)	0.631*** (1.70)
SIZE	0.296 (1.03)	2.406** (3.44)	0.461 (1.00)	0.400** (2.50)	-0.706** (-2.36)	-1.017 (-1.16)	-0.829*** (-1.75)	-0.534* (-3.09)
LSY	-0.213* (-2.91)	-0.718* (-4.11)	-0.392* (-3.76)	-0.166* (-4.35)	-0.241* (-2.96)	-0.477* (-2.91)	-0.365* (-3.22)	-0.158* (-3.39)
Cons	4.822 (0.61)	-44.632 (-1.65)	3.495 (0.28)	1.524 (0.35)	26.387* (3.12)	39.180 (1.63)	32.150 (2.45)	20.629* (4.24)
R-square	0.24	0.15	0.21		0.05	0.03	0.03	
N	425	425	425	425	425	425	425	425
F-test		8.79*				10.51*		
Breusch-Pagan Lagrange			282.06*				350.17*	
Hausman test		17.86*				6.55*		
Modified Wald		3.5*				8.0*		
Wooldridge test		5.78**				6.04**		

Note: \*, \*\*, \*\*\* significant level at 1%, 5% and 10% respectively; t value in OLS FEM and z value REM and FGLS in parathesis

Tables 5 and 6 show how the OLS, FEM, REM, and FGLS models were used to estimate the results where FP is measured by ROA and ROE. In these models, the F-test shows that H0 is rejected (Prob=0.000), thus the FEM is more appropriate than the pooled OLS. For the Breusch-Pagan Lagrange test, it shows that hypothesis H0 is declined (Prob = 0.000) thus the REM is more appropriate than the OLS. For the Hausman test, that hypothesis H0 is declined (Prob = 0.000) means that the FEM model is more appropriate than the REM model. Thus, the final fit model to measure

this relationship is the FEM model, with a 1% significance level. The Breusch-Pagan Lagrangian multiplier test shows that the regression model has heteroscedasticity, and the Wooldridge test shows the model has autocorrelation. Therefore, this study uses the FGLS approach to fix the issues.

The final regression results show a positive and statistically significant effect of EAID on profitability which is significantly positive at the 1% level. Specifically, as a moderating variable, leverage weakens the relationship when financial performance is measured by ROA and ROE,

whereas the quality of financial statements (the Big 4 variable) strengthens the nexus between EAID and ROE.

Meanwhile, the R-Square values in the final fit models are 15% and 5%, respectively. These results show that environmental accounting information disclosure affects ROA by 15%, whereas disclosure influences ROE by just 5%, and the remaining percentages are influenced by other variables.

The duality of the CEO position does not moderate the relationship because of insignificant statistics.

**Table 6. Regression results with profitability measured by ROE**

Variables	Y = ROE (Model 3)				Y=ROE (Model 4)			
	OLS	FEM	REM	FGLS	OLS	FEM	REM	FGLS
EAID	0.058* (2.75)	-0.042 (-1.22)	0.014 (0.52)	0.059* (6.72)	0.055** (2.58)	-0.026 (-0.73)	0.012 (0.45)	0.055* (5.88)
LEV	-0.085* (-3.32)	-0.315* (-4.23)	-0.121* (-3.18)	-0.070* (-7.61)				
BIG4	2.512*** (1.90)	-1.888 (-0.76)	1.246 (0.72)	1.179** (2.15)				
DUAL	0.726 (0.46)	1.372 (0.78)	1.698 (1.08)	0.788 (1.19)	0.941 (0.59)	1.957 (1.09)	1.993 (1.26)	0.227 (0.37)
SIZE	1.215** (2.41)	6.100* (2.91)	1.506*** (1.93)	0.958* (4.55)	1.031** (2.33)	0.796 (0.46)	0.782 (1.12)	0.621* (3.42)
LSY	-0.454* (-3.52)	-1.361* (-4.10)	-0.645* (-3.49)	-0.326* (-5.46)	-0.431* (-3.30)	-0.976 (-2.98)	-0.621 (-3.35)	-0.374* (-6.38)
Cons	-18.140 (-1.31)	-132.041 (-2.37)	-21.172 (-1.00)	-12.731** (-2.23)	-16.497 (-1.31)	-2.282 (-0.05)	-6.424 (-0.33)	-5.815 (-1.16)
R-square	0.06	0.05	0.05		0.05	0.03	0.04	
N	425	425	425	425	425	425	425	425
F-test		5.39*				5.26*		
Breusch-Pagan Lagrange			154.63*				164.09*	
Hausman test		21.60*					8.72	
Modified Wald		1.3*						
Wooldridge test		1.0					0.282	

Note:\*, \*\*, \*\*\* p-value significant level at 1%, 5% and 10% respectively; t value of OLS and FEM and z value of REM and FGLS in parathesis

### 3.2. Discussion

The study’s purpose is to determine the effect of environmental accounting information disclosure on financial performance proxies by ROA and ROE, with the moderating effects for Vietnamese listed firms for 5 years (2017–2021). The final regression results emphasize that the relationship between EAID and profitability is positively moderated by Big4 whereas leverage negatively moderates the relationship. This finding implies that the greater sthe percentage of environmental accounting information disclosure, a company can increase the

Firm size and listing time also control positively and negatively financial performance, respectively.

As a result, the structure equation of regression analysis for the final fit models is:

$$ROA_{it}= 0.018*EAID - 0.135*LEV + 0.958*SIZE - 0.166*LSY + \epsilon$$

$$ROE_{it}= -12.731+ 0.059*EAID - 0.070*LEV + 1.179* BIG4+ 0.958*SIZE -0.326*LSY + \epsilon$$

profitability of industrial companies listed on the Ho Chi Minh Stock Exchange. These findings also provide support for the voluntary theory, stakeholder theory, and legitimacy theory.

It is found that EAID has a slightly positive effect on profitability proxies measured by ROA. This finding is consistent with prior empirical research (Abdullah et al., 2020; Nguyen & Tran, 2019; Yin et al., 2019; Wang et al., 2020). Therefore, hypothesis H1 is accepted in this study. The result supports the voluntary disclosure theory, which holds that businesses that disclose environmental

information will better be able to show their commitment to environmental protection and sustainable development, drawing in more investors and giving them a position in the marketplace. In addition, the legitimacy theory proposes that a company's legitimacy improves if the firm discloses information about its impact on the environment. When a firm shows it cares about the environment and acts accordingly, it is more likely to attract investors. The results could have management implications for managers in industrial firms. For example, Vietnamese industrial firms need to increase their responsibility towards the environment by adopting advanced technologies to produce environmentally friendly products, save energy, and reduce their negative impact on the environment. So, the environmental information disclosed will have financial benefits for firms.

Furthermore, leverage negatively moderates the impact of EAID on ROA in industrial-listed firms. This finding indicates that a company's leverage reduces the impact of environmental accounting information disclosure on profitability. H2 is also supported in this research. Hence, managers should use debt financing efficiency to control the leverage ratio in financing their activities towards environmental protection strategies.

While there is a slightly positive relationship between EAID and ROA, a stronger positive relationship between EAID and ROE is confirmed. However, in both two cases with and without moderating variables, EAID also affects ROE. This implies that if the company increases the level of disclosure EAI, the higher ROE the firm obtains without moderators. The finding is also consistent with previous studies (Nguyen & Nguyen, 2020; Yin et al., 2019). It is the same case with FP measured by ROA, leverage also weakens the relationship when FP is proxied by ROE. The relationship is positively moderated by the quality of the financial reports that are assured by big4 auditing firms. Therefore, hypothesis H3 is accepted. It can be explained that the firms' financial reports are audited by one of the big four auditing firms, which can help improve your company's bottom line. As a result, the finding implies that listed companies' managers should seek services from one of the Big4 firms to enhance higher ROA and ROE from reporting environmental information.

However, this study cannot confirm the negative effect of CEO duality as a moderator of the relationship between EAID and profitability. Therefore, hypothesis H4 is rejected in this study. This result is inconsistent with Yuan et al. (2022) and Rossi et al. (2021). There is a small percentage of listed industrial firms (3.9%) in this sample that have CEO duality, so the study cannot accept hypothesis H4.

Size, which can be explained because large-scale enterprises will have more significant resources, will have a greater impact on financial performance. The number of the listing year has a negative influence on profitability as measured by ROA and ROE. This can be explained because the longer a company is listed on the stock exchange, the more saturated the market becomes, reducing the impact on the company's bottom line. This result is not in line with Wang et al.'s 2020 study when they state that the number of the listing year has a positive effect on financial performance. The rationale is that companies with a long history in a certain industry know more about the market than other newcomers, therefore, the listing time positively influences financial performance which is measured by another financial indicator like Return on Investment (ROI).

#### 4. CONCLUSIONS

To sum up, the study confirms the positive nexus between EAID and the financial performance of industrial listed companies on the Vietnamese Stock Exchange. The moderating variable of leverage and the quality of financial statements assured by Big4 are also verified. The study's results are in line with those from earlier empirical research and with theories of voluntary disclosure, legitimacy, and stakeholder. This research contributes to the existing literature of the Vietnam context in terms of empirical research and the industrial sector by giving evidence of how a firm's ROA can be influenced by increasing the level of EAID with moderators by Big4. This study also proves that increasing the level of EAID will make the firms gain ROE higher with no moderators.

A few factors constrain the study. It should be noted that the sample for this research is limited to industrial firms trading on the Ho Chi Minh Stock Exchange. However, the sample used in the study could not be expected to represent all companies with shares trading on the Ho Chi Minh Stock Exchange. Hence, to gain more results for the Vietnamese stock markets, future research can be

done in other industries and on other Stock Exchanges. Moreover, this study uses manual content analysis for calculating the unweighted score of EAID. The unweighted approach does not focus on disclosed non-financial and financial figures. Therefore, further research can utilize the weighted approach and adopt computerized content analysis by software such as Nvivo and MaxQDA.

Several financial and governance aspects of the industrial listed firm should be taken into consideration to determine the factors affecting its financial performance and the amount of

environmental disclosure. For example, some factors comprising politics, culture, governmental ownership, and foreign ownership are ignored in the study. So, in order to learn more about the link between environmental disclosure and financial performance, these factors may be added to the research model of future studies.

## ACKNOWLEDGMENT

This study is partly funded by Can Tho University, Code: T2022 - 48. The authors are thankful to Can Tho University for funding this research.

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