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Research Article

Corporate social responsibility and business performance: Approach quantile regression

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ABSTRACT

This study investigates the interplay between corporate social responsibility (CSR), ESG practices, and business performance within the ASEAN-6 region, focusing on the under-explored role of carbon control. A critical area for further research is the differential impact of ESG on businesses with varying levels of financial performance. It examines the impact of environmental, social, and governance (ESG) initiatives on profitability, using Return on Assets (ROA), Return on Equity (ROE), and a variable denoted by Q. Using data from Refinitiv Eikon's business reports for the period 2016-2022, we employ the GMM regression to address potential endogeneity issues. Quantile regression analysis can be used to explore deeper into the differences in the effects of ESG on companies with varied financial performance levels. The research reveals a positive relationship between a business's ESG score, emissions score, and business performance. Interestingly, this study shows the differential impact of ESG and carbon control across financial performance quantiles. The study proposes practical policy recommendations to empower sustainable development for emerging countries. This research contributes to the existing body of knowledge in several significant ways. First, it adds to the ongoing scholarly debate regarding the relationship between ESG and financial performance, offering empirical evidence from the ASEAN-6 region. Second, it provides compelling evidence of the crucial impact of carbon control on business performance, which is increasingly vital in climate change. Third, it provides empirical evidence of the complexity of this relationship, showing differential impacts across many financial performance quantiles. By incorporating these elements, the study offers a comprehensive and insightful analysis that advances our understanding of the critical interplay between CSR, ESG, carbon control, and business performance in ASEAN-6.

Key words: ASEAN, CSR, ESG, Financial performance, Sustainable development

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INTRODUCTION

Growing consciousness regarding issues like inequality and climate change has increased the tendency to invest in socially responsible ways. Investing with an emphasis on Environmental, Social, and Governance (ESG) aspects is gaining traction and supports both sustainable development and financial development. ESG is growing more important to investors in the financial sector, both individual and institutional. ESG integration, or carefully incorporating environmental, social, and governance (ESG) issues into decisions regarding investments, is the most popular approach to environmental, social, and governance (ESG) investing among institutional investors worldwide in 2021, according to survey data. Since 2019, the adoption rate of ESG integration has more than doubled, and by 2021, it will stand at 48%. In general, the adoption of ESG practices is increasing, while the percentage of people who do not use ESG practices has increased, minimizing gradually over this time. [1].

While not mandated by law, our data aligns with Raghavan's [2] findings that ESG disclosure strengthens a company's financial well-being. This trend underscores the growing importance of social responsibility and environmental considerations in business management. According to McKinsey projections, $9.2 trillion in yearly capital expenditures across all economic sectors will be necessary to achieve net zero by 2050. Furthermore, the Disinflation Act and the Green New Deal have pledged $370 billion and 1 trillion euros, respectively, to reach net zero. McKinsey's analysis indicates that despite all these developments, a sizable investment gap still needs to be closed. (McKinsey, 2023)

In the Association of Southeast Asian Nations (ASEAN), among other places, ESG practices are a new, rapidly expanding worldwide corporate trend. Ten Southeast Asian nations comprise ASEAN: Brunei, Cambodia, Indonesia, Lao, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. These countries have a combined population of 664 million and a GDP valued at 3.35 trillion USD (ASEAN Secretariat, 2022). Due to shifting local laws, pressure from abroad (mainly from industry), and a

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quickly expanding economy, the area is becoming increasingly recognized as an ESG focus.

The economies of ASEAN are welcoming of outside investment and trade. About 12% of all foreign direct investment went to ASEAN in 2020–2021, and roughly 45% of the region's GDP came from exports. This exposure to international markets and investors is driving the adoption of ESG. The primary external effects on ESG practices in member nations are covered in this section, with particular attention paid to the roles played by global supply chains and institutional finance and the particular advancements that have come about as a result. from the US and Europe, respectively. The US and Europe are significant trading and investment partners for ASEAN and have significantly impacted the region's implementation of environmentally friendly (ESG) standards.

ESG research is conducted at the corporate and national levels; however, the results are inconsistent due to the inconsistent use of data and context. Although effect relationships are assumed in all investigations, impact patterns will be reflected in the data's form. Since companies are the backbone of any nation, comparing the nations' markets where foreign investors participate in ASEAN is essential to gain a partner's viewpoint on ESG in ASEAN (Habib and Mourad) [3].

The Report on ESG Practices in ASEAN and Korea – Pathways to Sustainable Development states that ASEAN has been putting numerous initiatives into place to create a sustainable community, such as clean energy, gender equality, migrant worker protection, green finance, the circular economy, and forest protection. Even though there has been a lot of progress, ASEAN still has many obstacles to overcome before achieving these objectives. However, ASEAN is progressively creating a sustainable future for the region through strong collaboration among its member states, as seen by several efforts about ESG practices in the area: ASEAN Plan of Action for Energy Cooperation, ASEAN Declaration on the Implementation of the ASEAN Community Vision 2025 and Sustainable Development Goals (2017), ASEAN Taxonomy for Sustainable Finance (2021), and Framework for Circular Economy for the ASEAN Economic Community (2021).

Investigating how social responsibility (ESG), particularly carbon reduction, affects the financial success of businesses in developing nations is more important than ever in light of the increasingly severe effects of climate change. Under much strain from climate change, these nations must develop sustainable ways to boost their economies. To enhance and assess the effect model across various financial performance levels, this study uses quantitative approaches to explore impact analysis based on regression methods, quantile regression, and decomposition techniques. Numerous studies have demonstrated that by offering targeted answers and activities to address environmental, social, and economic concerns, the implementation of ESG strategies has an essential relationship to the SDG goals. ESG (environmental, social, and governance) principles are a fundamental component of sustainable development, and have attracted attention from policymakers, governments, the public, and academics to meet the sustainable development goals (SDGs) [4–7].

To fill the existing research gap on the relationship between social responsibility, carbon control, and financial performance at the corporate level in emerging market countries, the topic "corporate social responsibility and business performance" was selected. The role of carbon control, and neglected components in the connection between social responsibility and financial performance in developing countries, will be thoroughly investigated in this study. Evaluating how social responsibility and carbon control enhance financial performance is vital, given the urgency of climate change and the growing desire for sustainable development. The research offers specific policy and management recommendations tailored to each country's unique roadmap, promoting responsible environmental practices and a low-carbon economy.

The complex relationship between carbon control, environmental, social, and governance (ESG) variables, and corporate financial success is examined in this paper, focusing on how these interactions change depending on the performance level. Although panel data models (fixed/random effects) and OLS, two conventional regression techniques, could be used, they have limitations when examining data across quantiles. When estimating distinct quantiles, these techniques either significantly reduce the sample size or fall short in addressing the impact of outliers, a common characteristic of financial datasets.

Quantile regression, pioneered by Koenker and Bassett [8], offers a more robust approach [8]. It enables the estimation of explanatory variable coefficients at specific quantiles of the dependent variable's distribution, leveraging the full dataset and mitigating the impact of outliers. This is particularly relevant in finance, where data often exhibit skewness and extreme values. Following established practice in the finance literature, we focus on the 10th, 25th, 50th, 75th, and 90th quantiles of financial performance [9–11].

Our quantile regression analysis reveals a complex and heterogeneous relationship between ESG/carbon controls and financial performance. Crucially, the magnitude of the impact of ESG and carbon controls on financial performance is not uniform across the performance spectrum. We find that these effects are more pronounced for firms exhibiting higher levels of financial performance.

These findings offer valuable insights for both academics and practitioners. We gain a more granular understanding of the intricate links between ESG, carbon management, and financial performance by employing quantile regression. This study contributes to the existing body of knowledge in finance and provides actionable managerial implications. Businesses can leverage these insights to tailor their strategies to their specific performance context, optimizing operations and progressing towards sustainability goals. In conclusion, this research demonstrates the importance of utilizing appropriate methodological approaches, such as quantile regression, to unravel the complex dynamics within the financial landscape and effectively analyze the heterogeneous impacts of ESG and carbon controls on firm performance.

In addition, the study will propose governance implications to encourage businesses to implement social responsibility and control carbon more effectively, while raising public awareness of the importance of sustainable development. This study contributes to realising the Sustainable Development Goals (SDGs) on climate action and economic growth.

LITERATURE REVIEW AND HYPOTHESIS

There are many approaches to social responsibility (Corporate Social Responsibility - CSR). Carroll [12] affirmed that Social Responsibility is the responsibility of businesses to the economy, society, and the environment. In addition, Caroll [13] also proposed the concept of CSR according to the pyramid model.

According to the World Business Council for Sustainable Development's view on corporate CSR, "Corporate CSR is the commitment of businesses to contribute to sustainable economic development through compliance with standards on environmental protection, gender equality, labor safety, fair wages, employee training and development, community development, product quality assurance... in a way beneficial for businesses, as well as the general development of society.

ESG first appeared in 2004 in the United Nations' "Who Cares Wins " report. Over nearly two decades, ESG has changed from a set of specialized standards that evaluate the overall business picture of a business as a basis for financial investors to a general term to refer to how.

Businesses are vital to the goals of sustainable development. Their efforts are crucial in directing long-term sustainable development since their commercial operations directly impact society and the environment. Businesses must use sustainability reporting as a vital tool to promote stakeholder responsibility, show stakeholders how committed they are to sustainable development, and make their activities visible. The relationship between corporate value and ESG has gained increased attention since the introduction of dual carbon objectives. Stakeholder theory, signaling theory, and the natural resource-based viewpoint are examples of analytical stances [2]. The relationship between a company's cost of capital and its ESG scores has been a topic of numerous ESG research [2,3].

A company's concern for sustainability and compliance in business, as well as reducing shortsighted conduct during the development process, is demonstrated by its favorable ESG performance [14]. Another strategy, ESG/CSR, has contradictory hypotheses and results and is strongly tied to markets, ownership and leadership traits, corporate risk, performance, and value. [5].

Though this perspective highlights that ESG ratings can properly indicate how corporations engage with specific CSR concerns, they represent corporate social responsibility [15]. Another perspective holds that companies can become more accountable to society and investors by focusing on their ESG performance. Resources will be more readily available to socially conscious businesses [16].

Numerous scholarly investigations have demonstrated a favorable correlation between environmental factors and corporation value [17–19]. Furthermore, Juan Wang [20] highlights the favorable correlation between financial success (ROA, Q) and carbon control. Analytically, several studies have found a positive relationship between a company's environment and FP [21–23], even though many authors support a negative or neutral association between EP and FP [24,25].

Many recent studies have focused on the relationship between carbon emissions and FP. Nevertheless, the findings from some research have led to a lot of debate and made it challenging to make assessments regarding the impact.

According to Trinks: businesses that use less carbon perform better profitably [26]. After investigating 289

Chinese companies[27], concluded that environmental information reporting, directly and indirectly, improves corporate financial performance (via analyst coverage, report volume, and analyst count).

ESG and sustainable development[27,28], ESG frameworks and standards[29], and ESG governance policies[30]. The relationship between ESG and financial performance[31]. ESG reporting and investor behavior[32,33]. Some of the noteworthy findings are the following: boosting stakeholder interactions[34], raising business competitiveness in the market[35], and improving corporate reputation[36].

Improving anticipated future cash flows reducing the cost of stock[37], and lowering business risk[38,39] and the increasing demand for green resources over time[40].

There is debate concerning the relationship between ESG and financial performance, and little is known about how ESG and carbon control interact.

Legitimacy theory posits that businesses must meet societal expectations, including transparent ESG reporting, to maintain their operating license[40]. Resource dependence theory emphasizes the importance of managing relationships with external stakeholders and meeting their demands for ESG information[41]. Stakeholder theory broadens the focus of corporate responsibility beyond shareholders to encompass all affected parties, arguing that strong ESG performance benefits all stakeholders and contributes to long-term value creation[42]. This can translate to improved financial performance, reduced risk, and enhanced access to capital. However, agency theory[43] cautions that potential conflicts of interest between managers and shareholders may lead to suboptimal allocation of resources to ESG initiatives . Finally, signaling theory suggests that voluntary ESG disclosure acts as a positive signal to investors and other stakeholders, conveying a commitment to sustainability and good governance, thereby enhancing reputation and attracting investment[44]. These theories provide a robust framework for understanding the complex interplay between ESG factors and corporate performance. They highlight the multifaceted nature of ESG, moving beyond purely ethical consideration to a crucial element of sustainable business practice in the face of growing stakeholder scrutiny and evolving societal expectations.

Many studies on ESG and carbon control are conducted at the corporate level, using the same data sources, leading to limited comparison and analysis due to differences in culture, regulation, and economic conditions between regions. Furthermore, the level of adoption of ESG practices and disclosure requirements may vary across countries within the same region, affecting comparability. More research is needed to analyze the impact of ESG and carbon controls in specific regional contexts, while also considering distinct cultural factors, regulations, and economic conditions.

Another concern is that climate change caused by carbon dioxide (CO2) emissions has evolved into a global challenge, requiring investors and businesses to reallocate capital to support ESG and reshape financial markets[45].

ASEAN markets offer a compelling choice for researchers seeking regionally diverse samples with unique characteristics. While classified as emerging economies, ASEAN nations showcase distinct regulatory frameworks, such as the definition of Islamic finance present in Malaysia and Indonesia. This heterogeneity within a single region makes ASEAN markets a more cost-effective option for concluding regional diversification than analyzing broader global samples.

RESEARCH METHODS

Empirical Model

Accounting or market-based metrics can quantify a company's financial performance[46]. Using a stakeholder theory approach, Q is chosen as an indicator of the market-based financial performance of the company based on ROA, ROE, and market conditions. Q represents investors' expectations for the future. This is significant because when taking into account the efficacy of adopting social responsibility, the benefits of Q cannot be achieved immediately.

The concepts of ESG and CSR may have similarities and can be interpreted using similar variables but are not interchangeable. CSR encompasses strategic elements of a company that are not always captured by ESG scoring. In contrast, ESG scoring precisely measures CSR issues. According to Gillan ESG scoring can be viewed as an extension of CSR strategies, as ESG issues are rooted in CSR strategies[47].

Based on a combination of appropriate literature and theories, the author builds an analytical model as follows

$$
\begin{aligned}
FP_{it} &= \delta_0 + \delta_1 ESG_{it} + \delta_2 EESGCon_{it} \\
&+ \delta_3 ENV_{it} + \delta_4 SOC_{it} + \delta_5 GOV_{it} \\
&+ \delta_6 CSRstra_{it} + \delta_7 CSRC_{it} + \delta_8 CSRS_{it} \\
&+ \delta_9 CSR\,Audit_{\ it} + \delta_{10} CSRSCommittee_{it} \\
&+ \delta_{11} Emissions_{it} + \delta_{12} Total\ carbon_{\ it} \\
&+ \delta_{13} DE_{it} + \delta_{14} LE_{it} + \delta_{15} LDA_{it} \\
&+ \delta_{16} SDA_{it} + u_{it}
\end{aligned}
$$

FP_{it}: financial performance of firm i at year t = {ROA, ROE, Q}

Control variables = {LEV, SDA, LDA, DE}.

Variables are presented on Table 1.

The calculation of pillar scores is illustrated in Table 2.

Sample

The author uses ReInfinitiv Eikon data from 2016 to 2022, businesses in six nations including Singapore, Indonesia, Thailand, Malaysia, Philippines, and Vietnam have been selected. The industries include Energy, Basic Materials, Industrials, Consumer Cyclicals, Consumer Non-Cyclicals, Financials, Healthcare, Technology, Utilities, and Real Estate.

The author designed the data and removed any missing or empty values after gathering it. A balanced panel data set with 731 observations was the last outcome of the data-cleaning process.

Method

Using the fixed influencing factors model (FEM), random influencing factors model (REM), and pooled regression model (Pooled OLS) is the quantitative approach.

If there is autocorrelation or heteroskedasticity, do not utilize the Pooled OLS estimation method after looking for regression model violations if there is significant multicollinearity. based on the outcomes of the selection test, the generalized least squares method (GLS) will be used to produce the final regression result, and the GMM (SGMM or DGMM) will decide the final regression.

To check for undue limitations and the model's appropriateness- that is, whether it makes sense to use the instrumental variables the model includes - use the Sargan or Hansen test.

Use the AR test to determine residual correlations and select the DGMM approach over the traditional GMM method.

This study demonstrates that ESG and carbon control have an impact on financial performance, based on the above arguments made above regarding the relationship between the impact of the ESG index and CSR implementation factors on FP [49,50].

From the viewpoints of resource-based theory, stakeholder theory, legitimacy theory, and signaling theory, companies need to be open and honest in sharing information with all parties involved, not just shareholders. As a result, successful CSR/ESG implementation will enhance financial performance and enhance stakeholder satisfaction while lowering risks.

Because the technique allows us to estimate various distribution quantiles, quantile regression offers greater flexibility. Compared to OLS, quantile regression is less susceptible to outliers by reducing the sum of the absolute values of the errors. We can use quantile regression to investigate the intricate link between variables X and Y at various Y levels. Instead of focusing only on the average, we can obtain a more thorough and detailed picture of how X affects Y. The impact of variable X on variable Y is only estimated at the average level using conventional estimation techniques based on the error minimization rule, which concentrates on the middle portion of variable Y's distribution (Koenker & Basset, 1978) [51]. Meanwhile, the quantile regression estimation method gives robust results in the presence of outliers. The study's objective is to examine the variables whose effects change at different quantiles of the dependent variable. Although OLS regression, fixed-effects, and random-effects models can be used to estimate the coefficients at each quantile separately, this method leads to a significant reduction in the number of observations and does not address the problem of outliers. In contrast, quantile regression, while still estimating the coefficients of explanatory variables at each quantile of the dependent variable, makes full use of the data and can handle outliers well. Therefore, this thesis uses quantiles 10, 25, 50, 75 and 90, a common approach in financial studies when applying quantile regression [9–11].

It is anticipated that the use of ESG, carbon control, and social responsibility will have a positive impact on financial performance. The study proposes the following hypothesis:

This study demonstrates that ESG and carbon control positively affect financial performance based on the previous evidence regarding the relationship between ESG index impact and CSR implementation factors on financial performance [52].

According to legitimacy theory, signaling theory, resource-based theory, and stakeholder theory, companies must be transparent and forthright with all parties involved, not just shareholders. As a result, successful CSR and ESG adoption will lower risks while simultaneously enhancing financial performance and stakeholder satisfaction. Applying ESG, carbon control, and social responsibility will improve financial performance. The study proposes the following hypothesis:

H_1: ESG and carbon control have a positive impact on firm performance.

Firms may have to pay additional fees for excess emissions and submit more information to the government due to environmental restrictions, which could

Table 1: Sumarize variables

Variables	Explanation	Source
Dependent variable		
Q	TobinQ	
ROA	Return on Assets	Refinitiv
ROE	Return on Equity	Refinitiv
Independent variable		
ESG	ESG score	Refinitiv
ESGCon	The ESG controversies score is calculated based on 23 ESG controversy topics.	Refinitiv
ENV	Environment score	Refinitiv
SOC	Social score	Refinitiv
GOV	Governance	Refinitiv
CSRStra	CSR strategy category score reflects a company's practices in communicating in that it integrates the economic (financial), social, and environmental dimensions into its day-to-day decision-making processes.	Refinitiv
CSRC	CSR committee score	Refinitiv
CSRS	CSR Reporting score	Refinitiv
CSRAudit	Does the company have an external auditor for its CSR/Sustainability reports? Dummy variable. If True: 0, False: 1	Refinitiv
CSRSCommittee	Does the company have a CSR committee? Dummy variable. If True: 0, False: 1	Refinitiv
Emissions	Emission category score measures a company's commitment and effectiveness toward reducing environmental emissions in production and operational processes.	Refinitiv
Total carbon	CO2 total = direct (scope 1) + indirect (scope 2)	Refinitiv
LEV	Total debt on Total Assets	
DE	Total debt on Equity	
SDA	Short-term debt on Total assets	
LDA	Long-term debt on Total assets	

Source: Author summarizes

raise their expenses. As a result, the value of businesses directly impacted by the new carbon rules will be lower than that of businesses undamaged by the regulations [53].

Jensen and Meckling's agency theory offers another viewpoint on the relationship between ESG and financial performance [43]. This idea suggests that managers might not give ESG initiatives the greatest attention because they assume that doing so could harm shareholder interests and decrease profits. However, managers must consider the firm's short-term and long-term interests of the firm in the current environment, since investors' concerns about ESG elements are growing.

The impact of ESG regulations and carbon controls on corporate financial performance is not always negative. For companies with high financial performance, investing in sustainable activities can bring many long-term benefits such as improving brand image and attracting ESG-conscious customers and investors. Conversely, companies with low financial performance may have more difficulty implementing these activities due to lack of resources. Therefore, depending on the characteristics of each firm, there will

Table 2: Calculation of pillar scores [48]

Pillar	Category	Score	Weight	Sum of category Weight	Pillar scores
Environment	Emissions	0.98	0.15	0.44	0,94
Environment	Resource Use	0.97	0.15		
Environment	Innovation	0.85	0.13		
Social	Human Rights	0.95	0.05	0.31	0,94
Social	Community	0.89	0.09		
Social	Socially Responsible Products	0.92	0.04		
Social	Working Conditions	0.96	0.13	0.43*	
Governance	Shareholder Rights	0.73	0.05	0.26	0,32
Governance	CSR Strategy	0.34	0.03		
Governance	Management	0.19	0.17		

(Source : https://www.refinitiv.com/en/sustainable-finance/esg-scores)

be a separate strategy for ESG practices, CSR as well as appropriate carbon control policies.

H_2: The impact of implementing social responsibility and carbon control on financial performance varies by quartile.

EMPIRICAL RESULTS

The impact of ESG, carbon control on business performance

The impact of ESG, carbon control on Quantile business performance

DISCUSSION

emonstrates a positive correlation between ESG scores and financial performance. This suggests that disclosing information on social responsibility implementation can enhance corporate value. Stakeholder theory supports this relationship, positing that social responsibility builds shareholder trust, leading to long-term value creation, which aligns with this perspective' Sroufe and Gopalakrishna-Remani [54]. Sinha Ray and Goel proves that ESG score was positively associated with financial performance indicators [55]. This demonstrates the benefits of disclosing information on social responsibility implementation through environmental, social, and governance factors. According to stakeholder theory, implementing social responsibility helps build shareholder trust and bring future value. This finding is consistent with previous research [54] .

Q has been positively influenced by ESG Controversy, which is statistically significant at the 1% level. As a result, initiatives to resolve new problems improve financial performance and lessen financial limitations. Additionally, companies that actively tackle social and environmental challenges are more likely to draw investors who share their values [56].

Implementing a CSR strategy has a favorable and significant impact on financial performance (ROA, ROE, Q), according to CSRStra. According to stakeholder theory, a firm's ability to succeed depends on its ability to collaborate with its stakeholders, who offer both tangible and intangible resources that are necessary for its survival. These resources include labor (employees), working conditions public services (government agencies), and financial resources (shareholders). As such, the firm must inform stakeholders about its business operations rather than just owners [57,58]. Stakeholder satisfaction and financial performance will both increase with effective CSR and ESG management [59]. Integrating CSR plans with firm development strategies will guide social responsibility practices in their business activities ethically and responsibly. Gradually, these practices are incorporated into their corporate culture, guiding business activities to be ethically and responsibly sustainable. This leads to improved corporate reputation in the market and increased credibility, which in turn leads to improved access to finance [56].

ROA is positively impacted by the emission score (Emission); ROE and Q are negatively affected. The

Table 3: GMM regression

	ROA	ROE	Q
ESG	0.00989***	0.0157*	0.0347
	(3.37)	(2.13)	(1.76)
ESGCon	-0.000230	-0.00149	-0.00101
	(-0.51)	(-1.02)	(-0.73)
CSRStra	0.00216***	0.0131***	0.00473
	(3.83)	(8.82)	(1.66)
CSRCS	-0.000776	-0.00477	-0.00727*
	(-0.80)	(-1.86)	(-2.30)
CSRReport	0.00113	0.00173	0.0167**
	(1.18)	(0.58)	(3.02)
Emission	0.00220*	-0.00474*	-0.00421*
	(2.45)	(-2.25)	(-2.19)
CabonTotal	-6.61e-11	-4.80e-10***	6.62e-11
	(-1.48)	(-4.50)	(0.24)
ENV	-0.00488***	-0.0139***	-0.00523
	(-3.86)	(-4.64)	(-1.10)
SOC	-0.00451**	0.00415	-0.0326**
	(-2.85)	(0.95)	(-3.23)
GOV	-0.00381***	-0.00634*	-0.0104
	(-3.90)	(-2.42)	(-1.51)
CSRAudit	-0.0392	-0.255**	-0.605***
	(-1.33)	(-3.01)	(-4.61)
CSRCommittee	-0.0108	0.0993	0.367
	(-0.16)	(0.67)	(1.71)
SDA	0.0329	-0.0671	0.0588
	(0.98)	(-1.03)	(0.73)
LEV	-0.124	-0.548***	-0.459
	(-1.87)	(-3.49)	(-0.79)
LDA	-0.00351	-0.0580	-0.0888
	(-0.08)	(-0.49)	(-0.60)
DE	0.00336*	0.0914***	0.0159
	(2.10)	(20.31)	(0.35)

Source: Results of data processing from Stata

Table 4: Quantile Regression Results with Dependent Variable ROA

ROA	QR10	QR25	QR50	QR75	QR90
ESG	0.000535	-0.00039	-0.00125*	-0.00084	0.00103
	-1.03	(-1.02)	(-2.45)	(-0.73)	-0.47
ESGCon	0.000133	0.000114*	9.37E-05	0.000273*	0.000114
	-1.73	-2.08	-1.82	-2.26	-0.33
CSRStra	0.000058	8.06E-05	0.000115	0.000232	0.000229
	-0.6	-1.56	-1.56	-1.28	-0.68
CSRCS	0.000152	0.000239	0.000162	-0.0001	0.000503
	-0.61	-1.92	-0.9	(-0.24)	-0.75
CSRReport	0.000279	6.15E-05	-0.00012	0.000394	-0.00047
	-0.69	-0.34	(-0.38)	-0.5	(-0.50)
Emission	0.0000825	0.000192***	0.000276***	0.000261	0.000437
	-0.89	-3.84	-4.01	-1.87	-1.96
CabonTotal	1.02E-11	2.81E-12	-1.92E-12	-3.36E-12	-1.64E-11
	-0.04	-0.03	(-0.02)	(-0.02)	(-0.03)
ENV	-0.0000578	-1.2E-05	6.84E-05	-0.00019	-0.00129
	(-0.37)	(-0.12)	-0.45	(-0.60)	(-1.44)
SOC	-0.000534*	-4.2E-05	0.000349	0.000506	0.000354
	(-2.23)	(-0.26)	-1.67	-1.05	-0.47
GOV	-0.000275	0.000115	0.000353*	0.000244	-0.00076
	(-1.45)	-0.94	-2.13	-0.66	(-1.06)
CSRAudit	-0.000424	-0.00093	-0.00698	-0.0204*	-0.0142
	(-0.13)	(-0.38)	(-1.84)	(-2.39)	(-0.93)
CSRCommittee	-0.0112	-0.0148	-0.00201	0.0362	0.00295
	(-0.68)	(-1.81)	(-0.17)	-1.32	-0.07
SDA	0.023	0.0595***	0.106***	0.208***	0.266***
	-1.46	-8.91	-8.4	-6.48	-6.31
LEV	-0.0113	-0.00955	-0.029	-0.0892*	-0.147*
	(-0.95)	(-0.77)	(-1.54)	(-2.39)	(-2.36)
LDA	-0.00448	-0.00026	-0.00786	-0.0189	-0.0294
	(-0.84)	(-0.08)	(-1.32)	(-1.42)	(-1.03)
DE	-0.00613***	-0.00417	0.000277	0.00351	0.00696
	(-3.85)	(-1.47)	-0.05	-0.47	-0.47
_cons	0.00163	0.0046	0.0272	-0.0175	0.0955
	-0.07	-0.36	-1.58	(-0.36)	-1.32
N	731	731	731	731	731

Source: Results of data processing from Stata

Table 5: Quantile Regression Results with Dependent Variable ROE

ROE	QR10	QR25	QR50	QR75	QR90
ESG	0.00156	-0.0011	-0.000731	-0.000844	0.00568
	-1.23	(-1.01)	(-0.58)	(-0.73)	-0.65
ESGCon	0.000372	0.000362*	0.00027	0.000273*	0.00049
	-1.85	-2.24	-1.26	-2.26	-0.5
CSRStra	-0.0000171	-0.000219	-0.000473*	0.000232	-0.000181
	(-0.09)	(-1.26)	(-2.51)	-1.28	(-0.18)
CSRCS	0.00047	0.00025	0.00021	-0.000103	0.000607
	-1.74	-0.54	-0.55	(-0.24)	-0.22
CSRReport	-0.00066	0.000477	0.000537	0.000394	0.0028
	(-0.75)	-0.69	-0.67	-0.5	-0.63
Emission	-0.000426	0.000129	0.000395**	0.000261	0.00141
	(-1.76)	-0.66	-2.59	-1.87	-1.32
CabonTotal	4.40E-11	6.38E-12	-3.53E-11	-3.36E-12	-1.51E-10
	-0.06	-0.01	(-0.07)	(-0.02)	(-0.07)
ENV	0.00000627	0.000105	-0.000205	-0.00019	-0.00285
	-0.02	-0.34	(-0.51)	(-0.60)	(-1.23)
SOC	-0.00119*	0.000146	-0.0000932	0.000506	-0.00257
	(-2.31)	-0.3	(-0.20)	-1.05	(-0.68)
GOV	-0.000771	0.00042	0.00037	0.000244	-0.00234
	(-1.82)	-1.24	-0.86	-0.66	(-0.85)
CSRAudit	0.0210*	0.0149*	0.0200*	-0.0204*	0.00656
	-2.58	-2.06	-2.44	(-2.39)	-0.14
CSRCommittee	-0.0431**	-0.00274	0.022	0.0362	0.0576
	(-2.66)	(-0.08)	-0.87	-1.32	-0.33
SDA	0.106**	0.135***	0.287***	0.208***	1.073***
	-2.62	-5.15	-8.28	-6.48	-5.53
LEV	-0.143*	-0.246***	-0.397***	-0.0892*	-0.815**
	(-2.14)	(-3.45)	(-7.15)	(-2.39)	(-3.07)
LDA	-0.00125	0.0251*	0.0138	-0.0189	-0.0952
	(-0.11)	-2.01	-0.89	(-1.42)	(-1.17)
DE	-0.00473	0.0364	0.0977***	0.00351	0.249**
	(-0.20)	-1.66	-5.07	-0.47	-3.11
_cons	0.105	0.0104	0.0217	-0.0175	-0.04
	-1.92	-0.21	-0.42	(-0.36)	(-0.13)
N	731	731	731	731	731

t-statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001; *, **, *** 10%, 5%, 1%

Source: Results of data processing from Stata

Table 6: Quantile Regression Results with Dependent Variable Q

Q	QR10	QR25	QR50	QR75	QR90
ESG	0.00156	-0.0011	-0.000731	-0.000844	0.00568
	-1.23	(-1.01)	(-0.58)	(-0.73)	-0.65
ESGCon	0.000372	0.000362*	0.00027	0.000273*	0.00049
	-1.85	-2.24	-1.26	-2.26	-0.5
CSRStra	-0.0000171	-0.000219	-0.000473*	0.000232	-0.00018
	(-0.09)	(-1.26)	(-2.51)	-1.28	(-0.18)
CSRCS	0.00047	0.00025	0.00021	-0.000103	0.000607
	-1.74	-0.54	-0.55	(-0.24)	-0.22
CSRReport	-0.00066	0.000477	0.000537	0.000394	0.0028
	(-0.75)	-0.69	-0.67	-0.5	-0.63
Emission	-0.000426	0.000129	0.000395**	0.000261	0.00141
	(-1.76)	-0.66	-2.59	-1.87	-1.32
CabonTotal	4.40E-11	6.38E-12	-3.53E-11	-3.36E-12	-1.51E-10
	-0.06	-0.01	(-0.07)	(-0.02)	(-0.07)
ENV	0.00000627	0.000105	-0.000205	-0.00019	-0.00285
	-0.02	-0.34	(-0.51)	(-0.60)	(-1.23)
SOC	-0.00119*	0.000146	-0.0000932	0.000506	-0.00257
	(-2.31)	-0.3	(-0.20)	-1.05	(-0.68)
GOV	-0.000771	0.00042	0.00037	0.000244	-0.00234
	(-1.82)	-1.24	-0.86	-0.66	(-0.85)
CSRAudit	0.0210*	0.0149*	0.0200*	-0.0204*	0.00656
	-2.58	-2.06	-2.44	(-2.39)	-0.14
CSRCommittee	-0.0431**	-0.00274	0.022	0.0362	0.0576
	(-2.66)	(-0.08)	-0.87	-1.32	-0.33
SDA	0.106**	0.135***	0.287***	0.208***	1.073***
	-2.62	-5.15	-8.28	-6.48	-5.53
LEV	-0.143*	-0.246***	-0.397***	-0.0892*	-0.815**
	(-2.14)	(-3.45)	(-7.15)	(-2.39)	(-3.07)
LDA	-0.00125	0.0251*	0.0138	-0.0189	-0.0952
	(-0.11)	-2.01	-0.89	(-1.42)	(-1.17)
DE	-0.00473	0.0364	0.0977***	0.00351	0.249**
	(-0.20)	-1.66	-5.07	-0.47	-3.11
_cons	0.105	0.0104	0.0217	-0.0175	-0.04
	-1.92	-0.21	-0.42	(-0.36)	(-0.13)
N	731	731	731	731	731

t-statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001; *, **, *** 10%, 5%, 1%

Source: Results of data processing from Stata

findings demonstrate that FP benefits from deploying emission reduction (high Emission), consistent with numerous research[21,22]. This study supports the idea that incorporating sustainable practices such as reducing emissions can improve a firm's competitiveness and overall performance[60]. This finding reinforces the view that integrating sustainable practices, including emissions reduction, can positively contribute to a firm's overall performance and competitiveness[59].

Total carbon overall has a negative effect on ROE and a positive influence on Q [659], there is a substantial inverse link between corporate value and carbon total. According to Zhang and Vigne[59], the finance-reduction strategy penalizes companies that produce a lot of pollution; thus, these companies also have sluggish revenue growth and bad profitability. Moreover, a firm's financial performance can be impacted by lowering its carbon emissions in several ways[61].

Components of scores E, S, and G have a detrimental effect on financial performance. According to several studies, there is a negative correlation between firm financial performance and environmental performance[62–64]. The main theoretical explanation is that environmental issues increase the management costs of firms and reduce FP. One potential explanation is that firms with stronger corporate governance systems prioritise long-term investments over short-term profits. These investments may initially yield lower returns but have the potential for higher returns in the future. Focusing on long-term strategy and sustainability may make these firms sacrifice immediate profits, leading to a negative association between environmental scores and ROE. Another explanation could be that firms with strong corporate governance structures incur additional costs related to regulatory compliance and ethical practices. In addition, studies by Baatour and Ben Saada, Kabir et al highlight the global diversity in governance practices, indicating that cultural and institutional differences significantly influence the effectiveness of governance mechanisms in improving firm performance[65,66].

Similarly, the impact of social criteria (SOC) on FP shows an inverse effect: The negative association between SOC and ROE suggests that firms with higher SPS scores tend to have lower ROE. This may be because firms focusing more on social responsibility may be less focused on profit maximization.

The regression findings demonstrate a strong positive correlation between the firm's performance, as measured by ROE and ROA, and its financial structure, as measured by total debt. The findings show that decisions about capital structure financing favorably impact on financial success. This only applies to short-term debt, though. Both ROA and ROE are negatively and negligibly impacted by long-term debt. These findings bolster the notion of the pecking order, which is based on actual data showing a negative correlation between capital structure and organizational profitability[67]. Tobin's Q and financial leverage have a positive association; however, ROA, ROE, and financial leverage have negative correlations.

ESG's effect on financial performance differs based on the ROA, ROE, and Q quantiles are presented in Tables 4, 5 and 6 . In other words, the impact of ESG may differ based on the enterprise's size and present level of profitability.

The effects of the environmental, social, and governance (ESG) components change and are not ongoing across quantiles. Reducing pollutants, for instance, can increase profits, but not all businesses will benefit from this.

Although implementing ESG principles can benefit firms in many ways, they are unlikely to result in instant improvements in financial performance. Businesses must carefully assess internal and external factors to make the right investment choices.

The ESG score variable with high percentiles of ROA has a shift in impact sign from positive to negative at the 25th percentile, and the impact becomes positive again at the 90th percentile. At the 25th percentile, businesses in this percentile often have low business efficiency. Investing in ESG can disperse resources, leading to a decrease in ROA in the short term. At the 50th percentile, at the average percentile, improving the ESG score can lead to increased costs and reduced short-term profits due to activities such as investing in green technology and improving working conditions. The ESG score positively impacts ROE at the 10th and 90th percentiles but is not statistically significant. When the ESG score increases to a certain threshold, it begins to have a positive impact on ROE. Companies in the 10th and 90th percentiles may have reached this threshold, while companies in the other percentiles have not. Although it is not statistically significant, the ESG score improves Q at the 10th and 90th percentiles. The ESG Problematic Score (ESGCon) is only statistically significant at the 25th and 75th quantiles, but it has a favorable effect on Q at all quantiles.

The ESG Controversy Score (ESGCon) positively impacts ROA at all percentiles and is statistically significant at the 25th and 75th percentiles. While it has a positive impact on ROE at all percentiles and is

only statistically significant at the 25th and 75th percentiles. This means that the more actively companies in these two percentiles address ESG issues, the higher their return on equity. Effectively handling ESG controversies helps firms reduce legal, reputational, and financial risks for firms.

CSR Strategy (CSRStra) positively impacts on ROA at all quantiles but is not statistically significant. The benefits of CSR can be assessed at any size of enterprise. More and more investors, customers, and employees are concerned about ESG (Environmental, Social, and Governance) issues. Therefore, enterprises implementing CSR activities meet the needs of stakeholders. CSR Strategy (CSRStra) has a negative impact on ROE at all quantiles except 75 but is statistically significant at 50. The results of this study show that implementing a CSR strategy needs to be carefully considered and tailored to each enterprise. Although CSR can bring many long-term benefits, it also comes with short-term costs. Enterprises need to find a balance between business goals and social responsibility. Except for the 75th quantile, CSR Strategy (CSRStra) has a negative effect on Q; nonetheless, this effect is statistically significant at the 50th quantile.

CSR Committee (CSRCS) positively impacts ROA at the 10th, 25th, 50th, and 90th percentile but negatively at the 75th percentile. The publication of CSR reports demonstrates the transparency and responsibility of enterprises, thereby enhancing reputation, attracting customers and investors, and helping enterprises increase profits. CSR Council (CSRC) positively impacts ROE at the 10th, 25th, 50th, and 90th percentiles but negatively at the 75th percentile. CSRC helps enterprises monitor and manage CSR activities more effectively, minimize risks, and increase transparency. At the 10th, 25th, 50th, and 90th quantiles, CSR Committee (CSRCS) has a positive effect on Q; however, at the 75th quantile, it has a negative impact.

The publication of CSR reporting (CSRReport) positively impacts ROA at the 10th, 25th, and 75th percentiles but negatively impacts the 50th and 90th percentiles. The publication of CSR reports helps ensure published information's accuracy, objectivity, and transparency, enhancing the trust of investors, partners, and the public in enterprises. This may lead to an increase in stock prices and a decrease in the cost of capital, thereby increasing ROA. For high quantiles of ROA, the impact of CSR reporting is impractical because CSR reporting for these firms may require very high costs, leading to a decrease in ROA. CSR reporting (CSRReport) has a positive impact on ROE at the 10th quantile and a negative impact at the 10th quantile. At every quantile, CSR Reporting (CSRReport) has a positive effect on Q; at the 75th quantile, it has a negative effect. Only at the 50th quantile does it become statistically significant.

The Emission score positively impacts ROA at all quantiles but is only statistically significant at the 25th and 50th quantiles. The results of this study show that efforts to reduce emissions are not only a social responsibility but also a business strategy, helping businesses increase profits. The Emission index score positively impacts ROE at all quantiles but is only statistically significant at the 50th quantile and has a negative effect. Emissions Score has a positive effect on Q at all quantiles but is only statistically significant at the 50th quantile and is negative at the 10th quantile

Total carbon has a negative impact on ROA at all quantiles but are not statistically significant. Total carbon emissions (CarbonTotal) have a negative impact on ROE at the 50th, 75th, and 90th quantiles, but are not statistically significant. Total carbon emissions tend to have a negative impact on ROE at higher quantiles (50, 75, 90), although they do not reach statistical significance. This shows that reducing overall carbon emissions can benefit businesses in the long run. Total Carbon has a negative impact on Q at the 50th, 75th, and 90th quantiles but is not significant statistically significant.

Environmental score (ENV) has a negative impact on ROA at the 10, 25, 75, and 90 percentiles, but is not statistically significant, positive impact at the 50 percentile. Meanwhile, Social score (SOC) has a negative impact on ROA at the 10 and 25 percentiles, and is statistically significant at the 10 percentile. Positive impact at the 50, 75, and 90 percentiles, but is not statistically significant. Governance score (GOV) has a negative impact on ROA at the 10, 90 percentiles, but is not statistically significant. Positive impact at the 25, 50, 75 percentiles, and is only statistically significant at the 50 percentile. The results of the analysis show that the relationship between environmental, social, and governance (ESG) factors and return on total assets (ROA) is complicated and does not completely follow a specific rule. There is considerable variation in this effect's sign and statistical significance across different quantiles. The environmental score (ENV) has a negative effect on ROE at the 50th, 75th, and 90th quantiles, but it is not statistically significant. It is positive at the 10th and 25th quantiles. The social score (SOC) has a negative impact on ROE at the 10th, 50th, and 90th quantiles. The effect is only statistically significant at the 10th quantile. It is positive at the remaining quantiles, but it is not statistically significant.

The governance score (GOV) has a negative effect on ROE at the 10th and 90th quantiles, but it is not statistically significant. The CSRAudit variable on ROA has a negative effect at the 75th quantile, but it is only statistically significant at the 75th quantile. The CSRAudit variable has a negative effect on ROE at the 75th quantile, but it is statistically significant. The remaining quantiles have positive and statistically significant effects, except for the 90th quantile. Although it is not statistically significant, the Environmental Score (ENV) hurts Q at the 50th, 75th, and 90th percentiles. Impact in the 10th and 25th percentiles is positive. In contrast, Q is negatively impacted by Social Score (SOC) in the 10th, 50th, and 90th percentiles. Only at the 10th percentile is the influence statistically significant. Although not statistically significant, there is a positive influence at the remaining percentiles. Q has been negatively affected by Social Score (SOC) in the 10th and 90th percentiles, however this effect is not statistically significant.

The CSRCommittee variable has a negative impact on ROA at the 10th, 25th, and 50th percentiles, but is not statistically significant, and a positive impact at the 75th and 90th percentiles. The establishment of a CSRCommittee has a negative impact on ROE at the 10^{th} and 25th percentiles, is statistically significant at the 10th percentile, and has a positive effect on the remaining percentiles but is not statistically significant. The results of this study show that the impact of the CSR Committee on ROE is complex and depends on many factors

Although it is not statistically significant, the Environmental Score (ENV) hurts Q at the 50th, 75th, and 90th percentiles. Impact in the 10th and 25th percentiles is positive. In contrast, Q is negatively impacted by Social Score (SOC) in the 10th, 50th, and 90th percentiles. Only at the 10th percentile is the influence statistically significant. Although not statistically significant, there is a positive influence on the remaining percentiles. Q has been negatively affected by Social Score (SOC) in the 10th and 90th percentiles, however this effect is not statistically significant.

There is a statistically significant negative effect of CSRAudit on ROA on Q at the 75th percentile. Except for the 90th quantile, all other quantiles exhibit beneficial and statistically significant impacts.

Short-term debt (SDA) has a positive impact on ROA at the 10th percentile, and is statistically significant, except for the 10th percentile. Long-term debt (LDA) has a negative impact on ROA at the 75th and 90th percentiles. Meanwhile, the Debt ratio (LEV) has a negative impact on ROA at the 75th percentile and is statistically significant at the 75th and 90th percentiles. The Debt-to-equity ratio (DE) has a negative impact on ROA at the 25th percentile and a positive impact at the remaining percentiles and is statistically significant at the 10th percentile. The analysis results show that the relationship between debt indicators (short-term debt, long-term debt, total debt, debt-to-equity ratio) and return on total assets (ROA) is quite complicated and depends on the debt structure of the enterprise. This shows that using debt as a financial tool needs to be carefully considered to optimize business efficiency. Short-term debt (SDA) has a positive impact on ROE at all quantiles and is statistically significant. Long-term debt (LDA) has a negative impact on ROE at the 10th, 75th, and 90th quantiles, and is not statistically significant. The remaining quantiles have a positive impact, and are statistically significant at the 25th quantile. Debt ratio (LEV) has a negative impact on ROE at all quantiles and is statistically significant. The Debt-to-equity ratio (DE) has a negative impact at the 10th quantile and a positive impact at the remaining quantiles and is statistically significant at the 50th and 90th quantiles. Similar to ROA, the use of debt can help increase ROE but also comes with financial risks. Enterprises need to carefully consider the benefits and risks to choose the appropriate capital structure. Short-term debt (SDA) has a positive effect on Q at all quantiles and is statistically significant. Long-term debt (LDA) hurts Q at the 10th, 75th, and 90th quantiles, and is statistically significant at the 90th quantile. The remaining quantiles have a positive effect and are statistically significant at the 25th quantile. The debt ratio (LEV) hurts Q at the 10th quantile, and is statistically significant at the 50th and 90th quantiles.

CONCLUSION AND FUTURE RESEARCH

Using Refinitiv Eikon data, this research explored the effects of ESG and carbon control on the financial performance of firms across the ASEAN6 region. Empirical evidence suggests a positive correlation between ESG practices, CSR strategy, and firm performance metrics such as ROA, ROE, and Q. While carbon reduction efforts also demonstrated a positive impact, the study found that the influence of individual ESG dimensions varies, indicating a nuanced relationship between ESG and financial performance.

According to Shiller, financial markets are crucial in encouraging corporations to engage in social activities [68]. To draw in investors and strengthen corporate accountability, full and open disclosure of ESG information to stakeholders is essential [69].

According to the study's findings, ESG generally improves financial performance. The emission index positively impacts the performance of businesses. To detect the trend, future research must, however, consider the influence of the nonlinear relationship between financial performance and the adoption of social responsibility. Additionally, it must confirm the impact at the industry level, impact on financial structure, and financial efficiency based on field-specific characteristics and methods. Due to data limitations, future studies msut further consider carbon metrics and corporate social responsibility (ESG) practices.

ABBREVIATIONS

CSR: Corporate Social responsibility

ESG: Environment, Social, Govermance

FP: financial performance

CONFLICT OF INTEREST STATEMENT

No potential conflict of interest was reported by the authors.

AUTHOR CONTRIBUTIONS

All authors contributed equally to this work, the contributions of each author are as follows:

- Duong Nguyen Thanh Phuong is responsible for the following contents: Conceptualization, Software, Methodology, Investigation, Formal Analysis, Data Curation, Resources, and Writing – Original Draft, Review & Editing, and Funding Acquisition.

-Nguyen Quoc Anh is responsible for the following contents: Conceptualization, Investigation, Resources, Supervision, and Project Administration.

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